



DETAILS OF TRANSMISSION LINES ICTS AND TRANSFORMERS IN THE NORTHERN REGION

**Northern Regional Load Despatch Center
18-A, Qutab Institutional Area
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PREFACE

The necessity to consolidate and compile the data in regard to Transmission Lines, ICTs and Line / Bus Reactors in the region was being felt for quite some time. In order to meet such a requirement and to have a quick reference regarding the transmission lines length, type and size of conductors and their current carrying capacity, as well as ICTs and Line / Bus Reactors capacities, make and other details, the relevant data has been compiled in the present document. The document is divided into five Sections and contains the following information:

- Section A: Information on the transmission ckts. in the region under central as well as state sector (220 KV and above).
- Section B: Information on the ICT's in the 400 KV sub-stations in the region.
- Section C: Information on the line and bus reactors in the 400 KV sub-stations in the region.
- Section D: Information in regard to the Transformers Tap Positions.
- Section E: Information in regard to the transmission ckts. and ICTs current carrying capacity.

All possible efforts have been made to maintain the correctness and accuracy of the data. However, as the information has been derived from numerous sources, inaccuracies/omissions could exist at some places. Suggestions for incorporating any corrections/omissions are most welcome and shall further enhance the utility of the document. The protection details of some of the transmission ckts. as well as ICTs and Line / Bus Reactors mainly in case of state sector are still to be incorporated. All the state electricity boards and other utilities are requested to send such information to NRLDC at the earliest so that the same may be incorporated in the next edition of the document for its completeness.

Dy. General Manager (O&M)



CONTENTS

SECTION - A		SECTION - B		SECTION - C		SECTION - D		SECTION - E	
TRANSMISSION LINES		ICTs		BUS REACTORS AND LINE REACTORS		TRANSFORMERS TAP POSITIONS		MISCELLANEOUS	
A.0	Summary Sheet	B.1	POWERGRID NR-I	C.1	POWERGRID NR-I	D.1	POWERGRID- NR-I	E.1	Current Rating of Different Conductors
A.1	POWERGRID NR-I	B.2	POWERGRID NR-II	C.2	POWERGRID NR-II	D.2	POWERGRID- NR-II	E.2	Nominal Current Rating of ICT's
A.2	POWERGRID NR-II	B.3	NTPC	C.3	NTPC	D.3	NTPC	E.3	Lines / ICTs loading (in Amps) at different voltages / power factor (400kV level)
A.3	BBMB	B.4	NHPC	C.4	NHPC	D.4	BBMB	E.4	-do- (220kV level)
A.4	UPPC	B.5	BBMB	C.5	BBMB	D.5	UPPC	E.5	Line Parameters
A.5	RSEB	B.6	UPPC	C.6	UPPC	D.6	RSEB	E.6	400 KV Grid Diagram
A.6	DVB	B.7	RSEB	C.7	RSEB	D.7	DVB		
A.7	HVPN	B.8	DVB	C.8	DVB				
A.8	PSEB								
A.9	HPSEB								
A.10	PDD / J&K								



SECTION-A

TRANSMISSION LINES



A.0 - SUMMARY SHEET--TRANSMISSION LINES
± 500 kV HVDC & 400 kV / 220 kV A.C. TRANSMISSION LINES IN NORTHERN REGION

S.No.	Name of Constituent	± 500 kV Ckt. Km.	400 kV Ckt. Km.	220 kV Ckt. Km.
1.	POWERGRID / NR-I	1630.00	4922.965	2366.618
2.	POWERGRID/NR-II	-	2284.00	1050.00
3.	BBMB	-	574.00	2794.00
4.	UPPC	-	2825.247	6028.298
5.	RSEB	-	287.98	6363.892
6.	DVB	-	48.00	449.084
7.	HVPN	-	-	1294.60
8.	PSEB	-	-	3476.714
9.	HPSEB	-	-	354.581
10.	PDD/J&K	-	-	529.00
	TOTAL	1630.00	10942.192	24706.787
	Total Ckt. KM. Line in Northern Region = 37278.979			



A.1 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-I SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Protection Details	Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)		
A. + 500 kV HVDC LINES								
1.	Rihand-Dadri Pole-I	S/C	815	815	ACSR Quar. Bersimis	0.682/440	D.C. Line protection	
2.	Rihand-Dadri Pole-II	S/C	815	815	“	“	“	
	Total Ckt. Km = 1630							
B. 400 kV LINES								
1.	Singrauli-Anpara	S/C	27.00	27.00	ACSR Twin Moose	0.504/325	MI-IT-MM3T/YTG-31. MII-IB-P-10	
2.	Singrauli-Kanpur-I	S/C	434.00	434.00	“	“	MI-IT-MM3T/YTG-31 MII-IB-MM3T/YTG-31	
3.	Singrauli-Kanpur-II	S/C	414.00	414.00	“	“	MI-IT-Micro MHO/SHNB. 102 MII-IB-MM3T/YTG-31	
4.	Singrauli-Lucknow	S/C	405.00	405.00	“	“	MI-IT-Micro Mho/SHNB.102 MII-IB-MM3T/YTG-31	
5.	Singrauli-Rihand-I	S/C	42.026	42.026	“	“	MI-I-T-3/Telephase MII-IB-THR/Reyrolle.	
6.	Singrauli-Rihand-II	S/C	43.956	43.956	“	“	MI-IT-Micro Mho/SHNB.102 MII-THR/Reyrolle.	



A.1 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-I SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Protection Details	Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)		
7.	Singrauli-Vindhyachal	S/C	3.56	3.56	ACSR Twin Moose	0.504/325	MI-RALZB MII-RAZFE	
8.	Vindhyachal-Kanpur	S/C	398.423	398.423	“	“	MI-IT-Micro Mho/SHNB..102 MII-IB-THR/Reyrolle	
9.	Kanpur-Ballabgarh	S/C	410	410	“	“	MI-IT-Micro Mho/SHNB..102 MII-IB-THR/Reyrolle	
10.	Kanpur-Agra	S/C	240	240	“	“	MI-IT-P-40/YTG-33 MII-IB-MM3T/YTB-31	
11.	Kanpur-Panki-I	S/C	5.30	5.30	“	“	MI-IT-Micro Mho/SHNB 102 M-II-IB-Micro Mho/SHNB 102	
12.	Kanpur-Panki-II	S/C	5.70	5.70	“	“	MI-IT-Micro Mho/SHNB 102 MII-IT-Micro Mho/SHNB 102	
13.	Lucknow-Moradabad	S/C	331.00	331.00	“	“	MI-IT-RAZEF MII-IB-MM3T/YTG-31	
14.	Moradabad-Muradnagar	S/C	132.00	132.00	“	“	MI-IT-RAZFE MII-IB-LZ-96	



A.1 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-I SYSTEM

Sl. No.	Name of the Line	Circuit Configuration	Length		Conductor used		Protection Details	Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)		
15.	Dadri-Muradnagar	S/C	50.00	50.00	“	“	MI-IT-RAZEF MII-IB-MM3T/YTG-31	
16.	Dadri-Panipat	S/C	87.00	87.00	“	“	MI-IT-RAZFE MII-IB-MM3T/YTG-31	
17.	Dadri-Ballabgarh	D/C	53.00	106.00	ACSR Quadruple Bersimis	0.682/440	MI-IT-RAZFE MII-IT-RAZFE	
18.	Dadri-Mandola	D/C	46.00	92.00	“	0.682/440	MI-IT-RAZFE MII-IT-RAZFE	
19.	Dadri-Malerkotla	S/C	310.00	310.00	ACSR Twin Moose	0.504/325	MI-IT-RAZFE MII-IB-RAZFE	
20.	Ballabgarh-Bassi	S/C	217.00	217.00	“	“	MI-IT-RAZFE MII-IB-RAZFE	
21.	Ballabgarh-Agra	S/C	180.00	180.00	“	“	MI-IT-P-40/YTG-33 MII-IB-Micro Mho/SHNB-102	
22.	Bassi-Heerapura-I	S/C	40	40	“	“	MII-IT-P-10 MII-IT-Micro Mho/SHNB-102	
23.	Bassi-Heerapura-II	S/C	40	40	“	“	MI-IT-T-3/Telephase MII-IT-THR/Reyrolle	
24.	Auraiya-Agra	D/C	186	372	“	“	MI-IT-P40/YTG-33 MII-IB-Micro Mho/SHNB-102	



A.1 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-I SYSTEM

Sl. No.	Name of the Line	Circuit Configu-ration	Length		Conductor used		Protection Details	Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)		
25.	Agra-Bassi	S/C	259	259	“	“	MI-IT-P-40/YTG-33 MII IB-MM3T/YTG-31	
26.	Bassi-Hissar	S/C	278	278	“	“	MI-IT-Micro Mho/SHNB-102 MII-IB-P-40	
		Total Ckt. Km = 4922.965						
C. 220 kV LINES								
1.	Anta-Bhilwara-I/II	D/C	196	392	ACSR Zebra	0.403/260	MI-IT-LZ-96 MII-IT-LZ-96 Backup O/C & E/F- RX.1G/CDD-41	
2.	Anta Dausa-I/II	D/C	215.70	431.40	“	“	MI-IT-LZ-96 M-II-IB-LZ-96	LILO portion of 4X7.415km Constructed by RSEB
3.	Dausa-Heerapura-I/II	D/C	76.86	153.72			Back up o/c & E/F -RX 1G/CDD-41.	
4.	Auriaya-Sikandara	D/C	182	364	“	“	MI-IT-RAZFE M-II-IB-RAZFE	
5.	Tanakpur-Bareilly (CB ganj)	D/C	106	212	“	“	N.A.	
6.	RAPP-B-Chittorgarh D/C	D/C	128.8	257.6	“	“	N.A.	
7.	LILO of RAPP-A-Kota (S) at RAPP-B	D/C	1.449	2.898	“	“	N.A.	
8.	Unchahar-Kanpur	D/C	144.0	288.0	“	“		



A.1 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-I SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Protection Details	Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)		
9.	FaridabadGPS-Samaypur	D/C	17.5	35.0	“	“		
10.	RAPS.B-Udaipur	S/C	230.0	230.0	“	“	N.A	
			Total Ckt. Km = 2366.618					



A.2 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-II SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Protection Details	Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)		
A. 400 kV LINES								
1.	Uri-Wagoora	D/C	95	190	ACSR Twin Moose	0.504/325	MI-REZI MII-RALZB	
2.	Kishenpur-Chamera	S/C	101	101	“	“	MI-RAZFE MII-LZ-96	
3.	Chamera-Moga	D/C	236	472	“	“	MI-P-10 MII-Micro Mho	
4.	Moga-Hissar	D/C	211	422	“	“	MI-P-40 MII- Micro Mho	
5.	Hissar-Bhiwani	S/C	34	34	“	“	MI-I-P-40 MII- Micro Mho	
6.	Bhiwani-Bawana	S/C	99	99	“	“	MI-I-P-40 MII- Micro Mho	
7.	Hissar-Bawana	S/C	132	132	“	“	MI-I-P-40 MII- Micro Mho	
8.	Hissar-Nalagarh	D/C	250.0	500.0	“	“		
9.	Abdullapur-Bawana	D/C	167.0	334.0	“	“		
		Total Ckt. Km. = 2284						



