भारत सरकार/Government of India
केन्द्रीय विधुत प्राधिकरनण/Central Electricity Authority
प्रणली आयोजना एवं □रीयोजना मूल्यांकनण प्रभाग/SP&PA Division
आर के □रम/R.K. Puram
नई दिल्ली/New Delhi -110606

No. 1/9/08-SP&PA/ Date: 26-MAY-2009

-As per List enclosed-

विष्य/Subject: **27th meeting of the Standing Committee on Power System Planning of Northern Region**

महोदय/Sir,

The Agenda Note including additional items for 27th Standing Committee Meeting on Power System Planning of Northern Region, scheduled to be held on 30.5.2009 at Nainital, have already been uploaded on CEA website.

Following additional agenda items have been received from RRVNL and HPPTCL:

RRVPNL

RRVPNL vide letter dated 6.2.2009 had submitted its proposal to lay 765 kV transmission system in Rajasthan to evacuate power from proposed Super Critical Thermal Power Stations at Chhabra (2x660 MW), Banswara (2x660 MW) and Suratgarh (2x660 MW). The proposal included load flow studies corresponding to 2013-14 conditions. Subsequently, RRVPNL revised proposed generation capacity and time frame and submitted vide letter dated 20.5.2009. As per revised proposal, load flow conditions corresponding to 2016-17 has been considered for evacuation system of proposed Super Critical Thermal Power Stations at Chhabra (2x660 MW), Kewai (2x330 MW), Banswara (3x660 MW) and Suratgarh (3x660 MW). The revised proposal is enclosed as Annexure-III for information of members of the Committee.

HPPTCL

HPPTCL vide fax letter dated 22.5.2009 has requested for following 220 kV bays for their utilization:

(i) 2 nos. of bays at Banala i.e. 400 kV Parbati Pooling Station for termination of 220 kV D/C Allain Duhangan – Nalagarh line at Banala

(ii) 2 nos. of bays for termination of proposed 220 kV D/C line from 220/132 kV Bajora S/S at Banala

HPPTCL has also informed that above 4 nos. of 220 kV bays are in addition to 4 nos. of 220 kV bays required for termination of 2x220 kV (Quad) D/C line from Chenab Basin, as per CEA's Master Plan.

Clarifications

Regarding agenda-4 entitled " Evacuation of Power from Kutehr HEP (260 MW) in the upstream of Chamera III HEP", it is to inform that Member (PS), CEA had taken a meeting on 18.5.2009 to review the evacuation system for Budhil HEP (70 MW) in Himachal Pradesh because HPPTCL could not build designated pooling station in time. Keeping urgency of Budhil HEP (likely by March 2010), following decisions were taken:

(i) Lanco GPPL may preferably LILO circuit of 220 kV D/C Chamera II – Chamera III line being constructed by PGCIL at their generating station as only one bay at Chamera III was available. With this, the final configuration for Budhil HEP would be 220 kV S/C Budhil-Chamera III & 220 kV S/C Budhil-Chamera II. This arrangement would provide reliability. The other option is to construct 220 kV S/C (zebra conductor) from Budhil HEP to Chamera III but this alternative suffers from loss of reliability in case of outage of the line and may result into bottling of generation at Budhil HEP. It was for Lanco GPPL to decide which alternative to adopt after weighing the risks. In either option, Budhil HEP would be connected to Chamera III by dedicated 220 kV link. However, constructing S/C line would be suboptimal from ROW consideration.

(ii) It was decided that Pooling station at Lahal may be constructed as 400/220 GIS substation by HPPTCL. Lahal pooling station would be built by HPPTCL in phased manner in the time frame of remaining future hydro projects at Ravi Basin, namely Bharmour (45 MW), Kugti (45 MW), Hadsar (60 MW), Kutehar (260 MW), Bajoli Holi (200 MW) and Bara Bangal (200 MW). 220 kV portion of the substation would be commissioned first and then 400 kV Lahal-Chamera II Pooling point D/C charged at 220 kV. This would reduce ROW requirement as desired by the Forest Department. The line could be charged to 400 kV with development of upstream hydro projects.

(iii) As Budhil HEP would be connected to Chamera III switchyard, HPPTCL should construct Lahal pooling station in the time frame of Kutehar HEP, being developed by JSW Energy which is likely to be commissioned next. Member (PS) cautioned that if HPPTCL failed to do so then they will again face same problem and this would hamper development of hydro potential in the State.

(iv) Shri Bheshtoo informed that few 33 kV and 11 kV lines have been planned for evacuation of power from few small hydro projects in Ravi Basin. The magnitude of total generation was around 50 MW. Member (PS) stated that matter can not be discussed without full details and he advised that small hydro power should be brought to the nearest pooling station. It would not be optimal to develop a new 220 kV pooling station for such small generation.

(v) CEA observed that in case of connectivity at Chamera III, Lanco GPPL have to only pay the regional transmission charges and losses and therefore pancaking of transmission charges/losses would be avoided.

A copy of the minutes of the meeting is enclosed as Annexure-IV for reference.

Naresh Bhandari
Director

ANNEXURE III

Rajasthan Rajya Vidyut Prasaran Nigam Ltd.
Regd.Office:Vidyut Bhawan, Jyoti Nagar, Janpath, Jaipur
Phone Number:2740373
Fax No.:0141-2740794
E-MAIL: ppmrvpn@sancharnet.in

No.RVPN/SE(P&P)/PSS/D. 180 Jaipur,Dt: 20/5/09

Shri V. Ramakrishna
Member Secretary (PS)
Central Electricity Authority,
Sewa Bhawan,
R.K. Puram,
New Delhi - 110066.

Sub: Agenda Item of RVPNL to be included in 27th meeting of the Standing Committee on Transmission System Planning of NR

Dear Sir,

As per discussion of RVPNL Engineers with CEA officers on dated 15-5-09 at Sewa Bhawan, New Delhi, the revised Load Flow Studies have been conducted for the condition corresponding to 2016-17 for Evacuation System of the newly proposed Super Critical Thermal Power Stations at Chhabra (2*660 MW), Kewai (2*330 MW), Banwara (3*660 MW) and Suratgarh (3*660 MW).

Detailed proposal along with load flow study results is enclosed for inclusion in the 27th meeting of the Standing Committee on Transmission System Planning of NR for discussion.

With regards.

Your's faithfully,

20.5.09

(B.N. Saini)
CHIEF ENGINEER (PPM&R)

O/C AII

Encl:

1. **Appendix-1:Justification Note**
2. **Appendix-2: Cost Estimate**
3. **Appendix-3:Load Generation Balance Report**

21.5.09

Proposed Evacuation System of Chhabra Super Critical TPS (2*660 MW) & Kawai TPS (2*330MW)

Background

In Baran district of Rajasthan at Chhabra TPS, there are 2 units of 250 MW (under Stage I- Phase I) at commissioning stage and additional 2 units of 250 MW (under Stage I- Phase II) are under construction. RVUN has further stipulated 2x660MW at Chhabra TPS under Stage II and 4x330 MW Power Plant at Kawai TPS (a Generating Plant which would be very close to Chhabra TPS) under IPP sector is also in advance stage of finalization.

Existing/Approved Transmission System at Chhabra TPS

The approved 2xD/C 400 kV line from Chhabra TPS to 400/220 kV GSS at Dahra, Bhilwara and Hindaun are sufficient for evacuation of 4x250 MW power even under various contingencies. Further, for evacuation of power of approx. 1980 MW i.e. Chhabra TPS (2x660 MW) + Kawai TPS (2x330 MW- allocation to Rajasthan) would require new Transmission system.

Planning Criteria

- For evacuation of power of approx. 1980 MW from Chhabra TPS (2x660 MW) and Kawai TPS (2x330 MW- allocation to Rajasthan) at least 3 Nos. of 400 kV D/C lines on Twin Moose would be required. Laying of 3xD/C 400 kV lines on Twin Moose would pose serious Right Of Way problem, therefore, in order to reduce the environmental impact and land use, we have designed the Evacuation System with minimum number of transmission lines i.e. 2xS/C 765 kV.

- The tentative Cost Estimates of the Evacuation System at 765 kV voltage level on Quad Bersimis and 400 kV voltage level on Quad Moose indicate that the cost estimates are comparable, hence 765 kV option has been recommended for evacuation of generation from both Chhabra TPS (2x660 MW) and Kawai TPS (2x330 MW). Tentative Cost Estimates for Evacuation System at 765 kV voltage level and Evacuation System at 400 kV voltage level are placed at **Annexure I(A) and I(B)** respectively.

- Further, under future generation expansion at Chhabra TPS or/and Kawai TPS 2xS/C 765 kV lines would continue to suffice, hence the proposal of 765 kV would become more economical as compared to 400 kV proposal.

- The step up generation at Chhabra TPS and Kawai TPS would be 400 kV voltage level. Both the generators would be connected through 400 kV D/C lines to the proposed 400/765 kV Pooling Station at Chhabra (a location in between Chhabra TPS and Kawai TPS).

- The length of the interconnecting transmission lines involved would be of the order of 350 kms from the generating stations at Chhabra and Kawai in Baran district to major load centers at Jaipur. Therefore, in the Evacuation System on 765 kV voltage level, 400 kV transmission lines from the 765/400 kV GSS at Jaipur(South-PG) would involve laying down of shorter 400 kV transmission lines vis-à-vis in the Evacuation System on 400 kV voltage level. This proposal would reduce the transmission losses in the system.

- 765 kV 2xS/C transmission lines have been proposed to provide sufficient redundancy and reliability under N-1 contingencies of transmission lines.

- As the development of generation projects would take place in phased manner, it is expected that during initial years of operation, 765 kV transmission line may be lightly loaded. Thus in order to obviate the onerous task of reactive power management, 765 kV transmission line would be charged on 400 kV voltage level till the generators would generate 750 – 1000 MW.

- 765 kV transmission line would be generating large capacitive charging MVAR and, therefore, to limit over voltages under lightly loaded condition and also to limit switching over voltages, 3x80/110 MVAR, 765 kV line/bus type shunt reactors have been proposed.

- Keeping the above facts in mind, it is felt that there is a need to increase the AC transmission voltage beyond 400 kV and explore the possibility of establishing 765 kV network in Rajasthan. Now a days evacuation and transfer of bulk power over 765 kV transmission line is considered to be better option by PowerGrid in India and other countries.

