

**Rajasthan Rajya Vidyut Prasaran Nigam Ltd.**  
(Project, Planning & Monitoring Wing)



**PROJECT ESTIMATES**  
**TO INTER-CONNECT RVPN'S**  
**765 / 400 KV ANTA GSS WITH**  
**PGCIL'S 400/220 KV KOTA GSS**

## PROJECT ESTIMATES TO INTER-CONNECT RVPN'S 765/400 kV ANTA GSS TO PGCIL'S 400/220 kV KOTA GSS

### Introduction

The inter-connection of RVPN's 765/400 kV GSS at Anta and PGCIL's 400/220 kV Kota GSS through 400 kV S/C line was discussed in CEA's 29<sup>th</sup> Standing Committee Meeting on Power System Planning of Northern Region held on 29<sup>th</sup> December 2010 (Appendix-1), wherein it was decided that the cost of proposed 400kV S/C line and its 1 no. 400 kV bay at 765/400 kV Anta GSS would be borne by RVPNL whereas the cost of 1 No. 400kV line bay at PGCIL's 400/220 kV Kota GSS would be developed under regional system strengthening scheme NRSS-XXVII.

This issue was also discussed in the 19<sup>th</sup> meeting of Northern Regional Power Committee held on 4<sup>th</sup> January, 2011 at New Delhi (Appendix-2) wherein it was discussed that 400kV S/C line between Anta and Kota would facilitate interconnection between two corridors which would enable power transfer during maintenance/shut down/ power outage of the units/lines as well as result in lesser system loss. It was also agreed that cost of proposed 400kV S/C line and 400kV bay at Anta shall be borne by RVPNL whereas 400kV feeder bay at Kota(PG) would be developed under regional system strengthening scheme.

### Proposal

In the 133<sup>th</sup> BoD meeting of RVPN held on 30-5-2007, the following evacuation system had been approved for Chhabra TPS Stage I Phase I (2x250 MW):

1. 305 kms 400 kV S/C Chhabra TPS-Hindaun line with 1x 315 MVA, 400/220 kV GSS at Hindaun (20 km 400 kV D/C line exist at Chhabra TPS end).
2. 303 kms 400 kV S/C line Chhabra TPS – Bhilwara line with 1x315 MVA, 400/220 kV GSS at Bhilwara (130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra and one circuit is extended upto Bhilwara).
3. 220 kV S/C Chhabra TPS- Jhalawar line
4. 220 kV S/C Chhabra TPS-Kawai-Baran-Dahra line with 1x100 MVA, 220/132 kV GSS at Baran.

Further, in the 167<sup>th</sup> meeting of BoD of RVPN held on 24-7-09, it was decided that aforesaid evacuation system approved under Chhabra TPS Stage I Phase I (2x250 MW) would be sufficient for Chhabra TPS Stage I Phase II (2x250 MW), with the termination of 2<sup>nd</sup> circuit of already constructed 130 Kms 400 kV D/C Chhabra TPS-Dahra at 765/400 kV GSS Dahra. Later on due to change in the location of proposed 765/400 kV GSS from Dahra to Anta (Appendix-3), the 2<sup>nd</sup> circuit of already constructed 130 kms 400 kV D/C Chhabra TPS-Dahra line is presently lying unconnected, and hence the proposal to utilize the 2<sup>nd</sup> circuit has been discussed below.

To strengthen the Evacuation System of Chhabra TPS(2x250 MW) and other generation projects in that area, the following transmission system is proposed:-



1. LILO of 2<sup>nd</sup> circuit of 400 kV D/C Chhabra TPS-Dahra section at 765/400 kV Anta GSS (1km, D/C)
2. 400 kV S/C line from 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS  
(Since 130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra has already been constructed hence extension of 2<sup>nd</sup> circuit of 400 kV D/C Chhabra TPS-Dahra section upto PGCIL's 400/220 kV Kota GSS by constructing a new 45 km 400 kV S/C line between Dahra & Kota(PG) would be required)

### Justification

- State's large thermal generation projects viz. Chhabra SCTPS (2x660 MW) and Kalisindh TPS (2x600 MW) and IPP's Kewai TPC (2x660 MW) would be connected at 765/400 kV Anta GSS and in view of this it would be prudent to interconnect 765/400 kV Anta GSS with PGCIL's 400 kV Kota GSS, which is connected to RAPP-C (2x220 MW) and would be connected to RAPP-D (2x700 MW), for enhancing the reliability of operation.
- Since this tie line would inter-connect the two generating complexes, hence it would enable transfer of bulk generated power, especially when the units are under maintenance shut down or outages at either of the generating complexes.
- Since PGCIL's 400 kV Kota GSS is connected to RVPN's 400 kV Merta GSS through 400 kV D/C line, which has sufficient spare capacity to evacuate additional power from 765/400 kV Anta GSS, hence proposed 400 kV S/C Anta(765 kV GSS)-Kota(PG) line would facilitate interconnection between the two corridors and therefore increase system reliability for the whole of Northern Region.

### Technical Evaluation

For technical evaluation of the proposal, the load flow studies have been conducted considering following two alternatives for a system peak load of 8927 MW (Revised) corresponding to financial year 2011-12. Generation schedule for the condition corresponding to 2011-12 is placed at Appendix-4. Following cases have been considered to carry out the load flow studies:-

S. No.	Case Description	Exhibit No.
ALT.1	<ul style="list-style-type: none"> <li>• Second circuit of 400 kV D/C line from Chhabra TPS be terminated to RVPN's 765/400 kV Anta GSS (1km).</li> </ul>	1
ALT.2	<ul style="list-style-type: none"> <li>• LILO of 2<sup>nd</sup> circuit of 400 kV D/C Chhabra TPS-Dahra section at 765/400 kV Anta GSS (1km, D/C)</li> <li>• 400 kV S/C line from 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS (Since 130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra has already been constructed hence extension of 2<sup>nd</sup> circuit of 400 kV D/C Chhabra TPS-Dahra section upto PGCIL's 400/220 kV Kota GSS by constructing a new 45 km 400 kV S/C line between Dahra &amp; Kota(PG) would be required)</li> </ul>	2

OUTAGE.1	<ul style="list-style-type: none"> <li>The Transmission system proposed at ALT.2</li> <li>Outage of 765 kV S/C Anta – Kota(PG) line (charged on 400 kV voltage level)</li> </ul>	3
OUTAGE.2	<ul style="list-style-type: none"> <li>The Transmission system proposed at ALT.2</li> <li>Outage of 2x220 MW units at RAPP-C</li> </ul>	4

Results of load flow studies for the aforesaid cases are placed at respective Exhibits. The results of Load Flow Studies have also been tabulated below:

S. No.	Transmission Lines/GSS	ALT. 1	ALT.2	OUTAGE.1	OUTAGE.2
<b>A</b>	<b>Transmission Lines</b>				
1	400 kV D/C Kalisindh TPS – Anta(765 kV) line	830 MW	876 MW	840 MW	876 MW
2	400 kV S/C Chhabra TPS – Anta(765 kV) line	109 MW	178 MW	95 MW	201 MW
3	765 kV 2xS/C Anta – Jaipur(Phagi) line (charged on 400 kV voltage level)	936 MW	804 MW	541 MW	706 MW
4	400 kV S/C Chhabra TPS – Hindaun line	368 MW	349 MW	391 MW	273 MW
5	400 kV S/C Chhabra TPS – Bhilwara line	307 MW	275 MW	310 MW	324 MW
6	400 kV S/C Anta(765 kV) – Kota(PG) line	-	245 MW	390 MW	366 MW
7	400 kV D/C Kota(PG) – Merta line	253 MW	336 MW	401 MW	256 MW
8	400 kV S/C RAPP – Kota(PG) line	111 MW	62 MW	31 MW	(-)218 MW
9	400 kV D/C Jaipur(Phagi) – Heerapura line	519 MW	459 MW	343 MW	434 MW
10	400 kV D/C Jaipur(Phagi) – Ajmer line	82 MW	51 MW	20 MW	100 MW
11	400 kV D/C Jaipur(Phagi) – Bassi(PG) line	326 MW	289 MW	214 MW	167 MW
12	400 kV D/C Bhilwara – Ajmer line	216 MW	229 MW	286 MW	180 MW
<b>B</b>	<b>Grid Sub-stations</b>				
1	2x315 MVA, 400/220 kV ICT at Kota(PG)	(-)142 MW	(-)30 MW	(-)17 MW	(-)142 MW
2	1065 MVA, 400/220 kV ICT at Heerapura	545 MW	524 MW	483 MW	537 MW
3	2x315 MVA, 400/220 kV ICT at Ajmer(P)	204 MW	192 MW	179 MW	203 MW
4	2x315 MVA, 400/220 kV ICT at Bhilwara	13 MW	13 MW	26 MW	75 MW
5	2x315 MVA, 400/220 kV ICT at Hindaun	227 MW	221 MW	228 MW	208 MW
<b>C</b>	<b>Total System Losses</b>	279.59 MW	277.95 MW	-	-

