

Agenda note for 27th meeting of the Standing Committee on Power System Planning of Northern Region

1. Confirmation of minutes of 26th meeting held on 13.10.2008.

1.1 Minutes of 26th meeting was circulated vide letters dated 27.10.2008 and subsequently, corrigendum were issued vide CEA letter dated 12.11.08. The updated portion of the MoM indicating the corrigendum is enclosed.

The MOM of 26th meeting with the corrigendum as issued may be confirmed.

2. Status of Projects approved in the SCM/RPC:

PGCIL may furnish the status of various transmission projects agreed in the earlier meeting of Standing Committees /Regional Power Committees

3. System Strengthening scheme in Punjab

3.1 PSEB has indicated additional bays requirement at various 400 kV regional S/S located in Punjab, in line with the decision taken in the 23rd Standing Committee Meeting of Northern region held on 16.02.08. In the meeting, 6 nos. of 220 kV bays to be provided with 2x315MVA transformer and 4 nos. of 220 kV bays with 500 MVA transformer were agreed. PSEB have now proposed for augmentation of 220 kV bays at the following locations:-

Sl. No.	Name of the Substation	Existing/proposed T/F capacity	Existing 220 kV bays (nos.)	Required 220 kV bays as per decision in 23 rd SCM (nos.)	No. of additional bays required	Remarks
1	400 kV S/S Patiala	2x315 MVA, 400/220 kV	4	6	2	Additional 2 nos. 220 kV bays are required for connecting proposed 220 kV Nabha S/S
2	400 kV S/S Malerkotla	2x315 MVA (Existing) 1x500 MVA (proposed)	4	6+3 = 9	5	Provision of additional bays be made for future load growth

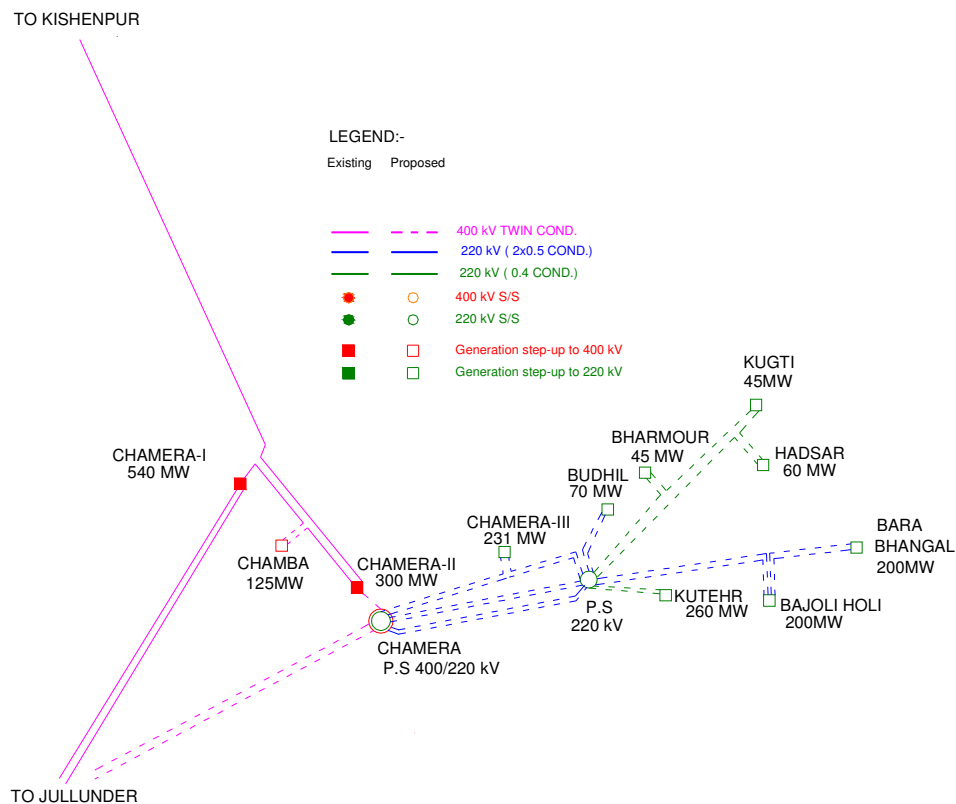
3	400 kV S/S Moga	4x250 MVA	6	6+2= 8	2	Provision of additional bays be made for future load growth
4	400 kV S/S Jalandhar	2x315 MVA	6	6	2*	* Additional 2 nos. 220 kV bays are required for connecting proposed 220 kV S/S Kapurthala
5	400 kV S/S Amritsar	2x315 MVA	2	6	4	2 nos. 220 kV bays are immediately required for connecting it with existing 220 kV S/S Khassa & remaining 2 nos. bays are required for the future load growth
6	400 kV S/S Ludhiana	2x315 MVA (Existing) 2x315 MVA (proposed)	6	6+4 = 10	4	2 nos. 220 kV bays are required for connecting proposed 220 kV S/S Doraha whereas 2 nos. bays may be kept for the future load growth

Members of the Committee may discuss and approve.

4. Evacuation of power from Kutehr HEP (260 MW) in the upstream of Chamera III HEP

4.1 In the 23rd Meeting of the Standing Committee for planning of transmission system in NR, it was decided 9.9(7) of 23rd MoM) that in phased development, pooling station upstream of Chamera-III would be constructed

by PGCIL as a regional pooling station with transmission charges recovered through pooled recovery method. On creation of this new regional pooling station, transmission charges for the section between the new pooling station and Chamera-III LILO point of 220kV line of Budhil would also become part of regional system. All future hydro generation projects in Rabi like Kutehr (260MW), Bajoli Holi (200MW), Bara Bangal (200MW), Bharmor (45MW) and Kugti (45MW) would terminate their 220kV/132 kV lines from their projects to this pooling station. Beyond this pooling station, more 220kV D/C lines towards Chamera-II pooling station shall be planned as and when required. For evacuation of power from Rabi basin projects in H.P a Master plan was evolved by CEA in consultation with HPSEB (the same is available in CEA website) and is as under:



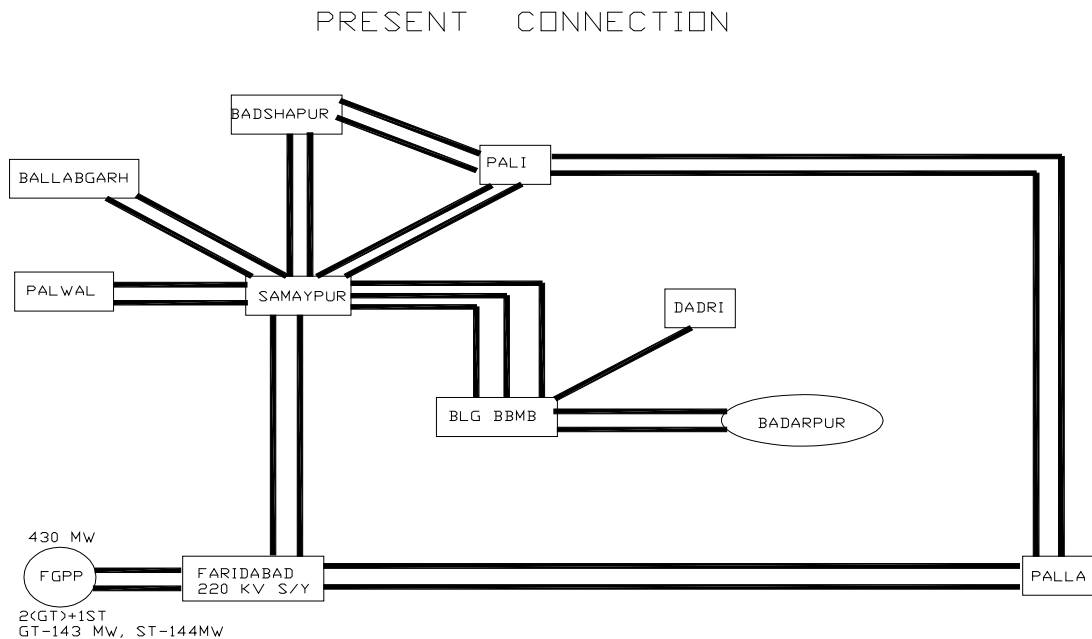
4.2 M/s JSW energy Ltd. the developer of Kuther HEP(260 MW) vide their letter dated 20th January, 2009 have indicated that Govt. of Himachal Pradesh have been allocated the project to them on BOOT basis and they have also signed an Pre-implementation agreement with them. They have requested to identify the location of the pooling station upstream of Chamera

III so that they can construct their line up to the pooling station for evacuation of their power. As such in line with the decision taken in the 23rd SCM, the committee may concur the construction of the following system as a part Regional transmission system.

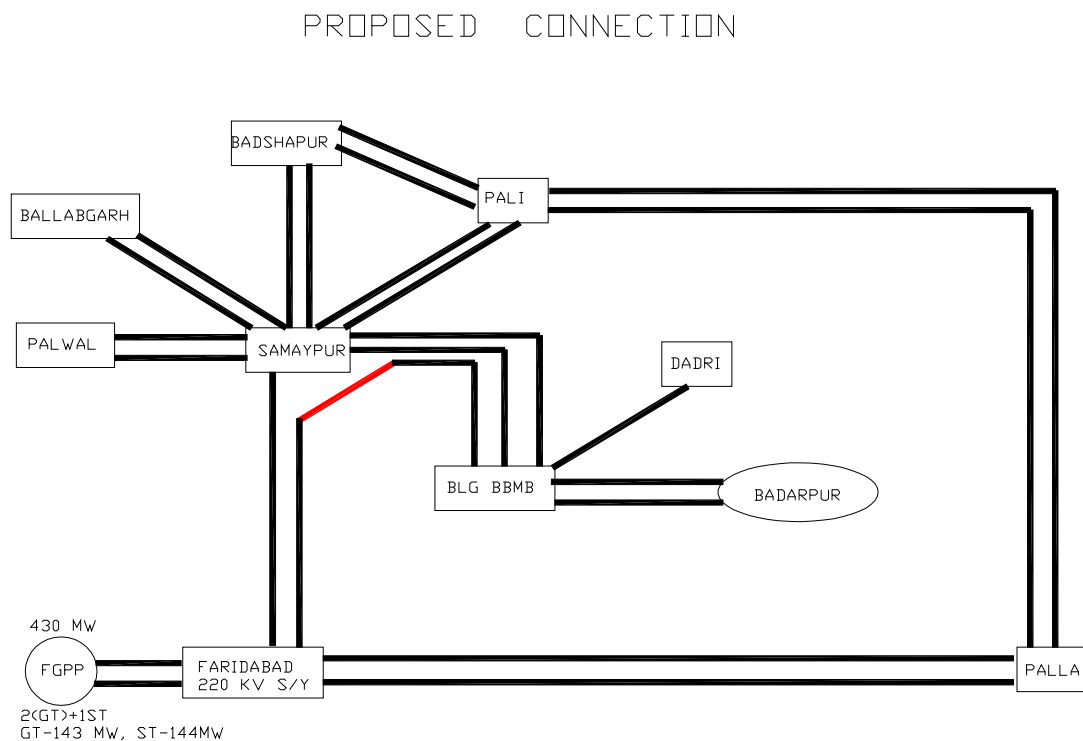
- Creation of 220/132 kV Pooling Station upstream of Chamera III
- 220 kV D/C line (twin Moose or equivalent) from the pooling station to Pooling Station near Chamera II
- Addition of two nos. of 220 kV bay each at Chamera II PS and 220/132 kV Pooling Station upstream of Chamera III

5. Modification of 220 kV transmission line from NTPC Faridabad to Samaypur sub- Station of BBMB – Regarding power evacuation constraint.

5.1 NTPC have indicated that the evacuation from their Faridabad CCGT (430 MW) is at 220 kV. There are 2 nos. of 220 kV D/C, one D/C towards 220 kV Samaypur S/S of BBMB and other towards 220 kV Palla S/S of HVPNL emanating from the Faridabad 220 kV switchyard. The line diagram of the existing system from and around Faridabad GPP is as under:



NTPC has indicated that their Faridabad GPP has witnessed several total station blackout on account of major failure at Samaypur S/S, when the only load center connected to their station i.e. 220 kV Palla, is inadequate because further dispersal from Palla is also through Samaypur. In view of this, they have proposed that one of the 220 kV Samaypur- Ballabgarh line be bypassed Samaypur and connected directly to one of the 220 kV Faridabad - Samaypur line, thus creating an alternative route for power evacuation from Faridabad GPP. The proposal indicated by NTPC is as under:



With this, besides having an alternate route for Faridabad power, there would be two nos. of 220 spare bays made available at Faridabad. NTPC has mentioned that the issue was deliberated in the 26th OCC meeting of NRPC, wherein it was referred to Standing Committee. Since the matter relates to enhancing the reliability of power evacuation from a central sector projects so the issue is put up to the committee for approval.

Members may discuss and concur.

6. System strengthening of Haryana

6.1 Temporary arrangement for LILO of Moga – Hissar at Rajiv Gandhi TPS (Khedar) for Testing & commissioning power

6.1.1 HVPNL indicated that Rajiv Gandhi Thermal Power Project (Khedar) at Hissar with installed capacity of 2x600 MW is at advanced stage and one unit will be commissioned three months ahead of schedule i.e. in September 2009. The 400 kV transmission system associated with RGTPP comprises 400 kV RGTPP – Kirori (HVPNL) D/C line and 400 kV RGTPP – Nuhiyawali (Sirsa) (HVPNL) D/C line with LILO of one circuit at Fatehabad (PGCIL). This was decided in 22nd and 23rd meeting of standing committee meeting of power system planning. This system will not be matched with the revised schedule of RGTPP (Khedar).

6.1.2 HVPNL requested that a temporary arrangement for energization of 400kV switchyard at RGTPP can be made by looping in and looping out of one circuit of existing Powergrid's 400kV Hisar – Moga D/C line which is passing at about ½ km distance from said plant.

6.2 Feeding arrangement for 400 kV substation Nawada

6.2.1 HVPNL requested for the change of the feeding arrangement for Nawada 400 kV substation. Earlier, in the 23rd meeting of the standing committee on transmission planning of Northern Region, it was decided that 400 kV Nawada substation will be created by Haryana by LILO of 400 kV G. Noida – Samaypur S/C line. In the 26th meeting of standing committee it was deliberated that to keep short circuit level in limit, Dadri - G.Noida/Maharani Bagh – Nawada –Samaypur 400 kV to be kept open from Delhi ring at samaypur.

HVPNL has raised concern that 400kV substation at Nawada and Maharani Bagh will become radial after opening of Dadri-G. Noida/M.Bagh – Nawada – Samaypur line at Samaypur which causes reliability problem. HVPNL

suggested that Nawada – Samaypur and Maharani Bagh – Samaypur line sections at Samaypur may be solidly joined after opening of these lines at Samaypur. Thus, a new ring comprising Dadri – G.Noida – Maharani Bagh – Nawada – Dadri 400 kV S/C line shall be formed.

Members may discuss both of the above proposals and concur.

7.0 Augmentation of Transformation Capacity at Maharani Bagh Substation

7.1 400/220 kV substation at Maharani Bagh was established under Tala project as an associated system for absorption of power in Delhi system. The substation has been planned with 4x315 MVA 400/220 kV ICTs. Against this, the substation has at present only 2x315 MVA 400/220 kV ICTs. With increase in loading, it proposed that the transformation capacity by 2x315 MVA 400/220 kV ICTs at Maharani Bagh substation may be augmented under Regional transmission projects, to cater to increasing load.

Members may discuss.