Proposed Evacuation for Chhabra TPS(2x660 MW) & Kawai TPS(3x 330 MW)

SNo.	Transmission System	Line Length/ No.	Transf. Capacity
A	**Chhabra TPS (2*660 MW)**		
1	400 kV 2xD/C (Quad Moose) Chhabra TPS - Chhabra Pooling Station line	10 kms, 2xD/C	
2	LILO of one ckt of 400 kV D/C+S/C Chhabra TPS - Dahra line at Chhabra Pooling Station	10 kms, D/C	
3	LILO of one ckt of 400 kV D/C Kalisindh TPS - Dahra line at Chhabra Pooling Station	50 kms, D/C	
4	1*1500 MVA,765/400 kV GSS at Chhabra Pooling Station (RVPN)	1 No.	1500 MVA
5	765 kV 2xS/C Chhabra TPS - Jaipur(South) line	330 kms 2xS/C	
6	1*1500 MVA,765/400 kV GSS at Jaipur(South)	1 No.	1500 MVA
7	3*80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Chhabra PP - Jaipur(South) lines	4 Sets	
8	3*110 MVAR (Single Phase), 765 kV Bus Reactors at Jaipur(South)	1 Sets	
9	10 kM LILO of 400 kV S/C Hindaun-Heerapura line at Jaipur(South)	10 kms, D/C	
10	10 kM LILO of one circuit of 400 kV D/C Chhabra TPS-Heerapura line at Jaipur(South)	10 kms, D/C	
11	10 kM LILO of one circuit of 400 kV D/C Ajmer-Heerapura line at Jaipur(South)	10 kms, D/C	
12	220 kV D/C interconnections at Jaipur (South)	50 kms, D/C	
	TOTAL(A)		
B	**Kawai TPS (2*330 MW)**		
1	400 kV D/C (Quad Moose) Kawai TPS - Chhabra Pooling Station line	20 kms, D/C	

Evacuation System of Suratgarh Super Critical Thermal Power Station (3*660 MW)

Introduction

The State Govt. has accorded 'in principle' approval for 2*660 MW at Suratgarh TPS under Extension Stage V (Unit 7 & 8) in Sriganganagar district to be set up by Rajasthan Rajya Vidyut Utpadan Nigam Ltd. (RVUNL). Furthermore, an additional 1*660 MW is also anticipated by RVUNL. Therefore, RVPNL have to design the Evacuation System for 3 * 660 MW at Suratgarh TPS.

Existing Transmission System at STPS

At Suratgarh TPS, there are 5 units of 250 MW under Stage I- III and one unit of 250 MW under Stage IV has been synchronized on 31st March '2009. The existing Evacuation System at STPS is as under:

SNo	Generator	Transmission System
A	STPS Stage I-III (5*250 MW)	2*S/C 400 kV STPS – Ratangarh line
		3*315 MVA, 400/220 kV GSS at Ratangarh
		2*S/C 220 kV STPS – Suratgarh line
		1*D/C 220 kV STPS – Ratangarh line
		1* S/C 220 kV STPS – Bikaner line
B	STPS Stage IV (1*250 MW)	1*S/C 400 kV STPS – Bikaner line (to be initially charged on 220 kV)..... works under progress
		1* S/C 220 kV STPS – Bhadra line

Now RVUN has further stipulated 3x660 MW at Suratgarh Super Critical TPS and the quantum of power to be evacuated would be 1980 MW. Since the existing 3 Nos. of 400 kV lines and 6 Nos. of 220 kV do not have sufficient spare capacity to evacuate additional 1980 MW, hence new lines would have to be laid.

Criteria for selecting the voltage level for new evacuation system

The tentative Cost Estimates for the evacuation on 765 kV voltage level (**Annexure II(A))** and the evacuation on 400 kV voltage level (**Annexure II(B))** indicate that the evacuation proposal on 765 kV voltage level would be more economical as compared to 400 kV voltage level on Quad Moose.

Assumptions for designing the evacuation system

1. The step-up generator voltage at Suratgarh TPS would be 765 kV.
2. 1x1500 MVA, 400/765 kV ICT has been proposed at Suratgarh TPS.
3. For ensuring the stability of the proposed Power Evacuation System under N-1 outage of transmission line, 2 Nos. S/C of 765 kV lines have been proposed.
4. 2xS/C 765 kV Suratgarh TPS – Neemrana lines with 1x1500 MVA, 765/400 GSS at Neemrana have been proposed, which would benefit the growing load centers at NCR (Alwar district).

Proposed Evacuation System for Suratgarh TPS (3x660 MW)

SNo.	Transmission System	Line Length/No	Transf. Capacity
1	1*1500 MVA,765/400 kV ICT at Suratgarh TPS	1 No.	1500 MVA
2	765 kV 2xS/C Suratgarh TPS - Neemrana line	350 kms 2xS/C	
3	1*1500 MVA,765/400 kV GSS at Neemrana	1 No.	1500 MVA
4	3*80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Suratgarh TPS-Neemrana lines	4 Sets	
5	3x110 MVAR (Single Phase), 765 kV Bus Reactors at Neemrana	1 Sets	
6	400 kV D/C (Twin Moose) Neemrana– Jhunjhunu line	120 kms, D/C	
7	2x315 MVA, 400/220 kV GSS at Jhunjhunu	1 No.	630 MVA
8	220 kV interconnections at 400/220 kV GSS at Jhunjhunu	60 kms, D/C	

Evacuation System of Banswara Super Critical Thermal Power Station (3*660 MW)

Background

The State Govt. has announced the implementation of 2*660 MW at Banswara TPS in Banswara district in the XII Plan period. This Generating Project would be set up under "Case-2" Projects.

Planning Criteria

- The proposed Evacuation System for Banswara TPS would have to pass through reserved forest and Wildlife sanctuary, which may call for laying of high capacity transmission corridor.

- It is anticipated that there could be addition of 1 to 2 units of 660 MW at Banswara TPS, therefore the proposed Evacuation System have been designed for 3x660 MW.

- The tentative Cost Estimates for the evacuation on 765 kV voltage level is at **Annexure III**

Proposed Evacuation System

SNo	Transmission System	Line Length/No	Transf. Capacity
1	765 kV 2xS/C Banswara TPS - Bhilwara(New) line	240 kms 2xS/C	
2	765 kV S/C Bhilwara(New) - Jaipur (South) line	250 kms	
3	1*1500 MVA, 765/400 kV GSS at Bhilwara(New)		1500 MVA
4	765 kV S/C Jaipur (South) - Neemrana line	160 kms	
5	3x80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Banswara TPS - Bhilwara(New) ,Bhilwara(New) - Jaipur (South) & Jaipur(South) - Neemrana lines	8 SETS	
6	3x110 MVAR (Single Phase), 765 kV Bus Reactors at Bhilwara(New)	1 SETS	
7	**400 kV inter-connections at 765/400 kV Bhilwara (New)**		
(i)	400 kV D/C Bhilwara(New) - Ajmer line with one circuit LILO at existing 400 kV GSS Bhilwara	150 kms, D/C	
(ii)	10 kM LILO of 400 kV S/C Bhilwara - Dahra line at Bhilwara (new)	10 kms, D/C	
(iii)	400 kV D/C Bhilwara(New) - Udaipur line	160 kms, D/C	
(iv)	2*315 MVA, 400/220 kV ICTs at Bhilwara(New) & associated bay works		630 MVA
(v)	220 kV interconnections at Bhilwara(New)	60 kms, D/C	
(vi)	2*315 MVA, 400/220 kV GSS at Udaipur		630 MVA
(vii)	220 kV interconnections at Udaipur	60 kms, D/C	

Load Flow Studies

It is anticipated that there would be increase in peak demand due to the impact of supply to Agriculture consumers from 3 blocks to 2 blocks. Also, higher growth rate has been anticipated in Industrial Sector due to development of Special Economic Zone in important cities of Rajasthan as well as fast urbanization. In view of these assumptions, it has been anticipated that Total System Peak Load of Rajasthan would be 16050MW in 2016-17 condition.

The load flow studies have been conducted for the following scenario:

System Condition	Exhibit No.	Table No.
The system condition corresponding to 2016-17 for the revised Total System Peak Load of 16050 MW: • Commissioning of 2x660 MW Units at Chhabra TPS, 2x330 MW at Kawai TPS, 3x660 MW each at Suratgarh TPS and Banswara TPS • Charging of 2x765 kV lines on 765 kV voltage level	1	1
The system condition corresponding to 2016-17 under Low Load of 12000 MW:	2	2

Observations:

1. The proposal of 400/765 kV pooling station at Chhabra would enable to optimize the number to EHV lines which should emanate for evacuation of power from Chhabra TPS and Kawai TPS.
2. 2 Nos of 765 kV lines from each of the Super Critical Generating Station would help to provide the system stability under N-1 contingency.
3. Sufficient shunt line/bus type reactors have been proposed in order to limit the over voltage problems under low load conditions.

Conclusion:

Proposed Evacuation System for Chhabra/Kawai TPS

1. Step up generation at Chhabra TPS (2x660 MW) and Kawai TPS (3x330 MW) at 400 kV voltage level
2. 400 kV interconnections between Chhabra TPS/ Kawai TPS and Chhabra Pooling Station (RVPN)
3. 1*1500 MVA, 400/765 kV GSS at Chhabra Pooling Station (RVPN)
4. 765 kV 2xS/C Chhabra TPS - Jaipur(South) line (330 kms)

5. 1*1500 MVA, 765/400 kV GSS at Jaipur(South)
6. 3*80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Chhabra PP - Jaipur(South) lines
7. 3*110 MVAR (Single Phase), 765 kV Bus Reactors at Jaipur(South)

Since 2x S/C 765 kV lines are proposed towards Jaipur(South), thus it is very essential that the commissioning of 765/400 kV GSS at Jaipur (South) is firmed in the same time frame in which the Units at Chhabra/Kawai TPS would commission. Secondly, due to the availability of sufficient number of the existing/approved 400 kV lines of RVPN in the southern part of Jaipur, hence dispersal of 1980 MW at Jaipur could be facilitated without any constraint. Therefore, it is proposed that 765/400 kV GSS at Jaipur (South) be constructed by RVPN vis-à-vis PGCIL**.**

Proposed Evacuation System for Suratgarh TPS

1. The step-up generator voltage at Suratgarh TPS would be 765 kV.
2. 1x1500 MVA, 400/765 kV ICT has been proposed at Suratgarh TPS.
3. 765 kV 2xS/C Suratgarh TPS - Neemrana line (350 kms)
4. 3*80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Suratgarh TPS - Neemrana lines
5. 3*110 MVAR (Single Phase), 765 kV Bus Reactors at Neemrana

Since PGCIL has already initiated the identification of suitable land at Neemrana for construction of 400/220 kV GSS and with the availability of sufficient number of proposed 400 kV regional lines at Neemrana, It is proposed that 765/400 kV GSS at Neemrana be constructed by PGCIL and accordingly PGCIL may consider up-gradation of their 400/220 kV GSS at Neemrana to 765 kV voltage level.

