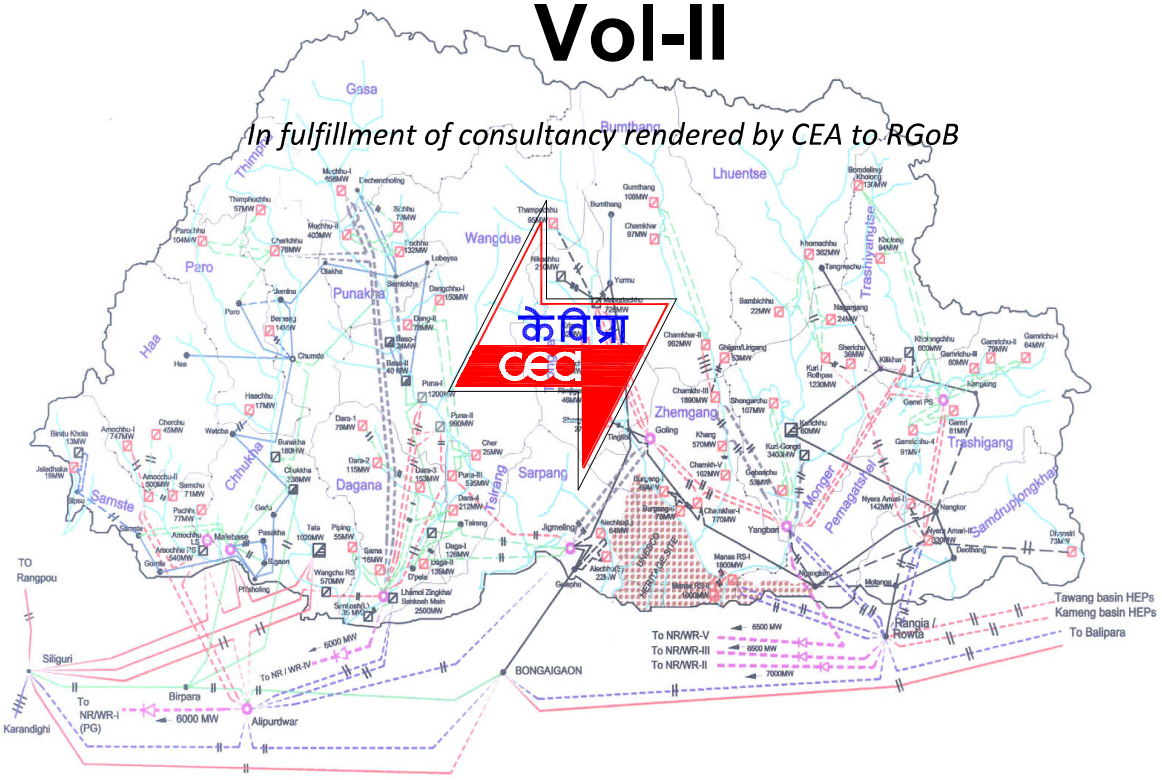
National Transmission Grid Master Plan (NTGMP) for Bhutan

Vol-II

In fulfillment of consultancy rendered by CEA to RGoB



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Annexure-I

EXISTING HYDRO GENERATING STATIONS IN BHUTAN

Name	Location	Installed capacity x Units) in MW	Generation Transformer	
			Voltage Ratio (kV)	MVA rating (No. x MVA)
Chukha HEP (CHPP)	Chukha	336 (4x84)	11/220	420 (12x35)
Tala HEP (THPP)	Chukha	1020 (6x170)	13.8/400	1260 (18x70)
Basochhu-I HEP (BHPP)	Wangduep hodrang	24 (2x12)	11/66	30 (2x15)
Basochhu-II HEP (BHPP)	Wangduep hodrang	40 (2x20)	11/220 220/66 66/11	60(2x30) 30(1x30) 5(1x5)
Kurichhu HEP (BHPP)	Monger	60 (4x15)	11/132	20 (4x20)
Total		**1480**		

Annexure-II

NEW HYDRO GENERATING STATIONS BY 2020 AD IN BHUTAN

Sl No.	Project Name	River basin/ Location	Installed capacity (MW)	Expected year of commissioning
1	Punatsangchhu-I HEP	Punatsangchhu/ Wangduephodrang	1200	2015
2	Punatsangchhu-II HEP	Punatsangchhu/ Wangduephodrang	1020	2017
3	Sunkosh Main HEP	Punatsangchhu/ Lhamoizingkha	2500	2020
4	Sunkosh Barrage HEP	Punatsangchhu/ Lhamoizingkha	85	2020
5	Wangchhu HEP	Wangchhu / Chukha	570	2019
6	Bunakha Reservoir HEP	Wangchhu / Chukha	180	2020
7	Amochhu Reservoir HEP	Amochhu/ Samtse/Chukha	540	2018
8	Dagachhu HEP	Punatsangchhu/ Trongsa	126	2015
9	Mangdechhu HEP	Mangdechhu / Trongsa	720	2017
10	Nikachhu HEP	Mangdechhu / Trongsa	210	2020
11	Chamkharchhu-I HEP	Mangdechhu / Zhemgang	770	2018
12	Kuri-Gongri HEP	Drangmechhu / Mongar	1800	2020
13	Kholongchhu HEP	Drangmechhu / Trashiyangtse	600	2018
14	Bindu Khola HEP	Mongar	13	2020
Total			**10334**	

Annexure III

BASINWISE HEPS BEYOND 2020 & UPTO 2030 SCENARIO

S.N.	Name of the Generating Station
	WANGCHHU BASIN
1	Bemengchhu -14MW
2	Cherichhu-76MW
3	Hachhu -17 MW
4	Parochhu -104 MW
5	Pipingchhu -55 MW
6	Thimphuchhu - 57 MW
	AMOCHHU BASIN
7	Amochhu-1 -747 MW
8	Amochhu-2 -500MW
9	Cherchu -45 MW
10	Pachhu -77 MW
11	Samchu -71 MW
	PUNASANGCHHU BASIN
12	Punatsangchhu III -595 MW
13	Cherchhu -25 MW
14	Dagachhu 2 - 135 MW
15	Dangchhu 1 -150 MW
16	Dangchhu 2 - 78 MW
17	Darachhu 1- 79 MW
18	Darachhu 2 - 115 MW
19	Darachhu 3 - 153 MW
20	Darachhu 4 -212MW
21	Mochhu I -658 MW
22	Mochhu II -403 MW
23	Phochhu -132MW
24	Samachu -16 MW
25	Sichhu -78 MW

S.N.	Name of the Generating Station
	MANGDECHHU BASIN
26	Burgangchhu I-69 MW
27	Burgangchhu II -70 MW
28	Chamkharchu-97 MW
29	Chamkharchu II 992 MW
30	Chamkharchu III -1890 MW
31	Chamkharchu 5 -162 MW
32	Ghijam/Lirigang -53 MW
33	Gumthang - 108MW
34	Krissa -32MW
35	Shergarchhu-27 MW
36	Rimjigangchhu -46 mW
37	Thampochhu -95 MW
38	Wachi -24 MW
39	Kheng (Shinghkar)-570 MW
	DRANGMECHHU BASIN
40	Gamrichu 1-64 MW
41	Gamrichu 2 -79 MW
42	Gamrichu 3 -80 MW
43	Gamri/Yamkhari -81 MW
44	Gamrichu 4 -91 MW
45	Komachhu-326 MW
46	Bambichhu -22 MW
47	Ngargangchhu -24 MW
48	Shongarchhu-107 MW
49	Gobarichhu -43 MW
50	Bomdeling -130Mw
51	Kuri/Rothpasang -1230 MW
52	Manas Reservoir I -1800 MW
53	Manas Reservoir II -1000 MW
	OTHER BASINS
54	Aiechhu (L)-64 MW
55	Aiechhu (S) 22 MW
56	Sherichu -36 MW
57	Jaldhaka -19 MW
58	Dhansiri -73 MW
59	Nyera Amari I -142 MW
60	Nyera Amari II -330 MW
61	Yangtse/ kholong -94 MW