A.2 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN POWERGRID / NR-II SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
B. 220 kV LINES							
1.	Wagoora-Pampore	D/C	11	22	ACSR Twin Moose	0.504/325	
2.	Salal-Kishenpur I&II	D/C	60	120	ACSR Zebra	0.403/260	
3.	Salal-Kishenpur III&IV	D/C	59	118	“	“	
4.	Kishenpur-Udhampur	D/C	23	46	“	“	
5.	Kishenpur-Sarna	D/C	103	206	“	“	
6.	Salal-Jammu I	S/C	56	56	“	“	
7.	Salal-Jammu II	S/C	63	63	“	“	
8.	Jammu-Heeranagar	S/C	46	46	“	“	
9.	Heeranagar-Sarna	S/C	45	45	“	“	
10.	Sarna-Dasuya	D/C	53	106	“	“	
11.	Bairasiul-Jessore	S/C	57	57	“	“	
12.	Jessore-pong	S/C	40	40	“	“	
13.	Bairasiul-Pong	S/C	97	97	“	“	
14.	Hissar(PG)-Hissar(HVPN) III & IV	D/C	14	28	“	“	
		Total Ckt. Km. = 1050					



A.3 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN BBMB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
A. 400 kV LINES							
1.	Dehar-Panipat	S/C	262.00	262.00	ACSR Twin Morkulla	0.512/330	
2.	Dehar-Bhiwani	S/C	312.00	312.00	“	“	
		Total ckt. Km. = 574.00					
B. 220 kV LINES							
1.	Ganguwal-Dhulkote	D/C	110.00	220.00	ACSR Kundah	0.388/250	
2.	Dhulkote-Panipat	D/C	130.00	260.00	“	“	
3.	Panipat-Narela	D/C	64.00	128.00	“	“	
4.	Panipat-Narela	S/C	58.00	58.00	ACSR Zebra	0.403/260	
5.	Narela-Rohtak Road	D/C	21.00	42.00	ACSR Kundah	0.388/250	
6.	Pong-Jalandhar	D/C	98.00	196.00	“	“	
7.	Jamalpur-Sangrur	D/C	78.00	156.00	“	“	
8.	Sangrur-Hisar	D/C	139.00	278.00	“	“	
9.	Hisar-Bhiwani-Dadri	D/C	94.00	188.00	“	“	
10.	Dadri-Ballabgarh	S/C	118.00	118.00	“	“	
11.	Dadri-Samaypur-Ballabgarh	S/C	122.00	122.00	“	“	
12.	Jalandhar-Jamalpur	D/C	63.00	126.00	ACSR Zebra	0.403/260	



A.3 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN BBMB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
13.	Bhakra (R)-Jamalpur	D/C	86.00	172.00	ACSR Zebra	0.403/260	
14.	Ballabgarh-Badarpur	D/C	25.00	50.00	“	“	
15.	Bhiwani-Dadri	D/C	36.00	72.00	“	“	
16.	Samaypur-Ballabgarh	D/C	5.00	10.00	“	“	
17.	Pong-Dasuya	S/C	42.00	42.00	“	“	
18.	Dasuya-Jalandhar	S/C	56.00	56.00			
19.	Ganguwal-Jagadhari	S/C	158.00	158.00	“	“	
20.	Jagadhari-Kurukshetra	S/C	48.00	48.00	“	“	
21.	Kurukshetra-Panipat	S/C	73.00	73.00	“	“	
22.	Panipat-Dadri	S/C	115.00	115.00	“	“	
23.	Sangrur-Barnala	S/C	39.00	39.00	“	“	
24.	Barnala-L' mohabat	S/C	35.00	35.00	“	“	
25.	L' mohabat-Bhatinda	S/C	32.00	32.00			
			Total Ckt. km = 2794.00				



A.4 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN UPPC SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
A.	400 kV LINE.						
1.	Obra-Panki	S/C	386.6	386.6	ACSR Twin Moose	0.504/325	
2.	Obra-Sultanpur	S/C	230.4	230.4	-do-	0.504/325	
3.	Obra-Anpara	S/C	40.00	40.00	“	0.504/325	
4.	Anpara-A-Sarnath	S/C	140.00	140.00	“	0.504/325	
5.	Anpara-B-Sarnath	D/C	159.00	318.00	“	“	
6.	Sarnath-Azamgarh	S/C	95.00	95.00	“	0.504/325	
7.	Sarnath-Mau	S/C	106.000	106.000	“	0.504/325	
8.	Azamgarh-Sultanpur	S/C	125.50	125.50	“	0.504/325	
9.	Sultanpur-Lucknow	S/C	145.10	145.10	“	0.504/325	
10.	Panki-Muradnagar	S/C	395.20	395.20	“	0.504/325	
11.	Moradabad-Rishikesh	S/C	159.8	159.8	“	0.504/325	
12.	Muradnagar-Rishikesh	S/C	182.747	182.747	“	0.504/325	
13.	Mau-Azamgarh	S/C	48.4	48.4	“	0.504/325	
14.	Azamgarh-Gorakhpur	S/C	90.000	90.000	“	0.504/325	Presently charged on 220 kV
15.	Unnao-Agra	S/C	274.80	274.80	“	0.504/325	
16.	Unnao-Lucknow	S/C	39.16	39.16	“	0.504/325	
17.	Unnao-Panki	S/C	48.54	48.54	“	0.504/325	
		Total Ckt. Km. = 2825.247					



A.4 - DETAILS OF 400 KV / 220 KV TRANSMISSION LINES IN UPPC SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
B. 220 kV LINES.							
1.	Obra-Sahupuri	D/C	98.30	196.60	ACSR ZEBRA	0. 403/260	
2.	Obra-Allahabad	D/C	180.0	360.0	ACSR DEER	“	
3.	Obra- Allahabad	S/C	216	216	ACSR DEER	“	
4.	Sahupuri-Sarnath	S/C	45.00	45.00	ACSR ZEBRA	“	
5.	Sarnath-Azamgarh	S/C	58.913	58.913	“	“	
6.	Azamgarh-Jaunpur	S/C	73.3	73.3	“	“	
7.	Sarnath-Ghazipur	S/C	52.00	52.00	“	“	
8.	Sahupuri-Dehri (U.P. portion only)	S/C	36.656	36.656	ACSR DEER	“	
9.	Allahabad-Fatehpur	D/C	125.00	250.00	“	“	
10.	Fatehpur-Naubasta	S/C	76.00	76.00	“	“	
11.	Naubasta-Panki	S/C	14.00	14.00	“	“	
12.	Fatehpur-Panki	S/C	90.00	90.00	“	“	
13.	Panki-Unnao(LILO)-Lc’now	D/C	65.00	130.00	“	“	
14.	Panki-Mainpuri	D/C	155.85	311.70	“	“	
15.	Sultanpur-Phulpur	S/C	77.264	77.264	“	“	



A.4 - DETAILS OF 400 KV / 220 KV TRANSMISSION LINES IN UPPC SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
16.	Sultanpur-Gonda	S/C	110.00	110.00	ACSR ZEBRA	0.403/260	
17.	Sultanpur-Tanda	D/C	69.30	138.60	“	“	
18.	Tanda-Basti	S/C	52.70	52.70	“	“	
19.	Basti-Gorakhpur	S/C	56.10	56.10	“	“	
20.	Tanda-Gorakhpur	S/C	95.90	95.90	ZEBRA + DEER	“	
21.	Unchahar-Fatehpur	D/C	56.5	113.0	ACSR MOOSE	0.504/325	
22.	Unchahar-Lucknow	S/C	115.0	115.0	“	“	
23.	Unchahar-Chinhat	S/C	120.00	120.00	“	“	
24.	Chinhat-Lucknow	S/C	30.00	30.00	“	“	
25.	Lucknow-Sitapur	S/C	96.20	96.20	ZEBRA	0.403.260	
26.	Sitapur-Shahjahanpur	S/C	93.80	93.80	“	“	
27.	Mainpuri-Harduanj	D/C	128.3	256.60	DEER	“	
28.	Mainpuri-Parichha	S/C	213.0	213.0	“	“	
29.	Mainpuri-Firozabad-Agra	S/C	106.639	106.639	“	“	
30.	Agra (220 kV)-Agra (400 kV)-Harduanj	S/C	97.7	97.7	“	“	
31.	Agra (400 kV)-Mathura	S/C	39.20	39.20	“	“	
32.	Harduanj-NAPP	S/C	34.00	34.00	DEER	“	
33.	NAPP-Moradabad	S/C	84.944	84.944	“	“	



A.4 - DETAILS OF 400 KV / 220 KV TRANSMISSION LINES IN UPPC SYSTEM

Sl. No.	Name of the Line	Circuit Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
34.	NAPP-Khurja	D/C	60.047	120.094	ZEBRA	“	
35.	NAPP-Simboli	S/C	83.00	83.00	“	“	
36.	Khurja-Jahangirabad	S/C	24.5	24.5	“	“	
37.	Khurja-Harduaganj	D/C	42.50	85.00	DEER	“	
38.	Khurja-Muradnagar(220kV)	D/C	82.494	164.988	“	“	
39.	Muradnagar(400kV)-Muradnagar(220kV)	D/C	4.00	8.00	“	“	
40.	Muradnagar(400kV)-Meerut	S/C	45.8	45.8	ZEBRA	0.403/260	
41.	Meerut-Simboli	S/C	46.00	46.00	ZEBRA	0.403/260	
42.	Meerut-Muzafarnagar	S/C	35.985	35.985	“	“	
43.	Muzafarnagar-Rishikesh	S/C	108.872	108.872	ZEBRA+DEER	“	
44.	Moradabad-C.B.Ganj	S/C	86.542	86.542	ZEBRA	“	
45.	C.B. Ganj-Badaun	S/C	52.399	52.399	ZEBRA+DEER	“	
46.	Rishikesh-Uttarkashi	S/C	104.529	104.529	ZEBRA	“	
47.	Rishikesh-Chamba	S/C	40.1	40.1	ZEBRA	“	
48.	Chamba-Uttarkashi	S/C	64.5	64.5	ZEBRA	“	
49.	Khodri-Rishikesh	S/C	97.632	97.632	DEER	“	
50.	Khodri-Chibro Ckt.I	S/C	5.771	5.771	DEER	“	
51.	Khodri-Chibro Ckt.II	S/C	8.556	8.556	“	“	
52.	Khodri-Saharanpur Ckt.I	S/C	85.6	85.6	DEER	“	