Following agenda points have been furnished by Powergrid

8.0 Transfer of Power from Lucknow 765/400 kV substation towards Western part of Northern Grid

8.1 To facilitate import of power from Eastern Region to Northern following transmission lines are existing / under implementation for injection of power at Lucknow:

1. Gorakhpur – Lucknow 400 kV 2 * D/c (one D/c existing & another D/c under implementation)
2. Balia – Lucknow 400 kV D/c with Series Compensation (Existing)
3. Balia – Lucknow 765 kV S/c (under implementation with DVC scheme)

In addition to above one more Balia – Lucknow 765 kV S/c line is being planned during Tillaiya time frame.

8.2 However, for transfer of power beyond Lucknow, presently there is only one 400 kV D/c and 400 kV one S/c line, towards Bareilly. For transfer of power beyond Lucknow, 2 no. of 765 kV lines has been planned i.e. one with NKSTPP and other with Tillaya, Barh-II & Nabinagar. A schematic diagram of Lucknow area is enclosed at **Annexure-I**.

8.3 From the above it may be seen that for injection of power at Lucknow (PG) there are six number of 400 kV line and one no of 765 kV line which are existing / under implementation, whereas for transfer of power beyond Lucknow, lines would be available at much later stage. It has been observed from the studies that till the time Lucknow – Bareilly - Meerut 765kV circuit is implemented, there would be evacuation constraints for transfer of power from Lucknow.

8.4 In this regard, studies have been carried out for two scenarios i.e. 2011-12 and 2014-15. Load flow study results for 2011-12 scenario for the above are enclosed at:

- | | |
|--|-------------------|
| ➤ Without any strengthening beyond Lucknow | Exhibit-1 |
| ➤ Outage of one ckt of Lucknow – Bareilly 400 kV | Exhibit-1A |
| ➤ Outage of one ckt of Bareilly –Meerut 400 kV | Exhibit-1B |

8.5 From the above it may be seen that under the outage of one ckt of Bareilly – Meerut 400 kV D/c line, the other ckt gets loaded to 906 MW and Bareilly – Moradabad is loaded to 657 MW each ckt. Hence, strengthening is required in this corridor in this time frame. For transfer of power from Lucknow, Lucknow-Bareilly 765 kV S/c line has been considered and study results are enclosed at **Exhibit-2**. For transfer of power beyond Bareilly, two options have been studied i.e. at 765 kV level and at 400 kV level. Study results with the two options are enclosed at

Option-1

- Bareilly – Meerut 765 kV S/c **Exhibit-3**
- Outage of one ckt of Bareilly – Moradabad 400 kV line **Exhibit -3A**

Option-2

- Bareilly – Kashipur – Roorkee – Saharanpur 400 kV D/c **Exhibit-4**
- Outage of one ckt of Bareilly – Meerut 400 kV D/c line **Exhibit -4A**

From the study results it may be seen that even with Bareilly – Meerut 765 kV S/c line the loading on 400 kV parallel lines is on the higher side (**ref Exhibit-3 & 3A**), which gets relived with the provision of above mentioned 400 kV corridor (**ref Exhibit-4 & 4A**).

8.6 Studies were also carried out to ascertain whether 400 kV corridor is required up to Saharanpur or can it limited up to Roorkee. The results are indicated at **Exhibit 5**. It may be seen that in case the 400 kV corridor is limited to Roorkee then the loading on 400 kV Bareilly – Meerut D/c line has gone up to 1450 MW which is critical. Under these conditions, outage of one circuit of Bareilly – Meerut D/c line, the loading on other circuit reaches 930 MW (**Exhibit 5A**). This substantiates the need for 400 kV corridor up to Saharanpur i.e. 400 kV Bareilly-Kashipur-Roorkee-Saharanpur D/c line.

8.7 Studies were repeated for 2014-15 with the provision of Balia-Lucknow-Bareilly 765 kV 2xS/c lines, without considering 400 kV corridor. The study results are enclosed at

With Lucknow - Bareilly 765 kV 2xS/C & Bareilly - Meerut 765 S/c **Exhibit-6**
Outage of one ckt of Bareilly – Meerut 400 kV **Exhibit-6A**

From the above it may be seen that under the outage of one ckt of Bareilly – Meerut 400 kV line the other ckt gets loaded to 776 MW in the same corridor. Therefore studies were repeated with Bareilly – Kashipur – Roorkee – Saharanpur 400 kV D/c line corridor. Study results are for base case is enclosed at **Exhibit-7** and outage of one ckt of Bareilly – Meerut is enclosed at **Exhibit-7A**. Power flow is within limit under base case as well as during

contingency. This indicates that with 400 kV corridor as stated above the 2nd 765 kV ckt from Bareilly to Meerut which has been planned with Tillya may be deferred for implementation at a later date and linked to future generation projects.

8.8 Keeping above in view it is proposed that the following scheme may be taken up on priority as **Northern Region System Strengthening -XXI**:

- Lucknow - Bareilly 765 kV S/c line (already agreed and approved)
- Bareilly – Kashipur – Roorkee – Saharanpur 400 kV D/c.
- Establishment of 2x1500 MVA, 765/400 kV substation at Bareilly

Members may discuss.

9.0 Tehri PSP Transmission System

9.1 It may be recalled that the transmission system to be associated with Tehri PSP was discussed and agreed during the 18th Standing Committee Meeting of Northern Region Transmission Planning held on 06/06/2005 and following transmission system was agreed:

- Tehri Generation – Tehri Pooling Stn. 400 kV (Quad Conductor)
- LILO of Bareilly – Mandaula 400 kV D/c at Meerut
- Charging of Tehri Pooling – Meerut line at 765 kV by establishment of 765/400 kV, 3x1500 MVA substations at Tehri Pool & Meerut. Due to Space constraints, Tehri Pooling station would be GIS.
- Modification of Series Capacitors for operation at 765 kV level

9.2 Out of the above transmission system, following transmission elements have been agreed as a part of System Strengthening in Central Part of Northern region during the 26th Standing Committee Meeting:

- LILO of Bareilly – Mandaula 400 kV D/c at Meerut
- Charging of Meerut substation at 765 kV level with 2x1500 MVA transformation capacity

9.3 Keeping above in view following transmission system is proposed to be taken up with Tehri PSP:

- Tehri Generation – Tehri Pooling Strn. 400 kV (Quad Conductor)
- Establishment of 765/400 kV, 3x1500 MVA GIS substation at Tehri Pool
- Augmentation of 765/400 transformation capacity by 1x1500 MVA
- Charging of Tehri Pooling – Meerut line at 765 kV level
- Modification of Series Capacitors for operation at 765 kV level

Members may discuss.

10. Establishment of Samba 400/220 kV Substation in J&K and Provision of Second 400 kV S/c for Reliable evacuation of Power from Dulhasti

10.1 The establishment of 2x315MVA, 400/220 kV substation at Samba in Jammu region was agreed in the 26th Standing Committee meeting of Northern Region Transmission Planning, however 400 kV connectivity was to be decided after a survey. Based on the information from site it is to inform that Samba is situated in south of Kishenpur substation at a distance of about 35 km. Keeping this in view it is proposed that connectivity to Samba may be provided with Kishenpur – Samba 400 kV D/c line.

10.2 Further, it is to mention that the issue of provision of 2nd 400 kV outlet from Dulhasti was discussed in the 23rd Standing Committee of Northern Region Transmission planning. During the meeting it was proposed to link the 2nd 400 kV circuit from Dulhasti with Ramban. However, it appears that Ramban substation would come up at a much later stage and therefore it is proposed that the 2nd 400 kV outlet from Dulhasti may be planned towards Samba.

10.3 Keeping above in view following transmission scheme is proposed:

- Establishment of 2x315 MVA, 400/220 kV substation at Samba
- Kishenpur – Samba 400 kV D/c line
- Dulhasti – Samba 400 kV S/c line

Members may discuss.

11. Augmentation of Transformation Capacity at Bahadurgarh and Lucknow

11.1 400/220 kV substations at Lucknow & Bahadurgarh were established with Tala Main and Tala Supplementary transmission Schemes respectively. At both these substations only 1x315 MVA ICTs at 400/220 kV level were provided and with the outage of this single ICT, the 220 kV connectivity with 400 kV bus is lost. Accordingly to provide the reliability at these substations it is proposed to augment the transformation capacity at both these substations. Accordingly following transmission elements are proposed under the scheme:

- Augmentation of 400/220 kV transformation capacity by 1x315 MVA at Lucknow with 2 nos. of 220 kV line bays
- Augmentation of 400/220 kV transformation capacity by 1x315 MVA at Bahadurgarh with 2 nos. of 220 kV line bays

Members may discuss.

12. Transmission System in Haryana – Reg connectivity with HVDC Bipole Terminal at Mohindergarh

12.1 The following connectivity at Mohindergarh HVDC bipole was discussed and agreed in the 26th Standing Committee Meeting of Northern Region Transmission Planning:

- LILO of the one circuit of Bhiwadi – Moga 400 kV D/c line at Mohindergarh HVPNL and LILO of other circuit of Bhiwadi – Moga 400 kV D/c line at Mohindergarh HVDC terminal of Adani
- Mohindergarh HVDC Terminal – Mohindergarh HVPNL 400 kV D/c (Triple)

12.2 The proposals were also discussed in the NRPC meeting held at Sariska, Alwar on 6.1.2009 subject to some conditions regarding provision of special protection scheme in the event of contingency.

12.3 The above network configuration was revisited as with the above arrangement two HVDC terminals i.e. at Bhiwadi & Mohindergarh would come in close proximity / direct connectivity which may cause interaction and control problems while operation. With such close proximity fault on the DC system in the vicinity, any of these terminals may trigger problem at other HVDC station.

12.4 In order to avoid direct connectivity of Mohindergarh with Bhiwadi, it is now proposed that instead of above mentioned both the LILO arrangement, a 400 kV D/c line from Mohindergarh to Bhiwani 765/400 kV substation can be considered. Bhiwani is further connected to Moga, Meerut and Jhatikalan by 765 S/c kV lines which can be used for delivery of power to other states.

12.5 Accordingly following is proposed:

- Mohindergarh HVDC Terminal – Mohindergarh HVPNL 400 kV D/c (Triple)
- Mohindergarh HVDC Terminal – Bhiwani (new) 400 kV D/c
- Mohindergarh HVPNL – Jhajjar Stage-II (2x660 MW) 400 kV D/c

A schematic diagram giving earlier proposal and revised proposal is enclosed at **Annexure-II (1&2)**.

Members may deliberate on the revised proposal.

13. Sasan / Vindhyachal pool connectivity/ Power evacuation system from Rihand III TPS (2x500 MW)

13.1 NTPC vide letter dated 15.12.08 had informed that fault level of existing 400kV bus at Vindhyachal station would exceed the permissible limits even without its connection with Vindhyachal-IV due to its interconnection with Sasan Generating station through LILO of Vindhyachal-Jabalpur 400kV D/c line at Sasan approved as a part of Sasan generation project. Accordingly, the matter was examined and it is found that in order to reduce the short ckt MVA at Vindhyachal generating station, LILO of Vindhyachal – Jabalpur 400kV D/c line at Sasan may be disconnected at a later date after establishment of

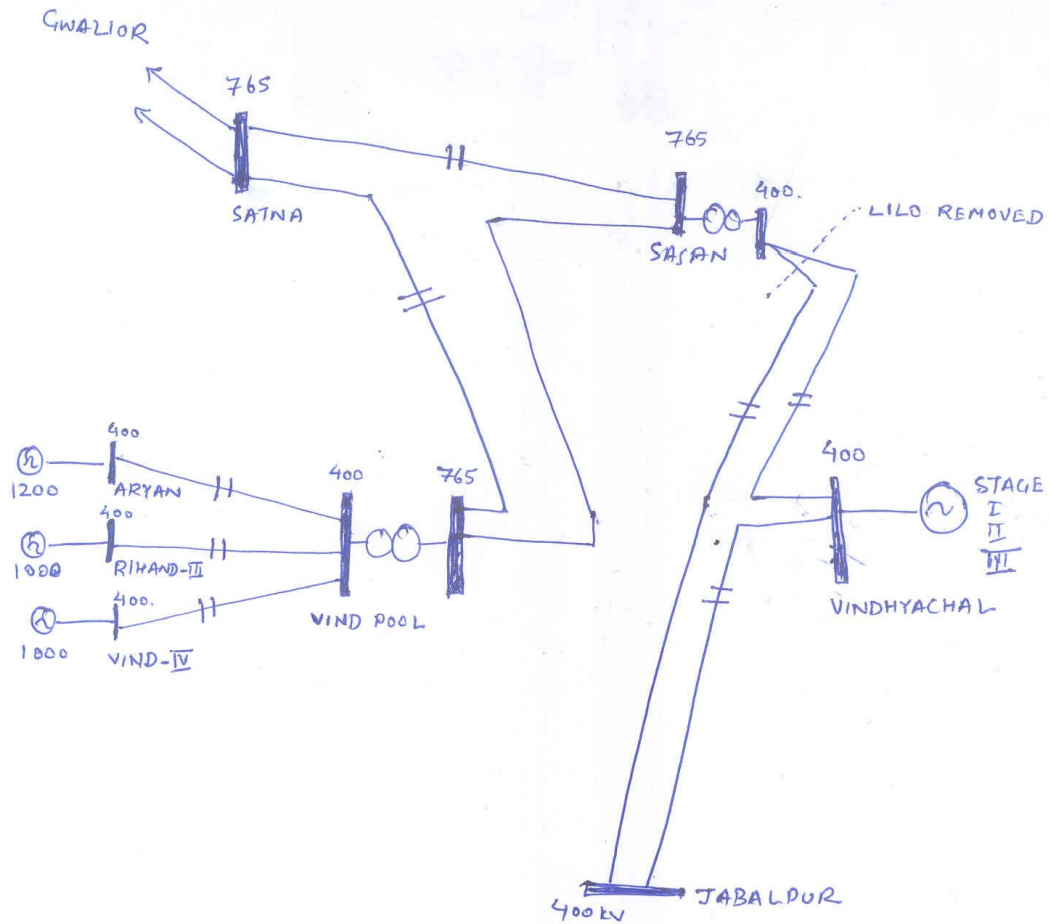
765/400 kV Vindhyachal Pooling station but before commissioning all units. To keep the connectivity of Sasan and Vindhyachal pooling station, Sasan-Vindhyachal pool 765 kV S/C line could be established as a new transmission line.

As per the information available, land for pooling station near to Vindhyachal generating station is not available and Vindhyachal pooling station shall be located at a distance of about 40 to 50 km.

At Vindhyachal pooling point, Rihand-III (1000 MW), Vindhyachal-IV (1000 MW) and Aryan Coal (1200 MW), are presently proposed to be connected. As the generators would be coming in different time frame, the transmission system connected with Vindhyachal pooling station requires to be phased. The following phasing is suggested:

- (i) When the initial unit at Vindhyachal stage-III and Rihand-III generation are commissioned they could be connected to Vindhyachal Pooling point and the Vindhyachal Pooling-Satna-Gwalior 765 kV link is charged at 400 kV level.
- (ii) In this time frame few units at Sasan would only be commissioned and there would not be any short circuit level problems at Vindhachal 400 kV generating bus due to LILO of Vindhyachal- Jabalpur 400 kV D/C at Sasan.
- (iii) When the entire planned generating stations connected to Vindhyachal pooling station are commissioned, at that stage the Vindhyachal Pooling-Satna-Gwalior link can be charged at 765 kV level along with interconnection of Sasan-Vindhyachal 765 kV S/C.
- (iv) After charging at 765 kV level the LILO of Vindhyachal – Jabalpur 400 kV D/C line at Sasan could be disconnected with suitable switching arrangements at Sasan 400 kV switchyard to meet its starting power requirements.

