

भारत सरकार
केन्द्रीय विद्युत प्राधिकरण
प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग
सेवा भवन, रामकृष्णपुरम्, नई दिल्ली 110066

क. सं. : 26/10/2013-प्र. यो. प. मू/ 377-390

दिनांक: 09.07.2013

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विषय :- पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 36वीं बैठक ।
महोदय,

पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 36वीं बैठक की एक कार्यसूची सूचना केन्द्रीय विद्युत प्राधिकरण की वेबसाइट
www.cea.nic.in पर लिंक Home page - Power Systems-Standing Committee on Power System Planning-Western Region)
पर उपलब्ध है ।

संलग्न - उपरोक्त

रविंद्र गुप्ता

{रविंद्र गुप्ता}
निदेशक



भारत सरकार / Government of India
विद्युत मंत्रालय / Ministry of Power
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority
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No. 26/10/2013-SP&PA/ 377 - 390

Date: 9th July 2013

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|---|--|
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Sub: 36th meeting of the Standing Committee on Power System Planning in Western Region

Sir,

The 36th meeting of the Standing Committee on Power System Planning in Western Region is proposed to be held by end of July 2013. The agenda notes for the meeting are available on CEA website (www.cea.nic.in at the following link: Home page-Wing Specific Document-Power Systems-Standing Committee on Power System Planning-Western Region).

The venue and the date of the meeting will be intimated in due course.

Yours faithfully,


(Ravinder Gupta)
Director

Agenda Note for 36th Meeting of Standing Committee on Power System Planning in Western Region

- 1.0 Confirmation of the minutes of 35th meeting of the Standing Committee on Power System Planning in Western Region (SCPSPWR) held on 3rd January 2013 at M.P Hall, Power Grid Township Sector-43, Gurgaon.**
- 1.1 The minutes of the 35th SCPSPWR were issued vide CEA letter No.26/10/2013-SP&PA/74-87 dated 4th Feb., 2013. POWERGRID vide its letter no. C/SEF/W/OA/SCM dated 5th March, 2013 has requested for modification of item no. 17.10 of the minutes of the meeting. A corrigendum vide CEA letter of even no. dated 5th March, 2013 was issued to modify item no. 17.10 of the minutes. The minutes of the 35th SCPSPWR with modified item no. 17.10 as given in corrigendum may be confirmed.
- 2.0 Review of Progress on Earlier Agreed Transmission Schemes.**
- 2.1 PGCIL may furnish the status of implementation of earlier agreed transmission schemes under construction / approved.
- 2.2 **LILO of one circuit of 400 kV D/C Mundra UMPP – Chorania line at Halvad (GETCO) substation, as an interim arrangement:** The LILO of one circuit of 400 kV D/C Mundra UMPP – Chorania line at Halvad (GETCO) substation was agreed as an interim arrangement till the planned network from Halvad sub-station was completed in the 34th SCM, in order to provide operation flexibility. In the 35th SCM, GETCO had informed that the interim arrangement would be implemented in 5 to 6 months time and as regarding planned system from Halvad, order for the same would be placed in four months time. GETCO may inform the present status.
- 2.3 **LILO of 400 kV S/c line between Raipur (PG) and Khedamera (Bhilai) at Raipur (Raita) 400kV substation and provision of 2X50 MVAR switchable line reactors at Raita end.** In the 34th standing committee meeting, interalia, provision of 2x50 MVAR switchable line reactors at Raipur (Raita) end of Raipur (Raita)-Jagdalpur 400 kV D/C line was agreed instead of 1x125 MVAR bus reactor at Raipur (Raita). In the 35th SCM, CSPTCL had stated that the 2X50 MVAR reactors were initially planned as fixed line reactors and now they exploring the possibility of conversion fixed line reactors to switchable line reactors. CSPTCL may inform the present status.
- 2.4 **Status of 10 nos. of bus reactors agreed in the 33rd SCM of WR:** In the 35th SCM POWERGRID had informed that the order for 1x125 MVA bus reactors at Jabalpur, Khandwa, Shujalpur, Bhatapara, Raigarh, Aurangabad has already placed and would be commissioned progressively from Jan'14 to Jun'14. GETCO had informed that the order for 1x125 MVA bus reactors at Ranchodpura, Versana, Amreli and Rajkot has been placed and would be commissioned by June 2013. GETCO and POWERGRID may inform the present status.
- 2.5 **Status of 17 nos. of bus reactors agreed in the 34th SCM of WR:** In the 35th SCM MSETCL had informed that for 1x125 MVA bus reactors at Nanded, Solapur, Kolhapur and Akola, LOI would be issued within three months time and would be commissioned in 12 months time after issue of LOI. Regarding reactors at Jetpur, Zerda and Limbdi (Chorania) GETCO had informed that order for these reactors has been placed and would be commissioned by July 2013. MPPTCL had informed that they have ordered two no. of 80 MVA bus reactors for Bhopal and Indore and the

same would be commissioned by October, 2013. Regarding reactor at Nagda, MPPTCL stated that there is space constraint at Nagda and they are exploring the possibility of creating additional space at Nagda or replacing one of the existing 2x50 MVAR by 1x125 MVAR reactor. POWERGRID informed that order for the reactors at Damoh, Bachau, Pirana, Itarsi, Seoni, Parli, Raipur and Gwalior would be placed by March 2013. POWERGRID, MSETCL, MPPTCL, GETCO may inform the present status.

3.0 Contingency arrangement for Rihand–III and Vindhyachal–IV projects of NTPC.

3.1 The transmission system associated with Vindhyachal-IV and Rihand-III agreed in the 29th and 32nd SCM of WR is as given below:

Part-I: Generation specific transmission system

A : Rihand-III: For NR only

- (i) Rihand-III – Vindhyachal Pooling Station 765kV 2xS/C (initially operated at 400kV)

B : Vindhyachal-IV: For WR only

- (ii) Vindhyachal-IV – Vindhyachal Pooling Station 400kV D/c (Quad)

Part-II: Common System: For both WR and NR

- (iii) Vindhyachal Pooling Station–Satna 765kV 2xS/c (initially to be operated at 400kV)
- (iv) Satna – Gwalior 765kV 2xS/c
- (v) Sasan – Vindhyachal Pooling Station 765kV S/c
- (vi) Sasan – Vindhyachal Pooling Station 400kV D/c
- (vii) Establishment of 765/400kV 2x1500MVA S/s at Vindhyachal Pooling Station

Part-III: NR Strengthening in Regional pool

- (viii) Gwalior – Jaipur 765/400 kV S/c.

3.2 In the 32nd SCM, due to non availability of associated transmission system in the matching time frame of Vindhyachal-IV generation project and to ease out the loading on existing 400kV lines from Vindhyachal complex, the following interim arrangement was agreed:

- a. Completion of Vindhyachal IV- Sasan 400kV D/c (bypassing at Vindhyachal Pooling Station) and bunching of both ckts. to make single ckt only
- b. Completion of Sasan - Satna 765kV S/c (to be operated at 400kV level) with termination at 765kV yard as planned by interconnecting 400kV and 765kV yards as well as interconnect Vindhyachal IV-Sasan 400kV bunched line
- c. Completion of Satna – Bina 765kV S/c (to be operated at 400kV level) with termination at 765kV yard as planned by interconnecting

400kV and 765kV yards

- d. Installation of 765/400kV transformers each at Bina and Gwalior S/s
- e. Completion of 765kV Bina - Gwalior S/c.

In the 33rd SCM of WR, interconnection of Vindhyachal-IV STPP 400 kV bus with the existing Vindhyachal-III STPP 400 kV to be implemented along with 1x125 MVAR bus reactor at Bina end was also agreed as an interim arrangement.

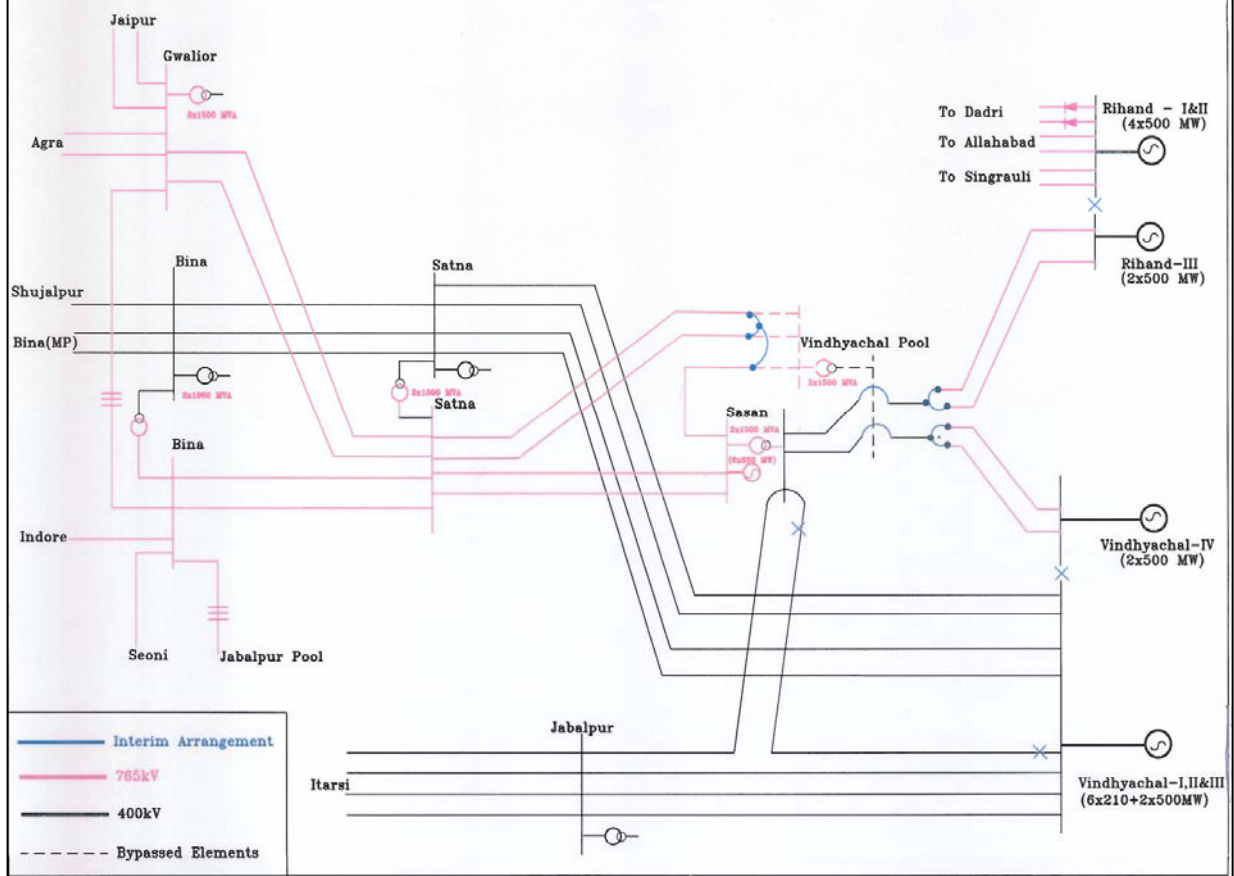
In the 35th SCM of WR, item (a) & (b) of the agreed interim arrangement were modified to Vindhyachal IV - Sasan 400 kV D/C line by bypassing Vindhyachal pool and charging of Sasan-Satna 765 kV 2XS/C lines at 765 kV along with 765/400 kV ICT at Sasan. This was done in view of the delay in Vindhyachal -pooling substation due to land issue and to facilitate the evacuation of power from Vindhyachal-IV and Sasan UMPP generation projects.

3.3 The transmission system associated with Vindhyachal-IV and Rihand-III is under implementation by POWERGRID. POWERGRID has informed that the elements (ii) and (vi) at 3.1 above have already been commissioned and the remaining elements at 3.1 shall be available progressively from October 2013 to December 2013. However, due to delay in implementation of the 765/400 kV Vindhyachal pooling station, POWERGRID has proposed the following interim arrangement till the completion of 765/400 kV, 2X 1500 MVA Vindhyachal PS:

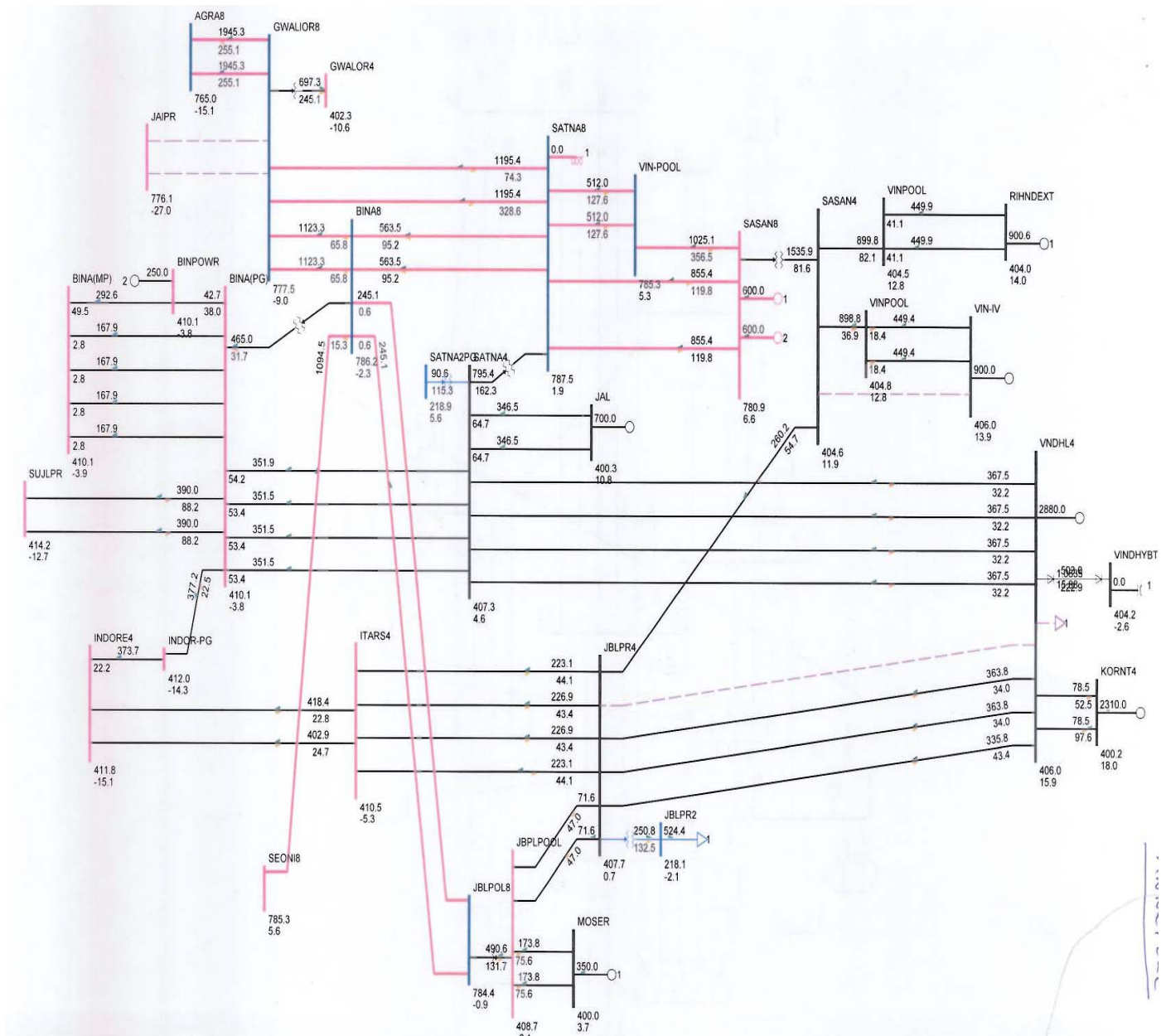
- Bunching of both circuits of Rihand III - Vindhyachal Pooling station line and interconnection with one circuit of Vindhyachal PS – Sasan 400 kV D/C line by bypassing Vindhyachal PS.
- Bunching of both circuits of Vindhyachal IV - Vindhyachal Pooling station 400 kV D/C (quad) line and interconnection with another circuit of Vindhyachal PS – Sasan 400 kV D/C line by bypassing Vindhyachal PS.
- Bunching of both circuits of Vindhyachal PS – Satna 765 kV 2XS/C lines and interconnection with Sasan–Vindhyachal PS 765 kV S/C line through bypassing Vindhyachal PS.
- Bus sectionalizers between Rihand-III and existing stages at Rihand and between Vindhyachal-IV and existing stages at Vindhyachal are to be kept open.
- The 400 kV line section between Vindhyachal and Sasan (of LILO one circuit of Vindhyachal – Jabalpur 400 kV D/C line at Sasan) shall be kept open. Further, the transformation capacity at Sasan 765/400 kV switchyard shall be 2X1000 MVA, for full evacuation of power from Rihand-III & Vindhyachal-IV STPP.

The exhibit showing the above interim arrangement is as given below:

CONTINGENCY ARRANGEMENT FOR POWER EVACUATION FROM RIHAND-III & VINDHYACHAL-IV (2X500 MW)



The exhibit showing the results of the Load Flow study carried out by POWERGRID is given below.



3.4 To facilitate the evacuation of power from Rihand-III and Vindhyachal-IV, in principle approval of the above interim arrangement was given to POWERGRID by CEA in June 2013 with following observations:

- Generation from Vindhyachal-IV or Rihand –III is evacuated over 400 kV S/C lines up to Sasan. In case of outage of the 400 kV S/C line, the entire generation of 1000 MW from Vindhyachal-IV or Rihand –III stage would be lost.
- For full evacuation of 2000 MW power from Rihand-III and Vindhyachal-IV, 2X1000 MVA, 765/400 kV transformation capacity at Sasan is required. In case outage of any 1000 MVA ICT at Sasan, there would be overloading of other ICT. To avoid overloading generation back down at Rihand-III / Vindhyachal-IV would be required.

3.5 Members may concur the interim arrangement proposed by POWERGRID.

4.0 Termination of 400 kV D/C (2nd) line from Khandwa to Rajgarh at Indore in place of Rajgarh.

4.1 The transmission system associated with Mauda-II generation project of NTPC was agreed in the 31st and 32nd Standing Committee meeting for Power System Planning in Western Region held on 27.12.2010 and 13.05.2011 respectively and is given below:

- (i) Mauda-II – Betul 400 kV D/C (quad) line.
- (ii) Betul – Khandwa 400 kV D/C (quad) line.
- (iii) Khandwa – Rajgarh 400 kV D/c line.
- (iv) Establishment of 2X315 MVA, 400/220 kV Betul (GIS) substation.

4.2 POWERGRID has intimated that the area in which Rajgarh substation is located has been notified as Bird Sanctuary by Madhya Pradesh Government. The transmission system associated with Mauda-II (2X660 MW) generation project of NTPC includes Khandwa – Rajgarh 400 kV D/C (2nd) line, which will pass through the Bird Sanctuary. Therefore, there would be delay in completion of the transmission system. It has been further intimated that transmission system associated with Mauda-II (2X660 MW) generation project of NTPC is under tendering stage and the Mauda-II generation project is scheduled for commissioning by December 2015.

4.3 In view of anticipated delay in implementation of Khandwa – Rajgarh 400 kV D/C (2nd) line, POWERGRID has proposed termination of the Khandwa – Rajgarh 400 kV D/C (2nd) line at Indore (PG) 400 kV substation instead of at Rajgarh. POWERGRID had requested in principle approval of CEA, so that they can go ahead with tendering activities for the revised system. The revised transmission system associated with Mauda-II generation project of NTPC for which in principle approval of CEA had been sought is as given below:

- (i) Mauda-II – Betul 400 kV D/C (quad) line.
- (ii) Betul – Khandwa 400 kV D/C (quad) line.
- (iii) **Khandwa – Indore (PG) 400 kV D/c line.**
- (iv) Establishment of 2X315 MVA, 400/220 kV Betul (GIS) substation.

The load flow studies carried out by POWERGRID is enclosed at Annexure – I.

4.4 The transmission system of Mauda-II is under tendering stage and to enable POWERGRID to go ahead with the tendering activities for the revised system, in-principle approval of CEA was given to POWERGRID in April 2013.

4.5 Members may concur. POWERGRID may intimate the status of implementation.

5.0 Review of transmission system associated with Solapur STPP 1320 MW (2X660 MW) of NTPC.

5.1 The transmission system associated with Solapur STPP (2X660 MW) generation project of NTPC was agreed in the 30th Standing Committee meeting for Power System Planning in Western Region held on 08.07.2010 is as given below:

- (i) Solapur NTPC- Solapur (PG) 400kV D/c line.
- (ii) Solapur NTPC - Pune (PG) 400kV (Quad) D/c line.
- (iii) Augmentation of 400/220kV ICT by 1x315 MVA transformer at Solapur (PG).

5.2 POWERGRID has requested for modification in the transmission system associated with Solapur STPP in view of the changed load-generation scenario. At the time of finalization of the transmission system of Solapur STPP, it was envisaged that Southern Region would be surplus in power and would export power to Western Region. With most of the envisaged generation addition not happening in Southern Region, huge power deficit is anticipated in SR and there is requirement of export of power from WR to SR through the inter-regional links between WR and SR. The result of the load flow studies carried out by POWERGRID is enclosed as Annexure-II. In this changed load-generation scenario, the associated transmission system of Solapur STPP has been reviewed and the modified transmission system associated with Solapur STPP, proposed by POWERGRID is given below:

- (i) Solapur NTPC- Solapur (PG) 400kV D/c (**Quad**) line.
- (ii) Solapur NTPC - Pune (PG) 400kV (Quad) D/c line (deferred as of now, and shall be taken up as and when required in future).
- (iii) Augmentation of 400/220kV ICT by 1x315 MVA transformer at Solapur (PG).

The load flow studies are enclosed at Annexure-II.

5.3 In-principle approval for the modifications in the agreed system was given to POWERGRID in April 2013 so that they can go ahead with the tendering activities for the revised system.

5.4 NTPC vide its letter dated 28-06-2013 has requested to provide additional 400 kV D/C outlet from Solapur STPP in order to utilize the 2 no. Pune line bays either through LILO of any existing line or 2nd outlet to Solapur (PG).

5.5 Members may deliberate.

6.0 Approval for conversion of Line reactors into Bus reactors at Kasor (GETCO) as an interim arrangement.

6.1 GETCO vide its letter to POWERGRID has intimated that during low load conditions, high voltage is experienced at 400 kV Kasor (GETCO) substation and hence has requested for utilizing the commissioned Line bays and Line reactors associated with Kasor-Rajgarh 400 kV D/c line as Bus reactor bays and Bus reactor at Kasor (GETCO) substation to contain the over voltages.

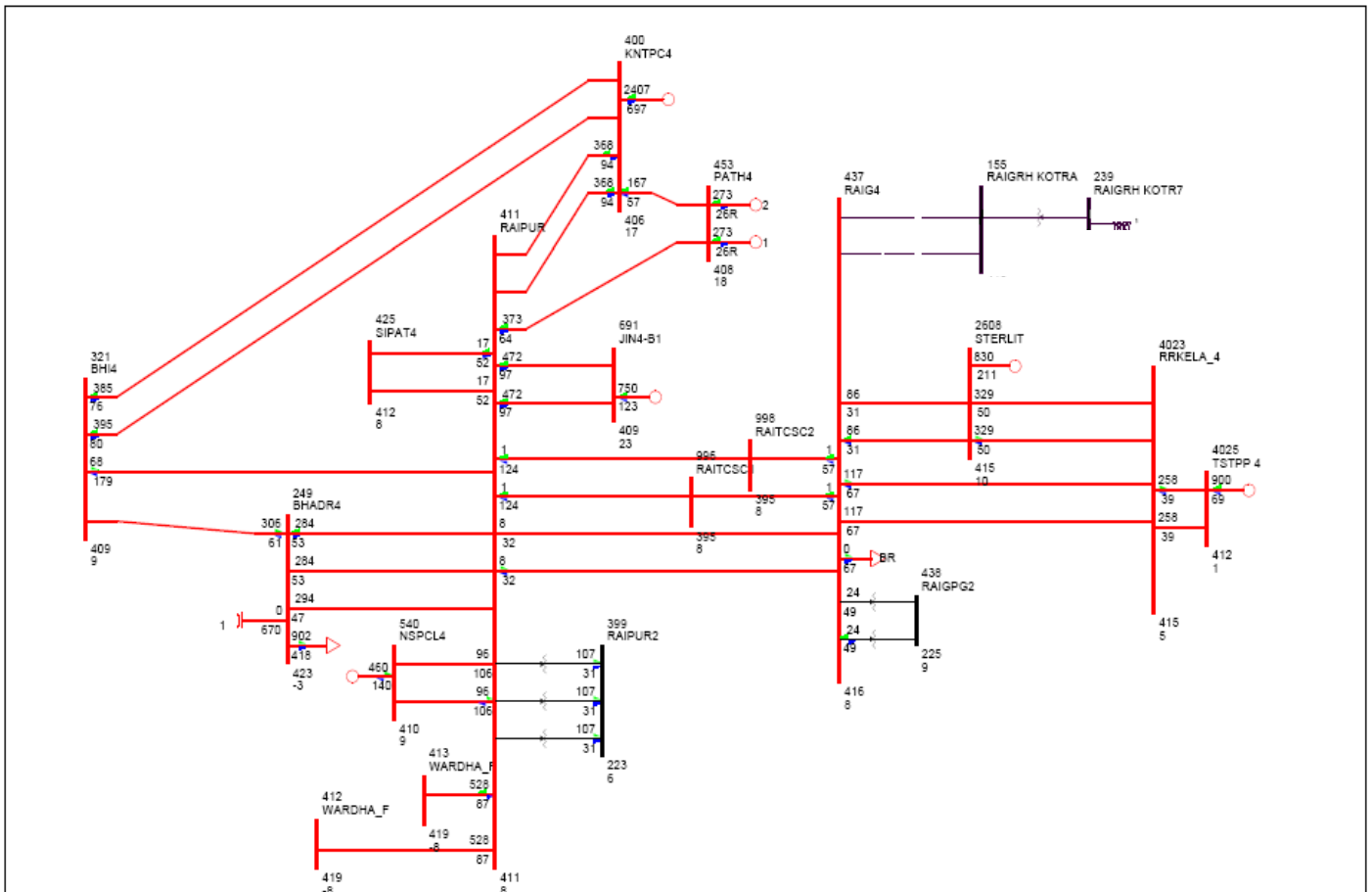
6.2 POWERGRID has informed that the Line bays and Line reactors (2x50MVAR) at Kasor end of Kasor-Rajgarh 400kV D/c line (Line being implemented by Reliance Power Transmission Limited) are already charged w.e.f 01/09/2012 and are out of service, as associated Kasor-Rajgarh transmission line is not yet ready. POWERGRID has proposed to utilize the commissioned Line bays and Line reactors associated with Kasor-Rajgarh 400kV D/c line at Kasor (GETCO) sub-station as Bus reactor bay and Bus reactor. This would be an interim arrangement till the availability of Kasor-Rajgarh 400kV D/c line.