A.4 - DETAILS OF 400 KV / 220 KV TRANSMISSION LINES IN UPPC SYSTEM

Sl. No.	Name of the Line	Circuit Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
53.	Khodri-Saharanpur Ckt.II	S/C	81.049	81.049	“	“	
54.	Saharanpur-Khara	S/C	60.258	60.258	ZEBRA	“	
55.	Khara-Shamli	S/C	119.3	119.3	“	“	
56.	Shamli-Muradnagar(400kV)	S/C	86.60	86.60	DEER	“	
57.	Muradnagar(400kV)-Baraut	S/C	41.438	41.438	ZEBRA	“	
58.	Baraut-Shamli	S/C	39.752	39.752	“	“	
59.	Shamli-Saharanpur	S/C	69.523	69.523	DEER	“	
60.	Muradnagar(400kV)-Sahibabad	D/C	26.03	52.06	ZEBRA	“	
61.	Sahibabad-Gazipur-Noida-BTPS	S/C	25.232	25.232	“	“	
62.	Sahibabad-Patparganj	S/C	7.002	7.002	“	“	
63.	Mainpuri-Safai-Parichha	S/C	220.0	220.0	ZEBRA	“	
64.	Moradabad-Nehtaur	S/C	67.7	67.7			
65.	Gorakpur(400kV)-Gorakpur (220kV)	D/C	24.85	49.7			
		Total Ckt. Km. = 6028.298					



A.5 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN RSEB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
A. 400 kV LINES							
1.	Suratgarh-Ratangarh I	S/C	143.735	143.735	ACSR Twin Moose	0.504/325	Presently charged at 220kV
2.	Suratgarh-Ratangarh II	S/C	144.245	144.245	“	“	-do-
		Total Ckt. km. = 287.98					
B. 220 kV LINES							
1.	BTPS-Alwar	S/C	136.00	136.00	ACSR Zebra	0.403/260	
2.	Alwar-Bhiwadi	D/C	82.245	164.49	“	“	
3.	Dausa-Alwar	S/C	96.13	96.13	“	“	
4.	Dausa-Hindaun	S/C	85.89	85.89	“	“	
5.	Dausa-Bharatpur	S/C	133.36	133.36	“	“	
6.	LILO of Anta-H’pura I & II at Dausa	D/C + D/C	7.415	29.66	“	“	
7.	Anta-Kota (S)	S/C	68.00	68.00	“	“	
8.	Bhilwara-Bali	S/C	145	145.00	“	“	
9.	Bali-Sirohi	S/C	57.51	57.51	“	“	
10.	Bhilwara-Chittorgarh	S/C	47.0	47.0	“	“	
11.	Chittorgarh-Udaipur	S/C	96.36	96.36	“	“	
12.	Udaipur-Banswara	S/C	150.0	150.0	“	“	
13.	Udaipur-RAPP (A)	S/C	198	198	“	“	
14.	RAPP (B)-Kota (S)	S/C	44.0	44.0	“	“	



A.5 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN RSEB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
15.	RAPP (A)-Kota (S)	D/C	44.0	88.0	ACSR Zebra	0.403/260	
16.	KTPS-Jaipur	S/C	190.5	190.5	“	“	
17.	Kota(S)- Ujjain	S/C	56.00	56.00	“	“	
18.	Kota (S)-Morak (Rajasthan portion Only)	S/C	56.00	56.00	“	“	
19.	Morak (S)- Ujjain	S/C	28.52	28.52	“	“	
20.	Kota (S)- Jaipur	S/C	183.98	183.98	“	“	
21.	Kota (S)-Bhilwara	D/C	130.00	260.00	“	“	
22.	KTPS-Kota (S)	D/C	0.75	1.5	“	“	
23.	KTPS-Kota (S)	S/C	0.67	0.67	“	“	
24.	KTPS-Kota (S)	S/C	1.50	1.50	“	“	
25.	KTPS-Beawar	D/C	190.0	380.0	“	“	
26.	Beawar-Bhilwara	S/C	93	93	“	“	
27.	Beawar-Merta	S/C	73.415	73.415	“	“	
28.	Beawar-Bilara	S/C	64.5	64.5	“	“	
29.	Bilara-Jodhpur	S/C	81.536	81.536	“	“	
30.	Bhilwara-Jodhpur	S/C	195.45	195.45	“	“	
31.	Jodhpur-Balotra	S/C	110.379	110.379	“	“	
32.	Beawar-Ajmer	S/C	59.31	59.31	“	“	
33.	Ajmer-Phulera-Jaipur	S/C	183.6	183.6	“	“	



A.5 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN RSEB SYSTEM

Sl. No.	Name of the Line	Circuit Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
34.	Jaipur-Khetri-I	S/C	144.0	144.0	“	“	
35.	Jaipur-Khetri-II	S/C	138.83	138.83	“	“	
36.	Khetri-Ratangarh	S/C	123.0	123.0	“	“	
37.	Ratangarh-Bukari (Bikaner)	S/C	255.608	255.608	“	“	
38.	Ratangarh-Suratgarh	S/C	167.9	167.9	ACSR Zebra	0.403/260	
39.	Suratgarh-Hanumangarh	S/C	64.479	64.479	“	“	
40.	Ratangarh-Sikar	S/C	138.64	138.64	“	“	
41.	Sikar-Reengus						
42.	Reengus-Khetri	S/C	100	100	“	“	
43.	Reengus-Jaipur	S/C	68.2	68.2	“	“	
44.	Reengus-Chomu	S/C	68.2	68.2	“	“	
45.	Chomu-Jaipur						
46.	Hissar-Khetri	S/C	115	115	“	“	
47.	Dadri-Khetri-I	S/C	70.91	70.91	“	“	
48.	Dadri-Khetri-II	S/C	77.18	77.18	“	“	
49.	Agra-Bharatpur	S/C	48.0	48.0	“	“	
50.	LILO of Kota-Ujjain at Morak	D/C	11.145	22.24	“	“	
51.	Barsingsar-Bikaner	S/C	31.6	31.6	“	“	
52.	Suratgarh-Suratgarh (Th.)-I	S/C	25.13	25.13	“	“	



A.5 - DETAILS OF 400 / 220 kV TRANSMISSION LINES IN RSEB SYSTEM

Sl. No.	Name of the Line	Circuit Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
53.	Suratgarh-Suratgarh (Th.)-II	S/C	24.963	24.963	“	“	
54.	Bhilwara-Kankaroli	S/C	81.841	81.841	“	“	
55.	Kankroli-Sirohi	S/C	146.00	146.00	“	“	
56.	Merta-Nagour	S/C	67.662	67.662	“	“	
57.	Sirohi-Bhinmal	S/C	60.939	60.939	“	“	
58.	Jodhpur-Tinwari	S/C	43.81	43.81	“	“	
59.	KTPS-Sanganer-Jaipur	S/C	196.5	196.5	“	“	
60.	Alwar-Kukas-Jaipur	S/C	190.0	190.0	ACSR Zebra	0.403/260	
61.	Sirohi-Balotra	S/C	132.0	132.0	“	“	
62.	Chittorgarh-Nimbahera	S/C	42.00	42.00	“	“	
63.	Nagour-Bikaner	S/C	110.0	110.0	“	“	
64.	Bali-Pindwara	D/C	25.00	50.00	“	“	
		Total ckt.km = 6363.892					



A.6 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN DVB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/m m)	
A. 400 kV LINE.							
1.	Mandola-Bawana	D/C	24.00	48.00	ACSR Quadruple Bersimis	0.682/440	
		Total Ckt. Km		48.00			
B. 220 kV LINE.							
1.	BTPS-Mehrauli	D/C	16.604	33.208	ACSR Zebra	0.403/260	
2.	BTPS-Okhla	D/C	9.750	19.500	“	”	
3.	BTPS-IP Extn	D/C	24.1	48.200	“	“	
4.	Mandola-Narela	D/C	18.990	37.98	“	“	
5.	Mandola-Patparganj	D/C	25.016	50.032	“	“	
6.	Mandola-Gopalpur	D/C	24.189	48.378	“	“	
7.	Narela-Bawana	S/C	11.17	11.17	“	“	
8.	Bawana-Shalimar Bagh	S/C	10.752	10.752	“	“	
9.	Narela-Shalimar Bagh	S/C	21.682	21.682	“	“	
10.	Bawana-Najafgarh	D/C	21.114	42.228	“	“	
11.	Najafgarh-Mehrauli	D/C	22.522	45.044	“	“	
12.	Shalimar Bagh-Rohini	D/C	4.5	9.00	“	“	
13.	IP-IP Extn.	D/C	1.950	3.900	“	“	



A.6 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN DVB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/m m)	
14.	Patparganj-IP	D/C	3.950	7.900	“	“	
15.	IP -Rajghat	D/C	1.500	3.000	“	“	
16.	IP Extn.- Parkstreet	D/C	7.330	14.660	Cable	0.977/630	
17.	Gopalpur-Subzi Mandi	D/C	7.300	14.600	ACSR Zebra	0.403/260	
18.	Mehrauli-Vasantkunj	D/C	9.00	18.00	“	“	
19.	Kashmiri Gate T-off (Mandola-Patparganj-II)	S/C	2.350	2.350	“	“	
20.	Papankalan T-off (Mehrauli-Najafgarh-II)	S/C	7.500	7.500	“	“	
			Total Ckt. Km = 449.084				



A.7 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN HVPN SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
A. 220 kV LINE							
1.	Panipat (BBMB)-Panipat (Th.)	D/C+ D/C	11.00	44.00	ACSR Zebra	0.403/260	
2.	Panipat (Th.)-Karnal	S/C	48.00	48.00	“	“	
3.	Kunihar-Panchkula	D/C	41.00	82.00	“	“	
4.	Shahbad-Pehowa	D/C	36.00	72.00	“	“	
5.	Pehowa-Kaithal	D/C	40.00	80.00	“	“	
6.	Kaithal-Nissing	D/C	36.00	72.00	“	“	
7.	Kaithal-Narwana	D/C	40.00	80.00	“	“	
8.	Narwana-Fatehabad-Sirsa	S/C	108.00	108.00	“	“	Fatehabad S/s. yet to be constructed.
9.	Narwana-Panipat (Th.)	D/C	76.00	152.00	“	“	
10.	Narwana-Hisar (HVPN)	S/C	70.00	70.00	“	“	
11.	Bhiwani(BBMB)-Bhiwani (HVPN)	D/C	6.8	13.6	“	“	
12.	Hisar(HVPN)-Hisar (BBMB)	S/C	5.00	5.00	“	“	



A.7 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN HVPN SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
13.	C. Dadri-Rewari	S/C	59.00	59.00	ACSR Zebra	0.403/260	
14.	C.Dadri-Mahendra garh-Narnaul	S/C	66.00	66.00	“	“	Mahendragarh S/S yet to be constructed.
15.	Panipat (T)-Rohtak	S/C	63.00	63.00	“	“	
16.	Narnaul-Rewari	S/C	60.00	60.00	“	“	
17.	Rewari-Badshahpur	S/C	54.00	54.00	“	“	
18.	Samaypur-Badshahpur	D/C	24.0	48.00	“	“	
19.	Samaypur-Palwal	D/C	19.00	38.00	“	“	
20.	Paniapt(Th)-Nissing	D/C	40.0	80.0			
			Total Ckt. km. = 1294.60				