Total Capacity addition beyond 2020 :14720 MW

Annexure –IV

EXISTING TRANSMISSION LINES

A. 400 kV LINES					
	Name of Line		**Route Length (km.)**	**Conductor Name & Size**	**Remarks**
1	Tala-Khogla (Feeder No. I & II)		25.615	ACSR Twin moose	
2	Tala-Malbase-Pugli (Feeder No. III & IV)		49.528	ACSR Twin moose	
	Total		75.143		
B. 220 kV LINES					
1	Chukha-Semtokha		54.01	ACSR zebra	
2	Semtokha-Rurichhu		44.9	ACSR zebra	
3	Rurichhu-Tsirang		46.6	ACSR zebra	At present charged at 66 kV
4	Chukha-Gedu-India border		35.78	ACSR zebra	
5	Chukha-Gedu-Malbase		29.84	ACSR zebra	
6	Malbase -India border(Birpara)		4.075	ACSR zebra	
7	Malbase-Singhigaon-Fdr-I		1.7	ACSR zebra	
8	Malbase-Singhigaon-Fdr-II		2.6	ACSR zebra	
	Total		**219.505**		
C 132 kV Lines					
1	Kurichhu-Kilikhar	Single	10.1	ACSR panther	
2	Kilikhar-Kanglung	Single	29.6	ACSR panther	
3	Kilikhar-Tangmachhu (Lhuentse)	Single	42.8	ACSR panther	At present charged at 33 kV
4	Kurichhu-Nangkor	Single	31	ACSR panther	
5	Nangkor-Deothang	Single	23.3	ACSR panther	
6	Deothang -Nganglam	Single	34.07	ACSR panther	
7	Nganglam -Tingtibi	Single	83.33	ACSR panther	
8	Tingtibi -Gelephu	Single	45.74	ACSR panther	
9	Tingtibi -India Border	Single	0.1	ACSR panther	
10	Deothang-Motanga	Single	10.5	ACSR panther	
11	Tintibi-Yurmoo	Single	32.628	ACSR panther	At present charged at 33 kV
12	*Motanga-India Border*	Single	*1.5*	ACSR panther	
	Total		**344.668**		
D 66 kV Lines					
1	Chhukha-Chumdo	Single	36.98	ACSR Dog	
2	Chumdo-Olakha	Single	5.82	ACSR Dog	

3	*Khasadrapchu-Olakha*	*Single*	*11.7*		
4	Chumdo-Paro	Single	24	ACSR Dog	
5	Chumdo-Haa	Single	33.4	ACSR Dog	
6	Watcha Tie Li ne	Single	0.5	ACSR DOG	
7	Semtokha-Olakha	Single	1.7	ACSR DOG	
8	Khasadrapchu-Jemina	Double	5.96	ACSR DOG	
9	Semtokha-Lobeysa	Single	24.3	ACSR DOG	
10	Lobeysa-Rurichhu	Single	20.3	ACSR DOG	
11	Rurichhu-Hebisa	Single	3.08	ACSR DOG	
12	Semtokha-Dechencholing	Single	11.45	ACSR DOG	
13	Chhukha-Gedu	Single	20.4	ACSR DOG	
14	Gedu-Phuentsholing	Single	16.7	ACSR DOG	
15	Phuentsholing-Gomtu	Single	26.9	ACSR DOG	
16	Malbase-Phuentsholing	Single	8.986	ACSR DOG	
17	Malbase-Pasakha	3 Circuits	3.4	ACSR DOG	
18	*Yurmoo-Trongsa*		*20.94*		At present charged at 33 kV
19	*Yurmoo-Bumthang*		*34.856*		
			311.372		

- ***Existing*** **Transmission system associated with Chukha, Kurichu and Tala HEPs**

Chukha HEP (336MW):

- 220 kV,1xD/C, Chukha(Bhutan) -Birpara (West Bengal)
- 220 kV,1xS/C, Chukha(Bhutan) -Birpara(West Bengal) via Singhigaon

Kurichu HEP (60MW):

- 132 kV,1xS/C, Kurichu(Bhutan) –Gelephu (Bhutan)-Salakati (Assam)

Tala HEP (1020MW):

- 400kV, 2xD/C Tala (Bhutan) – Siliguri(West Bengal) line (one of the circuit of a D/C line is LILOed at Malbase S/S in Bhutan

Annexure -V

PLANNED/UNDER CONSTRUCTION TRANSMISSION SYSTEMS

A. 400 kV LINES

	Name of Line	No. of Circuits	Route Length (km.)	Conductor Name & Size	Remarks
A	**400kV LINES**				
1	Punatsangchhu-I I)-Lhamoizingkha	Double	92	ACSR Twin Moose	Under construction
2	Punatsangchhu(I)-Lhamoizingkha via (vi Punatsangchhu-II	Double	92	ACSR Twin Moose	Under construction
	Total		**184**		
B	**220 kV LINES**				
1	Dagachhu-Tsirang-Jigmeling-Lodrai	Double	60.70	ACSR Zebra	Under construction
2	Malbase-Samste	Double	43.00	ACSR zebra	Under construction
	Total		**103.70**		
D	**66kV LINES**				
2	Samtse-Gomtu	Double	15	ACSR wolf	Under construction
3	Samtse-Sipsu	Single	35	ACSR wolf	Under construction
			50		

Annexure -VI

EXISTING SUBSTATIONS (66KV & ABOVE)

Sl. No.	Name of Substation	Voltage Ratio (kV)	Existing Transformer & capacity in MVA	Total Capacity (MVA)
1.	MALBASE	400/220/33	1x200	200
		220/66	3x63	189
		66/11	2x20	40
2	SINGHIGAON	220/66	1x50+ 2x35	210
		66/11	1x5+1x10	15
3	GOMTU	66/33	1x5	5
		66/11	1x5+1x3	8
4	PHUENTSHOLING	66/33	2x10	20
		66/11	1x3+ 1x12.5	15.5
5	GEDU	66/33	2x8	16
		66/11	2x5	10
6	SEMTOKHA	220/66	6x6.67	40
		66/11	2x10	20
7	OLAKHA	66/33	2x20	40
8	DECHENCHOLING	66/33	2x10	20
9	JEMINA	66/33	1x10	10
10	PARO	66/33/11	2x2.5	5
		66/11	1x10	10
11	HAA	66/11	2x5	10
12	LOBEYSA	66/33	1x5	5
		66/11	2x5	10
13	WATCHA	66/33	1x5	5
14	CHUMDO (SW)	66		
15	GELEPHU	132/66	2x25	50
		66/11	1x10	10
		66/33/11	4x2.5	10
16	TINTIBI	132/33	2x3	6
17	DHAJEY(Tsirang)	66/33	2x5	10
18	DEOTHANG	132/33	2x5	10
19	NANGKOR	132/33	2x5	10
20	KILIKHAR	132/33	2x5	10
21	KANGLUNG	132/33	2x5	10
22	NGANGLAM	132/33	2x3	6
23	TANGMACHHUB *	33/11	2x1.5	3
24	CHUKHA HEP	220/66	2x30	60