6.3 The Completion of Kasor-Rajgarh 400kV D/c line by M/s RPTL is pending due to forest clearance issues whereas the associated Line bays and Line reactors (2x50MVAR) at Kasor end are already been charged. In principle approval for the proposal of POWERGRID for conversion of Line reactors and Line bays into Bus reactor and Bus reactor bay at Kasor (GETCO) substation to contain the over voltages was given to POWERGRID in April 2013. This is as an interim arrangement till the availability of Kasor-Rajgarh 400kV D/c line.

6.4 Members may agree with the above proposal.

7.0 Commissioning of 1X240 MVAR, 765 kV Bus reactor and 1500 MVA, 765/400 kV transformer at Raigarh pooling station (Kotra).

7.1 POWERGRID has intimated that during light load conditions, the voltage at Raigarh (existing) substation is in the range 430 kV – 435 kV. Further one 240 MVAR bus reactor along with 1X1500 MVA, 765/400 kV ICT at Raigarh (Kotra) pooling station and the 400 kV D/c line between Raigarh pooling station and Raigarh (existing) was ready for commissioning. The studies (as given below) shows a voltage relief of about 4 kV at 400 kV Raigarh (existing) bus with charging of the 240 MVA bus reactor at Raigarh (Kotra) through the 765/400 kV, 1500 MVA ICT and the Raigarh (Kotra) – Raigarh (existing) 400 kV D/C line. Raigarh (existing) 400 kV substation being an important substation in the East-West corridor, POWERGRID had requested for in principle approval for commissioning of the above elements.



- 8.3 Load flow studies have been carried out for the revised load generation scenario for 2016-17 condition and it has been observed that Wardha – Hyderabad 765kV D/c line is loaded to the extent of 3500 MW and loading on Solapur – Raichur 765kV 2xS/c line is about 750 MW. Under outage of one ckt. of Wardha – Hyderabad 765kV line, the loading on the other ckt is about 2900 MW and power flow on Raichur – Solapur lines increases to 1100 MW. To balance the loading between these 2 corridors from WR to SR (Wardha-Hyderabad & Raichur – Solapur) Aurangabad – Solapur 765kV D/c line has been considered. It is found from the load flow studies that the loading on Wardha – Hyderabad is about 2500 MW and loading on Solapur – Raichur is about 1500 MW. The loading under contingency of Wardha – Hyderabad 765kV one ckt. reduces to 2400MW. Load flow study results are enclosed at **Annexure-III**.
- 8.4 Keeping above in view, in principle approval was given to POWERGRID to implement Aurangabad- Solapur 765kV D/c line in lieu of Solapur-Pune 765 kV S/c (2nd ckt) and LILO of one ckt of Aurangabad-Padghe 765 kV D/C line at Pune in lieu of Kolhapur-Padghe 765 kV D/C one ckt via Pune in May 2013 as system strengthening scheme in WR for transfer of power to SR from IPPs in Chhattisgarh.
- 8.5 Members may agree with the above proposal.

9.0 Transmission system associated with Mundra UMPP (5X800 MW).

- 9.1 The transmission system associated with Mundra UMPP comprises of Generation specific transmission system, system strengthening in WR and system strengthening in NR. The generation specific transmission system consists of the following elements which has already been commissioned:
- (i) Mundra UMPP – Bachau - Ranchodpura 400 kV D/C (triple snowbird) line.
 - (ii) Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) line.
 - (iii) Mundra UMPP – Jetpur 400 kV D/C (triple snowbird) line.
- 9.2 The transmission scheme was planned considering the Transmission Planning Criteria, published in 1994. Regarding steady state operation, the criteria required secure operation of grid without necessitating generation rescheduling or load shedding following loss of one element i.e. 'N-1'. The manual on Transmission Planning Criteria, 1994 was silent about subsequent fault. This has been elaborated in the revised Transmission Planning Criteria, 2013 as 'N-1-1'. The manual specifies that subsequent to the outage of a 400 kV S/C line, the system shall be able to survive a permanent single phase to ground fault on a 400 kV line close to the bus. The criteria also provides for review of the existing and planned transmission.
- 9.3 The system studies carried out by POWERGRID (enclosed at **Annexure- IV**) with full dispatch from Mundra UMPP and under the contingency of outage of Mundra UMPP – Bachau 400 kV D/C line, the angular separation of 36 degree between Mundra and Limbdi is observed. To overcome this, POWERGRID has proposed the following transmission system strengthening as an immediate measure in the transmission system associated with Mundra UMPP generation project:

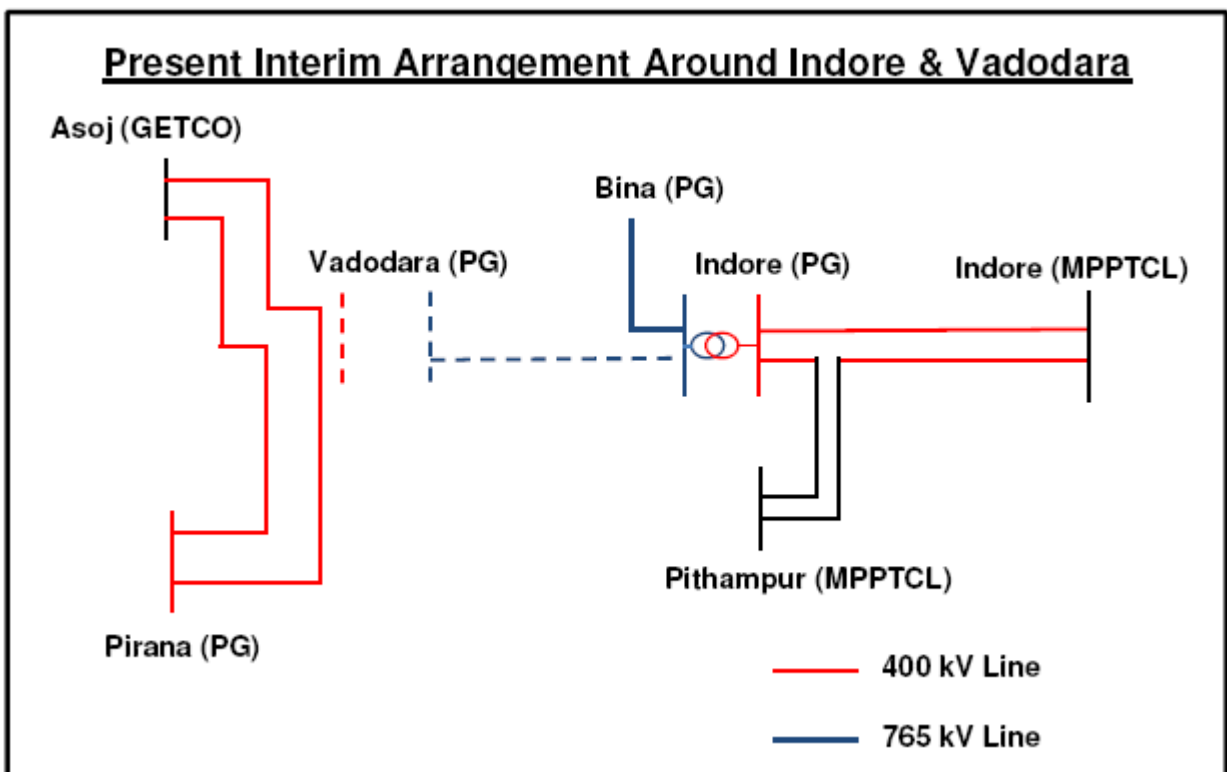
- a) LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) at Bachau.
- b) LILO of one circuit of under construction Bachau – Versana 400 kV D/C line at Mundra UMPP (the LILO portion shall be with triple snowbird conductor).

9.4 The transmission system strengthening proposed to comply with ‘N-1-1’ criteria of the Transmission Planning Criteria was agreed in principle in June 2013.

9.5 Members may concur.

10.0 Interim arrangement around Indore and Vadodara.

10.1 Interconnection of Vadodara-Asoj 400 kV D/C line and Vadodara-Pirana 400 kV D/C line by bypassing Vadodara S/S so as to form Pirana-Asoj 400 kV D/C line as given below was agreed in the 35th SCM as a contingency arrangement till the availability of Vadodara S/S.



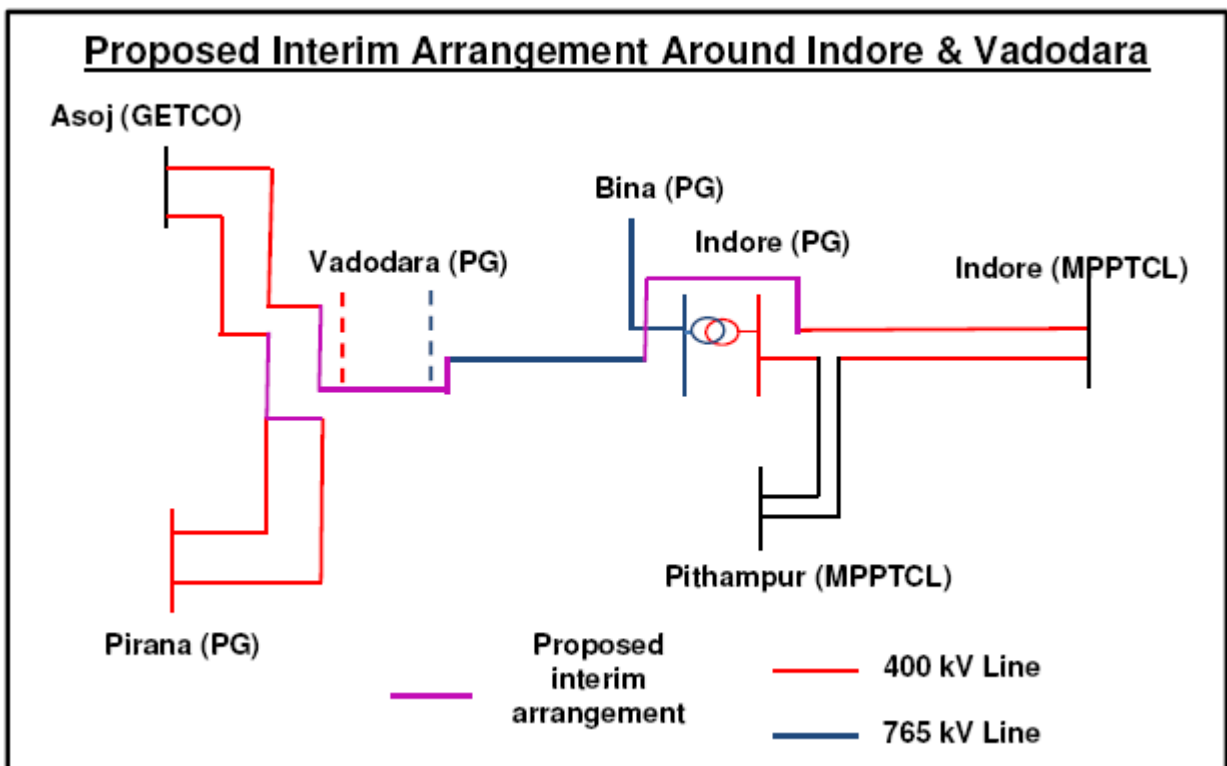
10.2 MPPTCL has requested POWERGRID for provision of two number bays at Indore (PG) 400 kV substation for termination of the Pithampur – Indore (PG) 400 kV D/c line. Due to delay in implementation of 2 nos. of bays at Indore(PG), POWERGRID has proposed the termination of the 400 kV D/c line from Pithampur into one circuit of Indore(MPPTCL)- Indore(PG) 400 kV D/c line as shown in the exhibit above.

10.3 POWERGRID has informed that Indore (PG)-Vadodara 765 kV S/C line, Vadodara-Pirana 400 kV D/C (Quad) line and Vadodara-Asoj 400 kV D/C (Quad) line approved as a part of IPP projects in MP and Chhattisgarh (HCPTC-IV & V) are expected to be commissioned by October 2013. The Vadodara 765/400 kV 2x1500 MVA sub-station would be delayed due to problems in land acquisition. In order to transfer power from the IPPs in MP and Chhattisgarh to Gujarat and provide connectivity to Pithampur (MPPTCL) 400 kV sub-station, POWERGRID has proposed following interim arrangement till the availability of 765/400 kV Vadodara S/S.

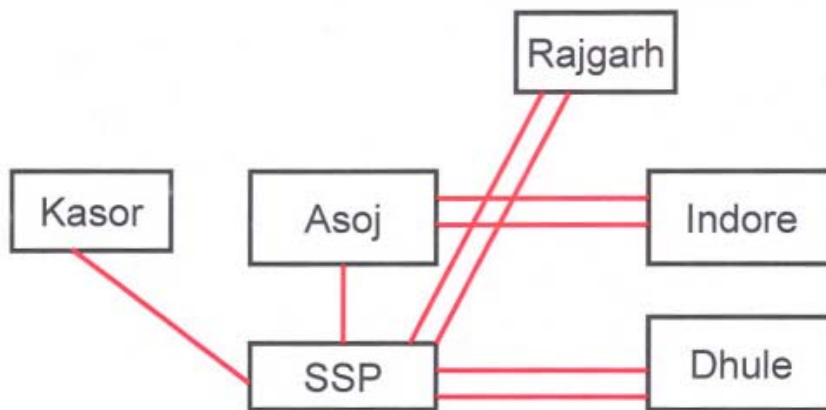
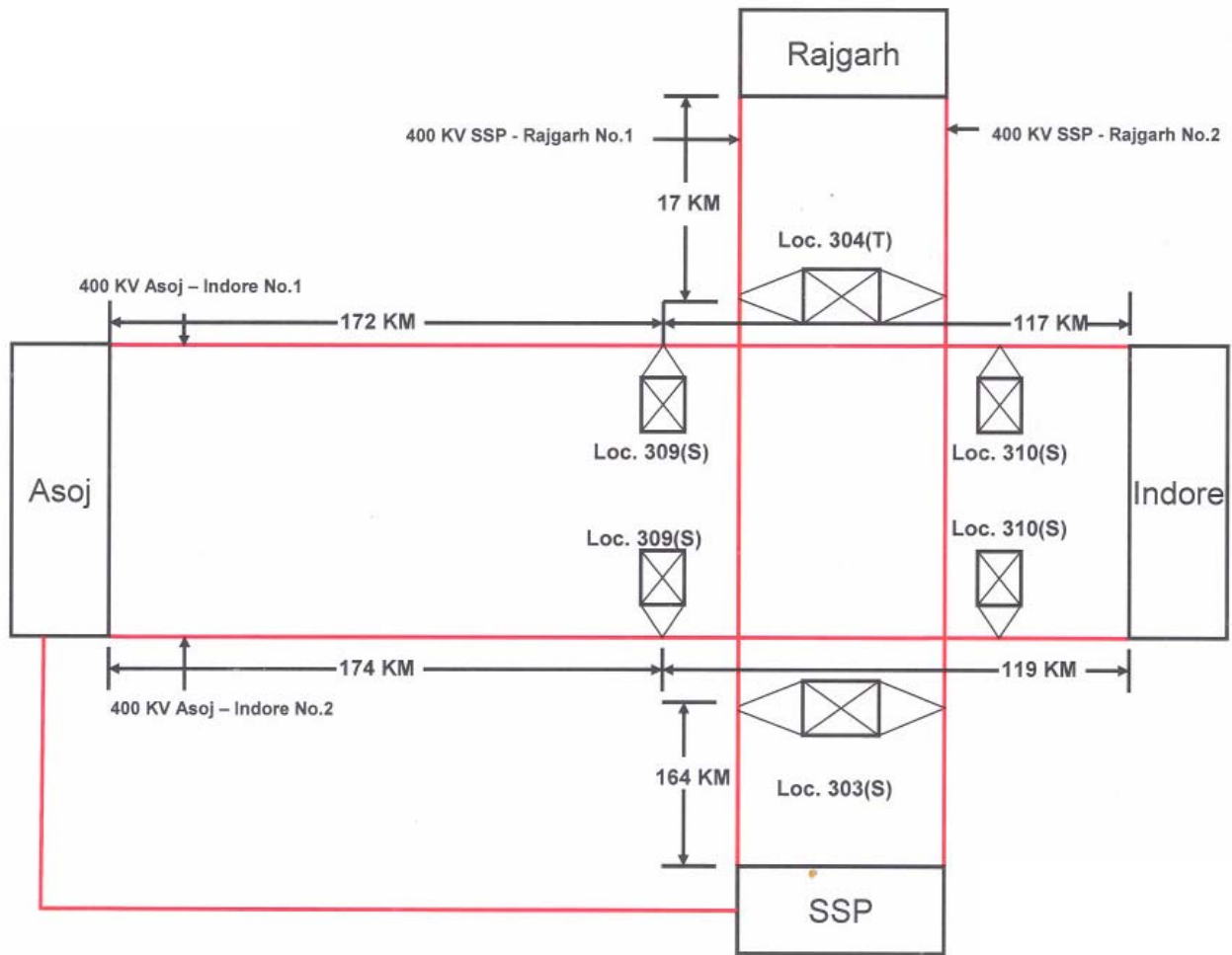
- c) Opening of 1st ckt of Indore (MPPTCL)-Indore (PG) 400 kV D/C line at Indore (PG) end and connecting it with Indore (PG)-Vadodara 765 kV S/C line by bypassing Indore (PG) S/S.
- d) Connecting Vadodara end of the above Indore (MPPTCL)-Vadodara line to one circuit of Vadodara-Asoj 400 kV D/C line by bypassing Vadodara S/S so as to form Indore (MPPTCL)-Asoj 400 kV S/C line.
- e) Bunching of Vadodara-Pirana 400 kV D/C line and connecting it with other circuit of Vadodara-Asoj (GETCO) 400 kV line by bypassing Vadodara S/S
- f) LILLO of 2nd ckt of Indore (MPPTCL)-Indore (PG) 400 kV D/C line at Pithampur (MPPTCL).

10.4 The interim arrangement proposed would result in following configuration:

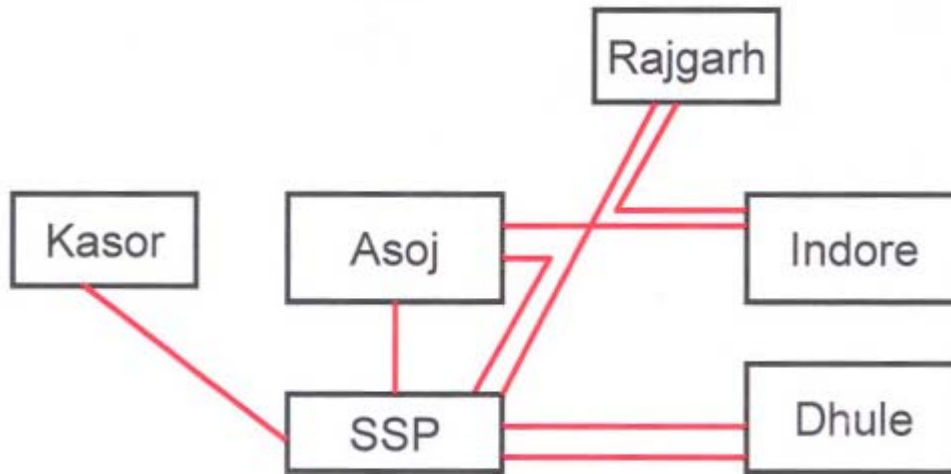
- i) Indore (MPPTCL)-Asoj 400 kV S/C line by bypassing Indore (PG) and Vadodara sub-stations. The length of the line would be around 380 km and for charging of the above line POWERGRID has informed that following reactive compensation would be available:
 - a) 125 MVAR bus reactor at Indore (MPPTCCL)
 - b) 240 MVAR line reactor (at 765 kV) charged at 400 kV at Indore (PG)
 - c) 50 MVAR bus reactor at Asoj (GETCO)
- ii) Asoj-Pirana 400 kV S/C line by bypassing Vadodara sub-stations
- iii) Indore (MPPTCL)-Pithampur (MPPTCL) 400 kV S/C line
- iv) Indore (PG)-Pithampur (MPPTCL) 400 kV S/C line



(vii) SSP – Dhule 400 kV D/c line.



Existing Configuration



Proposed configuration

- 11.3 The reconfiguration provides second interconnection between SSP and Asoj. The length of the existing line between SSP and Asoj is 83 km whereas the length of the second interconnection after reconfiguration would be about 340 km and unequal power flow on these lines.
- 11.4 The interim arrangement proposed by POWERGRID at item no. 10 provides two nos. of additional in feeds to Asoj. The system studies (**Annexure - V**) carried out with interim arrangement at no. 10 and with about 1200 MW dispatch at SSP, indicates normal power flows even in case of outage of SSP- Asoj or SSP – Kasor 400 kV S/C line.
- 11.5 Members may discuss.

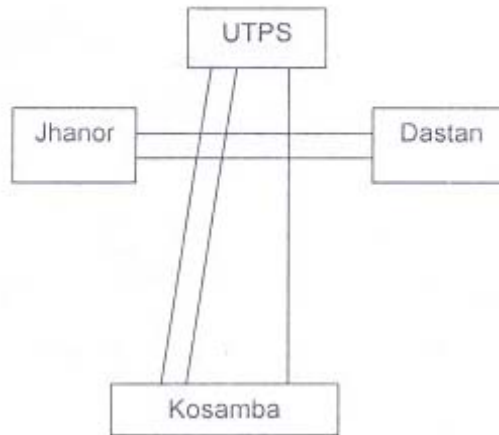
12.0 Proposal for modification in existing network arrangement for smooth operation of power system in South Gujarat- agenda by GETCO

12.1 GETCO has intimated that with the increased generation from coastal coal based power projects (Mundra UMPP, Mundra Adani, Essar Vadinar), generation from gas based power projects in south Gujarat (TPGL, GSEG, Kawas, Gandhar etc.) has been reduced considerably due to high cost / non-availability of gas. This has resulted in loading of lines in south of Gujarat viz., Jhanor – Haldarwa 220 kV D/C line, Kawas- Ichchapore 220 kV D/C line, Kosamba – Kim 220 kV S/C line, Ukai – Mota 220 kV D/c line etc. to its thermal rating on continuous basis. To avoid this overloading GETCO has suggested the following modification in the existing 400 kV network:

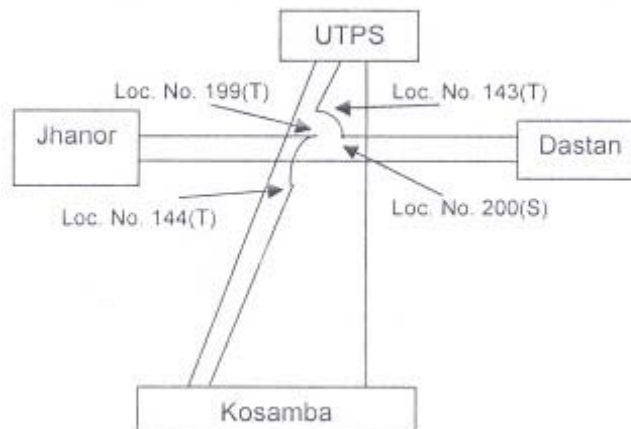
- (i) Ukai – Kosamba 400 kV D/c line of GETCO and Jhanor – Navsari (Dastan) 400 kV D/C line of POWERGRID crosses each other. Interconnection of one circuit each of these lines to form Ukai – Navsari 400 kV S/C line and Jhanor – Kosamba 400 kV S/C line.
- (ii) The above interconnection is proposed as an interim arrangement till availability of Kosamba- Vapi 400 kV D/c line.
- (iii) LILO of Jhagadia - Haldarwa 220 kV S/c line at Jhanor TPS. This would help in control loading of Jhanor-Haldarwa 220 kV D/C line.