A.8 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN PSEB SYSTEM

Sl. No.	Name of the Line	Ckt. Con-figuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
A.	220 kV Line						
1.	Dehar-Ganguwal	D/C	56	112	ACSR Zebra	0.403/260	
2.	Ganguwal-Bhakra (L)	D/C	24	48	ACSR Kundah	0.388/250	
3.	Ganguwal-Bhakra (L)	S/C	24	24	ACSR Zebra	0.403/260	
4.	Ganguwal-Bhakra (R)	D/C	25	50	“	“	
5.	Ganguwal-Mohali	S/C	73.814	73.814	“	“	
6.	Ganguwal-G’garh-II	D/C	73.456	146.912	“	“	
7.	Ganguwal-Jamalpur	D/C	78.00	156.00	“	“	
8.	G’ garh-II-G garh-I	D/C	7.089	14.178	“	“	
9.	G’ garh-I-Patiala	D/C	31.7	63.40	“	“	
10.	G’ garh-I-Malerkotla	S/C	44.60	44.60	“	“	
11.	Link line between 400 kV & 220 kV Malerkotla	D/C	0.30	0.60	ACSR Twin Moose	0.504/325	
12.	G’garh-I-Ropar	D/C	63.00	126.00	ACSR Zebra	0.403/260	
13.	Ropar-Laltokalan	S/C	91.6	91.6	ACSR Moose	0.504/325	
14.	Ropar-Snehwal-L’kalan	S/C	91.6	91.6	“	“	
15.	Patiala-Patran	D/C	56.00	112.00	ACSR Zebra	0.403/260	
16.	Patiala-Rajpura	D/C	24.00	48.00	“	“	
17.	Rajpura-Mohali	D/C	35.00	70.00	“	“	
18.	Mohali-Derabassi	S/C	20.5	20.5	“	“	
19.	Mohali-Ropar	D/C	46.00	92.00	“	“	
20.	Ropar-Jamsher	S/C	104.7	104.7	“	“	
21.	Bhakra (R)-Jamsher	S/C	98.375	98.375	“	“	



A.8 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN PSEB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
22.	Bhakra (R)-Mahilpur	S/C	51.00	51.00	“	“	
23.	Mahilpur-Jamsher	S/C	43.38	43.38	ACSR Zebra	0.403/260	
24.	Jamsher-Sultanpur	D/C	40.60	81.20	“	“	
25.	Jamsher-Jallandhar	D/C	14.00	28.00	“	“	
26.	Sultanpur-Patti	D/C	39.13	78.26	“	“	
27.	Patti-Verpal	D/C	37.62	37.62	“	“	
28.	Verpal-Butari	S/C	30.38	30.38	“	“	
29.	Butari-Jallandhar	S/C	57.40	57.40	“	“	
30.	Sarna-Batala	D/C+D/C	60.00	240.00	“	“	
31.	Batala-Verpal	D/C	48.00	96.00	“	“	
32.	Batala-Fathegarh	S/C	33.48	33.48	“	“	
33.	Jamalpur-Dhandrikalan	D/C	9.0	18.00	“	“	
34.	Dhandrikalan-Laltokalan	D/C	14.00	28.00	“	“	
35.	Laltokalan-Malerkotla	S/C	58.70	58.70	“	“	
36.	Laltokalan-Jagraon	D/C	32.00	64.00	“	“	
37.	Moga-Ferozpur	D/C	55.00	110.00	“	“	
38.	Moga-Jagraon	D/C	34.00	68.00	“	“	
39.	Moga-Muktsar	S/C	70.555	70.555	“	“	S/C line on D/C Tower.
40.	Pong-Dasuya	S/C	42.00	42.00	“	“	
41.	Dasuya-Jallandhar	S/C	56.00	56.00	“	“	
42.	Link line between 400 kV Moga to 220 kV Moga	D/C	1.5	3.00	ACSR Twin Moose	0.504/325	
43.	Muktsar-Bhatinda	S/C	50.00	50.00	ACSR Zebra	0.403/260	



A.8 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN PSEB SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
44.	Bhatinda-Lehra Mohabat	S/C	32.00	32.00	“	“	
45.	Lehra Mohabat- Barnala (PSEB)	S/C	35.00	35.00	“	“	
46.	Barnala (PSEB)-Malerkotla	S/C	57.46	57.46	“	“	
47.	Ropar-Goraya	S/C	75	75	ACSR Zebra	0.403/260	
48.	Goraya-Jamsher	S/C	35	35	“	“	
49.	Ranjitsagar Dam-Sarna	D/C	30	60	“	“	
50.	Lehra Mohabbat-Mansa	D/C	74.5	149.0	“	“	
51.	Mansa-Sunam	D/C			“	“	
52.	Sunam-Dhuri	D/C	25.0	50.0	“	“	
53.	Dhuri-Malerkotla	D/C	25.0	50.0	“	“	
		Total Ckt. Km. = 3476.714					



A.9 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN HPSEB SYSTEM

Sl. No.	Name of the Line	Ckt. Configu-ration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/mm)	
A.	220 kV LINE.						
1.	Khodri-Majri (Giri)	S/C	35.161	35.161	ACSR Zebra	0.403/260	
2.	Bhaba-Kunihar	S/C	130.95	130.950	- do -	0.403/260	
3.	Kunihar-Panchkula (upto Barotiwala)	D/C	26.015	52.030	“	0.403/260	
4.	Bhaba-Jeori	S/C	15.44	15.44	“	0.403/260	
5.	Jeori-Kunihar	S/C	118.00	118.00	“	0.403/260	
6.	Dehar-Kangoo	S/C	3.0	3.0	“	0.403/260	
		Total Ckt. Km. = 354.581					



A.10 - DETAILS OF 400 kV / 220 kV TRANSMISSION LINES IN PDD/J&K SYSTEM

Sl. No.	Name of the Line	Ckt. Configuration	Length		Conductor used		Remarks
			Line Length	Ckts. Length	Name	Size (Sq.Inch/ mm)	
A. 220 kV LINE.							
1.	Kishenpur-Pampore	D/C	174.00	348.00	ACSR Zebra	0.403/260	
2.	Sarna-Udhampur	S/C	125.00	125.00	ACSR Zebra	0.403/260	
3.	Wagoora-Ziankote	D/C	28.00	56.00	- do -	0.403/260	
		Total Ckt. Km. = 529.00					



SECTION - B

INTERCONNECTING TRANSFORMERS



SECTION - B

B. DETAILS OF ICTs AT 400 KV SUB-STATIONS IN NORTHERN REGION

Sl.No	Sub-Station	Voltage Level	MVA Capacity	Configuration	Make	Protection Details
B.1 POWERGRID – NR 1						
1.	Kanpur	400/220 KV	2x315 = 630 MVA	3 phase unit	BHEL	-
2.	Agra	Switching Station	-	-	-	-
3.	Bassi	Switching Station	-	-	-	-
4.	Ballabgarh	400/220 KV	3x315=945MVA	3 phase unit	BHEL	Diff-RADSB REF:RADHD Backup-CDD-41 Overload-RX1G Overfluxing-RATUB
5.	Mandola	400/220KV ICT-I	1x315 MVA	3 phase unit	BHEL	Diff:RADSB REF-RADHD Backup CDD-41 Overload-RX1G Overfluxing-RATUB
		400/220 KV ICT II, III & IV	3x315 =945MVA	3 phase unit	CGL	Diff-DTH-31 REF-CDD-41 Backup CDD-41 Overload-CTU-12 Overfluxing-GTT-21



Sl.No	Sub-Station	Voltage Level	MVA Capacity	Configuration	Make	Protection Details
6.	Vindhyachal (Back to Back S/S)	Switching Station	-	-	-	-
B.2 POWERGRID – NR 2						
1.	Kishenpur	400/220 KV	2x315=630 MVA	3x1 phase unit	BHEL	Diff-MBCH REF-CAD-14 Backup CDD-41
2.	Moga	400/220 KV	2x250=500 MVA	3 phase unit	BHEL	Diff-MBCH REF-CAG-14 Backup-CDD-41 Overfluxing-GTTM
3.	Hissar	400/220 KV	2x315=630 MVA	3 phase unit	BHEL	Diff-MBCH REF-CAG-14 Back up CDD-41
4.	Malerkotla	400/220 KV ICT I	1x315 MVA	3 phase unit	BHEL	Diff-RADSB REF-RADHD Directional O/C E/F-CDD-41 O/C-RX1G Overfluxing-RATUB
		400/220 KV ICT-II	1x315=315 MVA	3 phase unit	CGL	Diff-MBCH REF-CAG-14 Directional O/C- E/F-CDD-41 O/C-CT1G Overfluxing-GTTM



Sl.No	Sub-Station	Voltage Level	MVA Capacity	Configuration	Make	Protection Details
5.	Wagoora	400/220 KV	2x315=630 MVA	3 x1 phase unit	BHEL	Diff: RADSB REF:RADHD Overload-Rx1G Overfluxing-RATUB
B.3 NTPC						
1.	Singrauli STPS	400/132 KV	2X100 = 200 MVA	3 phase unit	BHEL	NA
2.	Rihand STPS	400/132 KV	1x200=200 MVA IBT-2	-do-	BHEL	NA
3.	Dadri (Thermal)	400/220 KV	2x500=1000MVA	3x1 phase unit	CGL	NA
4.	Dadri (Gas)	400/220 KV	2x500=000 MVA	-do-	BHEL	NA
5.	Auraiya	400/220 KV	1x315=315 MVA 1x315 =315MVA	3 phase unit -do-	BHEL TELK	NA NA
B.4 NHPC						
1.	Chamera	-	-	-		-
2.	Uri	-	-	-		-
B.5 BBMB						
1.	Dehar	400/220 KV	1x250=250 MVA	3x1 phase unit	TELK	Diff.1-DTH-31 Diff-II-CAG-34 O/C-CAG-31 Overfluxing-GTT-21
2.	Bhiwani	400/220 KV	1x500 =500 MVA	3x1 phase unit	TELK	Diff.1-DTH-32 Diff-II-CAG-34 Overfluxing-GTT-41



Sl.No	Sub-Station	Voltage Level	MVA Capacity	Configuration	Make	Protection Details
3.	Panipat	400/220 KV ICT-I	1x450=450 MVA	3x1 phase unit	TELK	Diff.1-DTH-32 Diff-II-CAG-34 O/C-CDG-51 Overfluxing-GTT-21
		400/200 KV ICT-II	1x450=450 MVA	3x1 phase unit	TELK	Diff- DTH-32 REF-CDD-41 Back up-CDD-41 Overload-CTU-12 Overfluxing-GTT-21
B.6 UPPC						
1.	Anpara	400/132 KV	3X100= 300 MVA	3 phase units	1-BHEL 2&3 - CGL	NA
2.	Obra	400/220 KV	2x240=480 MVA	-do-	GEC, Alsthom	NA
3.	Panki	400/220 KV	2x240=480 MVA	-do-	BHEL	NA
4.	Sarnath	400/220 KV	2x240=480 MVA	-do-	I-BHEL II-TELK	NA
5.	Mau	400/132 KV	1x200=200 MVA	-do-	ABB	NA
6	Azamgarh	400/220 KV	2x240=480 MVA	-do-	BHEL	NA
7.	Sultanpur	400/220 KV	2x240=480 MVA	-do-	II-HITACHI,	NA
8.	Lucknow	400x220 KV	2x240=480 MVA	-do-	I-GEC,ALSTHOM II-HITACHI	NA
9.	Moradabad	400/220 KV	2x240=480 MVA	-do-	I-MITSUBISHI II-BHEL	NA