Annexure -VII

PLANNED/UNDER CONSTRUCTION/PROPOSED SUB-STATIONS (66KV & ABOVE)

Sl. No.	Name of Substation	Voltage Ratio (kV)	No. of Transforme & Capacity in MVA	Additional Transformation Capacity By 2020	Total Capacity (MVA)
1	Jigmeling	220/132	2x63	160	286
		132/33	1x15	15	
		400/220		4X167	500
2	Tsirang	220/66	2x10		20
3	Samtse	220/66		3x63	189
		66/33	25		
4	Dagachhu	220/66	2x10		20
5	Chumdo	220/66		2x50	100
6	Punatsangchhu-	400/220	1x315		315
7	Mangdechhu	400/132		4X67+3X67	400
8	Rurichhu	220/66	2x10		20
9	Amochhu LS	220/11		2X10	20
10	Malbase	400/220		200 (2^{nd})	200
		220/66		1X63 (2^{nd})	63
11	Chamkharchu I	400/132		4X67	200
12	Kholongchhu	400/132		4X67	200
13	Yangbari	400/132		4X67	200
14	Gelephu	132/66		50 (3^{rd})	50

Annexure VIII

SUBSTATION WISE ANTICIPATED LOAD (MW/MVAr) IN BHUTAN BY 2020 & 2030AD

S. NO.	NAME OF SUB-STATION	PEAK LOAD AS ON 2011		2020 Load Scenario						ANTICIPATED PEAK LOAD BY 2030 AD	
		MW	MVAR	Anticipated Peak Load		Enhanced Peak load		Off Peak Load			
				MW	MVAr	MW	MVAr	MW	MVAr	MW	MVAr
	WESTERN BHUTAN										
1	SEMTOKHA	16	8	33	16	51	24	38	18	127	61
2	DECHENCHOLING	14	7	32	15	49	23	37	18	40	19
3	JEMINA	3	1	6	3	9	4	7	3	15	7
4	CHUKHA LOCAL	4	2	8	4	12	6	9	4	20	10
5	LOBESA	6	3	13	6	20	9	15	7	33	16
6	HAA	2	1	4	2	6	3	5	2	10	5
7	PARO	8	4	16	8	25	13	18	9	41	20
8	GEDU	4	2	6	3	9	4	7	3	15	7
9	GOMTU	22	11	25	12	38	18	29	14	64	31
10	SINGHEGAON	75	36	75	36	115	55	86	42	192	93
11	PASAKHA	130	63	130	63	190	90	142	67	132	64
12	MALBASE	15	7	32	15	49	23	37	18	282	136
13	PHUENTSHOLING	16	8	21	10	32	15	24	12	54	26
14	WASTA	1	0	2	1	3	1	2	1	5	2
15	PUNATSANGCHU I & II	5	2	16	8	25	12	18	9	0	0
16	OLAKHA	6	3	15	7	23	11	17	8	38	19
17	KEWATHANG	1	0	6	3	6	3	7	3	5	7
18	TSIRANG	2	1	10	5	15	7	12	6	67	32
19	SAMTSE			100	48	153	74	115	56	226	124
20	JIGMELING			291	141	440	213	329	159	657	339
21	YURMU	0		10	5	15	7	11	4	30	13
22	BHUMTHANG	1		2	1	3	1	2	1	5	2
23	CHUMDO			2	1	3	1	2	1	49	23
24	SISSU			2	1	3	1	2	1	5	2
25	AMOCHHU LS					10	4	8	3	40	
26	DAGAPELA					10	4	8	3	40	
	SUB TOTAL	**331**	**159**	**857**	**414**	**1314**	**626**	**987**	**472**	**2192**	**1058**
EASTERN & CENTRAL BHUTAN											
1	KILIKHAR	3	1	6	3	9	4	7	3	15	7
2	KANGLUNG	4	2	8	4	12	6	9	4	20	10
3	NGANGKHOR	2	1	4	2	6	3	5	2	10	5
4	NGANGLAM+DUNGSAM CEMENT	1	0	26	13	40	19	30	14	66	32
5	TINTIBI	3	1	7	3	11	5	8	4	18	9
6	GELEPHU	4	2	20	10	31	15	23	11	51	24
7	DEWATHANG	3	1	7	3	11	5	8	4	18	9
8	MOTANGA INDUSTRY	20	10	40	19	61	29	46	22	102	49
9	TANGMACHU	1	0	3	1	5	2	3	2	8	4
	SUB TOTAL	**41**	**18**	**121**	**58**	**186**	**88**	**139**	**66**	**308**	**149**
	TOTAL BHUTAN	**372**	**177**	**978**	**472**	**1500**	**714**	**1126**	**538**	**2500**	**1207**

Annexure IX

GENERATION DISPATCHES FOR PEAK & LIGHT LOAD CONDITIONS DURING 2020 & 2030 AD IN BHUTAN

Sl.	Name of the Generating Station	Installed Capacity	I.C. by 2020	I.C. by 2030	Peak load despatch 2020	Max^{m} hydro 2020	Off peak gen 2020	Peak load Dispatch 2030
Wangchhu Basin								
1	Tala	6X170=1020	1020	1020	1015	1122	170	1015
2	Chukha	4X84=336	336	336	334	369	85	334
3	Bemengchhu	14		14				14
4	Bunakha-RS	3x60=180	180	180	179	198	40	179
5	Cherichhu	76		76				76
6	Hachhu	17		17				17
7	Parochhu	104		104				104
8	Pipingchhu	55		55				55
9	Thimphuchhu	57		57				57
10	Wangchhu	570	570	570	568	627	100	568
	Sub Total (Wangchhu basin)		**2106**	**2429**	**2096**	**2316**	**395**	**2419**
Amochhu Basin								
11	Amochhu-1	747		747				744
12	Amochhu-2	500		500				498
13	Cherchu	45		45				45
14	Pachhu	77		77				77
15	Samchu	71		71				71
16	Amochhu-RS	540	540	540	537	594	140	537
	Sub Total (Amochhu basin)		**540**	**1980**	**537**	**594**	**140**	**1972**
Punatsangchhu basin								
17	Basochhu-L	2x12=24	24	24	24	26	8	24
18	Basochhu-U	2x20=40	40	40	40	44	10	40
19	Cherchhu	25		25				25
20	Dagachhu	126	126	126	125	139	19	125
21	Dagachhu 2	135		135				135
22	Dangchhu 1	150		150				150
23	Dangchhu 2	78		78				78
24	Darachhu 1	79		79				79
25	Darachhu 2	115		115				115
26	Darachhu 4	212		212				211
27	Mochhu 1	658		658				655
28	Mochhu 2	403		403				401
29	Phochhu	132		132				132
30	Punatsangchhu III	595		595				593