The exhibits showing existing and proposed arrangement are given below:

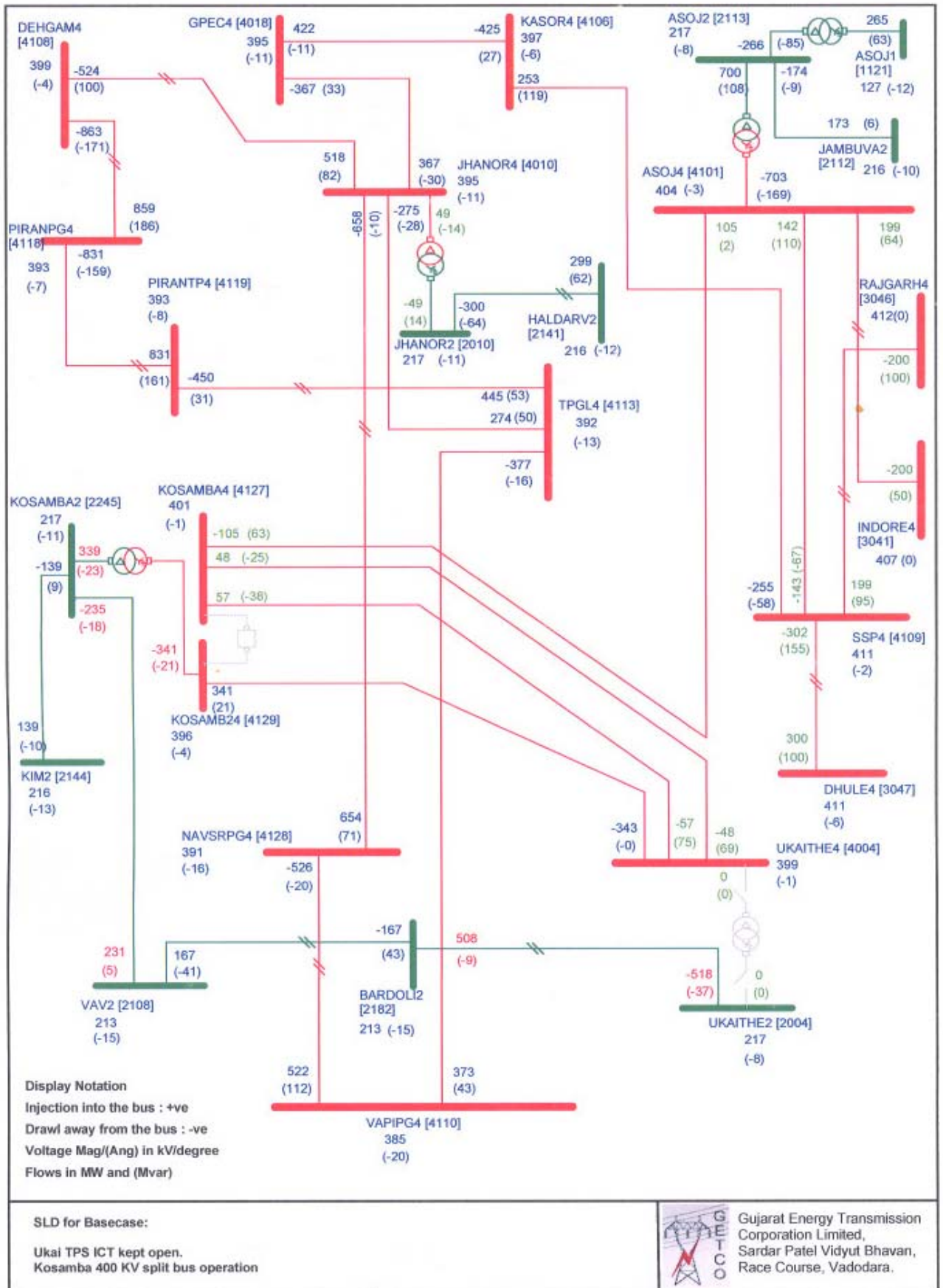
Present configuration:

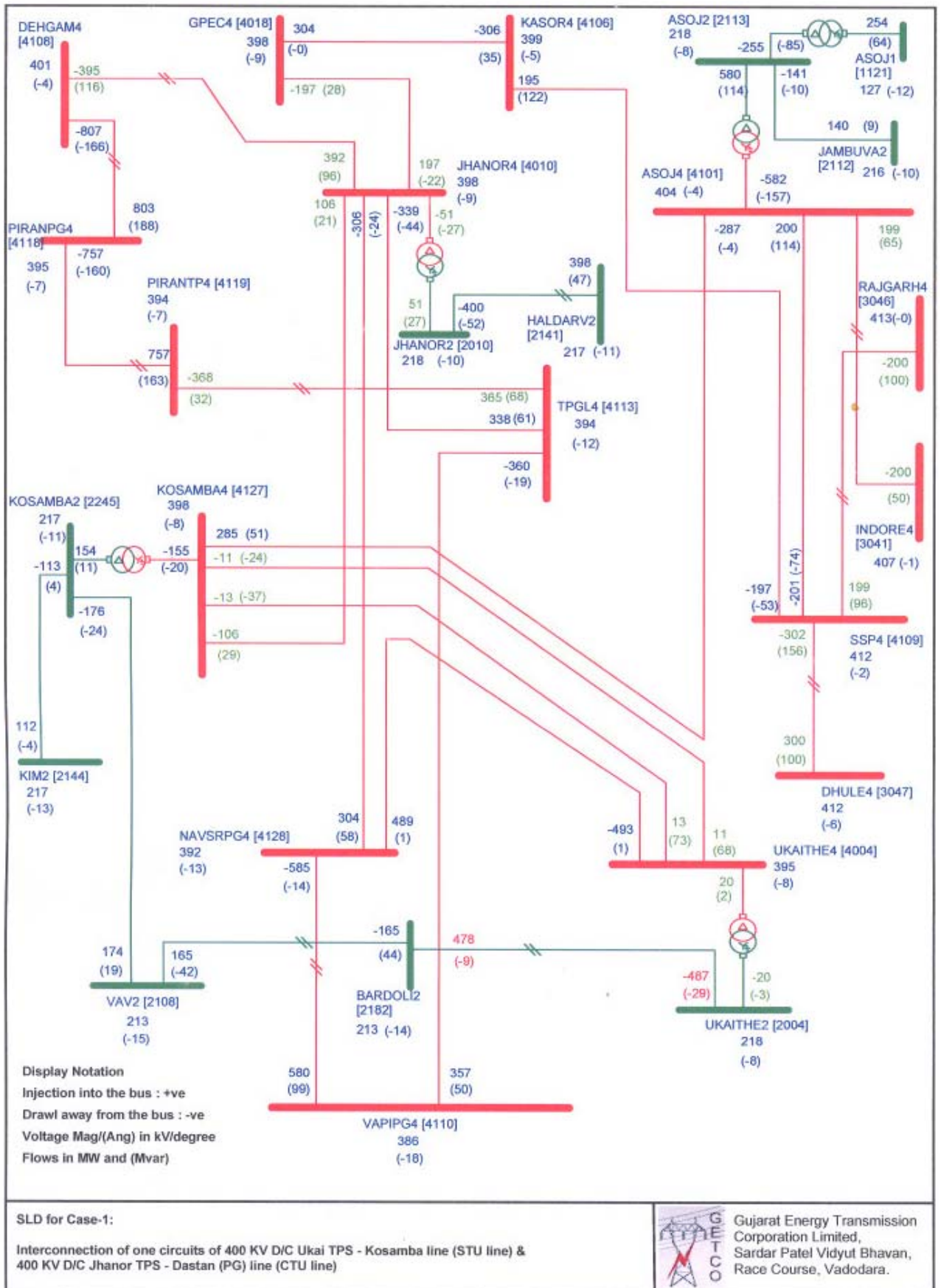


Proposed configuration



12.2 The system studies carried out by GETCO showing the power flow with existing and proposed arrangement is shown below:





12.3 Members may agree the interconnection of Jhanor - Navsari 400 kV line and Ukai – Kosamba 400 kV line as an interim arrangement. Regarding the LILO of Jhagadia - Haldarwa 220 kV S/c line at Jhanor TPS, the availability of 220 kV bays at Jhanor TPS may be confirmed from NTPC.

13.0 Interim arrangement for 765/400kV Champa Pooling Substation under High Capacity Corridor – V for IPPs in Chhattisgarh.

13.1 Champa Pooling station has been planned at 765 kV with the following interconnections:

- Champa Pool – Raigarh Pool (Kotra) 765kV S/c line.
- Champa Pool – Raipur Pool 765kV D/c line.
- Champa Pool – Dharamjaygarh/Korba 765kV S/c.

13.2 POWERGRID had informed that the above lines shall be ready progressively from October, 2013 to December, 2013. There is delay in implementation of 765/400kV Champa Pooling substation due to land acquisition problem. Further, 400 kV 2xD/c lines from KSK Mahanadi (dedicated lines being implemented by KSK Mahanadi) are to be terminated at Champa Pool. KSK Mahanadi has been provided with an interim arrangement through LILO of both circuits of Raigarh – Raipur 400 kV D/c line out of which LILO of one circuit has been implemented.

13.3 Due to delay in implementation of 765/400 kV Champa pooling station, POWERGRID has proposed for following contingency arrangement till the availability of Champa Pooling substation:

- Interconnection of Raigarh Pool (Kotra) - Champa Pool 765kV S/c with Champa Pool – Dharamjaygarh 765kV S/c line bypassing Champa Pool.
- Out of the KSK Mahanadi - Champa Pool 400 kV 2xD/c line, one 400 kV D/c line shall be terminated to LILO of one circuit of Raigarh – Raipur 400 kV D/c line (as per existing arrangement). The other 400 kV D/c from KSK Mahanadi to Champa shall be extended to Raipur (Existing) by connecting this to Champa Pool – Raipur Pool 765 D/c line (charged at 400 kV & bunching and interconnecting this line with one circuit Raipur Pool – Raipur (existing) 400 kV D/c line). This arrangement shall make KSK Mahanadi – Champa Pool (Champa Pool bypassed) – Raipur Pool (bunching of 765 kV D/c line and bypassing Raipur Pool 765 kV bus) – Raipur (existing) line charged at 400 kV. Also the other circuit of Raipur Pool – Raipur (existing) 400 kV D/c line shall remain with existing arrangement connected to 765/400 kV ICTs at Raipur Pool.

13.4 The interim arrangement and Load Flow study is enclosed in attached **Annexure-VI**. All the loadings of lines are within their limits.

13.5 With the above arrangement, power from IPPs coming up at Raigarh Pool(Kotra) and Raigarh Pool (Tamnar) can also be evacuated through these lines till completion of 765/400kV, Champa Pool substation. However, in the event of contingency of any line till the availability of Raipur Pool – Wardha 765 kV Dc/ line, back down of generation may be required.

Members may agree the interim arrangement proposed as above.

14.0 MPPTCL Proposal of Installation of Line shunt reactors on Nagda-Indira Sagar and Indira Sagar-Satpura 400kV Lines at 400kV S/s at Nagda, Indira Sagar HEP and Satpura TPS end.

- 14.1 Madhya Pradesh is experiencing very high voltage during the off peak condition and to control over voltages many of the 400/220kV lines are kept open in the State. Indira Sagar to Nagda 400kV line plays a vital role in evacuation of power from Indira Sagar HEP and during the full generation from this station in the Monsoon season, the 400kV line has to be tripped due to over voltages. However, it is undesirable to trip such strategically important line due to system requirement and reliability point of view.
- 14.2 The matter of tripping of line due to over voltages has been raised and discussed at different platforms between MPPTCL, ISP and WRPC. On latest investigation carried out by a team of engineers deputed and headed by WRPC on 10.05.2013, it was again concluded that normally the voltages at ISP is around 420kV to 430kV. As there are no bus reactor or line reactors provided at ISP end, this results in further rise in voltages and result in manual or auto tripping of 400kV Indore and Satpura feeder emanating from ISP.
- 14.3 Since power corridor from Sarni TPS and ISP to load centers of Western MP is passing through 400kV bus of ISP, 400kV S/s Indore & 400kV S/s Nagda, it creates system reliability problem when high voltage trippings of 400kV elements i.e. 400kV ISP-Nagda, 400kV ISP-Sarni lines occurs, which isolates Western MP load centre with generating source of Sarni TPS & ISP. This situation shall become more critical after addition of generating capacity at Sarni TPS. Therefore, it becomes very essential to keep all these line in service, all the time, for proper evacuation of power from Sarni TPS and ISP.
- 14.4 For controlling over voltage, it is proposed by MPPTCL proposes to install Reactors as under:
- (i) Bus reactor of 125 MVAR, 400kV rating at Indira Sagar HEP.
 - (ii) Line reactor of 50 MVAR, 400kV rating at Satpura 400kV Substation on Indira Sagar-Satpura 400kV line.
 - (iii) Line reactor of 50MVAR 400kV rating on Indira Sagar-Nagda 400kV line at Nagda 400kV Substation.

The Committee may like to discuss and approve.

15.0 Additional System Strengthening based on new Transmission Planning Criteria for Mundra UMPP (5x830 MW)

- 15.1 In principle approval to POWERGRID was given by CEA (agenda item no. 9) for following transmission system strengthening in the transmission system associated with Mundra UMPP generation project:
- a) LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) at Bachau.
 - b) LILO of one circuit of under construction Bachau – Versana 400 kV D/C line at Mundra UMPP (the LILO portion shall be with triple snowbird conductor).
- 15.2 With the establishment of Bhuj pooling station as a part of transmission system strengthening for renewable energy sources in Gujarat, LILO section of **item b**

above would be terminated at Bhuj pooling station and the Bachau – Versana 400 kV D/c line would be restored to its original configuration.

15.3 The additional transmission system strengthening proposed for Mundra UMPP, to comply with 'N-1-1' criteria of the Transmission Planning Criteria is given below:

- (i) LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/c (triple snowbird) at Bachau*.
- (ii) Mundra UMPP – Bhuj Pooling station 400 kV D/c line (triple snowbird)#

* LILO of Mundra UMPP- Limbdi at Saurashtra Pool agreed in 35th Meeting of Standing Committee on Power system Planning as may be deleted.

Since Bhuj is proposed to be established as a new 765/400 kV Pooling Station, therefore as an interim measure the Mundra – Bhuj Pool line shall be terminated into one circuit of Bachau – Varsana 400 kV D/c line to form LILO configuration, till establishment of Bhuj pooling station. Bachau-Versana 400 kV D/c line is being implemented by POWERGRID. With the implementation of Bhuj Pooling station, Bachau – Varsana 400 kV line would be restored to original configuration and the line from (LILo section) Mundra UMPP may be terminated at Bhuj Pool.

15.4 Load Flow studies with above schemes have been carried out and results are enclosed at **Annexure-VII**. Further, “n-1-1” contingency have been carried and all the loadings and angles are within their limits. Presently, SPS has been planned with Mundra UMPP as backing down of generation is required with “n-1-1” contingency. To avoid backing down of available generation the scheme mentioned at 15.3 needs to be implemented on urgent basis.

16.0 Additional transmission system strengthening for Sipat STPS (2x500 + 3x660 MW).

16.1 The immediate evacuation from Sipat STPS consists of following elements which have been commissioned:

- (i) Sipat – Bilaspur Pooling Station 765 kV 2xS/c line
- (ii) 2x1000 MVA, 765/400 kV transformers at Sipat STPS.

16.2 In the 35th SCM, NTPC had requested to review the evacuation system of Sipat STPP and provide an additional 765 KV circuit to Bilaspur/ any other location from Sipat to enhance the redundancy in the evacuation system. The request was made as, there have been several instances of station outages at Sipat Station. In some of the instances, it has been observed that tripping of one of the 765 KV Sipat-Bilaspur Pooling station line has led to tripping of other 765 KV line. WRPC/RLDC has also

recommended strengthening of transmission system from Sipat with additional 765 KV circuit to Bilaspur Pooling station.

16.3 To following additional transmission system strengthening is proposed to enhance redundancy in the Sipat evacuation system:

- (i) Sipat – Bilaspur Pooling Station 3rd 765 kV S/c line.
- (ii) Bilaspur Pooling Station – Dhanwali pooling station 765 kV D/c line.
- (iii) Establishment of new 2X1500, 765/400 kV Dhanwali Pooling Station.
- (iv) LILO of both circuits of Jabalpur- Orai 765 kV D/C at Dhanwali pooling station.
- (v) LILO of all circuits of Vindhyachal – Jabalpur 400 kV 2xD/c line at Dhanwali pooling station.

The load flow study is enclosed as **Annexure-VIII**.

16.4 Members may discuss the above proposal.

17.0 400 kV interconnection of Gwalior 765/400 kV substation

17.1 With the upgradation of Gwalior 400 kV to 765 kV substation and charging the Bina – Gwalior 765 lines and Gwalior – Agra 765 lines at its rated voltage, there are no 400 kV interconnections at Gwalior. Presently the Gwalior substation has transformation capacity of 2x1500 MVA, 765/400 kV & 3x315 MVA, 400/220 kV making the power to drop from 765 kV level to 220 kV level.

17.2 In view of the above, it is proposed to establish a new 400/220 kV substation near Morena and interconnect it with Gwalior through a 400 kV D/c (quad) line. This proposal shall also improve the reliability of power supply in Gwalior area and also help in effective utilization of 765/400 kV transformers at Gwalior.

17.3 Members may discuss the above proposal.

18.0 Additional Strengthening of transformation capacity at Raipur 765/400 substation.

18.1 Presently Raigarh (Tamnar) pooling station is connected to Raigarh (Kotra) through 765 kV D/c line. To improve the reliability of Raigarh (Tamnar) substation it is proposed to LILO both circuits of Jharsuguda – Dharamjaigarh 765 kV 1xD/c line at Raigarh (Tamnar). Further it is informed by site that Jarsuguda – Dharamjaigarh 765 kV D/c line is passing through close vicinity of Raigarh (Tamnar) 765/400 kV pooling station.

18.2 Presently there is only 1x1500 MVA, 765/400 transformer at Raipur 765/400 kV pooling station. To improve the reliability of this substation it is proposed to augment the transformation capacity by 1x1500 MVA, 765/400 kV transformer.

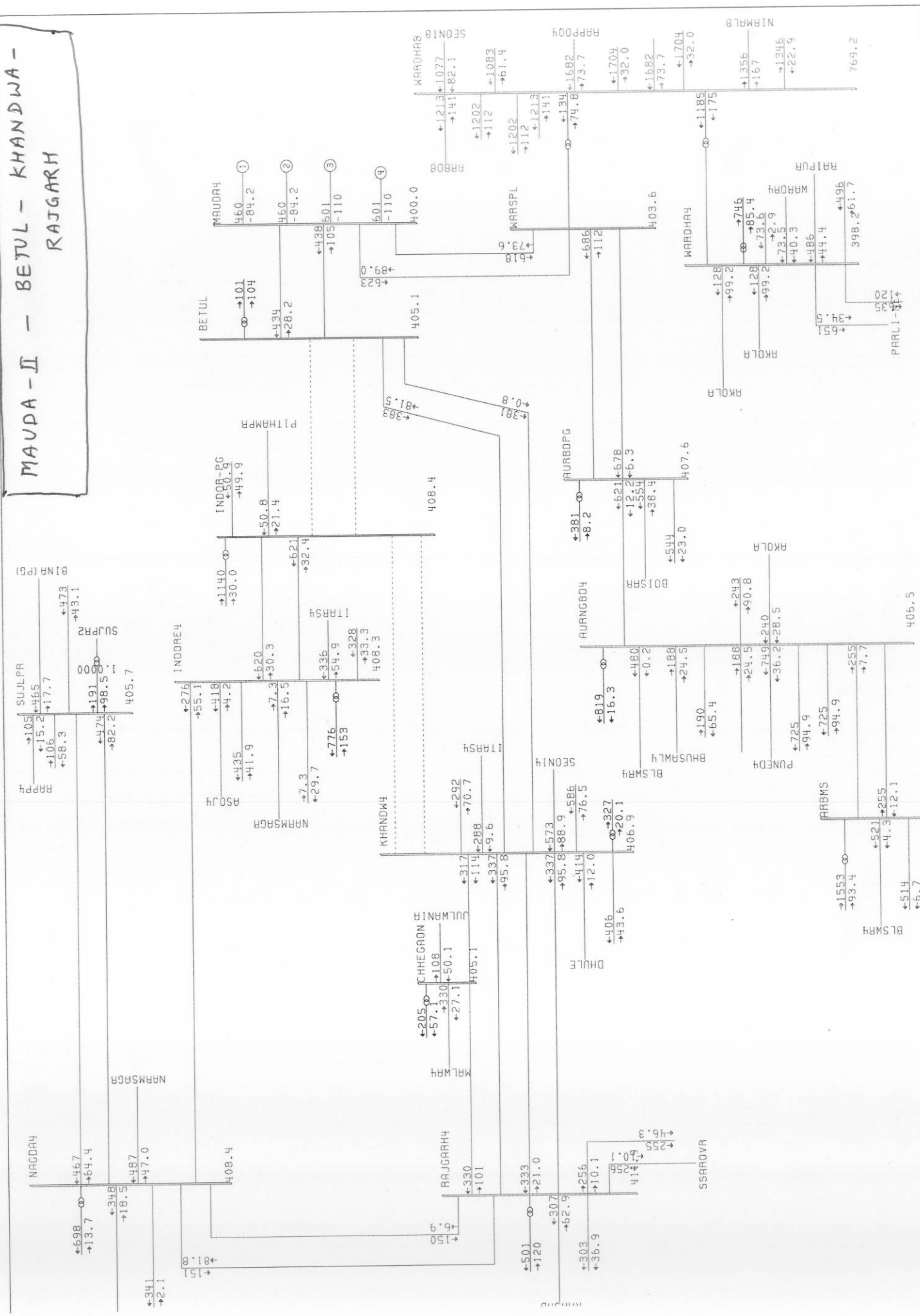
18.3 Members may discuss the above proposal.