PROPOSED CONNECTIVITY AT VINDHYACHAL POOLING



It needs to be noted that NTPC has proposed interconnection of both 400 kV and 765 kV Vindhyachal pooling point buses with Sasan UMPP 400 kV and 765 kV buses to increase the reliability and redundancy of power evacuation from both the projects.

Members may discuss.

14. Transmission System Associated with the Tilaiya Ultra Mega Power Project (4000 MW), in Jharkhand, Nabinagar (1000MW) of Railways and NTPC, Barh-II (1320 MW), and IPPs in Jharkhand, Orissa, MP, Chattisgarh, and Maharashtra”

A. BACKGROUND:

NTPC have indicated that Rihand III HEP with 2x500 MW would be taken up by them. The first unit has been targeted for commissioning by August 2011 and power from the project would be allocated to Northern region.

Further, POWERGRID has received various long term open access applications for transfer a large quantum of power to Northern Region from various generation projects, located outside the region. As per the information received from the various applicants most of the generation informed to come up progressively in next 3 – 5 years time.

It may be noted that most of the IPPs have not yet firmed up their beneficiaries and also the generation capacity being stated to be implemented for 11th plan / early 12th plan is much in excess of the load demand projected by the state utilities. There are uncertainties in generation addition, therefore, it becomes necessary to implement the transmission system in phased manner.

B. IMPORT OF POWER BY NR

B.1 GENERATION PROJECTS IN EASTERN REGION:

Details of projects in Eastern Region under Central Sector and IPPs who have applied for Long Term Open Access for wheeling of power from their generation projects in Jharkhand, Bihar, Orissa and West Bengal to different beneficiaries is given below.

List of Projects Applied for LTOA upto 2013-14									
Sl no	Projects	Developer/Applicant	Time Frame	Installed Capacity	Capacity for LTOA	Allocation			

						NR	WR	ER	SR	Total
I.	Present Allocation									
1	Present Allocation(from Tala, Chukha, Rangit, Kurichu, Farakka, Kahalgaon-I, Talcher-I)			1400	1400	1089	185.5		125	1400
2	Kahalgaon-II	NTPC	2007-08	1500	1500	513	412	350		1275
3	DVC Projects (Mejia & Chandrapura)	DVC	2007-08	1210	1210	400	400	410		1210
4	Jindal (IPP)	IPP	2007-08	75	75	75				75
			Sub-total	4185	4185	2077	998	760	125	3960
II.	Future Projects									
IIA.	DVC & NTPC Projects									
a.	DVC & Maithon RB Projects									
1	DVC Projects (Mejia, Bokaro, Koderma, Durgapur, Raghunathpur)	DVC	2010	4700	4700	2900	100	1700		4700
2	Maithon-RB	JV (DVC-TATA)	2009-10	1000	900	600		300		900
b.	NTPC Projects									0
1	Barh-I	NTPC	2010	1980	1980	745	776	290		1811
2	Barh-II	NTPC	2011-12	1320	1320	660	660			1320
3	North Karanpura	NTPC	2011-12	1980	1980	707	726	547		1980
			Sub-total	10980	10880	5612	2262	2837	0	3300
			Total	15165	15065	7689	3260	3597	125	7260
IIB.	Long Term Access Projects									
	Projects in Jharkhand									
1	Chitrapur	Chitrapur Coal & Power Ltd/(Applicant : PTC)	Sep-09	540	480	240	240			480
2	Adhunik	Adhunik Thermal Energy Limited	Mar-11	1005	910	500		350		850
3	Corporate	M/s Corporate Power Limited	Jul-11	660	594	594				594
4	ESSAR	Essar Power (Jharkhand) Ltd.	Oct-11	1800	1650	600	600	450		1650
5	Electrosteel	Electrosteel Thermal Power Ltd.	Dec-11	1200	1100	600	500			1100
6	Tillaiyya UMPP	Jharkhand Integrated Power Ltd.(Tillaiyya)	Jun-12	4000	4000	1700	800	1500		4000
7	Dumka	CESC Ltd.(Dumka)	Jun-12	1200	1080	540	540			1080
8	Dumka	Jindal Power Ltd	Sep-12	2640	2450	1225	612.5			2450
		Subtotal(Jharkhand)		13045	12264	5999	3292.5	2300	0	12204
	Projects in Bihar									
1	Nabinagar	Bhartiya Rail Bijlee Company Ltd	Mar-11	1000	910	60	410	440		910
	Projects in Orissa									
1	Sterlite	Sterlite Energy Ltd	Jun-09	2400	2400	500	500	0		1000
2	GMR	GMR Energy Ltd	Feb-11	1050	1000	350	200	0	175	725
3	Ind-Bharat	Ind Bharat Energies (Utkal)	Dec-10	700	700			700	0	700
4	KVK Neelanchal	KVK Nilachal Power Pvt. Ltd.	Mar-11	600	560	140	140	140	140	560
5	Nav Bharat	Navabharat Power Private Ltd (Phase-I)	Jul-11	1050	720	465	255	0		720
6	Monnet Ispat	Monet Power Company Ltd	Sep-11	1005	900	300	375	225		900
7	Mahanadi Aban	Mahanadi Aban Power Ltd.	Dec-11	1030	1030	0	257.5	257.5	257	772.5
8	Bhushan	Bhushan Energy	Jan-13	2000	2000	880	880	240		
9	Adhunik	Adhunik Power & Natural Resources Limited	Feb-12	1005	900	200	200	350	150	900
10	CESC	CESC Ltd.(Orisssa)	Jun-12	1000	900	450	450			900
11	Visa Power	Visa Power Ltd	Sep-12	1000	1000	250	250			500
12	Lanco Babandh	Lanco Babandh Power Pvt. Ltd	Oct-12	2640	1600	389	1590			1979

13	Essar	Essar Power Ltd.	Oct-12	1200	900	625		0		625
14	Jindal	Jindal India Thermal Power Ltd.	Dec-11	1200	1200	694	350	156		1200
15	Tata#	Tata Power	Dec-12	1000	0					
16	Nav Bharat – II	Navabharat Power Private Ltd(Phase-II)	Apr-13	1200	1100	533	300	277		1110
17	Ib Thermal	OPGCL	Apr-13	1200	600	400	200			600
	# - LTOA expected shortly									
		Subtotal(Orissa)		21280	17510	6176	5947.5	2345.5	722	13192
c.	Projects in Sikkim									
i.	Sikkim HEPs	IPPs	2009-2013	4035	4035	2017.5	2017.5			4035
d.	Projects in West Bengal									
1	Farakka-III	NTPC	Aug-10	500	500	245	205	50		500
2	Haldia	CESC/NPCL (Haldia)	Jun-11	600	550	150		400		550
3	Katwa (1000 MW), Bakreshwar(920 MW), Santaldih(500 MW), Purulia (900 MW)	WBPDC/ Applicant WBSEDCL	Dec-12	2000	2000	1200	800			2000
		Subtotal(West Bengal)		3100	3050	1595	1005	450	0	3050
			Total(ER)	41460	36859	15788	12263	5095.5	723	32481

From the enclosed list it may be seen that at present there is an allocation of about 2077 MW from ER to NR. With the materialization of DVC projects, Barh-I & II and NKSTPP the allocation to Northern region is likely to increase to 7689 MW. The transmission system for Barh-I and DVC is already under implementation, transmission system for NKSTPP has already been planned and transmission system for Barh-II is under planning.

As per the Long term open access applications in Eastern region, power of the order of 15788 MW is for consumption in Northern region. Out of this long term open access for 2643 MW (Chitrapur-240 MW; KVK Neelachal: 140 MW; Sikkim IPPs ; 2018; Farakka-III – 245 MW) has already been discussed and agreed in the earlier meetings with the constituents.

Hence, as per the available information a total of about 23477 MW (Long Term Access: 15788 MW + Present allocation & DVC, Barh NKSTPP: 7689 MW) power is to be transferred from Eastern to Northern region in next 4-5 years.

The generation projects would be coming up in phased manner and accordingly transmission system has also to be constructed in phased manner. Based on the progress of materializing some of the projects within the 11th Plan/ early 12th Plan, priority projects have been identified. List of

such generation projects and quantum of their sought open access for NR is given below:

MW of Open access sought for NR

Jharkhand:

Essar (1800)	600
Corporate (660MW)	594
Electrosteel (1200MW)	600
Adunik(1005MW)	500
DumkaCESC(1200MW)	540
Tillaiya (4000 MW)	1700
<i>Sub total</i>	<i>4534</i>

Bihar

Nabinagar (1000 MW)	60
<i>Sub total</i>	<i>60</i>

Orissa:

Sterlite (2400MW)	500
GMR (1050MW)	350
Monet(1005MW)	300
Jindal (1200MW)	694
Essar (1200MW)	625
Lanco (2640MW)	389
Nav Bharat (1050 MW)	465
<i>Sub total</i>	<i>3323</i>

West Bengal:

WBPDC projects at Katwa(1000MW), Bakareshwar(920MW), Santhaldih(500MW) and PuruliaPSS(900MW) of which they have sought to export 2000MW. In total 1595 MW power transfer to NR from West Bengal projects have been sought. Out of 1595 MW LTOA for Farakka-III for 245 MW has already been granted and system for the balance **1350 MW** is to be evolved.

From the above it may be seen that import by Northern Region from **priority projects** of Eastern Region would be about 9267 MW.

The total import by Northern region considering Central Sector projects, with already granted open access and priority IPPs would be 19599 MW. Out of 19599 MW, transmission system for 9672 MW (7689-660+2643MW) has already been planned and system for balance about 9927 MW is to be planned.

B.2 IMPORT FROM WR

POWERGRID has received applications in WR from various generation developers with about 63160 MW installed capacity seeking Long Term Open Access for transfer of about 53155 MW power from fifty two (52) new generation projects located in WR to different target beneficiaries in Western/Northern/Southern region. Further, CSEB has also applied for Long-term Open Access for transfer of 8500MW power from various proposed generation projects in Chhattisgarh. CSEB has applied for transfer of 8500 MW power, which includes 5800 MW allocation from IPPs, on a/c of first right of refusal (35%) and balance 2700 MW from state sector/JV projects. It is to mention that out of 5800 MW, majority of allocation from IPPs has already been accounted in above projects. Therefore, for transfers only 2700 MW exclusively from CSEB has been considered and allocation to NR(1485 MW) /WR(1215 MW) has been made on pro rata basis Commissioning schedule of the generation projects as per the applications is progressively by end 11th Plan and beyond. Out of transfer requirement of about 53,155 MW, about 34722 MW power is to be drawn by different beneficiaries in Western Region. Northern region has a total allocation of about 16463 MW and balance 1970 MW has been allocated to Southern region target beneficiaries.

The details of the projects to be developed like installed capacity, location of the project, allocation to different target beneficiaries in various regions are as under:

S.No	Project	Distt. Location / Complex	Installed Capacity (MW)	OA Sought (MW)	Target Allocation as per application(MW)			
					WR	NR	SR	TOTAL
1.	Adani Power Ltd.	Gujarat	2640	200	200			200
2.	Maharashtra Energy (Reliance)	Maharashtra	4000	4000	3500		500	4000

S.No	Project	Distt. Location / Complex	Installed Capacity (MW)	OA Sought (MW)	Target Allocation as per application(MW)			
					WR	NR	SR	TOTAL
3.	Jaiprakash Associates	MP	1320	1320	840	480		1320
4.	Today's Home	MP	1200	1000	600	400		1000
5.	Reliance Industries (Shadol)	MP	1050	1050	700	350		1050
6.	Aryan Coal Benefication –III	M.P.	1200	1200	900	300		1200
7.	Adhunik Thermal Energy Ltd.	Chattisgarh	1005	900	630	270		900
8.	AES Chhattisgarh	Chattisgarh	1200	1000	700	300		1000
9.	Aryan Coal St-II	Chattisgarh	1200	1100	550	550		1100
10.	Athena Chhattisgarh Power Pvt. Ltd	Chattisgarh	1320	1220	793	427		1220
11.	BEC Power Pvt. Ltd.	Chattisgarh	505	450	181	269		450
12.	Bharat Aluminium Co. Ltd.	Chattisgarh	1200	600	300	300		600
13.	Bhushan Energy Ltd.	Chattisgarh	1000	1000	625	375		1000
14.	Bhushan Power & Steel Ltd.	Chattisgarh	1000	900	585	315		900
15.	BLA Chhattisgarh	Chattisgarh	600	600	180	420		600
16.	Chambal Infrastructure Ventures Ltd.	Chattisgarh	1200	725	362	363		725
17.	CSEB **	Chattisgarh	2700	2700	1215	1485		2700
18.	DB Power Ltd.	Chattisgarh	1200	1100	750	350		1100
19.	DCM Shriram Consolidate Ltd.	Chattisgarh	600	390	115	275		390
20.	Dheeru (PTC)	Chattisgarh	1050	1050	668	382		1050
21.	Essar Power Chhattisgarh	Chattisgarh	1200	750	330	420		750
22.	GMR Energy	Chattisgarh	1050	1000	700	300		1000
23.	Godawari Power	Chattisgarh	1200	1025	512.5	512.5		1025
24.	Ind Barath energy Ltd.	Chattisgarh	600	552	329	223		552
25.	Indiabulls	Chattisgarh	1320	1320	924	396		1320
26.	Ispat Industries Ltd.	Chattisgarh	1200	650	325	325		650
27.	Jain Energy Ltd.	Chattisgarh	1200	1092	662	430		1092
28.	Jindal India Thermal Power Ltd.	Chattisgarh	1200	1200	810	390		1200
29.	Jindal Power Ltd.	Chattisgarh	2640	2450	950	1300	200	2450
30.	JSW Energy Ltd.	Chattisgarh	1200	800	400	400		800
31.	Karnataka Power	Chattisgarh	1200	1200	360		840	1200
32.	Korba West Power Co. Ltd.	Chattisgarh	700	550	550			550
33.	KSK Energy & Wardha Power	Chattisgarh	3600	3000	3000			3000
34.	KVK Power & Infrastructure Ltd.	Chattisgarh	1320	1200	480	720		1200
35.	Lanco Amarkantak Power Pvt. Ltd. (Lanco-III)	Chattisgarh	1320	1320	1247	73		1320
36.	Mahavir Energy & Coal Benefication	Chattisgarh	60	60	30	30		60
37.	Mahavir Global	Chattisgarh	540	540	270	270		540

S.No	Project	Distt. Location / Complex	Installed Capacity (MW)	OA Sought (MW)	Target Allocation as per application(MW)			
					WR	NR	SR	TOTAL
38.	Maruti CCPL	Chhattisgarh	300	300	222	78		300
39.	Patni Power Projects Pvt. Ltd.	Chattisgarh	540	540	180	180	180	540
40.	Prakash Industries	Chattisgarh	1050	450	350	100		450
41.	RKM Powergen Ltd.	Chattisgarh	1400	900	900			900
42.	Sarda Energy and Minerals Ltd.	Chattisgarh	1200	1080	505	325	250	1080
43.	Shyam Century Infrastructure Ltd	Chattisgarh	1200	1100	550	550		1100
44.	Singhal Energy Ltd.	Chattisgarh	270	155	90	65		155
45.	SKS Ispat & Power Ltd.	Chattisgarh	1200	1092	728	364		1092
46.	Sona Power Pvt. Ltd.	Chattisgarh	600	525	315	210		525
47.	Suryachakara Power Corpn. Ltd.	Chattisgarh	600	552	331.2	220.8		552
48.	Topworth Steels Pvt. Ltd	Chattisgarh	600	354	177	177		354
49.	Torrent Power Ltd.	Chattisgarh	1320	1214	1214			1214
50.	Vandana Global	Chattisgarh	1200	1200	960	240		1200
51.	Vandana Vidyut Ltd.	Chattisgarh	540	265	165	100		265
52.	Videocon Industries Ltd	Chattisgarh	1200	1110	775	335		1110
53.	Visa Power Ltd.	Chattisgarh	1200	1104	986	118		1104
		Total	63160	53155	34722	16463	1970	53155

Out of the above projects, following projects which are on fast track, have already been discussed for grant of Long Term Open Access in Western region meeting:

S.No.	Project	Location	Installed Capacity (MW)	OA Sought (MW)	Target Allocation as per application(MW)			
					WR	NR	SR	TOTAL
1	Jaiprakash Associates	MP	1320	1320	840	480		1320
2	Aryan Coal Benefication -III	M.P.	1200	1200	900	300		1200
3	Dheeru +PTC	Chhattisgarh	1050	1050	668	382		1050
4	Maruti CCPL	Chhattisgarh	300	300	222	78		300
		Total				1240		

As the above projects have already been discussed in WR and have target beneficiaries in NR also, these projects need to be discussed in NR also for before the grant of long term open access. Detailed agenda for these four projects would be put up by CTU

In addition to above, in past other Long term open access applicants have also been granted open access in ISTS. List of IPPs who have been granted LTOA with target allocation to Northern Region is given as under.