Sl.	Name of the Generating Station	Installed Capacity	I.C. by 2020	I.C. by 2030	Peak load despatch 2020	Max^{m} hydro 2020	Off peak gen 2020	Peak load Dispatch 2030
31	Punatsangchu-I	6x200=1200	1200	1200	1194	1320	200	1194
32	Punatsangchu-II	6x170=1020	1020	1020	985	1090	165	985
33	Samachhu	16		16				16
34	Sankosh	2500	2500	2500	2488	2750	420	2488
35	Sankosh barrage	85	85	85	85	94	8	85
36	Sichhu	78		78				78
Sub Total (Punatsangchhu basin)			**4995**	**7671**	**4941**	**5462**	**830**	**7609**
Mangdechhu basin								
37	Buraganchu 1	69		69				69
38	Buraganchu 2	70		70				70
39	Chamkharchu	97		97				97
40	Chamkharchu 2	992		992				988
41	Chamkharchu 3	1890		1890				1881
42	Chamkharchu 5	162		162				162
43	Chamkharchu-1	770	770	770	766	847	110	766
44	Ghijam/Lirigang	53		53				53
45	Gumthang	108		108				108
46	Krissa	32		32				32
47	Mangdechu	4x180=720	720	720	716	792	90	716
48	Nikachu	210	210	210	209	231	35	209
49	Shergarchhu	27		27				27
50	Rimjigangchhu	46		46				46
51	Thampochhu	95		95				95
52	Wachi	24		24				24
53	Kheng (Shingkhar)	570		570				568
Sub Total (Mangdechhu basin)			**1700**	**5935**	**1691**	**1869**	**235**	**5911**
Drangmechhu basin								
54	Kuruchu	3x20=60	60	60	60	66	15	60
55	Darachhu 3	153		153				153
56	Gamri/Yamkhari	81		81				81
57	Gamrichu 1	64		64				64
58	Gamrichu 2	79		79				79
59	Gamrichu 3	80		80				80
60	Gamrichu 4	91		91				91
61	Gobarichu	43		43				43
62	Bambichhu	22		22				22
63	Bomdeling/Kholong	130		130				130
64	Yangtse/Kholong	94		94				94
65	Kuri-Gongri	1800	1800	1800	1791	1980	300	1791
66	Kholongchu	600	600	600	596	660	130	596
67	Komachhu	362		362				361

Sl.	Name of the Generating Station	Installed Capacity	I.C. by 2020	I.C. by 2030	Peak load despatch 2020	Max^{m} hydro 2020	Off peak gen 2020	Peak load Dispatch 2030
68	Kuri/Rothpasang	1230		1230				1224
69	Manas Reservoir 1	1800		1800				1791
70	Manas Reservoir 2	1000		1000				995
71	Ngargangchhu	24		24				24
72	Sherichu	36		36				36
73	Shongarchu	107		107				107
	Sub Total (Drangmechhu basin)		**2460**	**7856**	**2447**	**2706**	**445**	**7822**
Other basins								
74	Aiechhu-small	22		22				22
75	Aiechhu-large	64		64				64
76	Jaldhaka	19		19				19
77	Dhansiri	73		73				73
78	Nyera Amari i	142		142				142
79	Nyera Amari ii	330		330				329
80	Bindu Khola	13	13	13	12	14	2	12
	Sub Total (Other basin)		**13**	**663**	**12**	**14**	**2**	**661**
TOTAL			**11814**	**26534**	**11724**	**12961**	**2047**	**26394**

** with Kuri Gongri HEP of 3400 MW* ***Total*** ***13414*** ***28134*** ***13316*** ***14719*** ***2147*** ***27986***

ANNEXURE X

GENERATION SPECIFIC TRANSMISSION SYSTEM FOR HEPS BY 2030

Sl. N.	Name of the Generating Station	route length (30 % increase)
Beyond 2020 & Upto 2030 Scenario		
WANGCHHU BASIN		
1	**Bemengchhu -14MW**	
	66 KV Bemengchhu - Chumdo D/C line	10
2	**Cherichhu-76MW**	
	i. LILO of one ckt. of 400 KV Mochhu I-Sankosh at cherichhu	5
	ii. 220 KV Cherichhu-Paro S/C line	15
	iii. 400/220 KV ,4x105 MVA at Cherichhu	
3	**Hachhu -17 MW**	
	66 KV Hachhu - Watcha D/C line	10
4	**Parochhu -104 MW**	
	220 KV Parochhu-Cherichhu D/C line	45
5	**Pipingchhu -55 MW**	
	220 KV Pipingchhu - Sankosh Main 2x S/C line	30
6	**Thimphuchhu - 57 MW**	
	LILO of one ckt.of 220 KV Parochhu-Cherichhu at Thimphucchhu	5
AMOCHHU BASIN		
7	**Amochhu-1 -747 MW**	
	400 KV Amochhu I - Amochhu II pooling station 2xS/C line	15
8	**Amochhu-2 -500MW**	
	i 400 KV Amochhu II- Alipurduar D/C line with one ckt LILO at Amochhu RS	40
	ii. 400/220KV, 4X105 MVA Transformer at Amochhu II	
9	**Cherchu -45 MW**	
	220 KV Cherchu- Amochhu II D/C line	20
10	**Pachhu -77 MW**	
	220 KV Pachhu-Malbase D/C line	15

Sl. N.	Name of the Generating Station	route length (30 % increase)
11	**Samchu -71 MW**	
	220 KV Samchu -Amochhu II D/C line	10
PUNASANGCHHU BASIN		
12	**Punatsangchhu III -595 MW**	
	i.400kV Punatsangchhu III - Lhamozingkha D/C line	55
	ii. LILO of 400kV Punatsangchhu II-Jigmeling D/C at Punatsangchhu III	10
	iii. 400/220 KV ,7X105 MVA ICT	
13	**Cherchhu -25 MW**	
	LILO of one ckt of of 220kV Dangchhu II - Punatsangchhu III D/C line	5
14	**Dagachhu 2 - 135 MW**	
	i. 220 kV Dagachuu II-Dagachhu D/C line	5
	ii.220 kV Dagachuu II-Jigmeling D/C line	
15	**Dangchhu 2 -150 MW**	
	LILO of one ckt (2nd ckt)of 220kV Dangchhu 1 - Punatsangchhu III D/C line	10
16	**Dangchhu 1 - 78 MW**	
	220kV Dangchhu I- Punatsangchhu III D/C line	65
17	**Darachhu 1- 79 MW**	
	220kV Darachhu I - Darachhu II D/C line	10
18	**Darachhu 2 - 115 MW**	
	220kV Darachhu 2 - Darachhu 3 D/C line	15
19	**Darachhu 3 - 153 MW**	
	220kV Darachhu 3 - Sankosh 2X D/C line with one ckt LILO at Darachhu 4 with moose conductor	30
20	**Darachhu 4 -212MW**	
	LILO of one ckt of 220kV Darachhu 3 - Sankosh 2X D/C line with moose conductor	20
21	**Mochhu I -658 MW**	
	400kV Mochhu I - Sankosh D/C line with tripple moose conductor	175
22	**Mochhu II -403 MW**	
	LILO of one ckt. of Mochhu I - Sankosh 400 KV line at Mochhu II	3