- 19.0 18th Open Access meeting on Connectivity and Long Term Open Access (LTOA) applications in Western Region.**
- 19.1 The Open Access meeting would be held after the Standing Committee meeting. The agenda regarding Connectivity and Long Term Open Access (LTOA) applications in Western Region would be circulated by POWERGRID.
- 20.0 Any other item with the permission of the chair.**

ANNEXURE – I

STUDIES FOR MAUDA - II

MAUDA - II - BETUL - KHANDWA - RAJGARH

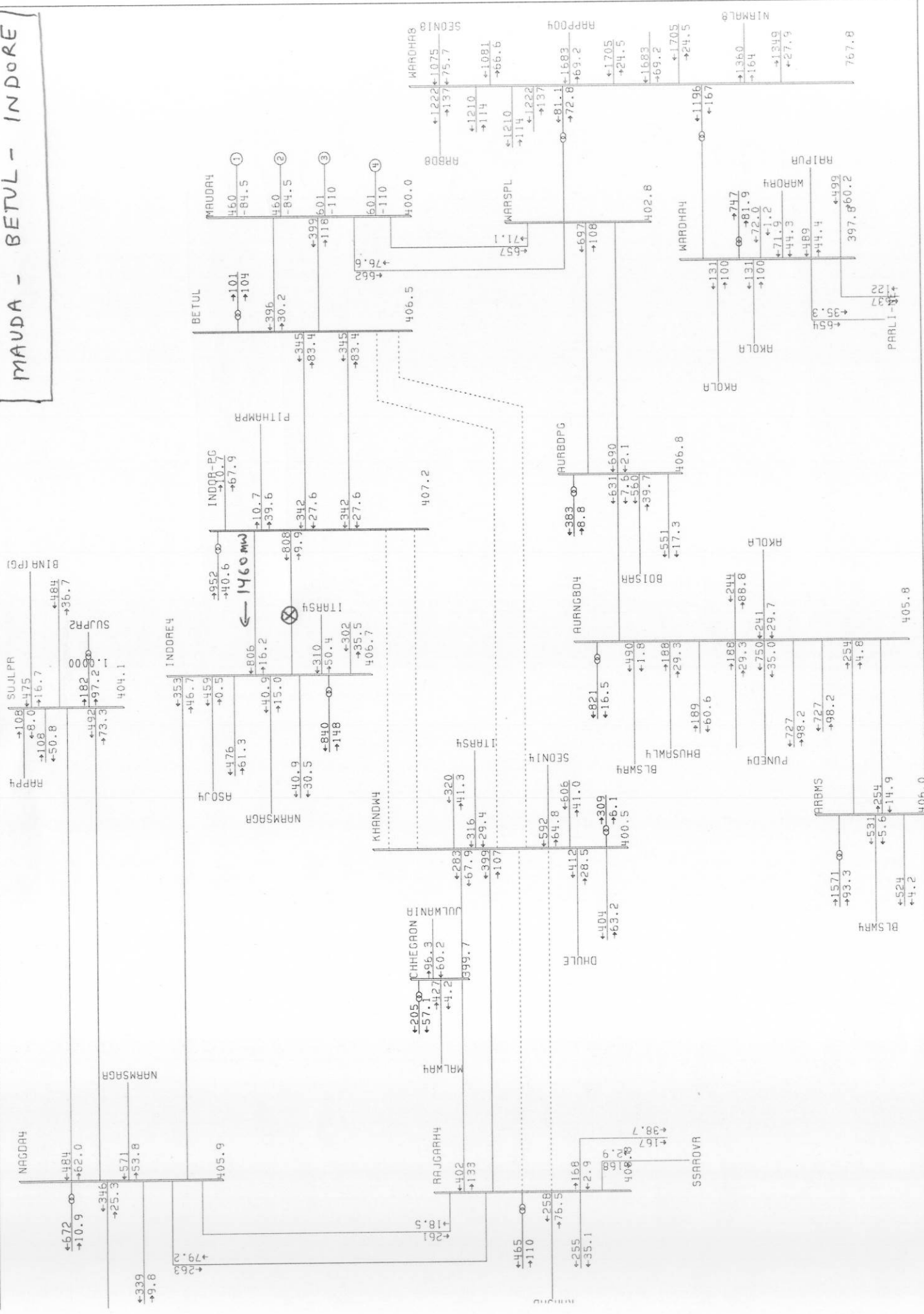


BUS - VOLTAGE (KV)
 BRANCH - MW/MVAR
 EQUIPMENT - MW/MVAR
 11. 000 11. 0013 10.00

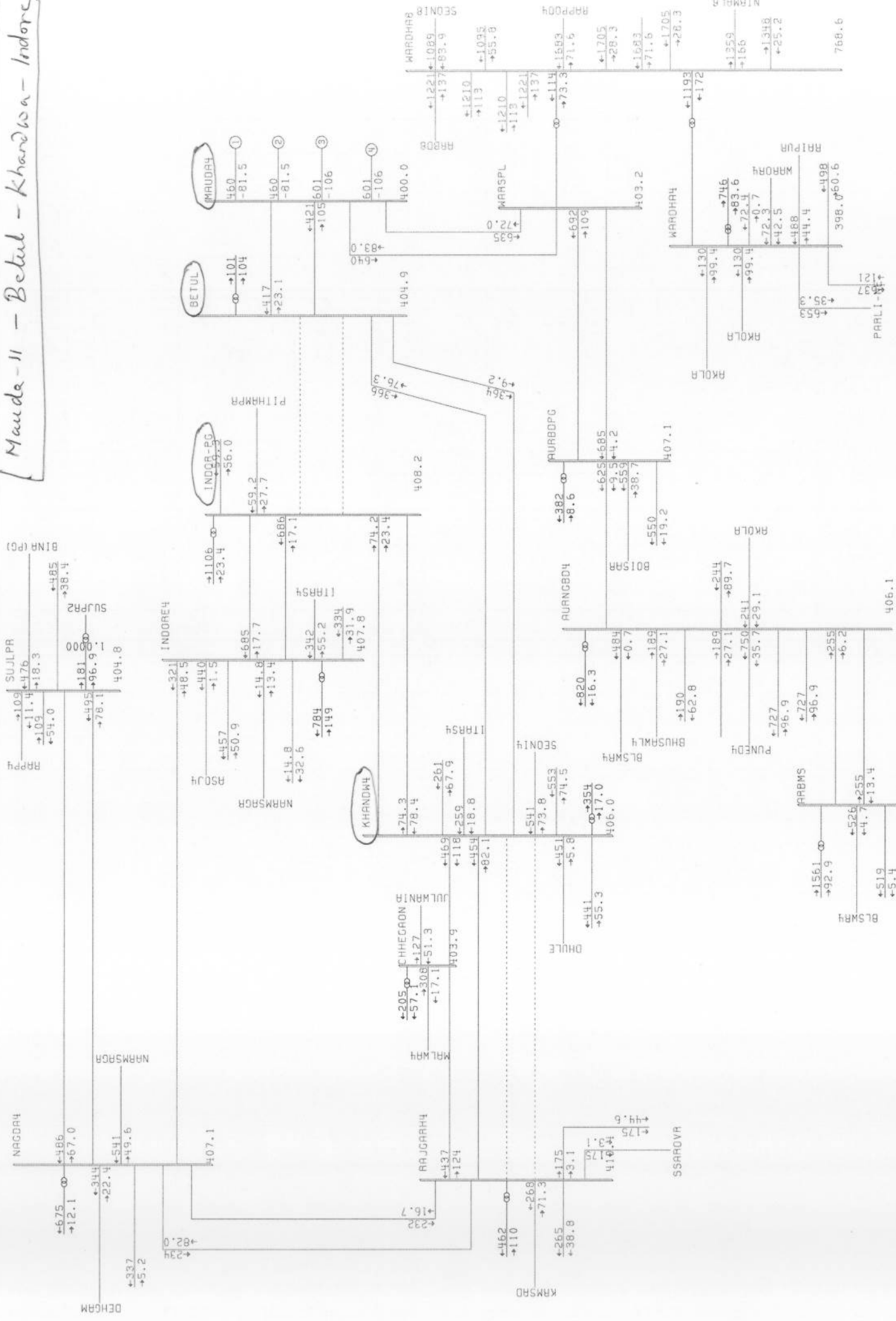
Existing Proposal

MAUDA - II STUDIES

MAUDA - BETUL - INDORE



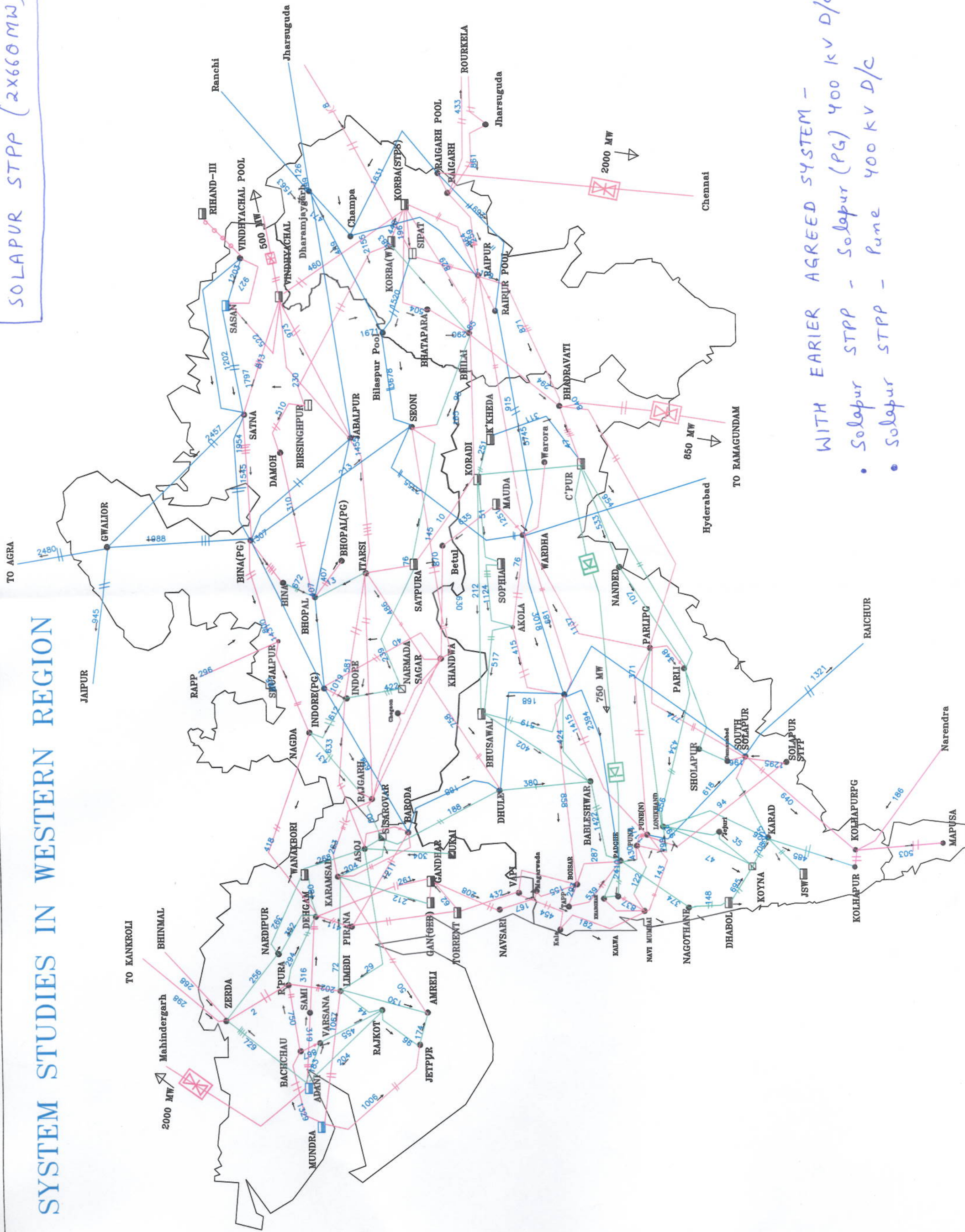
Manda-11 - Betul - Khandwa - Indore



ANNEXURE -II

SOLAPUR STPP (2x660 MW)

SYSTEM STUDIES IN WESTERN REGION

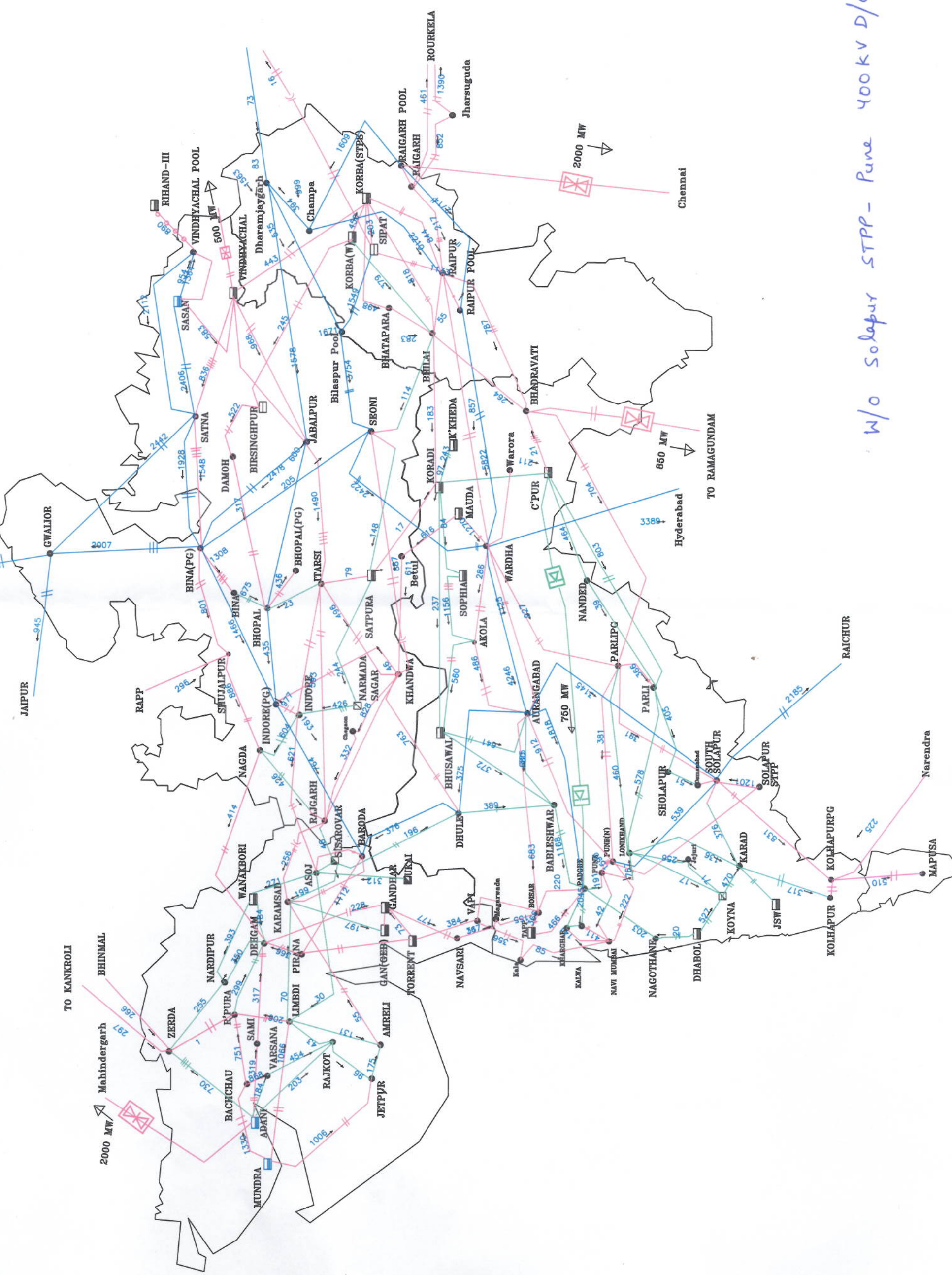


WITH EARIER AGREED SYSTEM -

- Solapur STPP - Solapur (PG) 400 kv D/c
- Solapur STPP - Pune 400 kv D/c

SOLAPUR STPP (2x660 MW)

SYSTEM STUDIES IN WESTERN REGION



W/o Solapur STPP - Pune 400kV D/c

ANNEXURE –III

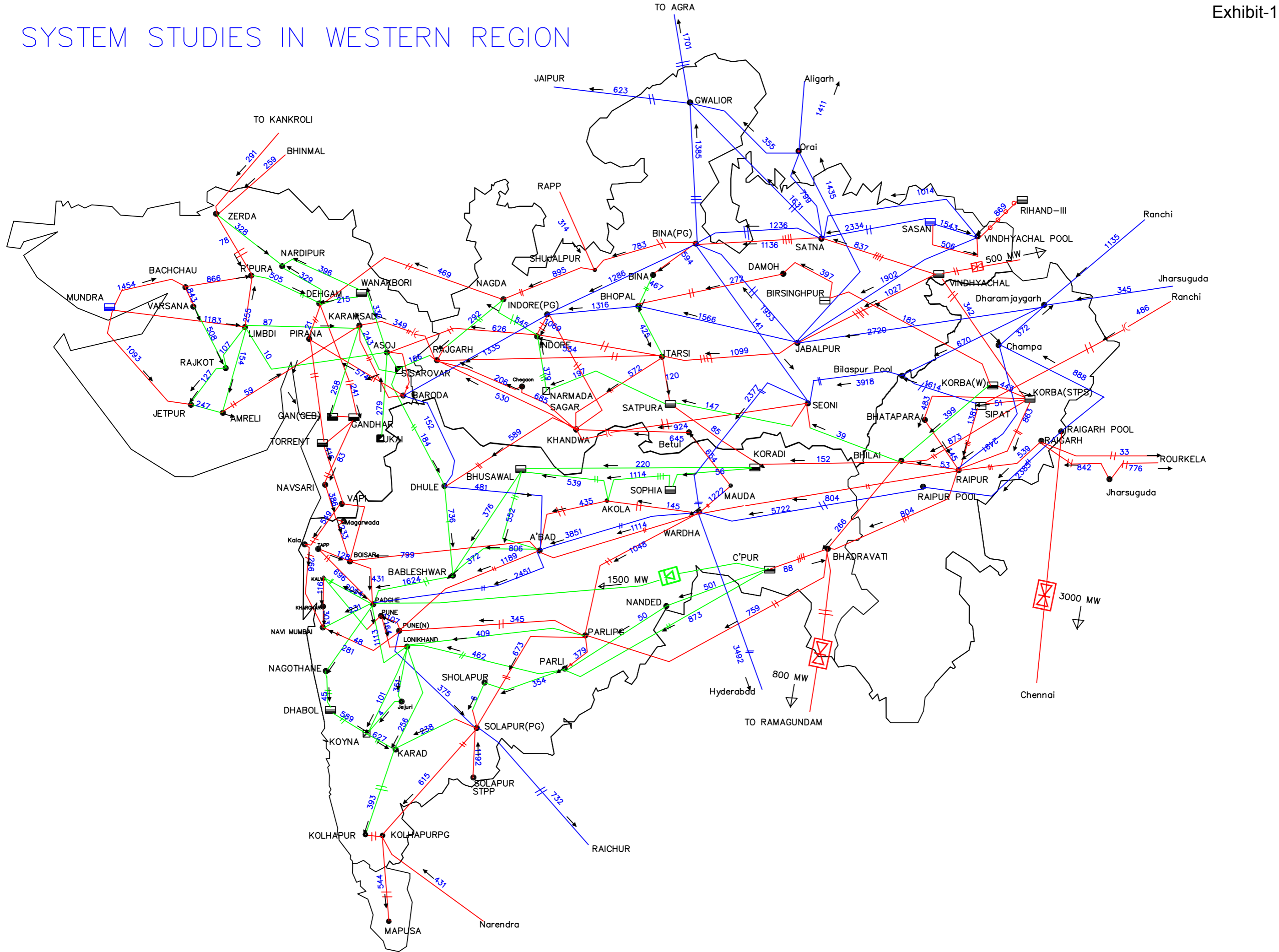
Solapur-Aurangabad Studies – Brief

- Studies carried out for 2016-17 conditions
- Load Generation Balance given at *Annexure-1*

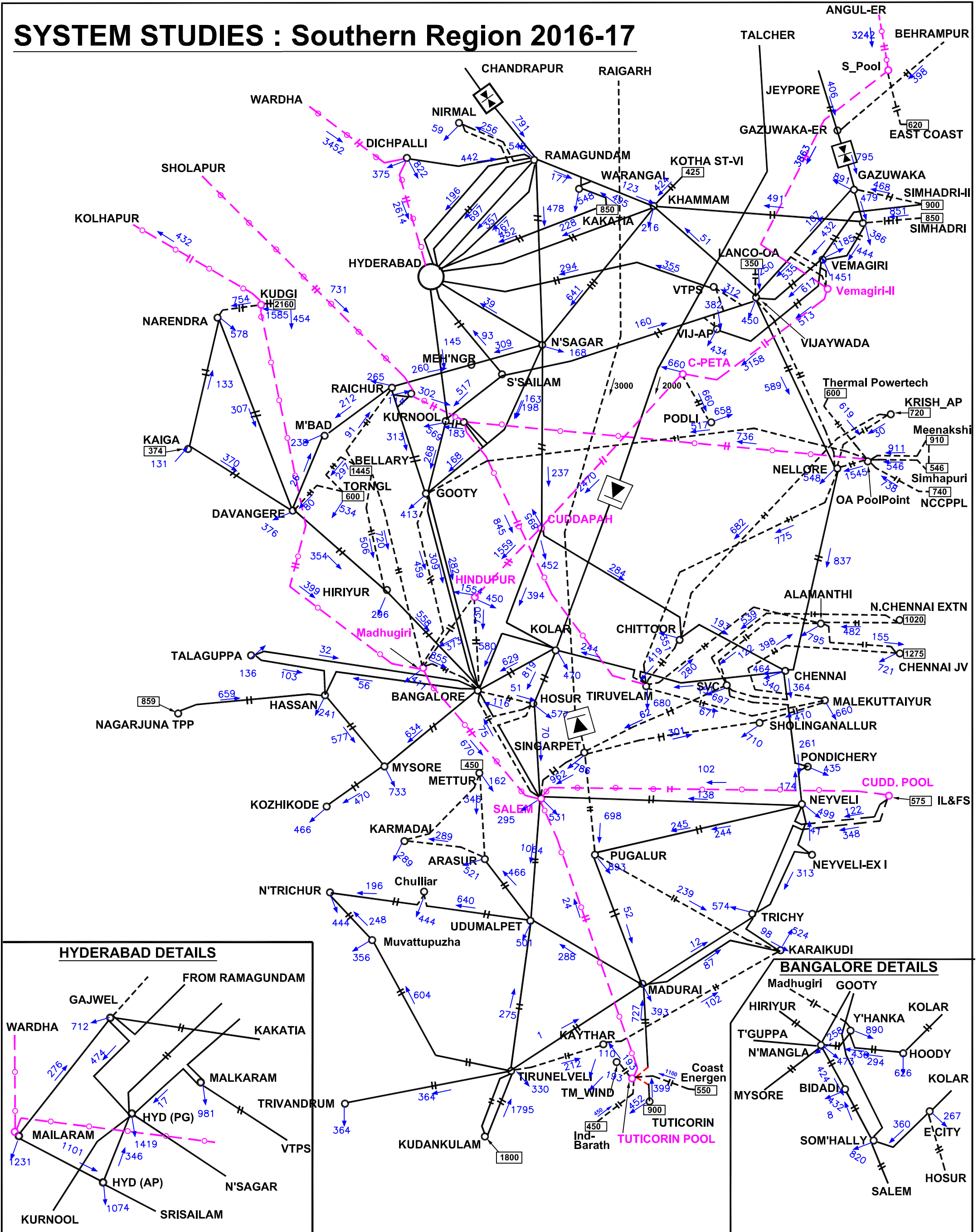
Load Flow Study Results:

1. Case-1: Base Case wherein Loading on Wardha-Hyderabad 765 kV D/c line is 3492 MW & Solapur - Raichur is 732 MW. (*Exhibit-1: Power Flow of WR& SR*)
 2. Case-2 : Outage of Wardha-Hyderabad 765 kV S/c line and loading on other circuit is 2873 MW & Solapur-Raichur is 1071 MW. (*Exhibit-2: Power Flow of WR& SR*)
 3. Case-3 : With Aurangabad - Solapur 765 kV D/c, loading on Wardha-Hyderabad 765 kV D/c line is 2989 MW, Solapur-Raichur is 1496 MW & on Aurangabad-Solapur 765kV D/c is 2667 MW. (*Exhibit-3: Power Flow of WR& SR*)
 4. Case-4 : With Aurangabad - Solapur 765 kV D/c, Outage of Wardha-Hyderabad 765 kV S/c line and loading on other circuit is 2437 MW, Solapur-Raichur is 1812 MW & on Aurangabad-Solapur 765kV D/c is 2893 MW. (*Exhibit-4: Power Flow of WR& SR*)
 5. Case-5: With Aurangabad-Solapur 765 kV D/c + LILO of Aurangabad-Padghe 765 kV S/c at Pune, Loading of Wardha-Hyderabad 765 kV D/c line is 2945 MW; Solapur-Raichur is 1548 MW. **Solapur – Pune 765kV S/c is in floating condition (97 MW).** (*Exhibit-5: Power Flow of WR& SR*).
 6. Case-6: With Aurangabad-Solapur 765 kV D/c + LILO of Aurangabad-Padghe 765 kV S/c at Pune, Outage of Wardha-Hyderabad 765 kV S/c line and loading on other circuit is 2400 MW; Solapur-Raichur is 1860 MW. **Solapur – Pune 765kV S/c is in floating condition (32 MW).** (*Exhibit-6: Power Flow of WR& SR*)
- **Observations:**
 1. In Case-3, with the provision of Aurangabad - Solapur 765 kV D/c line the power flow on Solapur - Raichur line is increased from 732 MW to 1496 MW thereby relieving Wardha - Hyderabad line from 3492 MW to 2989 MW.
 2. Further with the provision of Aurangabad - Solapur additional 1500 MW can be exported to SR.
 3. With interconnection of Aurangabad-Pune 765kV line (either direct interconnection or through LILO), the line loading on Solapur - Pune 765kV S/c reduces thus, the same may not be optimally utilized.