project report between 765kV Anta and 100kV Kota GSS



## Benefit Of The Proposal

- The results of Load Flow Studies indicate that there would be a power flow of 245 MW under the base conditions, thus creating sufficient redundancy in the other EHV lines emanating from Chhabra TPS and 765/400 kV Anta GSS(charged on 400 kV).
- The total system losses would reduce from 279.59 MW (ALT 1) to 277.95 MW (ALT 2), thereby resulting in a saving of 1.64 MW.
- Under outage of 765 kV S/C Anta – Jaipur(Phagi) (charged on 400 kV) (Outage.1), the power flow on 400 kV S/C Anta – Kota(PG) line would increase to 390 MW, which would obviate the overloading of other healthy 765 kV circuit (Charged at 400 kV)
- Under Outage 2 i.e. units at RAPP\_C indicates that the inter-connection of 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS would facilitate bulk transfer between generators under maintenance shut down/outages of the units at either of the generating complexes.

## Conclusion

Looking at the benefit of inter-connecting RVPN's 765/400 kV GSS at Anta and PGCIL's 400/220 kV Kota GSS, the following transmission system is proposed:

1. LILO of 2<sup>nd</sup> circuit of 400 kV D/C Chhabra TPS-Dahra section at 765/400 kV Anta GSS (1km, D/C)
2. 400 kV S/C line from 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS (45km S/C).

(Since 130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra has already been constructed, hence extension of 2<sup>nd</sup> circuit of 400 kV D/C Chhabra TPS-Dahra section upto PGCIL's 400/220 kV Kota GSS by constructing a new 45 km 400 kV S/C line between Dahra & Kota(PG) would be required)

## Estimated cost

The estimated cost of the above mentioned transmission system works to Rs. 41.68 Crores (excluding IDC) as per abstract cost estimate given at Annexure-I which further works out to Rs. 45.91 Crores ( including IDC), as per IDC calculation sheet given at Annexure-II.

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Annexure-I

ABSTRACT COST ESTIMATE

SCHEME: Interconnection of RVPN's 765/400kV Anta GSS with PGCIL's 400/220kV Kota GSS

(i)	LILO of 2nd circuit of 400 kV D/C Chhabra TPS-Dahra section at 765/400 kV Anta GSS	1	km D/C
(ii)	400 kV S/C line from 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS #	45	km S/C
(iii)	400kV Bay Equipments at 765/400kV GSS at Anta		

S.No.	Particulars	Amount (Rs. in lacs)
1	Preliminary expenses (Inclusive in line cost)	0.00
2	Land (Crop compensation etc. inclusive in line cost)	0.00
3	PLCC & Telephones (inclusive in Substation Equipments)	0.00
4	Office Equipments	0.00
5	Social Infrastructure & Community Services	8.00
6	Civil Works (inclusive in Substation Equipments)	0.00
7	Sub-station equipments (Details as per Appendix-A)	1650.19
8	Transmission lines (Details of per km cost as per Appendix-B)	2510.00
9	Vehicles	0.00
	Total	4168.19

Capital cost of scheme (excluding IDC)= Rs. 4168.19 lacs.

Note: # Since 130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra has already been constructed hence extension of 2nd circuit of 400 kV D/C Chhabra TPS-Dahra section upto PGCIL's 400/220 kV Kota GSS by constructing a new 45 km 400 kV S/C line between Dahra & Kota(PG) would be required.



# I. D.C. CALCULATION :

Annexure-II

Scheme: Interconnection of RVPN's 765/400kV Anta GSS with PGCIL's 400/220kV Kota GSS

## A. Details of Transmission system covered under the scheme:

S.No	Transmission System covered under the scheme	(Rs. in lacs.)		
		Route Length (In km)	Estimated Cost (excluding IDC)	Refer
(i)	LILO of 2nd circuit of 400 kV D/C Chhabra TPS-Dahra section at 765/400 kV Anta GSS	1		
(ii)	400 kV S/C line from 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS #	45	4168.19	Annexure-I
(iii)	400kV Bay Equipments at 765/400kV GSS at Anta			
TOTAL PROJECT COST			4168.19	

## B. IDC Calculation of the scheme :

Year	% Loan during the	Opening Balance	Loan during the year	Interest @ 11.0% Opening balance	Interest % 5.50% loan during the year	Total I.D.C. (5+6)	(All figures are in Rs. lacs.)	
							Loan during the year with IDC (4+7)	Closing Balance with IDC (3+4+7)
I	40%	0.00	1667.28	0.00	91.70	91.70	1758.98	1758.98
II	60%	1758.98	2500.92	193.49	137.55	331.04	2831.95	4590.93
Total	100%		4168.19	193.49	229.25	422.74	4590.93	

TOTAL PROJECT COST INCLUDING I.D.C.=Rs.

4590.93

lacs.

(Say Rs.=

45.91

Crores)

Note: # Since 130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra has already been constructed hence extention of 2nd circuit of 400 kV D/C Chhabra TPS-Dahra section upto PGCIL's 400/220 kV Kota GSS by constructing a new 45 km 400 kV S/C line between Dahra & Kota(PG) would be required.

Government of India  
Central Electricity Authority  
System Planning & Project Appraisal Division  
Sewa Bhawan R K Puram,  
New Delhi -110066

No.1/9/10-SP&PA/

-As per List enclosed-

Dated: 20.01.2011

Sub: Minutes of the 29<sup>th</sup> meeting of the Standing Committee on Transmission System Planning of Northern Region and Long Term Access meeting held on 29<sup>th</sup> December, 2010 at POWERGRID, Gurgaon.

Sir,

It is intimated that the minutes of the 29<sup>th</sup> meeting of the Standing Committee on Transmission System Planning of Northern Region and Long Term Access meeting held on 29<sup>th</sup> December, 2010 at POWERGRID, Gurgaon, have been uploaded on CEA website (under [www.cea.nic.in/PS wing/ standing committee meeting/NR](http://www.cea.nic.in/PS_wing/standing_committee_meeting/NR))

This is for your kind information and further necessary action at your end please.

Yours faithfully

(B. K. Sharma)  
Director (SP&PA)



same. In accordance with above even Inter-State Generating Stations owned by the Central Government need to apply for Connectivity/Long Term Access as applicable. POWERGRID stated that they had already requested SJVNL vide letters dated 28/04/2010, 30/08/2010 & 03/12/2010 for applying connectivity and Long Term Access, however the applications was yet to be received.

However, POWERGRID indicated following tentative system after the preliminary system studies:

**Associated transmission for Luhri generation:**

- LLO of Rampur-Nallagarh 400kV line at Luhri
- Luhri-Mohali 400kV D/c (Triple Conductor)

**System Strengthening:**

- Mohali-Malerkotla 400kv D/c
- LLO of one circuit of Nallagarh - Patiala line at Mohali 400kV D/c
- Establishment of 2x315 MVA 400/220kV GIS substation at Mohali

Members decided that SJVNL should first apply for connectivity and LTA to the POWERGRID (CTU) and thereafter the transmission system for the project would be taken up for consideration of the committee.