Sl. N.	Name of the Generating Station	route length (30 % increase)
23	**Phochhu -132MW**	
	220kV Phochhu - Mochhu II D/C line	30
24	**Samachu -16 MW**	
	LILO of one ckt of 220kV Pipingchhu I - Lhamol Zingkha D/C line	5
25	**Sichhu -78 MW**	
	LILO of one ckt.of 220kV Phochhu - Mochhu II D/C line	10
	MANGDECHHU BASIN	
26	**Burgangchhu I-69 MW**	
	132kV Burgangchhu I - Chamkharchu I D/C line	20
27	**Burgangchhu II -70 MW**	
	LILO of one ckt of 132kV Burgangchhu I - Chamkharchu I D/C line at Burgangchhu II	5
28	**Chamkharchu (97 MW)**	
	LILO of one ckt of 220 KV Gumthang-Chamkharchu II line	10
29	**Chamkharchu II 992 MW**	
	i. 400 KV Chamkharchu II- Chamkharchu III 2 X D/C line	15
	ii. 400 /220 KV ,4 X105 MVA ICT	
30	**Chamkharchu III -1890 MW**	
	400kV Chamkharchu III - Yangbari 3xD/C lines line	55
	400/132 KV, 2X100 MVA ICT	
31	**Chamkharchu 5 -162 MW**	
	220 kV Chamkharchu 5 - Kheng D/C line	20
32	**Ghijam/Lirigang -53 MW**	
	132kV Ghijam- Chamkharchu III D/C line	10
33	**Gumthang - 108MW**	
	220 kV Gumthang - Chamkharchu II D/C line	55
34	**Krissa -32MW**	
	132kV Krissa - Wachi line D/C line	10
35	**Shergarchhu-27 MW**	
	132kV Shergarchhu - Goling D/C line	15

Sl. N.	Name of the Generating Station	route length (30 % increase)
36	**Rimjigangchhu -46 mW**	
	132kV Rimjigangchhu - Shergarchhu D/C line	5
37	**Thampochhu -95 MW**	
	132 KV Thampochhu-Mangdechhu 1xD/C lines line	45
38	**Wachi -24 MW**	
	LILO of 132kV Tingtibi-Yurmu S/C line	5
39	**Kheng (Shinghkar)-570 MW**	
	i. LILO of one D/C line of 400kV Chamkharchu III - Yangbari 3XD/C lines at Kheng	5
	ii. 400/220 KV ,315 MVA Transformer at Kheng	
	DRANGMECHHU BASIN	
40-44	**Gamrichu 1(64 MW), Gamrichu 2 (79 MW), Gamrichu 3 (80 MW),Gamri/Yamkhari (81 MW) & Gamrichu 4 (91 MW)**	
	Gamrichu 1(64 MW)	
	i.Gamrichhu I- Gamrichhu III 220 kV S/C line with moose conductor	15
	ii.Gamrichhu I- Gamrichhu II 220 kV S/C line with moose conductor	10
	Gamrichu 2 (79 MW)	
	Gamrichhu II- Gamri PS 220 kV S/C line with moose conductor	20
	Gamrichu 3 (80 MW)	
	Gamrichhu III- Gamri PS 220 kV S/C line with moose conductor	15
	Gamri/Yamkhari (81 MW)	
	LILO of Gamrichhu IV- Gamri PS 220 kV D/C line with moose conductor at Gamri	5
	Gamrichu 4 (91 MW)	
	i. Gamrichhu IV- Gamri PS 220 kV D/C line with moose conductor	15
	ii. LILO of one ckt of 400 KV Kholongchu-Yangbari line at Gamri PS	10
	iii. 400/220 KV 315 MVA Transformer at Gamri PS	
45-47	**Komachhu (326 MW),Bambichhu (22 MW) & Ngargangchhu (24 MW)**	
	220 KV Khomachhu - Kuri-Rothpass 2xD/C lines	45
	LILO of one ckt of 220 KV Khomachu-Kuri-Rothpass lines at Bambhichhu	5
	LILO of 2nd ckt of 220 KV Khomachu-Yangbari lines at Ngargangchhu	5

Sl. N.	Name of the Generating Station	route length (30 % increase)
48	**Shongarchhu (107 MW)**	
	Shongarchhu-Yangbari 220 KV D/C line	45
49	**Gobarichhu (43 MW)**	
	LILO of Shongarchhu-Yangbari 220 KV D/C line at Gobarichhu	5
50	**Bomdeling (130MW)**	
	220kV Bomdeling - Gamri PS D/C lines with moose conductor	75
51	**Kuri/Rothpasang -1230 MW**	
	i. 400 KV Kuri Rothpass-Nyera Amari II 2 X D/C line	50
	ii. 400/220 KV,7X105 MVA ICT at Kuri Rothpass	
52	**Manas Reservoir I -1800 MW**	
	400kV Manas Reservoir I - Rangia 2xD/C Quad moose line	55
	2X80 MVAr,420 kV Bus reactor	
53	**Manas Reservoir II -1000 MW**	
	400kV Manas Reservoir II - Manas RS I 2xD/C line	5
	2X80 MVAr, 420 kV Bus reactor	
	OTHER BASINS	
54,55	**Aiechhu large (64 MW) & Aiechhu Small (22 MW)**	
	132kV Aiechhu L - Gelephu D/C line with LILO of one ckt at Aiechhu S	10
56	**Sherichu -36 MW**	
	132 kV Sherichu - Kuri/Rothpashong D/C line	15
57	**Jaldhaka -19 MW**	
	LILO of one ckt of 66 KV Sipsu-Bindu Khola D/C line	10
58	**Dhansiri -73 MW**	
	132kV Dhansiri - Nyera Amari II line	60
59	**Nyera Amari I -142 MW**	
	132kV Nyera Amari I- Nyera Amari II D/C line with zebra conductor	10
60	**Nyera Amari II -330 MW**	
	i. 400 KV Nyera Amari II- Rangia 2XD/C line with quad conductor	60
	ii. 400/132 KV 2X200 MVA ICT	
	iii. 132 KV Nyera Amari II- Motanga D/C line	15
	iv. 132 KV Nyera Amari II- Nangkor S/C line	15
61	**Yangtse/ kholong -94 MW**	
	LILO of one D/C of of 220kV Bombdeling- Gamri PS D/C lines at Kholong	5

Annexure XI

SHORT CIRCUIT STUDY RESULTS

Fault level at various buses in Bhutan

400, 220kV & 132kV Sub-Stations in Bhutan	Three Phase to Ground Fault level (kA)
Tala 400 kV	34.4
Malbase 400 kV	25.0
Amochhu-RS 400 kV	26.6
Wangchhu 400 kV	34.8
Sunkosh 400 kV	44.4
Punatsangchhu 1 400 kV	31.5
Punatsangchhu 2 400 kV	37.3
Mangdechhu 400 kV	32.3
Yangbari 400 kV	48.5
kholongchhu 400 kV	26.8
Jigmeling 400 kV	41.6
Goling 400 kV	42.8
Kuri Gongri 400 kV	40.8
Amochhu 1 400 kV	15.9
Amochhu 2 400 kV	18.3
Mochhu 1 400 kV	12.1
Mochhu 2 400 kV	12.6
Punatsangchhu 3 400 kV	38.9
Chamkharchu 3 400 kV	37.2
Kheng 400 kV	35.3
Chamkharchhu 1 400 kV	38.5
Manas Reservoir I 400 kV	37.0
Manas Reservoir II 400 kV	34.3
Kuri/Rothpashong 400 kV	26.3
Gamrichu 4 400 kV	31.6
Cherichhu 400 kV	11.9
Chamkharchu 2 400 kV	34.0
Chukha 220 kV	13.1
Malbase 220 kV	17.3
Singigaon 220 kV	11.3
Semtokha 220KV	9.4
Jigmeling 220 kV	20.3
Tsirang 220 kV	15.2
Rurichu 220 kV	11.4
Samste220 kV	9.8

