Annexure-VI

भारत सरकार
Government of India
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
पश्चिम क्षेत्रीय विद्युत समिति
Western Regional Power Committee
एफ -3, एमआयडीसी क्षेत्र, अंधेरी (पूर्व), मुंबई - 400 093
F-3, MIDC Area, Andheri (East), Mumbai - 4000 93

आई एस ओ : 9001-2015
ISO : 9001-2015

दूरभाष Phone: 022- 28221636; 28200194;195;196
Website : www.wrpc.gov.in

फैक्स Fax : 022 – 28370193
E-mail : ms-wrpc@nic.in

No: WRPC/AS/ISTS plan./2022/2670

Date: 04.03.2022

To,

Shri P C Garg,
COO, CTUIL,
"Saudamini", 1st Floor, Plot no. 2, Sector-29,
Gurugram - 122001
Haryana.

Sub: **Part MoM of 41st WRPC meeting on the Agenda Item no. 34.1 "ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE Scenario in Southern Region" - reg.**

Sir,

CTU vide letter no. CTU/W/00/WRPC dated 21.01.2022 (copy enclosed) have requested the views of WRPC on "**ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE Scenario in Southern Region**".

The above scheme was discussed in the of 41st TCC/WRPC held on 21/23 February 2022 under Item no. 34.1 and the part MoM of the 41st WRPC meeting along with the comments received from MSEDCL vide their letter no. CE/PP/WRPC/04706 dated 28.02.2022 is enclosed herewith for further needful.

Thanking you.

Yours faithfully,

(Satyanarayan S.)
Member Secretary

Encl: As above

Copy to:
1. Chief Engineer, STU, MSETCL, Prakashganga, Bandra Kurla Complex, Bandra (East), Mumbai 400051

2. Addl. Chief Engineer, R&C/STU, GETCO.
3. Superintending Engineer, STU, MPPTCL.
4. Chief Engineer, STU, CSPTCL.
5. Chief Electrical Engineer, Goa.
6. Chief Engineer, DD &DNH.
7. Chief Engineer (PP), MSEDCL, 5th Floor, Prakashgad, Plot no. G-9, Bandra (East), Mumbai-400051
8. Chief Engineer (PSP&A-I), CEA, Sewa Bhawan, R.K. Puram, New Delhi 110066.

Item no. 34. Any other item

34.1. ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE Scenario in Southern Region

CTU has given two schemes as given in the Annexure 34.1a in which following are recommended:

1. Narendra New (GIS) – Pune (GIS) 765kV D/c line with 1x330MVAr switchable line reactor on each ckt at both ends
2. Upgradation of Narendra (New) (GIS) to its rated voltage of 765 kV level along with 4x1500 MVA transformer and 2x330 MVAr Bus Reactor.

41st TCC meeting Discussions:

CTU representative gave a presentation on the scheme (enclosed at Annexure 34.1b). Detailed scheme scope and capacity and deliberation process undertaken was explained.

MS (WRPC), enquired whether the combined meeting for the constituents of both SR & WR was held or separate meetings were held.

Sh. PS Das, CTUIL representative informed that joint meeting was conducted. GETCO & MP have concurred the proposal. Also the scheme is under discussion in the SRPC, since approval from both the RPC is required. He also informed that RPCs, have to give comments within 45 days as per the order of Ministry of Power and therefore to expedite the matter as timelines have to be met.

41st WRPC meeting Discussions:

MS WRPC explained the agenda position and the discussions of the TCC meeting and requested all the states to give their views.

Gujarat, Chhattisgarh, MP, Goa, DD & DNH had no comments for the agenda.

MSEDCL representative informed that the network planning is not done as per the normal assumptions made for the planning of ISTS network. He requested CTUIL to provide the study case and the assumptions made by CTU since the methodology & the assumptions seems to be unrealistic. He also informed that this issue was also deliberated in SRPC where the constituents

have objected to the methodology of the study for the ISTS network planning. He further informed that Maharashtra STU has not approved the above scheme.

Maharashtra STU representative informed that they have objected about the LILO to Lonikhand-Jejuri line. He further informed that MSEDCL wants the clarification on the PoC charges liabilities on account of this scheme.

Sh. P.S. Das, CTUIL representative informed that all the studies were done as per the standard assumptions. All STUs were invited to the meeting and the study was shared with the constituents. The proposal was moved ahead only after the approval of STUs. He also informed that SRPC constituents did not object to the scheme, they had issues which were suitably replied by CTUIL. He also informed that LILO of Jejuri- Lonikhand Line was removed when Maharashtra STU objected to it. He requested MSEDCL to provide the comments on the issue and the same can be resolved. He also informed that MSEDCL has not raised any objections or given any views till now.

MS (WRPC) requested MSEDCL to give comments on the above scheme on priority basis as only 45 days are given for comments on the scheme. He further informed that views of WRPC may be communicated to the NCT which will take the final decision. He also requested CTU to ensure that all the issues are resolved at the initial levels only so that the States can get sufficient time to discuss it and there should not be any delay at the level of WRPC. He requested all the States Utilities (STU, DISCOM) to discuss the scheme amongst themselves so that objections, if any, be raised at earliest. He requested Maharashtra to send its views on urgent basis to WRPC with a copy to CTU.

Gujarat, MP, Chhattisgarh, Goa, DD & DNH representative did not offer any comments on the scheme in the meeting.

Post meeting update:

MSEDCL vide their letter no. CE/PP/WRPC/04706 dated 28.02.2022 have intimated their views on the above scheme. The copy of the letter is enclosed at Annex 34.1c.

The TCC/WRPC noted the same.

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. No.: CTU/W/00/WRPC

Date: 21.01.2022

Member Secretary
Western Regional Power Committee
MIDC area, Marol, Andheri East,
Mumbai 400 093

Sub: ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region

Dear Sir,

This is with reference to proposed ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region. The scheme was agreed in the 2nd Consultation Meetings for Evolving Transmission Schemes in Western Region (CMETS-WR) held on 28.12.2021 & Southern Region (CMETS-WR) held on 29.12.2021 at an estimated cost of Rs. 2374 Crores. Details of the scheme are given at **Enclosure-I**.

In line with MoP office order no. 15/3/2018-Trans-Pt(5) dated 28.10.2021 regarding reconstitution of NCT, prior consultation with RPC is 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 stipulate 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."

In this regard it may be noted that the scheme would facilitate integration and evacuation of power various from various REZs in SR and cater to SR export requirements under high RE scenario, acting as well to mitigate operational constraints being faced presently. Thus, the scheme acts as an enabler towards achieving the Govt. of India target of establishing 500 GW capacity from non-fossil based energy sources by 2030.

In consideration of above, it is requested that WRPC may forward their views in respect of the "ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region" at the earliest, so that the scheme may be taken up promptly for consideration in the NCT meeting along with the views of WRPC.

Thanking you,

Yours faithfully,

(Partha Sarathi Das)
Sr. General Manager

Encl: As Above

Copy to:

Chief Engineer (PSP&A – I)
Central Electricity Authority
Sewa Bhawan, R.K.Puram,
New Delhi-110 066.

Enclosure-I

ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region

<table>
<tr><th>S. No.</th><th>Items</th><th>Details</th></tr>
<tr><td>1.</td><td>Name of Scheme</td><td>ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region</td></tr>
<tr><td>2.</td><td>Scope of the scheme</td><td>
<table>
<tr><th>Sl.</th><th>Scope of the Transmission Scheme</th><th>Capacity /km</th></tr>
<tr><td>1.</td><td>Narendra New (GIS) – Pune (GIS) 765kV D/c line with 1x330MVAr switchable line reactor on each ckt at both ends</td><td>340 km
765 kV line bays -2 (GIS) (at Narendra New)
765 kV line bays -2 (GIS) (at Pune)
765 kV, 330 MVAr SLR – 2 nos (7 X 110 MVAr incl. 1 switchable spare unit) at Pune (GIS)
765 kV, 330 MVAr SLR – 2 nos (6 X 110 MVAr) at Narendra (New) (GIS)</td></tr>
<tr><td>2.</td><td>Upgradation of Narendra (New) (GIS) to its rated voltage of 765 kV level along with 4x1500 MVA transformer and 2x330 MVAr Bus Reactor.</td><td>765/400 kV, 1500 MVA- 4 no. (13 X 500 MVA incl. 1 spare unit)
765 kV ICT bays- 4 nos.(GIS)
400 kV ICT bays- 2 nos.(GIS)^
765 kV, 330 MVAr BR – 2 nos. (7 X 110 MVAr inc. 1 switchable spare unit to be used for both bus/line reactors)
765 kV Bus Reactor bays – 2 nos. (GIS)</td></tr>
</table>
*Narendra (New)(GIS) - Kolhapur 765kV D/c line to be kept charged at 400kV level
^Two nos. equipped 400kV bays (opposite Koppal line bays) under implementation under TBCB route (Koppal</td></tr>
</table>

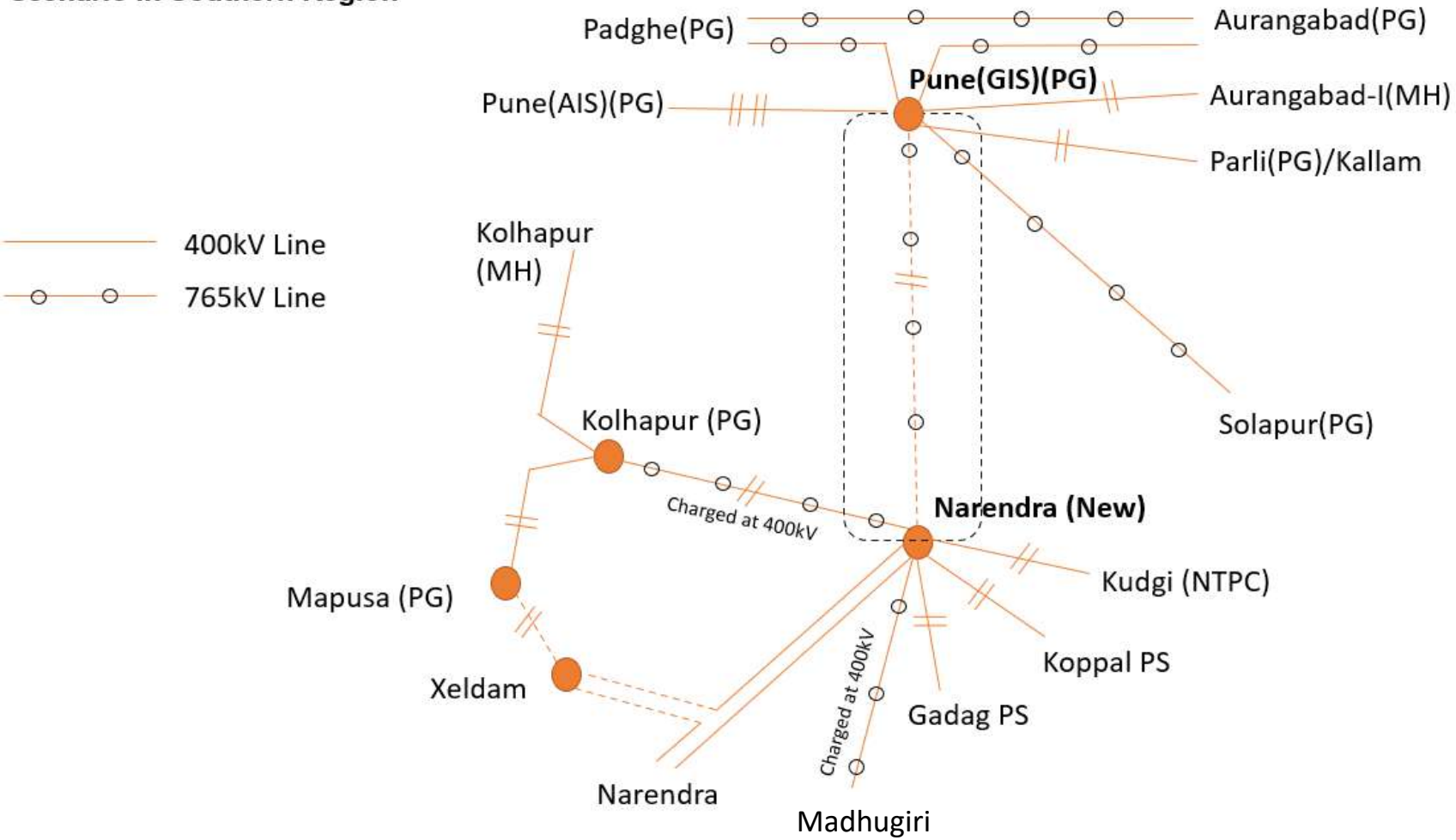
		WEZ scheme) to be utilised for 400kV side of 2 nos. 765/400kV Transformers
3.	Depiction of the scheme on Transmission Grid Map	**Annexure-I**
4.	Upstream/downstream system associated with the scheme	Not applicable
5.	Objective / Justification	To cater to export requirement from SR under high RE scenario as well as to mitigate operational constraints being faced on Kolhapur – Kolhapur(MSETCL) 400kV D/c line under real-time as elaborated below: 1. NLDC as part of operational feedbacks has highlighted the high loadings on transmission lines beyond Kolhapur (i.e. Kolhapur(PG)-Kolhapur(MH) 400kV D/c line, Kolhapur(MH)-Karad 400kV D/c line) which is attributable to multiple factors viz. high generation at Kudgi TPS, low generation at plants in southern Maharashtra, high load around Kolhapur area, high renewable (Solar) generation in Southern Region etc. In addition, number of large RE based generation projects are envisaged in Southern Region especially in the prioritized REZs of Koppal, Gadag, Karur and Tuticorin areas. Stage-II Connectivity and LTA applications have already been received / granted from a number of generation projects in these areas. 2. Transmission system for integration and immediate evacuation of power from these REZs has already been planned and is under different phases of implementation. However, constraints are observed for export of surplus power from REZs in Southern Region to Western Region under high RE scenario in SR. Considering above aspects, the subject network expansion scheme has been proposed between WR and SR for export of surplus power from SR.
6.	Estimated Cost	Rs. 2374 Crore
7.	Impact on the total Annual Transmission charges in % along with the existing ATC	A. ATC (considering Levelized Tariff @15% of estimated cost): 356.1 Crore B. Present ATC: Rs. 41,292.01 Crore[#] C. A/B (%): 0.862%
8.	Need of phasing, if any	Not Applicable
9.	Implementation timeframe	**18 months** from date of allocation to implementing agency / SPV Transfer (as the case may be).

		Tentative time-frame: **Feb'24** (Considering 6 months for necessary approvals & subsequent award of the project)
10.	Inclusion of any wild life/protected area along the transmission line route	No major National Park, Wildlife Sanctuary or other protected areas observed. However, for details of forest/protected areas, survey is required to be done.
11.	System Study for evolution of the proposal	Minutes of Joint study meeting for Western Region & Southern Region regarding transmission system strengthening beyond Kolhapur for export of power from Solar & Wind Energy Zones in Southern Region held on 16.12.2021 are attached at **Annexure-II** with details of study considerations, load flow and short circuit results for various alternatives studied during the meeting.

 # Total YTC allowed for Nov'21, as per Notification of Transmission Charges payable by DICs for Billing Month of January, 2022 dated 25.12.2021 posted on NLDC website

Annexure-I

ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region



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

Ref: CTU/W/07/WR & SR Joint Study

19th Jan, 2022

As per Distribution List

Sub: Joint study meeting on Transmission Planning for Western Region and Southern Region held on 16.12.2021 – Minutes of Meeting

Sir,

Please find enclosed the minutes of the Joint study meeting on Transmission Planning for Western Region and Southern Region held on 16.12.2021 (through video conferencing) to discuss ISTS Network Expansion beyond Kolhapur for export of surplus power during High RE scenario in Southern Region and Constraints at Raigarh (Kotra) under various operating conditions.

Thanking you,

Yours faithfully,

(Partha Sarathi Das)
Sr. General Manager

Encl: Minutes of Meeting

Distribution List:

1.	**Chief Engineer (PSP&A - I)** Central Electricity Authority Sewa Bhawan, R.K.Puram New Delhi-110 066	2.	**Chief Engineer (PSP&A - II)** Central Electricity Authority Sewa Bhawan, R.K.Puram New Delhi-110 066
3.	**Director (SO)** POSOCO B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi-110 016	4.	**Member Secretary** Western Regional Power Committee MIDC area, Marol, Andheri East, Mumbai 400 093
5.	**Chief General Manager I/C** Western Regional Load Despatch Centre F-3, M.I.D.C. Area, Marol, Andheri East, Mumbai-400 093	6.	**Member Secretary** Southern Regional Power Committee 152, Madhava Nagar, Gandhi Nagar, Bengaluru, Karnataka 560001
7.	**Executive Director** Southern Regional Load Despatch Centre 29, Race Course Cross Road, Bangalore- Karnataka-560009	8.	**Managing Director** Gujarat Energy Transmission Corp. Ltd, Sardar Patel Vidyut Bhawan, Race Course, Vadodara -390 007
9.	**Director (Operation)** Maharashtra State Electricity Transmission Co. Ltd., 4th Floor, "Prakashganga", Plot No. C-19, E- Block, Bandra – Kurla Complex, Bandra (East), Mumbai- 400051	10.	**Managing Director** Chhattisgarh State Power Transmission Co. Ltd., Dangania, Raipur- 492 013
11.	**Executive Engineer** Administration of Union Territory of Dadra & Nagar Haveli and Daman & Diu, Secretariat, Moti Daman-395220	12.	**Chairman & Managing Director** Madhya Pradesh Power Transmission Co. Ltd.; Block No. 3, Shakti Bhawan, Rampur, Jabalpur-482 008
13.	**Chief Engineer** Electricity Department The Government of Goa, Malacca Rd, Patto Colony, Panaji, Goa – 403001	14.	**Director (Trans. & System Op.),** Kerala State Electricity Board Ltd. Vidyuthi Bhawanam, Pattom, P.B. No. 1028 Thiruvananthapuram – 695 004
15.	**Director (Transmission)** Transmission Corp. of Andhra Pradesh Ltd. (APTRANSCO) Vidyut Soudha, Gunadala, Eluru Rd, Vijayawada, Andhra Pradesh – 520004	16.	**Director (Transmission Projects)** Tamil Nadu Transmission Corporation Ltd (TANTRANSCO) 6th Floor, Eastern Wing, 800 Anna Salai, Chennai – 600 002
17.	**Director (Grid Operation)** Transmission Corp. of Telangana Ltd. Vidyut Soudha Hyderabad – 500 082	18.	**Director (Transmission)** Karnataka State Power Transmission Corporation Limited, Cauvery Bhawan, Banglore-560009
19.	**Superintending Engineer –I** First Floor, Electricity Department Gingy Salai, Puducherry – 605 001		

Minutes of Joint study meeting for Western Region & Southern Region held on 16.12.2021 over VC regarding ISTS Network Expansion beyond Kolhapur for export of surplus power during High RE scenario in Southern Region and Constraints at Raigarh (Kotra) under various operating conditions

The Joint Study Meeting on Transmission Planning for Western Region & Southern Region was held on 16.12.2021 over Video conferencing amongst CEA, CTU, POSOCO, WR, and SR constituents to discuss ISTS Network Expansion beyond Kolhapur for export of surplus power during High RE scenario in Southern Region and Constraints at Raigarh (Kotra) under various operating conditions. List of participants is enclosed at **Annexure-I**. Sr.GM, CTUIL welcomed the participants. Thereafter, deliberations as per the agenda commenced and the gist of deliberations are as given below.