Proposed Evacuation System for Banswara TPS

1. 765 kV 2xS/C Banswara TPS - Bhilwara(New) line (240 kms)
2. 765 kV S/C Bhilwara(New) - Jaipur (South) line (250 kms)
3. 1*1500 MVA, 765/400 kV GSS at Bhilwara(New)
4. 765 kV S/C Jaipur (South) - Neemrana line (160 kms)
5. 3x80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Banswara TPS - Bhilwara(New), Bhilwara(New) - Jaipur (South) & Jaipur(South) - Neemrana lines
6. 3x110 MVAR (Single Phase), 765 kV Bus Reactors at Bhilwara(New)

EXPORT/IMPORT FROM CENTRAL SECTOR PROJECTS AND SHARED PROJECTS CORRESPONDING TO 2016-17 UNDER LOW HYDRO (30% IC) SCENARIO			
	NAME OF STATION	**INSTALLED CAPACITY**	**Allocation to Rajasthan**
A	**SHARED PROJECTS**		
1	**SHARED PROJECTS OUTSIDE RAJASTHAN(Excl. GS HEP & Satpura Thermal)**		200.58
2	**SHARED PROJECTS INSIDE RAJASTHAN (30% IC)**	81.30	40.65
	TOTAL(A) (30% IC)		241.23
	IMPORT ON NREB_HYDRO BUS		159.93
B	**CENTRAL SECTOR PROJECTS**		
1	**PROJECTS OUTSIDE RAJASTHAN**		
	NTPC, NLC		1539.12
	NPC		144.00
	NHPC & OTHERS (30% IC)		361.48
	TOTAL (B1)		2044.60
2	**PROJECTS INSIDE RAJASTHAN**		
	Anta Gas	419.33	83.07
	Barsingsar (NLC)	250.00	250.00
	RAPP-UNIT 2 to4	640.00	325.00
	RAPP-UNIT 5 & 6	440.00	88.00
	RAPP-UNIT 7 & 8	1400.00	280.00
	TOTAL (B2)	3149.33	1026.07
	TOTAL(B)		3070.67
C	**ULTRA MEGA POWER PROJECTS**		800.00
	IMPORT ON NREB_THERMAL BUS		721.34
	TOTAL (SHARED/ALLOCATION)		4111.90
	TOTAL GENERATION INSIDE RAJASTHAN	3230.63	
	NET POWER IMPORT ON TIE LINES		881.27
	PEAKING CAPABILITY AT 70%		616.89

EXPORT/IMPORT FROM CENTRAL SECTOR PROJECTS AND SHARED PROJECTS CORRESPONDING TO 2016-17 UNDER LOW THERMAL (70% IC) SCENARIO			
	NAME OF STATION	**INSTALLED CAPACITY**	**Allocation to Rajasthan**
A	**SHARED PROJECTS**		
1	**SHARED PROJECTS OUTSIDE RAJASTHAN(Excl. GS HEP & Satpura Thermal)**		668.61
2	**SHARED PROJECTS INSIDE RAJASTHAN**	271.00	135.50
	TOTAL(A)		804.11
	IMPORT ON NREB_HYDRO BUS		533.11
B	**CENTRAL SECTOR PROJECTS**		
1	**PROJECTS OUTSIDE RAJASTHAN**		
	NTPC, NLC (70% IC)		-233.15
	NPC (70% IC)		-289.10
	NHPC & OTHERS		1204.92
	TOTAL (B1)		682.67
2	**PROJECTS INSIDE RAJASTHAN**		
	Anta Gas	419.33	83.07
	Barsingsar (NLC)	250.00	250.00
	RAPP-UNIT 2 to4	640.00	325.00
	RAPP-UNIT 5 & 6	440.00	88.00
	RAPP-UNIT 7 & 8	1400.00	280.00
	TOTAL (B2) (70% IC)	2204.53	718.25
	TOTAL(B)		1400.92
C	**ULTRA MEGA POWER PROJECTS**		800.00
	TOTAL (SHARED/ALLOCATION)		3005.03
	IMPORT ON NREB_THERMAL BUS		-3.61
	TOTAL GENERATION INSIDE RAJASTHAN	2475.53	
	NET POWER IMPORT ON TIE LINES		529.50
	PEAKING CAPABILITY AT 70%		370.65

TABLE-1 : Power flow for the system condition corresponding to 2016-17 for 16050 MW system load		
SNo.	**Transmission System**	**POWER FLOW(MW)**
		Exhibit -2
A	**765 kV Transmission Lines**	
	2* S/C Chhabra (PP) - Jaipur(South) line	1348 MW
	2* S/C STPS - Neemrana line	1240 MW
	2* S/C Banswara TPS - Bhilwara(New) lines	1970 MW
	1* S/C Bhilwara (New)- Jaipur (South) line	713 MW
	1* S/C Jaipur(South) - Neemrana line	424 MW
B	**765/400 kV ICT**	
	1*1500 MVA, 765/400 kV Bhilwara (New)	1247 MW
	2*1500 MVA, 765/400 kV Jaipur (South)	1629 MW
	2*1500 MVA, 765/400 kV Neemrana	1659 MW
	2*1500 MVA, 400/765 kV Chhabra (PP)	1351 MW
	*1500 MVA, 765/400 kV Suratgarh TPS	729 MW
C	**400 kV Transmission Lines**	
I	**At 765/400 kV Jaipur(South)**	
	3*S/C Jaipur (South) - Heerapura line	1224 MW
	1*S/C Jaipur (South) - Ajmer line	-19 MW
	1*S/C Jaipur (South) - Dahra line	-338 MW
	1*S/C Jaipur (South) - Hindaun line	133 MW
II	**At 400/220 kV Jaipur(North)**	
	1*S/C Jaipur (North) - Heerapura line	-428 MW
	1*S/C Jaipur (North) - Merta line	99 MW
	2*S/C Jaipur (North) - Bassi(PG) line	336 MW
	1*S/C Jaipur (North) - Sikar(PG) line	24 MW
	1*S/C Jaipur (North) - Kotputli(PG) line	168 MW
III	**At 765/400 kV Neemrana**	
	D/C Neemrana(PG) - Alwar line	331 MW
	D/C Alwar - Hindaun line	-101 MW
	D/C Neemrana(PG) - Sikar(PG) line	115 MW
	D/C Neemrana(PG) - Hissar(PG-NR) line	-17 MW
	D/C Neemrana(PG) - Jhunjhunu line	632 MW
	D/C Neemrana(PG) - Manesar(PG-NR) line	0 MW
IV	**At 765/400 kV Bhilwara (New)**	
	D/C Bhilwara - Ajmer line	231 MW
	S/C Bhilwara - Dahra line	-341 MW
	D/C Bhilwara - Udaipur line	466 MW
V	**At STPS**	
	2*S/C STPS - Ratangarh line	740 MW
	S/C STPS - Bikaner line	443 MW

TABLE-2 : Power flow for the system condition corresponding to 2016-17 for 12000 MW system load		
SNo.	**Transmission System**	**POWER FLOW(MW)**
		Exhibit -3
A	**765 kV Transmission Lines**	
	2* S/C Chhabra (PP) - Jaipur(South) line	1098 MW
	2* S/C STPS - Neemrana line	852 MW
	2* S/C Banswara TPS - Bhilwara(New) lines	1312 MW
	1* S/C Bhilwara (New)- Jaipur (South) line	385 MW
	1* S/C Jaipur(South) - Neemrana line	270 MW
B	**765/400 kV ICT**	
	1*1500 MVA, 765/400 kV Bhilwara (New)	923 MW
	2*1500 MVA, 765/400 kV Jaipur (South)	1210 MW
	2*1500 MVA, 765/400 kV Neemrana	1120 MW
	2*1500 MVA, 400/765 kV Chhabra (PP)	1101 MW
	*1500 MVA, 765/400 kV Suratgarh TPS	463 MW
C	**400 kV Transmission Lines**	
I	**At 765/400 kV Jaipur(South)**	
	3*S/C Jaipur (South) - Heerapura line	914 MW
	1*S/C Jaipur (South) - Ajmer line	-6 MW
	1*S/C Jaipur (South) - Dahra line	-268 MW
	1*S/C Jaipur (South) - Hindaun line	73 MW
II	**At 400/220 kV Jaipur(North)**	
	1*S/C Jaipur (North) - Heerapura line	-313 MW
	1*S/C Jaipur (North) - Merta line	114 MW
	2*S/C Jaipur (North) - Bassi(PG) line	-259 MW
	1*S/C Jaipur (North) - Sikar(PG) line	-8 MW
	1*S/C Jaipur (North) - Kotputli(PG) line	101 MW
III	**At 765/400 kV Neemrana**	
	D/C Neemrana(PG) - Alwar line	243 MW
	D/C Alwar - Hindaun line	-73 MW
	D/C Neemrana(PG) - Sikar(PG) line	108 MW
	D/C Neemrana(PG) - Hissar(PG-NR) line	-61 MW
	D/C Neemrana(PG) - Jhunjhunu line	446 MW
	D/C Neemrana(PG) - Manesar(PG-NR) line	0 MW
IV	**At 765/400 kV Bhilwara (New)**	
	D/C Bhilwara - Ajmer line	72 MW
	S/C Bhilwara - Dahra line	-329 MW
	D/C Bhilwara - Udaipur line	397 MW
V	**At STPS**	
	2*S/C STPS - Ratangarh line	554 MW
	S/C STPS - Bikaner line	337 MW

TENTATIVE COST ESTIMATES		
SNo.	Transmission System	Unit Cost (Rs. Crores)
1	765 kV S/C line	1.45
2	765/400 kV GSS without ICT	261.30
3	1*1500 MVA. 765/400 kV ICT (Banks of 4 Single Phase Transformers)	51.00
4	3*80 MVAR, 765 kV Line Reactors	28.00
5	3*110 MVAR, 765 kV Bus Reactors	32.00
6	2x315 MVA, 400/220 kV GSS	79.41
7	1*315 MVA, 400/220 kV ICT	11.50
8	400 kV D/C line (Twin Moose)	0.80
9	400 kV D/C line (Quad Moose)	1.95
10	50 MVAR, 400 kV Line Reactors	3.50
11	63 MVAR, 400 kV Line Reactors	4.75
12	80 MVAR, 400 kV Line Reactors	5.00
13	125 MVAR, 400 kV Bus Reactors	5.50
14	40 % Series Compensation on 400 kV D/C (Quad Moose) lines	30.00
15	220 kV D/C line (Zebra)	0.37

Annexure - III(a)

Cost of Proposed Evacuation System at 765 kV voltage level for Super Critical Thermal Power Stations at Banswara TPS (3x660 MW)

SNo	Transmission System	Line Length/ sets	Transformation Capacity	Cost (In Cr.)
1	765 kV 2xS/C Banswara TPS - Bhilwara(New) line	240 kms 2xS/C		696.00
2	765 kV S/C Bhilwara(New) - Jaipur (South) line	250 kms		362.50
3	1*1500 MVA, 765/400 kV GSS at Bhilwara(New)		1500 MVA	312.30
4	765 kV S/C Jaipur (South) - Neemrana line	160 kms		232.00
5	3x80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Banswara TPS - Bhilwara(New) ,Bhilwara(New) - Jaipur (South) & Jaipur(South) - Neemrana lines	8 SETS		224.00
6	3x110 MVAR (Single Phase), 765 kV Bus Reactors at Bhilwara(New)	1 SETS		32.00
7	**400 kV inter-connections at 765/400 kV Bhilwara (New)**			
(i)	400 kV D/C Bhilwara(New) - Ajmer line with one circuit LILO at existing 400 kV GSS Bhilwara	150 kms, D/C		119.70
(ii)	10 kM LILO of 400 kV S/C Bhilwara - Dahra line at Bhilwara (new)	10 kms, D/C		7.98
(iii)	400 kV D/C Bhilwara(New) - Udaipur line	160 kms, D/C		127.68
(iv)	2*315 MVA, 400/220 kV ICTs at Bhilwara(New) & associated bay works		630 MVA	79.41
(v)	220 kV interconnections at Bhilwara(New)	60 kms, D/C		22.20
(vi)	2*315 MVA, 400/220 kV GSS at Udaipur		630 MVA	79.41
(vii)	220 kV interconnections at Udaipur	60 kms, D/C		22.20
	Total Cost of Power Evacuation System of Banswara TPS (3x660 MW)			**2317.38**

Annexure - III(b)

Cost of Proposed Evacuation System at 400 kV voltage level for Super Critical Thermal Power Stations at Banswara TPS (3x660 MW)