Sl.No	Sub-Station	Voltage Level	MVA Capacity	Configuration	Make	Protection Details
10.	Muradnagar	400/220 KV	1x315=315 MVA 2x240=480 MVA	-do- -do-	BHEL	NA
11.	Rishikesh	400/220 KV	1x240=240 MVA	-do-	MITHUBISHI	NA
12.	Unnao	400/220kV	2x315=630 MVA	-do-	BHEL	NA
13.	Agra	400/220kV	1x315=315 MVA	-do-	BHEL	NA
B.7 RSEB						
1.	Heerapura	400/220 KV	3x250=750 MVA	-do-	TELK	NA
B.8 DVB						
1.	Bawana	400/220 KV	3x315=945 MVA	-do-	TELK	NA



SECTION - C

BUS REACTORS AND LINE REACTORS



SECTION - C

C. DETAILS OF BUS REACTORS & LINE REACTORS AT 400 KV SUB-STATIONS IN NORTHERN REGION

Sl.No	Sub-Station	Bus/Line Reactor	Capacity	Configuration	Make	Protection Details
C.1 POWERGRID - NR 1						
1.	Kanpur	i) Bus Reactor	80 MVAR	3 phase unit	ACEC	Diff. RADHA REF-RADHD Back up-RAKZB
		ii) SVC	2x140= 280 MVAR	3 phase unit	ABB	Diff-RADSB-RADHA REF-RADHD Back up-RATUG21H Overload-RATUG-21H O/fluxing-RAKZB, RATUG21H
		iii) Kanpur-Singrauli-I	80 MVAR	3 phase unit	FUJI	Diff-CAG-34 REF-CAG-14 Back up-YTG-33
		iv) Kanpur-Singrauli-II	80 MVAR	3 phase unit	FUJI	-do-
		v) Kanpur-Agra	50 MVAR	3 phase unit	MELCO	-do-
		vi) Kanpur-Vindychal	80 MVAR	3 phase unit	MELCO	Diff-RADHA REF-RADHD Backup-RAKZB
		vii) Kanpur-Ballabgarh	80 MVAR	3 phase unit	MELCO	-do-
		viii) Kanpur-Panki-I & II	-	-	-	-



Sl.No	Sub-Station	Bus/Line Reactor	Capacity	Configuration	Make	Protection Details
2.	Agra	i) Bus Reactor	50 MVAR	3 phase unit	CGL	Diff-RADHA REF-RADHD Backup-RAKZB Diff-CAG-34
		ii)Agra-Kanpur	50 MVAR	3 phase unit	FUJI	
		iii)Agra-Bassi	50 MVAR	3 phase unit	FUJI	REF-CAG-14 Back up-YTG-33
		Iv) Agra-Auraiya I & II v) Agra-Ballabgarh	50 MVAR each -	3 phase unit -	BHEL -	-do- -



3.	Bassi	i) Bus Reactor	50 MVAR	3 phase unit	FUJI	Diff-RADHA REF-RADHD Back up-RAKZB
		ii) Bassi-Ballabgarh	50MVAR	3 phase unit	MELCO	-do-
		iii) Bassi-Agra	50MVAR	3 phase unit	MELCO	Diff-CAG-34 REF: CAG-14 Back up-YTG-33
		iv) Bassi-Hissar	50 MVAR	3 phase unit	BHEL	-do-
		v) Bassi-Heerapura I/II	-	-	-	-
4.	Ballabhgarh	i) Bus Reactor	80 MVAR	3 phase unit	BHEL	Diff-RADHA REF-RADHD Back up-RAKZB
		ii) Ballabgarh-Kanpur	80 MVAR	3 phase unit	MELCO	Diff.-RADHA REF-RADHD Backup-RAKZB
		iii) Ballabgarh-Bassi	50 MVAR	3 phase unit	MELCO	-do-
		iv) Ballabgarh-Agra	50 MVAR	3 phase unit	BHEL	Diff-CAG-34 REF-CAG-14 Back up-YTG-33
		v) Ballabgarh-Dadri I&II	-	-	-	-



5.	Mandola	i) Bus Reactor	50 MVAR	3 phase unit	BHEL	Diff-RADHA REF-RADHD Backup-RAKZB
		ii)Mandola-Dadri-I& II	-	-	-	-
		iii) Mandola-Bawana-I&II	-	-	-	-
6.	Vindhyachal (Back to Back S/S)	i) Bus Reactor ii) Vindhyachal-Kanpur	93 MVAR -	3 phase unit -	ASIA	Diff-RADHA Back up Rx1G (This is also used as L/R for charging of Vindh- Knp line)



C.2 POWERGRID - NR – II						
1.	Kishenpur	Kishenpur-Chamera	-	-	-	-
2.	Moga	i) Bus Reactor	50 MVAR	3 phase unit	BHEL	Diff-CAG-34 REF=CAG-14 Back up-YTG-33
		ii) Bus Reactor	2x25=50 MVAR(33 KV)	3 phase unit	CGL	NA
		iii) Moga-Chamera-I	50 MVAR	3 phase unit	BHEL	Diff-CAG-34 REF=CAG-14 Back up= YTG-33
		iv) Moga-Chamera-II	50 MVAR	3 phase unit	BHEL	-do-
		v) Moga-Hissar-I & II	-	-	-	-
3.	Hissar	i) Hissar-Moga-I	50 MVAR (Switchable Reactor)	3 phase unit	BHEL	Diff-CAG-34 REF-CAG-14 Back up-YTG-33
		ii) Hissar-Moga-II	50 MVAR	3 phase unit	BHEL	Diff-CAG-34 REF-CAG-14 Back up-YTG-33
		iii) Hissar-Bassi	50 MVAR	3 phase unit	BHEL	Diff-CAG-34 REF-CAG-14 Back up-YTG-33
		iv) Hissar-Bhiwani	-	-	-	-
		v) Hissar-Bawana	-	-	-	-



4.	Malerkotla	i) Bus Reactor	50 MVAR	3 phase unit	BHEL	Diff=RADHD, REF- RADHD, Back up= RAKZB, Diff=RADHA REF-RADHD Back up=RAKZB
		ii) Malerkotla-Dadri	63 MVAR	3 phase unit	BHEL	
5.	Wagoora	Wagoora-Uri-I & II	-	-	-	-
C.3 NTPC						
1.	Singrauli STPS	i) Singrauli-Kanpur-I	80 MVAR	3 phase unit	ASEA	Differential-CAG-34 REF- CAG-14 Backup-YTG-33
		ii) Singrauli- Kanpur -II	80 MVAR	3 phase unit	FUJI	-do-
		iii) Singrauli-Lucknow	63 MVAR	3 phase unit	TOSHIBA	-do-
		iv) Singrauli-Rihand D/C	-	-		-
		v) Singrauli-Vindhyachal	-	-		-
		vi) Singrauli-Anpara	-	-		-
2.	Rihand STPS	Rihand-Singrauli D/C	-	-		-
3.	Dadri	i) Dadri-Mandola D/C	-	-	-	-
		ii) Dadri-Ballabgarh D/C	-	-	-	-
		iii) Dadri-Panipat	-	-	-	-
		iv) Dadri-Muradnagar	-	-	-	-
		v) Dadri-Malerkotla	63 MVAR	3 phase unit	BHEL	Differential-RADHA REF-RADHD Back up-RAKZB
4.	Auraiya	i) Bus Reactor	2x25=50 MVAR (33KV)	3 phase unit	CGL	NA
		ii) Auraiya-Agra D/C	-	-	-	-



C.4 NHPC						
1.	Chamera	i)Chamera-Kishenpur ii)Chamera-Moga I iii)Chamera-Moga-II	- 50 MVAR 50 MVAR	- 3 phase unit 3 phase unit	- I-BHEL II-ABB	- NA NA
2.	Uri	Uri-Wagoora-I & II	50 MVAR each	3 phase unit	ABB	NA
C.5 BBMB						
1.	Dehar	i) Dehar-Bhiwani ii) Dehar-Panipat	- -	- -	- -	- -
2.	Bhiwani	i) Bus Reactor ii)Bhiwani-Dehar iii)Bhiwani-Hissar iv)Bhiwani-Bawana	50 MVAR 50 MVAR - -	3 phase unit 3 phase unit - -	TELK TELK - -	Diff-CAG-34 REF-CAG-40 Back up-YTG-33 -do- - -
3.	Panipat	Panipat-Dehar	63 MVAR	3 phase unit	ACEC	Diff-CAG-34 REF-CAG-40 Back up-YTG-33
C.6 UPPC						
1.	Anpara	i) Bus Reactor ii) Anpara A-Sarnath- I / II / III iii) Anpara B-Sarnath iv) Anpara B2-Sarnath v)Anpara Singrauli vi)Anpara-Obra	2x25= 50 MVAR (33 KV) - - - - -	3 phase unit - - - - -	I-CGL II- MITHUBISHI	NA - - - - -



2.	Obra	i) Bus Reactor ii)Obra-Anpara iii)Obra-Sultanpur Iv)Obra-Panki	3x25=75 MVAR (33 KV) - 50 MVAR 80 MVAR	3 phase unit - 3 phase unit 3 phase unit	CGL - ABB ABB	NA - NA NA
3.	Panki	i) Bus Reactor ii) Bus Reactor iii)Panki-Obra iv)Panki-Muradnagar v)Panki-K I & II	50 MVAR 2x25=50 MVAR (33 KV) 80 MVAR 50MVAR -	3 phase unit 3 phase unit 3 phase unit 3 phase unit -	CGL CGL GEC GEC -	NA NA NA NA -
4.	Sarnath	i) Bus Reactor ii) Sarnath-Anpara A iii)Sarnath-Anpara B1 iv)Sarnath-AnparaB2 v)Sarnath-Azamgarh vi)Sarnath-Mau	50 MVAR - - - - -	3 phase unit - - - - -	CGL - - - - -	NA - - - - -
5.	Mau	i) Bus Reactor ii)Mau-Sarnath iii)Mau-Azamgarh	31.5MVAR (33KV) - -	3 phase unit - -	CGL - -	NA - -
6	Azamgarh	i) Bus Reactor ii) Bus Reactor iii)Azamgarh-Sarnath iv)Azamgarh-Mau v)Azamgarh- Sultanpur vi)Azamgarh- Gorakhpur	50 MVAR 2x31.5MVAR(33KV) 50 MVAR - - -	3 phase unit 3 phase unit 3 phase unit - - -	CGL CGL TELK - - -	NA NA NA - - -