A. ISTS Network Expansion beyond Kolhapur for export of surplus power during High RE scenario in Southern Region

i. Background:

The following transmission system was agreed in the 2nd SR Standing Committee on Transmission held on 10.06.2019 for evacuation of power from Phase-II Solar Energy Zone in Gadag, Karnataka:

Gadag SEZ (2500 MW)

i. Establishment of 400/220 kV, 5x500 MVA Gadag Pooling Station.
ii. Gadag PS-Koppal PS 400 kV (high capacity equivalent to quad moose) D/C Line.
iii. Gadag PS-Narendra (New) PS 400 kV (high capacity equivalent to quad moose) D/C Line.
iv. 220 kV line bays for interconnection of solar projects (8 nos.)
v. 1x125 MVAr (400 kV) bus reactor at Gadag PS.
vi. Upgradation of Narendra (New) to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x330 MVAr Bus Reactor.
vii. Upgradation of Kolhapur (PG) to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x330 MVAr Bus Reactor.
viii. Upgradation/charging of Narendra new - Kolhapur (PG) 765 kV D/c line (initially charged at 400 kV) to its rated voltage of 765 kV along with 1x330 MVAr switchable Line Reactor on Kolhapur (PG) end of each circuit.

It was also noted that the proposed system strengthening in the inter-regional corridors and system strengthening beyond Kolhapur in Western region shall require all-India study.

Subsequently, study was carried out to check the adequacy of existing IR corridors between WR & SR to cater to export of power from REZs in Southern Region to Western Region under high SR export scenario. The same was discussed in the 3rd WRPC(TP) meeting held on 14.06.2021 and after deliberations, the following was agreed in the meeting:

- Re-conductoring of Kolhapur (PG) – Kolhapur 400 kV D/c line with conductor of minimum capacity of 2100 MVA/Ckt at nominal voltage along with bay

upgradation work at Kolhapur (MSETCL) ***– Being implemented under RTM by POWERGRID***
(Anticipated: Mar'23)

- The strengthening requirement beyond Kolhapur other than reconductoring of Kolhapur (PG) – Kolhapur 400 kV D/c line would be studied in a separate joint study meeting with CEA, CTU, WRPC & POSOCO.

ii. Deliberations and decisions taken in the meeting

CTU informed that NLDC as part of Operational Feedbacks vide its letter dated 02.02.2021 has highlighted high loadings beyond Kolhapur which is attributable to multiple factors viz. high generation at Kudgi TPS, low generation at plants in southern Maharashtra, high load around Kolhapur area, high renewable (Solar) generation in Southern Region etc. (copy of letter enclosed at **Annexure-II**). CTU further informed that comprehensive studies have been carried out to evolve network expansion schemes for addressing the high loadings beyond Kolhapur and also enabling export of power from REZs in Southern Region to Western Region and further to Northern Region under high SR export scenario. Important considerations for carrying out the study are enclosed at **Annexure-III.**

CTU presented the various alternatives studied for evolving above network expansion schemes. Details of the alternatives alongwith outcomes based on studies are given below:

Alternative/Case		**Outcomes based on studies**
I	Base case: (Kolhapur (PG) – Kolhapur (MH) reconductoring) (MW)	Constraints are observed under N-1 contingency of Kolhapur (PG) – Kolhapur(MSETCL) 400kV D/c line, Kolhapur(MSETCL) – Karad 400kV D/c line.
II	Case-I + Upgradation of Narendra New – Kolhapur (PG) to 765kV	Constraints are observed under N-1 contingency of Kolhapur (PG) – Kolhapur(MSETCL) 400kV D/c line, Kolhapur(MSETCL) – Karad 400kV D/c line, Kolhapur(PG) 765/400kV, 2X1500MVA ICTs and Narendra New 765/400kV, 2X1500MVA ICTs.
III	Case-II + Kolhapur (PG) – Pune (PG) 765kV D/c line	Under N-1 contingency of Narendra (New) – Kolhapur(PG) 765kV D/c line, about 3855MW flow is observed on other circuit.
IV	Case-I + Narendra (New)-Kolhapur 400kV D/c line + Narendra New – Solapur 765kV D/c line	Under N-1 contingency of Narendra (New) – Solapur 765kV D/c line, about 3600MW flow is observed on other circuit. Further, high fault level (~ 48A) is observed at 400kV Narendra (New) GIS which is designed for 50kA leaving no margin for future and may possibly cross the design limits with further interconnections.
V	Case-I + Narendra-Kolhapur (400kV D/c line) + Establishment of 2X1500MVA, 765/400 kV Jejuri S/s + Narendra New – Jejuri 765kV D/c line + Jejuri 765kV – Pune (PG) GIS D/c line + Jejuri – Jejuri (MSETCL) 400kV D/c line	Power flows and SC levels are generally in order. Further, it provides additional feed at Jejuri (MSETCL) which leads to improved voltage profile of Jejuri and adjoining areas which generally remain on lower side during peak demand period. Further, reliability of supply w.r.t Jejuri and adjoining areas is improved and in future, any additional drawl requirement of Maharashtra can also be met by LILO or direct feed to nearby loads (Kesurdi, Hinjewadi,

Alternative/Case		Outcomes based on studies
		Lonikhand etc). Four Nos. of 765/400kV, 2X1500MVA. ICTs at Narendra (New) S/s is required.
VI	Case-II + Kolhapur – Jejuri (New) 765kV D/c line + Jejuri (New) 765kV – Pune (PG) GIS D/c line + Jejuri (New) – Jejuri (MSETCL) 400kV D/c line	Under N-1 contingency of Narendra (New) – Kolhapur (PG) 765kV D/c line, about 3830MW flow is observed on other circuit. Four Nos. of 765/400kV, 2X1500MVA. ICTs at Narendra (New) S/s is required.
VII	Case-I + Narendra (New) - Kolhapur (400kV D/c line) + Narendra (New) – Pune (GIS) 765kV D/c line	Power flows and SC levels are generally in order. There would be no additional feed to Maharashtra. However, in case such additional feed is required by MSETCL, Narendra New (GIS) – Pune 765kV D/c line can be LILOed in future at a suitable location as per requirement of MSETCL.

Summary of power flow results for different alternatives along with 3-Phase Short Circuit levels are enclosed at **Annexure-IV.**

WRLDC representative informed that providing additional ISTS feed to west Maharashtra would help improving the voltage profile, which generally remains in the lower side during peak demand period inter alia improving the reliability of power supply for Jejuri and adjoining areas. He added that Jejuri met around 1200 MW of load during peak condition with only two nos. 400kV infeed and N-1 non-compliance was observed in past. He, further added that low voltage and N-1 non-compliance issues in Western Maharashtra area was reported in operational feedbacks of WRLDC. He stated that considering the above facts, Alternative-V would be help in relieving the constraints and the same can be implemented in compressed time frame.

Representative from SRLDC informed that alternative-V & alternative-VII are both feasible. However, considering long length of 765kV Narendra(New)-Pune D/c line and the constraints in Western Maharashtra as informed by WRLDC, Alternative-V would be more beneficial. SRLDC enquired about up-gradation of 765kV Narendra-Kolhapur D/c line which is presently charged at 400kV level. CTU informed that same would be continued at 400kV level presently; however in future if need arises, the corridor would be reviewed for upgradation.

NLDC mentioned that in present scenario also, SR to WR TTC is limited due to constraints in evacuation beyond Kolhapur PG and hence implementation of this scheme on urgent basis would help in relieving transmission constraints.

MSETCL representative stated that thermal and RE generations dispatches at Narendra (New) have been taken on the higher side. They further enquired regarding the feasibility of Narendra (New) to Raichur 765kV D/c interconnection. It was clarified that worst-case scenario has been simulated to check the adequacy of the ISTS system under stressed conditions. Regarding, proposal for Narendra (New) to Raichur 765kV D/c interconnection, it was informed that the option had already been studied and high fault level at Narendra(New) 400kV S/s has been observed with the interconnection due to which the alternative was not found technically feasible and accordingly has not been included in the proposal.

Further, MSETCL informed that LILO of Karad- Lonikand 400kV is now being proposed at Jejuri (MSETCL) S/s instead of earlier planned Kesurdi S/s along with some changes in downstream network. CTU stated that with the proposed changes of MSETCL, there shall not be significant change in the load flows. However, the same shall be incorporated in the studies and revised studies shall be made part of the minutes.

In order to mitigate operational constraints being observed in Western Maharashtra, representative of MSETCL agreed with Alternative-V and stated that location of Jejuri S/s should be close to Jejuri (MSETCL) to take care of ROW issues in that area.

TANTRANSCO representative stated that they need some time for studying the proposal. Towards this CTU informed that they have already received applications in the month of November 2021 of the order of 620 MW seeking transfer of power from SR to NEW Grid and same are to be taken-up for discussions in the upcoming meeting to be held in December. In case the network expansion schemes for enabling export of power from REZs in Southern Region to Western Region are not identified timely, it may not be possible to grant LTA to these applicants and generation may get stranded. Further, in respect of TANTRANSCO observations regarding diversity factors and generation dispatches considered in the System Studies, it was clarified that diversity factors and generation dispatches have been considered as per the methodology finalized in a meeting held in CEA on 11.03.2021 regarding Load Generation Balance for All India Studies for 2024-25 for integration of RE projects (9 scenarios). Further, the worst case scenario (Solar Max (Jun'24 Afternoon Peak)) has been considered for the system studies wherein maximum export is expected from Southern Region.

TANTRANSCO enquired about the LTA applications received in Southern Region. CTU informed that about 4200 MW LTA has been granted from SR to NEW grid with availability of Transmission System for Evacuation of Power from various REZ's in SR and System Strengthening in WR (Reconductoring of Kolhapur (PG) – Kolhapur (MSETCL) 400kV D/c line. Further, additional LTA applications of 620 MW has been received in the month of November 2021.

Representative from APTRANSCO agreed for the proposal. On a specific query from TSTRANSCO, it was clarified that the Import capability of Southern region shall not be hampered and instead the same shall be enhanced with addition of the proposed inter-regional link. TSTRANSCO agreed for the proposal and requested for impact on ATC to be included along with the analysis. CTU further informed that the link shall be taken into consideration for calculation of TTC/ATC once the proposal is approved. APTRANSCO and TSTRANSCO agreed for the proposal.

Representative from KPTCL stated that they need some time for studying the proposals and to submit their comments on the shared study files, however the proposal is agreeable in-principally and comments/observations if any, shall be forwarded separately.

Representative from KSEB found the proposal generally in-order and agreed for the same. However, in case of any specific comments/observations, same shall be submitted separately.

Representative from SRPC stated that the proposal is in-principally agreeable.

CEA stated that creation of Jejuri may be feasible only with consent of MSETCL. In case MSETCL does not agree to the LILO at Jejuri, the direct link viz. Narendra (New)-Pune

765kV D/C may be considered. Upon enquiry from CEA regarding whether the generation in Southern Region can be consumed within the region, CTU stated that export of power from SR is being visualized in present time-frame itself and the same is expected to only increase upon commissioning of more RE generation in Southern Region.

In view of the above deliberations, the following two alternatives were found to be technically in order:

i) Narendra(New) – Pune (GIS) 765kV D/c line(Alternative-VII)
ii) Narendra(New) – Jejuri – Pune (GIS) 765kV D/c line wherein a new S/s at Jejuri was proposed for improved reliability and for mitigating low voltage issues in Jejuri and adjoining areas.(Alternative V)

The merits of the above two alternatives over total 7 nos. alternatives studied in the meeting were observed as below:

- Power flows are generally in order
- Fault level at Narendra(New) is well within its design limits
- Four Nos. of 765/400kV, 1X1500MVA ICTs at Narendra (New) S/s are required (as against 5x1500MVA ICTs required in some of the other alternatives).
- System losses are also low as this alternative results in direct feed of power from generation pockets in SR to load centres in WR
- The alternative of LILO of Narendra(New) – Pune 765kV D/c line at Jejuri improves reliability of power supply as well as leads to improvement in voltage profile of Jejuri and adjoining areas.

It was clarified that the scheme is basically Narendra(New) – Pune (GIS) 765kV D/c line with LILO at Jejuri which is envisaged for increased reliability of power supply and for improvement of voltage profile at Jejuri and adjoining areas. In case MSETCL does not presently require the LILO, the alternative of Narendra(New) – Pune (GIS) 765kV D/c line would be confirmed and LILO at a suitable location as per requirements of MSETCL would be planned in future as a separate scheme.

The matter was further deliberated and MSETCL stated that they are agreeable for both the proposals. However, they agreed to the alternative involving LILO at Jejuri considering the merits and also agreed principally for Jejuri–Jejuri (MSETCL) 400kV D/c interconnection. MSETCL further stated that they would be seeking approval of their higher management in respect of the LILO and interconnection with MSETCL network but are otherwise in agreement with the rest of the proposal, viz. Narendra(New)-Pune(GIS) 765kV D/c line.

After deliberations in the Joint Study meeting, Alternative-V (Establishment of 2X1500MVA, 765/400 kV Jejuri S/s, Narendra New – Jejuri 765kV D/c line , Jejuri 765kV – Pune (PG) GIS D/c line & Jejuri – Jejuri (MSETCL) 400kV D/c line) was technically **agreed in-principle** by all constituents with implementation time-frame of **18 months** from date of allocation to implementing agency / SPV Transfer (as the case may be).

It was further concluded that MSETCL would confirm regarding approval of higher management w.r.t LILO at Jejuri and interconnection with MSETCL.

However, in the 2nd Consultation Meeting for Evolving Transmission Schemes (CMETS) in Western Region was held on 28.12.2021, MSETCL stated that they are yet to obtain approval of higher management. MSETCL added that barring the LILO at Jejuri and interconnection with MSETCL, they in agreement with the rest of the proposal, viz.765kV Narendra(New)-Pune D/c line.

CTU stated that the subject scheme is required on urgent basis considering the export requirement from SR under high RE scenario as well as to mitigate operational constraints being faced w.r.t line loadings of Kolhapur – Kolhapur(MSETCL) 400kV D/c line in real-time. MSETCL was requested to expedite approval from higher management and confirm regarding 400kV interconnection(s) from the proposed 765/400kV Jejuri S/s within 2 weeks of the meeting. MSETCL agreed for the same.

Subsequently, MSETCL vide e-mail dated 11.01.2022 informed that at present MSETCL does not require any 400 kV bays from the proposed 765/400 kV Jejuri (PG) S/s.

It may be noted that during the joint study meeting, the alternative of direct interconnection of Narendra(New) with Pune(GIS) through 765kV D/c line was found to be technically in order. However, in order to address low voltage issue as well as for improved supply reliability for Jejuri and adjoining areas, it was suggested that Maharashtra may be given an additional feed at Jejuri, vide LILO of the above line and establishment of a new ISTS Substation at Jejuri. However, since 400kV outlets from the proposed Jejuri S/s are now not required by MSETCL, it was agreed that the same shall be dropped and instead of Narendra(New) – Jejuri – Pune(GIS) 765kV D/c corridor, the Narendra(New) – Pune(GIS) 765kV D/c line shall be implemented under above scheme with implementation time-frame of **18 months** from date of allocation to implementing agency / SPV Transfer (as the case may be).

In view of the above, the details of the finally agreed scheme (Alternative-VII) are given below:

ISTS Network Expansion scheme between Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region

Sl. No.	***Scope of the Transmission Scheme***	***Capacity /km***
1.	Narendra New (GIS) – Pune(GIS) 765kV D/c line with 1x330MVAr switchable line reactor on each ckt at both ends	340 km 765 kV line bays -2 (GIS) (at Narendra New) 765 kV line bays -2 (GIS) (at Pune) 765 kV, 330 MVAr SLR – 2 nos (7 X 110 MVAr incl. 1 switchable spare unit) at Pune

Sl. No.	*Scope of the Transmission Scheme*	*Capacity /km*
		765 kV, 330 MVAr SLR – 2 nos (6 X 110 MVAr) at Narendra (New)
2.	Upgradation of Narendra (New) (GIS) to its rated voltage of 765 kV level alongwith 4x1500 MVA transformer and 2x330 MVAr Bus Reactor.	765/400 kV, 1500 MVA- 4 no. (13 X 500 MVA incl. 1 spare unit) 765 kV ICT bays- 4 nos.(GIS) 400 kV ICT bays- 2 nos.(GIS)^ 765 kV, 330 MVAr BR – 2 nos. (7 X 110 MVAr inc. 1 switchable spare unit to be used for both bus/line reactors) 765 kV Bus Reactor bays – 2 nos. (GIS)

**Narendra (New)(GIS) - Kolhapur 765kV D/c line to be kept charged at 400kV level*

^Two nos. equipped 400kV bays (opposite Koppal line bays) under implementation under TBCB route (Koppal WEZ scheme) to be utilised for 400kV side of 2 nos. 765/400kV Transformers

The Narendra New (GIS) – Pune 765kV D/c line may be LILOed in future at a suitable location as per requirement of MSETCL.

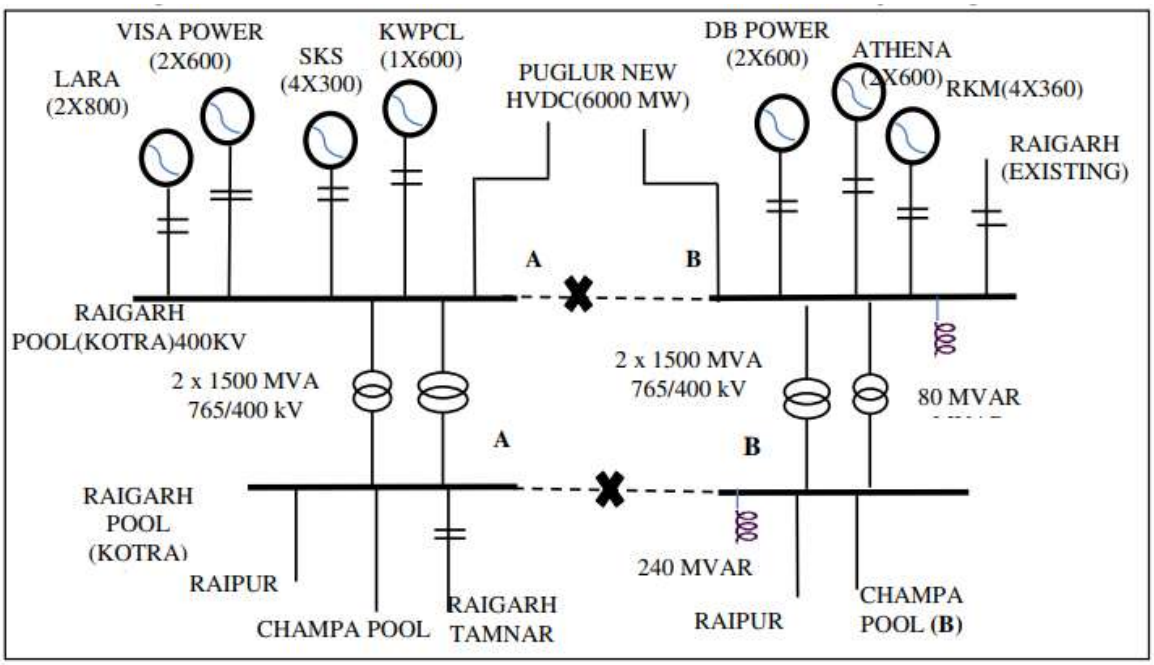
Study exhibits are enclosed at Annexure-V.