SNo	Transmission System	Line Length/ sets	Transformation Capacity	Cost (In Cr.)
1	400 kV 2xD/C (Quad Moose) Banswara TPS - Bhilwara(New) line	240 kms 2xD/C		936.00
2	400 kV D/C (Quad Moose) Bhilwara(New) - Jaipur (South) line	250 kms, D/C		487.50
3	400 kV D/C (Quad Moose) Bhilwara(New) - Jodhpur (New) line	230 kms, D/C		448.50
3	3*315 MVA, 400/220 kV GSS at Bhilwara(New)		945 MVA	90.91
4	400 kV D/C (Quad Moose) Jaipur (South) - Neemrana line	160 kms, D/C		312.00
5	40 % Series Compensation on 400 kV 2xD/C (Quad Moose) Banswara TPS - Bhilwara(New) , D/C Bhilwara(New) - Jaipur (South), D/C Bhilwara(New) - Jodhpur (New) & D/C Jaipur (South) - Neemrana lines	5 Sets		150.00
6	2*80 MVAR Line Reactors at both ends of 400 kV 2xD/C (Quad Moose) Banswara TPS - Bhilwara(New) , D/C Bhilwara(New) - Jaipur (South), D/C Bhilwara(New) - Jodhpur (New) & D/C Jaipur (South) - Neemrana lines	20 Sets		100.00
7	125 MVAR , 400 kV Bus Reactors at Bhilwara(New) and Jodhpur(New)	2 SETS		11.00
8	400 kV D/C Bhilwara(New) - Ajmer line with one circuit LILO at existing 400 kV GSS Bhilwara	150 kms, D/C		119.70
9	10 kM LILO of 400 kV S/C Bhilwara - Dahra line at Bhilwara (new)	10 kms, D/C		7.98
10	400 kV D/C Bhilwara(New) - Udaipur line	160 kms, D/C		127.68
11	2*315 MVA, 400/220 kV ICTs at Bhilwara(New) & associated bay works		630 MVA	79.41
12	220 kV interconnections at Bhilwara(New)	60 kms, D/C		22.20
13	2*315 MVA, 400/220 kV ICTs at Jodhpur (New) & associated bay works		630 MVA	79.41
14	220 kV interconnections at Jodhpur (New)	60 kms, D/C		22.20
15	2*315 MVA, 400/220 kV GSS at Udaipur		630 MVA	79.41
16	220 kV interconnections at Udaipur	60 kms, D/C		22.20
	Total Cost of Power Evacuation System of Banswara TPS (3x660 MW)			**3096.10**

TENTATIVE COST ESTIMATES		
SNo.	Transmission System	Unit Cost (Rs. Crores)
1	765 kV S/C line	1.45
2	765/400 kV GSS without ICT	261.30
3	1*1500 MVA. 765/400 kV ICT (Banks of 4 Single Phase Transformers)	51.00
4	3*80 MVAR, 765 kV Line Reactors	28.00
5	3*110 MVAR, 765 kV Bus Reactors	32.00
6	2x315 MVA, 400/220 kV GSS	79.41
7	1*315 MVA, 400/220 kV ICT	11.50
8	400 kV Switching Station	57.00
9	400 kV D/C line (Twin Moose)	0.80
10	400 kV D/C line (Quad Moose)	1.95
11	50 MVAR, 400 kV Line Reactors	3.50
12	63 MVAR, 400 kV Line Reactors	4.75
13	80 MVAR, 400 kV Line Reactors	5.00
14	125 MVAR, 400 kV Bus Reactors	5.50
15	40 % Series Compensation on 400 kV D/C (Quad Moose) lines	30.00
16	220 kV D/C line (Zebra)	0.37

Annexure -I(A)

765 kV PROPOSAL : Total Estimated Cost for Evacuation System of Chhabra TPS (2*660 MW) & Kewai TPS (2*330 MW)

SNo.	Transmission System	Line Length/Set	Transf. Capacity	Estimated Cost (Rs. Cr)
A	**Chhabra TPS (2*660 MW)**			
1	400 kV 2xD/C (Quad Moose) Chhabra TPS - Chhabra Pooling Station line	10 kms, 2xD/C		39.00
2	LILO of one ckt of 400 kV D/C+S/C Chhabra TPS - Dahra line at Chhabra Pooling Station	10 kms, D/C		7.98
3	LILO of one ckt of 400 kV D/C Kalisindh TPS - Dahra line at Chhabra Pooling Station	50 kms, D/C		39.90
4	1*1500 MVA,765/400 kV GSS at Chhabra Pooling Station (RVPN)	1 No.	1500 MVA	312.30
5	765 kV 2xS/C Chhabra TPS - Jaipur(South) line	330 kms 2xS/C		957.00
6	1*1500 MVA,765/400 kV GSS at Jaipur(South)	1 No.	1500 MVA	312.30
7	3*80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Chhabra PP - Jaipur(South) lines	4 Sets		112.00
8	3*110 MVAR (Single Phase), 765 kV Bus Reactors at Jaipur(South)	1 Sets		32.00
9	10 kM LILO of 400 kV S/C Hindaun-Heerapura line at Jaipur(South)	10 kms, D/C		7.98
10	10 kM LILO of one circuit of 400 kV D/C Chhabra TPS-Heerapura line at Jaipur(South)	10 kms, D/C		7.98
11	10 kM LILO of one circuit of 400 kV D/C Ajmer-Heerapura line at Jaipur(South)	10 kms, D/C		7.98
12	220 kV D/C interconnections at Jaipur (South)	50 kms, D/C		18.50
	TOTAL(A)			**1854.92**
B	**Kewai TPS (2*330 MW)**			
1	400 kV D/C (Quad Moose) Kewai TPS - Chhabra Pooling Station line	20 kms, D/C		39.00
	TOTAL(B)			**39.00**
	Total Estimated Cost for Evacuation System of Chhabra TPS (2*660 MW) & Kewai TPS (2*330 MW)			**1893.92**

Annexure -I(B)

400 kV (QUAD MOOSE) PROPOSAL: Total Estimated Cost for Evacuation System of Chhabra TPS (2*660 MW) & Kewai TPS (2*330 MW)

SNo	Transmission System	Line Length/set	Transf. Capacity	Estimated Cost (Rs. Cr)
A	**Chhabra TPS (2*660 MW)**			
1	400 kV Pooling Station at Chhabra			57.00
2	400 kV 2xD/C (Quad Moose) Chhabra TPS - Chhabra Pooling Station line	10 kms, 2xD/C		39.00
3	LILO of one ckt of 400 kV D/C+S/C Chhabra TPS - Dahra line at Chhabra Pooling Station	10 kms, D/C		7.98
4	LILO of one ckt of 400 kV D/C Kalisindh TPS - Dahra line at Chhabra Pooling Station	50 kms, D/C		39.90
5	400 kV D/C (Quad Moose) Chhabra TPS - Jaipur(South) line	330 kms, D/C		643.50
6	400 kV D/C (Quad Moose) Chhabra TPS - Alwar line	360 kms, D/C		702.00
7	400 kV D/C (Quad Moose) Neemrana - Alwar line	80 kms, D/C		63.84
8	40 % Series Compensation on 400 kV D/C (Quad Moose) Chhabra TPS - Jaipur(South) , Chhabra TPS - Alwar & Neemrana - Alwar lines	3 Sets		90.00
9	2*80 MVAR Line Reactors at both ends of 400 kV D/C Chhabra TPS - Jaipur(South) ,Chhabra TPS-Alwar & Neemrana - Alwar lines	12 Sets		60.00
10	125 MVAR, 400 kV Bus Reactors at 400/220 kV GSS Jaipur(South-PG), Alwar & Neemrana	3 Sets		16.50
11	10 kM LILO of 400 kV S/C Hindaun-Heerapura line at Jaipur(South)	10 kms, D/C		7.98
12	10 kM LILO of one circuit of 400 kV D/C Chhabra TPS-Heerapura line at Jaipur(South)	10 kms, D/C		7.98
13	10 kM LILO of one circuit of 400 kV D/C Ajmer-Heerapura line at Jaipur(South)	10 kms, D/C		7.98
14	220 kV D/C interconnections at Jaipur (South), Alwar and Neemrana	100 kms, D/C		37.00
	TOTAL(A)			**1780.66**
B	**Kewai TPS (2*330 MW)**			
1	400 kV D/C Kewai TPS – Chhabra Pooling Station (Quad Moose) line	20 kms, D/C		78.00
	TOTAL(B)			**78.00**
	Total Estimated Cost for Evacuation System of Chhabra TPS (2*660 MW) & Kewai TPS (2*330 MW)			**1858.66**

TENTATIVE COST ESTIMATES		
SNo.	Transmission System	Unit Cost (Rs. Crores)
1	765 kV S/C line	1.45
2	765/400 kV GSS without ICT	261.30
3	1*1500 MVA. 765/400 kV ICT (Banks of 4 Single Phase Transformers)	51.00
4	3*80 MVAR, 765 kV Line Reactors	28.00
5	3*110 MVAR, 765 kV Bus Reactors	32.00
6	2x315 MVA, 400/220 kV GSS	79.41
7	1*315 MVA, 400/220 kV ICT	11.50
8	400 kV D/C line (Twin Moose)	0.80
9	400 kV D/C line (Quad Moose)	1.95
10	50 MVAR, 400 kV Line Reactors	3.50
11	63 MVAR, 400 kV Line Reactors	4.75
12	80 MVAR, 400 kV Line Reactors	5.00
13	125 MVAR, 400 kV Bus Reactors	5.50
14	40 % Series Compensation on 400 kV D/C (Quad Moose) lines	30.00
15	220 kV D/C line (Zebra)	0.37

Annexure - II(B)

Total Estimated Cost for Evacuation System of Suratgarh TPS (3*660 MW) with 400 kV D/C line on Quad Moose

SNo	Transmission System	Line Length/Set	Transf. Capacity	Estimated Cost (Rs. Cr)
1	400 kV D/C (Quad Moose) Suratgarh TPS – Jhunjhunu line	230 kms, D/C		448.50
2	400 kV D/C (Quad Moose) Suratgarh TPS – Nagaur line	270 kms, D/C		526.50
4	400 kV D/C (Quad Moose) Jhunjhunu - Sikar(PG) line	75 kms, D/C		146.25
5	400 kV D/C (Quad Moose) Nagaur - Jodhpur(New) line	150 kms, D/C		292.50
6	2x315 MVA, 400/220 kV GSS at Jhunjhunu	1 No.	630 MVA	79.41
7	220 kV interconnections at 400/220 kV GSS at Jhunjhunu	60 kms, D/C		22.20
8	2x315 MVA, 400/220 kV GSS at Nagaur	1 No.	630 MVA	79.41
9	220 kV interconnections at 400/220 kV GSS at Nagaur	60 kms, D/C		22.20
10	2*80 MVAR Line Reactors at both ends of 400 kV D/C Suratgarh TPS - Jhunjhunu-Sikar(PG) line	8 Sets		40.00
11	2*80 MVAR Line Reactors at both ends of 400 kV D/C Suratgarh TPS - Nagaur & Nagaur – Jodhpur(New) lines	8 Sets		40.00
12	125 MVAR, 400 kV Bus Reactors at Jhunjhunu & Nagaur	2 Sets		11.00
13	40 % Series Compensation on 400 kV D/C Suratgarh TPS – Jhunjhunu , Suratgarh TPS – Nagaur, Jhunjhunu - Sikar & Nagaur - Jodhpur lines	4 Sets		120.00
	Total Estimated Cost for Evacuation System of Suratgarh TPS (3*660 MW)			**1827.97**