7.	Sultanpur	i) Bus Reactor ii)Sultanpur-Obra iii)Sultanpur-Lucknow iv)Sultanpur-Azamgarh	2x25=50 MVAR (33 KV) 50 MVAR - -	3 phase unit 3 phase unit - -	CGL ASIA	NA NA - -
8.	Lucknow	i)Bus Reactor ii) Bus Reactor iii)Lucknow-Sultanpur iv)Lucknow-Singrauli v) Lucknow-Moradabad	50 MVAR 2x25=50MVAR (33 KV) - 63 MVAR 50 MVAR	3 phase unit 3 phase unit - 3 phase unit 3 phase unit	ACEC CGL - TOSHIBA BHEL	Diff-CAG-34 REF-CAG-14 Back up-YTG-33 NA Diff-CAG-34 REF=CAG-14 Backup=YTG-33 -do-
9.	Moradabad	i) Bus Reactor ii) Bus Reactor iii)Moradabad-Lucknow iv)Moradabad-Rishikesh v)Moradabad-Muradnagar	50 MVAR 2x31.5=63MVAR(33KV) 50 MVAR(33 KV) - -	3 phase unit 3 phase unit 3 phase unit - -	ACEC GEC BHEL	NA NA Diff-CAG-34 REF-CAG-14 Backup-YTG-33 -



10.	Moradnagar	i) Bus Reactor	50 MVAR	3x1 phase unit	CGL	Diff-CAG-34 REF=CAG-14 Back up-YTG-33
		(ii) Bus Reactor	2x25=50 MVAR(33 KV)	3 phase unit	CGL	NA
		iii)Muradnagar-Panki	50 MVAR	3 phase unit	BHEL	NA
		iv)Muradnagar-Moradabad	-	-	-	-
		v)Muradnagar-Dadri	-	-	-	-
		vi)Muradnagar-Rishikesh	-	-	-	-
11.	Rishikesh	i) Bus Reactor	50 MVAR	3 phase unit		NA
		ii) Bus Reactor	2x31.5=63 MVAR(33 kV)	3 phase unit		NA
		iii) Rishikesh-Muradnagar	-	-		-
		iv)Rishikesh-Moradabad	-	-		-
C.7 RSEB						
1.	Heerapura	Heerapura-Bassi I & II	-	-	-	-
C.8 DVB						
1.	Bawana	i)Bawana-Mandola I & II	-	-	-	-
		ii)Bawana-Hissar	-	-	-	-
		iii)Bawana-Bhiwani	-	-	-	-



SECTION - D

TRANSFORMER TAP POSITIONS



D. TAP POSITION OF 400 / 220 KV ICTs IN NORTHERN REGION

D.1 POWERGRID (NR-I)

Sl. No	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	BALLABGARH	POWERGRID (NR-I)	1 2 3	315 315 315	17, (1.25% each) 17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9 9 9		
2.	MANDOLA	POWERGRID (NR-I)	1 2 3 4	315 315 315 315	17, (1.25% each) 17, (1.25% each) 17, (1.25% each) 17, (1.25 % each) (Taps on HV side)	9 9 9 9		



D-2 POWERGRID (NR-II)

Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	HISSAR	POWERGRID (NR-II)	1 2	315 315	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9b 9b		
2.	MALERKOTLA	POWERGRID (NR-II)	1 2	315 315	17, (1.25% each) 17, (1.25 % each) (Taps on HV side)	9b 9b		
3.	MOGA	POWERGRID (NR-II)	1 2	250 250	17, (1.25% each) 17, (1.25 % each) (Taps on HV side)	9b 9b		
4.	KISHENPUR	POWERGRID (NR-II)	1 2	315 315	17, (1.25% each) 17, (1.25 % each) (Taps on HV side)	9b 9b		
5.	WAGOORA	POWERGRID (NR-II)	1 2	315 315	17, (1.25% each) 17, (1.25 % each) (Taps on HV side)	9b 9b		



D-3 NTPC

Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	AURAIYA	NTPC	1 2	315 315	17(1.25%each) 17(1.25%each) (Taps on HV side)	9 9		
2.	DADRI(TH)	NTPC	1 2	500 500	17(1.25%each) 17(1.25%each)	10 10		
3.	DADRI(GAS)	NTPC	1 2	500 500	17(1.25%each) 17(1.25%each)	10 10		

D-4 BBMB

Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	DEHAR	BBMB	1	250	9, (1.25 % each) (Taps on LV side)	5		
2.	PANIPAT	BBMB	1 2	450 450	17, (1.25% each) 17, (1.25% each) (Taps on LV side)	13 13		
3.	BHIWANI	BBMB	1	500	17, (1.25% each) (Taps on HV side)	9		



D-5 UPPCL

Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	UNNAO	UPSEB	1 2	315 315	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9 -		
2.	SARNATH	UPSEB	1 2	240 315	17, (% each) 17, (% each) (Taps on HV side)			
3.	PANKI	UPSEB	1 2	240 240	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9 9		
4.	SULTANPUR	UPSEB	1 2	240 240	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9 9		
5.	MURADNAGAR	UPSEB	1 2 3	240 315 240	17, (1.25% each) 17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9 9 9		
6.	MORADABAD	UPSEB	1 2	240 240	17, (1.25% each) 17, (.1.25% each) (Taps on HV side)	9 9		
7.	RISHIKESH	UPSEB	1 2	240 240	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	9 -		



Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
8.	LUCKNOW	UPSEB	1 2	240 240	17, (1.25 % each) 17, (1.25% each) (Taps on HV side)	9 9		
9.	AZAMGARH	UPSEB	1 2	240 240	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	10 10		
10.	OBRA-B	UPSEB	1 2	240 240	17, (1.25% each) 17, (1.25% each) (Taps on HV side)	10 10		
11.	AGRA	UPSEB	1	315	17, (1.25% each) (Taps on HV side)	9		



D-6 RSEB

Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	HEERAPURA	RSEB	1	250	17, (1.25% each)	9		
			2	250	17, (1.25% each)	9		
			3	250	17, (1.25% each)	9		
					(Taps on HV side)			



D-7 DVB

Sl. No.	NAME OF SUB-STATION	AGENCY	ICT		NO. OF TAPS & % OF NOMINAL	NOMINAL TAP POSITION	CURRENT TAP POSITION	TAP LAST CHANGED ON
			No.	MVA Capacity				
1.	BAWANA	DVB	1	315	17,(1.25% each)	9b		
			2	315	17,(1.25% each)	9b		
			3	315	17.(1.25% each) (Taps on HV side)	9b		



SECTION - E

MISCELLANEOUS



SECTION-E

E.1 A - SIZE / TYPE & CURRENT RATING OF DIFFERENT CONDUCTORS

Sl. No	Conductor Size Sq. Inch/Sq. MM/ (Cu. equiv.)	Code Name	Conductor Age-Year	Current Carrying Capacity in Amps at Ambient Temp. (° C) [AMPACITY] {Maximum design temperature of conductor = 60 deg.C}										
				0	5	10	15	20	25	30	35	40	45	50
1.	0.388/250 $\frac{42}{350}$ MM AL + $\frac{7}{136}$ MM ST	ACSR Kundah	Upto 1 1 to 10 Beyond 10	1035.1 1088.6 1105.8	992.0 1044.3 1061.2	926.0 973.0 989.9	821.3 862.8 880.2	752.1 790.6 807.9	649.9 683.2 701.1	543.7 571.5 590.2	477.7 502.7 520.8	344.9 362.7 383.0	276.6 290.3 310.4	186.9 195.9 216.4
2.	0.403/260 $\frac{54}{318}$ MM AL + $\frac{7}{318}$ MM ST	ACSR Zebra	Upto 1 1 to 10 Beyond 10	1090.3 1147.8 1166.3	1044.9 1101.2 1119.3	952.0 1003.8 1022.3	839.4 885.4 904.6	766.2 809.0 828.1	656.3 693.6 713.5	541.7 573.1 594.2	495.0 522.4 542.1	352.2 371.9 394.3	267.1 283.1 305.4	171.0 182.0 204.9
3.	0.504/325 $\frac{54}{353}$ MM AL + $\frac{7}{353}$ MM ST	ACSR Moose	Upto 1 1 to 10 Beyond 10	1259.8 1328.6 1350.7	1207.5 1274.7 1296.4	1098.3 1160.3 1182.4	965.5 1020.7 1043.8	880.0 931.4 954.4	750.3 795.3 819.3	614.6 652.9 678.5	534.5 569.4 594.3	358.4 384.9 414.6	264.5 286.2 315.1	147.5 163.6 193.4
4.	0.512/330 $\frac{42}{413}$ MM AL + $\frac{7}{230}$ MM ST	ACSR Morkulla	Upto 1 1 to 10 Beyond 10	1292.5 1363.0 1385.7	1238.8 1307.7 1329.9	1126.9 1190.4 1213.1	990.6 1047.2 1070.9	902.9 955.6 979.2	770.0 816.1 840.7	630.9 670.1 696.3	548.7 584.4 610.0	368.2 395.4 425.8	271.9 294.1 323.8	151.9 168.4 198.9
5.	0.682/440 $\frac{42}{457}$ MM AL + $\frac{7}{254}$ MM ST	ACSR Bersimis	Upto 1 1 to 10 Beyond 10	1498.6 1583.1 1610.2	1436.5 1519.0 1545.6	1304.6 1380.8 1407.9	1143.4 1211.4 1239.8	1040.6 1104.1 1132.4	883.2 938.9 968.7	718.0 765.8 797.6	622.1 665.8 696.9	404.2 438.3 476.3	292.3 320.5 357.1	150.3 171.7 209.6

NOTE : The ampacity for temperatures 0 to 40 deg.C have been directly taken from the tables in the CBI&P Technical Report No.77 on “Current Carrying Capacity of Overhead Transmission line ACSR conductors for Northern Region” (May 1991) while the ampacity for 45 & 50 deg.C have been approximated using linear regression.