**14. Transmission system for Singrauli-III TPS (500 MW)**

Director (SP&PA), CEA informed that NTPC was implementing Singrauli STPP Stage-III (500 MW) in UP with Northern region beneficiaries. The project is likely to be commissioned in 2013-14. It was informed that the present available system would not be adequate to evacuate power from this project. He further informed that studies were carried out by POWERGRID & CEA and after analysing the same, following transmission scheme was proposed for evacuation of power from Singrauli-III TPS:

- Singrauli-Allahabad 400kV S/c
- Allahabad-Kanpur 400kV D/c

POWERGRID further mentioned that in existing Singrauli-Allahabad line, about 50 km section is S/c strung on D/c towers and in view of severe ROW constraint at Singrauli, the proposed Singrauli-Allahabad 400kV S/c would be strung on the above D/c towers wherever possible. Balance portion would be developed as S/c line. Allahabad - Kanpur 400 kV D/c line would be required for transfer of power beyond Allahabad.

POWERGRID also stated that NTPC had applied for connectivity, however it was advised that NTPC might apply for LTA, before the above works could be taken up for implementation.

Members agreed for the above.

**15. Anta-Kota 400kV Line -Agenda by RVPN**

RRVPNL (Rajasthan) had proposed following system for connection of ISTS and their system:

- Anta(RRVPNL)-Kota(PG) 400kV S/c line

Director (RRVPN) stated that large state thermal generation projects viz. Chhabra and Kalisindh were coming at 765/400 kV Anta/ Dahra S/s and in view of this it would be prudent to interconnect Anta substation with 400 kV Kota S/s (PG) for enhancing the reliability of operation.

POWERGRID stated that the above proposed line would facilitate interconnection between the two corridors and therefore increase system reliability. The cost of proposed 400kV S/c line and its bay at 400 kV Anta S/s would be borne by RRVPNL whereas one no. 400kV line bay at Kota (PG) S/s would be developed under regional system strengthening scheme NRSS-XXVII.

Members agreed for the above proposal.

**16. Srinagar-Tehri Pooling Station 400 kV D/c (Quad) Line**

Director (SP&PA), CEA stated that as a part of master plan for evacuation of power from generation projects in Uttarakhand, a 400kV D/c had been proposed from Srinagar HEP (330MW) to Srinagar 400kV substation. Srinagar 400kV substation would further be connected to Kashipur substation of PTCUL. Further, it had also been proposed to pool the power of other regional projects like Tapovan Vishnugarh, Vishnugarh Pipalkoti etc. at Kashipur S/s.

POWERGRID stated that for system reliability and stability there was a need of inter valley inter-connection. They proposed a 400kV D/c Line from Tehri Pooling Station to Srinagar 400kV substation. Director (RRVPNL) suggested that in view of ROW constraints in hilly area, the proposed 400 kV line might be constructed with Quad conductor. The same was agreed by members.

POWERGRID further stated that PTCUL might inform the implementation schedule for Srinagar S/s and other associated lines within their scope. POWERGRID also stated that the implementation of proposed 400 kV D/c (Quad) line from Tehri Pooling Station to Srinagar 400kV substation (PTCUL) would be taken up after the awards for Srinagar S/s and associated lines at Srinagar were placed. PTCUL was requested to inform the progress of above works.

The issue was deliberated by members and it was agreed to take up 400kV D/c (Quad) Line from Tehri Pooling Station to Srinagar 400kV substation (PTCUL) as regional system strengthening scheme.

Members agreed for the above proposal.

**17. Bus reactor at Rihand**

POWERGRID stated that it was agreed to provide 1x125 MVAR bus reactor at Rihand in the 28<sup>th</sup> standing committee meeting held on 23.02.10. Subsequently NTPC indicated that presently 80 MVAR bus reactors were being procured by them under Rihand-III and Vindhyachal-IV projects. In view of this, NTPC requested to examine the possibility of installing 1x80 MVAR bus reactor for ease of procurement through the



दूरभाष Tel.: 26967842, 26868681  
फैक्स Fax : 26865206

PS/OMT/11/4780  
Date: 24/1/11  
वेबसाइट Website : www.nrpc.gov.in

D (Tech)

24 JAN 2011

भारत सरकार  
उत्तर क्षेत्रीय विद्युत समिति  
18-ए, शहीद जीत सिंह मार्ग, कटवारिया सराय, नई दिल्ली - 110016  
Government of India  
Northern Regional Power Committee  
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016

Project Report No. NRPC/SE(C)/19-RPC/11/ 3587-3623  
for Dagra- No. NRPC/SE(C)/19-RPC/11/ 3587-3623  
Kata Pablu

दिनांक: 19 जनवरी, 2011  
Dated: 19 January, 2011

सेवा में,  
To,  
उत्तरी क्षेत्रीय विद्युत समिति के सदस्य  
(संलग्न सूची के अनुसार)

Members of Northern Regional Power Committee  
(As per list attached)

कार्यालय मुख्य अभियन्ता (पी. पी. एम. एंड आर.)  
रा. रा. वि. प्र. नि. लिमिटेड, विद्युत भवन, जनपथ, जयपुर

पत्र प्राप्ति  
संख्या 205  
दिनांक 25-1-11

विषय: उत्तरी क्षेत्रीय विद्युत समिति की 19 वीं (विशेष) बैठक का कार्यवृत्त।  
Subject: Minutes of 19th (Special) meeting of Northern Regional Power Committee

महोदय,  
Sir,

उत्तरी क्षेत्रीय विद्युत समिति की 19 वीं (विशेष) बैठक 04 जनवरी, 2011 (मंगलवार) को होटल संगरी-ला-इरोस, नई दिल्ली में आयोजित की गयी थी। इस बैठक के कार्यवृत्त की एक प्रति आपकी सूचना व आवश्यक कार्यवाही हेतु इस पत्र के साथ संलग्न है।

The 19<sup>th</sup> (Special) meeting of Northern Regional Power Committee was held on 04<sup>th</sup> January, 2011 at Hotel Sangri-La's-Eros, New Delhi. A copy of the summary record of discussions of the meeting is enclosed herewith for favour of information and necessary action.

संलग्नक: यथोपरि।  
End: As above

भवदीय,  
Yours faithfully,  
अशोक अग्रवाल  
19/01/2011  
(अशोक कुमार अग्रवाल)  
(A. K. Aggarwal)  
सदस्य सचिव  
Member Secretary

S. E. (P&P) RVPNL : JAIPUR	
C. R. No.	5290
Date	27/1/11
XEN/PSS/HYDEL/PROJ/MONIT/ JR. ACCT/STY/EST. ( )	
OS (P&P)	SE (P&P)

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XEN (P&P/STY) 27/1

AACPS)

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31/1/2011

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# NORTHERN REGIONAL POWER COMMITTEE

## SUMMARY RECORD OF DISCUSSIONS OF 19<sup>th</sup> SPECIAL MEETING OF NORTHERN REGIONAL POWER COMMITTEE

List of participants is enclosed at Annexure.

Shri A.K. Aggarwal, Member Secretary, NRPC, welcomed NRPC Members & other participants. He informed that Shri Anurag Agarwal, CMD Punjab State Transmission Corp. Ltd. and Chairman, NRPC could not attend the meeting due to prior commitments and had asked to proceed with the meeting. He proposed the name of Member (GO&D), CEA to chair the meeting. With the consent of the house, he requested Shri S.M.Dhiman, Member (GO&D), CEA to chair the NRPC meeting. He further proposed the name of Shri Y K Raizada (Director) RVPN, as Chairman, TCC which was also agreed by the Members.

Executive Director, POWERGRID (NR-I) welcomed participants of the 19<sup>th</sup> special meeting of NRPC and thanked them for attending the meeting, despite severe winter conditions and problems in traveling due to road/air traffic disruptions.