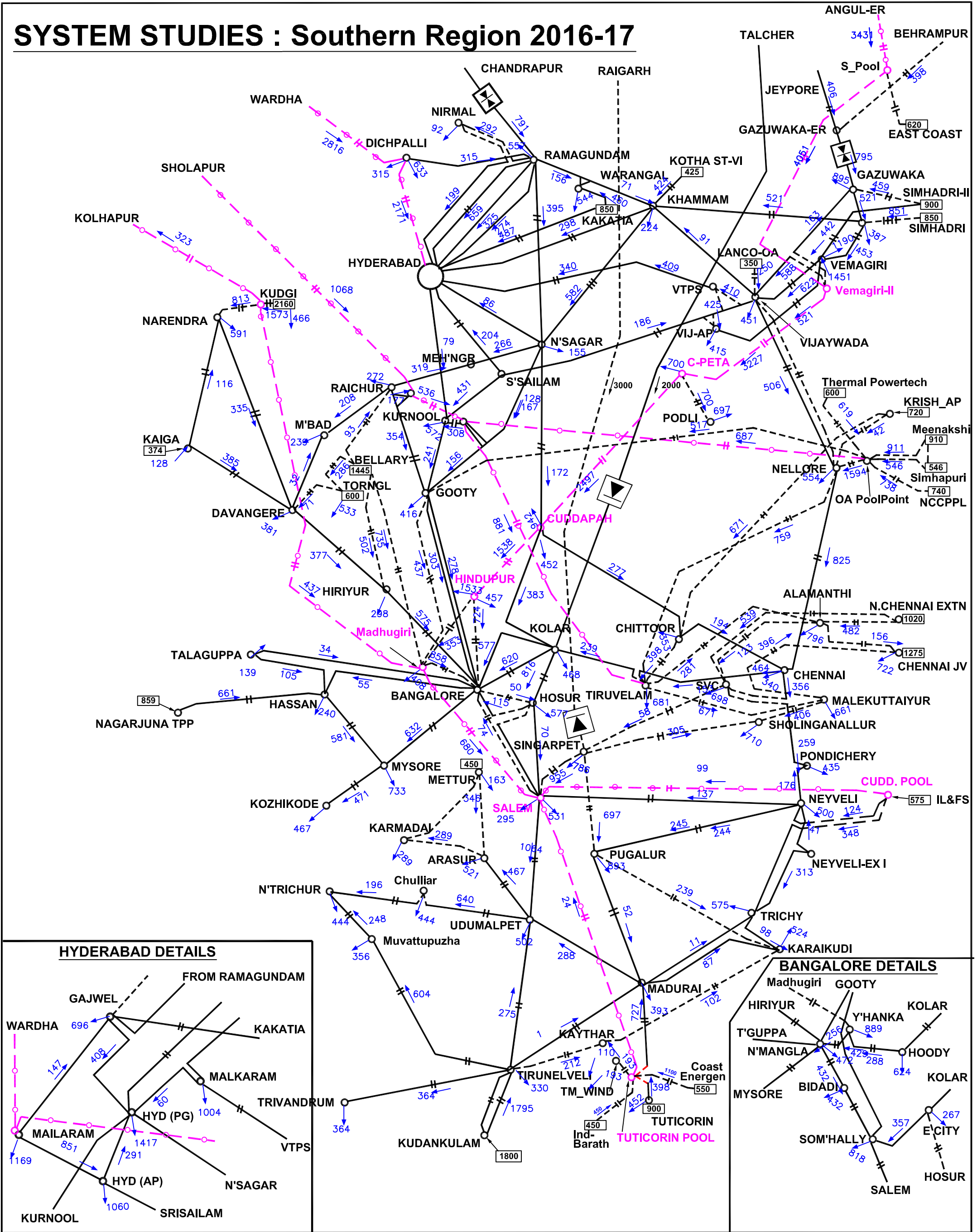
SYSTEM STUDIES IN WESTERN REGION



SYSTEM STUDIES : Southern Region 2016-17



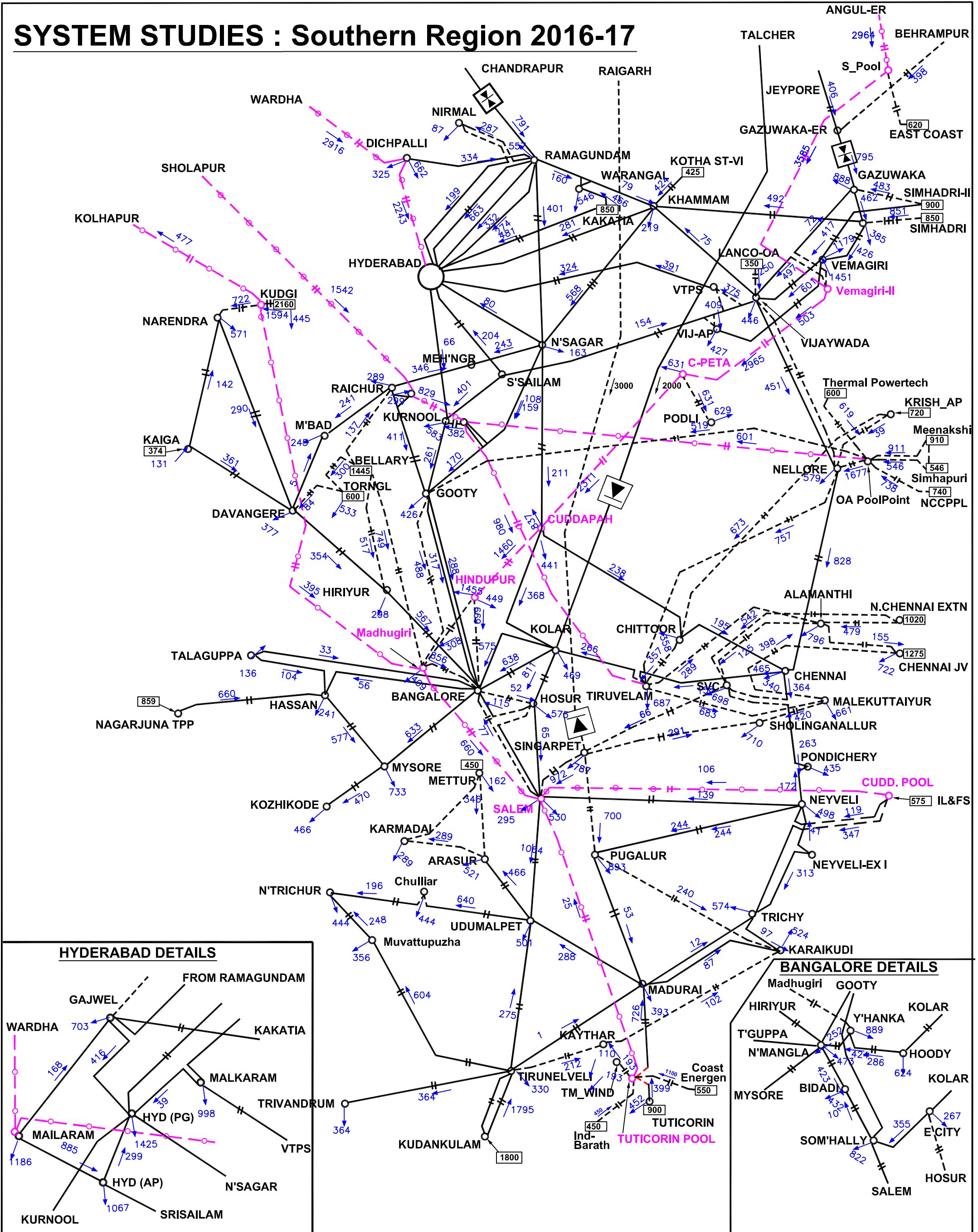
SYSTEM STUDIES : Southern Region 2016-17



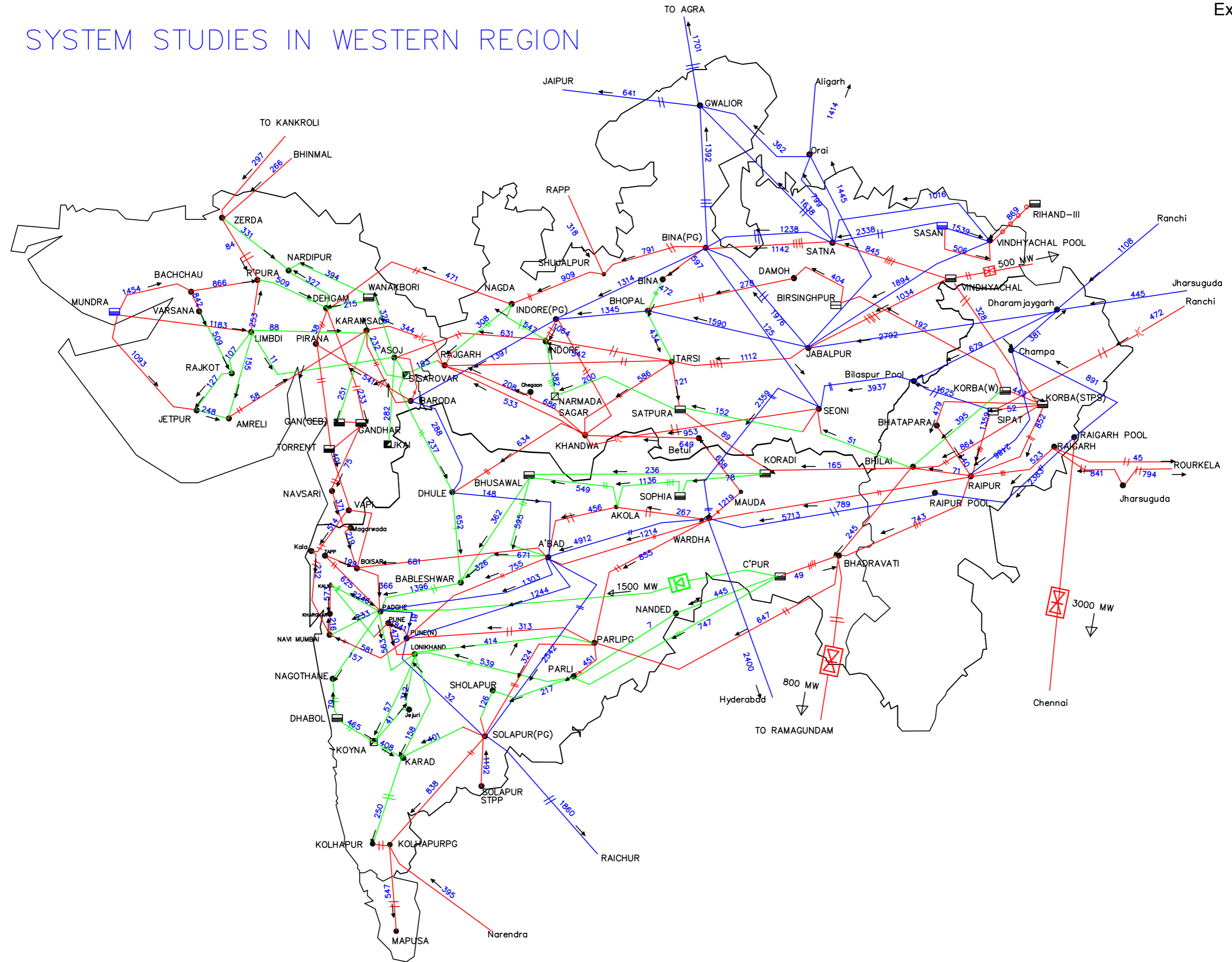
SYSTEM STUDIES IN WESTERN REGION



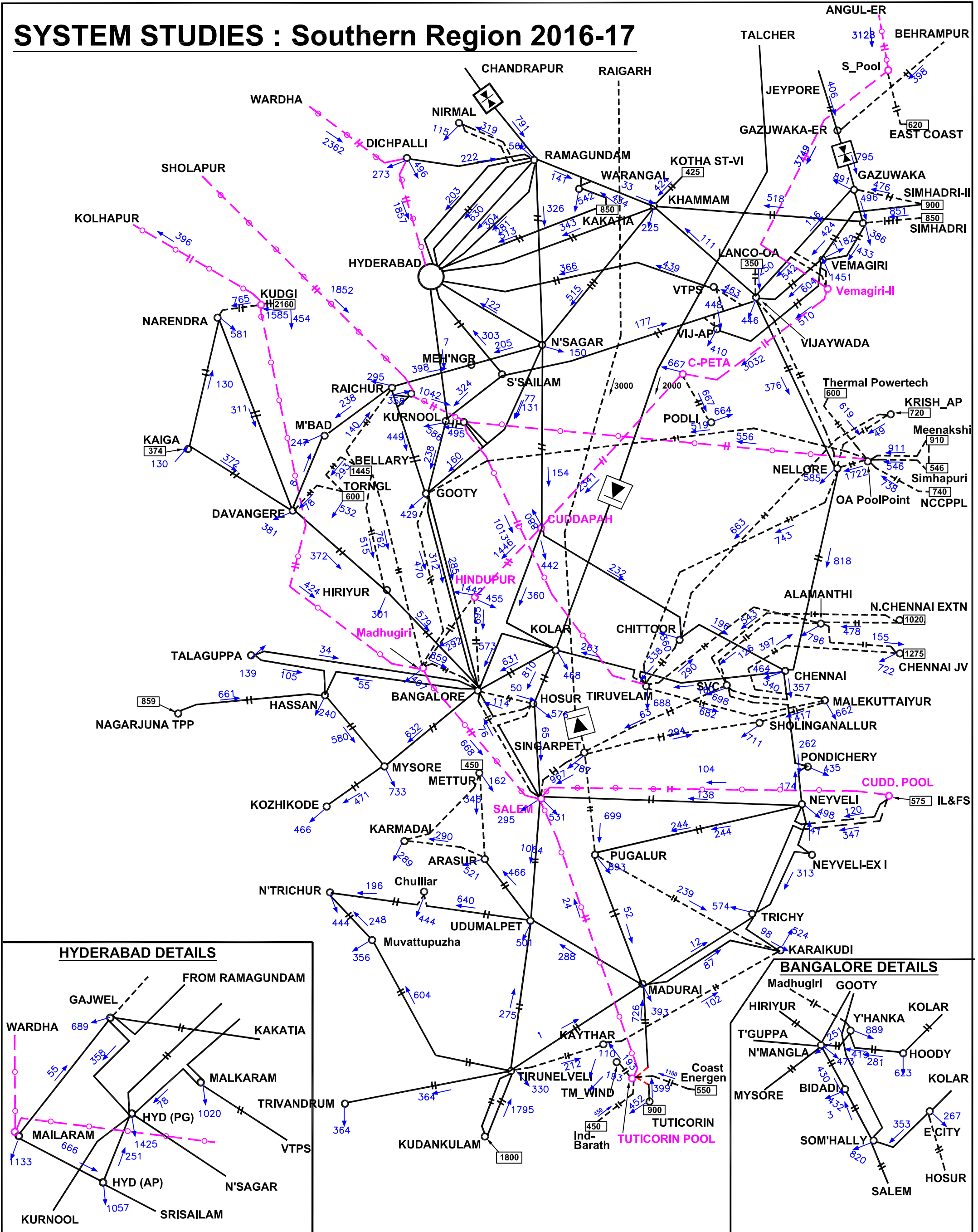
SYSTEM STUDIES : Southern Region 2016-17



SYSTEM STUDIES IN WESTERN REGION



SYSTEM STUDIES : Southern Region 2016-17



AREA TOTALS

IN MW/MVAR

| X-- AREA --X | FROM -----AT AREA BUSES----- | | | | TO | | | | -NET INTERCHANGE- | | | DESIRED NET INT |
|------------------|------------------------------|----------------------|------------------|---------------------|-----------------|--------------------|------------------|------------------|-------------------|---------------------|---------------------|--------------------|
| | GENE- RATION | FROM IND GENERATN | TO IND MOTORS | TO LOAD | TO BUS SHUNT | GNE BUS DEVICES | TO LINE SHUNT | FROM CHARGING | TO LOSSES | TO TIE LINES | TO TIES + LOADS | |
| 1 NORTH | 47764.0 -10634.6 | 0.0 0.0 | 0.0 0.0 | 59546.3 5906.7 | 0.0 3790.6 | 0.0 0.0 | -2.7 19187.9 | 0.0 64697.3 | 1655.2 24596.2 | -13434.9 581.2 | -13434.9 581.2 | -12360.0 |
| 2 NRTHEAST | 3834.4 -269.1 | 0.0 0.0 | 0.0 0.0 | 2865.7 911.2 | 0.0 1288.7 | 0.0 0.0 | 0.0 709.7 | 0.0 3575.4 | 111.7 731.4 | 857.0 -334.7 | 857.0 -334.7 | 2281.0 |
| 3 WEST | 71624.0 935.3 | 0.0 0.0 | 0.0 0.0 | 59818.4 19661.4 | 0.0 -3465.2 | 0.0 0.0 | 0.0 31014.1 | 0.0 86707.5 | 2391.2 36950.3 | 9414.5 3482.3 | 9414.5 3482.3 | 4730.0 |
| 4 EAST | 41585.2 300.4 | 0.0 0.0 | 0.0 0.0 | 23724.5 5371.4 | 0.0 3379.6 | 0.0 0.0 | 0.0 4134.4 | 0.0 23853.6 | 1046.6 13568.1 | 16814.0 -2299.3 | 16814.0 -2299.3 | 26000.0 |
| 5 SOUTH | 44078.5 -3338.4 | 0.0 0.0 | 0.0 0.0 | 56000.0 7571.3 | 0.0 -3404.0 | 0.0 0.0 | 0.0 11356.6 | 0.0 40586.2 | 1729.1 23153.4 | -13650.6 -1429.5 | -13650.6 -1429.5 | 80.0 |
| 6 WIND GEN | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 0.0 | 0.0 |
| COLUMN TOTALS | 208886.0 -13006.4 | 0.0 0.0 | 0.0 0.0 | 201954.9 39421.9 | 0.0 1589.7 | 0.0 0.0 | -2.7 66402.7 | 0.0 219419.9 | 6933.9 98999.3 | 0.0 0.0 | 0.0 0.0 | 20731.0 |

| | TO AREA: | 1 | 2 | 3 | 4 | 5 |
|-----------|----------|-------|------|-------|-------|------|
| FROM AREA | * | ----- | | | | |
| 1 | * | | | | | |
| NORTH | * | | | -5408 | -9097 | |
| | * | | | -977 | 1988 | |
| | * | ----- | | | | |
| 2 | * | | | | 857 | |
| NRTHEAST | * | | | | -335 | |
| | * | ----- | | | | |
| 3 | * | 5408 | | -2666 | 7805 | |
| WEST | * | 977 | | 1208 | 416 | |
| | * | ----- | | | | |
| 4 | * | 9097 | -857 | 2666 | | 5797 |
| EAST | * | -1988 | 335 | -1208 | | 238 |
| | * | ----- | | | | |
| 5 | * | | | -7805 | -5797 | |
| SOUTH | * | | | -416 | -238 | |
| | * | ----- | | | | |

FROM AREA 1 NORTH

TO AREA 3 WEST

| X----- FROM AREA BUS -----X | | X----- TO AREA BUS -----X | | CKT | MW | MVAR | | | | |
|-----------------------------|--------------|---------------------------|-------|--------------|---------|------|--------|---------|-----------------|--|
| BUS# | X-- NAME --X | BASKV | BUS# | X-- NAME --X | BASKV | | | | | |
| 14407 | MGARHA | 400.00* | 33406 | ADANI | 400.00 | 2DC | -823.6 | 310.2 | TWO TRM DC "3" | |
| 14449 | KURUKSH | 400.00* | 36492 | CHAMPA-I | 400.00 | 2DC | -782.2 | 265.5 | TWO TRM DC "31" | |
| 14449 | KURUKSH | 400.00* | 36492 | CHAMPA-I | 400.00 | 2DC | -782.2 | 265.5 | TWO TRM DC "32" | |
| 14407 | MGARHA | 400.00* | 33406 | ADANI | 400.00 | 2DC | -823.6 | 310.2 | TWO TRM DC "4" | |
| 16221 | KOTA2 | 220.00* | 31247 | UJAN22 | 220.00 | 1 | 133.3 | -52.4 | | |
| 16221 | KOTA2 | 220.00* | 31247 | UJAN22 | 220.00 | 2 | 133.3 | -52.4 | | |
| 16416 | RAPP4 | 400.00 | 31449 | SUJLPR | 400.00* | 1 | 158.6 | -87.7 | | |
| 16416 | RAPP4 | 400.00 | 31449 | SUJLPR | 400.00* | 2 | 158.6 | -87.7 | | |
| 16435 | KANKRL | 400.00* | 33496 | ZRDA4 | 400.00 | 1 | 298.1 | -37.6 | | |
| 16445 | BHINMAL | 400.00* | 33496 | ZRDA4 | 400.00 | 1 | 264.7 | -82.3 | | |
| 18465 | RIHNDEXT | 400.00* | 31451 | VNDLPOOL | 400.00 | 1 | 435.1 | -125.0 | | |
| 18465 | RIHNDEXT | 400.00* | 31451 | VNDLPOOL | 400.00 | 2 | 435.1 | -125.0 | | |
| 18822 | AGRA8 | 765.00 | 31850 | GWALIOR8 | 765.00* | 1 | -851.4 | -59.9 | | |
| 18822 | AGRA8 | 765.00 | 31850 | GWALIOR8 | 765.00* | 2 | -851.4 | -59.9 | | |
| 18830 | JAIPR | 765.00* | 31850 | GWALIOR8 | 765.00 | 1 | -318.5 | -639.4 | | |
| 18830 | JAIPR | 765.00* | 31850 | GWALIOR8 | 765.00 | 2 | -318.5 | -639.4 | | |
| 18863 | ORAI7 | 765.00* | 31824 | SATNA8 | 765.00 | 2 | -796.0 | -143.6 | | |
| 18863 | ORAI7 | 765.00* | 31850 | GWALIOR8 | 765.00 | 2 | 362.5 | 170.0 | | |
| 18863 | ORAI7 | 765.00* | 31883 | JBLPOL8 | 765.00 | 1 | -720.2 | -53.2 | | |
| 18863 | ORAI7 | 765.00* | 31883 | JBLPOL8 | 765.00 | 2 | -720.2 | -53.2 | | |
| TOTAL FROM AREA 1 TO AREA 3 | | | | | | | | -5408.5 | -977.3 | |

TO AREA 4 EAST

| X----- FROM AREA BUS -----X | | X----- TO AREA BUS -----X | | CKT | MW | MVAR | | | | |
|-----------------------------|--------------|---------------------------|-------|--------------|---------|------|--------|----------|--------|--|
| BUS# | X-- NAME --X | BASKV | BUS# | X-- NAME --X | BASKV | | | | | |
| 17480 | MUGLS4 | 400.00 | 48492 | SASRM-NR | 400.00* | 1 | -497.6 | 41.7 | | |
| 17880 | VARNASI8 | 765.00 | 43808 | GAYA | 765.00* | 1 | -596.5 | 281.7 | | |
| 17880 | VARNASI8 | 765.00 | 43808 | GAYA | 765.00* | 2 | -596.5 | 281.7 | | |
| 18427 | GRKPRPG | 400.00 | 41401 | MZFRPUR | 400.00* | 1 | -326.3 | 86.7 | | |
| 18427 | GRKPRPG | 400.00 | 41401 | MZFRPUR | 400.00* | 2 | -326.3 | 86.7 | | |
| 18427 | GRKPRPG | 400.00 | 41468 | MOTIHARI | 400.00* | 1 | -441.3 | 68.2 | | |
| 18427 | GRKPRPG | 400.00 | 41468 | MOTIHARI | 400.00* | 2 | -439.5 | 93.8 | | |
| 18440 | ALADB4 | 400.00 | 48491 | SSRAM-RF | 400.00* | 1 | -140.2 | 93.3 | | |
| 18827 | FATHEPR | 765.00* | 48892 | SASARAM7 | 765.00 | 1 | -494.8 | 52.9 | | |
| 41430 | BALIA | 400.00 | 41405 | BIHR | 400.00* | 1 | -302.5 | 93.1 | | |
| 41430 | BALIA | 400.00 | 41405 | BIHR | 400.00* | 2 | -302.5 | 93.1 | | |
| 41430 | BALIA | 400.00 | 41406 | PATNA | 400.00* | 1 | -558.8 | 77.0 | | |
| 41430 | BALIA | 400.00 | 41406 | PATNA | 400.00* | 2 | -558.8 | 77.0 | | |
| 41430 | BALIA | 400.00 | 41406 | PATNA | 400.00* | 3 | -630.2 | 69.6 | | |
| 41430 | BALIA | 400.00 | 41406 | PATNA | 400.00* | 4 | -630.2 | 69.6 | | |
| 41807 | BALIA | 765.00 | 43808 | GAYA | 765.00* | 1 | -985.7 | 292.4 | | |
| 41807 | BALIA | 765.00* | 43808 | GAYA | 765.00 | 2 | -983.0 | 227.0 | | |
| 44218 | KHARAGPU | 220.00* | 44418 | KHARAGAP | 400.00 | 1 | -143.0 | -48.7 | | |
| 44218 | KHARAGPU | 220.00* | 44418 | KHARAGAP | 400.00 | 2 | -143.0 | -48.7 | | |
| TOTAL FROM AREA 1 TO AREA 4 | | | | | | | | -9096.7 | 1987.9 | |
| TOTAL FROM AREA 1 NORTH | | | | | | | | -14505.2 | 1010.6 | |

FROM AREA 2 NRTHEAST

TO AREA 4 EAST

| X----- FROM AREA BUS -----X | | X----- TO AREA BUS -----X | | CKT | MW | MVAR | | | | |
|-----------------------------|--------------|---------------------------|-------|--------------|---------|------|-------|--------|--------|--|
| BUS# | X-- NAME --X | BASKV | BUS# | X-- NAME --X | BASKV | | | | | |
| 21206 | BNGN | 220.00 | 44225 | BIRPRA | 220.00* | 1 | 14.7 | -1.0 | | |
| 21206 | BNGN | 220.00 | 44225 | BIRPRA | 220.00* | 2 | 14.7 | -1.0 | | |
| 21206 | BNGN | 220.00* | 44273 | ALIPURDU | 220.00 | 1 | -2.3 | -26.8 | | |
| 21206 | BNGN | 220.00* | 44273 | ALIPURDU | 220.00 | 2 | -2.3 | -26.8 | | |
| 21406 | BNGN | 400.00* | 44472 | SLGR | 400.00 | 1 | 165.0 | -31.5 | | |
| 21406 | BNGN | 400.00* | 44472 | SLGR | 400.00 | 2 | 165.0 | -31.5 | | |
| 21406 | BNGN | 400.00* | 44473 | ALIPURDU | 400.00 | 3 | 251.0 | -108.4 | | |
| 21406 | BNGN | 400.00* | 44473 | ALIPURDU | 400.00 | 4 | 251.0 | -108.4 | | |
| TOTAL FROM AREA 2 TO AREA 4 | | | | | | | | 857.0 | -335.5 | |
| TOTAL FROM AREA 2 NRTHEAST | | | | | | | | 857.0 | -335.5 | |