400, 220kV & 132kV Sub-Stations in Bhutan	Three Phase to Ground Fault level (kA)
Dagachhu 1 220 kV	13.2
Bunakha RS 220 kV	13.9
Chumdo 220kV	10.0
Punatsangchhu 1 220kV	14.5
Pachhu 220kV	12.1
Samachu 220kV	9.6
Thimphuchhu 220kV	5.6
Parochhu 220kV	5.3
Cherchu 220kV	7.1
Dangchhu 1 220kV	8.1
Dangchhu 2 220kV	8.1
Cherichu 220kV	12.8
Punatsangchhu 3 220kV	19.8
Darachhu 1 220kV	5.8
Darachhu 3 220kV	6.6
Darachhu 4 220kV	6.4
Khomachhu 220kV	13.6
Bambichhu 220kV	12.5
Ngargangchhu 220kV	12.3
Shongarchhu 220kV	13.5
Gobarichhu 220kV	17.8
Sichhu 220kV	5.0
Mochhu 2 220kV	5.6
Pochhu 220kV	4.9
Yagbari 220kV	27.1
Sankosh Main 220kV	7.0
Samachu 220kV	6.3
Pipingchhu 220kV	5.9
Sankosh Barrage 220kV	6.4
Cherichu 220kV	9.5
Dechencoling 220kV	4.7
Parochhu 220kV	5.9
Amochhu 220kV	10.7
Darachhu 220kV	6.1
Dagachhu 220kV	12.8
Kuri/Rothpashong 2 220kV	17.5
Chamkharchhu 2 220kV	18.3
Gumthang 220kV	10.1
Chamkharchhu 220kV	10.1
Gamri PS 220kV	24.3
Gamrichhu4 220kV	18.7
Gamrichhu1 220kV	16.6
Gamrichhu2 220kV	17.2

400, 220kV & 132kV Sub-Stations in Bhutan	Three Phase to Ground Fault level (kA)
Gamrichhu3 220kV	18.0
Gamri 220kV 220kV	21.3
Bomdeling 220kV	11.0
Kholong 220kV	11.9
Kheng 220kV	11.7
Chamkharchhu5 220kV	10.1
Gelephu 132 kV	10.1
Tintibi 132 kV	20.1
Deothang 132 kV	19.7
Nangkor 132 kV	26.4
Kilikhar 132 kV	19.0
Kanglung 132 kV	15.8
Nganglam 132 kV	28.1
Jigmeling 132 kV	11.8
Kurichu 132 kV	16.8
Tangmachhu 132 kV	5.9
Yurmu 132 kV	20.2
Motanga 132 kV	26.4
Mangdechu 132 kV	21.7
Nikhachhu 132kV	19.3
Kholongchhu 132 kV	31.6
Goling 132 kV	21.7
Yangbari 132 kV	20.1
Wachi 132 kV	15.1
Krissa 132 kV	12.5
Burgangchhu1 132 kV	13.4
Burgangchhu2 132 kV	14.2
Rimjigangchhu 132 kV	13.9
Shergarchhu 132 kV	15.3
Chamkharchu 3 132 kV	21.6
Ghijam 132 kV	17.6
Aiechhu L 132 kV	9.1
Sherichhu 132 kV	5.9
Nyera Amari 1 132 kV	24.4
Dhansiri 132 kV	9.9
Chamkharchu 1 132 kV	22.4
Kuri/Rothpashong 132 kV	6.4
Gumthang 132 kV	13.1
Thimphuchhu 132 kV	9.6
Aiechhu S 132 kV	10.1
Nyera Amari 2 132 kV	34.1

Annexure XII

SITE VISITS TO BHUTAN

1. First joint site visit of CEA and Bhutan team during 19-5-10 to 28-5-10:

A team of four officers from CEA along with the officers from DoE and BPCL, Bhutan jointly visited some of the hydro project sites, existing sub-stations and potential sites for major pooling stations in Bhutan during 19-5-10 to 28-5-10. The inputs that were gathered/shared by DoE/BPCL and project officers about physical terrains for building new transmission corridors, availability of land for power house switchyards and grid sub-stations/pooling stations, scope of expansion of existing sub-stations, etc., provide an overview about the existing transmission system of Bhutan and its future expansion. Our findings were as given below:

- **Semtokha 220/66, 6x6.67 MVA substation**

  The 220kV Semtokha substation established in the northern Bhutan is one of the nodal grid stations catering to the load demand of Thimpu, Paro, Lobesa, and its adjoining areas. It is well connected to Chukha HEP and Rurichhu (Bosochhu-II) HEP through 220 kV lines. At present 6x6.67 MVA, 220/66 kV Transformers is existing and proposed to be replaced by 2x50 MVA, 220/66kV 3Ø transformers by Dec 2011. The total area of the substation is around 8.5 Acre and space is available for one 220 kV Bay extension.

- **Site of Mangdechhu HEP (720 MW)**

  Mangdechhu Dam site and Power House site is about 2 km and 45 km downstream of Trongsa Town respectively. Power House is proposed to be underground with GIS switchyard. For supply of construction power of about 15 MW to Mangdechhu Power House, BPC has a proposal for setting up of a 132/33 kV S/S at Yurmo. Presently Yurmo feeder from Tintibi is charged at 33 kV level upto Kewathang and may not be able to cater to the construction power requirements. Construction power for Dam is

about 5 MW and proposed to be supplied from 33kV Kewathang S/S. Construction power for power house is being envisaged to be supplied from Yurmo point, about 1-2km from the PH site. There is existing a 132kV Tintibi-Yurmo panther conductor line being operated at 33kV which feeds the Kewathang 33/11 kV, 2.5x2 MVA S/S. It is being envisioned for setting up 132/33 kV substation at Yurmo by BPCL. The Tintibi-Yurmo line typically crosses a valley spanning about 2.1 km. This 2.1 km span is with 400 kV towers at both ends. This corridor seems to be utilized for developing 400kV power evacuation line for Mangdechhu HEP and it could be a critical issue.

- **Tintibi 132/33 kV, 2x3 MVA substation**

  This substation is on 12.7 Acres of land with a local load of 5 MW. It is located in central Bhutan. BPCL has embarked upon developing the proposed west-east link by LILO of 132kV Tintibi-Gelephu line at Jigmeling S/S. This line is being presently operated at 33kV through a jumper connection to the 33kV bus and can be charged at 132 kV by changing the jumper connections at any point of time. There is no space available for switchyard expansion at the Tintibi S/S.