B. Constraints at Raigarh (Kotra) under various operating conditions

i. Background:

CTU representative informed that in order to contain high fault level at 765/400 kV Raigarh (Kotra) PS due to large number of thermal generating units expected to be connected in the vicinity of Raigarh (Kotra), bus split arrangement at 400 kV and 765kV at Raigarh (Kotra) PS was agreed in the 39th Standing Committee Meeting of Western Region held on 30th Nov 2015. Raigarh Pool (Kotra) to Raigarh (Existing) 400 kV D/c line was also agreed to be operated as normally open and may be switched on as per operational requirement of grid.

Schematic of the splitting arrangement at Raigarh (Kotra) PS is shown below:



At present, some of the generating stations planned to be connected at Raigarh PS viz., Athena Power (2x600 MW– Bus Section-B) and Visa Power (2X600 MW – Bus Section-A) have been abandoned and are unlikely to come up in the future.

It was informed that ± 800kV, 6000 MW HVDC Raigarh-Pugalur link between Western region and Southern Region has the provision to operate in reverse mode with 3000MW power order. However, the splitting arrangement was proposed considering WR as surplus and SR as deficit region.

In view of the above, following issues are observed:

a. With HVDC operating under blocked mode or reverse mode during high renewable generation in southern region and high generation at Raigarh (Kotra) PS, 2x1500 MVA, 765/400 kV ICTs at Raigarh PS Bus sections (A & B) may become N-1 non compliant.
b. With HVDC operating under forward mode and under low generation at either of the buses, 2x1500 MVA, 765/400 kV ICTs at Raigarh PS Bus sections (A & B) may become N-1 non compliant

It was further informed that the matter at (a) above (reversal mode) was deliberated in 1st SRPC (TP) meeting held on 16.12.2019, wherein, SR constituents insisted on a tangible plan to bring the Raigarh-Pugalur-Trissur HVDC corridor in to beneficial use so as to avoid the up-gradation of the existing ISTS corridors. Further, the matter was also deliberated in 38th SRPC meeting held on 23.12.2020, wherein, SR constituents expressed concern on beneficial utilization of the HVDC Raigarh (Chhatisgarh)-Pugalur (TN)-Trissur (KER) corridor in view of present surplus scenario and optimistic RE capacity addition projections in SR. SRLDC stated that in view of surplus scenario and optimistic RE capacity addition projections, this HVDC system could also be used for export of power. It was deliberated that Raigarh-Pugalur HVDC system can operate in the reverse mode by minor investment at Raigarh vide augmentation of ICTs.

The issue was also highlighted by WRLDC during the testing of HVDC Raigarh – Pugalur Bipole – II i.e. (Pole- 3 & 4) for which operationalization of the approved bus split arrangement at 400 kV Raigarh (Kotra) PS was required.

The HVDCs can be operated at various power orders during the day as per the grid requirement. Accordingly, operation of Raigarh – Pugalur HVDC in both the directions needs to be facilitated. Considering the above, study has been carried out to identify strengthening requirement beyond Raigarh (Kotra) PS under various operating conditions.

iii. Deliberations and decisions taken in the meeting

CTU representative briefed the participants that studies have been carried out to evolve a scheme for enabling operation of Raigarh-Pugalur HVDC link in reverse mode from Southern Region to Western Region under high SR export scenario. Important considerations for carrying out the study are enclosed at **Annexure-VI.** Details of the studies are given below and schematic of study results are enclosed at **Annexure-VII**:

- In reverse flow case, in order to make the Raigarh (Kotra) 765/400kV ICTs N-1 compliant on each section, 1x1500MVA ICT is proposed at Section-A and 2x1500MVA ICTs are proposed at Section-B.
- N-1 ICT Flows – Section A: 2x1335MW; Section B: 3x1304MW. Section A ICTs remain N-1 compliant (2x1485MW) [Champa – Kurukshetra Bipole-1 Dispatch of 2000MW has been considered i.r.o the Bus section with which Lara is connected].
- Raigarh (Kotra) (Sec-B) – Champa 765kV S/c line flow of 3900MW is observed under outage of Raigarh (Kotra) (Sec-B) – Raipur Pool 765kV line. Similar flow is observed on Raigarh (Kotra) (Sec-B) – Raipur Pool 765kV line under outage of Raigarh (Kotra) (Sec-B) – Champa 765kV S/c line. However, the thermal limit and angular difference of the lines are within limits. It is proposed that under such outage conditions, the 765kV bus sectionalizer may be kept closed to ensure system reliability till the outage is restored.
- The proposed ICTs shall also help to maintain N-1 compliancy under forward flow case (full dispatch of 6000MW) and under low generation at either of the Raigarh (Kotra) 400kV bus sections
- With the above proposed ICTs on both the sections, fault level at 400kV Section-A is about 45kA and Section-B is about 30kA.

WRLDC representative informed that as per standing committee decision, 400kV bus sectionalizer breakers at Kotra would be opened shortly. However, that would result in constraint in HVDC operation at full capacity and hence two 765/400kV ICTs at Kotra Section-B and one 765/400kV ICT at Section-A may be agreed as mentioned by CTU.

WRLDC further informed that opening of 765kV Bus sectionalizer breaker under the present scenario could be reviewed. He further added that in Chhattisgarh, Pooling stations at Champa, Kotra, Tamnar etc. were planned to evacuate large quantum of power from coal based thermal generating stations but at present only around 50% of

the capacity has been commissioned and the same are also not expected to come up in near future as various projects have got abandoned. Considering the present circumstances, short circuit level at 400kV Kotra is required to be addressed and in future opening of 765kV bus sectionalizer may be reviewed.

CTU informed that Raigarh-Puglur HVDC was planned with bus sectionalizer breakers in open condition at 765kV as well as 400kV level and hence it may not be possible to keep breakers at 765kV level in closed condition as this may require separate studies w.r.t various controller settings at Kotra viz. Sub Synchronous Damping Control (SSDC), Reactive Power Control (RPC), Runback Control/Frequency Control of each Bipole,etc which are designed considering network elements connected at respective AC buses with bus split arrangement.

WRLDC representative informed that the purpose of sectionalizing bus section was to address the issue of high short circuit level but presently with 765kV Bus sectionalizer closed and that at 400kV open, the actual short circuit level at 765kV is much below the design level. He further added that recently opening of 765kV & 400kV Bus sectionalizer breakers at Champa PS had been done to control the SC level. This had resulted in severe high voltage beyond IEGC operating band despite having bus reactors at 765kV & 400kV levels. Further, opening of 765kV bus sectionaliser would lead to less reliability for evacuation of power from 765kV Kotra PS.

On enquiry, CTU informed that under reverse mode of HVDC operation with 3000MW power order in Raigarh-Pugalur HVDC link, in case of tripping of one 765kV line from Section-B, the other circuit would be loaded to around 3900MW and hence during such contingencies, modulation of HVDC link, 765kV bus sectionalizer closing or any other appropriate measures can be taken.

CTU stated that reduction of TTC/ATC by NLDC in WR to SR direction with the operationalization of Bus split arrangement at Raigarh (Kotra) is not agreeable as calculations are not in line with transmission planning criteria and NLDC has considered highly skewed generation dispatches on both the sections.

NLDC representative informed that capacity connected at 400kV Section-A is about 2800MW and that at Section-B about 2640MW and the generation considered while assessing the export TTC/ATC based is based on past generation data only. He added that when generation is below 1500MW in Section-B, ICTs would be N-1 non-compliant when HVDC Raigarh-Puglur Bipole-1 flow from WR to SR is 3000MW. He further, added that generation in Section-A remains between 0-700 MW most of the time, whereas generation in Section-B generation varies and even a minimum of about 500 MW has also been observed. Hence, considering worst credible contingency scenario and based on generation availability, import TTC is being reviewed by NLDC. Generation trend for past one year was also shown to the forum by NLDC.

After discussions, it emerged that Section-A was having no LTA (excluding LARA STPP) whereas Section-B is having LTA of around 1200MW. However, at Section-A 2800MW capacity of thermal generator is connected and at Section-B around 2640MW capacity of thermal generator is connected. Accordingly, ample amount of generations are available on both the sections.

CEA representative stated that under low generation scenario on Section-A and with Bipole flow of 3000MW, opening of Lara-Champa PS 400kV D/c line may also be

explored so that power from Lara STPS is diverted to Section-A. It was informed that the same needs to be taken up with NTPC as it involves opening of Lara-Champa 400kV D/c lines.

It was informed that under low generation scenario on both the buses, if any contingency of ICT occurs then modulation of Champa-kurukshetra HVDC link, closing of 400kV sectionalizer breaker, opening of Lara-Champa 400kV D/c lines or any other appropriate measures can be taken without reduction in import capability of SR. It was also mentioned that with the implementation of proposed ICTs on both the sections, the constraints under import scenario of SR with skewed generation at Raigarh (Kotra) would also be resolved.

Representative from TANGEDGO stated that the Raigarh – Pugalur HVDC link was approved to facilitate power from NEW Grid to SR Grid for a capacity of 6000 MW. However the same may not be utilized as planned in case of reduction of ATC due to operational constraints. In such a situation, the tariff for the subject scheme may not be approved and the same has been raised by TANGEDCO before CERC. It is also requested to clarify whether the reduction in ATC shall be continued until the referred ICT augmentation is implemented.

Towards this, CTU informed that the scenario has entirely changed from the time the transmission system was planned. A number of generators have either been abandoned or have relinquished their LTA. The generation considered by POSOCO is very skewed and may occur very rarely. Further such occurrences may be considered as operational matter and shall be dealt accordingly. In view of the above, CTU clarified ATC/TTC is not being reduced. The Raigarh – Pugalur HVDC link shall be utilized for 6000 MW; however in case any constraints are observed in export of power to Southern Region, interim measures like modulation of Champa-kurukshetra HVDC link, closing of 400kV sectionalizer breaker, opening of Lara-Champa 400kV D/c lines or any other appropriate measures shall be implemented to ensure the same.

After discussions it was decided that review of opening of bus sectionalizer breakers at 765kV & 400kV Kotra PS would be studied separately amongst CEA, CTU & POSOCO along with PGCIL if required as it is an operational issue.

After deliberations, the following transmission system augmentation was agreed under ISTS with implementation time-frame of 12 months from date of allocation to implementing agency:

Western Region Expansion Scheme-XXV (WRES-XXV)

- Augmentation of transformation capacity at Raigarh(Kotra) by 1x1500MVA, 765/400kV ICT at Section-A (3rd ICT on Section A) and by 2x1500MVA, 765/400kV ICTs at Section-B (3rd & 4th ICTs on Section B) along with associated ICT bays.

Annexure-I

List of Participants

Name	Organization	Designation
Vikas Sachan	Central Electricity Authority	Deputy Director
J Ganesh Rao	Central Electricity Authority	Deputy Director
N S MALINI	SRPC	Executive Engineer
Pushpa Seshadri	WRLDC, POSOCO	General Manager
Pradeep Kumar Sanodiya	WRLDC, POSOCO	Manager
M Venkateswara Rao	WRLDC, POSOCO	Dy. Manager
Priyam Jain	NLDC, POSOCO	Manager
Prabhankar Porwal	NLDC, POSOCO	Dy. Manager
Goodelli Madhukar	SRLDC, POSOCO	DGM
Sanjeev Bhole	MSETCL	CE (STU)
Deepak Rokade	MSETCL	Consultant
Dipak Patel	GETCO	SE (GETCO)
M. Sheshagiri	TSTRANSCO	Divisional Engineer/ System Studies-II
G Ramesh Kumar	TANGEDCO	EE, System Studies
T Sumathi	TANGEDCO	EE, System Studies
G Rammohan	APTRANSCO	AEE
Vishwanath Naik	KPTCL	CE, Planning
Gayatri Kulkarni	KPTCL	EE, Power System Studies
Meetha Jadav	KPTCL	AEE, Power System Studies
Anu.S.Ramesh	SLDC, Kerala	AE
P.S. Das	CTUIL	Sr GM
Anil Kr. Meena	CTUIL	Sr DGM
Bhaskar Wagh	CTUIL	Ch. Manager
Ajay Dahiya	CTUIL	Ch. Manager
Pratyush Singh	CTUIL	Manager
Ankush Patel	CTUIL	Manager
Shashank Shekhar	CTUIL	Dy. Manager
Ajay Kumar	CTUIL	Engineer

Annexure-II
(under Annexure-VI)

पावर सिस्टम ऑपरेशन कॉर्पोरेशन लिमिटेड
(भारत सरकार उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Government of India Enterprise)
केन्द्रीय कार्यालय : 61, आई एफ सी आई टावर, 8 एवं 9वी मंजिल, नेहरू प्लेस, नई दिल्ली–110019
Corporate Office : 61, IFCI Tower, 8 & 9th Floor, Nehru Place, New Delhi - 110019
CIN : U40105DL2009GOI188682, Website : wwwposoco.in, E-mail : posococc@posoco.in, Tel.: 011-40234672

संदर्भ: NLDC/SO/CEA/RPC/KLHR/ दिनांक: 02nd Feb 2021

To,

Member Secretary **Southern Regional Power Committee** 152, Madhava Nagar, Gandhi Nagar, Bengaluru, Karnataka 560001	**Member Secretary** **Western Regional Power Committee** M.I.D.C. Central Road, Seepz, Andheri East, Mumbai, Maharashtra 400093

विषय:– High Loading of 400 kV Kolhapur (PG) – Kolhapur (MS) D/C lines and Remedial Measures – Regarding

Sir,

400 kV Kolhapur (PG) – Kolhapur (MS) D/C (twin moose) is an important line on the Southern and Western regional boundary of the Indian grid (network diagram enclosed at **Annexure-I**). The line connects southern Maharashtra area in the Western Region with Kudgi TPS (3x800 MW) in the Southern Region and is also important for connecting the Mapusa (Goa) system with Kolhapur (PG).

The high loading of 400 kV Kolhapur (PG) – Kolhapur (MS) D/C has been highlighted by NLDC/RLDCs through its various Operational Feedbacks as well as in different forums. Recently, during Dec'20 – Jan'21 period, the power flow on this line has been observed to be very high with N-1 compliance issues being faced for significant period (trend enclosed at **Annexure-II**). The high loading on the line during this period may be attributed to multiple factors viz., high generation at Kudgi TPS (after revision in its variable charge), low generation at plants in southern Maharashtra region (Koyna HEP, Jaigad, RGPPL etc.), high load around Kolhapur area, high renewable (solar) generation in southern region etc.

NLDC and RLDCs are undertaking various measures in operations horizon such as reduction in power order of HVDCs towards southern region (Talcher – Kolar, Bhadrawati, Raigarh - Pugalur) to the extent possible to relieve the loading of 400 kV Kolhapur (PG) – Kolhapur (MS) D/C. HVDC Raigarh-Pugalur is also being reversed (towards WR) during the high loading period This reversal of HVDC Raigarh - Pugalur is resulting in another constraint in the form of high loading of 400 kV Lara – Raigarh (twin moose) D/C line especially during low generation at Lara TPS. Similarly, during high generation at Lara TPS, loading of 400 kV Lara – Champa D/C line is observed to be on the higher side. Further, reduction in HVDC B'wati after a certain

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extent is getting restricted due to high loading of 400 kV Warora (MS) – Wardha (PG) line (details enclosed at **Annexure-III**).

Apart from above, the additional measures that will significantly help in controlling the loading of 400 kV Kolhapur (PG) – Kolhapur (MS) D/C line in both operational as well as long-term horizon are given below:

a) Operationalization of 220 kV Kolhapur - Chikodi & 220 kV Mudshingi – Chikodi lines in such a way that Maharashtra load gets fed from Karnataka. This will significantly relieve the loading of 400 kV Kolhapur (MS) – Kolhapur (PG) D/C. Therefore, operationalization of these lines may be taken up with the concerned states on priority. Some load rearrangement by MSETCL might be required to keep loading of these 220 kV line within limits.

b) Bypassing of 400 kV Koradi II - Wardha (PG) line and 400 kV Wardha (PG) – Warora line at Wardha (PG) (forming 400 kV Koradi II – Warora 400 kV line) is already approved in 41st WR SCM meeting (minutes enclosed at **Annexure- IV**). Operationalization of this bypass arrangement on priority basis may be ensured to address the high loading constraint on 400 kV Warora (MS) - Wardha (PG) line during reversal of HVDC Bhadrawati.

c) Restoration of 400 kV Solapur – Karad line (MSETCL) which is under outage since Nov 2017 (subsequently some portion of this line has been utilized for 220 kV Solapur-Jeuri line) will also help in relieving the loading of 400 kV Kolhapur (MS) – Kolhapur (PG) D/C. The early restoration of this line may therefore be taken up with concerned agencies.

d) The possibility of increase in generation in the Southern/Western Maharashtra and reduction in Southern Region to address the high loading issue on 400 kV Kolhapur (MS) – Kolhapur (PG) D/C may be explored. Similarly, possibility of network reconfiguration which might help in addressing the constraint may also be explored in consultation with concerned states.

e) The operation of HVDC Raigarh – Pugalur in reverse direction (towards WR) poses constraint of high loading of 400 kV Lara – Raigarh (twin moose) D/C line especially under high generation at Raigarh PS and low generation at Lara TPS. The addressal of this also needs to be discussed and requisite actions need to be initiated accordingly.

f) Following system upgradation scheme has already been agreed in joint study meeting between CEA, CTU and POSOCO. Same was also put up for approval in 2nd SRPC (TP) meeting held on 01st Oct 2020.

- Reconductoring of 400 kV Kolhapur (PG) - Kolhapur (MS) D/C
- Construction of 765 kV Kolhapur (PG) -Pune (GIS) D/C

The scheme however could not be discussed and finalized in the meeting.

Further, the power flow on Western Maharashtra Axis is observed to be on the higher side during morning hours with the flow crossing 7000 MW on some occasions (details enclosed at **Annexure – V**).

Outlets to either Pune or Padghe from Kolhapur (PG) as mentioned above will provide additional connectivity to western Maharashtra area from southern region and will significantly enhance the reliability of the power supply in this area. Therefore, the approval and implementation of the proposed scheme can be taken up.

The availability of 400 kV Kolhapur (PG) – Kolhapur (MS) D/C line is critical for reliable power supply to Goa, southern Maharashtra (Kolhapur area) region as well as for safe evacuation of power from Kudgi TPS. With increase in renewable energy penetration in southern region, the loading of this line is expected to increase further. As the outage of this line could result in a large disturbance in Kolhapur area, it is of utmost importance that the issues are taken up at the earliest.

In view of above, it is requested to kindly take up these issues with all the concerned for implementation of above-mentioned measures.