FROM AREA 3 WEST

| TO AREA 1 NORTH | | | | | | | | | | | | | |
|-----------------------------|-----|----------|-----|---------|---------------------------|-----|----------|-----|---------|-----|--------|--------|-----------------|
| X----- FROM AREA BUS -----X | | | | | X----- TO AREA BUS -----X | | | | | | | | |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV | CKT | MW | MVAR | |
| 33406 | | ADANI | | 400.00 | 14407 | | MGARHA | | 400.00* | 2DC | 823.6 | -310.2 | TWO TRM DC "3" |
| 36492 | | CHAMPA-I | | 400.00 | 14449 | | KURUKSH | | 400.00* | 2DC | 782.2 | -265.5 | TWO TRM DC "31" |
| 36492 | | CHAMPA-I | | 400.00 | 14449 | | KURUKSH | | 400.00* | 2DC | 782.2 | -265.5 | TWO TRM DC "32" |
| 33406 | | ADANI | | 400.00 | 14407 | | MGARHA | | 400.00* | 2DC | 823.6 | -310.2 | TWO TRM DC "4" |
| 31247 | | UJAN22 | | 220.00 | 16221 | | KOTA2 | | 220.00* | 1 | -133.3 | 52.4 | |
| 31247 | | UJAN22 | | 220.00 | 16221 | | KOTA2 | | 220.00* | 2 | -133.3 | 52.4 | |
| 31449 | | SUJLPR | | 400.00* | 16416 | | RAPP4 | | 400.00 | 1 | -158.6 | 87.7 | |
| 31449 | | SUJLPR | | 400.00* | 16416 | | RAPP4 | | 400.00 | 2 | -158.6 | 87.7 | |
| 31451 | | VNDLPOOL | | 400.00 | 18465 | | RIHNDEXT | | 400.00* | 1 | -435.1 | 125.0 | |
| 31451 | | VNDLPOOL | | 400.00 | 18465 | | RIHNDEXT | | 400.00* | 2 | -435.1 | 125.0 | |
| 31824 | | SATNA8 | | 765.00 | 18863 | | ORAI7 | | 765.00* | 2 | 796.0 | 143.6 | |
| 31850 | | GWALIOR8 | | 765.00* | 18822 | | AGRA8 | | 765.00 | 1 | 851.4 | 59.9 | |
| 31850 | | GWALIOR8 | | 765.00* | 18822 | | AGRA8 | | 765.00 | 2 | 851.4 | 59.9 | |
| 31850 | | GWALIOR8 | | 765.00 | 18830 | | JAIPR | | 765.00* | 1 | 318.5 | 639.4 | |
| 31850 | | GWALIOR8 | | 765.00 | 18830 | | JAIPR | | 765.00* | 2 | 318.5 | 639.4 | |
| 31850 | | GWALIOR8 | | 765.00 | 18863 | | ORAI7 | | 765.00* | 2 | -362.5 | -170.0 | |
| 31883 | | JBLPOL8 | | 765.00 | 18863 | | ORAI7 | | 765.00* | 1 | 720.2 | 53.2 | |
| 31883 | | JBLPOL8 | | 765.00 | 18863 | | ORAI7 | | 765.00* | 2 | 720.2 | 53.2 | |
| 33496 | | ZRDA4 | | 400.00 | 16435 | | KANKRL | | 400.00* | 1 | -298.1 | 37.6 | |
| 33496 | | ZRDA4 | | 400.00 | 16445 | | BHINMAL | | 400.00* | 1 | -264.7 | 82.3 | |
| TOTAL FROM AREA 3 TO AREA 1 | | | | | | | | | | | 5408.5 | 977.3 | |

| TO AREA 4 EAST | | | | | | | | | | | | |
|-----------------------------|-----|----------|-----|---------|---------------------------|-----|----------|-----|---------|-----|---------|--------|
| X----- FROM AREA BUS -----X | | | | | X----- TO AREA BUS -----X | | | | | | | |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV | CKT | MW | MVAR |
| 31202 | | KRBAE2 | | 220.00* | 42215 | | BRAJRAJ | | 220.00 | 1 | 113.9 | -26.1 |
| 31202 | | KRBAE2 | | 220.00* | 42215 | | BRAJRAJ | | 220.00 | 2 | 113.9 | -26.1 |
| 31299 | | RAIGARH | | 220.00* | 42215 | | BRAJRAJ | | 220.00 | 3 | 86.0 | -29.7 |
| 31470 | | SIPAT | | 400.00 | 44446 | | RANCHI | | 400.00* | 1 | -239.8 | 111.6 |
| 31470 | | SIPAT | | 400.00 | 44446 | | RANCHI | | 400.00* | 2 | -239.8 | 111.6 |
| 31872 | | DHRMJYNG | | 765.00 | 42815 | | JRSG-765 | | 765.00* | 1 | -148.9 | 255.1 |
| 31872 | | DHRMJYNG | | 765.00 | 42815 | | JRSG-765 | | 765.00* | 2 | -148.9 | 255.1 |
| 31872 | | DHRMJYNG | | 765.00 | 42815 | | JRSG-765 | | 765.00* | 3 | -148.9 | 255.1 |
| 31872 | | DHRMJYNG | | 765.00 | 42815 | | JRSG-765 | | 765.00* | 4 | -148.9 | 255.1 |
| 31872 | | DHRMJYNG | | 765.00 | 44846 | | RANCHI | | 765.00* | 1 | -553.0 | 90.0 |
| 31872 | | DHRMJYNG | | 765.00 | 44846 | | RANCHI | | 765.00* | 2 | -553.0 | 90.0 |
| 34499 | | RAIGARH | | 400.00 | 42412 | | ROURKELA | | 400.00* | 1 | 24.2 | 11.8 |
| 34499 | | RAIGARH | | 400.00 | 42412 | | ROURKELA | | 400.00* | 2 | 24.2 | 11.8 |
| 34499 | | RAIGARH | | 400.00* | 42415 | | JRSG-400 | | 400.00 | 3 | -423.3 | -78.4 |
| 34499 | | RAIGARH | | 400.00* | 42415 | | JRSG-400 | | 400.00 | 4 | -423.3 | -78.4 |
| TOTAL FROM AREA 3 TO AREA 4 | | | | | | | | | | | -2665.7 | 1208.5 |

| TO AREA 5 SOUTH | | | | | | | | | | | | | |
|-----------------------------|-----|----------|-----|---------|---------------------------|-----|-----------|-----|---------|-----|--------|--------|-----------------|
| X----- FROM AREA BUS -----X | | | | | X----- TO AREA BUS -----X | | | | | | | | |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV | CKT | MW | MVAR | |
| 32460 | | BHADRV4 | | 400.00 | 51409 | | CHAND-SR | | 400.00* | 2DC | 398.1 | -191.5 | TWO TRM DC "11" |
| 32460 | | BHADRV4 | | 400.00 | 51409 | | CHAND-SR | | 400.00* | 2DC | 398.1 | -191.5 | TWO TRM DC "12" |
| 36489 | | RAIGAR-1 | | 400.00* | 54416 | | SINGAR | | 400.00 | 2DC | 1510.8 | 723.0 | TWO TRM DC "33" |
| 36489 | | RAIGAR-1 | | 400.00* | 54416 | | SINGAR | | 400.00 | 2DC | 1510.8 | 723.0 | TWO TRM DC "34" |
| 32419 | | KOLHPRPG | | 400.00 | 52415 | | NARDR-NW | | 400.00* | 1 | -238.4 | 69.4 | |
| 32419 | | KOLHPRPG | | 400.00 | 52415 | | NARDR-NW | | 400.00* | 2 | -238.4 | 69.4 | |
| 32806 | | WARDHA8 | | 765.00 | 51862 | | DICHPALI8 | | 765.00* | 1 | 1458.1 | -226.3 | |
| 32806 | | WARDHA8 | | 765.00 | 51862 | | DICHPALI8 | | 765.00* | 2 | 1458.1 | -226.3 | |
| 32822 | | SOLPR8 | | 765.00* | 52803 | | RAIC800 | | 765.00 | 1 | 773.8 | -166.8 | |
| 32822 | | SOLPR8 | | 765.00* | 52803 | | RAIC800 | | 765.00 | 2 | 773.8 | -166.8 | |
| TOTAL FROM AREA 3 TO AREA 5 | | | | | | | | | | | 7804.7 | 415.7 | |

| | | | | | | | | | | | | |
|------------------------|--|--|--|--|--|--|--|--|--|--|---------|--------|
| TOTAL FROM AREA 3 WEST | | | | | | | | | | | 10547.5 | 2601.5 |
|------------------------|--|--|--|--|--|--|--|--|--|--|---------|--------|

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E MON, JUL 08 2013 12:14
 AREA TIE LINE
 INTERCHANGE

| FROM AREA 4 EAST | | | | | | | | | | | | |
|------------------|-----|----------|-----|---------|---------------------------|-----|----------|-----|---------|-----|-------|--------|
| TO AREA 1 NORTH | | | | | X----- TO AREA BUS -----X | | | | | | | |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV | CKT | MW | MVAR |
| 41401 | | MZFRPUR | | 400.00* | 18427 | | GRKPRPG | | 400.00 | 1 | 326.3 | -86.7 |
| 41401 | | MZFRPUR | | 400.00* | 18427 | | GRKPRPG | | 400.00 | 2 | 326.3 | -86.7 |
| 41405 | | BIHR | | 400.00* | 41430 | | BALIA | | 400.00 | 1 | 302.5 | -93.1 |
| 41405 | | BIHR | | 400.00* | 41430 | | BALIA | | 400.00 | 2 | 302.5 | -93.1 |
| 41406 | | PATNA | | 400.00* | 41430 | | BALIA | | 400.00 | 1 | 558.8 | -77.0 |
| 41406 | | PATNA | | 400.00* | 41430 | | BALIA | | 400.00 | 2 | 558.8 | -77.0 |
| 41406 | | PATNA | | 400.00* | 41430 | | BALIA | | 400.00 | 3 | 630.2 | -69.6 |
| 41406 | | PATNA | | 400.00* | 41430 | | BALIA | | 400.00 | 4 | 630.2 | -69.6 |
| 41468 | | MOTIHARI | | 400.00* | 18427 | | GRKPRPG | | 400.00 | 1 | 441.3 | -68.2 |
| 41468 | | MOTIHARI | | 400.00* | 18427 | | GRKPRPG | | 400.00 | 2 | 439.5 | -93.8 |
| 43808 | | GAYA | | 765.00* | 17880 | | VARNASI8 | | 765.00 | 1 | 596.5 | -281.7 |
| 43808 | | GAYA | | 765.00* | 17880 | | VARNASI8 | | 765.00 | 2 | 596.5 | -281.7 |
| 43808 | | GAYA | | 765.00* | 41807 | | BALIA | | 765.00 | 1 | 985.7 | -292.4 |
| 43808 | | GAYA | | 765.00 | 41807 | | BALIA | | 765.00* | 2 | 983.0 | -227.0 |

| | | | | | | | | |
|-----------------|-----------|----------------|---------|---|--------|---------|--|--|
| 44418 KHARAGAP | 400.00 | 44218 KHARAGPU | 220.00* | 1 | 143.0 | 48.7 | | |
| 44418 KHARAGAP | 400.00 | 44218 KHARAGPU | 220.00* | 2 | 143.0 | 48.7 | | |
| 48491 SSRAM-RF | 400.00* | 18440 ALADB4 | 400.00 | 1 | 140.2 | -93.3 | | |
| 48492 SASRM-NR | 400.00* | 17480 MUGLS4 | 400.00 | 1 | 497.6 | -41.7 | | |
| 48892 SASARAM7 | 765.00 | 18827 FATHEPR | 765.00* | 1 | 494.8 | -52.9 | | |
| TOTAL FROM AREA | 4 TO AREA | 1 | | | 9096.7 | -1987.9 | | |

| | | | | | | | | | |
|--------------------|-----------|---------|------|-------|-------|---------|------|--------|-------|
| TO AREA 2 NRTHEAST | | | | | | | | | |
| X---- | FROM AREA | BUS | ---- | X | ----- | TO AREA | BUS | ----- | X |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV |
| 44225 | BIRPRA | 220.00* | | 21206 | BNGN | 220.00 | 1 | -14.7 | 1.0 |
| 44225 | BIRPRA | 220.00* | | 21206 | BNGN | 220.00 | 2 | -14.7 | 1.0 |
| 44273 | ALIPURDU | 220.00 | | 21206 | BNGN | 220.00* | 1 | 2.3 | 26.8 |
| 44273 | ALIPURDU | 220.00 | | 21206 | BNGN | 220.00* | 2 | 2.3 | 26.8 |
| 44472 | SLGR | 400.00 | | 21406 | BNGN | 400.00* | 1 | -165.0 | 31.5 |
| 44472 | SLGR | 400.00 | | 21406 | BNGN | 400.00* | 2 | -165.0 | 31.5 |
| 44473 | ALIPURDU | 400.00 | | 21406 | BNGN | 400.00* | 3 | -251.0 | 108.4 |
| 44473 | ALIPURDU | 400.00 | | 21406 | BNGN | 400.00* | 4 | -251.0 | 108.4 |
| TOTAL FROM AREA | 4 TO AREA | 2 | | | | | | -857.0 | 335.5 |

| | | | | | | | | | |
|-----------------|-----------|---------|------|-------|----------|---------|------|--------|---------|
| TO AREA 3 WEST | | | | | | | | | |
| X---- | FROM AREA | BUS | ---- | X | ----- | TO AREA | BUS | ----- | X |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV |
| 42215 | BRAJRAJ | 220.00 | | 31202 | KRBAE2 | 220.00* | 1 | -113.9 | 26.1 |
| 42215 | BRAJRAJ | 220.00 | | 31202 | KRBAE2 | 220.00* | 2 | -113.9 | 26.1 |
| 42215 | BRAJRAJ | 220.00 | | 31299 | RAIGARH | 220.00* | 3 | -86.0 | 29.7 |
| 42412 | ROURKELA | 400.00* | | 34499 | RAIGARH | 400.00 | 1 | -24.2 | -11.8 |
| 42412 | ROURKELA | 400.00* | | 34499 | RAIGARH | 400.00 | 2 | -24.2 | -11.8 |
| 42415 | JRSG-400 | 400.00 | | 34499 | RAIGARH | 400.00* | 3 | 423.3 | 78.4 |
| 42415 | JRSG-400 | 400.00 | | 34499 | RAIGARH | 400.00* | 4 | 423.3 | 78.4 |
| 42815 | JRSG-765 | 765.00* | | 31872 | DHRMJYNG | 765.00 | 1 | 148.9 | -255.1 |
| 42815 | JRSG-765 | 765.00* | | 31872 | DHRMJYNG | 765.00 | 2 | 148.9 | -255.1 |
| 42815 | JRSG-765 | 765.00* | | 31872 | DHRMJYNG | 765.00 | 3 | 148.9 | -255.1 |
| 42815 | JRSG-765 | 765.00* | | 31872 | DHRMJYNG | 765.00 | 4 | 148.9 | -255.1 |
| 44446 | RANCHI | 400.00* | | 31470 | SIPAT | 400.00 | 1 | 239.8 | -111.6 |
| 44446 | RANCHI | 400.00* | | 31470 | SIPAT | 400.00 | 2 | 239.8 | -111.6 |
| 44846 | RANCHI | 765.00* | | 31872 | DHRMJYNG | 765.00 | 1 | 553.0 | -90.0 |
| 44846 | RANCHI | 765.00* | | 31872 | DHRMJYNG | 765.00 | 2 | 553.0 | -90.0 |
| TOTAL FROM AREA | 4 TO AREA | 3 | | | | | | 2665.7 | -1208.5 |

| | | | | | | | | | |
|-----------------|-----------|---------|------|-------|----------|---------|------|--------|--------|
| TO AREA 5 SOUTH | | | | | | | | | |
| X---- | FROM AREA | BUS | ---- | X | ----- | TO AREA | BUS | ----- | X |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV |
| 42419 | TALCHER | 400.00* | | 52411 | KOLAR | 400.00 | 2DC | 1004.8 | 416.6 |
| 42499 | GAZ-ER | 400.00 | | 51410 | GAZU-SR | 400.00* | 2DC | 397.3 | -229.2 |
| 42499 | GAZ-ER | 400.00 | | 51410 | GAZU-SR | 400.00* | 2DC | 397.3 | -229.2 |
| 42419 | TALCHER | 400.00* | | 52411 | KOLAR | 400.00 | 2DC | 1004.8 | 416.6 |
| 42814 | ANGL-765 | 765.00* | | 51891 | SRI_POOL | 765.00 | 1 | 1496.5 | -68.5 |
| 42814 | ANGL-765 | 765.00* | | 51891 | SRI_POOL | 765.00 | 2 | 1496.5 | -68.5 |
| TOTAL FROM AREA | 4 TO AREA | 5 | | | | | | 5797.2 | 237.8 |

| | | | | | | | | | |
|-----------------|---|------|--|--|--|--|--|---------|---------|
| TOTAL FROM AREA | 4 | EAST | | | | | | 16702.7 | -2623.1 |
|-----------------|---|------|--|--|--|--|--|---------|---------|

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E MON, JUL 08 2013 12:14
 AREA TIE LINE
 INTERCHANGE

| | | | | | | | | | |
|-------------------|-----------|---------|------|-------|----------|---------|------|---------|--------|
| FROM AREA 5 SOUTH | | | | | | | | | |
| TO AREA 3 WEST | | | | | | | | | |
| X---- | FROM AREA | BUS | ---- | X | ----- | TO AREA | BUS | ----- | X |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV |
| 51409 | CHAND-SR | 400.00* | | 32460 | BHADRV4 | 400.00 | 2DC | -398.1 | 191.5 |
| 51409 | CHAND-SR | 400.00* | | 32460 | BHADRV4 | 400.00 | 2DC | -398.1 | 191.5 |
| 54416 | SINGAR | 400.00 | | 36489 | RAIGAR-1 | 400.00* | 2DC | -1510.8 | -723.0 |
| 54416 | SINGAR | 400.00 | | 36489 | RAIGAR-1 | 400.00* | 2DC | -1510.8 | -723.0 |
| 51862 | DICHPALI8 | 765.00* | | 32806 | WARDHA8 | 765.00 | 1 | -1458.1 | 226.3 |
| 51862 | DICHPALI8 | 765.00* | | 32806 | WARDHA8 | 765.00 | 2 | -1458.1 | 226.3 |
| 52415 | NARDR-NW | 400.00* | | 32419 | KOLHPRPG | 400.00 | 1 | 238.4 | -69.4 |
| 52415 | NARDR-NW | 400.00* | | 32419 | KOLHPRPG | 400.00 | 2 | 238.4 | -69.4 |
| 52803 | RAIC800 | 765.00 | | 32822 | SOLPR8 | 765.00* | 1 | -773.8 | 166.8 |
| 52803 | RAIC800 | 765.00 | | 32822 | SOLPR8 | 765.00* | 2 | -773.8 | 166.8 |
| TOTAL FROM AREA | 5 TO AREA | 3 | | | | | | -7804.7 | -415.7 |

| | | | | | | | | | |
|-----------------|-----------|---------|------|-------|----------|---------|------|---------|--------|
| TO AREA 4 EAST | | | | | | | | | |
| X---- | FROM AREA | BUS | ---- | X | ----- | TO AREA | BUS | ----- | X |
| BUS# | X-- | NAME | --X | BASKV | BUS# | X-- | NAME | --X | BASKV |
| 52411 | KOLAR | 400.00 | | 42419 | TALCHER | 400.00* | 2DC | -1004.8 | -416.6 |
| 51410 | GAZU-SR | 400.00* | | 42499 | GAZ-ER | 400.00 | 2DC | -397.3 | 229.2 |
| 51410 | GAZU-SR | 400.00* | | 42499 | GAZ-ER | 400.00 | 2DC | -397.3 | 229.2 |
| 52411 | KOLAR | 400.00 | | 42419 | TALCHER | 400.00* | 2DC | -1004.8 | -416.6 |
| 51891 | SRI_POOL | 765.00 | | 42814 | ANGL-765 | 765.00* | 1 | -1496.5 | 68.5 |
| 51891 | SRI_POOL | 765.00 | | 42814 | ANGL-765 | 765.00* | 2 | -1496.5 | 68.5 |
| TOTAL FROM AREA | 5 TO AREA | 4 | | | | | | -5797.2 | -237.8 |

| | | | | | | | | | |
|-----------------|---|-------|--|--|--|--|--|----------|--------|
| TOTAL FROM AREA | 5 | SOUTH | | | | | | -13602.0 | -653.5 |
|-----------------|---|-------|--|--|--|--|--|----------|--------|