Annexure - II(A)

Total Estimated Cost for Evacuation System of Suratgarh TPS (3*660 MW) with evacuation on 765 kV lines

SNo.	Transmission System	Line Length/No	Transf. Capacity	Estimated Cost (Rs. Cr)
1	1*1500 MVA,765/400 kV ICT at Suratgarh TPS	1 No.	1500 MVA	
2	765 kV 2xS/C Suratgarh TPS - Neemrana line	350 kms 2xS/C		1015.00
3	1*1500 MVA,765/400 kV GSS at Neemrana	1 No.	1500 MVA	312.30
4	3*80 MVAR (Single Phase) Line Reactors at both ends of 765 kV 2xS/C Suratgarh TPS-Neemrana lines	4 Sets		112.00
5	3x110 MVAR (Single Phase), 765 kV Bus Reactors at Neemrana	1 Sets		32.00
6	400 kV D/C (Twin Moose) Neemrana– Jhunjhunu line	120 kms, D/C		95.76
7	2x315 MVA, 400/220 kV GSS at Jhunjhunu	1 No.	630 MVA	79.41
8	220 kV interconnections at 400/220 kV GSS at Jhunjhunu	60 kms, D/C		22.20
	Total Estimated Cost for Evacuation System of Suratgarh TPS (3*660 MW)			**1668.67**

TABLE-3(400 KV PROPOSAL) : Power flow for the system condition corresponding to 2016-17 for 16050 MW system load		
SNo.	**Transmission System**	**POWER FLOW(MW)**
		Exhibit -5
A	**400 kV Transmission Lines (Quad Moose)**	
	D/C Chhabra (PP) - Jaipur(South) line	770 MW
	D/C Chhabra (PP) - Alwar line	750 MW
	D/C STPS -Jhunjhunu line	774 MW
	D/C STPS -Nagaur line	496 MW
	2xD/C Banswara TPS - Bhilwara(New) lines	1970 MW
	D/C Bhilwara (New)- Jaipur (South) line	347 MW
	D/C Bhilwara (New)- Jodhpur line	315 MW
	D/C Jaipur(South) - Neemrana line	197 MW
	D/C Nagaur-Jodhpur(New) line	30 MW
	D/C Jhunjhunu-Sikar line	48 MW
C	**400 kV Transmission Lines**	
I	**At 400 kV Jaipur(South)**	
	3*S/C Jaipur (South) - Heerapura line	756 MW
	1*S/C Jaipur (South) - Ajmer line	-94 MW
	1*S/C Jaipur (South) - Dahra line	-352 MW
	1*S/C Jaipur (South) - Hindaun line	49 MW
II	**At 400/220 kV Jaipur(North)**	
	1*S/C Jaipur (North) - Heerapura line	-266 MW
	1*S/C Jaipur (North) - Merta line	-59 MW
	2*S/C Jaipur (North) - Bassi(PG) line	306 MW
	1*S/C Jaipur (North) - Sikar(PG) line	-17 MW
	1*S/C Jaipur (North) - Kotputli(PG) line	170 MW
III	**At 400 kV Neemrana**	
	D/C Neemrana(PG) - Alwar line	225 MW
	D/C Alwar - Hindaun line	46 MW
	D/C Neemrana(PG) - Sikar(PG) line	-9 MW
	D/C Neemrana(PG) - Hissar(PG-NR) line	-16 MW
	D/C Neemrana(PG) - Manesar(PG-NR) line	0 MW
IV	**At 400 kV Bhilwara (New)**	
	D/C Bhilwara - Ajmer line	292 MW
	S/C Bhilwara - Dahra line	-273 MW
	D/C Bhilwara - Udaipur line	432 MW
V	**At STPS**	
	2*S/C STPS - Ratangarh line	766 MW
	S/C STPS - Bikaner line	411 MW

TABLE-4 (OUTAGE OF 765/400 KV ICT AT STPS) : Power flow for the system condition corresponding to 2016-17 for 16050 MW system load		
SNo.	**Transmission System**	**POWER FLOW(MW)**
		Exhibit -1
A	**765 kV Transmission Lines**	
	2* S/C Chhabra (PP) - Jaipur(South) line	1294 MW
	2* S/C STPS - Neemrana line	1970 MW
	2* S/C Banswara TPS - Bhilwara(New) lines	1970 MW
	1* S/C Bhilwara (New)- Jaipur (South) line	655 MW
	1* S/C Jaipur(South) - Neemrana line	113 MW
B	**765/400 kV ICT**	
	1*1500 MVA, 765/400 kV Bhilwara (New)	1305 MW
	2*1500 MVA, 765/400 kV Jaipur (South)	1822 MW
	2*1500 MVA, 765/400 kV Neemrana	2070 MW
	2*1500 MVA, 400/765 kV Chhabra (PP)	1297 MW
	*1500 MVA, 765/400 kV Suratgarh TPS	OUT
C	**400 kV Transmission Lines**	
I	**At 765/400 kV Jaipur(South)**	
	3*S/C Jaipur (South) - Heerapura line	1379 MW
	1*S/C Jaipur (South) - Ajmer line	12 MW
	1*S/C Jaipur (South) - Dahra line	-339 MW
	1*S/C Jaipur (South) - Hindaun line	122 MW
II	**At 400/220 kV Jaipur(North)**	
	1*S/C Jaipur (North) - Heerapura line	-487 MW
	1*S/C Jaipur (North) - Merta line	140 MW
	2*S/C Jaipur (North) - Bassi(PG) line	363 MW
	1*S/C Jaipur (North) - Sikar(PG) line	96 MW
	1*S/C Jaipur (North) - Kotputli(PG) line	146 MW
III	**At 765/400 kV Neemrana**	
	D/C Neemrana(PG) - Alwar line	363 MW
	D/C Alwar - Hindaun line	-82 MW
	D/C Neemrana(PG) - Sikar(PG) line	321 MW
	D/C Neemrana(PG) - Hissar(PG-NR) line	0 MW
	D/C Neemrana(PG) - Jhunjhunu line	674 MW
	D/C Neemrana(PG) - Manesar(PG-NR) line	0 MW
IV	**At 765/400 kV Bhilwara (New)**	
	D/C Bhilwara - Ajmer line	261 MW
	S/C Bhilwara - Dahra line	-353 MW
	D/C Bhilwara - Udaipur line	474 MW
V	**At STPS**	
	2*S/C STPS - Ratangarh line	282 MW
	S/C STPS - Bikaner line	294 MW

LOAD FLOW ANALYSIS CONVERGED, ITERATIONS P : 9 Q : 8
CASE NO : 1 CONTINGENCY : 0 SCHEDULE NO : 0
CONTINGENCY NAME : Basecase RATING CONSIDERED : NOMINAL

From	Name	To	Name	From(MW)	From(MVAR)	%Loading	ckts	tap
50	STPS2	52	STPS220G	-448.072	36.413	69.349	2	0.9750
51	STPS4	53	STPS400G	-896.447	-50.745	68.649	4	0.9750
51	STPS4	50	STPS2	441.490	178.140	74.665	2	0.9750
30	RATHNGH4	301	RTNGD42	312.357	12.417	32.809	3	1.0000
65	KTPS2	60	KTPS#1	-197.034	-23.744	78.692	2	1.0000
65	KTPS2	61	KTPS#2	-376.011	-37.563	74.918	2	1.0000
65	KTPS2	62	KTPS#3	-188.006	-18.781	74.918	1	1.0000
417	ANTA2	70	ANTA#1	-238.828	-23.385	79.135	3	1.0000
417	ANTA2	71	ANTA#2	-139.444	-21.835	79.792	1	1.0000
415	RAPPA	80	RAPP#1	-179.109	-13.112	70.929	1	1.0000
416	RAPPB	81	RAPP#2	-397.670	-72.795	81.055	2	1.0000
1510	MAHI_I	92	MAHI#1	-47.624	-17.603	89.511	2	1.0000
1511	MAHI_II	93	MAHI#2	-87.402	-33.012	87.538	2	0.9750
230	DBR2	1230	DEBR1	314.066	29.390	93.689	1	1.0000
1520	RMG132	95	RMGHG	-59.846	8.359	58.478	2	1.0000
312	TINW2	1312	TINWRI1	247.102	45.979	88.970	3	1.0000
160	SKT2	1160	SKT1	429.116	130.469	111.216	4	1.0000
1500	RPS1	97	RPSG	-166.487	7.140	149.678	2	0.9750
1501	JS1	98	JSG	-95.374	2.487	111.563	2	0.9750
210	BHL2	1210	BHIL1	478.812	123.083	100.616	5	1.0000
10	HERPR4	150	HIRAPR2	902.145	354.656	91.012	1	0.9750
43	BASSI4	431	BASSI2	420.112	84.357	67.519	2	1.0000
150	HIRAPR2	1150	HRAPR132	234.106	33.593	80.017	3	1.0000
202	BWR_2	1201	BEAWR1	114.234	25.358	60.478	2	1.0000
311	BIL2	1311	BILARA	101.709	-10.554	53.098	2	1.0000
310	JDP2	1310	JODHPR	364.057	87.955	128.462	3	1.0000
360	BALI2	1360	BALI1	100.644	13.574	103.857	1	1.0000
332	PIND2	1332	PIND1	113.049	13.465	59.103	2	1.0000
330	SRH2	1330	SIROHI1	188.284	21.527	65.448	3	1.0000
350	BALOT2	1350	BALOT1	114.770	-4.927	77.804	1	1.0000
221	NMBR2	1221	NIMBHRA	266.938	75.551	76.847	4	1.0000
154	PHLRA2	1154	PHLRA1	118.512	0.691	84.263	1	1.0000
153	CHMU2	1153	CHMU1	178.890	50.207	95.762	2	1.0000
152	KUKAS2	1152	KUKAS1	191.415	36.181	99.116	2	1.0000
155	SNG2	1155	SANGR1	198.571	44.921	103.365	2	1.0000
120	DAUS2	1120	DAUS1	216.187	-12.806	54.666	4	1.0000
272	RNGUS2	1272	RNGUS1	319.291	4.499	65.277	5	1.0500
250	KHTRI2	1250	KHETRI1	353.086	79.876	77.084	5	1.0000
101	KOTP2	1101	KOTP1	176.471	38.589	73.479	1	1.0000
100	ALW2	1100	ALW1	230.579	57.021	96.725	1	1.0000
102	BHD2	1102	BHD1	241.908	67.642	84.329	3	1.0000
110	BHT2	2110	BHT21	276.660	-9.536	73.085	4	1.0500
130	HIND2	1130	HIND1	323.108	62.846	83.294	4	1.0000
262	KUCH2	1262	KUCH1	160.356	47.999	87.469	2	0.9500
200	AJM2	1200	AJM1	319.897	-4.227	106.373	2	1.0000
261	NAGR2	1261	NAGR1	210.006	38.930	73.259	3	1.0000
260	MRT2	1460	MRT_1	246.950	13.804	83.968	3	1.0500
271	SIKAR2	1271	SIKAR1	341.942	51.729	69.192	5	0.9500
341	UDYOG2	1341	UDYOG1	128.290	31.680	92.679	1	1.0000
320	HNMNGH	1320	HANUMNG	103.912	8.840	53.982	2	1.0500
340	SURTH2	1340	SURATGH1	269.257	79.150	95.474	3	1.0000
302	RTNGD22	1302	RTNGH1	423.583	-2.260	140.834	3	1.0000
380	BIKNR2	1380	BIKNR1	385.867	4.589	78.125	5	1.0500
251	JJN2	1251	JJN21	164.586	35.665	89.246	2	1.0000
403	HISSR2	1403	HISSR1	0.000	0.000	0.000	1	0.9750
331	BHIN2	1331	BHINML1	201.575	65.604	109.990	2	1.0000
240	KNK2	1240	KANKRLI	180.331	-1.557	59.411	3	1.0000