Thanking you,

Yours Sincerely,

(Debasis De)
Executive Director, NLDC

Encl: As above

Copy to:

1. Chief Engineer (PSP&A-I) / (PSP&A-II) Central Electricity Authority, New Delhi — **with request to further taking up points (e) & (f)**
2. Chief Operating Office (CTU), POWERGRID, Gurgaon
3. Executive Director, WRLDC / SRLDC

Annexure-I

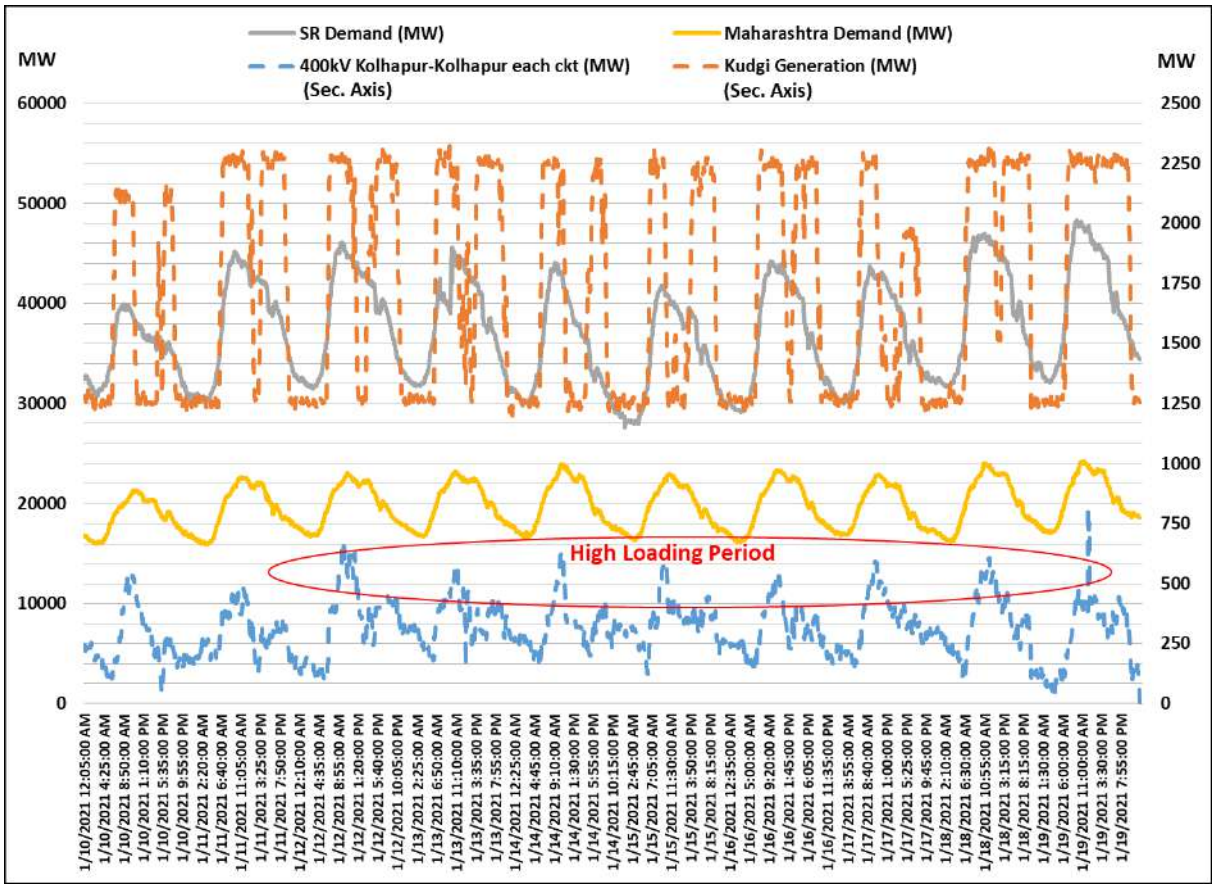
Network Diagram

Kolhapur (MS) – Kolhapur (PG) D/C

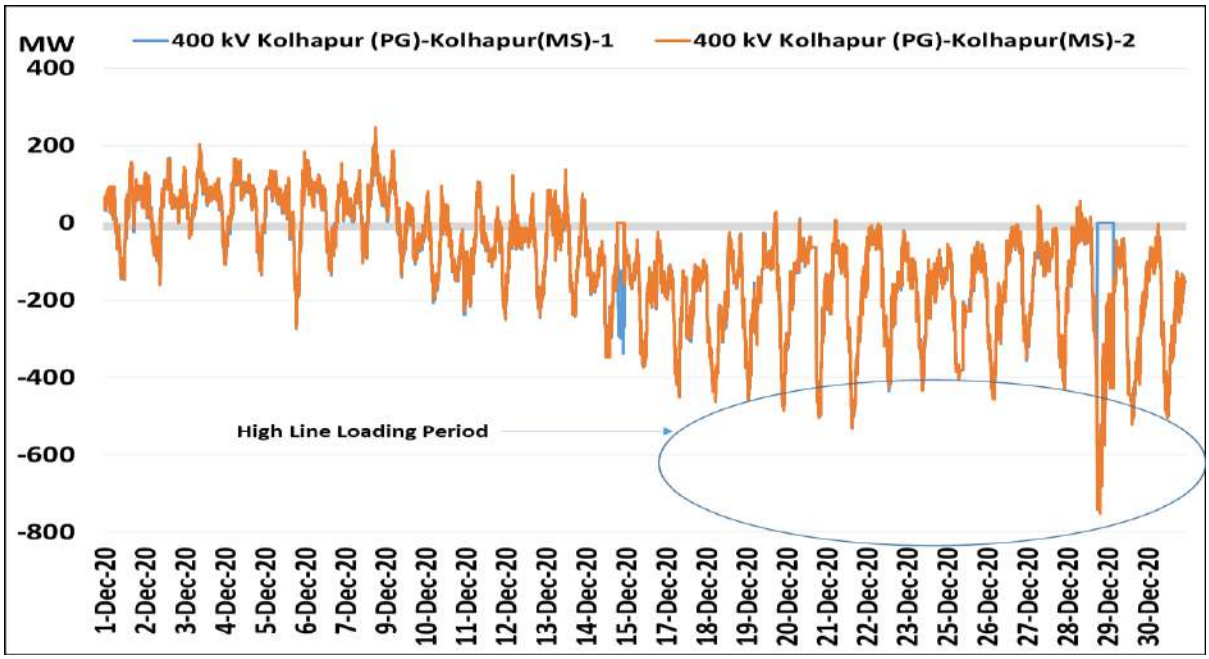
Annexure-II

Line Loading of 400 kV Kolhapur (PG) - Kolhapur (MS) D/C

10th Jan 2021 – 19th Jan 2021

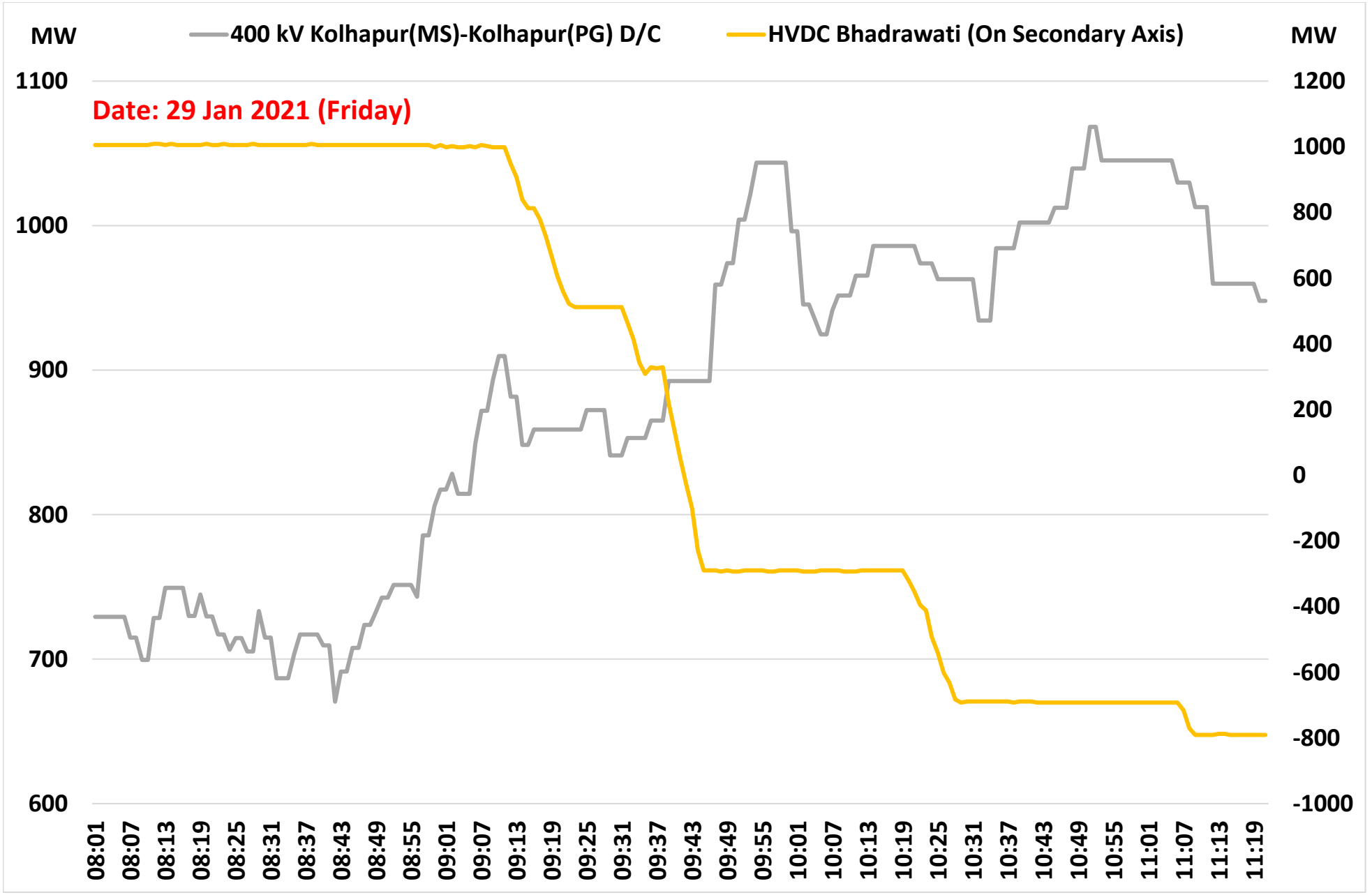


Dec 2020



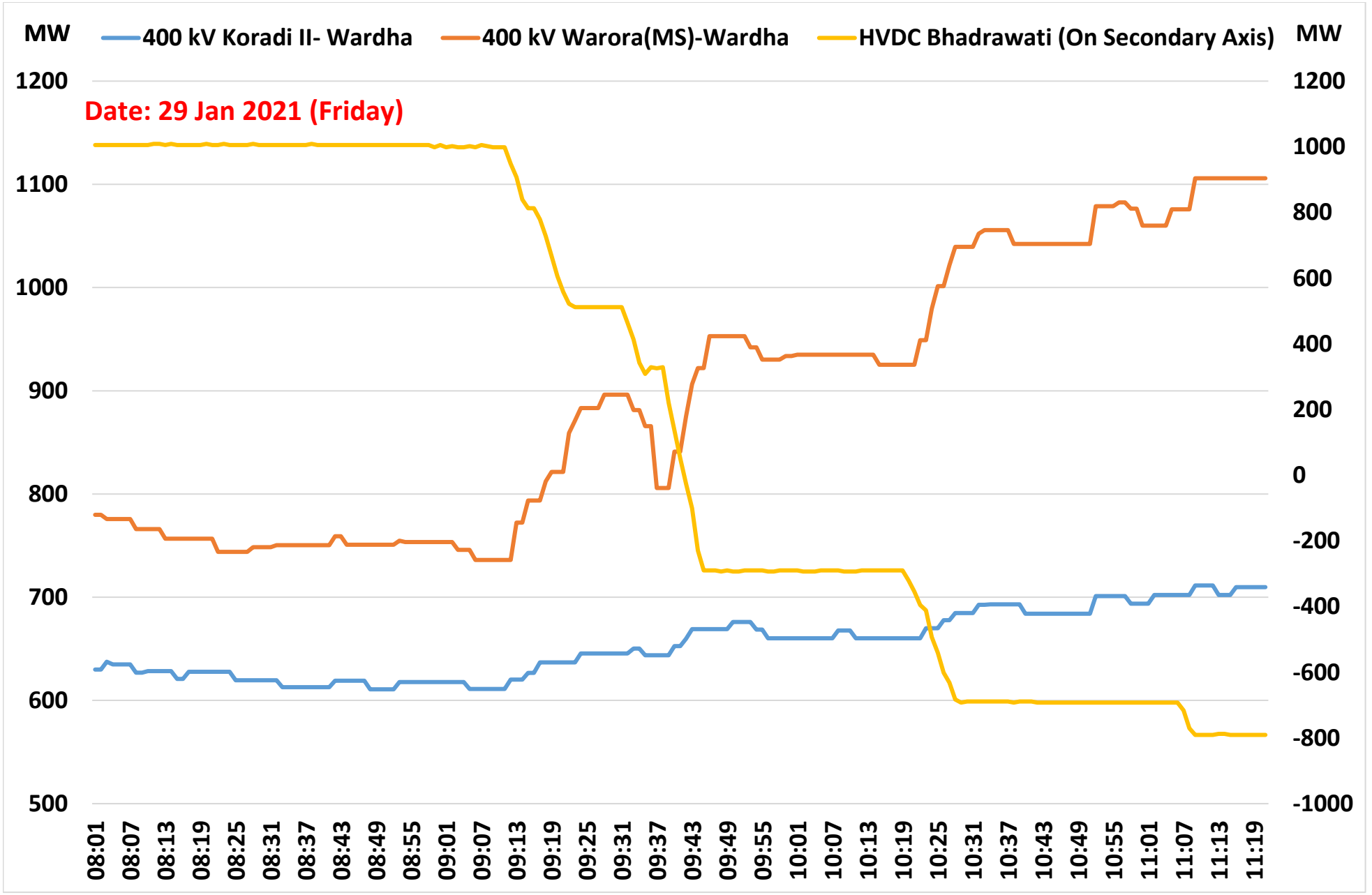
Annexure-III

Line Loading of 400 kV Kolhapur (PG) - Kolhapur (MS) D/C and HVDC Bhadrawati - 29th Jan 2021



Annexure-III

Line Loading of 400 kV Wardha - Waroda D/C, Koradi-II - Wardha D/C and HVDC Bhadrawati



Annexure-IV

भारत सरकार / Government of India
विद्युत मंत्रालय / Ministry of Power
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग - I
Power System Planning & Appraisal Division-I
सेवा भवन आरण केण पुरम नई दिल्ली–110066
Sewa Bhawan, R. K. Puram, New Delhi-110066 [ISO: 9001:2008]
वेबसाइट / Website: www.cea.nic.in

No. 26/10/2017/PSP&PA-I/92- 106 **Date: 16.02.2017**

1. The Member (PS), Central Electricity Authority, Sewa Bhawan, R. K. Puram, New Delhi-110066
2. The Member Secretary, Western Regional Power Committee, MIDC Area, Marol, Andheri East, Mumbai Fax 022 28370193
3. The Director (Projects), GCIL, Saudamini, Plot No. 2, Sector-29, Gurgaon-122001 Fax 0124-2571760/2571932
4. Chairman and Managing Director, MPPTCL, Shakti Bhawan, Rampur, Jabalpur-482008 Fax 0761 2664141
5. The Managing Director, CSPTCL, Dangania, Raipur (CG)-492013 *Fax 0771 2574246/ 4066566*
6. The Managing Director, GETCO, Sardar Patel Vidyut Bhawan, Race Course, Baroda-390007 Fax 0265-2338164
7. Director (Operation), MAHATRANSCO, 'Prakashgad', Plot No.G-9, Bandra-East, Mumbai-400051 Fax 022-26390383/26595258
8. Chief Engineer (Trans), NPCIL, 9S30, VS Bhavan, Anushakti Nagar, Mumbai-400094 Fax 022-25993570
9. The Executive Director (Engg.), NTPC Ltd., Engg. Office Complex, A-8, Sector-24, NOIDA 201301 *Fax 0120-2410201/2410211*
10. The Chief Engineer, Electricity Department, The Government of Goa, Panaji Fax 0832 2222354
11. Executive Engineer (Projects) UT of Dadra & Nagar Haveli, Department of Electricity , Silvassa *Ph. 0260-2642338/2230771*
12. Executive Engineer, Administration of Daman & Diu (U.T.), Department of Electricity, Moti Daman-396220 *Ph. 0260-2250889, 2254745*
13. GM, WRLDC, Plot no F-3, MIDC Area, Marol, Andheri(East) Mumbai-400093 Fax no 022-28235434
14. CEO, POSOCO, B-9, Qutab Institutinal Area, Katwaria Sarai, New Delhi-110016 Fax 011-26852747
15. Director (Trans), MoP, Shram Shakti Bhawan, Rafi Marg, New Delhi

Sub: Minutes of the 41st Standing Committee meeting on Power System Planning of Western Region

Sir / Madam,

The minutes of the 41st Standing Committee meeting on Power System Planning of Western Region held on 21st December 2016 at New Delhi, is available on CEA website (www.cea.nic.in) at the following link: http://www.cea.nic.in/compsplanning.html (i.e. Home page-Wings-Power Systems-PSP&PA-I - Standing Committee on Power System Planning-Western Region).

Yours faithfully,

रवीन्द्र गुप्ता 16/2/17

(Ravinder Gupta)
Chief Engineer, PSP&A-I

Encl: as above

7	Mapusa (PG) 3X315 MVA, 400/220	2	Jun/Jul'18 (WRSS-16)	Mapusa - Tuem 220 kV D/c	UC	No participation
8	Satna (PG) 1x500MVA, 400/220kV	2	Jun/Jul'18 (WRSS-16)	LILO of one circuit of Satna (MPPTCL) - Chhatarpur 220 kV line at Satna (PGCIL) 400 kV S/s (3Km)	Targeted to complete by March- 2018	
9	Vadodara GIS 2 x 500 MVA, 400/220 kV	4	March – 2017	220 kV Venkatpura-Vadodara D/C Line 220 KV Jambua – Vadodara D/C Line	Lines planned by GETCO	Dec, 2017 Dec, 2018
10	Bijawar (TBCB) 2 x 500 MVA, 400/220 kV	4	RfQ stage	LILO of Tikamgarh – Chhattarpur 220kV D/c line at Bijawar	To be awarded	
11	Navsari 2x315MVA + 1x500MVA, 400/220kV	2	May'18	Navsari – Bhestan 220kV D/c line	DGENTPL under TBCB	May'18
12	Rewa PS 2x500MVA, 400/220kV	6	Mar'17	Rewa UMSPP – Rewa PS 220kV 3xD/c line	UC by Rewa UMSPP	Mar'17

7. Measures to control fault level at Wardha Substation

7.1. Director (PSPA-I), CEA stated that the issue of measures to control the fault level at Wardha sub station was discussed in the 40th meeting of SCPSPWR held on 01.06.2016, wherein,400 kV bus splitting scheme through a series reactor to control fault level at Wardha substation was agreed in principle. However, in the studies it was observed that, the short circuit level of 74 kA at Koradi gets reduced to 56 kA with implementation of the bus splitting scheme at Wardha, which was still higher than its design limit of 40 kA. Therefore, it was decided in the 40th meeting of SCPSPWR to carry out joint studies by CEA, CTU, POSOCO and MSETCL for limiting the high fault level in Koradi complex.

7.2. He added that a joint studies meeting was held on 10.08.2016 among CEA, CTU, POSOCO and MSETCL to discuss issues regarding utilization of Navi Mumbai substation and High fault currents in Koradi complex. In the meeting, it was agreed that MSETCL shall examine the case of high fault current at Koradi (MSETCL) S/s and would evolve feasible alternatives in consultation with CEA, CTU and POSOCO. However, no further communication has been received in this regard from MSETCL.

7.3. MSETCL representative informed that presently, 2 no. of 660 MW units of Koradi II have been commissioned. There is a 400/220 ICT at Koradi II S/s, which is connected with Kaulewada S/s through 220 kV D/C line. Koradi II is also connected to Wardha and Warora (through termination of Koradi II - Wardha 400 kV D/C into one ckt of Warora – Wardha 400 kV D/C line - an interim arrangement). Further, Koradi - II would be connected with Koradi III through Koradi II – Koradi III (765/400/ 220 kV) 400 kV

D/C quad line, which is expected to be commissioned by March, 2017. As per the studies carried out by them, with the proposed bus splitting at Wardha, the short circuit level is within the design limit in both cases - with and without the existing interim arrangement. However, with bypassing of Koradi II-Wardha 400 kV D/C line and Wardha (PG) – Warora 400 kV line at Wardha, the 400 kV Koradi II – Warora lines and 220 kV Koradi II – Kaulewada D/C line may be over loaded. Therefore, MSETCL requested to keep the interim arrangement in place till the commissioning of 400 kV Koradi II – Koradi III D/C quad line.