S.No.	Open Access Applicant	Location	Capacity (MW)	Target Allocation as per application(MW) to NR
1	Lanco-II (PTC)	Chhattisgarh	300	300
2	Mundra (Tata Power)	Gujarat	4000	1300
3	Sasan (Reliance Power)	MP	3960	2475
4	JSW Energy	Maharashtra	1200	300
		Sub total		4375

Based on the above generation addition programme, it is estimated that about 20838 MW (16463MW+4375 MW) power would be allocated to Northern region from Western region. Out of this Long Term Open Access for 4375 MW has already been granted and transmission system for balance power (about 16463MW) is to be evolved.

Further it is to mention that the generation addition would be in phased manner and transmission system has also to be developed in phased manner. It is assumed that out of about 63,150 MW projects about 10,000 MW capacity shall be materializing in next 4-5 years out of which Northern region shall have a target allocation of about 2600-2700 MW. It is proposed that initially transmission system is planned for transfer of about 4000 MW of power from WR to NR (excluding the project for which LTOA has already been granted) viz about 1240 MW-already discussed in WR and about 2760 MW allocation to NR from new projects.

B.3 IMPORT FROM SOUTHERN REGION

Further, Long Term Open Access applications have also been received from generation developers in Southern Region having target beneficiaries in NR. As per the applications, all such projects are expected to be commissioned progressively in next 3-4 years i.e.by 2011-12 and beyond. List of LTOA applicants located in SR with target beneficiaries in NR is given below.

SL No.	Projects	Developer/Applicant	Time Frame	Installed Capacity	Capacity for LTOA	Target Allocation NR
B	Projects in Southern Region					
1	Krishnapatnam Power Corporation Ltd. (Navyuga)	Krishnapatnam Power Corporation Ltd. (Navyuga)	June, 2011	1860	1860	900
2	Kenita Power Private Ltd.	Kenita Power Private Ltd.	June, 2012	1830	1830	1000
3	GVK Power (Samalkote) Pvt. Ltd.	GVK Power (Samalkote) Pvt. Ltd.	1st Qtr, 2011	1150	1150	450
4	Athena Kakinada Power Private Limited	Athena Kakinada Power Private Limited	Oct- 09	2232	2160	900
5	East Coast Energy Pvt. Ltd.	East Coast Energy Pvt. Ltd.	Oct-10	2640	2640	1100
6	JSW Power Trading Co. Ltd.	JSW Power Trading Co. Ltd.	Jul-10	600	600	300
7	SRM Energy Pvt. Ltd.	SRM Energy Pvt. Ltd.	Dec-12	1800	1665	500
8	Coastal Tamil Nadu Power Ltd.	Coastal Tamil Nadu Power Ltd.	2013-14	4000	4000	500
9	IND-Barath Power (Madras) Ltd.	IND-Barath Power (Madras) Ltd.	Mar-11	1400	945	425
10	Lanco Kondapalli		June 2009	375	350	150
11	Meenakshi		Sept 2010	540	540	170
12	Krishnapatnam (APPDCL)		March 2012	1860	1860	175
			Total			6670

In addition LTOA for 100 MW for transfer of power from Nagarjuna constructions to Punjab has already been granted.

Out of the above some of the projects have requested to put their LTOA applications on hold, so the capacity equivalent to 1350 MW to NR is not to be considered for the time being.

Detailed agenda for import of power by NR from SR for LTOA projects would be put up by CTU.

B.4 TOTAL IMPORT BY NORTHERN REGION

From the above following may be summarized:

	TOTAL Transfer Targeted (MW)	Envisaged transfer in next 4-5 years (MW)	Capacity Already planned / LTOA Granted (MW)	To be planned (first phase) (MW)
ER	23477	19599	9672	9927
WR	20838	8375	4375	4000

SR	6770	5420	100	5320
TOTAL	51085	33394	14147	19247

In addition to above it is envisaged that about **3650 MW** power (including share from Lower Subansiri, Kameng and target allocation from Open Access Projects) shall be transferred to Northern Region from North-eastern region.

From the above it may be seen that there would be a total allocation of about 37044 MW to Northern region from other regions considering allocation from Central Sector projects, allocation from already granted LTOA projects and target allocation from new LTOA priority projects. Further, considering the availability of 85 %, the total import to Northern Region would be about 31488 MW, out of which 16360 MW is the additional power likely to flow to Northern region.

Further it is also to mention that Rihand-III transmission system is also being planned via WR, hence the total additional power transfer to NR would be about 17360 MW.

C. POWER SUPPLY SCENARIO IN NORTHERN REGION

The total load of Northern region for 2014-15 conditions as per 17th EPS is 62800 MW. The installed capacity within Northern region is expected to be about 61300 MW. Considering an availability of 70% from old generation projects & 80% from new generation projects, the availability within Northern region comes to about 46600 MW. From this it may be seen that there would be a power shortage of about 16000 MW in NR. From the above it was indicated that about 32100 MW power is likely to flow to NR.

Considering the high availability in Northern region, an enhanced load equivalent to about 78,700 MW has been assumed in NR.

D. APPROACH FOR THE SYSTEM STUDY

D.1 Development of Pooling Point Substations

There is a large concentration of generations at various locations especially in Orissa and Chattisgarh. It may be observed that large quantum of power is concentrated at these locations/complexes and this would require high capacity transmission lines as well as high capacity pooling stations to facilitate transmission of power towards load centers/target beneficiaries. However, in view of the huge generation capacity proposed and in order to limit the short circuit level of these pooling stations, it would be prudent to develop different smaller pooling stations in the same generation complex connecting to main pooling station or there could be bus split arrangement in a large single pooling station in which different bus sections could normally operate in isolation to each other so that they do not contribute short circuit currents in the event of fault conditions but bus sections could be closed in case of exigencies. Further, due to limitation in short circuit capacity of the pooling station, it is proposed that dedicated transmission system interconnecting the project with pooling station should be injecting power at pooling station on different voltage levels like 765kV and 400kV so that short circuit capacity of one voltage level bus say at 400kV or 765kV level does not cross the designed limits.

D.2 Planning with 'N-0' Redundancy

It is to mention that most of the IPPs are yet to firm up their beneficiaries. In addition, as mentioned earlier, the generation capacity being stated to be planned for commissioning by end of 11th Plan/early 12th Plan is much in excess of load demand projected by the state utilities even considering accelerated load growth. In view of this, it would be prudent to evolve optimal transmission system which would provide basic system for connectivity and onward transmission through the main identified corridor. This transmission system could be augmented depending upon actual generation addition programme. Keeping in view the fact that the power that would flow on these

transmission corridors is yet to be tied-up through PPAs/firm allocation and also, there could always be some delays in such an ambitious capacity addition programme, it would be prudent to consider only 'N-0' redundancy approach at this stage, instead of conventional 'N-1' redundancy approach so as to optimize the investment in transmission and avoid the problems associated with over provisioning of the transmission system.

D.3 Planning for Dedicated Transmission System

The dedicated transmission system from various IPP projects to different pooling stations will be under the scope of the respective generation developer which shall be built, owned and operated by him. Optimal planning of these transmission corridors would result into better utilization of Right of way, as well as saving in cost of the dedicated transmission system.

D.4 Planning for Main Transmission Corridors

Considering the quantum of power flow, distance from the load centres and Right of Way constraints, it is considered prudent to develop high capacity transmission system which can be developed in phases.

E. SYSTEM STUDIES

With the above transmission system and load generation scenario detailed system studies have been carried out. Results of studies for Northern Region are enclosed at **Exhibit-I**. Based on the studies transmission system has been identified and transmission system strengthening scheme for transfer of power from each of the projects has been identified and categorized into three (3) parts i.e.,

- (i) system required exclusively for a specific generation project(immediate evacuation system),
- (ii) common purpose transmission system for WR/NR and
- (iii) System strengthening within NR.

The proposed transmission system is given in following paragraphs.

F PROPOSED TRANSMISSION SYSTEM

F.1 Generation Specific Transmission System

Following transmission system has been proposed for immediate connectivity / evacuation of the power from Central sector / IPP projects. Here it is to mention that NTPC has proposed **augmentation of Rihand generation project** by 1000 MW. Power from the project shall be mainly utilized by Northern region beneficiaries and project is likely to be commissioned by Sept 2011. Evacuation from Rihand-III has also been considered while evolving the transmission system for various other generation projects coming up in Eastern and Western regions.

F.11 RIHAND-III (1000 MW) Transmission System

NTPC have indicated that Rihand III HEP with 2x500 MW would be taken up by them. The first unit has been targeted for commissioning by August 2011. Tentative allocation of power from the project as indicated by NTPC is as under:

	State	(MW)
i)	Uttar Pradesh share of 100 MW, i.e. 10%)	276 (includes home state)
ii)	Uttaranchal	33
iii)	Delhi	107
iv)	Haryana	45
v)	Punjab	67
vi)	Rajasthan	91
vii)	Himachal Pradesh	27
viii)	J&K	51
ix)	UT Chandigarh	4
x)	NTPC(for open market, 15%)	150
xi)	Unallocated (10%)	100
		----- 1000 MW -----

The proposal of NTPC for evacuation of power from Rihand III has been viewed with the power evacuation requirement from Vindhyachal Extn. TPS (1000 MW) also being developed by NTPC and both the generating station are contiguous. Beside this there are other generation are being planned under private sector in or around Jarkhand, Chhitisgarh and Orissa etc. Most of the power from these

projects would be consumed either in NR or WR. So while planning for the evacuation from Rihand III and Vindhyachal Extn., the aspect of the system requirement from these generation projects have also been kept in view. As number of generation projects are envisaged in that area which includes generation expansion plan of UPPCL and also keeping in view the existing high fault current level at Singrauli/Rihand Complex and possibility of excursion of the fault current limit in the event of Rihand III generation being injected at the existing bus bar of Rihand, it is proposed that Rihand III to be operation in isolation from the existing Rihand system (with the bus of Rihand III being sectionalized from the existing bus bar by a breaker which is normally kept open). Considering area of Northern region specially Kanpur, Allahabad portion are already crowded with existing/under planned transmission system, the following system is being proposed as a part of ATS with Rihand II and Vindhyachal.

- For evacuation of power from Rihand-III, Rihand-Vindhyachal pooling 2xS/C 765kV lines operated at 400kV are proposed (considering ageing of Rihand-Dadri HVDC system, it is suggested that in future, if it is decided to decommission the HVDC system, a 765kV switchyard could be established at Rihand utilizing the space of HVDC terminal. Considering this, 2XS/C 765kV lines operated at 400kV are being suggested instead of 400kV quad D/C line. Here it is also to be mentioned that under the scenario when HVDC bipole is to be adandoned and 765/400 kV yard is to be established, the bus sectionlisation scheme would have to be modified and 4 units would be required to be taken on 765 kV side and 2 units on 400 kV side with 400 kV interconnections to NR. This is primarily required to control the power flow from WR to NR incase they are directly connected at Rihand.)

**F.12 Generation Specific Transmission System with Vindychal Ext. –
For information of NR constituents**

Vindychal Ext. - 765/400 kV Pooling station near Vindychal Ext. 400 kV D/c line

F.13 Tilaiya UMPP (4000MW)

1. Tilaiya UMPP – Sasaram, 765kV S/C line
2. Tilaiya UMPP – Gaya, 765kV S/C line
3. Tilaiya UMPP – Balia 765kV S/C line

F.14 Nabinagar (1000MW)

1. Nabinagar-Sasaram 400kV D/C line

F.15 Barh-II (1320MW)

1. Barh – Gorakhpur 400kV quad D/C line

F.16 Generation Specific Transmission System for other ER projects:

POWERGRID has received Long Term Open Access application / information from various generation developers seeking transfer of power from projects in Orissa (20000 MW), Jharkhand (8000 MW), West Bengal etc. to beneficiaries in Western/Northern Region. For Transfer of power from these projects high capacity transmission system is envisaged. Out of the total power to be transferred some power shall be transferred through ER-NR corridors and some through ER-WR-NR corridor depending upon the location of the project. The details of the high capacity transmission system have been discussed in the subsequent paragraphs. It has been envisaged to pool the power at various pooling stations from where high capacity transmission system is planned to be developed. The details of immediate connectivity are discussed below:

For pooling of power from proposed power projects in Orissa, following three (3) nos. of 765/400kV pooling substation are proposed to be established in Orissa:

a. Pooling Station at Jharsuguda

b. Pooling Station at Dhenkanal

c. Pooling Station at Angul

These substations are planned to be interconnected with each other through following 765kV 2xS/c ring network:

- Dhenkanal Pooling Station – Angul Pooling Station 765kV 2xS/c
- Angul Pooling Station – Jharsuguda Pooling Station 765kV 2xS/c
- Jharsuguda Pooling Station – Dhenkanal Pooling Station 765kV 2xS/c

For onward transfer of power to WR/NR, the pooled power from different generating stations in Orissa at three pooling stations mentioned above is proposed to be injected at new pooling station near Dharamjaygarh in Chhattisgarh through **Jharsuguda – Pooling Station – Dharamjaygarh 765kV 4xS/c or 2xD/c lines**. This pooling station near Dharamjaygarh is proposed to be established by LILO of Ranchi – WR Pooling Point 765 kV S/c line and a separate Ranchi-Dharamjaygarh-WR Pooling 765 kV 2nd S/c line which will also be utilized for transfer of power from Jharkhand projects.

Generation specific transmission system is given below:

Essar(1800MW), Electrosteel(1200MW) and Corporate(800MW):

These three IPPs in Jharkhad would connect at 400kV to Ranchi 765/400kV substation through dedicated/common 400kV transmission lines

Adunik (1000MW) and DumkaCESC (1200MW) :

These two IPPs in Jharkhand would connect to ER grid at Jamshedpur/Maithon/Gaya

Sterlite(2400MW), GMR (1050MW), Monet (1005MW), Jindal (1200MW), Essar(1200MW) and Lanco (2640MW)

These IPPs in Orissa would connect to 765kV and 400kV system specifically proposed in ER for Orissa IPPs. Three 765/400kV pooling

stations at Jharsuguda, Angul and Denkenal have been proposed together with Jarsuguda-Angul-Denkenal-Jharsuguda 2xS/C 765kV lines. This system is proposed to be connected to WR system through following provision:

1. LILO of all four circuits of Rourkela-Raigarh 2xD/C 400kV lines at Jharsuguda.
2. Jarsuguda-Dharmjaygarh 4xS/c or 2xD/C 765kV lines.