SECTION-E

E.1 B - SIZE / TYPE & CURRENT RATING OF DIFFERENT CONDUCTORS

Sl. No	Conductor Size Sq. Inch/Sq. MM/ (Cu. equiv.)	Code Name	Conductor Age-Year	Current Carrying Capacity in Amps at Ambient Temp. (° C) [AMPACITY] {Maximum design temperature of conductor = 65 deg.C}										
				0	5	10	15	20	25	30	35	40	45	50
1.	0.388/250 $\frac{42}{310}$ MM AL + $\frac{7}{136}$ MM ST	ACSR Kundah	Upto 1 1 to 10 Beyond 10	1069.5 1126.0 1144.3	1050.6 1105.0 1122.6	969.1 1019.6 1037.4	871.4 916.8 935.2	807.3 850.1 868.3	714.7 753.0 771.7	621.6 655.3 674.5	565.8 597.3 615.7	461.5 487.7 506.9	384.6 406.6 426.3	303.5 321.4 341.3
2.	0.403/260 $\frac{54}{318}$ MM AL + $\frac{7}{318}$ MM ST	ACSR Zebra	Upto 1 1 to 10 Beyond 10	1126.5 1187.4 1207.0	1083.4 1143.1 1162.3	996.3 1051.8 1071.4	891.2 941.4 961.7	823.4 870.8 891.0	724.1 766.7 787.5	647.5 684.1 704.9	588.9 623.2 643.2	477.6 506.2 527.1	392.6 416.9 438.4	307.9 327.8 349.6
3.	0.504/325 $\frac{54}{353}$ MM AL + $\frac{7}{353}$ MM ST	ACSR Moose	Upto 1 1 to 10 Beyond 10	1301.8 1374.5 1397.9	1252.1 1323.4 1346.4	1149.7 1216.2 1239.5	1025.8 1086.1 1110.4	946.7 1003.7 1027.9	829.7 881.1 906.1	711.7 757.5 783.5	645.0 688.1 713.1	511.7 548.4 575.0	407.3 439.0 466.3	303.2 330.0 357.9
4.	0.512/330 $\frac{42}{413}$ MM AL + $\frac{7}{230}$ MM ST	ACSR Morkulla	Upto 1 1 to 10 Beyond 10	1335.6 1410.1 1434.1	1284.5 1357.7 1381.2	1179.5 1247.7 1271.6	1052.5 1114.3 1139.2	971.3 1029.8 1054.5	851.4 904.0 929.7	730.4 777.4 804.0	662.0 706.1 731.8	525.3 562.9 590.2	418.3 450.9 478.9	311.6 339.1 367.7
5.	0.682/440 $\frac{42}{457}$ MM AL + $\frac{7}{254}$ MM ST	ACSR Bersimis	Upto 1 1 to 10 Beyond 10	1548.7 1638.0 1666.7	1489.7 1577.2 1605.4	1365.9 1447.6 1476.3	1215.6 1289.9 1319.8	1120.6 1190.9 1220.7	978.8 1042.4 1073.3	835.7 892.6 924.8	756.4 810.0 841.0	593.9 640.7 673.3	467.7 508.0 541.9	341.7 376.3 410.9

NOTE : The ampacity for temperatures 0 to 40 deg.C have been directly taken from the tables in the CBI&P Technical Report No.77 on “Current Carrying Capacity of Overhead Transmission line ACSR conductors for Northern Region” (May 1991) while the ampacity for 45 & 50 deg.C have been approximated using linear regression.



SECTION-E

E.1 C - SIZE / TYPE & CURRENT RATING OF DIFFERENT CONDUCTORS

Sl. No	Conductor Size Sq. Inch/Sq. MM/ (Cu. equiv.)	Code Name	Conductor Age-Year	Current Carrying Capacity in Amps at Ambient Temp. (° C) [AMPACITY] {Maximum design temperature of conductor = 67 deg.C}										
				0	5	10	15	20	25	30	35	40	45	50
1.	0.388/250 $\frac{42}{360}$ MM AL + $\frac{7}{136}$ MM ST	ACSR Kundah	Upto 1 1 to 10 Beyond 10	1082.7 1140.5 1159.1	1065.3 1120.9 1138.9	985.6 1037.4 1055.6	890.1 937.1 955.9	827.9 872.4 891.0	738.7 778.8 797.9	649.7 685.5 704.9	596.9 630.8 649.5	499.9 528.9 548.1	422.7 447.5 467.2	344.6 365.6 385.4
2.	0.403/260 $\frac{54}{318}$ MM AL + $\frac{7}{318}$ MM ST	ACSR Zebra	Upto 1 1 to 10 Beyond 10	1140.5 1202.6 1222.6	1098.4 1159.4 1179.1	1013.1 1070.1 1090.1	910.5 962.5 983.2	844.8 894.0 914.6	749.1 793.8 814.9	677.3 716.2 737.9	622.0 658.3 679.0	518.6 550.3 571.1	433.2 460.5 482.1	351.8 375.0 396.7
3.	0.504/325 $\frac{54}{353}$ MM AL + $\frac{7}{353}$ MM ST	ACSR Moose	Upto 1 1 to 10 Beyond 10	1318.0 1392.2 1416.1	1269.4 1342.4 1365.8	1169.3 1237.5 1261.4	1048.3 1110.6 1135.4	971.6 1030.7 1055.4	858.9 912.7 938.1	746.4 795.0 821.2	683.6 729.7 754.9	560.5 600.8 627.1	455.2 490.6 517.9	355.0 385.9 413.6
4.	0.512/330 $\frac{42}{413}$ MM AL + $\frac{7}{230}$ MM ST	ACSR Morkulla	Upto 1 1 to 10 Beyond 10	1352.1 1428.3 1452.7	1302.3 1377.1 1401.1	1199.6 1269.6 1294.0	1075.6 1139.5 1164.9	996.9 1057.5 1082.8	881.3 936.5 962.6	766.0 815.8 842.7	701.6 748.8 774.7	575.4 616.6 643.6	467.4 529.1 531.6	364.7 425.7 424.7
5.	0.682/440 $\frac{42}{457}$ MM AL + $\frac{7}{254}$ MM ST	ACSR Bersimis	Upto 1 1 to 10 Beyond 10	1568.0 1659.2 1688.5	1510.4 1599.9 1628.7	1389.3 1473.2 1502.5	1242.6 1319.4 1349.9	1150.5 1223.4 1253.8	1014.0 1080.5 1111.9	877.6 937.9 970.4	803.1 860.3 891.6	653.5 703.9 736.7	525.5 570.4 604.3	404.4 443.8 478.4

NOTE : The ampacity for temperatures 0 to 40 deg.C have been directly taken from the tables in the CBI&P Technical Report No.77 on “Current Carrying Capacity of Overhead Transmission line ACSR conductors for Northern Region” (May 1991) while the ampacity for 45 & 50 deg.C have been approximated using linear regression.



SECTION-E

E.1 D - SIZE / TYPE & CURRENT RATING OF DIFFERENT CONDUCTORS

Sl. No	Conductor Size Sq. Inch/Sq. MM/ (Cu. equiv.)	Code Name	Conductor Age-Year	Current Carrying Capacity in Amps at Ambient Temp. (° C) [AMPACITY] {Maximum design temperature of conductor = 75 deg.C}										
				0	5	10	15	20	25	30	35	40	45	50
1.	0.388/250 $\frac{42}{160}$ MM AL + $\frac{7}{136}$ MM ST	ACSR Kundah	Upto 1 1 to 10 Beyond 10	1158.0 1219.5 1239.2	1120.9 1181.4 1200.9	1047.0 1104.2 1124.0	960.0 1012.9 1033.2	904.3 955.1 975.3	825.6 872.8 893.3	749.5 793.2 813.9	705.6 747.8 767.8	627.4 666.0 686.0	546.6 581.5 602.3	476.3 508.0 529.0
2.	0.403/260 $\frac{54}{318}$ MM AL + $\frac{7}{318}$ MM ST	ACSR Zebra	Upto 1 1 to 10 Beyond 10	1193.8 1261.2 1282.8	1155.0 1221.4 1242.8	1076.0 1138.9 1160.6	982.4 1040.9 1063.3	947.8 1002.7 1024.5	864.1 915.2 937.3	783.2 830.5 853.0	737.3 783.0 804.6	654.3 696.2 717.9	578.4 595.2 638.1	507.7 518.1 564.0
3.	0.504/325 $\frac{54}{353}$ MM AL + $\frac{7}{353}$ MM ST	ACSR Moose	Upto 1 1 to 10 Beyond 10	1379.8 1460.3 1486.2	1335.1 1414.4 1439.9	1242.3 1317.5 1343.5	1132.0 1202.1 1228.9	1063.4 1130.9 1157.5	964.4 1027.5 1054.7	868.8 927.6 955.3	817.1 874.0 900.7	719.5 771.9 798.9	616.3 664.3 692.4	528.5 572.6 601.0
4.	0.512/330 $\frac{42}{413}$ MM AL + $\frac{7}{230}$ MM ST	ACSR Morkulla	Upto 1 1 to 10 Beyond 10	1415.5 1498.1 1524.6	1369.7 1451.0 1477.1	1274.5 1351.6 1378.2	1161.4 1233.3 1260.7	1091.1 1160.2 1187.6	989.6 1054.2 1082.1	891.6 951.8 980.2	838.5 896.7 924.1	738.4 792.1 819.8	632.6 681.7 710.6	542.5 587.7 616.9
5.	0.682/440 $\frac{42}{457}$ MM AL + $\frac{7}{254}$ MM ST	ACSR Bersimis	Upto 1 1 to 10 Beyond 10	1641.7 1740.6 1772.3	1588.6 1686.0 1717.3	1476.5 1569.0 1600.8	1342.8 1429.2 1462.1	1260.6 1343.7 1376.5	1140.9 1218.7 1252.2	1025.3 1098.1 1132.3	964.2 1034.5 1067.5	846.3 911.4 944.8	721.1 780.8 815.7	615.2 670.2 705.5

NOTE : The ampacity for temperatures 0 to 40 deg.C have been directly taken from the tables in the CBI&P Technical Report No.77 on “Current Carrying Capacity of Overhead Transmission line ACSR conductors for Northern Region” (May 1991) while the ampacity for 45 & 50 deg.C have approximated using linear regression.



E2 - NOMINAL CURRENT RATINGS OF ICTs

ICTs CAPACITY (MVA)	NOMINAL CURRENT RATING (AMPS)	
	400 kV SIDE	220 kV SIDE
240	346.40	630.00
250	360.80	656.10
315	454.60	826.60
450	649.50	1181.00
500	721.70	1312.20



E3.A LINES/ ICT'S LOADING (IN AMPS) AT DIFFERENT VOLTAGES AND POWER FACTORS (400 KV LEVEL)

		POWER FACTOR 0.98							POWER FACTOR 0.95							
MW	MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)							MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)						
		390	380	370	360	350	340	390		380	370	360	350	340		
230	46.70	347.44	356.58	366.22	376.39	387.14	398.53	75.60	358.41	367.84	377.78	388.28	399.37	411.12		
240	48.73	362.54	372.08	382.14	392.76	403.98	415.86	78.88	373.99	383.83	394.21	405.16	416.73	428.99		
250	50.76	377.65	387.59	398.06	409.12	420.81	433.19	82.17	389.58	399.83	410.63	422.04	434.10	446.87		
260	52.80	392.76	403.09	413.99	425.48	437.64	450.51	85.46	405.16	415.82	427.06	438.92	451.46	464.74		
300	60.92	453.18	465.10	477.68	490.94	504.97	519.82	98.61	467.49	479.79	492.76	506.45	520.92	536.24		
310	62.95	468.29	480.61	493.60	507.31	521.80	537.15	101.89	483.07	495.79	509.19	523.33	538.28	554.11		
320	64.98	483.39	496.11	509.52	523.67	538.64	554.48	105.18	498.66	511.78	525.61	540.21	555.65	571.99		
330	67.01	498.50	511.62	525.44	540.04	555.47	571.81	108.47	514.24	527.77	542.04	557.09	573.01	589.86		
400	81.22	604.24	620.14	636.90	654.59	673.29	693.10	131.47	623.32	639.72	657.01	675.26	694.56	714.98		
450	91.38	679.77	697.66	716.51	736.42	757.46	779.73	147.91	701.24	719.69	739.14	759.67	781.38	804.36		
500	101.53	755.30	775.17	796.13	818.24	841.62	866.37	164.34	779.15	799.65	821.27	844.08	868.20	893.73		
550	111.68	830.83	852.69	875.74	900.06	925.78	953.01	180.78	857.07	879.62	903.39	928.49	955.02	983.10		
600	121.84	906.36	930.21	955.35	981.89	1009.94	1039.65	197.21	934.98	959.58	985.52	1012.90	1041.84	1072.48		
650	131.99	981.89	1007.73	1034.96	1063.71	1094.10	1126.28	213.64	1012.90	1039.55	1067.65	1097.30	1128.65	1161.85		
700	142.14	1057.42	1085.24	1114.58	1145.54	1178.27	1212.92	230.08	1090.81	1119.52	1149.77	1181.71	1215.47	1251.22		
750	152.29	1132.95	1162.76	1194.19	1227.36	1262.43	1299.56	246.51	1168.73	1199.48	1231.90	1266.12	1302.29	1340.60		
800	162.45	1208.48	1240.28	1273.80	1309.18	1346.59	1386.20	262.95	1246.64	1279.45	1314.03	1350.53	1389.11	1429.97		
850	172.60	1284.01	1317.80	1353.41	1391.01	1430.75	1472.83	279.38	1324.56	1359.41	1396.15	1434.93	1475.93	1519.34		