220	CHT2	1220	CHTGH	332.110	130.668	96.245	4	1.0000
140	JHLW2	1140	JHALWR1	346.385	43.206	86.409	4	1.0000
141	MODK2	1141	MODAK1	57.009	26.943	41.767	1	1.0000
161	DHR2	1161	DHRA1	116.172	28.907	59.691	2	1.0000
44	NREB_HYD	445	TIE_220	321.694	108.691	32.967	4	1.0000
46	NREB_TH	447	NTIE_220	141.961	16.989	27.762	2	1.0000
159	SWM_2	2159	SAWAIMP	128.570	36.351	136.186	1	1.0000
47	BHWDI4	48	BHWD42	342.606	192.784	61.710	2	0.9750
317	BHOPL2	2319	BHOPL21	120.956	40.062	134.552	1	1.0000
361	PALI_2	2361	PALI_21	120.900	-3.297	63.034	2	1.0000
134	DHOLPR2	1134	DHLPR1	180.867	54.765	126.866	1	1.0000
11	MERTA_4	260	MRT2	438.357	111.493	71.477	2	1.0000
12	JODHPR_4	313	JDHPR_42	464.323	124.630	51.162	3	1.0000
309	SUJNGH2	1309	SUJNGH21	132.088	-10.836	67.442	2	1.0000
231	BANSWR2	1231	BNSR1	73.453	15.501	82.337	1	1.0000
370	JALORE_2	1375	JALOR_21	91.047	21.439	96.976	1	1.0000
65	KTPS2	63	KTPS#4	-348.286	-41.709	69.543	2	1.0000
263	MKRANA2	1263	MKRANA	50.143	-19.541	56.933	1	1.0000
318	PHALOD2	1317	PHALODI	274.391	107.308	75.260	3	1.0000
352	AMSGR2	2352	AMSGR1	-7.390	1.861	3.695	2	1.0000
351	BARMER2	1357	BARMER_1	106.515	4.458	105.623	1	1.0000
343	GLTPS_2	39	GLTPS_G	-240.801	-12.868	79.221	2	1.0000
232	DHAURIMA	2332	DHAURIMN	170.040	33.339	89.081	2	1.0500
270	KHNVS2	1270	KHNVSR	130.936	32.422	71.450	2	1.0000
149	DUNI2	2349	DUNI_1	89.892	14.564	91.904	1	1.0000
94	MADA2	34	MADA_33	-29.976	2.615	12.978	3	1.0000
96	TEMDRIA	35	TEMDRA33	-29.976	6.266	13.183	3	1.0000
2352	AMSGR1	36	AMSGR_33	-19.976	1.569	19.447	4	1.0000
150	HIRAPR2	1142	HPRRING1	111.058	33.391	117.708	1	1.0000
440	DGTPS_2	37	DGTPS_G	-313.615	-17.357	70.118	3	1.0000
375	BLTPS_2	75	BLTPS_G	-224.732	-84.863	81.521	2	1.0000
5	RAPP_CD4	82	RAPPC_G	-398.105	3.090	77.965	2	1.0000
7	KNKPG_4	170	KNKPG_2	328.555	124.535	37.565	3	0.9625
127	NEEMR_2	2127	NEMRN132	222.324	53.822	114.665	2	1.0000
128	BHADRA_2	2261	BADRA_21	76.981	-9.062	80.695	1	1.0000
129	SRIDUNG2	1394	SRIDUN21	98.039	29.137	53.243	2	1.0000
131	MANDA2	2123	MANDWR1	91.648	-4.181	46.342	2	1.0000
337	SANCHR2	2333	SANCHR	115.603	24.102	61.690	2	1.0000
8	CHABRA_4	180	CHABRA_2	267.770	24.184	83.248	1	1.0000
8	CHABRA_4	85	CHABRA_G	-996.879	7.705	51.446	6	1.0000
9	BHL_4	142	BHL_42	441.726	63.892	71.146	2	1.0000
143	BARA_2	2174	BARA_21	87.158	6.961	87.585	1	1.0000
13	HIND_4	132	HIND_42	432.299	56.887	69.015	2	1.0000
14	BIKANE_4	381	BIKANE_2	368.125	41.749	58.950	2	1.0000
6	KOTA_PG4	162	KOTA_42	152.722	44.871	24.839	2	1.0000
344	RJWST_2	49	RJWESTG1	-240.806	-24.435	79.864	2	1.0000
432	JAGATPU2	1432	JAGATPU1	117.269	17.918	60.593	2	1.0000
15	BHINM_4	450	BHIN_2	197.251	70.778	69.864	1	0.9625
410	VKIA_2	1105	VKIA_21	116.023	37.897	124.667	1	1.0000
16	RAJWEST4	45	RJWESTG2	-723.048	113.467	80.893	6	1.0000
16	RAJWEST4	344	RJWST_2	81.158	-18.648	26.296	1	1.0000
21	SIKAR_4	273	SIKAR_42	587.254	170.971	96.169	2	0.9750
217	RENWAL_2	1117	RENWL1	135.492	13.285	70.003	2	1.0000
23	JAISWF_4	353	JAISWF_2	-111.471	-50.275	19.007	2	1.0000
31	BARMER_4	351	BARMER2	99.610	-5.249	31.392	1	1.0000
105	KUSHKH_2	2105	KUSHKHR	210.201	81.084	75.735	3	1.0000
199	KISHAN_2	2200	KISHN_21	96.623	57.305	124.303	1	1.0000
374	VSLP_2	74	VSLP_G	-120.383	-15.358	80.343	1	1.0000
147	MANSAR_2	1156	MANSVR1	218.277	44.109	70.693	2	1.0000
181	KAWAI_2	2165	KEWAI	103.345	15.667	104.374	1	1.0000
158	NPH_2	1158	NPH1	204.468	40.163	66.292	2	1.0000
156	BAGRU_2	1123	BAGRU_21	51.418	8.547	54.447	1	1.0000
315	BORNDA_2	1299	BORNDA_!	67.149	38.669	80.005	1	1.0000

145	SEZ_FIR2	1172	SEZ_21	79.099	46.632	93.420	1	1.0000
253	NMTANA_2	1253	NEEMKT1	0.000	0.000	0.000	1	1.0000
103	MIA_2	2102	MIA	89.043	23.848	93.855	1	1.0000
18	KALISN_4	87	KALINS_G	-1074.951	-68.718	69.414	2	1.0000
26	AJMER_4	203	AJMER_42	321.486	13.165	50.658	2	1.0000
313	JDHPR_42	1397	JDHPR_41	121.637	24.999	127.153	1	1.0000
218	GULABP_2	1218	GULABPR	78.268	20.593	83.776	1	1.0000
233	MADRI_2	1235	MADRI	219.424	18.784	58.122	4	1.0000
277	DHOD_2	1277	DHOD	107.045	-23.785	37.063	3	1.0000
303	KGBAS_2	2103	KSHBAS	69.140	7.484	71.223	1	1.0000
264	NOKHA_2	1386	NOKHA	53.143	26.191	61.630	1	1.0000
255	CHIRAWA2	1255	CHIRAWA	213.862	43.149	58.784	4	1.0000
18	KALISN_4	182	KALISN_2	301.225	66.142	94.639	1	1.0000
308	DEDWANA2	1297	DEDWA_41	91.047	-4.567	92.622	1	1.0000
17	JPR_SOU4	151	JPR_SOU2	624.878	80.025	99.901	2	1.0000
22	NEENR_4	121	NEEM_PG2	405.654	64.600	32.341	4	1.0000
4	JPR_SOU7	17	JPR_SOU4	1629.103	49.352	54.108	2	1.0000
25	NEEMR_7	22	NEENR_4	1659.060	-55.958	54.953	2	1.0000
27	JPR_NOR4	148	JPR_NOR2	472.066	106.311	76.433	2	1.0000
28	DEDWANA4	308	DEDWANA2	495.960	43.483	79.665	2	1.0000
411	PURANA_2	1159	PURNGH1	181.275	20.487	58.298	2	1.0000
157	SHAHPU_2	2107	SHAHPRA1	142.552	19.549	73.730	2	1.0000
24	KOTPUT_4	126	KOTPUT42	392.603	86.705	63.776	2	1.0000
106	BANSUR_2	2106	BANSUR	69.345	9.153	71.765	1	1.0000
104	CHOPANK2	1185	CHOPAN21	68.645	21.030	72.184	1	1.0000
107	NEEMKA2	2363	NEENKA21	70.694	19.169	75.278	1	1.0000
38	BHL_765	3	BHL_74	1246.955	-13.344	83.564	1	1.0000
54	ALWAR_4	108	ALWAR_42	431.075	92.266	69.698	2	1.0000
5	RAPP_CD4	79	RAPP_DG	-1253.806	16.057	72.223	2	1.0000
1	KEWAI_7	90	KEWAI_G	-656.650	96.061	86.358	2	1.0000
269	NWALGAR2	1186	NWALG21	157.514	28.159	85.237	2	1.0000
259	KUCHERA2	1496	KUCHERA1	89.256	20.874	94.694	1	1.0000
55	JODP_74	307	JOD_72	335.511	104.280	56.168	2	1.0000
3	BHL_74	211	BHL_72	443.352	62.022	71.345	2	1.0000
8	CHABRA_4	86	CHABR_G2	-1315.050	207.298	76.380	2	1.0000
2	CHABR_R7	29	CHABR_R4	-1348.394	47.921	43.929	2	1.0000
69	JJN_7	252	JJN_42	627.112	193.614	70.766	3	1.0000
59	STPS_765	88	STPS_G3	-1969.667	160.553	76.145	3	1.0000
59	STPS_765	51	STPS4	729.251	67.271	47.971	1	1.0000
58	NAGAUR_4	265	NAGAUR42	283.998	77.579	47.298	2	1.0000
72	UDAIP_4	234	UDAIP_42	462.768	103.810	76.591	2	1.0000
32	BANS_765	89	BANSWA_G	-1969.467	-185.456	76.880	3	1.0000
109	BUNDI_2	2162	BUNDI	137.265	33.613	47.762	3	1.0000

Number of transformers : 163

LOAD FLOW ANALYSIS CONVERGED, ITERATIONS P : 7 Q : 6
CASE NO : 1 CONTINGENCY : 0 SCHEDULE NO : 0
CONTINGENCY NAME : Basecase RATING CONSIDERED : NOMINAL