WBPDCCL projects

To be connected to West Bengal and ER grid

F.17 Generation Specific Transmission System for WR projects:

Details for the Generation specific transmission system for the projects located in WR and which have already been discussed in Western region is given below:

Maruti Clean Coal & Power Ltd.

For injection of 300MW [Gross capacity] power from Maruti TPS and transfer to indicated target beneficiary, following dedicated interconnection into WR grid was considered.

- Maruti – WR Pooling Station near Sipat 400kV D/c

Dheeru Powergen Pvt. Ltd.

For transfer of power from the Dheeru gen. project to target beneficiaries, following dedicated interconnection into WR grid was considered.

- Dheeru – WR Pooling Station near Sipat 400kV D/c[Triple/Twin Lapwing]

Jaiprakash Associates Ltd.

For injection of 1320MW [Gross capacity] power from Jaiprakash TPS and transfer to indicated target beneficiary, following dedicated interconnection into WR grid was considered.

- JAL – Satna(PG) 400kV D/c (Quad)

Aryan Coal Benefication Pvt. Ltd. (MP)

For injection of 1200MW [Gross capacity] power from Aryan TPS and transfer to indicated target beneficiary, following dedicated interconnection into WR grid was considered.

- Aryan – VSTPP Pooling Station 400kV D/c (Triple)

Connectivity of other projects in Western Region :

This shall be decided based on the progress of the generation projects in Western region.

F.2 COMMON TRANSMISSION SYSTEM

Transmission system requirements have been identified based on studies carried out by CEA and PGCIL. To undertake the above envisaged power transfer, there is a need to develop large capacity corridors from the generation complexes in these states in ER to various load centres in WR/NR. For this, ± 800 kV, 6000 MW HVDC bipole line from generation complex of Orissa to load centre in NR has been proposed. Further, high capacity AC system directly from ER to NR has been proposed for transfer of power from generation projects in upper part of Jharkhand/Bihar (Tillaiya, Nabinagar and Barh-II etc). For transfer of power from lower part of Jharkhand & Orissa to NR/WR, high capacity transmission corridor from ER to NR via WR is considered. The studies have been carried out for evolving the system in an integrated manner considering a transmission system for the new generating stations coming up in all the other regions as well. The studies, carried out based on various transmission configurations and alternatives, indicate that in addition to existing and already planned transmission corridors, new high capacity transmission system, is required in following corridors:

F.21 System Strengthening in NR for transfer of power from generation projects in upper part of Jharkhand / Bihar

i) Tillaiya, Nabinagar and Barh-II –Proposed to be shared by NR Constituents

- Sasaram – Balia, 765kV S/C line
- Balia – Lucknow, 765kV (Second)S/C line
- Lucknow – Bareilly, 765kV (Second)S/C line
- Meerut – Moga, 765kV S/C line
- Bareilly – Kashipur –Roorkee – Saharanpur -Kaithal 400 kV D/c (Triple)

Out of the above transmission elements Lucknow – Bareilly 765 kV S/c and Bareilly – Kashipur –Roorkee – Saharanpur -Kaithal 400 kV D/c has been proposed as ***Northern Region System Strengthening – XXI.***

ii) Strengthening Scheme for NR (common for Jharkhand IPPs and import by NR from ER or from NER/SR/WR via ER) - To be shared by NR Constituents

- Gaya-Balia 765 kV S/C(2nd line)
- New 765/400kv S/s at Varanasi and Kanpur
- LILO of Sasaram –Balial 765kV S/C at Varanasi
- Varanasi - Kanpur 2xS/C 765kV lines
- Kanpur – Bareilly 765kV S/C line
- Kanpur – Jhatikalan 765kV S/C line
- 400kV connectivity for new 765/400kV S/S at Varanasi and Kanpur.

iii) ER-NR HVDC Corridor: - To be shared by NR Constituents

For transfer of power from the generation projects located in Orissa and southern part of ER, 6000MW, \pm 800kV HVDC bipole has been planned from Angul Pooling Point (ER-Orissa) to Barnala(NR) for transfer of power from ER to NR.

- Angul Pooling Point– Barnala (NR) 6000MW, \pm 800kV HVDC Bipole
- Barnala – Malerkotla 400 kV D/c (quad)
- Barnala – Amritsar 400kV D/c (quad)
- Barnala – Jullandhar 400kV D/c (quad) (one circuit via Nakodar)

- Barnala – Dhuri 400kV D/c (quad)

iv) Part of ER-WR-NR Corridor - Common for WR-NR – Proposed to be shared between WR & NR Constituents

Following system strengthening works have been identified which would benefit both WR and NR and accordingly are proposed as common system for WR and NR.

- Establishment of 765/400kV substation at Dharamjaygarh
- Jharsuguda Pooling Station – Dharamjaygarh 765kV 4xS/c or 2xD/c (*Presently design for 765 kV D/c lines are not available and technical feasibility of D/c lines to be established. In case there are problems in development of 765 kV D/c lines, 2x S/c lines shall be established*)
- LILO of Ranchi – WR Pooling 765kV S/c line at Dharamjaygarh
- Ranchi - Dharamjaygarh 765kV S/C line
- Dharamjaygarh – WR Pooling station 765 kV S/c line
- Dharamjaygarh-Jabalpur Pooling station 765kV 2xD/C or 4xS/c 765kV lines
- Pooling station at Jabalpur with 2x1500MVA 765/400kV
- Jabalpur Pooling station – Bina 765kV 2xS/c or D/c
- Bina – Gwalior 765kV S/c (3rd)
- Vindhyachal Pool – Satna 765kV 2xS/c or D/c
- Satna – Gwalior 765kV 2xS/c or D/c
- Establishment of 765/400kV 3x1500MVA substation near Vindhyachal Pool

iv-a) Out of above (part iv) following transmission system may be taken up as common transmission system of WR & NR for **Rihand-III (1000 MW) & Vindhyachal-IV (1000 MW)**, which may be shared equally by NR & WR constituents:

- Vindhyachal Pool – Satna 765kV 2xS/c or D/c
- Satna – Gwalior 765kV 2xS/c or D/c

- Establishment of 765/400kV 3x1500MVA substation near Vindhyachal Pool

v) NR Strengthening – For import of power from WR / Via WR – To be shared by NR constituents

- Gwalior – Jaipur 765kV 2xS/c
- Jaipur – Bhiwani 765 kV 2xS/c
- Bhiwani – Moga 765 kV S/c
- Charging of Kishenpur – Moga 2x765 kV line at 765 kV level
- Augmentation of Kishenpur substation to 765 kV level with 2x1500 MVA transformation capacity
- Establishment of 765/400 kV, 2x1500 MVA substation at Jaipur

v-a) Out of the above following transmission system may be taken up as System Strengthening in Northern Region for Rihand-III

- Gwalior – Jaipur 765kV S/c
- Establishment of 765/400 kV, 2x1500 MVA substation at Jaipur

Members of the Constituents may discuss and give specific concurrence to the transmission elements proposed to be taken up with Rihand-III & Vindhyachal – IV (mentioned at iv-a & v-a). This is required so that the transmission system can be taken up for implementation on priority and no evacuation constraints are faced.

G FUTURE PERSPECTIVE

If all the IPP generation projects in Orissa and Chattisgarh which have applied open access are considered and higher demand in WR and NR also need to be considered, then, in addition to above transmission corridors, HVDC corridors from Orissa and Chattisgarh to Northern Region would also be required. Power evacuation from projects in Chattisgarh listed above would also require HVDC outlets from Chattisgarh. As the beneficiaries from these projects and also for the

major capacity of other IPP generation projects is yet to be firmed-up, the HVDC outlets from Chattisgarh can not be firmed-up at this stage and would need to be studied further. Therefore, at this stage, it is proposed to discuss and decide the proposal in respect of only the AC system in the corridors mentioned above and HVDC from Orissa. Accordingly, only connectivity for Chattisgarh generation projects can be provided and open access would be considered after firming-up of beneficiaries

It may be noted that most of the IPPs have not firmed-up their beneficiaries. Also, the generation capacity being stated to be programmed for 11th Plan/ early 12th Plan is much in excess of load demand projected by the state utilities even with accelerated growth. In view of this, it would be desirable to take-up only that subset of transmission system which would provide basic system for connectivity and onward transmission through the main identified corridors. Also, in those transmission corridors on which power that would flow is yet to be tied-up in PPAs, instead of 'N-1' redundancy, only 'N-0' redundancy could be considered at this stage.

There would be additional transmission corridors in Western region for transfer of power for various projects.

H.0 SHARING OF TRANSMISSION CHARGES

H.1 Generation Specific Transmission System: Transmission charges for immediate evacuation of power from various projects are to be shared in proportion to the allocation of power from the generation project. Alternatively, dedicated transmission lines from the generating stations which would be constructed by the generators at their own cost, can be recovered by them through their generation tariff and when a group of generators would have common dedicated lines, they would share the cost between themselves and recover their respective investment through their respective generation tariff.

H.2 Transmission System for NR: Transmission system mentioned at para F.21 (part-(i), (ii), (iii) & (v)) is to be utilized for import and dispersal of power to Northern region therefore it is proposed that charges are shared by Northern region constituents. It is also proposed that the transmission system is added to regional pool of Northern region and allocation of power is added to the denominator. However, incase any particular generator is not able to define the long term open access and informs only about the region, then transmission charges for the equivalent MW shall have to be borne by the generator/ applicant.

H.3 Common Transmission System NR/WR

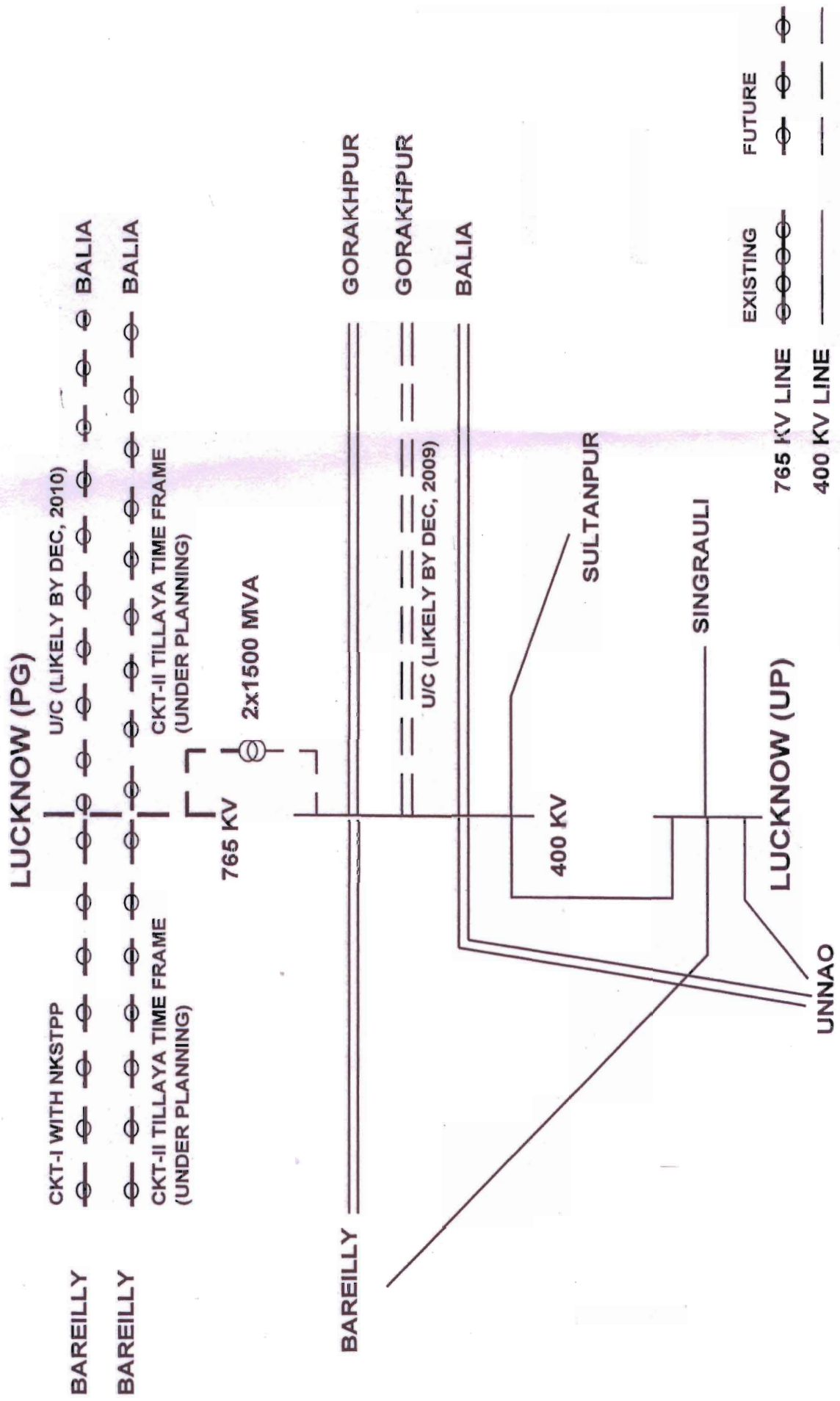
It is proposed that the transmission system identified under this head (mentioned at (F.21-iv) is shared in proportion to the allocation of power between NR and WR constituents. Transmission system identified for Rihand-III & Vindhyachal-IV (mentioned at **iv-a**) is shared equally between Northern & Western regions as both the projects are having equal capacity.

H.4 Utilisation of Other Regional System

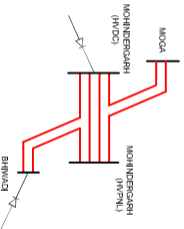
It is proposed that Allocation or PPA or open access for NR beneficiaries from WR projects / ER projects injecting power at Dharamjaigarh/ Vindhyachal pool/ Jabalpur pool, for transfer of power to NR would not share WR charges as the power would get delivered to NR directly through the common system of WR and NR and would not be utilizing the WR pooled system.

Pooling Stations for IPPs in Orissa and the 765 kV transmission lines interconnecting them, all the members from state utilities of WR were of the view that this system should be treated as common system for the IPPs in Orissa and should not be pooled with ER regional system and accordingly, beneficiaries of IPPs in Orissa should share only these charges and not to share ER regional charges.