7.4. CEA / MSETCL observed that in the bus splitting proposal at Wardha, all the three 765/400 kV ICTs at Wardha and feeder from Mouda are connected to Bus section – A only and bus section B has more no. of outgoing feeders than the incoming feeders. Therefore, one 400 kV outgoing feeder (say, Wardha – Akola 400 kV D/C line) may be kept on section A.

7.5. CTU stated the bus splitting proposal at Wardha has been arrived at looking into the physical reconfiguration possibilities at Wardha 765/400 kV substation. However, the suggestion would be looked into.

7.6. After further deliberation, it was decided to have a joint meeting of CEA, CTU, POSOCO & MSETCL to discuss the short circuit level at Koradi II and Wardha.

7.7. In line with the decision of 41st meeting of SCPSPWR held on 21.12.2016, a meeting was held on 13.01.2017 amongst CEA, CTU, POSOCO & MSETCL (minutes enclosed as Annexure-3) at CEA, New Delhi.

7.8. Based on the deliberation in the 41st meeting of SCPSPWR held on 21.12.2016 and subsequent meeting held on 13.01.2017, the following was agreed:

A. Scheme to control the fault level at Wardha substation

(i) Split of 400 kV Wardha substation into two sections, Section –A and Section-B as per following figure, with necessary switching arrangement.

(ii) Warora – Koradi II 400 kV (Quad) line [formed after disconnection of Koradi-II – Wardha 400 kV (Quad) line and connecting it with Warora – Wardha 400 kV (Quad) line at outskirt of Wardha substation]

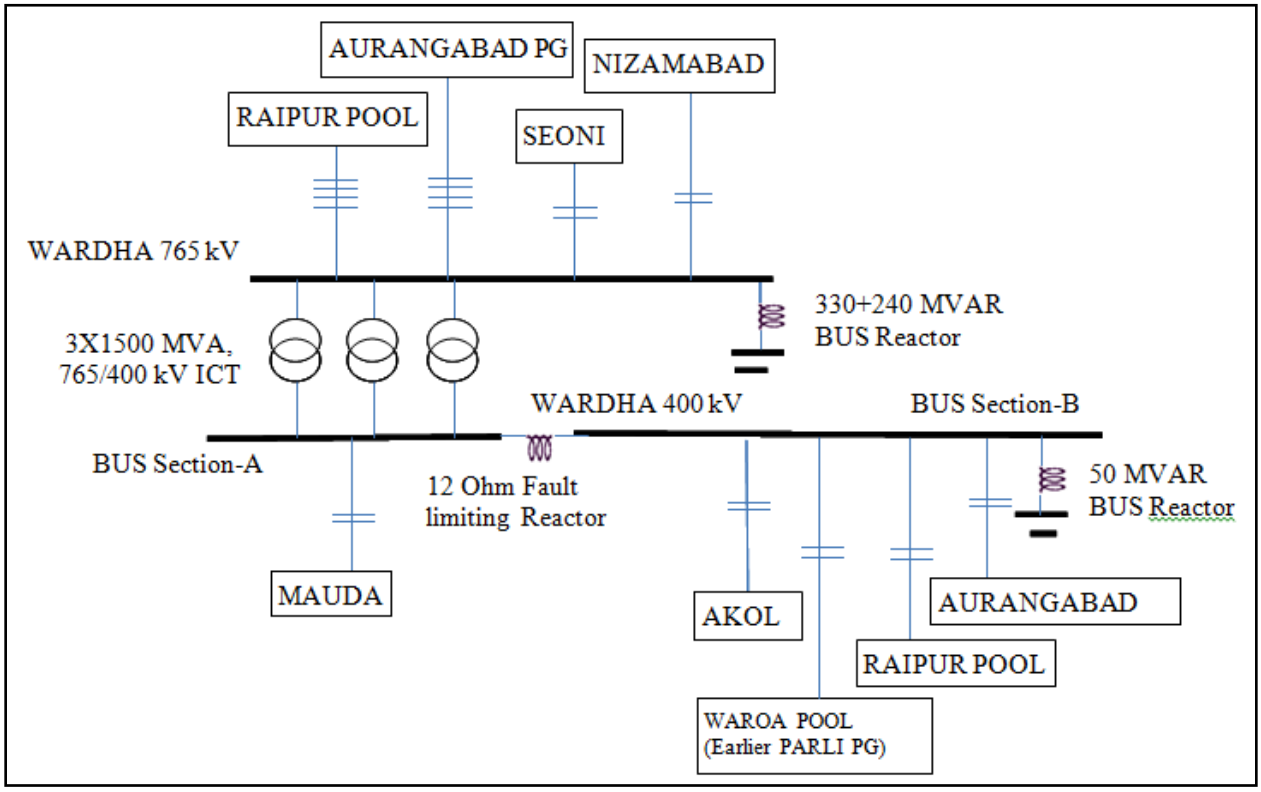
(iii) All necessary arrangement for Change in termination of Warora Pool -Wardha 400 kV D/C (Quad) line by disconnecting it from Wardha 400kV BUS Section A and terminating in vacant 400 kV bays of Warora and Koradi II 400 kV (Quad) lines at Wardha 400kV BUS Section B.

(iv) 12 Ohm fault limiting reactor to connect 400kV BUS Section A and BUS Section B of Wardha 400 kV BUS.

(v) 2 X 63MVAr line reactors at Wardha end of Wardha – Warora Pool 400kV D/c (quad) line to be used as bus reactors at Wardha S/s - section A (by using the two nos. of 400 kV bays which shall be vacant in Wardha Bus Section-A after shifting of Warora pool - Wardha 400 kV D/C line from Section-A to Section-B)

(vi) Necessary modification at Wardha substation like change of some elements including CTs if those are not designed for 50kA fault level.

Layout of Wardha 765/400 kV S/s is I type with two main BUS. BUS section A and B of one main BUS will be connected through 12 Ohm fault limiting reactor and BUS Section A and B in second main BUS will remain disconnected.



Splitting arrangement at Wardha (PG)

B. At present Koradi II - Wardha 400 kV D/C is terminated into one ckt of Warora – Wardha 400 kV D/C line as an interim arrangement (forming Koradi-II – Wardha 400 kV S/C line, Koradi-II – Warora 400 kV S/C line and Warora – Wardha 400 kV S/C line). Removal of the interim arrangement by bypassing of Koradi II-Wardha 400 kV D/C line and Wardha (PG) – Warora 400 kV line at Wardha (forming Koradi II – Warora 400 kV D/C line) would be done after commissioning of Koradi II – Koradi III 400 kV D/C quad line. At present, one ckt of Koradi II – Koradi III 400 kV D/C quad line has already been commissioned & another circuit is expected to be commissioned by March, 2017.

C. For evacuation of power from Koradi-II generation/ Tiroda generation project, system strengthening was required beyond Warora 400 (MSETCL) substation. MSETCL would finalise the transmission system strengthening beyond Warora and the same would be intimated in the next SCM of WR.

8. Progress of dedicated transmission lines of IPPs which are connected through interim arrangement

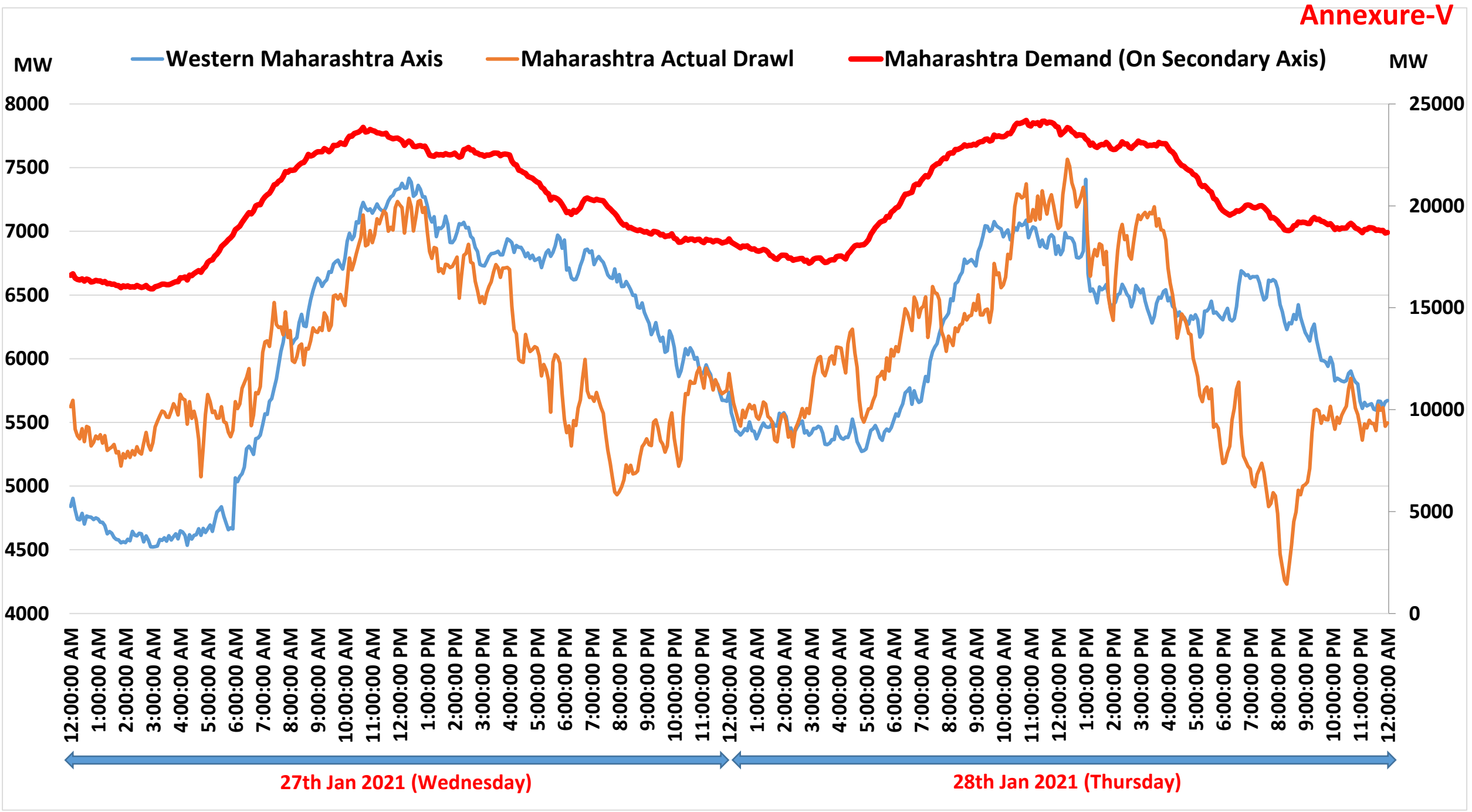
8.1. Director (PSPA-I), CEA stated that the progress of dedicated transmission lines of IPPs in Western Region, which were connected through interim arrangement was reviewed in 40th meeting of SCPSPWR held on 01.06. 2016. Subsequently, a meeting was held in CEA on 16.09.2016 to review the status of implementation of the dedicated transmission lines of the IPPs connected through interim arrangement. Out of the six IPPs, four IPPs have already removed their interim arrangement and are connected to the grid through their dedicated transmission system. Only two IPPs namely, Vandana Vidyut Ltd (VVL) and Essar Power M.P. Ltd (EPMPL) are still connected to the grid through their interim arrangement.

8.2. Representative of M/s Essar informed that EPMPL is a generating company having generation project of 1200 MW at Mahan, out of which one unit of 600 MW has achieved COD on 29th April 2013. The evacuation system of EPMPL, interalia, includes the EPMPL generation switchyard - Bilaspur pooling station 400 kV D/C line, being implemented by Essar Power Transmission Company Limited (EPTCL) as Transmission Licensee. There has been delay in implementation of the EPMPL generation switchyard - Bilaspur pooling station 400 kV D/C line. The transmission line is 337 km in length and has 942 no. of towers. The balance works left as on date is 4 no. of foundations to be completed, 33 no. of towers to be erected, stringing to be done for 140 km. It was stated that due to financial constraints and some issues at site, the works were held up. It is expected that the work would be resumed by Feb, 2017 and expected to complete by Dec, 2017.

8.3. Representative of M/s VVL intimated that its 2 x 135 MW has been commissioned in 2014, but they have no PPA. Further due to non-availability of coal, the plant is under forced shutdown from last 24 months. This led to financial crunch, thus the dedicated line couldn't be taken up. It was also informed that M/s VVL is consistently pursuing with its lenders for restructuring of its loan through regular meetings with lenders and it is expected that by March, 2017 the loan would be restructured. After loan restructuring proposal, they would be in a position to give the commitment for completion of their dedicated transmission line. M/s VVL requested their plant to remain connected with the grid through the existing LILO till the completion of their dedicated line.

8.4. NLDC informed that even though generating units are not in operation but the generating switchyard of M/s VVL is still connected with ISTS. Also there is no operation & maintenance staff at the generating switchyard. Therefore, from grid safety and security aspects, the LILO may be bypassed from their switchyard to avoid any instance of fault. Further, M/s VVL is drawing some nominal power through this

Annexure-V


Western Maharashtra Axis
Maharashtra Actual Drawl
Maharashtra Demand (On Secondary Axis)
MW
MW
8000
7500
7000
6500
6000
5500
5000
4500
4000
25000
20000
15000
10000
5000
0
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
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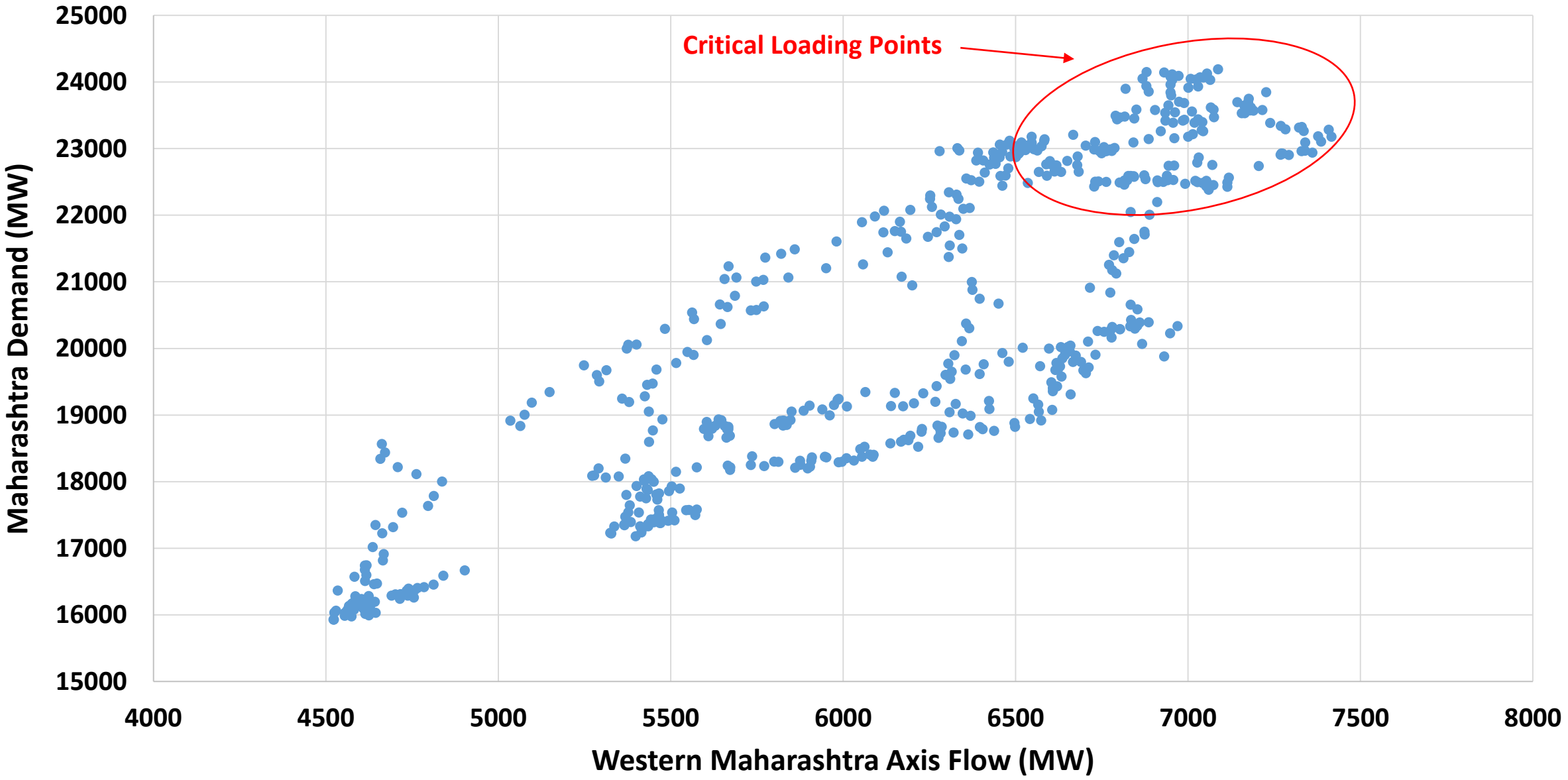
11:00:00 PM
12:00:00 AM
27th Jan 2021 (Wednesday)
28th Jan 2021 (Thursday)

Annexure-V

Western Maharashtra Axis Flow (MW) vs Maharashtra Demand (MW) for 27th and 28th Jan 2021



Annexure-III

Important Considerations for the study:

- Scenario: Solar Max (Jun'24 Afternoon Peak) with high generations in Narendra complex (Kudgi, Raichur, Bellary, Gadag SEZ & Koppal WEZ)
- Out of 18.5 GW potential REZ in SR, only 8 GW (Koppal-2.5 GW, Gadag-2.5 GW, Karur-2.5 GW & Tuticorin-0.5 GW) has been considered. Balance 10.5 GW (Bidar-2.5 GW, Kurnool & Anantapur – 8 GW) has not been considered due to non-availability of land and other issues.
- Out of 7GW REZ potential in Maharashtra, only 1 GW at Kallam has been considered. Further, additional 1 GW at Kallam is under Intra State and balance 5 GW (Wardha – 2.5 GW, Solapur – 2.5 GW) has not been considered due to non-availability of land and other issues.
- All India Demand of 224 GW has been considered and demand for WR & SR is considered as 69 GW & 54 GW respectively as per the Load Generation Balance considered for All India Studies for 2024-25 timeframe, as per the methodology finalized with CEA, CTU and POSOCO.
- For simulating the worst case:
    - 100% Despatch has been considered at Gadag and Koppal REZs (2500MW each)
    - 90% Thermal Despatch has been considered at Kudgi TPS (3x800MW)

With this, the Net SR Surplus in Solar Max scenario works out to about 5000 MW with SR to WR inter-regional flow to the tune of about 8000 MW. LGB shown at Annexure-I.