ANNEXURE -IV

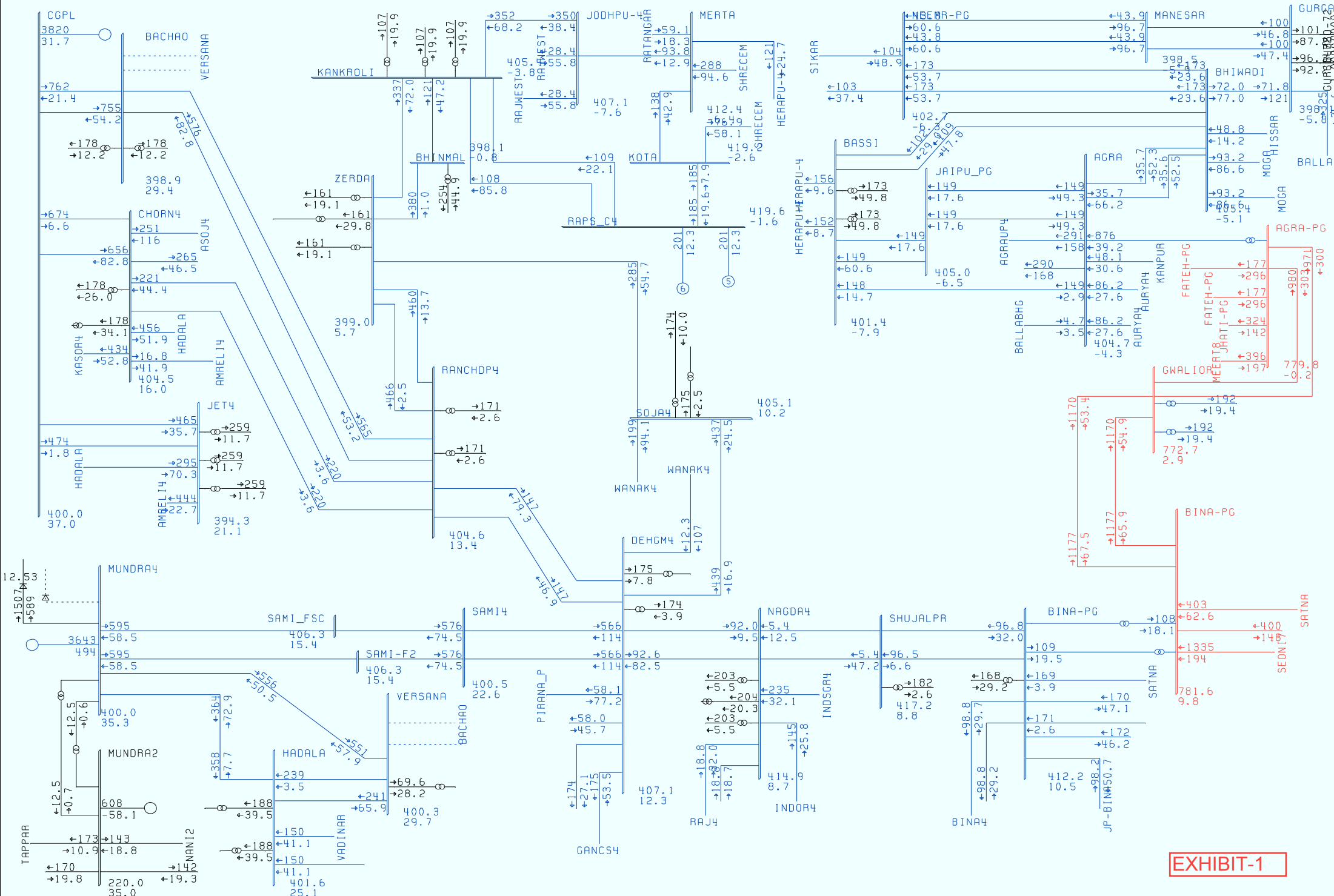


EXHIBIT-1

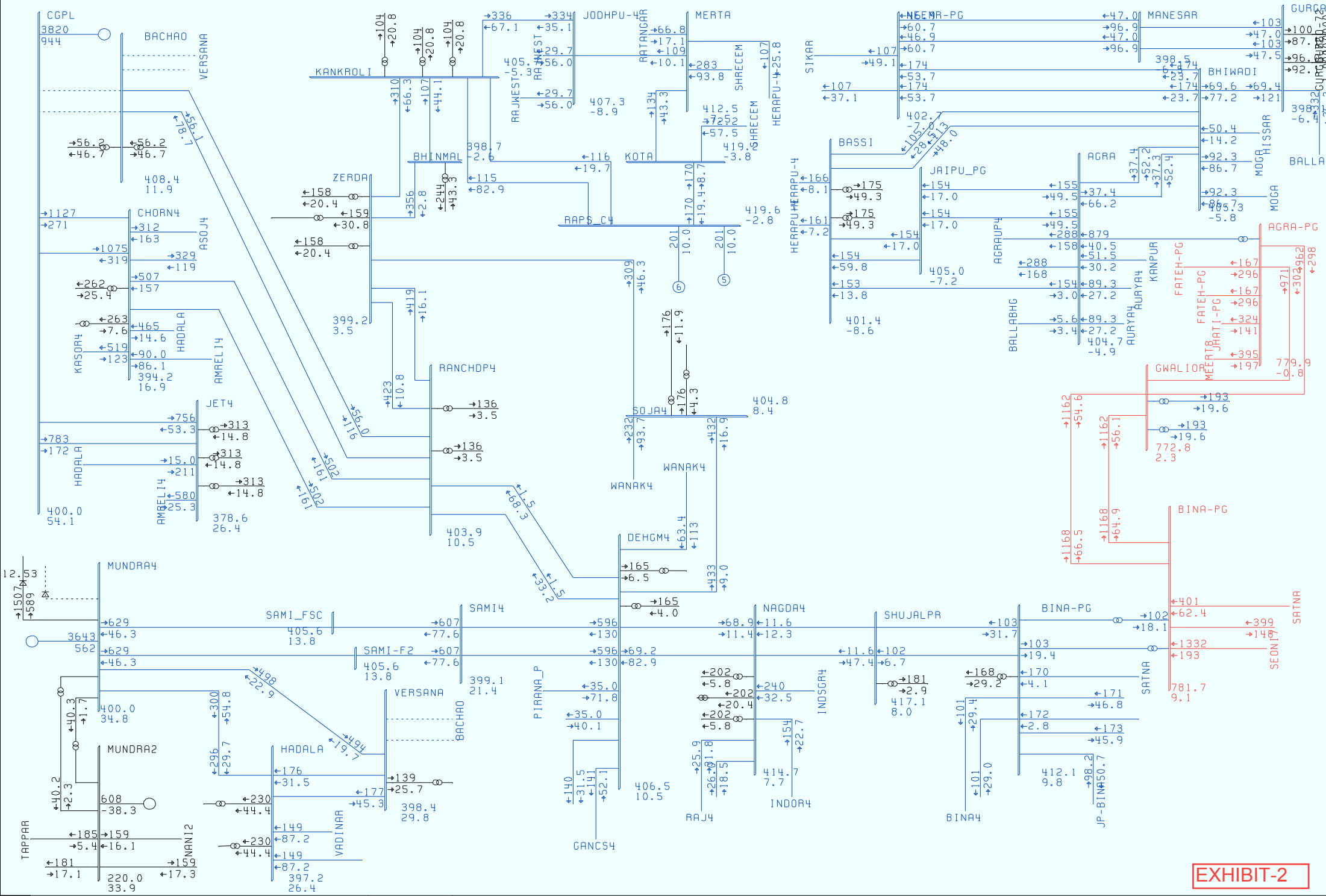


EXHIBIT-2

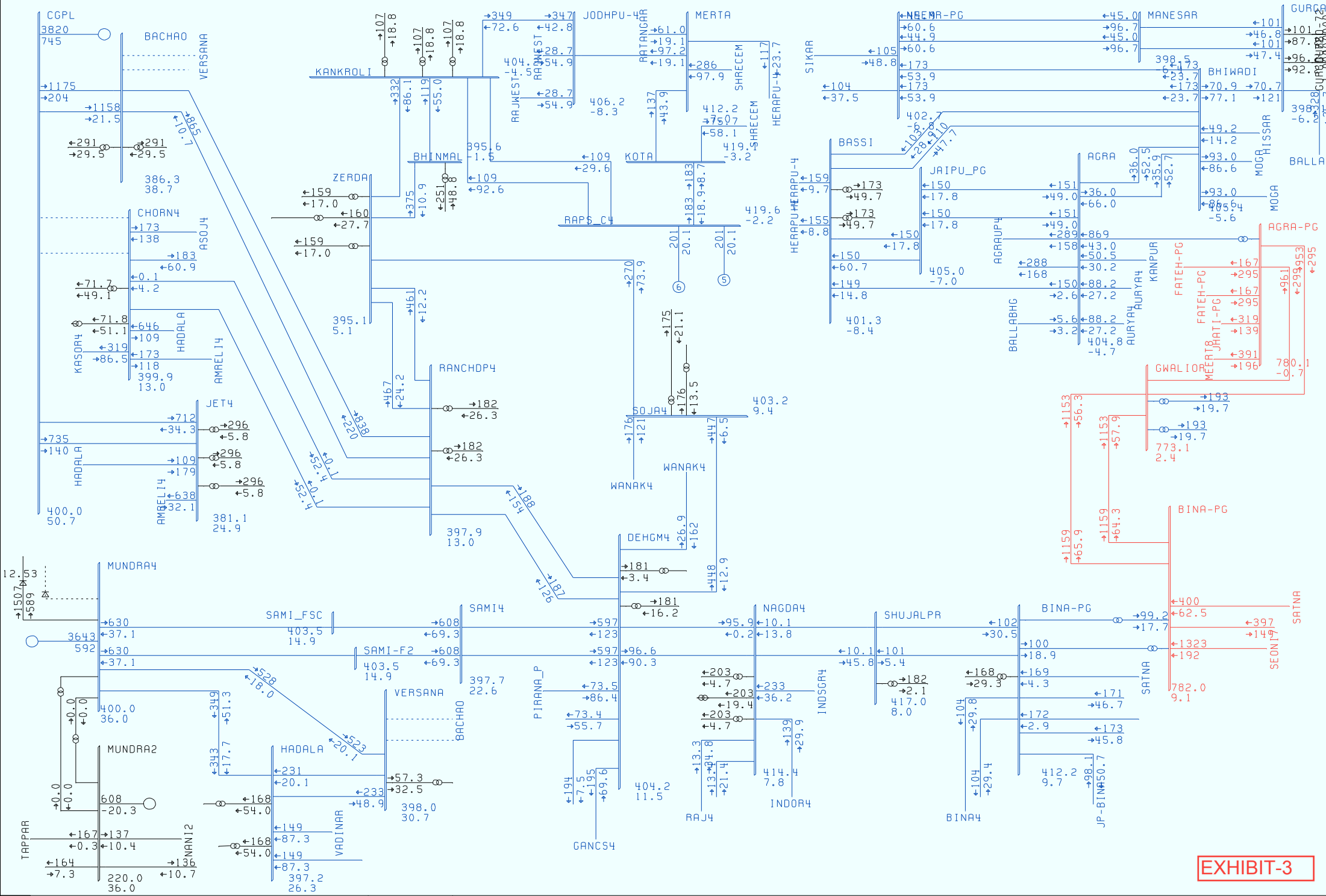


EXHIBIT-3

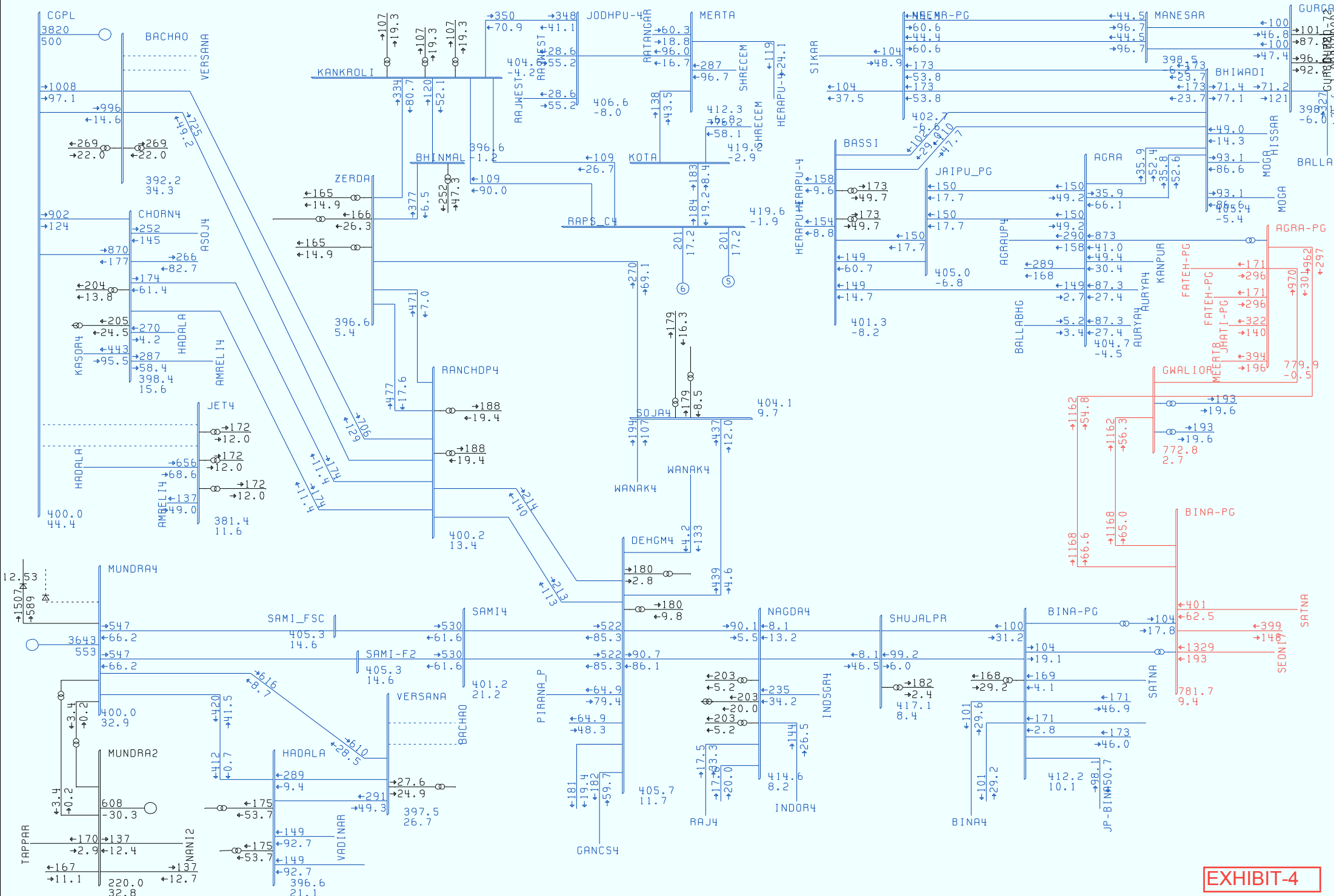
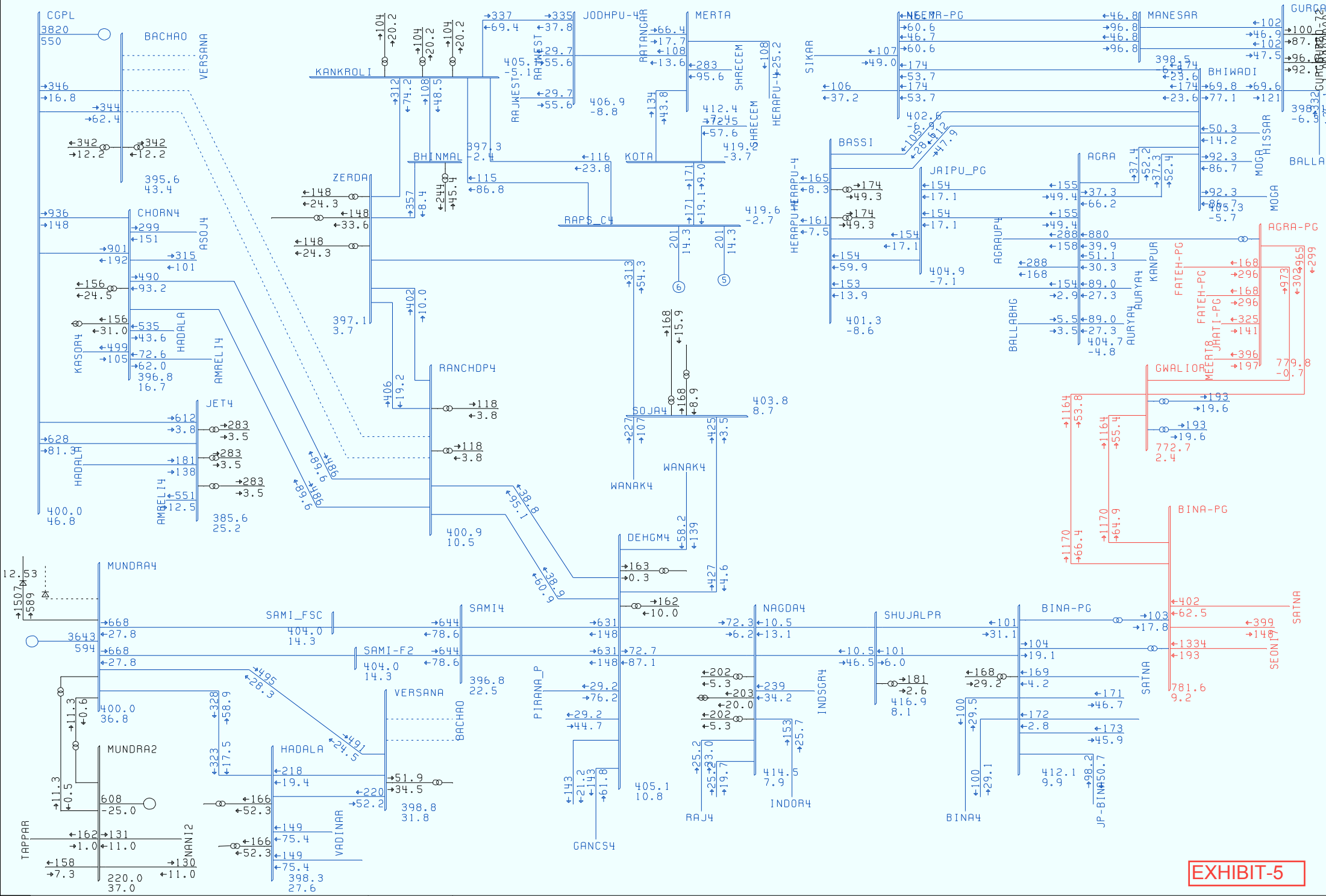


EXHIBIT-4



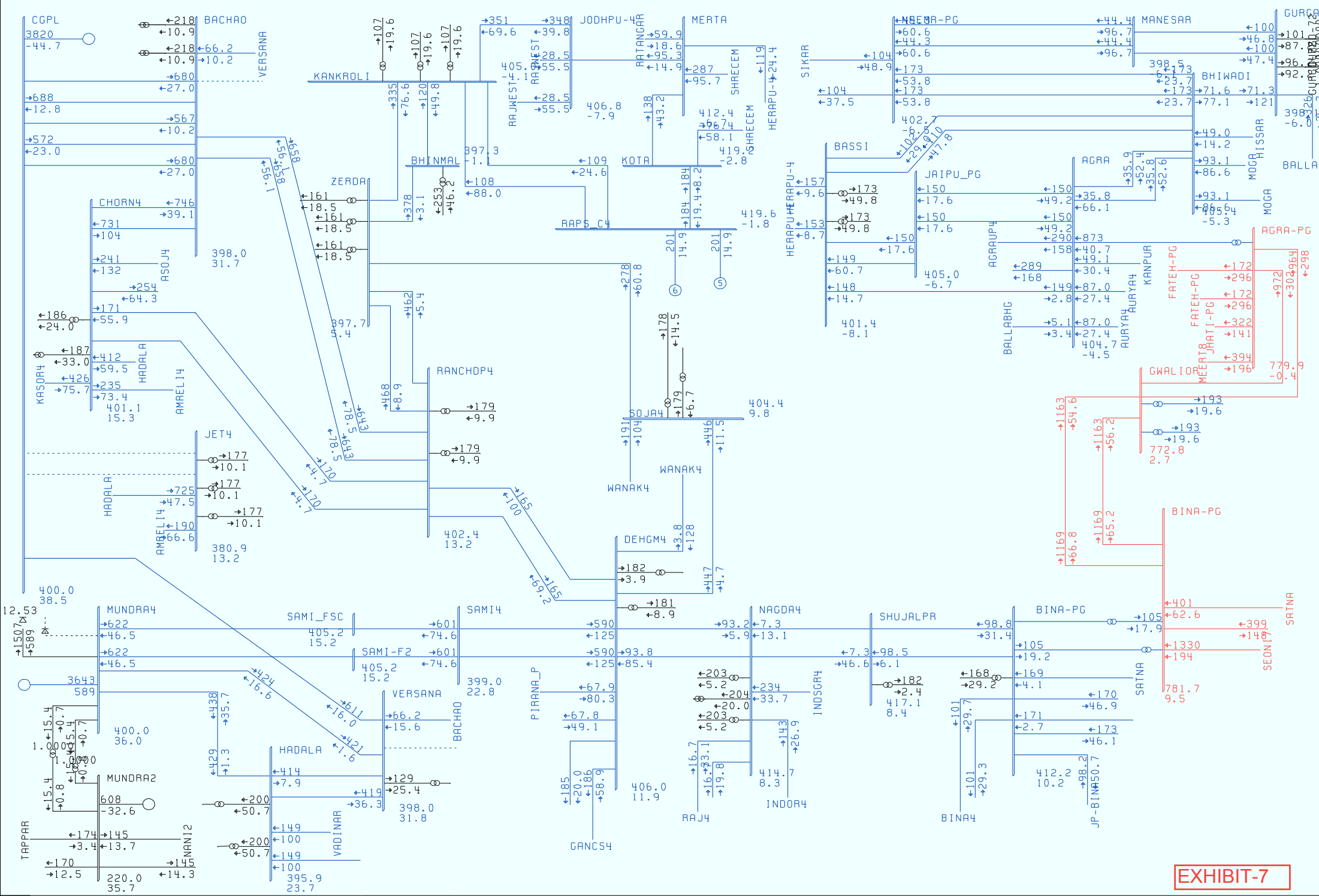


EXHIBIT-7

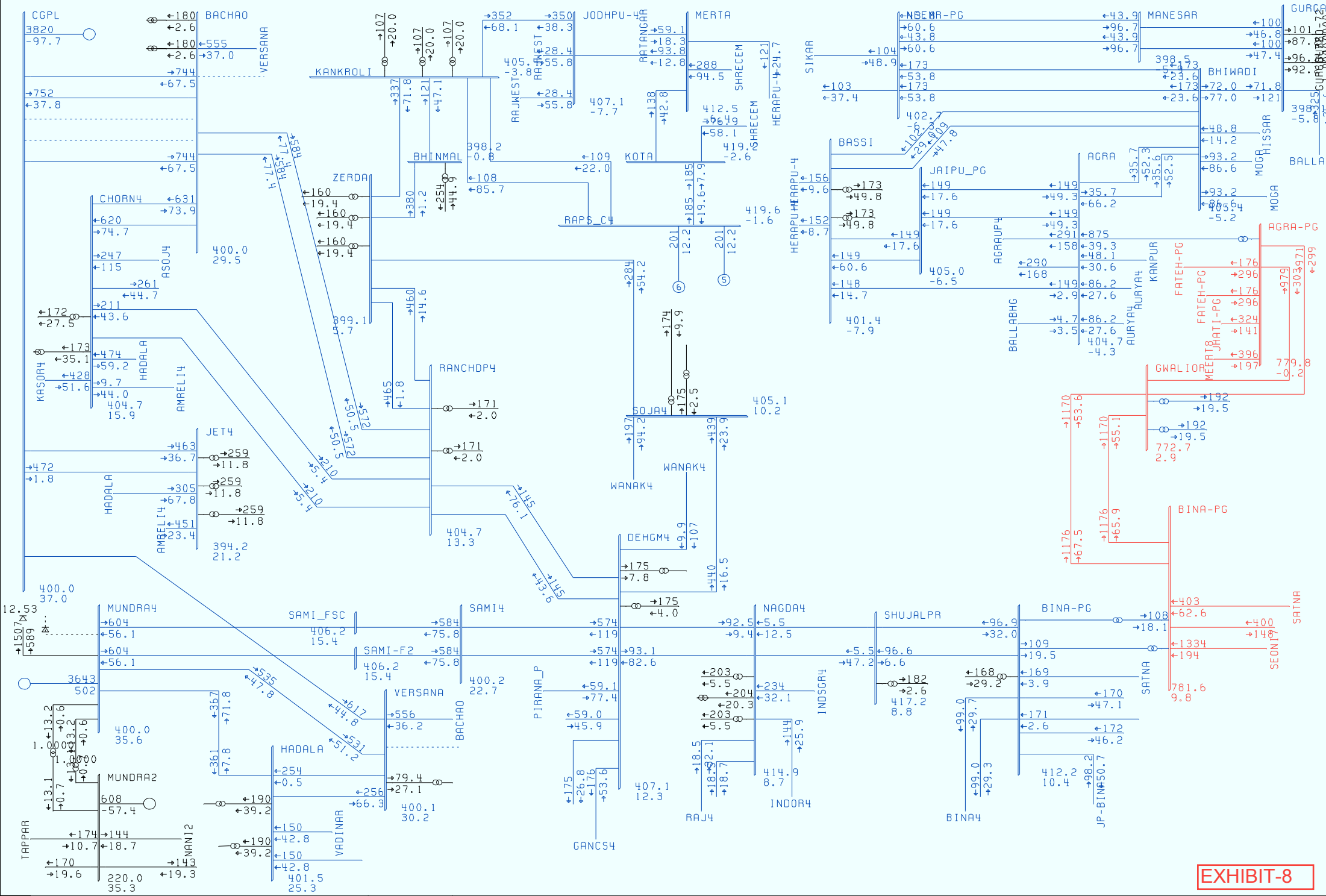


EXHIBIT-8

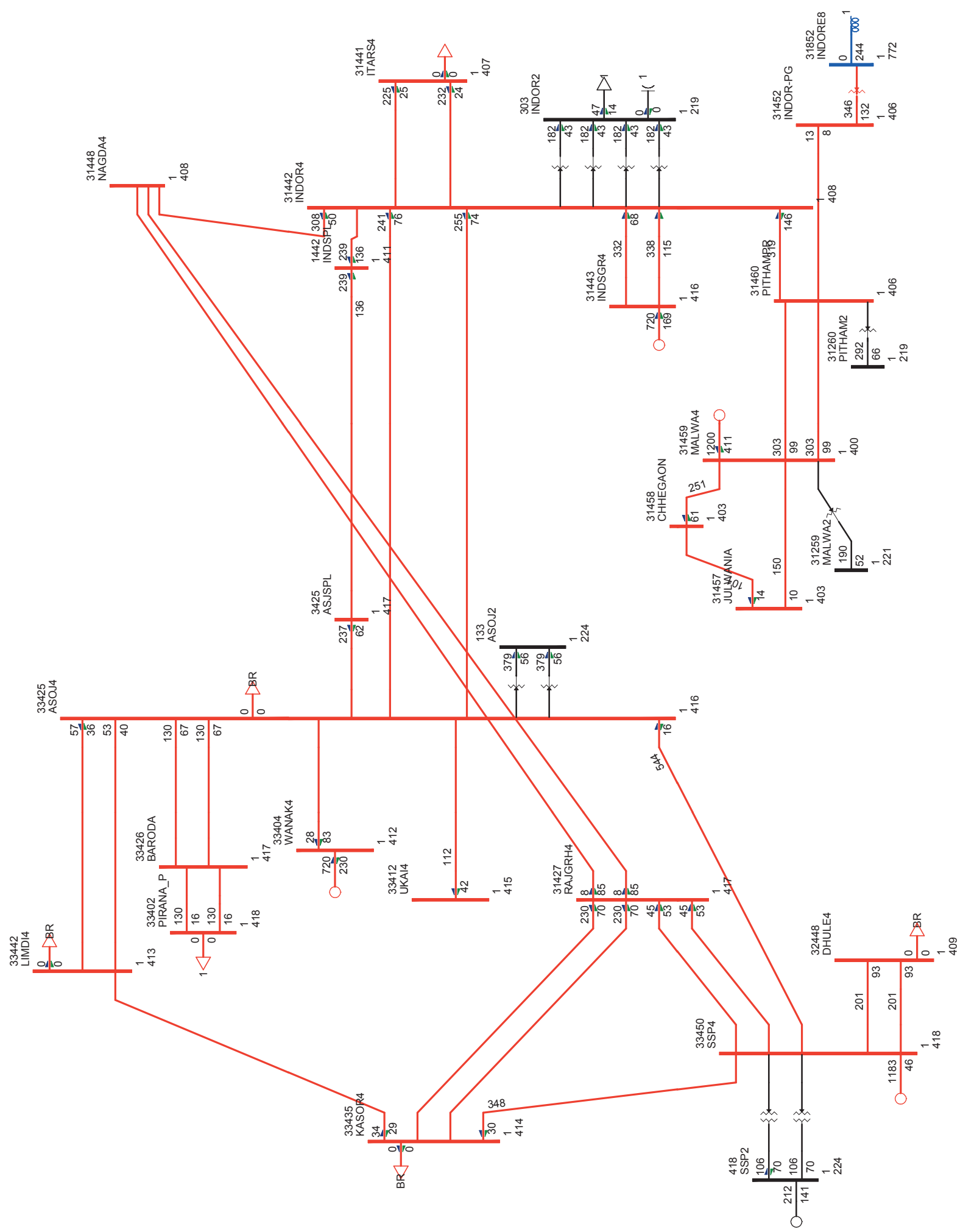
Summary for Load Flow Cases (Present Condition)

| | With 5 units at Mundra UMPP | Mundra - Bachau 400kV line (99km) | | Mundra - Limdi 400kV line(314km) | | Mundra - Jetpur 400kV line(337km) | | Bachau - Ranchodpura 400kV line(283km) | |
|---|--|-----------------------------------|--------------|----------------------------------|--------------|-----------------------------------|--------------|--|--------------|
| | | Flow | Angular Diff | Flow | Angular Diff | Flow | Angular Diff | Flow | Angular Diff |
| 1 | Base Case (<i>Exhibit-1</i>) | 2x762 | 8 | 2x674 | 21 | 2x474 | 16 | 2x576 | 16 |
| 2 | Mundra - Bachau D/c Outage(<i>Exhibit-2</i>) | 0 | - | 2x1127 | 36 | 2x783 | 28 | 2x56 | 2 |
| 3 | Mundra - Limdi D/c Outage(<i>Exhibit-3</i>) | 2x1175 | 12 | 0 | - | 2x735 | 25 | 2x865 | 25 |
| 4 | Mundra - Jetpur D/c Outage(<i>Exhibit-4</i>) | 2x1008 | 10 | 2x902 | 29 | 0 | - | 2x725 | 21 |
| 5 | Bachau - Ranchodpura D/c Outage (<i>Exhibit-5</i>) | 2x346 | 3 | 2x936 | 30 | 2x628 | 21 | 0 | - |
| | | | | | | | | | |