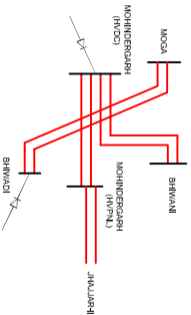
TRANSMISSION SYSTEM AROUND LUCKNOW



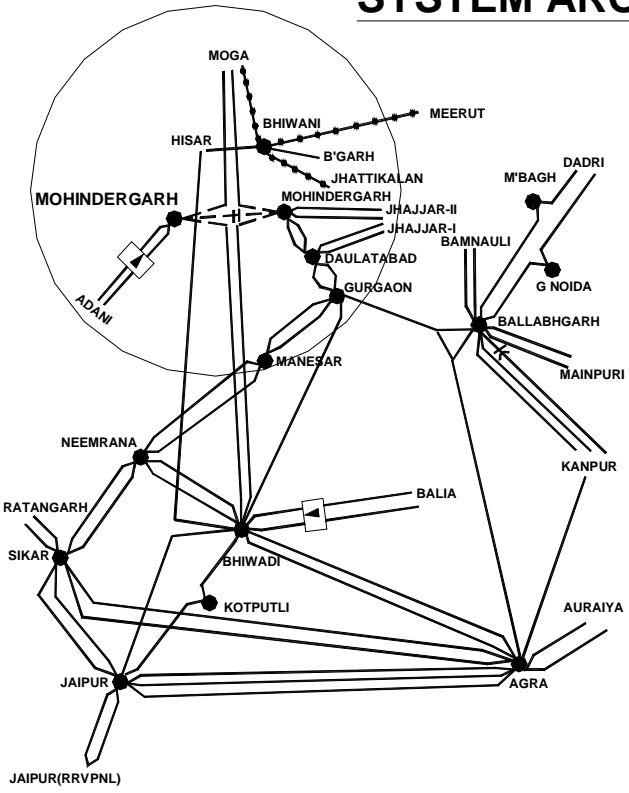
PROPOSAL AGREED ON 26th SCM



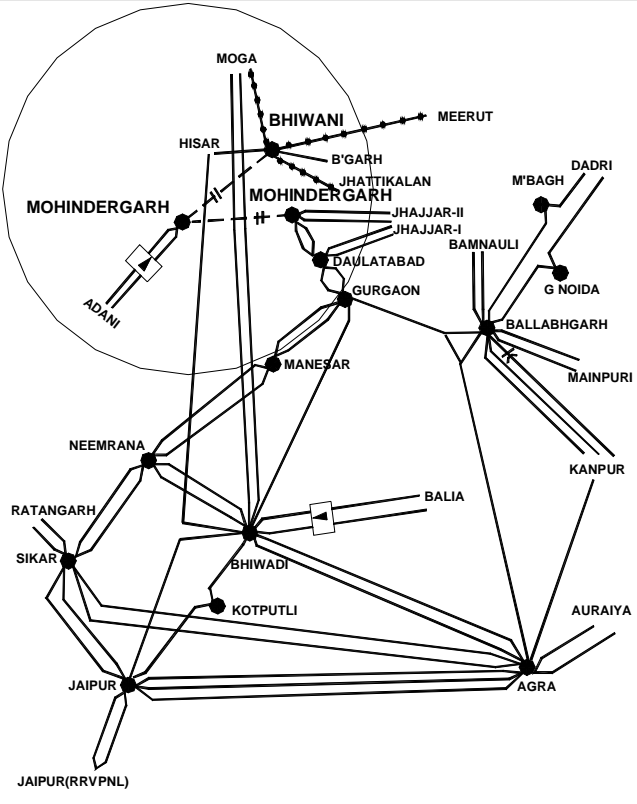
REVISED PROPOSAL FOR 27th SCM



SYSTEM AROUND MOHINDERGARH



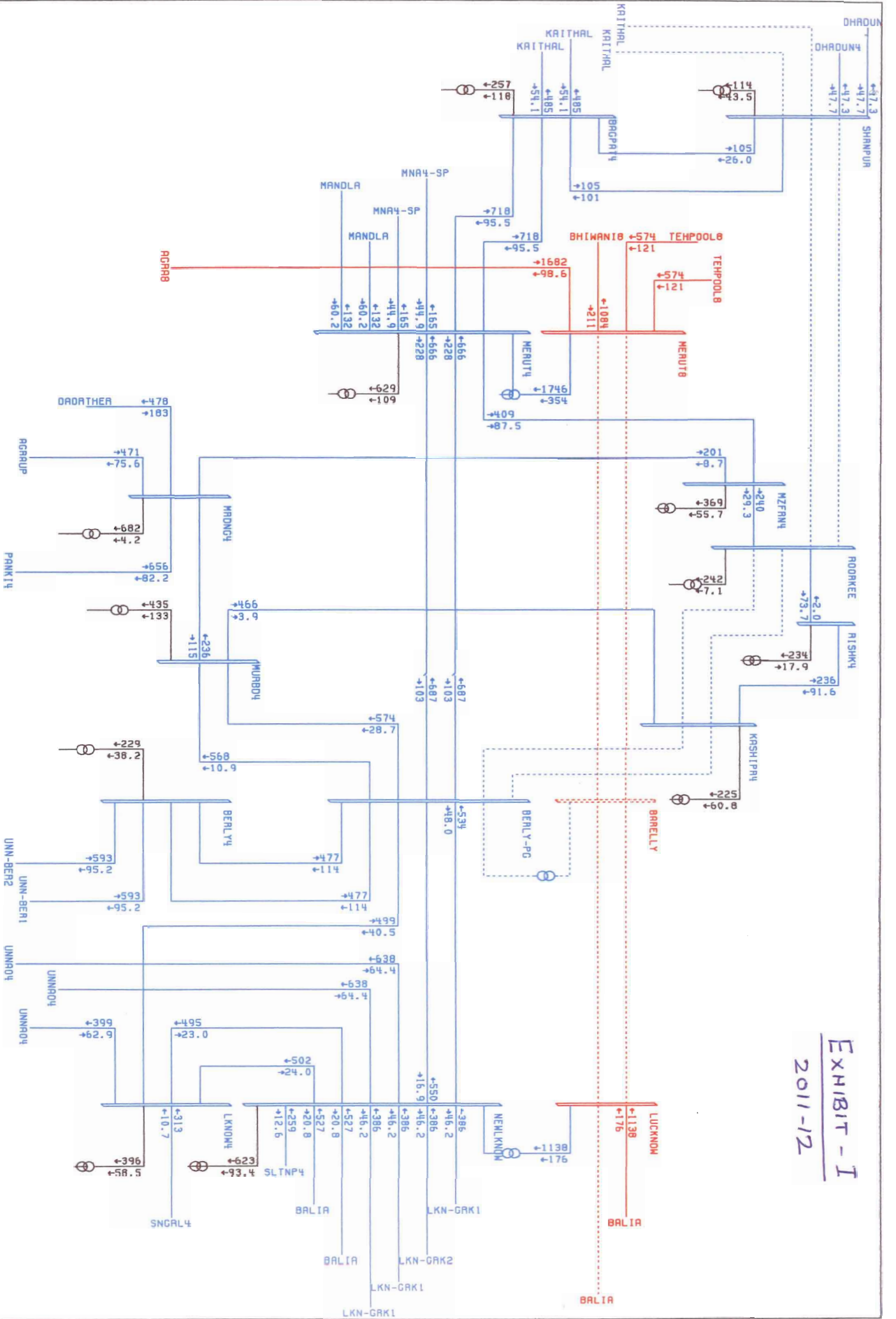
PRESENT SCHEME



REVISED SCHEME

EXHIBIT - I

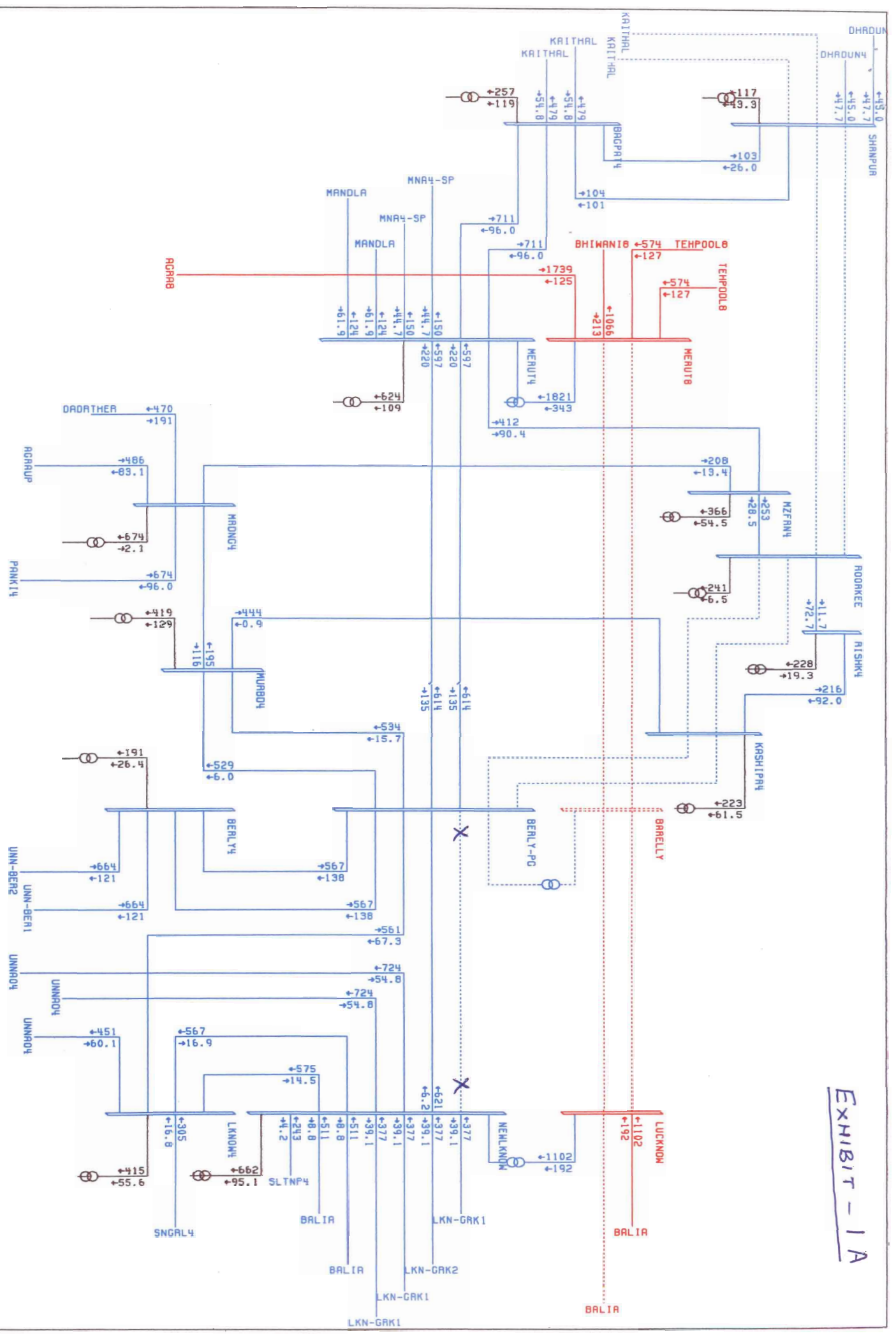
2011-12



STUDY FOR NEW PROJECTS IN NCR

POWER CORPORATION OF DELHI
EXHIBIT-1 : 2011-12 CONDITION THU, MAR 26 2009 15:58
KV: 220, 400, 765
BUS - NONE
BRANCH - MW/MVAR
EQUIPMENT - MW/MVAR

EXHIBIT - 1A



POWER TECHNOLOGIES
STUDY FOR NEW PROJECTS IN NCR
EXHIBIT-1A : 2011-12 CONDITION THU, MAR 26 2009 16:01
KV: s220 , s400 , s765
BUS - NONE
BRANCH - MM/MVAR
EQUIPMENT - MM/MVAR

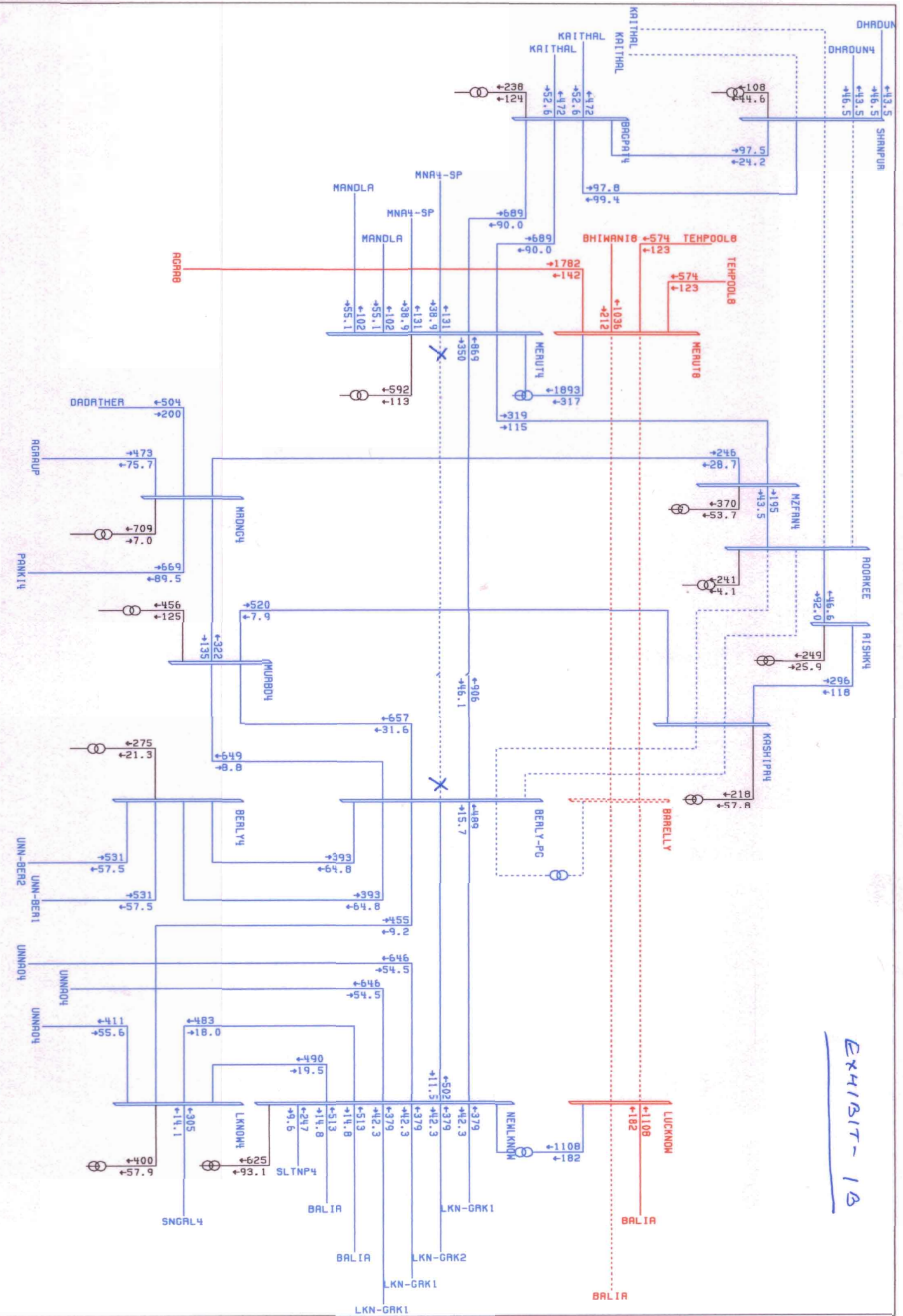
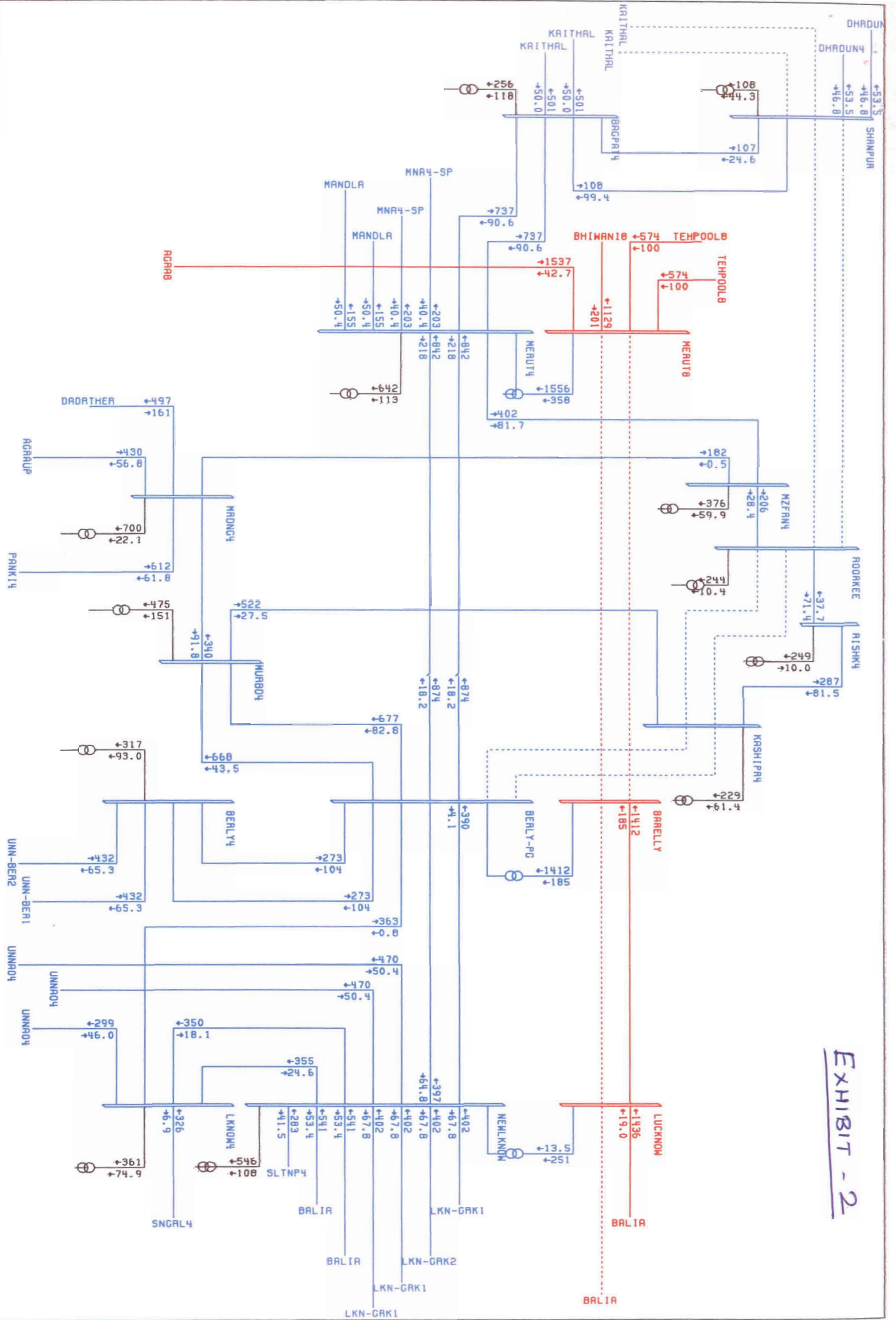