Director, RVPN welcomed the participants and stated that this special NRPC meeting was called for concurrence of the NRPC to the transmission proposal agreed in the Standing Committee meeting of transmission Planning in Northern Region before the timeline of Tariff based competitive bidding. He mentioned that many transmission schemes had been proposed in the agenda, which need to be approved. He further stated that although the trunk transmission system would remain same, the transmission system should be flexible enough to take care of subsequent requirement of any change or fine tuning in the system at future date.

Member (GO&D), CEA welcomed the participants to the 19<sup>th</sup> (special) NRPC meeting and wished them a very happy & prosperous new year 2011. He stated that the Power demand in Northern Region has been growing at faster rate resulting in continued shortage condition. He further stated that a number of IPP's, are coming up in the Eastern Region (Orissa, Jharkhand etc.) and in Southern/Western Region with target beneficiaries in Northern Region. For transfer of power from Regions having high concentration of new generating capacity to the other regions, high capacity corridors have been planned. He stated that as a part of the ongoing process for planning for transmission system for evacuation of power from additional generating capacity, a number of schemes have been identified for NR beneficiaries as also for System strengthening and discussed in the last Standing Committee meeting held in December 2010 which have been incorporated in the agenda for consideration. He stated that in the expansion of the transmission system, the provisions to ensure the stability and the reliability of the grid need to be given due consideration. He appreciated the action taken by the utilities of the Northern Region like cleaning of insulators and the replacement of



During the 29<sup>th</sup> Standing Committee Meeting, it was discussed that this would facilitate interconnection between the two corridors which would enable power transfer during maintenance/shut down/power outage of the units/ lines as well as result in lesser system loss. Considering above the scheme was agreed during the Standing Committee Meeting. It was also agreed that cost of proposed 400kV S/c line and 400 kV bay at Anta shall be borne by RVPNL whereas 400kV feeder bay at Kota(PG) would be developed under regional system strengthening scheme.

NRPC concurred to the proposal.

### 3.0 Transmission system associated with Meja TPS

Executive Director ,POWERGRID, explained that NTPC had been developing a 1320 MW power plant as a JV project with UPRVNL at Meja in UP. From Meja TPS, UP had share of about 900 MW and balance of about 400 MW power for other constituents. For evacuation of power from the generation projects like Meja, Bara, Karchanna etc., UPPTCL were developing an integrated transmission network. In order to integrate the system being developed by the State with ISTS and for transfer of power from Meja to other constituents following transmission system was agreed during the 29<sup>th</sup> Standing Committee Meeting:

- Meja-Allahabad (POWERGRID) - 400 kV D/c

Beyond Allahabad, available capacity in proposed Allahabad-Kanpur line would be utilized for transfer of power to the constituents.

Representative of UPPTCL enquired about the requirement of 400 kV D/c line from Rewa Road to Allahabad (PG) planned as a part of integrated network of UP. Chief Engineer, CEA stated that in view of the Meja-Allahabad 400 kV D/c line, Rewa Road - Allahabad (PG) 400 kV D/c line shall not be required.

NRPC concurred to the proposal.

### 4.0 Transmission system for Rajasthan Atomic Power project (RAPP) -7&8 (2x700 MW)

Executive Director , POWERGRID mentioned that NPCIL had been developing a 1400 MW (2x700 MW) Nuclear power plant in Rawatbhatan, in Rajasthan which was scheduled for commissioning by Jun-2016 and Dec-2016. Following Transmission system for RAPP-7&8 was proposed:

- RAPP – Jaipur (South) 400 kV D/c line of which one circuit to be LILOed at Kota
- RAPP – Shujalpur (WR) 400 kV D/C



1. The Board of Directors of RVPN, in its 167<sup>th</sup> meeting held on 24<sup>th</sup> July 2009, has approved the Composite Power Evacuation System of Chhabra Super Critical TPS and Kalisindh TPS where 2x765 kV S/C lines with 400/765 kV pooling station at Dahra and 765/400 kV sub-station at Jaipur (South) have been envisaged. The 400 kV D/C lines on Quad Moose have also been proposed from Chhabra Super Critical TPS and Kalisindh TPS to 765/400 kV pooling station at Dahra.

2. Also, the Board of Directors of RVPN, in its 169<sup>th</sup> meeting held on 25<sup>th</sup> August 2009, has accorded administrative and financial approval for evacuation system of Suratgarh and Banswara Super Critical TPS. The transmission system envisaged from Suratgarh Super Critical TPS includes 400 kV GSS Jhunjhunu with 400 kV D/C line on Quad Moose from Suratgarh Super Critical TPS and extending the 400 kV D/C line on Twin Moose from proposed 400 kV GSS Jhunjhunu up to Jaipur (North).

3. S.E.(TCC-III), Ajmer was instructed to search for the suitable land (about 20 Hactare) for construction of 400 kV GSS around Jhunjhunu with adequate ROW for emanating/terminating 400 kV as well as 220 kV transmission lines. He replied that there is no such land around Jhunjhunu. In the meanwhile, representations from the President Block Congress Committee, Khetri (Distt. Jhunjhunu) and the Pradhan Panchayat Samiti, Khetri (Distt. Jhunjhunu) have been made to the Hon'able Energy Minister, Govt. Of Rajasthan requesting to construct a 132 kV GSS in the area of Gram Panchayat, Babai. It has also been indicated in the representations that a piece of Govt. Land, measuring about 82 Hectare, is available along the Khetri-Neemkathana road in Vill. Sardarpura, Gram Panchayat Babai, Tehsil Khetri, Distt. Jhunjhunu where two numbers of 220kV and one number 132 kV transmission line are just passing. It has further been stated that construction of 400kV GSS at this land, being at the border of Jhunjhunu and Sikar District, would benefit both the Districts. So, the site indicated in the representations was visited and, as stated, it has been found to be most suitable and economical (due almost negligible length of 220kV interconnections) for construction of 400kV GSS and also construction of 132kV GSS at the same land. It will also obviate the 220kV proposed upgradation of Neemkathana GSS as well as would also meet demand of Railways for creation of 220 kV GSS by them at Maonda/ Neemkathana for proposed freight corridor.

4. A suitable land, near Vill. Phagi (measuring about 478 Bigha), has been identified for construction of 765/400 kV GSS around Jaipur (under composite evacuation system of Chhabra Super Critical TPS and Kalisindh TPS). The technical suitability for termination of 765 kV and 400 kV inter connections from this land has been examined and it is found that it would be the most suitable location for termination of all the EHV lines and also there would no problem in transportation of heavy equipment/ consignments to the site. The field officers have already been advised to get this land allotted from the GOR at the earliest.

5. The existing site for 400 kV switching station at Dahra was examined for its suitability and adequacy in construction of 765/400kV pooling sub-station at Dahra. It was observed that the land is in-adequate for construction of 765/400kV pooling sub-station and is in low lying area comprised of undulations. Moreover,



# GENERATION SCHEDULE FOR THE CONDITION CORRESPONDING TO 2011-12

APPENDIX-4

LOAD FLOW ANALYSIS CONVERGED, ITERATIONS P : 8 Q : 7  
CASE NO : 1 CONTINGENCY : 0 SCHEDULE NO : 0  
CONTINGENCY NAME : Basecase RATING CONSIDERED : NOMINAL