Annexure-IV

Alternatives studied:

Table 1: Summary of results for different alternatives

Name of transmission element	Case-I: Base case (Kolhapur (PG) – Kolhapur (MH) reconductoring) (MW)	Case-II: Case-I + Upgradation of Narendra New – Kolhapur (PG) to 765kV	Case-III: Case-II + Kolhapur (PG) – Pune (PG) 765kV D/c line (MW)	Case-IV: Case-I + Narendra (New)-Kolhapur 400kV D/c line + Narendra New – Solapur 765kV D/c line	Case-V: Case-I + Narendra-Kolhapur (400kV D/c line) + Narendra New – Jejuri (New) 765kV D/c line + Jejuri (New) 765kV – Pune (PG) GIS D/c line + Jejuri (New) – Jejuri (MSETCL) 400kV D/c line#	Case-VI: Case-II + Kolhapur – Jejuri (New) 765kV D/c line + Jejuri (New) 765kV – Pune (PG) GIS D/c line + Jejuri (New) – Jejuri (MSETCL) 400kV D/c line	Case-VII : Case-I + Narendra (New) - Kolhapur (400kV D/c line) + Narendra New – Pune(GIS) 765kV D/c line
Kolhapur(PG) 765/400kV ICTs		2*1463 (2540)	2*643	-		2*614 (992)	
Kolhapur (PG) – Kolhapur(MSETCL) 400kV D/c line	2*1453 (2521)	2*1517 (2624)	2*762 (1242)	2*757 (1285)	2*759 (1293)	2*727 (1182)	2*828 (1416)
Kolhapur(MSETCL) – Karad 400kV D/c line	2*748 (1021)	2*838 (1081)	2*434 (595)	2*486 (678)	2*383 (529)	2*383 (520)	2*455 (634)
Narendra New – Kolhapur(PG) 765kV D/c line (charged at 400kV)	2*1402 (1892)	-	-	2*742	2*757		2*815
Narendra New – Kolhapur(PG) 765kV D/c line	-	2*1473 (2582)	2*2287 (3853)@	-	-	2*2270 (3834)	-
Kolhapur(PG) – Pune(PG) 765kV D/c line (250 km)	-	-	2*1622 (2454)	-	-	-	-

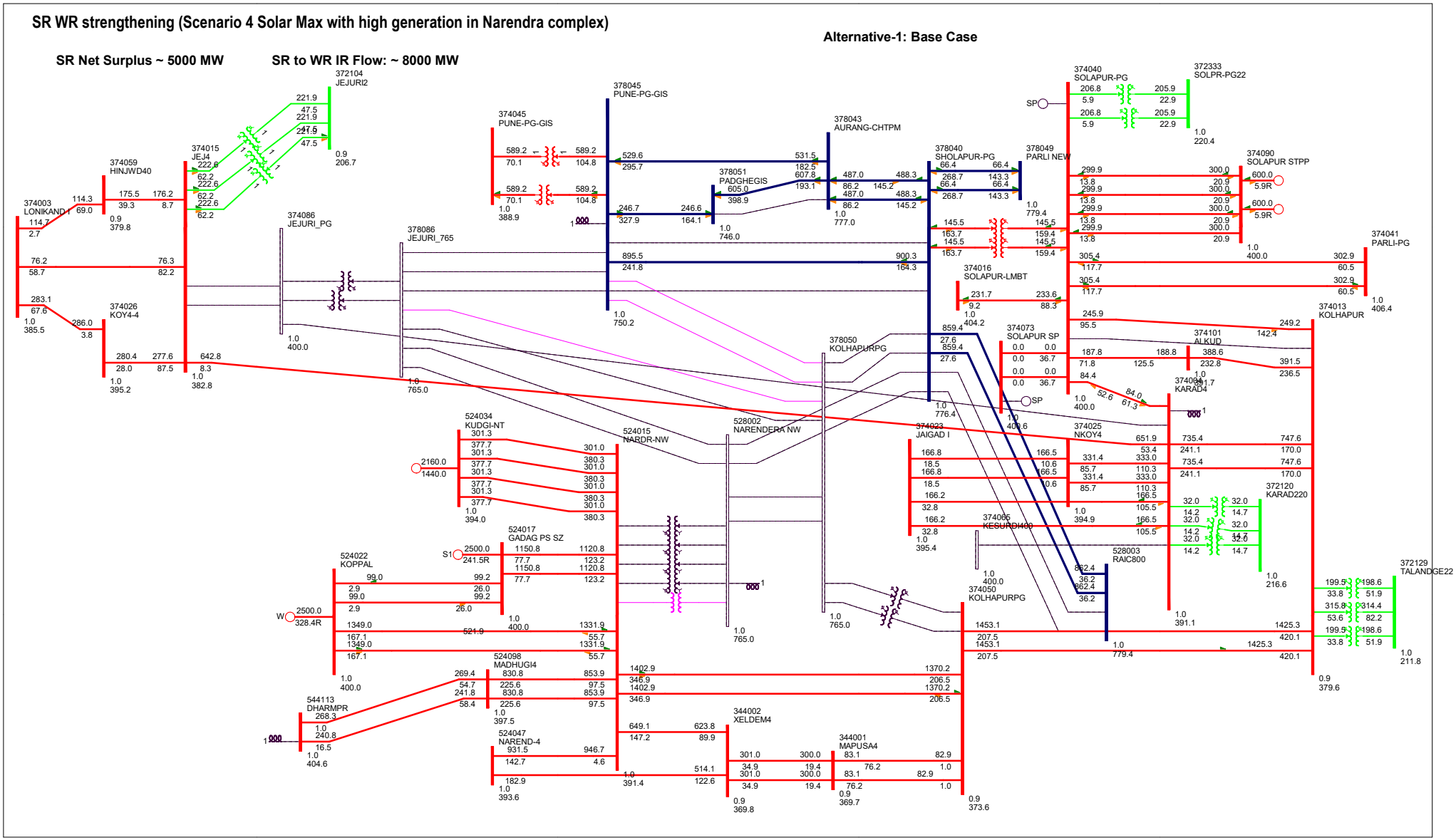
Narendra New – Solapur 765kV D/c line (150 km)	-	-	-	2*2161 (3616)	-	-	-
Narendra New 765/400kV ICTs	-	2*1473 (2563)	4*1143 (1474)	4*1080 (1376)	4*987 (1269)	4*1135 (1464)	4*935 (1203)
Narendra New – Madhugiri 765kV D/c line (Charged at 400kV)	2*854	2*837	2*556	2*359	2*424	2*564	2*437
Narendra New – Xeldem 400kV S/c line	649	621	507	336	352	503	373
Narendra New – Narendra 400kV S/c line	947	908	505	190	272	512	298
Solapur – Raichur 765kV 2xS/c lines	-2*862 (-1290)	-2*844 (-1262)	-2*543	-2*102	2*412	2*550	2*426
Wardha – Nizamabad 765kV D/c line	2*143	2*149	2*340	2*322	2*402	2*330	2*401
Warora – Warangal 765kV D/c line	2*213	2*219	2*373	2*420	2*436	2*370	2*428
Narendra New – Jejuri (New) 765kV D/c line (280 km)					2*1975 (3042)	0	-
Jejuri (New) - Pune (PG) GIS 765kV D/c line (60 km)					2*1295 (2304)	2*1020 (1806)	-
Jejuri (New) 765/400kV ICTs					2*657	2*599	-
Jejuri (New) – Jejuri 400kV D/c line					2*657	2*599	-
Kolhapur (PG) - Jejuri (New)765kV D/c line (250 km)					-	2*1634 (2483)	-
Narendra New – Pune (PG) GIS 765kV D/c line (340 km)							2*1870 (2899)

*Raigarh-Pugalur reverse flow of 3000 MW has been considered with proposed 1x1500MVA ICT at Section-A and 2x1500MVA ICTs at Section-B of 400kV Raigarh (Kotra) 765/400kV S/s.

Table 2: 3-Phase Short Circuit levels in different alternatives

Substation Bus	**Case-III :** **Case-II + Kolhapur (PG) – Pune (PG) 765kV D/c line (MW)**	**Case-IV :** **Case-I + Narendra (New)-Kolhapur 400kV D/c line + Narendra New – Solapur 765kV D/c line**	**Case-V :** **Case-I + Narendra-Kolhapur (400kV D/c line) +** **Narendra New – Jejuri (New) 765kV D/c line +** **Jejuri (New) 765kV – Pune (PG) GIS D/c line +** **Jejuri (New) – Jejuri (MSETCL) 400kV D/c line**	**Case-VI:** **Case-II + Kolhapur – Jejuri (New) 765kV D/c line + Jejuri (New) 765kV – Pune (PG) GIS D/c line + Jejuri (New) – Jejuri (MSETCL) 400kV D/c line**	**Case-VII:** **Case-I + Narendra (New) - Kolhapur (400kV D/c line) + Narendra New – Pune(GIS) 765kV D/c line**
Kolhapur(PG) 765kV	18.9	-	-	18.1	-
Kolhapur(PG) 400kV	27.3	21	20.8	26.8	20.8
Kolhapur(MSETCL) 400kV	27	24.4	24.5	27	24.3
Pune(PG) 765kV	30.3	25.9	31.2	30.9	30.1
Pune(PG) 400kV	41.4	40.1	42.1	41.7	41.6
Solapur 765kV	31.6	37.4	31.7	31.6	31.8
Solapur 400kV	40.2	41.4	40.2	40.2	40.2
Narendra New 765kV	16.8	23.1	17.9	16.5	17.7
Narendra New 400kV	37.5	47.3	42	37.1	41.7
Jejuri (New) 765kV	-	-	25.6	25.3	-
Jejuri (New) 400kV	-	-	31.5	31.1	-

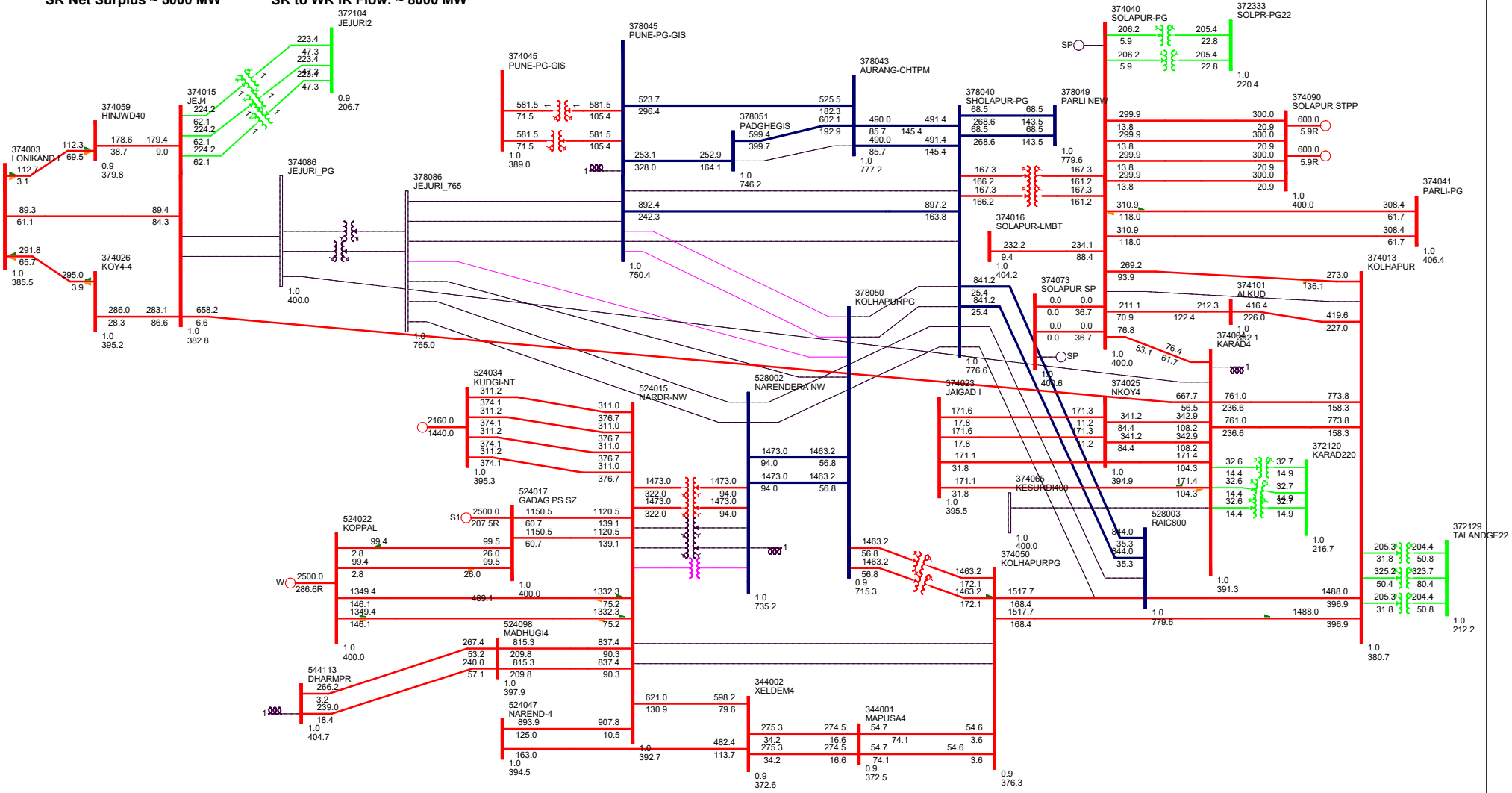
Annexure-V
(under Annexure-VI)



SR WR strengthening (Scenario 4 Solar Max with high generation in Narendra complex)

Alternative-2: Upgradation of Narendra New – Kolhapur (PG) to 765kV

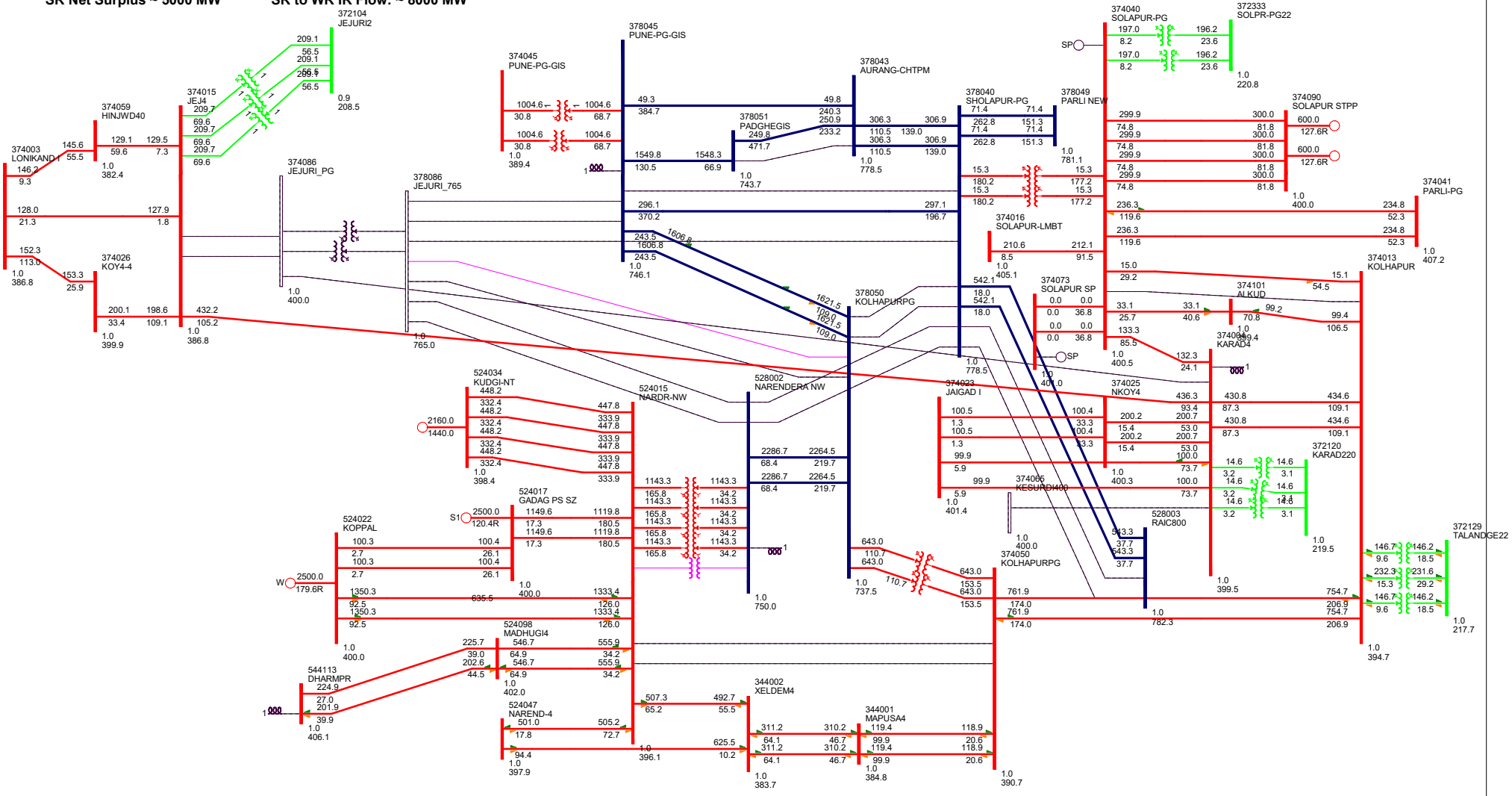
SR Net Surplus ~ 5000 MW **SR to WR IR Flow: ~ 8000 MW**



SR WR strengthening (Scenario 4 Solar Max with high generation in Narendra complex)

Alt-3: Kolhapur (PG) – Pune (PG) 765kV D/c line

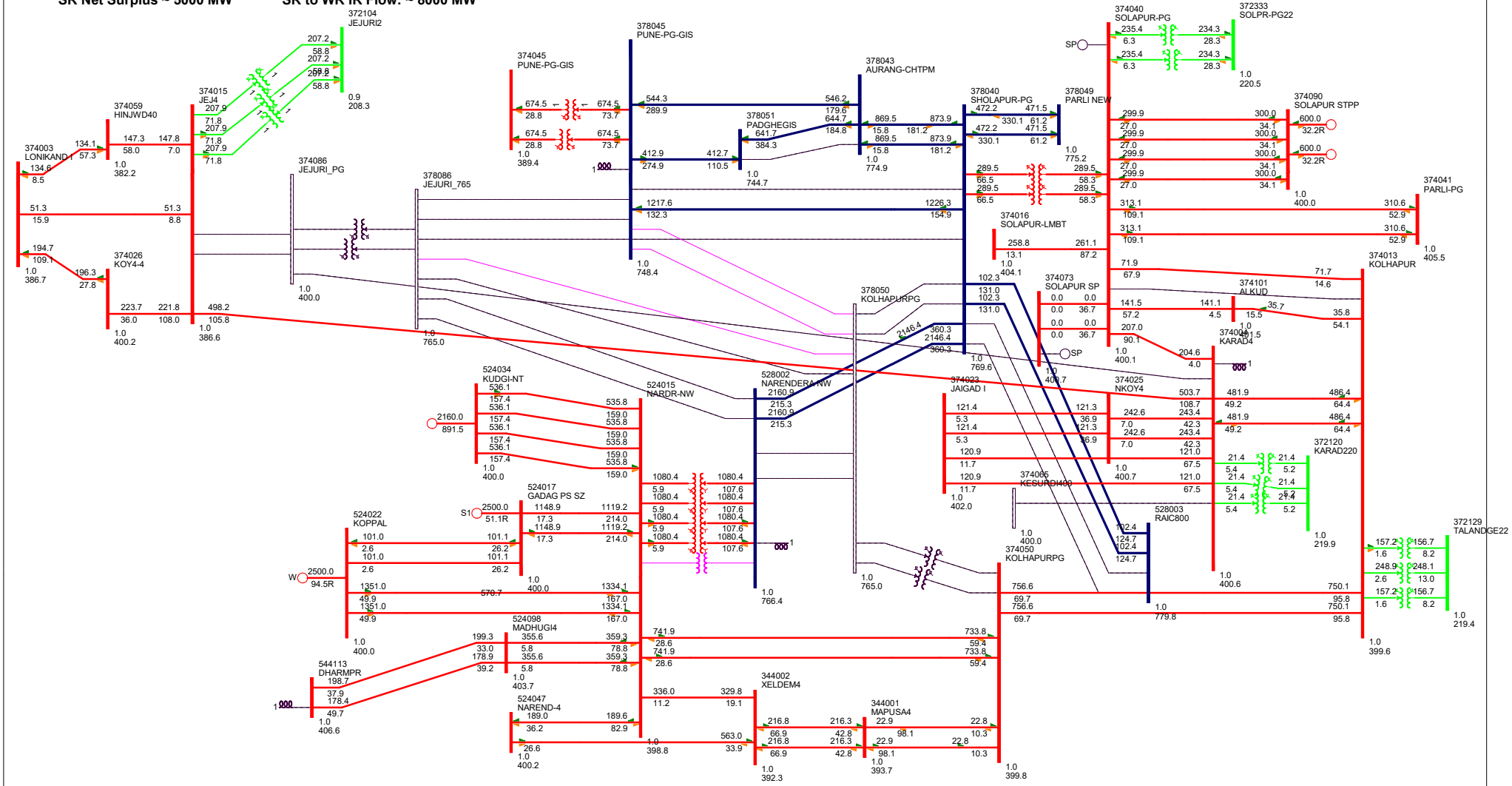
SR Net Surplus ~ 5000 MW **SR to WR IR Flow: ~ 8000 MW**