EXHIBIT-1B

EXHIBIT - 2



STUDY FOR NEW PROJECTS IN NCR

EXHIBIT-2 THU, MAR 26 2009 16:08

BUS - NONE
 BRANCH - MM/MVAR
 EQUIPMENT - MM/MVAR

POWER
 INC

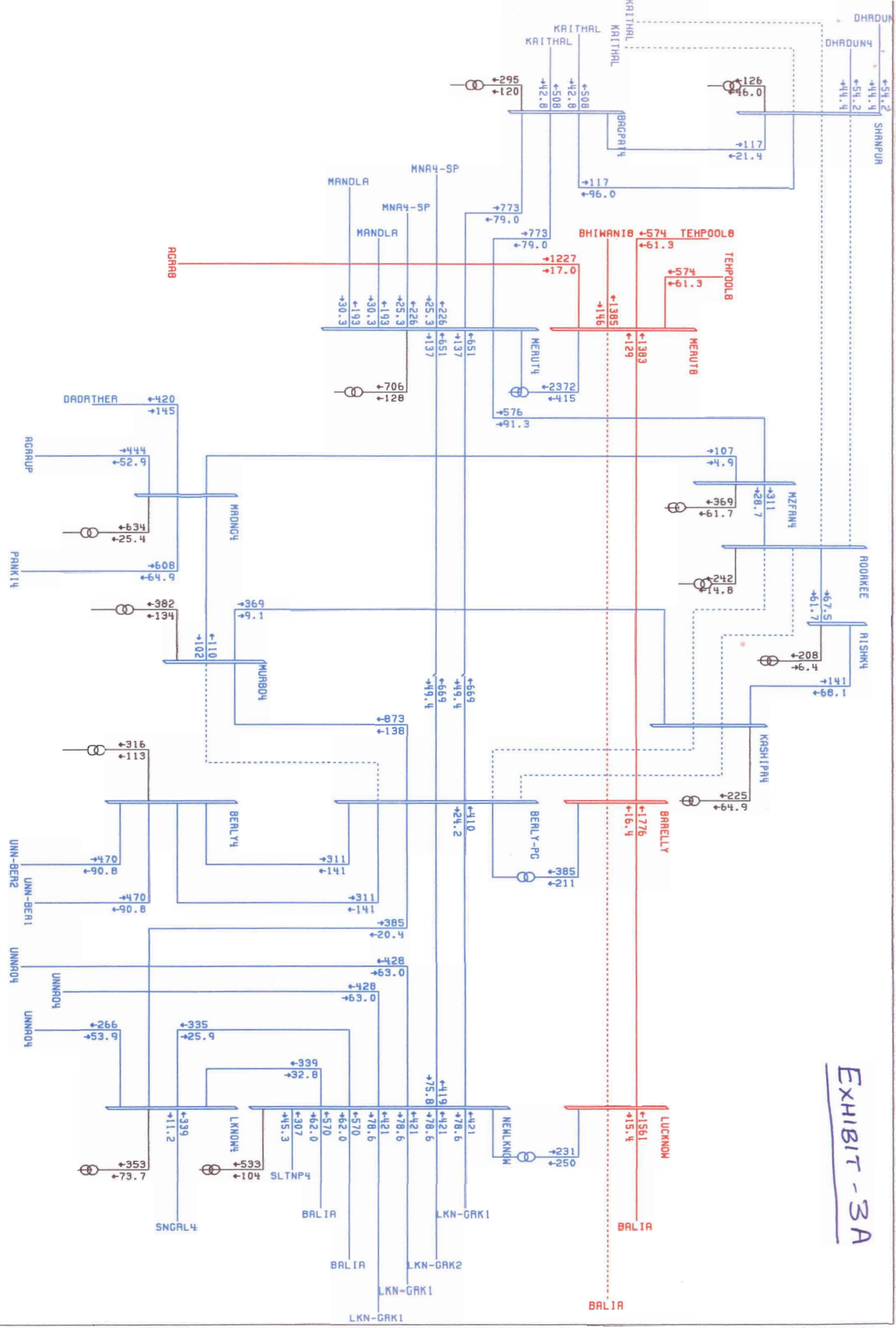


EXHIBIT-3A

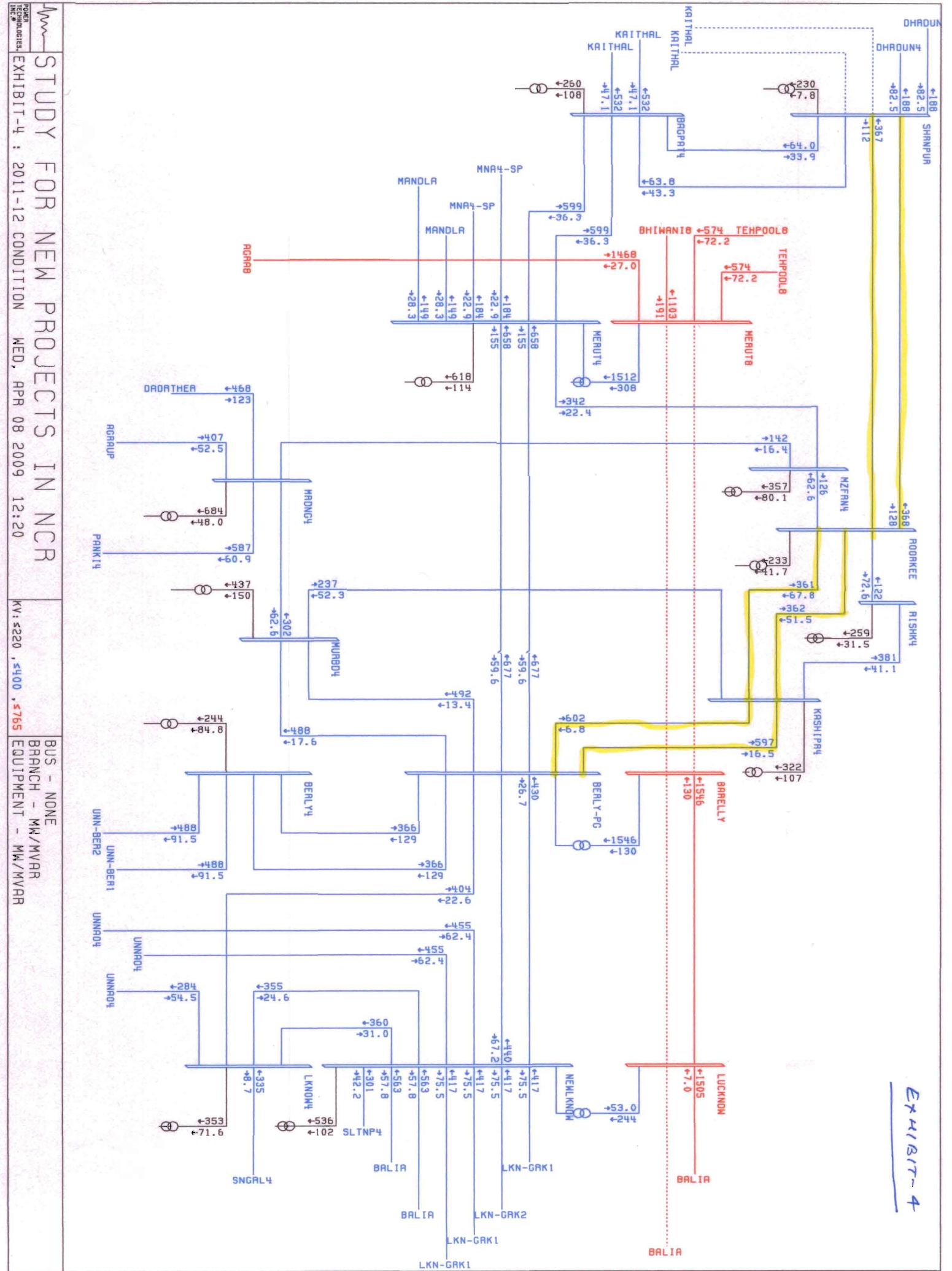


EXHIBIT-4

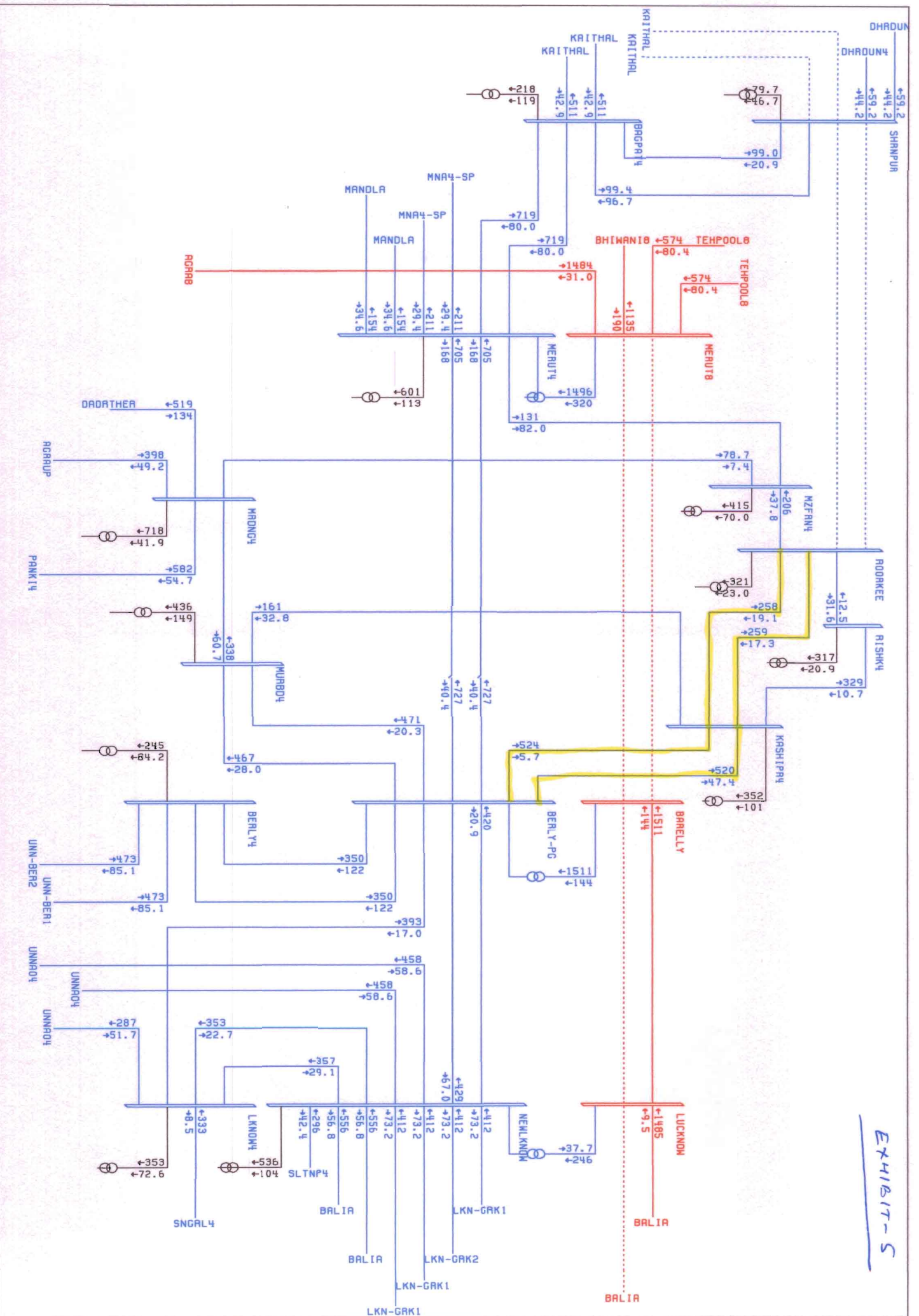
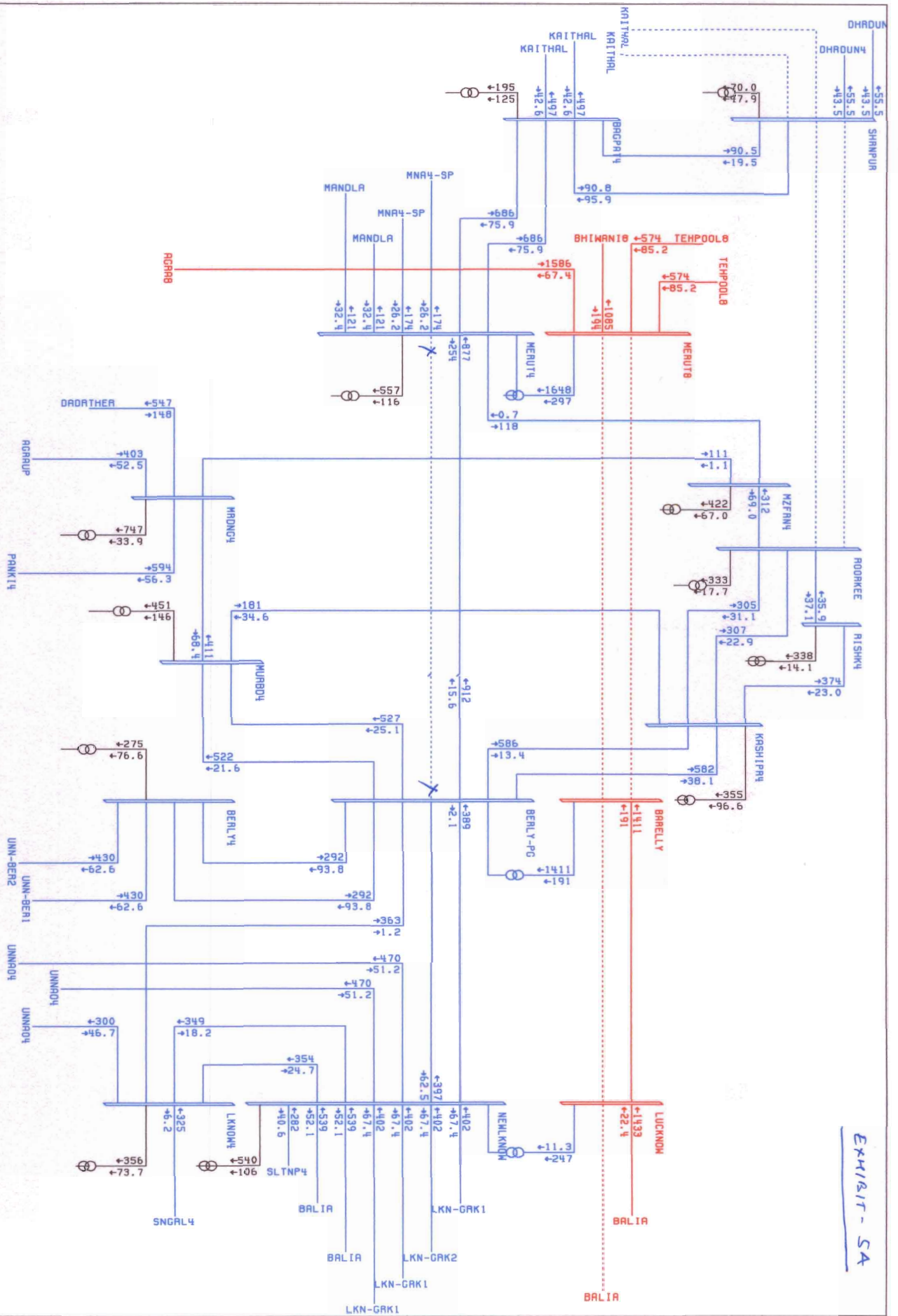