Number	Name	Zone	Area	Owner	Actual-pu	Angle(deg)	Pgen(MW)	Qgen(MVAR)	Qmin(MVAR)	Qmax(MVAR)
52	STPS220G	5	4	1	1.0000	6.5102	450.000	-3.321	-120.000	250.000
53	STPS400G	5	4	1	1.0000	8.0638	900.000	-58.332	-240.000	500.000
60	KTPS#1	5	4	1	1.0000	11.6062	198.000	2.156	-50.000	100.000
61	KTPS#2	5	4	1	1.0000	12.0860	378.000	5.365	-30.000	80.000
62	KTPS#3	5	4	1	1.0000	12.0860	189.000	2.683	-15.000	40.000
70	ANTA#1	4	4	1	1.0000	11.1526	240.000	6.634	-30.000	60.000
71	ANTA#2	4	4	1	1.0000	10.0026	140.000	3.430	-20.000	40.000
80	RAPP#1	4	4	1	1.0000	12.5279	180.000	-0.235	-9.000	18.000
81	RAPP#2	4	4	1	1.0000	12.5813	400.000	13.806	-18.000	36.000
92	MAHI#1	5	4	1	1.0000	2.7450	48.000	9.527	-24.000	24.000
93	MAHI#2	5	4	1	1.0000	3.9824	88.000	9.326	-50.000	50.000
95	RMGHG	5	4	1	1.0002	7.8628	105.000	-15.000	-15.000	30.000
97	RPSG	5	4	1	1.0000	8.0946	84.000	12.294	-20.000	40.000
98	JSG	5	4	1	1.0000	9.0098	64.000	5.842	-30.000	60.000
44	NREB_HYD	4	3	1	1.0149	-2.3355	250.000	-100.000	-100.000	200.000
46	NREB_TH	4	3	1	1.0000	0.0000	641.224	-154.087	-150.000	300.000
63	KTPS#4	5	4	1	1.0213	11.4488	350.000	80.000	-40.000	80.000
39	GLTPS_G	3	4	1	1.0300	11.7961	242.000	15.523	-20.000	40.000
37	DGTPS_G	5	4	1	0.9909	3.5310	315.000	45.000	-30.000	45.000
75	BLTPS_G	3	4	1	1.0300	3.7731	226.000	36.162	-20.000	40.000
82	RAPPC_G	5	4	1	1.0300	9.9371	400.000	32.802	-20.000	40.000
85	CHABRA_G	5	4	1	1.0000	16.6454	900.000	67.486	-240.000	500.000
49	RJWESTG1	5	4	1	1.0300	11.9923	242.000	19.548	-20.000	40.000
45	RJWESTG2	5	4	1	1.0300	11.3673	726.000	66.451	-60.000	120.000
74	VSLP_G	6	4	1	1.0300	6.6161	121.000	12.748	-10.000	20.000
87	KALINS_G	5	4	1	1.0000	20.0811	1080.000	136.969	-300.000	600.000
36	AMSGR_33	6	4	1	1.0065	2.3284	0.000	0.000	0.000	0.000
35	TEMRA33	6	4	1	1.0069	2.3199	0.000	0.000	0.000	0.000
34	MADA_33	3	4	1	1.0191	4.5134	0.000	0.000	0.000	0.000
353	JAI SWF_2	3	2	1	1.0196	4.7761	250.000	0.000	0.000	0.000
316	KETUKA_2	3	2	1	1.0060	-2.8170	0.000	0.000	0.000	0.000
1318	PS_5	3	1	1	0.9852	-6.1175	0.000	0.000	0.000	0.000
1613	PS3_1	3	1	1	0.9956	-5.5033	0.000	0.000	0.000	0.000
1610	PS2_21	3	1	1	1.0051	-4.8770	0.000	0.000	0.000	0.000
1614	PS2_1	3	1	1	1.0044	-5.0926	0.000	0.000	0.000	0.000
1383	PSNo1	3	1	1	1.0034	-5.3023	0.000	0.000	0.000	0.000
1612	BHADLA_1	3	1	1	1.0087	-3.6977	0.000	0.000	0.000	0.000
1197	BAP_1	3	1	1	1.0016	-4.7520	0.000	0.000	0.000	0.000
236	KUSH_2WF	2	2	1	0.9838	-4.3464	0.000	0.000	0.000	0.000
237	NAWA_2WF	2	2	1	0.9838	-4.3464	0.000	0.000	0.000	0.000

Number of generators : 40

## Summary of results

TOTAL REAL POWER GENERATION : 9207.224 MW  
TOTAL REAL POWER INJECT, -ve L : 0.000 MW  
TOTAL REACT. POWER GENERATION : 252.778 MVAR  
GENERATION pf : 1.000

TOTAL SHUNT REACTOR INJECTION : -0.000 MW  
TOTAL SHUNT REACTOR INJECTION : -3824.930 MVAR

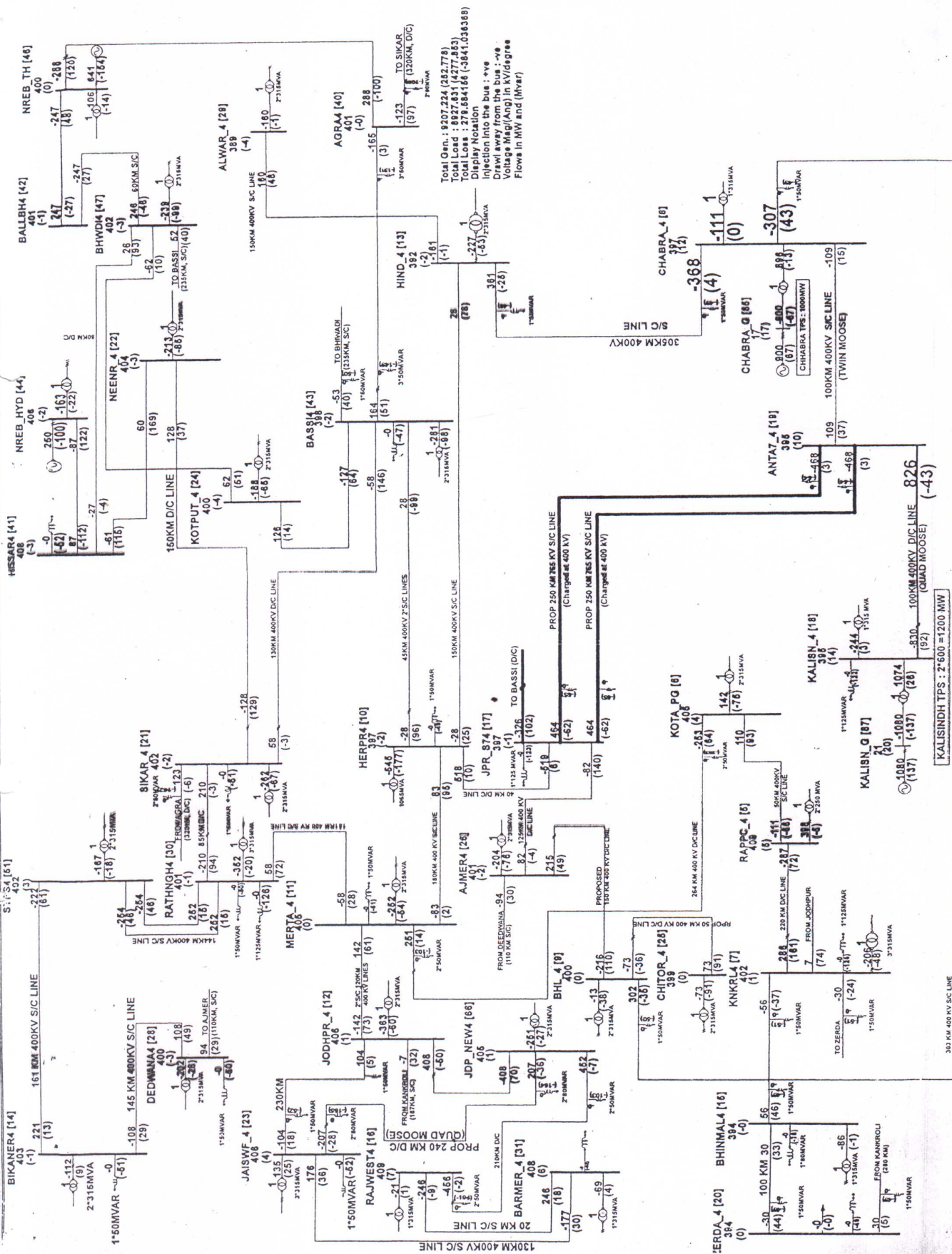
TOTAL SHUNT CAPACIT. INJECTION : 0.000 MW  
TOTAL SHUNT CAPACIT. INJECTION : 1754.525 MVAR