From	Name	To	Name	From(MW)	From(MVAR)	%Loading	ckts	tap
50	STPS2	52	STPS220G	-448.055	79.632	71.417	2	0.9750
51	STPS4	53	STPS400G	-672.375	15.955	68.128	3	0.9750
51	STPS4	50	STPS2	243.920	168.154	46.170	2	0.9750
30	RATHNGH4	301	RTNGD42	213.220	31.500	22.435	3	1.0000
65	KTPS2	60	KTPS#1	-197.014	-32.215	79.495	2	1.0000
65	KTPS2	61	KTPS#2	0.000	0.000	0.000	2	0.0000
65	KTPS2	62	KTPS#3	-187.987	-26.234	75.584	1	1.0000
417	ANTA2	70	ANTA#1	0.000	0.000	0.000	3	0.0000
417	ANTA2	71	ANTA#2	-139.421	-32.296	81.393	1	1.0000
415	RAPPA	80	RAPP#1	-0.000	-0.000	0.000	1	1.0000
416	RAPPB	81	RAPP#2	-397.674	-71.522	80.980	2	1.0000
1510	MAHI_I	92	MAHI#1	-23.617	-8.398	96.267	1	1.0000
1511	MAHI_II	93	MAHI#2	-0.000	0.000	0.000	1	0.9750
230	DBR2	1230	DEBR1	241.171	57.532	74.536	1	1.0000
1520	RMG132	95	RMGHG	-59.846	8.270	58.471	2	1.0000
312	TINW2	1312	TINWRI1	184.886	53.886	66.133	3	1.0000
160	SKT2	1160	SKT1	397.116	152.102	105.914	4	1.0000
1500	RPS1	97	RPSG	-0.000	-0.000	0.000	2	0.9750
1501	JS1	98	JSG	-0.000	0.000	0.000	2	0.9750
210	BHL2	1210	BHIL1	387.330	121.333	82.412	5	1.0000
10	HERPR4	150	HIRAPR2	702.556	339.273	72.681	1	0.9750
43	BASSI4	431	BASSI2	326.154	83.504	52.652	2	1.0000
150	HIRAPR2	1150	HRAPR132	173.630	48.167	60.403	3	1.0000
202	BWR_2	1201	BEAWR1	81.754	40.013	47.101	2	1.0000
311	BIL2	1311	BILARA	73.369	14.433	39.346	2	1.0000
310	JDP2	1310	JODHPR	266.768	84.967	94.122	3	1.0000
360	BALI2	1360	BALI1	74.542	23.549	79.393	1	1.0000
332	PIND2	1332	PIND1	85.214	24.190	45.746	2	1.0000
330	SRH2	1330	SIROHI1	143.672	40.590	51.127	3	1.0000
350	BALOT2	1350	BALOT1	84.865	13.797	57.691	1	1.0000
221	NMBR2	1221	NIMBHRA	213.227	83.167	62.749	4	1.0000
154	PHLRA2	1154	PHLRA1	89.843	17.867	64.122	1	1.0000
153	CHMU2	1153	CHMU1	132.189	58.677	73.991	2	1.0000
152	KUKAS2	1152	KUKAS1	141.242	43.331	74.541	2	1.0000
155	SNG2	1155	SANGR1	150.739	50.490	79.971	2	1.0000
120	DAUS2	1120	DAUS1	154.029	23.494	39.133	4	1.0000
272	RNGUS2	1272	RNGUS1	235.246	28.894	48.247	5	1.0500
250	KHTRI2	1250	KHETRI1	272.308	82.742	59.143	5	1.0000
101	KOTP2	1101	KOTP1	130.113	43.206	55.187	1	1.0000
100	ALW2	1100	ALW1	169.877	67.039	73.605	1	1.0000
102	BHD2	1102	BHD1	181.374	67.973	64.008	3	1.0000
110	BHT2	2110	BHT21	213.775	12.398	53.487	4	1.0500
130	HIND2	1130	HIND1	234.795	73.278	61.604	4	1.0000
262	KUCH2	1262	KUCH1	118.160	62.351	70.104	2	0.9500
200	AJM2	1200	AJM1	247.819	40.654	84.150	2	1.0000
261	NAGR2	1261	NAGR1	154.763	52.475	55.461	3	1.0000
260	MRT2	1460	MRT_1	185.657	32.929	63.513	3	1.0500
271	SIKAR2	1271	SIKAR1	261.965	101.668	56.069	5	0.9500
341	UDYOG2	1341	UDYOG1	95.030	32.845	69.234	1	1.0000
320	HNMNGH	1320	HANUMNG	75.842	8.266	38.794	2	1.0500
340	SURTH2	1340	SURATGH1	199.559	69.907	70.962	3	1.0000
302	RTNGD22	1302	RTNGH1	315.413	32.740	104.835	3	1.0000
380	BIKNR2	1380	BIKNR1	286.369	30.213	58.045	5	1.0500
251	JJN2	1251	JJN21	124.839	41.910	68.192	2	1.0000
403	HISSR2	1403	HISSR1	0.000	0.000	0.000	1	0.9750
331	BHIN2	1331	BHINML1	150.362	66.389	84.069	2	1.0000
240	KNK2	1240	KANKRLI	143.909	43.955	49.313	3	1.0000

220	CHT2	1220	CHTGH	258.633	112.823	75.435	4	1.0000
140	JHLW2	1140	JHALWR1	304.762	38.698	77.239	4	1.0000
141	MODK2	1141	MODAK1	26.153	37.239	30.338	1	1.0000
161	DHR2	1161	DHRA1	99.896	33.910	52.912	2	1.0000
44	NREB_HYD	445	TIE_220	269.996	71.101	27.107	4	1.0000
46	NREB_TH	447	NTIE_220	102.195	11.729	19.974	2	1.0000
159	SWM_2	2159	SAWAIMP	96.024	38.351	105.148	1	1.0000
47	BHWDI4	48	BHWD42	264.713	163.009	48.372	2	0.9750
317	BHOPL2	2319	BHOPL21	91.017	47.619	107.381	1	1.0000
361	PALI_2	2361	PALI_21	90.226	10.789	47.494	2	1.0000
134	DHOLPR2	1134	DHLPR1	146.411	46.899	102.136	1	1.0000
11	MERTA_4	260	MRT2	340.986	131.364	57.068	2	1.0000
12	JODHPR_4	313	JDHPR_42	329.667	89.998	35.811	3	1.0000
309	SUJNGH2	1309	SUJNGH21	96.105	4.611	49.144	2	1.0000
231	BANSWR2	1231	BNSR1	81.989	56.193	122.873	1	0.9125
370	JALORE_2	1375	JALOR_21	68.528	24.292	74.630	1	1.0000
65	KTPS2	63	KTPS#4	-348.251	-56.620	70.249	2	1.0000
263	MKRANA2	1263	MKRANA	37.537	-2.325	39.512	1	1.0000
318	PHALOD2	1317	PHALODI	205.167	82.228	53.493	3	1.0000
352	AMSGR2	2352	AMSGR1	-27.476	5.627	13.600	2	1.0000
351	BARMER2	1357	BARMER_1	75.536	12.520	75.450	1	1.0000
343	GLTPS_2	39	GLTPS_G	-120.406	-2.715	78.886	1	1.0000
232	DHAURIMA	2332	DHAURIMN	126.925	29.841	66.063	2	1.0500
270	KHNVS2	1270	KHNVSR	95.946	31.525	52.908	2	1.0000
149	DUNI2	2349	DUNI_1	69.030	18.239	71.779	1	1.0000
94	MADA2	34	MADA_33	-29.976	2.609	12.978	3	1.0000
96	TEMDRIA	35	TEMDRA33	-29.976	4.695	13.072	3	1.0000
2352	AMSGR1	36	AMSGR_33	-19.976	0.524	19.418	4	1.0000
150	HIRAPR2	1142	HPRRING1	83.496	33.636	90.527	1	1.0000
440	DGTPS_2	37	DGTPS_G	-313.648	-17.910	69.423	3	1.0000
375	BLTPS_2	75	BLTPS_G	-112.385	-41.529	81.011	1	1.0000
5	RAPP_CD4	82	RAPPC_G	-398.116	20.147	77.745	2	1.0000
7	KNKPG_4	170	KNKPG_2	246.068	169.584	31.637	3	0.9625
127	NEEMR_2	2127	NEMRN132	167.289	53.441	86.822	2	1.0000
128	BHADRA_2	2261	BADRA_21	57.836	2.626	59.295	1	1.0000
129	SRIDUNG2	1394	SRIDUN21	73.917	32.920	41.855	2	1.0000
131	MANDA2	2123	MANDWR1	71.872	12.666	36.622	2	1.0000
337	SANCHR2	2333	SANCHR	88.246	25.784	47.257	2	1.0000
8	CHABRA_4	180	CHABRA_2	238.301	39.608	74.743	1	1.0000
8	CHABRA_4	85	CHABRA_G	-996.883	19.339	51.417	6	1.0000
9	BHL_4	142	BHL_42	388.286	49.110	62.391	2	1.0000
143	BARA_2	2174	BARA_21	69.008	15.675	71.386	1	1.0000
13	HIND_4	132	HIND_42	302.282	67.664	48.453	2	1.0000
14	BIKANE_4	381	BIKANE_2	279.825	52.415	45.015	2	1.0000
6	KOTA_PG4	162	KOTA_42	180.072	96.512	31.729	2	1.0000
344	RJWST_2	49	RJWESTG1	-240.830	-10.623	79.089	2	1.0000
432	JAGATPU2	1432	JAGATPU1	91.010	23.037	47.548	2	1.0000
15	BHINM_4	450	BHIN_2	140.033	71.925	51.758	1	0.9625
410	VKIA_2	1105	VKIA_21	86.448	37.336	95.228	1	1.0000
16	RAJWEST4	45	RJWESTG2	-481.986	123.569	81.852	4	1.0000
16	RAJWEST4	344	RJWST_2	43.432	-10.957	14.035	1	1.0000
21	SIKAR_4	273	SIKAR_42	448.949	196.956	76.493	2	0.9750
217	RENWAL_2	1117	RENWL1	100.467	30.183	53.668	2	1.0000
23	JAISWF_4	353	JAISWF_2	-119.128	-16.209	18.592	2	1.0000
31	BARMER_4	351	BARMER2	70.610	1.591	22.065	1	1.0000
105	KUSHKH_2	2105	KUSHKHR	158.306	65.113	56.597	3	1.0000
199	KISHAN_2	2200	KISHN_21	65.305	40.495	82.625	1	1.0000
374	VSLP_2	74	VSLP_G	-120.390	-12.216	79.896	1	1.0000
147	MANSAR_2	1156	MANSVR1	162.723	51.936	53.724	2	1.0000
181	KAWAI_2	2165	KEWAI	85.231	19.281	87.745	1	1.0000
158	NPH_2	1158	NPH1	153.392	47.847	50.642	2	1.0000
156	BAGRU_2	1123	BAGRU_21	38.802	13.079	42.207	1	1.0000
315	BORNDA_2	1299	BORNDA_!	50.139	27.506	57.857	1	1.0000