EXHIBIT-5

EXHIBIT - SA



STUDY FOR NEW PROJECTS IN NCR

EXHIBIT-SA : 2011-12 CONDITION WED, APR 08 2009 12:18

BUS - NONE
BRANCH - MW/MVAR
EQUIPMENT - MW/MVAR

KV: 220, 400, 765

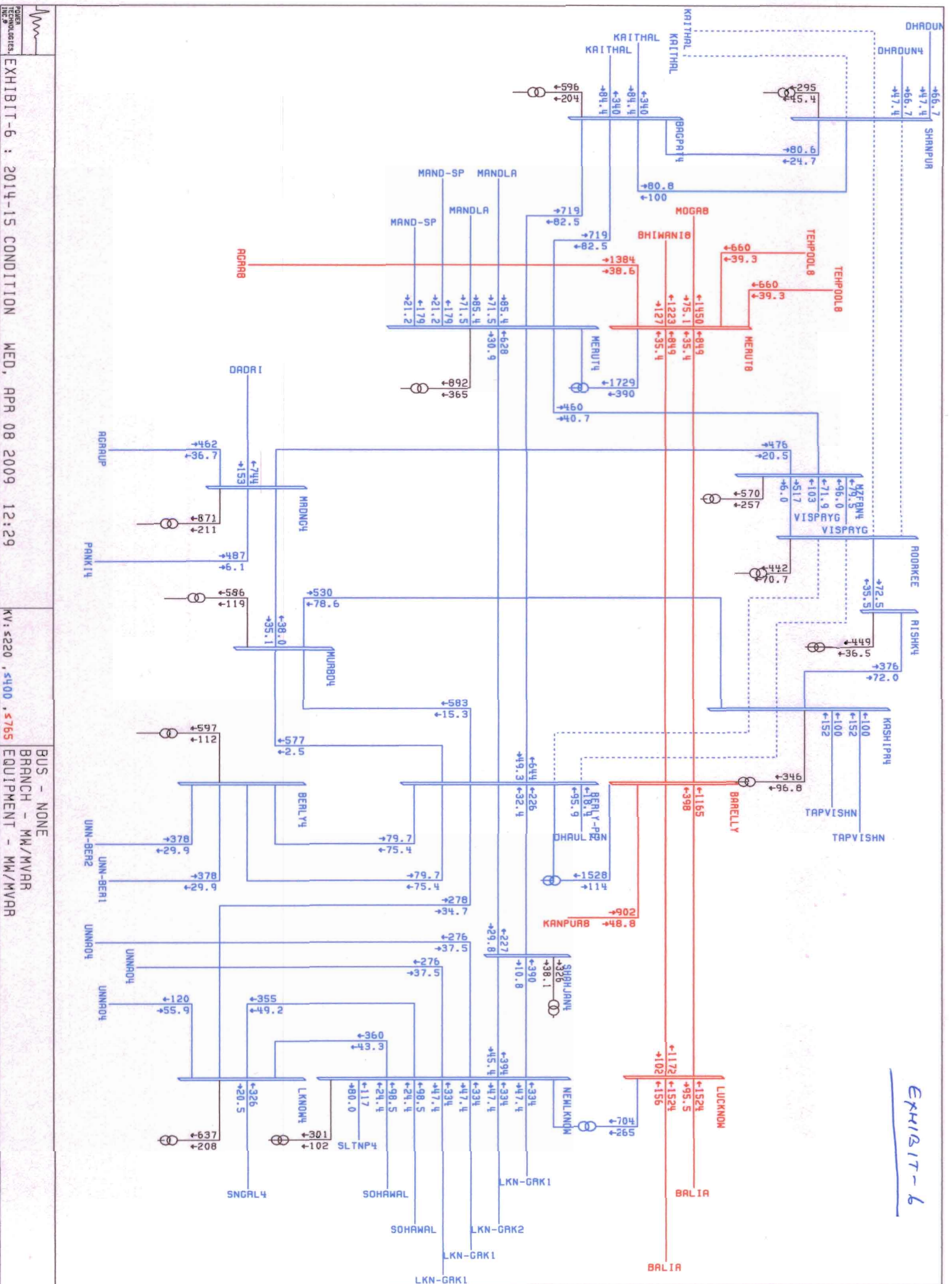


EXHIBIT-6

POWER TECHNOLOGIES
EXHIBIT-6 : 2014-15 CONDITION MED, APR 08 2009 12:29

KV: 220, 5400, 5765

BUS - NONE
BRANCH - MM/WVAR
EQUIPMENT - MM/WVAR

DHRUN
SHARPUR

EXHIBIT-6A

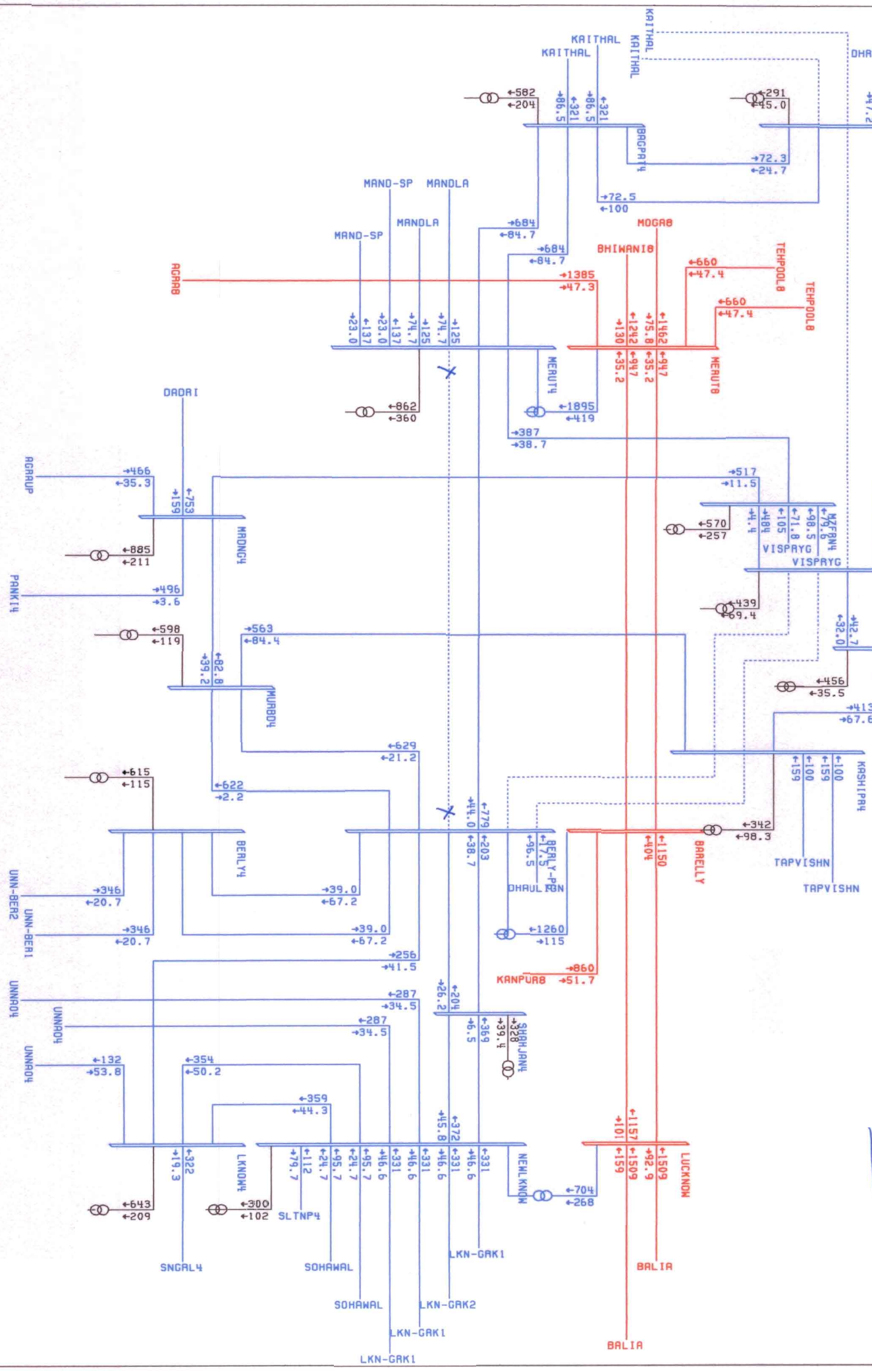
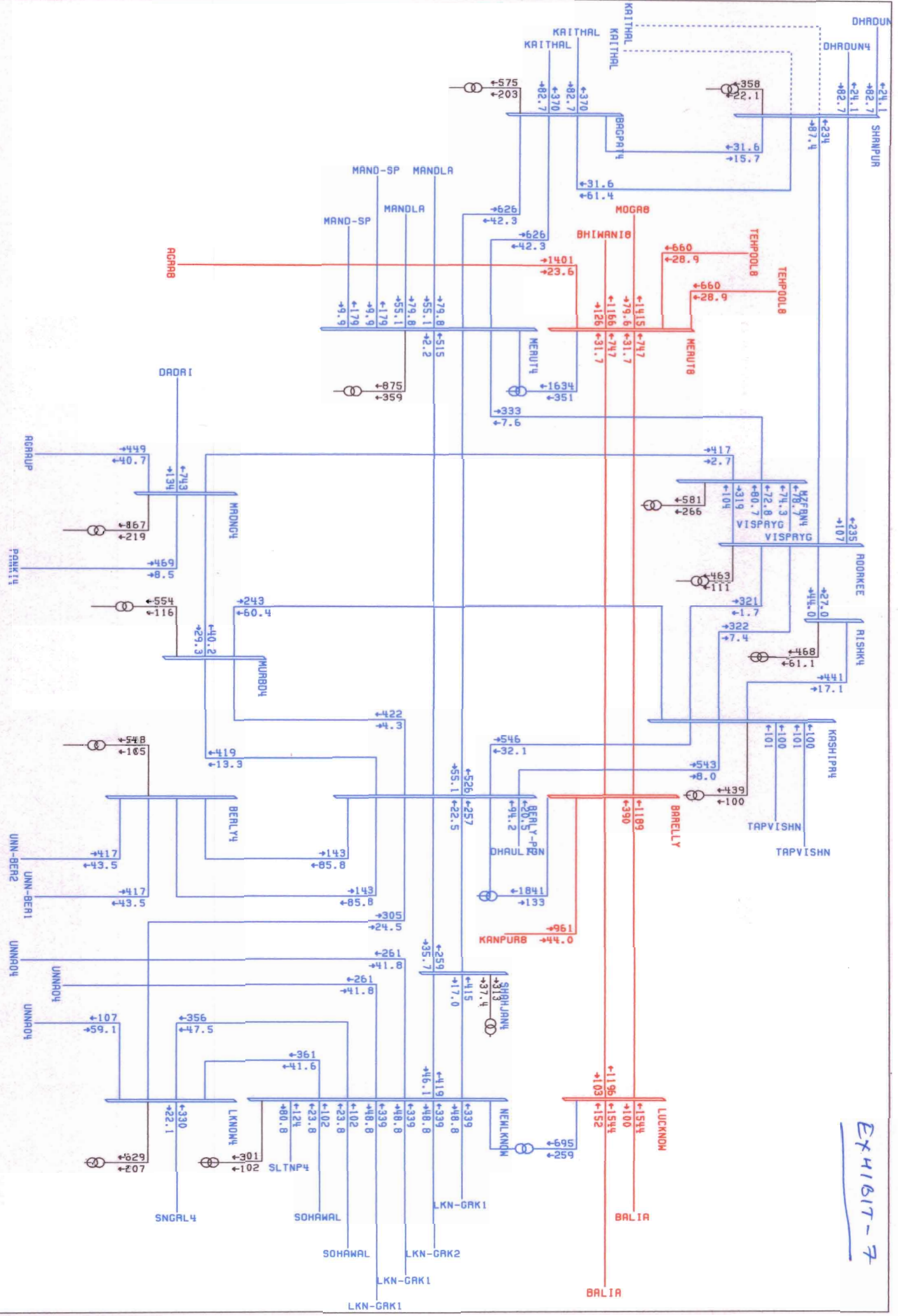


EXHIBIT-7



POWER
TECHNOLOGIES

EXHIBIT-7 : 2014-15 CONDITION MED, APR 08 2009 12:33

KV: 5220, 5400, 5765

BUS - NONE
BRANCH - MM/MVAR
EQUIPMENT - MM/MVAR

400/765 KV TRANSMISSION SYSTEM IN NORTHERN REGION