- **Site of 400/220kV, 220/132kV Jigmeling Pooling Station**

  About 1500 acres of land in Jigmeling village has been earmarked for developing industrial area and a major pooling station in Bhutan. Out of this land, 35 acres of land has been identified for the proposed Jigmeling pooling station. This site is about 2.5 km. from India Border and 55kms from Alipurduar. Close to it, exists the 132kV Gelephu S/S sub-station where about 210MW would be the estimated load demand/growth for Industrial area. The Tintibi-Gelephu 132 kV S/C line would be LILO-ed (from the tower no. GT-20 located in Lodrai) to Jigmeling station. The LILO portion i.e. Jigmeling-Lodrai (GT-20) would be 220 kV line with Zebra conductor on 220 kV tower charged at 132 kV. LILO portion would be about 12 kms. The distance of LILO point from Gelephu is 6 km. Further, 220kV Dagachhu-Tsirang-Jigmeling D/C line is in the process of development and it would supply power to Jigmeling from the on-going Dagachhu HEP. Initially 220/132 kV, 2x63 MVA and 132/33 kV 1x15 MVA capacity substation is proposed to be established by BPCL at Jigmeling to meet the

initial load requirement of 100 MW. Jigmeling would be the major power hub where generation from upcoming HEPs in northern and eastern Bhutan would be pooled and thereon power would be de-pooled for meeting internal demand of Bhutan and surplus would be exported to India through high capacity 400kV transmission lines.

- **Gelephu 132/66/33 kV, 2x25 MVA substation**

  The substation is on 10 acre area and out of this land 2.5 acre is available for future expansion. It is only 300 meters away from India Border and has 2x5 MVA 132/66 kV transformers meeting load demand of about 3-4MW. Presently, it is connected from 132kV Tintibi S/S through single circuit line. It is close to the upcoming Jigmeling pooling station.

- **Site of Sankosh HEP (2585 MW) Switchyard**

  The Power House is located on the Left Bank of the Sunkosh river, but switchyard location was earlier identified on the Right Bank of the River. During the site visit, THDC who has prepared showed the availability of sufficient land of more than 1000 Acres having gentle hilly terrain on the left bank as an alternative site for establishment of switchyard.

- **Site of Amochhu HEP (540 MW)**

  NTPC is preparing the DPR which is likely to be completed by July 2011. Power House would be of surface type. About 23 Acre government land has been made available which is reported to be adequate for PH and its switchyard. The existing 400kV Tala-Pagli/Siliguri D/C transmission line is passing near to the project site. Distance between Amochhu PH and Malbase 400kV sub-station will be approximately 12kms.

- **Malbase 400/220 kV, 220/66kV Substation**

  The 400kV Malbase substation is spread over 32 Acres . The evacuation from Tala HEP is through 2 nos. 400kV D/c twin moose lines i.e. Tala- Pagli (circuit I & II, 49 km upto Bhutan border) – Siliguri, and Tala –Khogla (circuit III & IV, 25 km upto Bhutan border) –Siliguri D/C lines. The 400 kV connectivity to Malbase is through

LILO in one circuit of Tala- Pagli (circuit no. III) 400 kV D/C line. There is provision of space for four more 400 kV line bays. At 220 kV level there is a provision of 13 bays out of which 9 bays are occupied. 2 bays out of the 4 available bays is proposed to be used for construction of Malbase- Samtey 220 kV D/C line. At 66 kV level 4 Bays out of 6 bays are occupied and 2 spare bays are available.From Malbase, 4 nos. of 66 kV lines to Pasaka 66kV sub-station is existing on a single multi-circuit tower. One circuit is opened at an intermediate location (tower no. 8) to construct 2nos. independent 66kV circuits, one is Malbase – Phuentsholing and the other is Pasaka -Singhigaon line. The maximum load fed through 3 no. of 66 kV circuits to Pasaka is 130 MW, and 23 MW through one no. 66 kV circuit to Phuentsholing.

- **Site of Punatsangchhu-I HEP (1200 MW)**

  The Punatsangchhu-I Power House and associated 400 kV GIS switchyard would be underground and is located on the left bank of the river. In the switchyard, 4X105 MVA, 400/ 220 kV ICT has been inter-alia planned with LILO of 220 kV Semtokha – Rurichhu (Bosochhu-II) S/C line. The transmission corridors for 400kV evacuation lines is on the right bank of the river. Though, it has been observed from the pothead switchyard location that mountain slope on the right bank is steep as compared to the slope on the left bank, the utilization of right bank corridors is a settled issue. The construction power to Power House is made through 33 kV lines from a 2X12.5 MVA, 66/33 kV substation established through LILO of Rurichhu-Lobesa-Semtokha 66 kV line. The LILO portion has been done through 66 kV cables. This substation was charged on 20.5.2010. In future construction power supply to Punatsangchhu-II, which is about 15km downstream of Punatsangchhu-I would also be made available from this substation.

2. Second Joint site visit of CEA and Bhutan team from 15-02-2011 to 22-02-2011

- **Visit to probable sites for developing a common pooling station in Eastern Bhutan**

  Kerongbali location, the confluence of Kerong, Kurung and Kuri-Gongri river, is indicated to be a possible site for pooling station, where about 400 acres land could

be available. It is about 15 km from Ngangalam enroute of Ngangalam-Gyelphosing highway. The coordinates of the point was 26 deg 53.18 min N, 91 deg 09.97 min E with an altitude of 335 meters. The site was not accessible through road. For approaching this site around 1 to 2 km of approach road from highway is required to be built. The location is about 20 km. from Manas RS HEP and 30 to 40 km. from Kuri Gongri HEP. The distance between Nganglam and Deothang was around 50 to 60 km. Also there was no reserve forest between Nganglam to Deothang. Nganglam is a future load centre where a Dungsam cement factory (under construction) and ancillary factory e.g. a Gunny Bag factory, a Polymers factory would come.

Along the Nganglam – Gyelphosing highway, Telung is a site located on the Left Bank of river Gongri. This is a Private land, with a relatively plain terrain. This is located in the Premaghasa district. The coordinates of this location is 26 deg 57.72 min N, 91 deg 10.93 min E with an altitude of 243 meters.

Another suitable site visited is Yangbari which is located in Mongar District. Over 250 Acres (needs to be confirmed) of private land is available and it may be acquired for developing a pooling station. This land is on the Right Bank of Gongri River. This location is about 25 km downstream of Kuri Gongri Project. There are no inhabitants on the plain land, but on the periphery towards the hill, about 23 families are living there. The coordinates of this location is 26 deg 58.05 min N, 91 deg 10.82 min E with an altitude of 292 meters.Yangbari in Mongar district and Telung in the Premghasa district are connected through a suspension bridge of 227.6 meters span.Towards the eastern site of Yangbari, Kholongchhu project and towards the west, Chamkharchhu HEP will be located and the Kuri Gungri project is towards the north east. This site is surrounded with hills having gentle slope. For developing this site as pooling station a bridge needs to be built over the river between highway and the pooling station site. The site location is about 35 kms from Nganglam. The existing Ngangalam-Tingtibi 132kV feeder is passing close to Yangbari site. So there would be a possibility of making LILO of Ngangalam-Tingtibi 132kV at prospective Yangbari pooling station.

- **Visit to the existing Nganaglam 132/33/11 kV substation**

  The area of this substation is 95X93 sq.m. It has Main and Transfer Bus switching scheme both at 132 kV and 33 kV. The maximum load incident on Ngangalam S/S is 0.6 MW. The coordinates of this location is 26 deg 51.88 min N, 91 deg 13.78 min E with an altitude of 575 meters. Near to this sub-station, Dungsam Cement Project is under construction and supply will be given from the sub-station. A 132 kV dedicated feeder which is 1.1 km long with 6 towers has already been constructed. Power to be supplied to the project would be stepped down to 6.6 kV at DCP. In the switchyard, space for two 132kV bays is available but it appears that adequate space is not available for placing the incoming towers. Therefore for terminating any new lines to Nganaglam, realignment of existing bays or provision of multi-circuit tower needs to be explored.