145	SEZ_FIR2	1172	SEZ_21	59.042	32.946	68.124	1	1.0000
253	NMTANA_2	1253	NEEMKT1	0.000	-0.000	0.000	1	1.0000
103	MIA_2	2102	MIA	65.196	27.810	71.459	1	1.0000
18	KALISN_4	87	KALINS_G	-1074.501	227.980	72.428	2	1.0000
26	AJMER_4	203	AJMER_42	248.821	50.486	39.999	2	1.0000
313	JDHPR_42	1397	JDHPR_41	89.246	26.145	93.297	1	1.0000
218	GULABP_2	1218	GULABPR	55.620	24.849	62.995	1	1.0000
233	MADRI_2	1235	MADRI	166.373	32.289	45.790	4	1.0000
277	DHOD_2	1277	DHOD	77.109	-13.311	26.551	3	1.0000
303	KGBAS_2	2103	KSHBAS	49.885	13.768	52.485	1	1.0000
264	NOKHA_2	1386	NOKHA	35.123	33.753	50.178	1	1.0000
255	CHIRAWA2	1255	CHIRAWA	158.867	51.776	43.960	4	1.0000
18	KALISN_4	182	KALISN_2	278.045	42.170	88.303	1	1.0000
308	DEDWANA2	1297	DEDWA_41	65.883	5.720	67.347	1	1.0000
17	JPR_SOU4	151	JPR_SOU2	493.163	68.354	78.347	2	1.0000
22	NEENR_4	121	NEEM_PG2	297.042	51.101	23.456	4	1.0000
4	JPR_SOU7	17	JPR_SOU4	1209.950	28.336	39.901	2	1.0000
25	NEEMR_7	22	NEENR_4	1119.807	-90.621	36.805	2	1.0000
27	JPR_NOR4	148	JPR_NOR2	365.265	104.441	59.513	2	1.0000
28	DEDWANA4	308	DEDWANA2	360.346	68.273	58.563	2	1.0000
411	PURANA_2	1159	PURNGH1	135.658	36.939	44.561	2	1.0000
157	SHAHPU_2	2107	SHAHPRA1	108.118	32.858	57.364	2	1.0000
24	KOTPUT_4	126	KOTPUT42	290.131	88.649	47.621	2	1.0000
106	BANSUR_2	2106	BANSUR	51.481	14.811	54.428	1	1.0000
104	CHOPANK2	1185	CHOPAN21	51.945	19.345	54.868	1	1.0000
107	NEEMKA2	2363	NEENKA21	50.282	18.647	54.416	1	1.0000
38	BHL_765	3	BHL_74	923.291	-58.133	62.175	1	1.0000
54	ALWAR_4	108	ALWAR_42	315.772	102.014	51.817	2	1.0000
5	RAPP_CD4	79	RAPP_DG	-626.921	33.915	72.029	1	1.0000
1	KEWAI_7	90	KEWAI_G	-656.647	100.800	86.387	2	1.0000
269	NWALGAR2	1186	NWALG21	116.617	35.291	63.402	2	1.0000
259	KUCHERA2	1496	KUCHERA1	66.000	25.233	72.176	1	1.0000
55	JODP_74	307	JOD_72	240.443	83.545	40.069	2	1.0000
3	BHL_74	211	BHL_72	390.161	47.096	62.648	2	1.0000
8	CHABRA_4	86	CHABR_G2	-657.440	166.339	77.759	1	1.0000
2	CHABR_R7	29	CHABR_R4	-1098.786	108.922	35.827	2	1.0000
69	JJN_7	252	JJN_42	443.209	174.439	50.401	3	1.0000
59	STPS_765	88	STPS_G3	-1315.377	206.194	50.938	3	1.0000
59	STPS_765	51	STPS4	462.529	83.489	30.568	1	1.0000
58	NAGAUR_4	265	NAGAUR42	205.838	99.978	36.248	2	1.0000
72	UDAIP_4	234	UDAIP_42	394.531	139.810	67.920	2	1.0000
32	BANS_765	89	BANSWA_G	-1312.808	65.942	77.782	2	1.0000
109	BUNDI_2	2162	BUNDI	112.327	38.551	40.113	3	1.0000

Number of transformers : 163

Annexure-IV

Meeting convened by Member (PS), CEA on 18.05.2009 to discuss the issues relating to the evacuation system from Budhil HEP (70 MW) in Himachal Pradesh

List of participants

Name	Designation
CEA	
1. Sh. V. Ramakrishna	Member (PS)
2. Sh. Ravinder	Chief Engineer (SP&PA)
3. Sh. Naresh Bhandari	Director (SP&PA)
HPPTCL	
Sh. H.S. Beshtoo	General Manager
Powergrid	
Sh. Mukesh Khanna	Chief Design Engineer (Engg.-SEF)
JSW Energy	
1. Satish Jindal	Sr. Vice President
2. Manoj Rastogi	Deputy General Manager
Lanco Green Power Private Limited	
1. RRS Manian	Vice President (E&M)
2. TR Sharma	General Manager (E)

Summary Record of discussion held in a meeting convened by Member (PS), CEA on 18.05.2009 to discuss the issues relating to the evacuation system from Budhil HEP (70 MW) in Himachal Pradesh

List of the participants is enclosed as Annexure.

1. Member (PS), CEA welcomed the participants. Giving background of the issue, he informed that CEA has prepared a Master plan of transmission for evacuation of power from power projects in Himachal Pradesh (HP). This plan was prepared in consultation with HPSEB as per the discussions held in the meeting convened by Chief Secretary, HP Govt. under the direction of Hon'ble High Court of HP and the same has been uploaded on the website of CEA. The plan developed way back in July 2007 has been discussed with all the beneficiaries of Northern Region in the Standing Committee and agreed to. As per the plan, power from projects proposed to be built on Ravi Basin was to be pooled at 220 kV pooling station, to be developed by HPSEB and now Himachal Pradesh Power Transmission Corporation Limited (HPPTCL) in the time frame. However, the pooling station has not been developed by HPPTCL so far.

2. Budhil HEP (70 MW) being developed by M/s Lanco Green Power Private Limited (LGPPL) is in advance stage of construction and expected to be commissioned by June 2010. Lanco GPPL have applied to HP Govt. for forest clearance. It was understood that Forest Department has referred the matter to HPPTCL to certify optimum utilization of transmission corridor. It was understood that HPPTCL has revised the Master Plan without consulting CEA. It was proposed that Lanco GPPL would construct 220 kV S/C line with zebra conductor between Budhil HEP and Chamera III as an interim arrangement. After commissioning of Pooling station at Lahal this line is proposed be taken over or dismantled by HPPTCL on mutually agreed terms and Lanco GPPL would have to construct another transmission line i.e. 220 kV D/C line from Budhil HEP to Lahal pooling station. Further, against two 220 kV D/C lines between HP's pooling station and Chamera II pooling station to evacuate about 1000 MW of hydro generation capacity as proposed in the Master Plan, HPPTCL in its revised plan has considered one 220 kV D/C line.

3. Member (PS) observed that the Master Plan should not have been revised unilaterally and further the proposed arrangement was not adequate to evacuate the power as per planning criteria. Shri Bheshtoo, GM, HPPTCL referred to the discussion held between Managing Director, HPPTCL and Member (PS), CEA. Shri Bheshtoo also referred to correspondence received from forest department regarding conservation of ROW. Member (PS) stated that MD, HPPTCL did discuss some temporary arrangement for evacuation of power from Budhil HEP which CEA took as HP's internal matter. MD, HPPTCL never referred to modification of Master plan.

4. Further, Shri Bheshtoo was advised that as the Master Plan was finalized in consultation with HPSEB and HP Govt., in case any reference is received from the forest department regarding optimization of ROW, the reference should be replied suitably and CEA should be consulted before reviewing the Master Plan. Shri Bheshtoo said that Forest Department has suggested to raise the voltage level from 220 kV to 400 kV to reduce the number of corridors. Member (PS), CEA observed that any suggestion by the Forest Department which result in modification of Master Plan should be discussed with CEA and in the Standing Committee.

5. Due to urgency of the matter and to avoid bottling up of generation at Budhil HEP, following decisions were taken:

(i) Lanco GPPL may preferably LILO circuit of 220 kV D/C Chamera II – Chamera III line being constructed by PGCIL at their generating station as only one bay at Chamera III was available. With this, the final configuration for Budhil HEP would be 220 kV S/C Budhil-Chamera III & 220 kV S/C Budhil-Chamera II. This arrangement would provide reliability. The other option is to construct 220 kV S/C (zebra conductor) from Budhil HEP to Chamera III but this alternative suffers from loss of reliability in case of outage of the line and may result into bottling of generation at Budhil HEP. It was for Lanco GPPL to decide which alternative to adopt after weighing the risks. In either option, Budhil HEP would be connected to Chamera III by

dedicated 220 kV link. However, constructing S/C line would be suboptimal from ROW consideration.

(ii) It was decided that Pooling station at Lahal may be constructed as 400/220 GIS substation by HPPTCL. Lahal pooling station would be built by HPPTCL in phased manner in the time frame of remaining future hydro projects at Ravi Basin, namely Bharmour (45 MW), Kugti (45 MW), Hadsar (60 MW), Kutehar (260 MW), Bajoli Holi (200 MW) and Bara Bangal (200 MW). 220 kV portion of the substation would be commissioned first and then 400 kV Lahal-Chamera II Pooling point D/C charged at 220 kV. This would reduce ROW requirement as desired by the Forest Department. The line could be charged to 400 kV with development of upstream hydro projects.

(iii) As Budhil HEP would be connected to Chamera III switchyard, HPPTCL should construct Lahal pooling station in the time frame of Kutehar HEP, being developed by JSW Energy which is likely to be commissioned next. Member (PS) cautioned that if HPPTCL failed to do so then they will again face same problem and this would hamper development of hydro potential in the State.

(iv) Shri Bheshtoo informed that few 33 kV and 11 kV lines have been planned for evacuation of power from few small hydro projects in Ravi Basin. The magnitude of total generation was around 50 MW. Member (PS) stated that matter can not be discussed without full details and he advised that small hydro power should be brought to the nearest pooling station. It would not be optimal to develop a new 220 kV pooling station for such small generation.

(v) CEA observed that in case of connectivity at Chamera III, Lanco GPPL have to only pay the regional transmission charges and losses and therefore pancaking of transmission charges/losses would be avoided.

Lanco GPPL informed that based on earlier proposal they had signed BPTA with Powergrid and PTC. Powergrid agreed to revise the BPTA in light of above.

The meeting ended with thanks to the Chair.

भारत सरकार/Government of India

केन्द्रीय विधुत प्राधिकरनण/Central Electricity Authority

प्रणली आयोजना एवं रीयोजना मूल्यांकनण प्रभाग/SP&PA Division

आर के रम/R.K. Puram

नई दिल्ली/New Delhi -110606

[आई.एस.ओ. : 9001-2000]

संखया/No. 8/14/SP&PA-08/ दिनांक/Date: 20-MAY-2009

1. ED (Engg.) POWERGRID , Saudamini, Plot No. 2 Sector - 29, Gurgaon - 122 001. Fax: 95124 - 2571932	2. Managing Director Himachal Power Transmission Co. Ltd., Barobalia House, Khalini Shimla – 2 Fax: 0177-2626284
3. Vice President-E&M Lanco Green Power Pvt. Ltd. Plot No. 397, Phase-III, Udyog Vihar, Gurgaon-122 016 Haryana Fax- 95124-4741400	4. General Manager-Energy, JSW Energy Limited, The Enclave, New Prabhadevi Road, Opp Appasaheb Maratha Marg, Prabhadevi, Mumbai-400 025 Fax 022-24238393

Subject: Meeting convened by Member (PS), CEA on 18.05.2009 to discuss the issues relating to the evacuation system from Budhil HEP (70 MW) in Himachal Pradesh

Sir,

Please find enclosed the minutes of the Meeting taken by Member (PS), CEA on 18.05.2009 at 1100 hours in his office to discuss the issues relating to the evacuation system from Budhil HEP (70 MW). This is for kind information and further necessary action at your end.

Encl: as above

(Naresh Bhandari)
Director