TOTAL SHUNT FACTS. INJECTION : 0.000 MVAR  
TOTAL SHUNT FACTS. DRAWAL : 0.000 MVAR

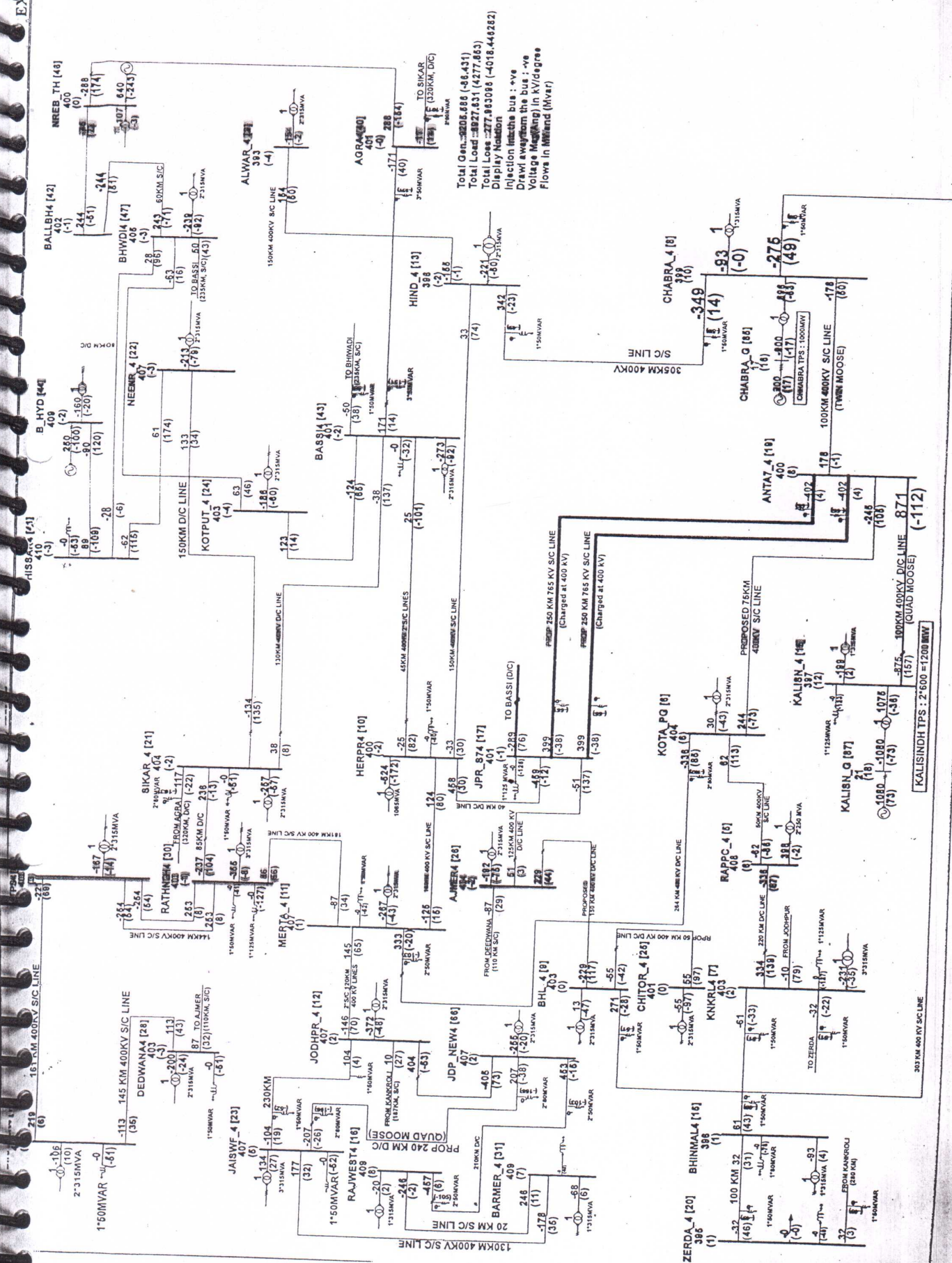
TOTAL REAL POWER LOAD : 8927.631 MW  
TOTAL REAL POWER DRAWAL -ve g : 0.000 MW  
TOTAL REACTIVE POWER LOAD : 4277.853 MVAR  
LOAD pf : 0.902  
TOTAL COMPENSATION AT LOADS : 0.000 MVAR  
TOTAL HVDC REACTIVE POWER : 0.000 MVAR

TOTAL REAL POWER LOSS (AC+DC) : 279.584156 MW (279.584156+ 0.000000)  
PERCENTAGE REAL LOSS (AC+DC) : 3.037  
TOTAL REACTIVE POWER LOSS : -3841.036368 MVAR