Summary for Load Flow Cases 2014-15 condition with proposed strengthening

| | With 5 units at Mundra UMPP + With LILO of one ckt of Bachau - Varsana 400kV at Mundra UMPP + With LILO of both ckts of Mundra - Limbdi 400kV at Bachau | Mundra - Bachau 400kV line (99km) | | Mundra - Jetpur 400kV line(337km) | | Mundra - Varsana 400kV line (70km) | | Bachau - Ranchodpura 400kV line(283km) | |
|---|---|-----------------------------------|--------------|-----------------------------------|--------------|------------------------------------|--------------|--|--------------|
| | | Flow | Angular Diff | Flow | Angular Diff | Flow | Angular Diff | Flow | Angular Diff |
| 1 | Base Case(<i>Exhibit-6</i>) | 3x537+ 2x446 | 5 | 2x435 | 15 | 1x445 | 5 | 2x593 | 13 |
| 2 | Mundra - Jetpur D/c Outage(<i>Exhibit-7</i>) | 3x688+ 2x572 | 7 | 0 | - | 1x611 | 5 | 2x658 | 18 |
| 3 | Mundra -Bachau D/c Outage (<i>Exhibit-8</i>) | 3x752 | 8 | 2x472 | 16 | 1x617 | 7 | 2x584 | 16 |
| 4 | Limdi - Ranchodpura D/c Outage(<i>Exhibit-9</i>) | 3x539+ 2x448 | 5 | 2x429 | 15 | 1x447 | 5 | 2x642 | 18 |

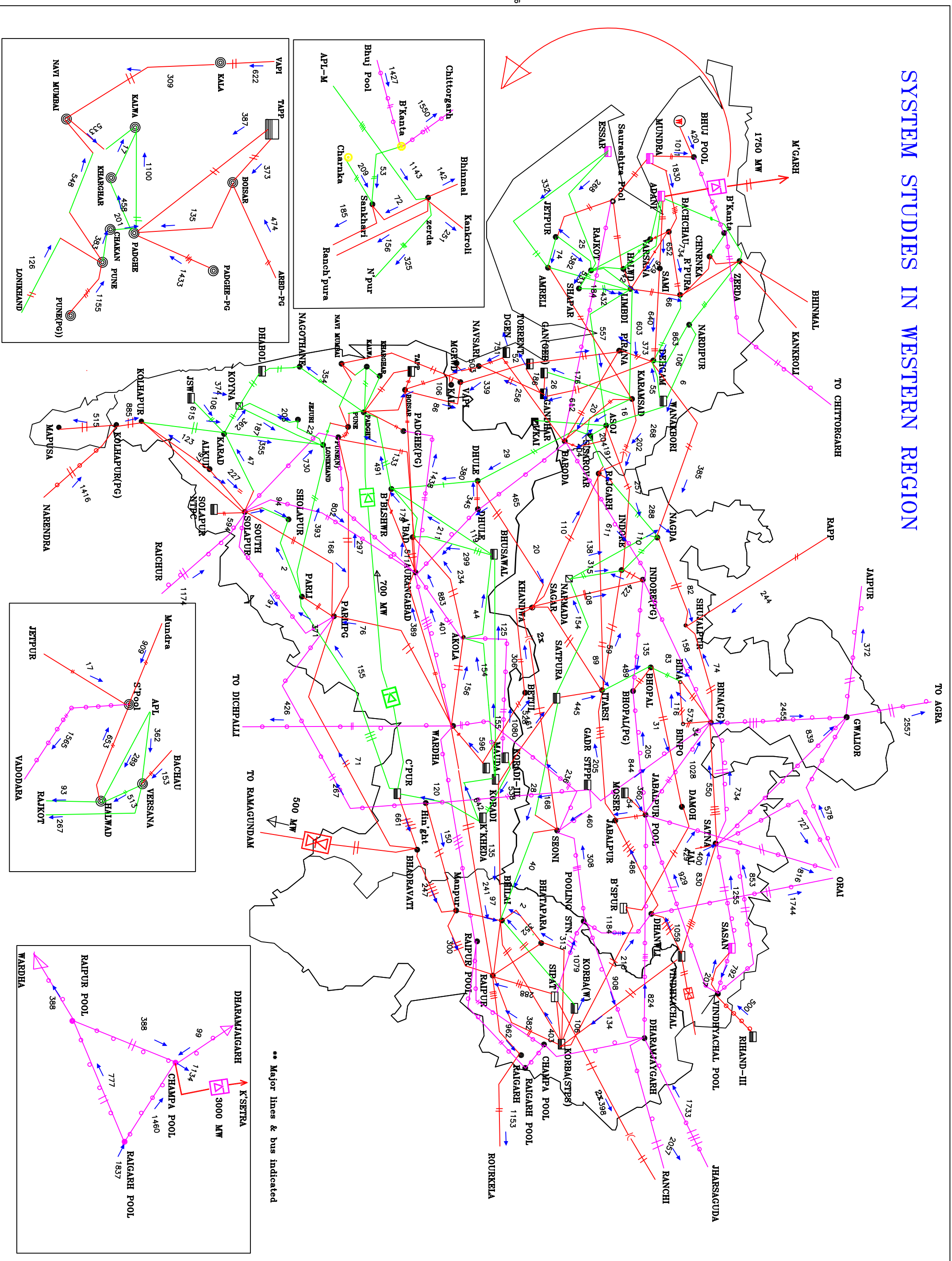
ANNEXURE - V



ANNEXURE – VI

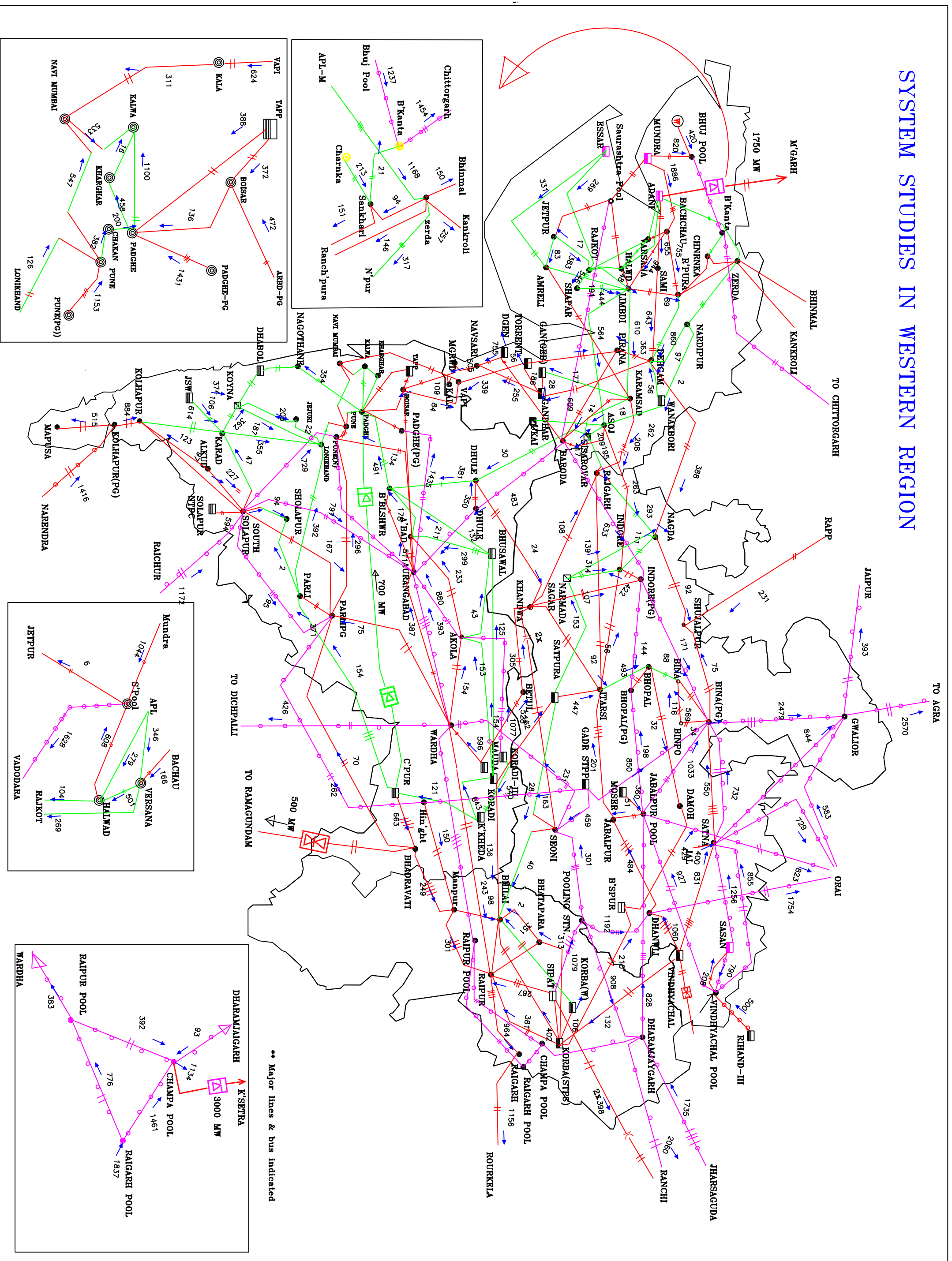
ANNEXURE - VII

SYSTEM STUDIES IN WESTERN REGION

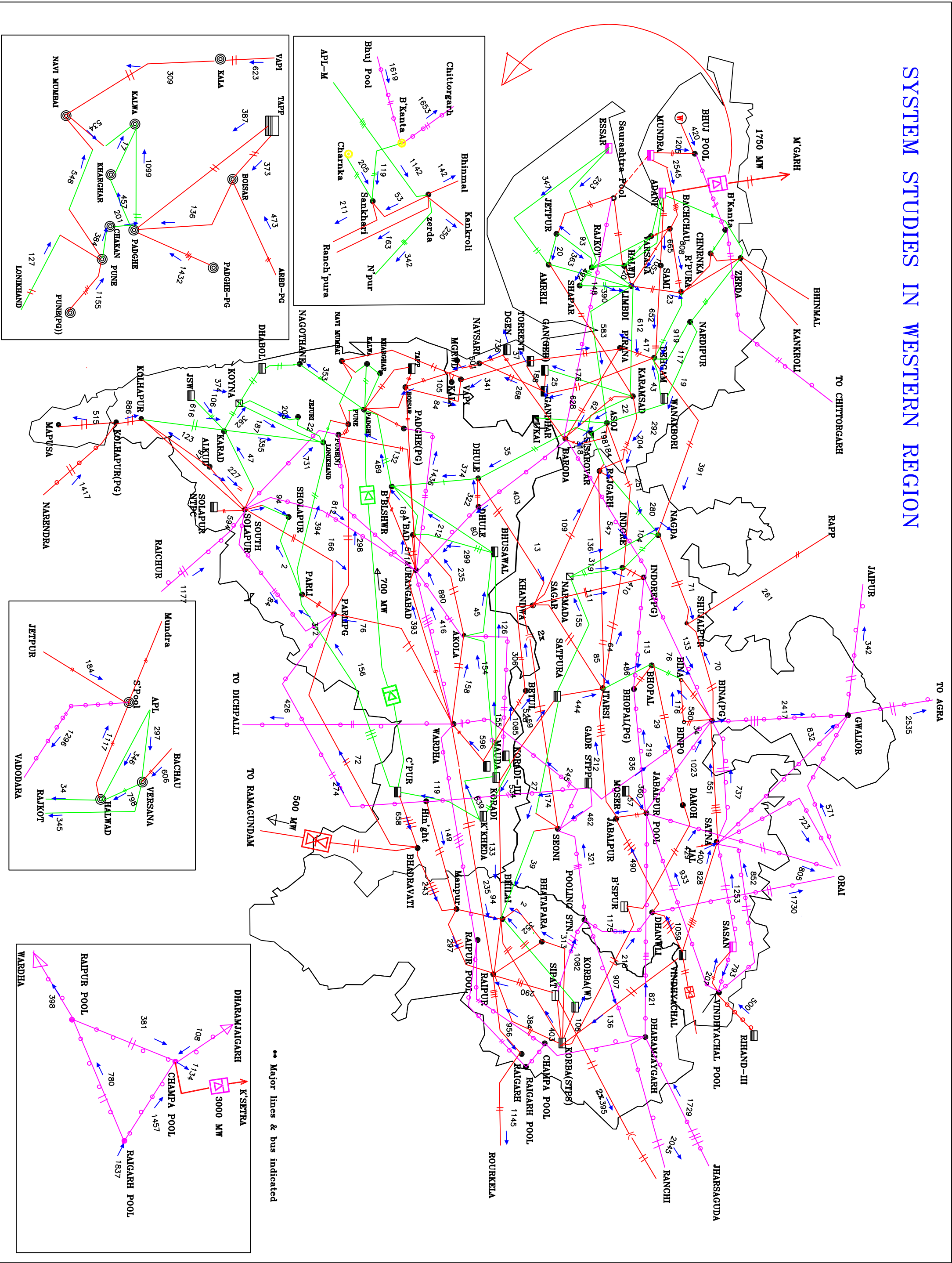


** Major lines & bus indicated

SYSTEM STUDIES IN WESTERN REGION

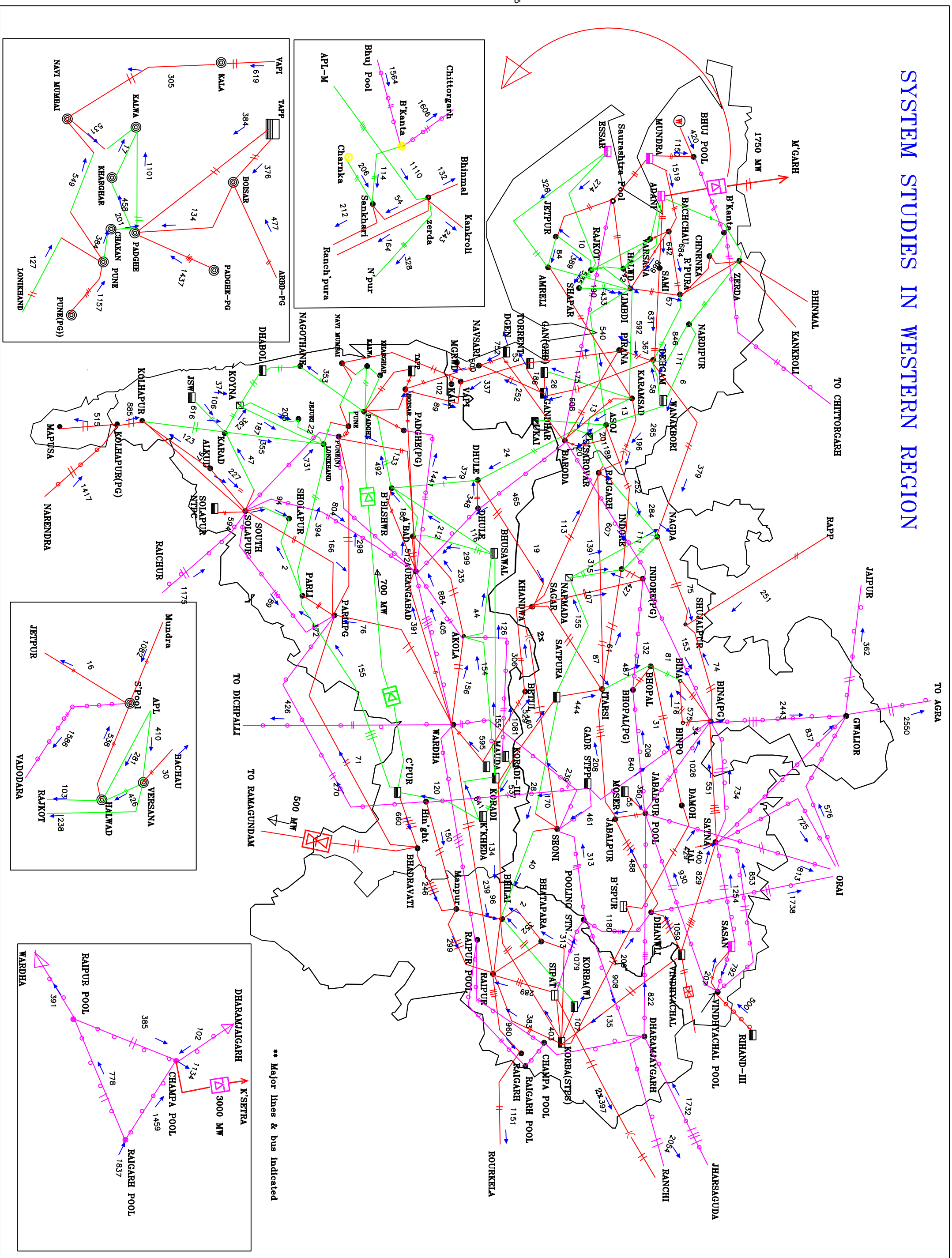


SYSTEM STUDIES IN WESTERN REGION



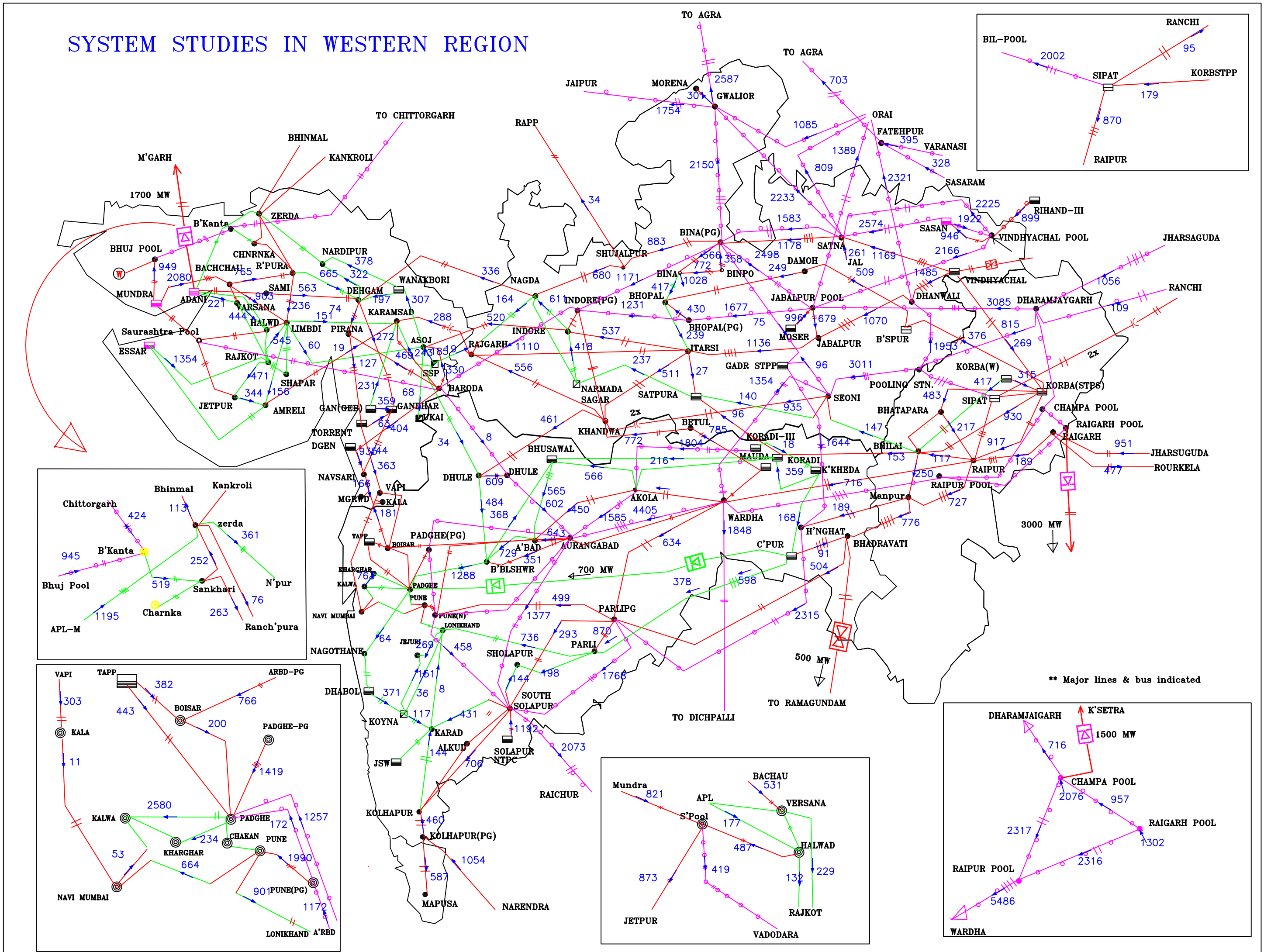
** Major lines & bus indicated

SYSTEM STUDIES IN WESTERN REGION

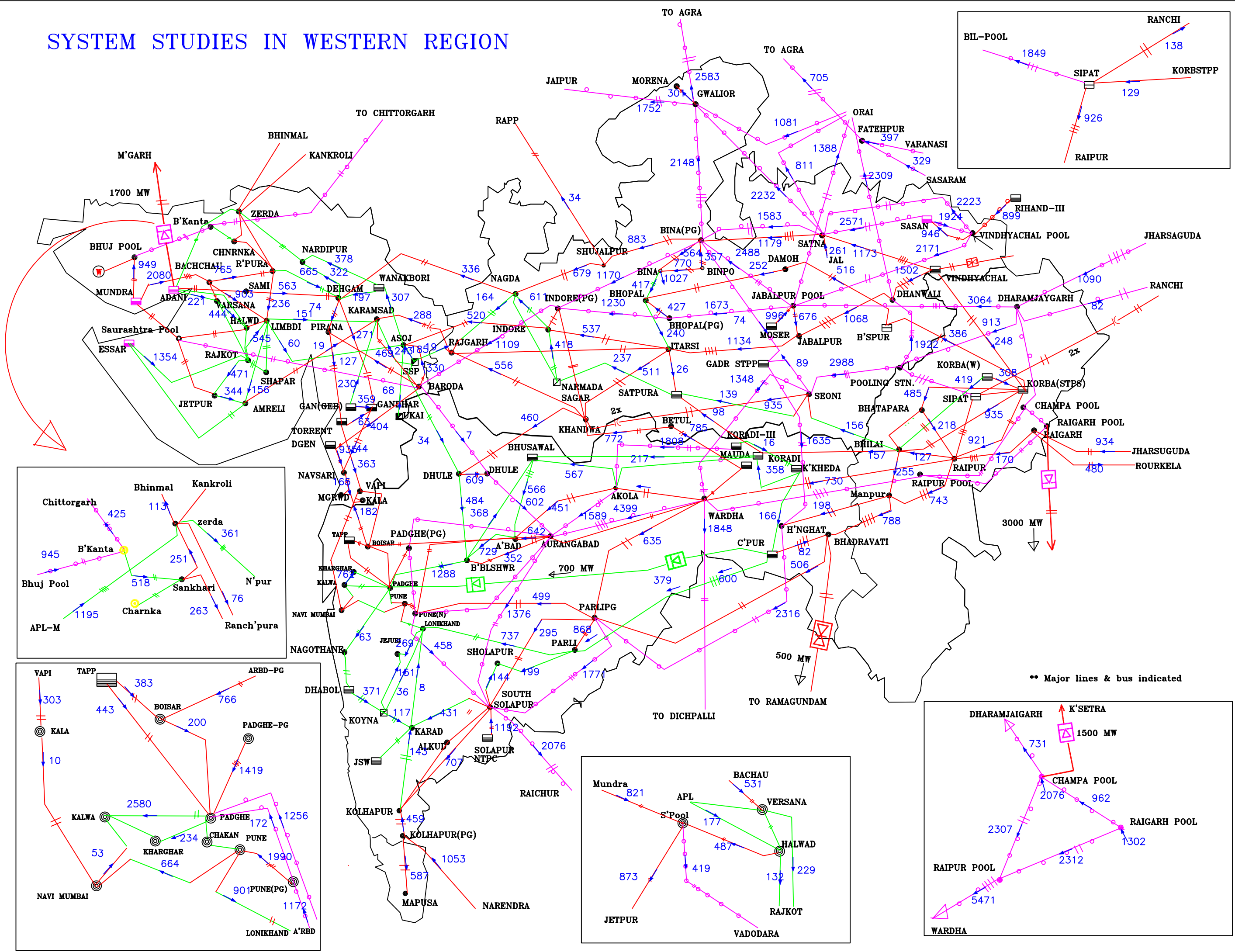


ANNEXURE - VIII

SYSTEM STUDIES IN WESTERN REGION



SYSTEM STUDIES IN WESTERN REGION



SYSTEM STUDIES IN WESTERN REGION