SR WR strengthening (Scenario 4 Solar Max with high generation in Narendra complex)

Alt-4: Narendra New – Solapur 765kV D/c line

SR Net Surplus ~ 5000 MW **SR to WR IR Flow: ~ 8000 MW**

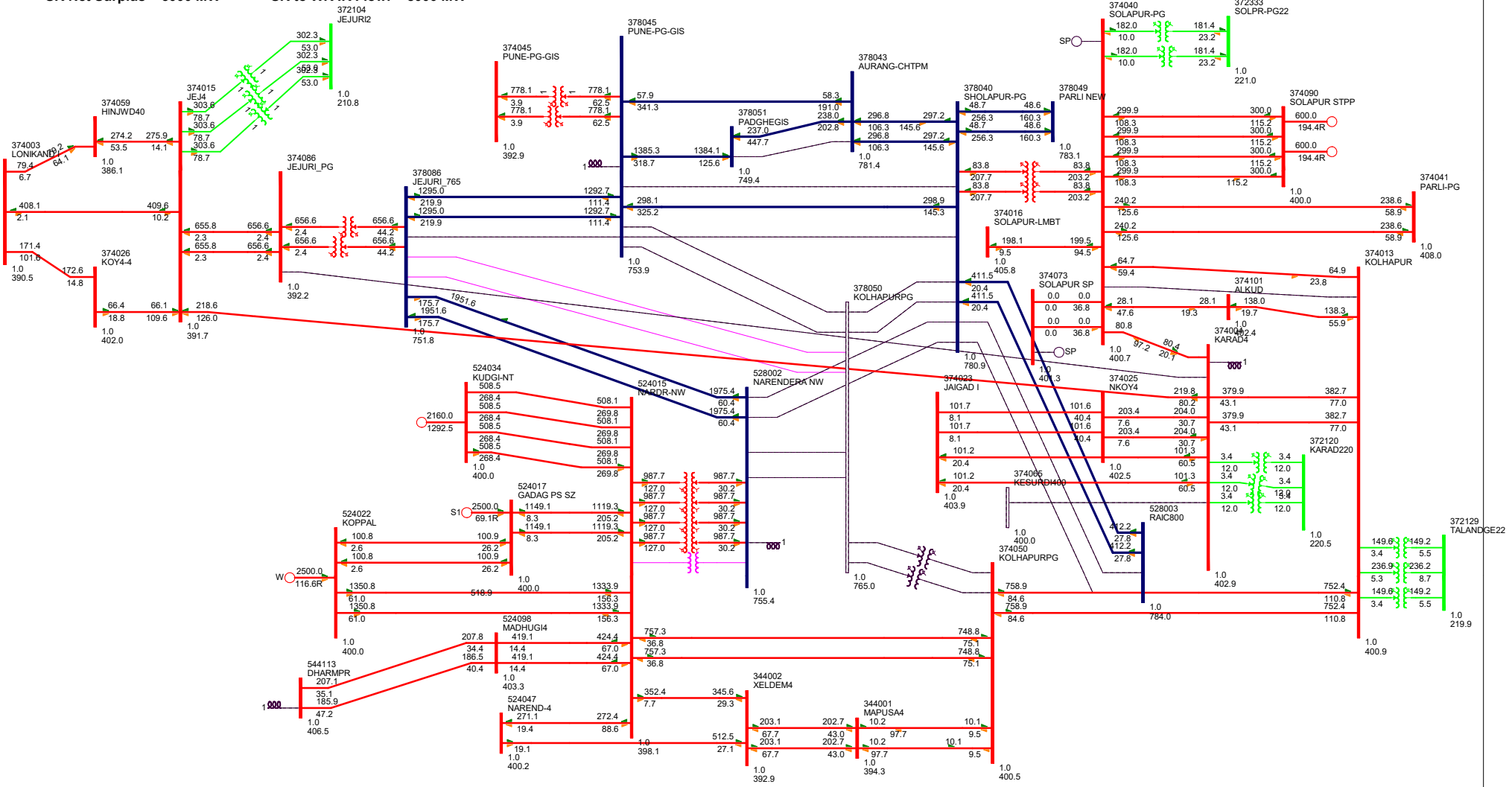


SR WR strengthening (Scenario 4 Solar Max with high generation in Narendra complex)

Alternative-5: Narendra New – Jejuri (New) 765kV D/c line

SR Net Surplus ~ 5000 MW

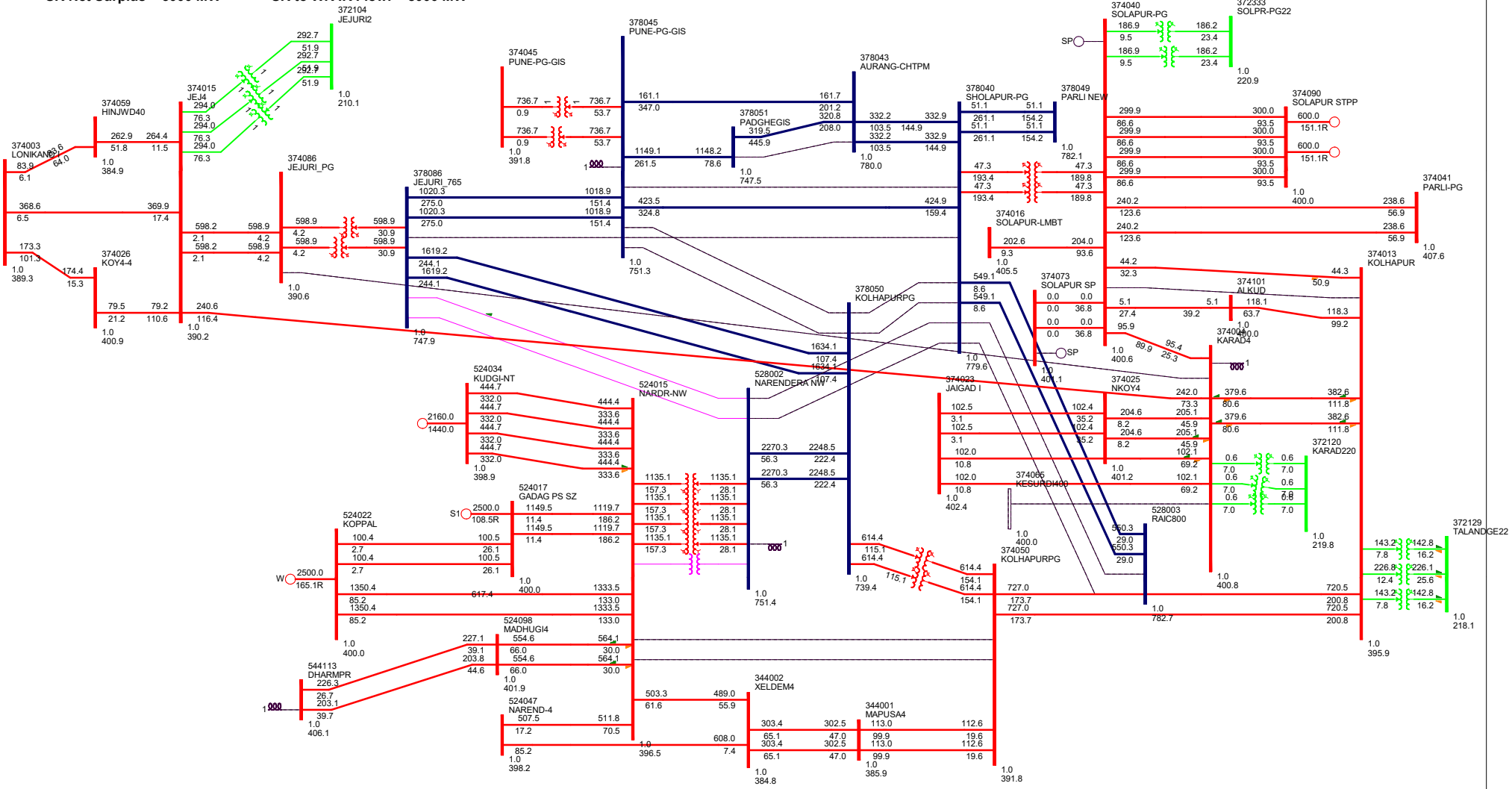
SR to WR IR Flow: ~ 8000 MW



SR WR strengthening (Scenario 4 Solar Max with high generation in Narendra complex)

Alt-6: Kolhapur – Jejuri (New) 765kV D/c line D/c line

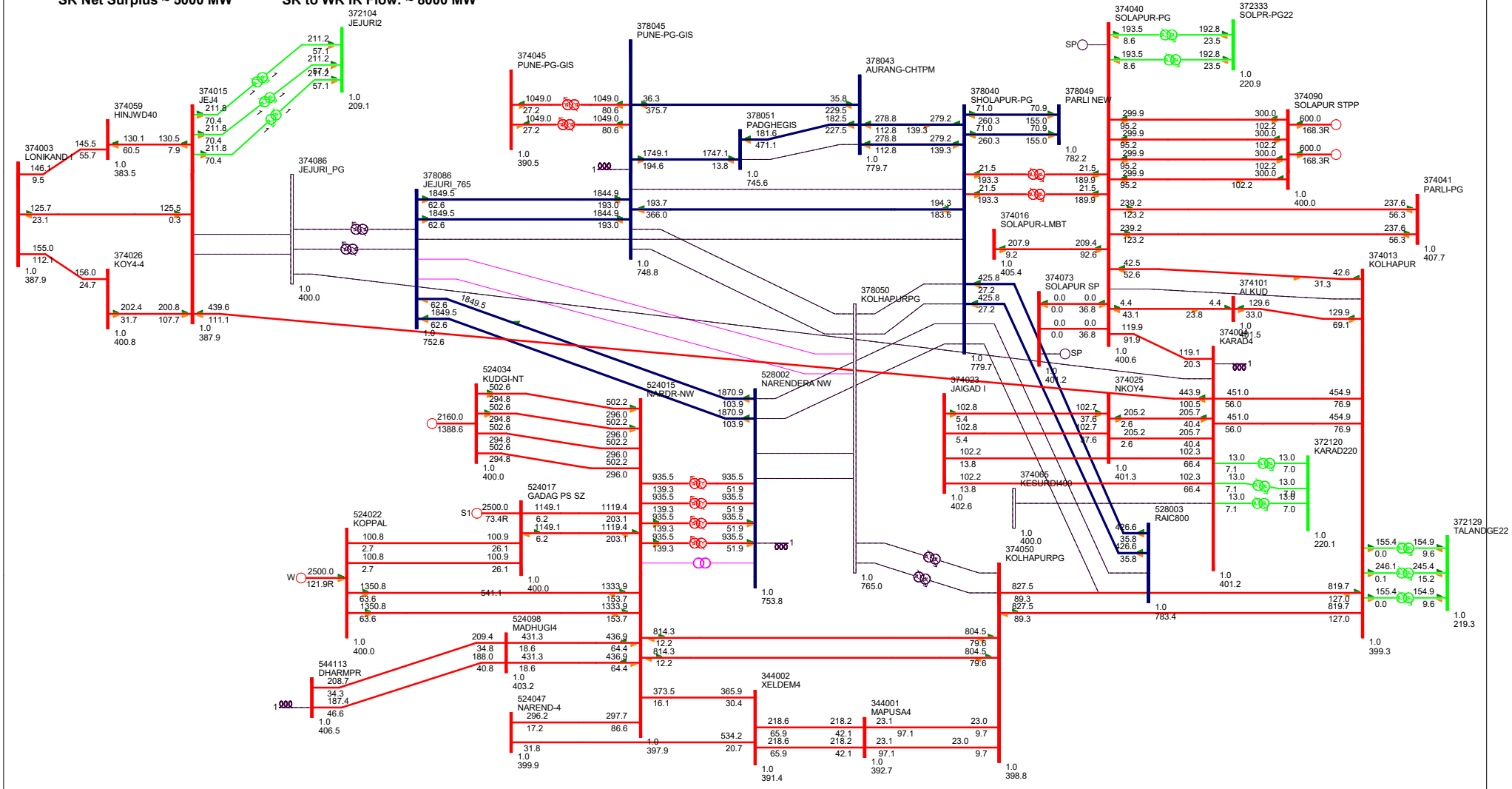
SR Net Surplus ~ 5000 MW **SR to WR IR Flow: ~ 8000 MW**



SR WR strengthening (Scenario 4 Solar Max with high generation in Narendra complex)

Alternative-7: Narendra New – Pune(GIS) 765kV D/c line

SR Net Surplus ~ 5000 MW **SR to WR IR Flow: ~ 8000 MW**



Annexure-VI

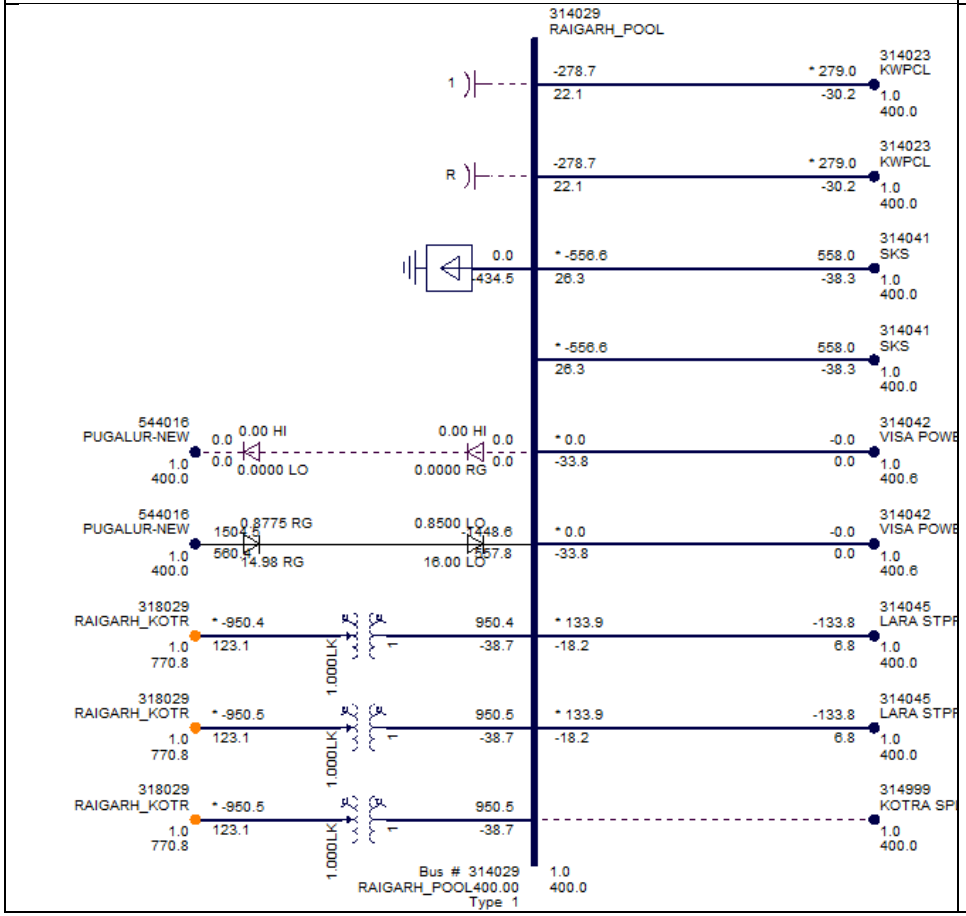
Important Considerations for the study:

- Load-Generation considerations are similar to those considered at (A) (ii) above.
- Full Generation considered from KWPCL Now (REGL) (600MW), SKS (4x300MW) & NTPC Lara (2x800MW) on Section A and DB Power (2x600MW) & RKM (4x360MW) on Section B.
- Athena Power (2x600 MW– Bus Section-B) and Visa Power (2X600 MW – Bus Section-A) have been abandoned and are unlikely to come up in future. Hence, NIL generation has been considered from these generators.
- For reverse flow case, Reverse flow upto 1500MW per bipole has been considered (i.e. 1500MW reverse flow is getting injected on each 400kV bus section)
- Champa – Kurukshetra HVDC is considered to be on forward mode with dispatch of 4500MW (3000MW on Bipole-1 connected to Lara and 1500MW on Bipole-2 connected to KSK).