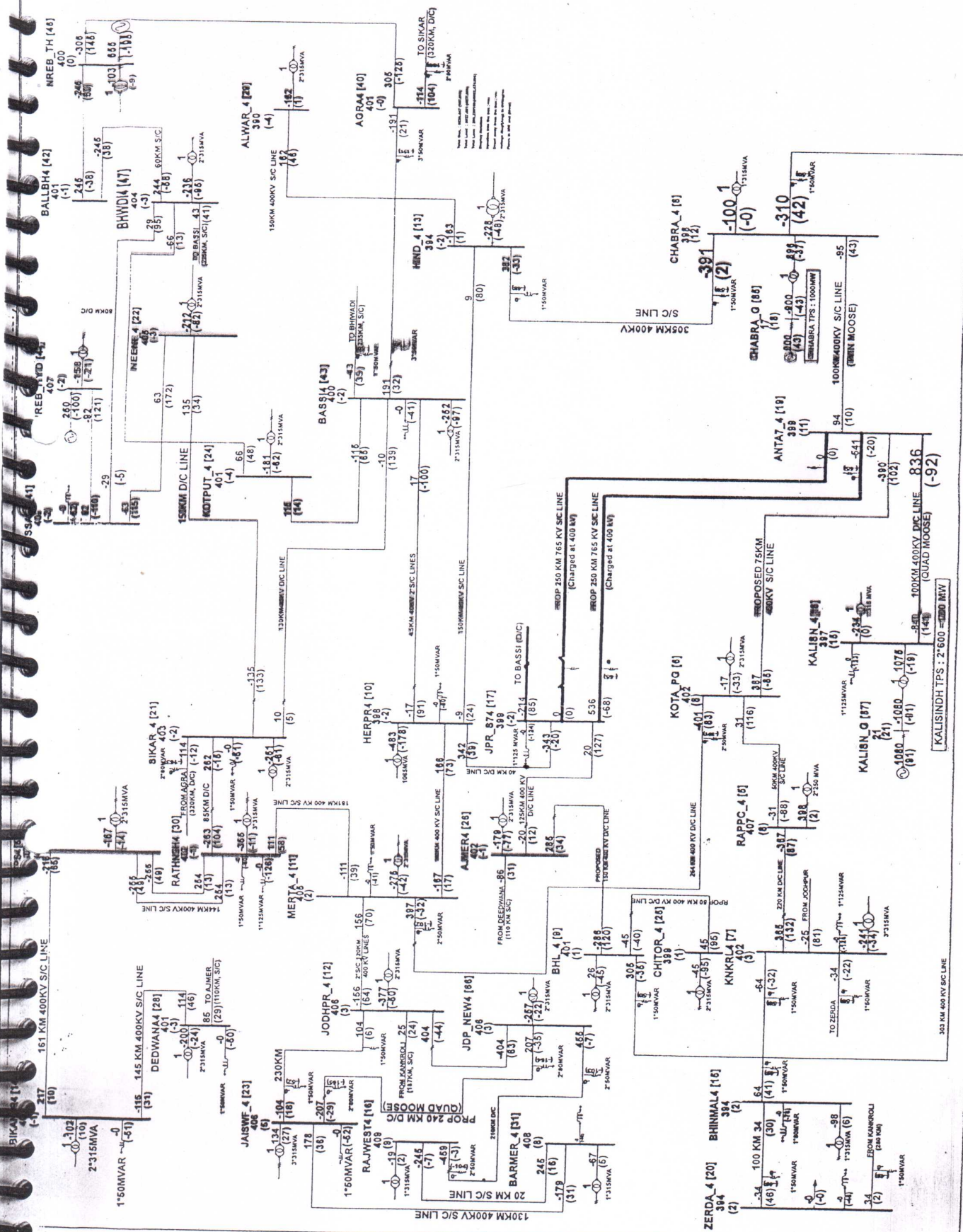
# E CASE; LOAD FLOW STUDY FOR THE CONDITION CORRESPONDING A



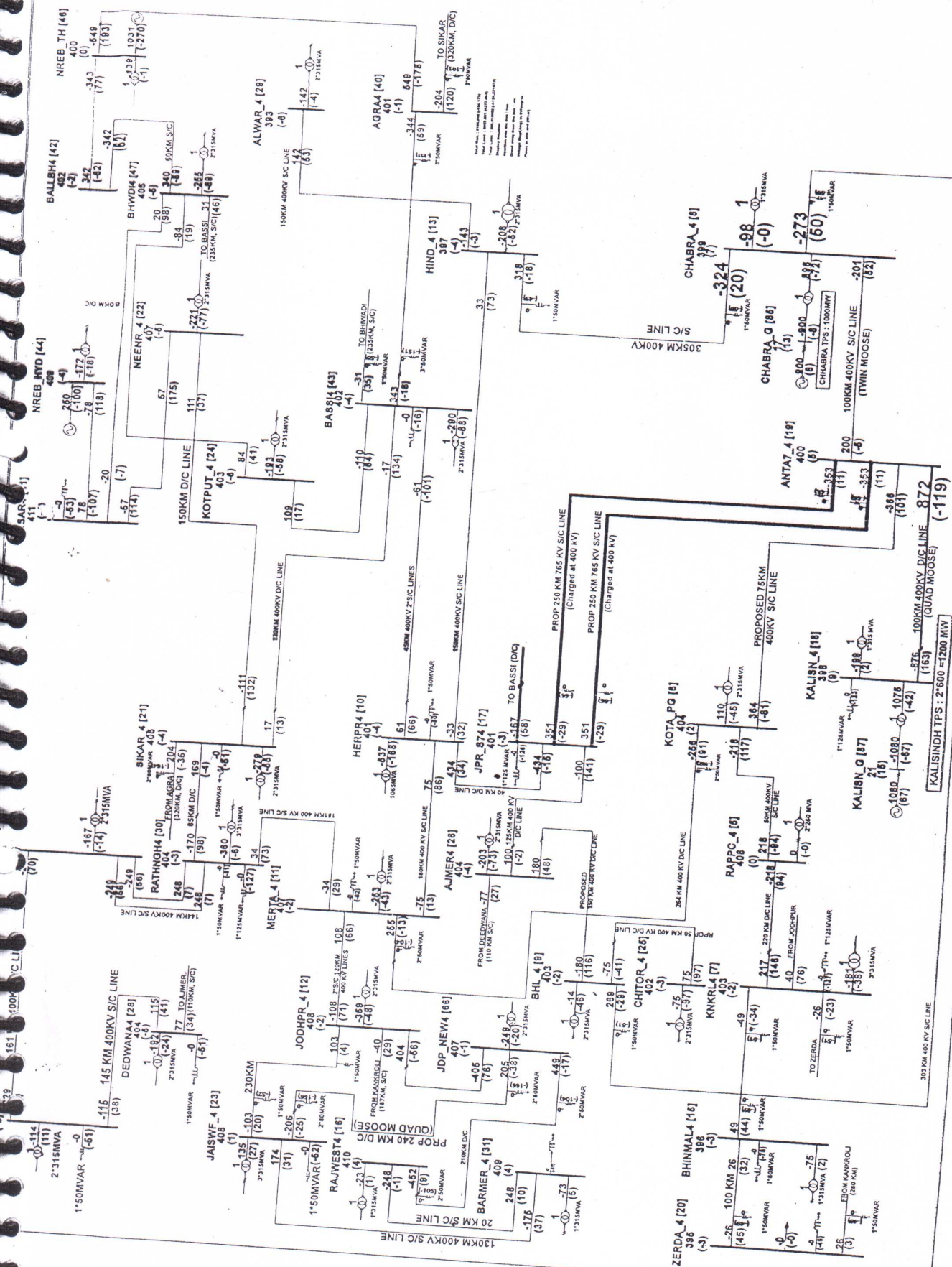












**COST ESTIMATE DETAILS OF INTERCONNECTION OF RVPN'S**  
**765/400kV ANTA GSS WITH PGCIL'S 400/220kV KOTA GSS**

**1.1 PRELIMINARY EXPENSES**

No provision is required under this head as the same is included in the per km transmission line cost.

**1.2 LAND**

No provision is required under this head since the crop compensation etc. are inclusive in the per km line cost.

**1.3. PLCC & TELEPHONES**

No provision is required under this head since PLCC system cost has been covered in the Sub-Station equipments in this project estimate report.

**1.4 OFFICE EQUIPMENTS**

No provision is required under this head.

**1.5 SOCIAL INFRASTRUCTURE & COMMUNITY SERVICES**

A total provision of **Rs. 8.00 lacs** has been made under the head "Social Infrastructure & Community Services" to meet out the expenses towards arrangements of temporary sheds, lat-bath, drinking water, any first aid medical facility etc. for labour/workers involved in construction of substation and line during construction stage as per following :

S. No.	Particulars	Amount (Rs. In lacs.)
1.	For 2 nos. 400kV lines associated with the substation (4 Nos. x 2.0 lacs)	8.0
	<b>Total</b>	<b>8.0</b>

**1.6 CIVIL WORKS**

No provision is required made under this head.



## 1.7 GRID SUB-STATION EQUIPMENTS

A provision of **Rs. 1650.19 lacs** has been made under this head to cover the cost of equipments required for 2 nos. 400kV extension bays at 765/400kV GSS Anta. The details of the equipments to be provided at 765/400kV Anta GSS is given at **Appendix-A1** and their cost estimates is given at **Appendix-A** :

S. No.	Name of Substation	Amount in lacs.
1.	2 nos. 400kV extension bays at 765/400kV GSS Anta	1650.19
Total		1650.19

## 1.8 TRANSMISSION LINE

A total provision of **Rs. 2510.00 lacs** has been made under this head to cover the cost of 400kV S/C and D/C Transmission lines of the scheme with ACSR Moose Conductor as per the following details :-

S. No.	Section of Line	Route length in km	Rate per km	Amount in lacs.
1	LILO of 2nd circuit of 400 kV D/C Chhabra TPS-Dahra section at 765/400 kV Anta GSS	1 D/C	80	80
2	400 kV S/C line from 765/400 kV Anta GSS to PGCIL's 400/220 kV Kota GSS #	45 S/C	54	2430
Total				2510

Note: # Since 130 kms 400 kV D/C line from Chhabra TPS to a location at Dahra has already been constructed hence extension of 2nd circuit of 400 kV D/C Chhabra TPS-Dahra section upto PGCIL's 400/220 kV Kota GSS by constructing a new 45 km 400 kV S/C line between Dahra & Kota(PG) would be required.

The above per km. estimates of 400kV D/C & 400kV S/C lines are as per **Appendix-B**.

## 1.9 VEHICLE

No provision is required made under this head.