E3.B LINES/ ICT'S LOADING (IN AMPS) AT DIFFERENT VOLTAGES AND POWER FACTORS (400 KV LEVEL)

MW	POWER FACTOR 0.90							POWER FACTOR 0.85						
	MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)						MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)					
		390	380	370	360	350	340		390	380	370	360	350	340
230	111.39	378.32	388.28	398.77	409.85	421.56	433.96	142.54	400.57	411.12	422.23	433.96	446.35	459.48
240	116.24	394.77	405.16	416.11	427.67	439.89	452.82	148.74	417.99	428.99	440.59	452.82	465.76	479.46
250	121.08	411.22	422.04	433.45	445.49	458.21	471.69	154.94	435.41	446.87	458.94	471.69	485.17	499.44
260	125.92	427.67	438.92	450.78	463.31	476.54	490.56	161.13	452.82	464.74	477.30	490.56	504.58	519.42
300	145.30	493.46	506.45	520.14	534.58	549.86	566.03	185.92	522.49	536.24	550.73	566.03	582.20	599.33
310	150.14	509.91	523.33	537.47	552.40	568.19	584.90	192.12	539.91	554.11	569.09	584.90	601.61	619.30
320	154.98	526.36	540.21	554.81	570.22	586.51	603.76	198.32	557.32	571.99	587.45	603.76	621.02	639.28
330	159.83	542.81	557.09	572.15	588.04	604.84	622.63	204.52	574.74	589.86	605.80	622.63	640.42	659.26
400	193.73	657.95	675.26	693.51	712.78	733.14	754.71	247.90	696.65	714.98	734.31	754.71	776.27	799.10
450	217.94	740.19	759.67	780.20	801.88	824.79	849.04	278.88	783.73	804.36	826.10	849.04	873.30	898.99
500	242.16	822.44	844.08	866.89	890.97	916.43	943.38	309.87	870.81	893.73	917.89	943.38	970.34	998.88
550	266.38	904.68	928.49	953.58	980.07	1008.07	1037.72	340.86	957.90	983.10	1009.67	1037.72	1067.37	1098.76
600	290.59	986.92	1012.90	1040.27	1069.17	1099.71	1132.06	371.85	1044.98	1072.48	1101.46	1132.06	1164.40	1198.65
650	314.81	1069.17	1097.30	1126.96	1158.26	1191.36	1226.40	402.83	1132.06	1161.85	1193.25	1226.40	1261.44	1298.54
700	339.03	1151.41	1181.71	1213.65	1247.36	1283.00	1320.74	433.82	1219.14	1251.22	1285.04	1320.74	1358.47	1398.43
750	363.24	1233.65	1266.12	1300.34	1336.46	1374.64	1415.07	464.81	1306.22	1340.60	1376.83	1415.07	1455.50	1498.31
800	387.46	1315.90	1350.53	1387.03	1425.56	1466.29	1509.41	495.80	1393.30	1429.97	1468.62	1509.41	1552.54	1598.20
850	411.67	1398.14	1434.93	1473.72	1514.65	1557.93	1603.75	526.78	1480.39	1519.34	1560.41	1603.75	1649.57	1698.09



E4.A LINES/ ICT'S LOADING (IN AMPS) AT DIFFERENT VOLTAGES AND POWER FACTORS (220 KV LEVEL)

MW	POWER FACTOR 0.98								POWER FACTOR 0.95							
	MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)						MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)							
		210	200	190	180	170	160		210	200	190	180	170	160		
130	26.40	364.70	382.94	403.09	425.48	450.51	478.67	42.73	376.22	395.03	415.82	438.92	464.74	493.79		
140	28.43	392.76	412.39	434.10	458.21	485.17	515.49	46.02	405.16	425.42	447.81	472.68	500.49	531.77		
150	30.46	420.81	441.85	465.10	490.94	519.82	552.31	49.30	434.10	455.80	479.79	506.45	536.24	569.75		
160	32.49	448.86	471.31	496.11	523.67	554.48	589.13	52.59	463.04	486.19	511.78	540.21	571.99	607.74		
170	34.52	476.92	500.76	527.12	556.40	589.13	625.95	55.88	491.98	516.58	543.76	573.97	607.74	645.72		
180	36.55	504.97	530.22	558.13	589.13	623.79	662.77	59.16	520.92	546.96	575.75	607.74	643.49	683.70		
190	38.58	533.03	559.68	589.13	621.86	658.44	699.60	62.45	549.86	577.35	607.74	641.50	679.24	721.69		
200	40.61	561.08	589.13	620.14	654.59	693.10	736.42	65.74	578.80	607.74	639.72	675.26	714.98	759.67		
210	42.64	589.13	618.59	651.15	687.32	727.75	773.24	69.02	607.74	638.12	671.71	709.03	750.73	797.65		
220	44.67	617.19	648.05	682.15	720.05	762.41	810.06	72.31	636.68	668.51	703.70	742.79	786.48	835.64		
230	46.70	645.24	677.50	713.16	752.78	797.06	846.88	75.60	665.62	698.90	735.68	776.55	822.23	873.62		
240	48.73	673.29	706.96	744.17	785.51	831.72	883.70	78.88	694.56	729.28	767.67	810.32	857.98	911.61		
250	50.76	701.35	736.42	775.17	818.24	866.37	920.52	82.17	723.50	759.67	799.65	844.08	893.73	949.59		
260	52.80	729.40	765.87	806.18	850.97	901.03	957.34	85.46	752.44	790.06	831.64	877.84	929.48	987.57		
300	60.92	841.62	883.70	930.21	981.89	1039.65	1104.62	98.61	868.20	911.61	959.58	1012.90	1072.48	1139.51		
310	62.95	869.67	913.16	961.22	1014.62	1074.30	1141.45	101.89	897.14	941.99	991.57	1046.66	1108.23	1177.49		
320	64.98	897.73	942.61	992.22	1047.35	1108.96	1178.27	105.18	926.08	972.38	1023.56	1080.42	1143.98	1215.47		
330	67.01	925.78	972.07	1023.23	1080.08	1143.61	1215.09	108.47	955.02	1002.77	1055.54	1114.18	1179.73	1253.46		



E4.B LINES/ ICT'S LOADING (IN AMPS) AT DIFFERENT VOLTAGES AND POWER FACTORS (220 KV LEVEL)

		POWER FACTOR 0.90							POWER FACTOR 0.85							
MW	MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)							MVAR	CURRENT(AMPS) AT DIFFERENT VOLTAGE LEVELS(KV)						
		210	200	190	180	170	160	210		200	190	180	170	160		
130	62.96	397.12	416.98	438.92	463.31	490.56	521.22	80.57	420.48	441.50	464.74	490.56	519.42	551.88		
140	67.81	427.67	449.05	472.68	498.94	528.29	561.31	86.76	452.82	475.46	500.49	528.29	559.37	594.33		
150	72.65	458.21	481.13	506.45	534.58	566.03	601.41	92.96	485.17	509.43	536.24	566.03	599.33	636.78		
160	77.49	488.76	513.20	540.21	570.22	603.76	641.50	99.16	517.51	543.39	571.99	603.76	639.28	679.24		
170	82.33	519.31	545.28	573.97	605.86	641.50	681.59	105.36	549.86	577.35	607.74	641.50	679.24	721.69		
180	87.18	549.86	577.35	607.74	641.50	679.24	721.69	111.55	582.20	611.31	643.49	679.24	719.19	764.14		
190	92.02	580.41	609.43	641.50	677.14	716.97	761.78	117.75	614.55	645.27	679.24	716.97	759.15	806.59		
200	96.86	610.95	641.50	675.26	712.78	754.71	801.88	123.95	646.89	679.24	714.98	754.71	799.10	849.04		
210	101.71	641.50	673.58	709.03	748.42	792.44	841.97	130.15	679.24	713.20	750.73	792.44	839.06	891.50		
220	106.55	672.05	705.65	742.79	784.06	830.18	882.06	136.34	711.58	747.16	786.48	830.18	879.01	933.95		
230	111.39	702.60	737.73	776.55	819.69	867.91	922.16	142.54	743.92	781.12	822.23	867.91	918.97	976.40		
240	116.24	733.14	769.80	810.32	855.33	905.65	962.25	148.74	776.27	815.08	857.98	905.65	958.92	1018.85		
250	121.08	763.69	801.88	844.08	890.97	943.38	1002.34	154.94	808.61	849.04	893.73	943.38	998.88	1061.31		
260	125.92	794.24	833.95	877.84	926.61	981.12	1042.44	161.13	840.96	883.01	929.48	981.12	1038.83	1103.76		
300	145.30	916.43	962.25	1012.90	1069.17	1132.06	1202.81	185.92	970.34	1018.85	1072.48	1132.06	1198.65	1273.57		
310	150.14	946.98	994.33	1046.66	1104.81	1169.79	1242.91	192.12	1002.68	1052.82	1108.23	1169.79	1238.61	1316.02		
320	154.98	977.52	1026.40	1080.42	1140.44	1207.53	1283.00	198.32	1035.03	1086.78	1143.98	1207.53	1278.56	1358.47		
330	159.83	1008.07	1058.48	1114.18	1176.08	1245.27	1323.09	204.52	1067.37	1120.74	1179.73	1245.27	1318.52	1400.92		



E.5 LINE PARAMETERS (p.u./km/ckt AT 100 MVA BASE)

Sl. No.	Line Voltage (kV)	Conductor Configuration	Positive Sequence			Zero Sequence		
			R	X	B	R	X	B
01.	765	Quad Bersimis	1.9513E-6	4.475E-5	2.4E-2	4.5E-5	1.8E-4	1.406E-2
02.	400	Twin Moose	1.862E-5	2.075E-4	5.55E-3	1.012E-4	7.75E-4	3.584E-3
03.	220	Zebra	1.547E-4	8.249E-4	1.42E-3	4.545E-4	2.767E-3	8.906E-4
04.	132	Panther	9.31E-4	2.216E-3	5.1E-4	2.328E-3	9.31E-3	

Source: Manual on Transmission Planning Criteria, CEA