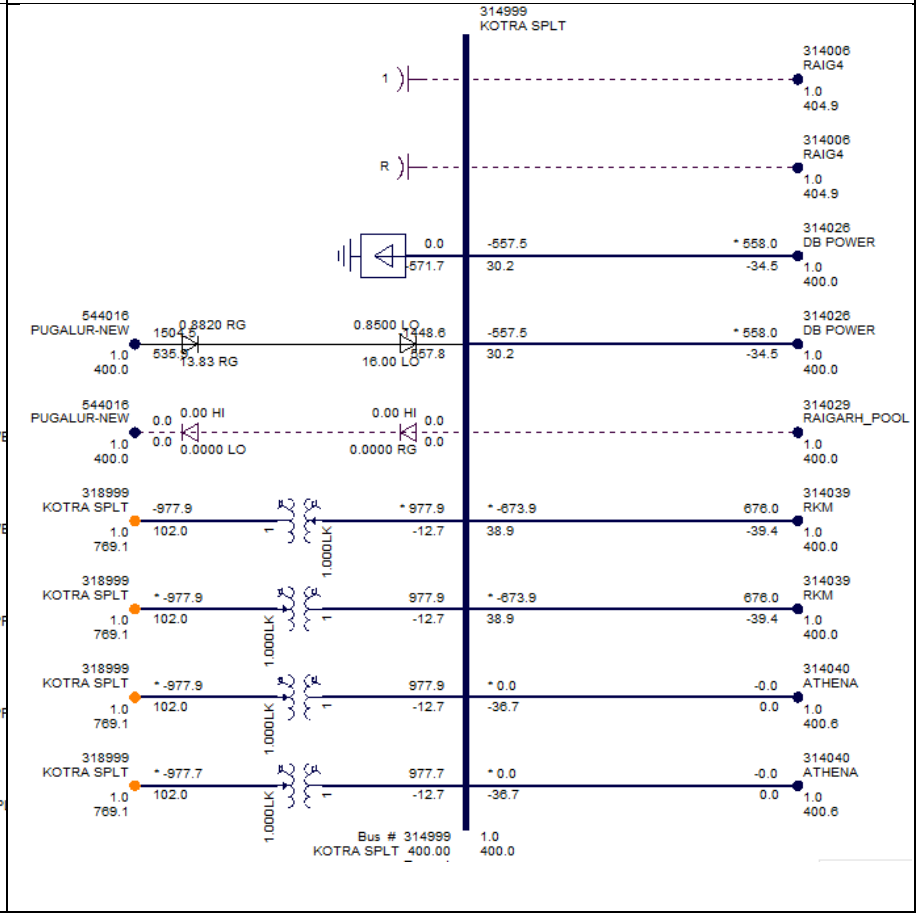
Annexure-VII

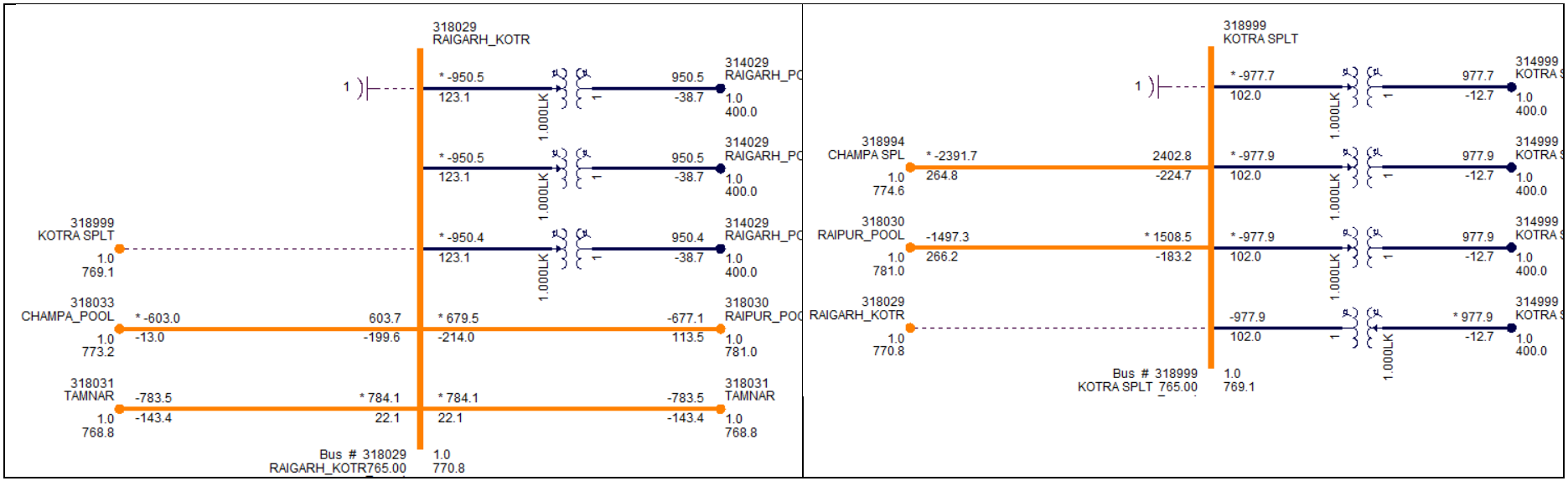
Load Flow Results

Section – A



Section – B




318029
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1
* -950.5
123.1
950.5
-38.7
314029
RAIGARH_PC
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318999
KOTRA SPLT
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-38.7
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RAIGARH_PC
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CHAMPA_POOL
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-199.6
* 679.5
-214.0
-677.1
113.5
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RAIPUR_POC
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781.0
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TAMNAR
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-143.4
* 784.1
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Five Year Rolling Plan & Planning Procedure for ISTS Capacity Addition

Major changes from earlier planning process

- Approval Process has been streamlined and schemes to be approved by CTU upto 100Cr., NCT between 100 & 500Cr. and RPC/NCT/MoP for more than 500Cr. Consultation with RPC is required only in case of ISTS schemes costing more than 500 crores.

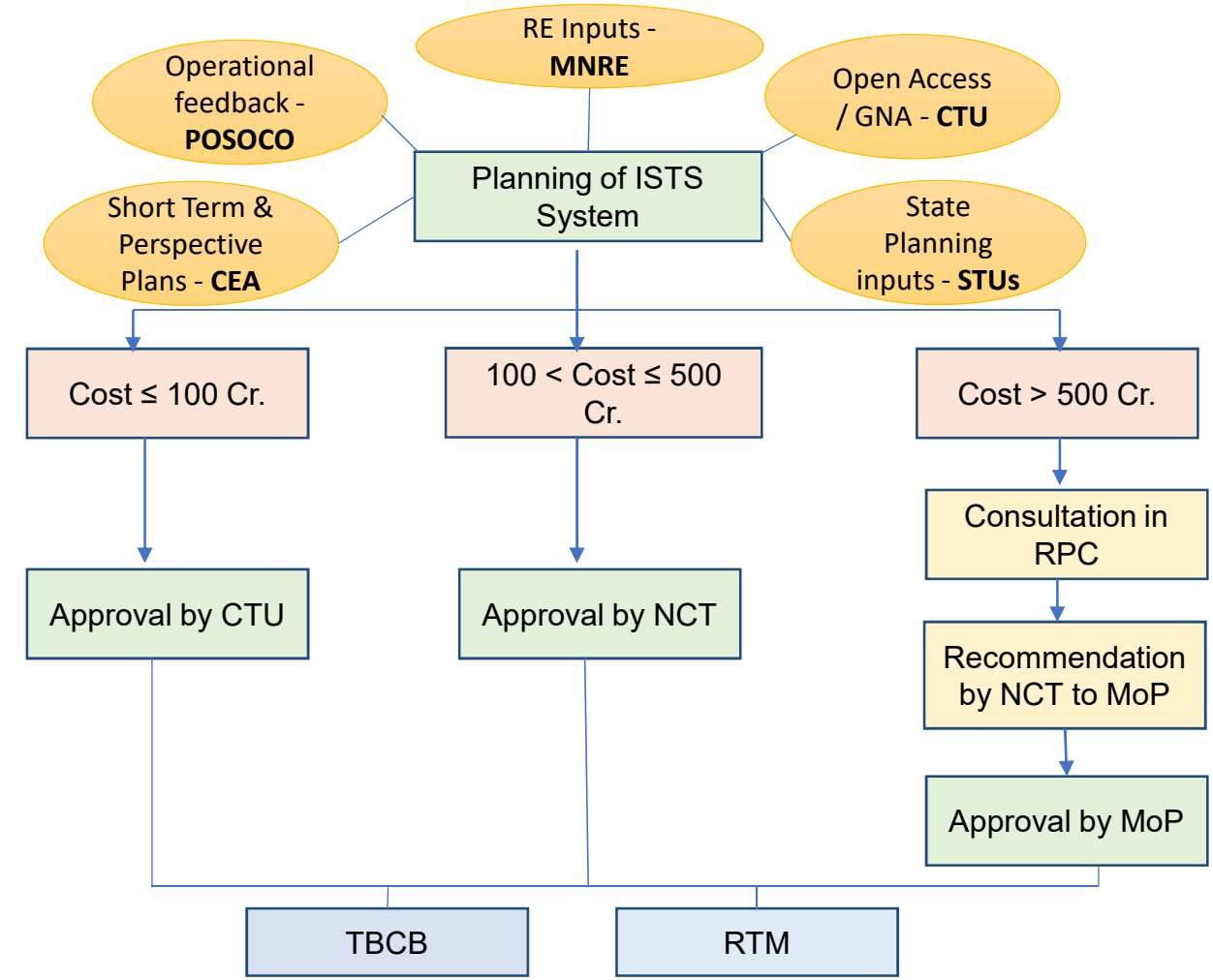
- CTU, RPCs & NCT to hold meetings on monthly basis or more frequently, if required.

- New ISTS schemes to be planned and developed based on demand assessment without any distinction of “generation linked” or “System Strengthening” schemes.

- MNRE shall be consulted by CEA & CTU for Transmission Planning related to RE.

- No requirement of Regulatory Approval.

Revised Transmission Planning & Approval Process



Consultation & Approval of planned ISTS schemes

- Meeting for consultation on transmission planning with participation from CEA, CTU, POSOCO, RPCs and STUs for respective region is being held on **monthly basis or earlier as the case may be**.

- Meeting deliberates on following aspects:
  - Processing of Open Access / General Network Access applications
  - Assessment of transmission system augmentation requirements in ISTS
  - Any other matter pertaining to planning of ISTS

- Approval of Planned ISTS schemes shall be as per MoP office order no. 15/3/2018-Trans-Pt(5) dated 28-10-2021 (refer slide 2 above)

- Approval shall include identification of mode of implementation viz. TBCB or RTM and also commissioning schedule.

Five Year Rolling Plan for ISTS Capacity Addition

- As per the Electricity Rules, 2021, CTU shall draw up plan for Inter-State Transmission System for upto next five years on rolling basis every year identifying specific transmission projects which are required to be taken up along with their implementation time lines.
- **Procedure for planning of ISTS** has been prepared in consultation with all stakeholders and uploaded on CTU website on **16.12.2021**.
- **Rolling Transmission plan** - Proposed to be undertaken on continuous basis, twice a year (**Apr-Sep Cycle & Oct-Mar Cycle**) involving following major steps:
  - ✓ Data Collection & Validation
  - ✓ Preparation of Scenarios/LGBs,
  - ✓ System Studies,
  - ✓ Preparation of preliminary proposals seeking stakeholder comments
  - ✓ **Final report** (based on comments received)

- Details of finalized schemes along with their implementation timelines and status of approval shall be made part of the **ISTS Rolling Plan for upto next five years**

- **In this direction, the "Network Plan (2024-25)" has also been published on CTU website on 31.12.2021.**

THANK YOU

ISTS Planning Cycle

Sl. No.	Activities	Responsibility	Timeline	
			(Apr- Sep)	(Oct-Mar)
1	Data Collection: • Inputs regarding plans made by CEA (short term & perspective plans for next ten years) • Open Access / General Network Access / Cross border transaction requests made by Designated Inter-state Customers / other entities • Data to be submitted by the STUs (to be co-ordinated by RPCs) • Operational Issues to be submitted by NLDC/ RLDCs to CTU • RE related inputs to be provided by MNRE	MNRE, CTU, CEA, STUs, RPCs, and POSOCO	01st to 30th Apr	01st to 31st Oct
2	Data validation and preparation of Load-Generation Balances (LGBs) for different scenarios through joint consultation in separate regional meetings	CTU, CEA, STUs, RPCs, and POSOCO	15th Jun	15th Dec
3	Preparation of base case files for identified LGB(s)	CTU	30th Jun	31st Dec
4	Single or Multi Regional Joint System studies for evolution of new ISTS schemes and / or augmentation of existing system	CTU, CEA, POSOCO, RPC(s) & STU(s)	31st Jul	31st Jan
5	Preliminary proposal along with assumptions on CTU website for stakeholders' comments	CTU	15th Aug	15th Feb
6	Stakeholders' comments on the preliminary proposal	Stake-holders	31st Aug	28th Feb
7	Finalisation of transmission schemes considering comments / suggestions of stakeholders and uploading of the final proposal on CTU	CTU	30th Sep	31st Mar

Annex 34.1c

MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd.

Maharashtra State Electricity Distribution Co. Ltd.
CIN = U40109MH200SSGC153645
5th floor, Prakashgad, Plot No.G-9, Bandra (East), Mumbai – 400 051 ☎ (O) 26474211
Email: ceppmsedcl@gmail.com Website: www.mahadiscom.in

Ref. No: CE/PP/WRPC/ No 04706 Date: 28 FEB 2022

To,
The Member Secretary,
Western Regional Power Committee,
F-3, MIDC Area, Marol,
Opp. SEEPZ, Central Road,
Andheri (East), Mumbai- 400093

Subject: MSEDCL comments on CTUIL's proposal of ISTS network expansion beyond Kolhapur for export of surplus power during high RE scenario in Southern Region.

Dear Sir,

The clause 6(3) of new Resolution dated 03.12.2021 of MoP is related to facilitate all functions of planning relating to inter-state/ intra-state transmission system with CTU/STU. Accordingly the same item was included in the Supplementary Agenda item 1 with heading "Planning of Inter-state transmission" for 41st TCC/WRPC meeting.

During the meeting the issue of proposed ISTS network expansion beyond Kolhapur for export of surplus power during high RE scenario in Southern Region was discussed. It is to note that, prior to this, no communication was done with the members regarding the proposed ISTS scheme having estimated cost of Rs.2374 Crs.

As per new Resolution dated 03.12.2021 of MoP, ISTS schemes costing more than 500 Crs. needs to be consulted with RPC whose views are then put before NCT and finally the approval would be accorded by MoP. Further, it is to note that MSEDCL still do not have the details about the study conducted by CTUIL while finalizing the proposed ISTS scheme and the proposal of CTUIL.

MSEDCL is in receipt of TANGEDCO's letter to CTUIL and Member Secretary, SRPC dated 09.02.2022 in which it has provided its views about the proposal.

In this regard, MSEDCL comments on the CTU's proposal of ISTS network expansion beyond Kolhapur for export of surplus power during high RE scenario in Southern Region, based on the limited information are as follows;

1) The proposed ISTS network expansion scheme seems to have been evolved based on the following assumptions / considerations by CTUIL:
   a. CTUIL has considered 100% RE dispatch in Karnataka state considering the anticipated RE capacity addition in Koppal and Gadag area along with 100% thermal generation which is impossible under any worst scenario.
   b. Huge mismatch in Load-Generation Balance in Maharashtra – Considering the projected demand of 26853 MW and only 10000 MW of generation which is also practically impossible scenario
   c. CTUIL has not considered already planned / implemented RE capacity addition in WR and NR.
   d. The diversity factors and generation dispatches are totally against the CEA's Transmission planning criteria.

e. The projected RE capacity addition in Maharashtra is not matching with the State's RE capacity addition program as well as CTU's approved plans for RE capacity addition by 2023-24
f. The loads considered in various substations of MSETCL as well as the PGCIL substations contiguous to the proposed EHV corridor are erroneous and unrealistic.

2) Due to the unrealistic scenario considered for this specific case study, numbers of 400 kV and 220 KV lines might have found to be over loaded. Hence, the proposal for upgradation needs to be reviewed technically.
3) The overloading in Kolhapur- Kolhapur(PG) D/c (2100MW each circuit) projected under N-1 condition seems to be unrealistic. Even if the unrealistic condition occurs, other options needs to be explored to reduce the overloading under high RE scenario by reconfiguration of MSETCL network and shifting of loads (to be studied in consultation with MSETCL).

4) In view of the above, CTU may clarify and bring on record about the following issues:
   a) ISTS connected RE in Maharashtra considered for the study and approved by the CERC.
   b) Need for reducing the intrastate generation of Maharashtra to 10000 MW under a huge deficit condition.
   c) Reason for neglecting the various suggestions of POSOCO vide letter dated 02.02.2021 including reconductoring of transmission lines to mitigate high loading of Kolhapur- Kolhapur (PG) 400 kV D/C line.
   d) The Raigarh- Pugalur -Trissur HVDC corridor with a design capacity of 6000 MW has been created to transfer power between Western Region and Southern Region. This HVDC system provides greater flexibility in dispatching power bi-directionally. However, it is underutilized. Similarly, the other HVDC systems viz. Talcher- Kolar, Jaipore-Gazuwaka has the flexible power transfer capability on either direction to exchange power between SR and WR. In view of this, constructing a new EHV transmission corridor may end up in creating redundant transmission assets. CTU may clarify on the same.
   e) CTUIL may also clarify as to why the HVDC transmission lines of SR region can not be operated in reverse mode (from import to export mode) in high RE scenario.
   f) Study considerations/ assumptions about the 28 GW RE capacity addition in WR
   g) Study considerations /assumptions in the 8GW RE study in SR (as per the approval of CERC)
   h) Reason / Justification for not bringing the Kolhapur (PG) 765/400 kV SS into beneficial use / not upgrading under RE capacity addition beyond 8 GW in SR
   i) Justification for the investment of huge public money to the tune of Rs2400 Crore to avoid over loading of 400 kV Kolhapur-Kolhapur (PG) 400 kV line (being strengthened as per the plan of CTU) without exploring alternate economical options.
   j) Various options as suggested by POSOCO are as given below;
      - Operationalisation of 220 kV Kolhapur-Chikodi 220 kV line and Mudshigi -Chikodi lines for transfer of power from SR to WR under SR surplus condition.
      - Rearrangement of loads in the substation in and around Kolhapur area(Southern Maharashtra)
      - Exploring possibility of increasing generation in southern / western Maharashtra.
      - Reconfiguration of network of MSETCL to mitigate the problem.

However, CTUIL has not considered above options. CTUIL may please give reasons for not considering the above options.

k) Various options were also suggested by TANGEDCO to mitigate the overloading issues in Kolhapur(MS)-Kolhapur(PG) 400 kV line under the same dispatch conditions. Those are as below;

- Base case: Without upgradation of Narendra (PG) under Full RE generation+ All HVDC systems in SR import mode.
- Case 1: Base case+ Raigarh-Pugalur in export(3000MW) mode+ Talcher-Kolar and Jaipore-Gazuwaka in block mode.
- Case 2: Case 1+ LILO of Kolhapur (MS)- Alkud 400 kV S/c line at Kolhapur (PG)
- Case 3: Case 1+ LILO of Kolhapur(MS) – Sholapur 400 kV S/c line at Kolhapur (PG)
- Case 4 : Case 1 + LILO of one circuit of Kolhapur(MS) – Karad 400 kV DC line at Kolhapur PG

CTUIL may clarify why these options can not be considered.

l) CTUIL may also clarify whether approval given by Maharashtra STU was for upgradation of Narendra New GIS 400 kV SS to 765 kV and a new 765 kV D/c line between Narendra New – Pune (GIS).

5) CEA opinion may be sought whether the considerations / assumptions of CTUIL are in line with the Planning criteria and whether general planning philosophy is followed.

6) POSOCO may clarify whether they support for the upgradation of Narendra SS when the RE capacity addition is well within the 8GW already approved by CERC

In view of the above, MSEDCL submits that there is a need to review the proposal of CTUIL on ISTS network expansion beyond Kolhapur for export of surplus power during high RE scenario in Southern Region and withholds its consent till satisfactory clarification from CTUIL, as redundant/underutilised assets will result in unnecessary financial burden on MSEDCL and thereby on the end consumers.

Further, it is worth to mention that CTUIL being the apex body in transmission planning should always consider the techno-commercial aspects while proposing any transmission scheme rather than only looking from technical aspects since end consumers will be the ultimate bearers of the hike in the power cost due to such assets.

Thanking You.

Yours faithfully,

Chief Engineer (Power Purchase)
MSEDCL

Copy s.w.rs. to:
The Director (Commercial), MSEDCL, Prakashgad, Bandra (E), Mumbai – 51.

Copy f.w.c.s to:

1) The Chief Operating Officer, Central Transmission Utility India Limited, Saudamini, Plot No.2, Sector 29, Near IFFco Chowk, Gurgaon (Haryana) – 122001
2) The Chief Engineer, State Transmission Utility, MSETCL, Prakashganga, Bandra Kurla Complex, Bandra (East), Mumbai- 400 051.