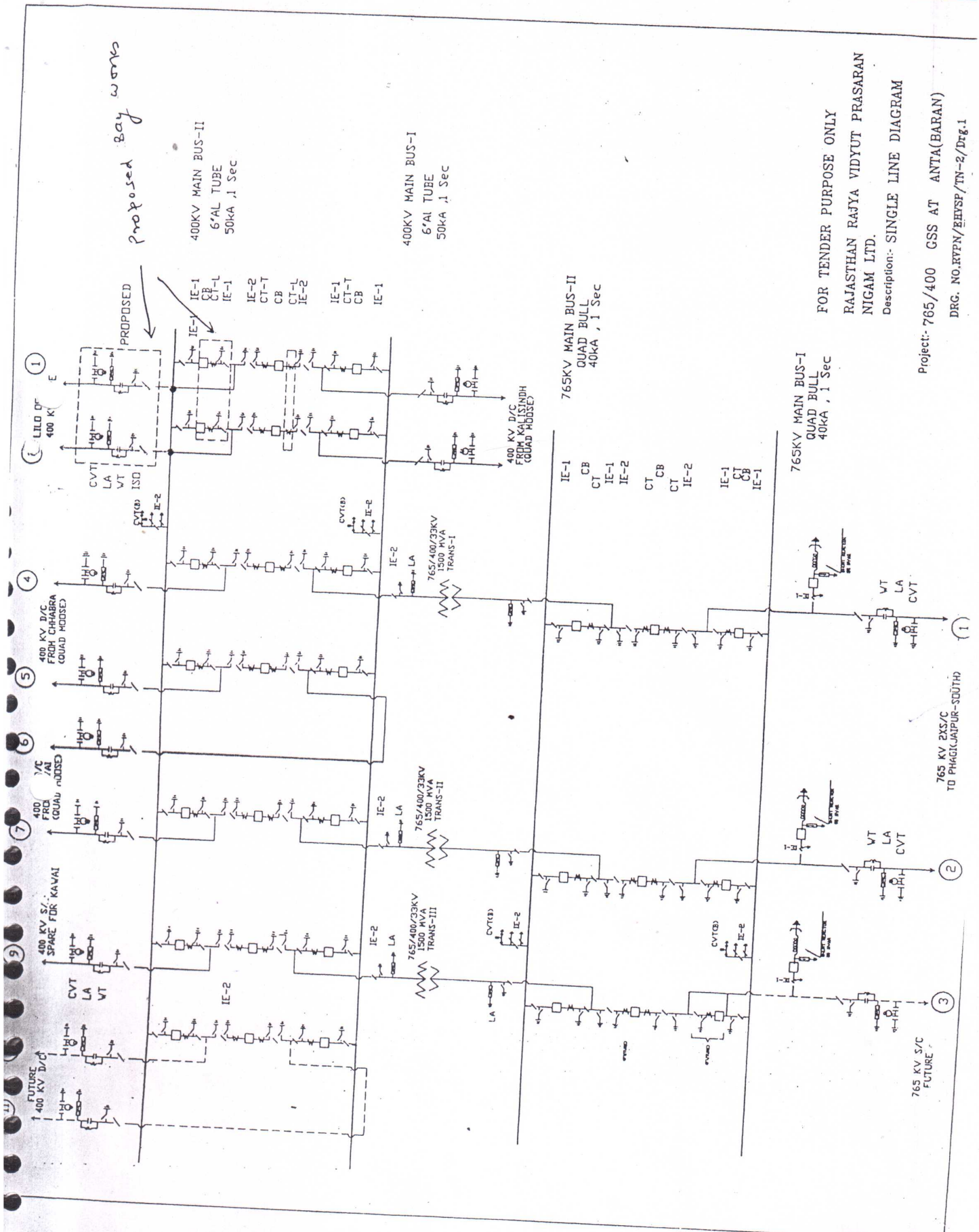
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**Estimate of Substation Equipments at 765/400kV GSS Anta**  
(Refer Single Line Diagram at Appendix-A1)

S.No.	Particulars	Qty.	Unit	(Rs. in lacs.)	
				Rate	Amount
1	420kV CVT's (1-phase)	6	Nos.	6.54	39.24
2	LA's for 400kV System (1phase)	6	Nos.	3.96	23.76
3	420kV Motor operated Isolators with single EB(3-phase)	4	Nos.	10.23	40.92
4	420kV Motor operated Isolators with double EB(3-phase)	0	Nos.	11.32	0
5	420kV, 3 pole Circuit Breaker (3-phase)	2	Nos.	54.05	108.1
6	420kV, 3 pole Circuit Breaker (3-phase) for controlling Shunt Reactor alongwith microprocessor based point of wave controller	0	Nos.	70.38	0
7	420 KV CT's (1-phase)	12	Nos.	9.54	114.48
8	420 KV Bus Post Insulators alongwith connectors	21	Nos.	0.47	9.87
9	420 KV Wave Traps (1-phase)	8	Nos.	6.14	49.12
10	400kV Bus-bar Protection scheme for the complete system (Augmentation)	1	L.S	15	15
11	400kV Contol and relay panel:				
	i) For transformer	0	Nos.	33.53	0
	ii) For Line feeder with Auto Reclose scheme	2	Nos.	32.83	65.66
	iii) For Breaker	2	Nos.	19.34	38.68
	iv) For Reactor	0	Nos.	22.29	0
12	Marshling Kiosks (MK) for 400kV system	2	Nos.	4.37	8.74
13	SCADA system : Automation/SCADA solution with associated accessories & equipments consisting of BCU's, Communication Interfaces, Networking elements, Computer Systems, SCADA software, Data acquisition elements, Sensors, Cubicles, GPS etc. [Augmentation]	1	LS	50	50
14	Power and control cable	1	L.S	150	150
15	Earthing equipments including Earth Mat, ground wire & connectors	1	L.S	75	75
16	Sub-Station Steel Structures	1	L.S	75	75
17	Bus bar material, clamps & Disc insulators including Aluminium tube, associated clamps, conductor for Bus-bars of 400kV system.	1	L.S	100	100
18	Fire fighting system	1	L.S	15	15
19	Air conditions & ventilation	1	L.S	10	10
20	Lighting system	1	L.S	10	10
21	PLCC System	1	LS	150	150
22	OLTE Communication System	1	LS	35	35
23	Cost of Civil Works @10% on "A"			Total "A"	1183.5700
					118.36
24	Overhead Charges on "B"			Total "B"	1301.93
i	Establishment including leave pension, CPF etc. @ 7.5%				97.64
ii	Audit and accounts charges @ 1%				13.02
iii	Losses on stock @ 0.25 %				3.25
iv	Spares @ 3%				39.06
v	Labour Charges @ 5%				65.10
vi	Transportation Charges @ 5%				65.10
vii	Contingencies @ 3%				39.06
viii	Tools & plants, vehicles special T&P etc.@ 1%				13.02
ix	Maintenance during construction @ 1%				13.02
				Total:	1650.19





FOR TENDER PURPOSE ONLY  
 RAJASTHAN RAJYA VIDYUT PRASARAN  
 NIGAM LTD.  
 Description:- SINGLE LINE DIAGRAM

Project:- 765/400 GSS AT ANTA(BARAN)  
 DRG. NO. RYTN/EEHVP/TN-2/Drg.1

## ESTIMATE OF 400kV TRANSMISSION LINES

S.No.	Item	Qty.	Rate in Rs. lacs.	Amount in Rs.lacs
<b>I</b>	<b>400 KV (D/C) TWIN MOOSE TRANSMISSION LINE</b>			
1	400 kV D/C (twin Configuration Per Phase) Tower Package including Insulators, Tower Structures, accessories and Earth Wire (OPGW), Hardware Fittings for Conductor and Earthwire, Earthing, Spacers, Vibration Dampers etc. including survey, civil works, erection, stringing. (Per Km)	1	47	47
2	400 kV D/C Conductor Package (ACSR Moose) for Twin Conductor Per Phase (Per Km)	1	33	33
	<b>TOTAL-I</b>			<b>80</b>
<b>II</b>	<b>400 KV (S/C) TWIN MOOSE TRANSMISSION LINE</b>			
1	400 kV S/C (twin Configuration Per Phase) Tower Package including Tower Structures, accessories and Earth Wire (OPGW), Hardware Fittings for Conductor and Earthwire, Earthing, Spacers, Vibration Dampers etc. including survey, civil works, erection, stringing. (Per Km)	1	36	36
2	400 kV S/C Conductor Package (ACSR Moose) for Twin Conductor Per Phase (Per Km)	1	15	15
3	400 kV S/C Insulator Package (160 kN & 120 kN Disc Insulators) for Twin Conductor Per Phase (Per Km)	1	3	3
	<b>TOTAL-II</b>			<b>54</b>