- **Visit to alternative site(s) to the Tali Boli pooling station**

  - Tamagonpa is one of the site visited. The coordinates of this location is 27 deg 07.57 min N, 90 deg 39.31 min E with an altitude of 1541 meters. This site is about 52 km from Mangdhechu Project site but buy road the distance is around 150 km. This site is located few meters above the existing road and it was a private land of small area with a slope of 1:7. It was not found to be a suitable site.

  - Tama- Zhengang is another site visited. This site is located below a school (Prince Nangyal Wangchuk Academy). There is a private land of about 60 acres area with sloppy terrain and 17 km away from Tingtibi substation (by road) and about 35 km away from the Mangdhechu Project site. The coordinates of this site is 27 deg 8 min 10 sec N, 90 deg 39 min 7 sec with an altitude of 1333 meters.

  - Goling village/site is another site visited. It is located on the left and right bank of the river Mangdhechu. Between the right bank and the foothills a large plain land suitable for pooling station is available. On the left bank, Wachnamthebi location is found to have suitable land for pooling station site. It is a private land. The coordinates of this site is 27 deg 07.41 min N, 90 deg 42.18 min E with an altitude

of 517 meters. Mangdhechu project site is about 40 km and Jigmelling pooling station site is about 55 km away from this site. This site is on the Left Bank of Mangdhechu river and about 2 km from PWD Camp on the main road on the right Bank. It is the common opinion of all the Bhutan and CEA officials that Goling area would be most suitable site for developing pooling station instead of Tali-Boli.

- **Visit to the existing 66/33 kV, 2x5 MVA Tshirang substation**

Tshirang is an existing 66/33 kV, 2x5 MVA substation to be upgraded to 220kV level. The substation land area is about 6.5 acre. The maximum load incident is 2 MW including 1.1 MW construction power for ongoing Dagachhu HEP. Upgradation of this substation has already been planned through 220/66, 2x15 MVA transformers. The 220 kV substation works has been awarded to KEC and is likely to be commissioned by Dec 2012. The implementation of Dagachhu-Jigmelling 220 kV D/C line with LILO of one ckt at Tshirang has been awarded to M/s Shyama Power. Presently Rurichu-Tshirang 220 kV S/C line charged at 66 kV is terminated on one of the two 66 kV bays and the other bay is idle. In future, these two bays would be utilized for 2x15 MVA, 220/66 kV transformers.

Annexure XIII

TENTATIVE COST ESTIMATE FOR NTGMP FOR 2020 SCENARIO

ATS	Voltage	ckt/ MVA/MVAr	Route Length (KM/No)	Unit rate (INR Cr. per kM) Line,ICT,Reactor	Cost (including asso. bays)
a) Punatsangchhu-I HEP - 1200 MW					
Punatsangchu-I - Sunkosh 400kV lines 2xD/C Twin moose line, one via Punatsangchu-II	400	**Under implementation**			
Sunkosh - Alipurduar 1xD/C Quad moose line (major portion in Indian side)	400				
4X105MVA ICT at Punatsanchhu I	400/220				
LILO of 220kV Bosochhu-II – Tsirang S/C line at Punatsangchhu-I.	220				
1X80MVAr Bus Reactor at Punatsangchhu I	420				
b) Punatsangchhu-II HEP - 1020 MW -Revised					
Loop-in-Loop-out(LILO) of one 400 kV D/C Punatsangchhu-I -Sankosh/Lhamo Zingkha line at Punatsangchhu-II HEP (with 4 nos. of 400 kV GIS line bays at Punatsangchhu II)	400 KV	Twin Moose D/C	20	3.3	110.4
400 kV Punatsangchhu-II HEP- Jigmeling D/C line (with 2 nos. 400 kV GIS line bays each at Punatsangchhu II & Jigmeling)	400 KV	Twin Moose D/C	80	3.3	308.4
1x80 MVAr Reactor at the Punatsangchhu-II HEP (with 1 no. 400 kV GIS Reactor bay)	420 KV	80 MVAr	1	4.2	15.3
					434.1
c) Mangdechhu HEP - 720 MW					
400 kV Mangdechhu HEP - Goling Switching station 2xS/C on D/C tower lines (with 2 nos. of 400 kV GIS line bays each at MHEP & Goling)	400 KV	Twin Moose 2X S/C on D/C tower	40	2.8	268.4
400/132 kV, 4x67MVA ICT substation at Mangdechhu (with 1 no. 400 kV GIS bay + 1 no. 132 kV AIS bay for ICT)	400/132 kV	200 MVA	1	6.5	19.6
400 kV Goling- Jigmeling 2xS/C on D/C tower lines (with 2 nos. of 400 kV GIS line bays each at Goling & Jigmeling)	400 KV	Twin Moose 2X S/C on D/C tower	70	2.8	436.4
132 kV Mangdechhu- Yurmu D/C lines (with 2 nos.132 kV AIS line bays each at MHEP & Yurmu)	132 KV	Panther D/C	5	1.15	13.75
1x80 MVAr Bus Reactor at Mangdechhu (with 1 no. 400 kV GIS Reactor bay)	420 KV	80 MVAr	1	4.2	15.3

ATS	Voltage	ckt/ MVA/MVAr	Route Length (KM/No)	Unit rate (INR Cr. per kM) Line,ICT,Reactor	Cost (including asso. bays)
400/220 kV, 4x167 MVA Jigmeling GIS substation ncluding ICT bays (with 1 no. 400 kV GIS bay + 1 nos. 220 kV GIS bay+ Establishment Cost)	400/220	500 MVA	1	12.7	110.3
1X80 MVAr Reactor at Jigmeling including bays (with 1 no. 400 kV GIS Reactor bay)	420 KV	80 MVAr	1	4.2	15.3
400 kV Jigmeling- Alipurduar D/C line from (Bhutan portion only) (with 2 nos. of 400 kV GIS line bays)	400 KV	Quad Moose D/C	2	2.15	26.5
					905.55
d) Sankosh HEP - (2500+85) MW					
400 kV Sankosh - Alipurduar 1x D/C (2nd D/C) (Bhutan portion only) (with 2 nos. of 400 kV GIS line bays at Sankosh)	400 KV	Quad Moose 1XD/C	14	2.15	52.3
Bussing of 400 kV 2XD/C lines from Punatsangchhu-I HEP to Lhamoizingkha/Sankosh at Sankosh HEP Bus (with 4 nos. of 400 kV GIS line bays)	400 KV	Twin Moose 2XD/C	5	1.5	59.4
Bussing of 400kV Lhamozingkha - Alipurduar D/C line at Sunkosh HEP (with 2 nos. GIS bays)	400 KV	Quad Moose D/C	5	2.15	32.95
400/220 kV, 200 MVA ICT at Sankosh Main with establishment cost of Sankosh switchyard (with 1 no. 400 kV GIS bay + 1 nos. 220 kV GIS bay+ Establishment Cost)	400/220 kV	200 MVA	1	6.1	83.7
Main Dam PH (2500MW) - Regulating Dam PH (85MW) D/C link (with 2 nos. of 220 kV GIS line bays each at Sankosh Main & Sankosh Barrage)	220 KV	Zebra D/C	15	0.8	38
2x80 MVAr 420kV Bus Reactor at Sankosh Main HEP (with 2 nos. 400 kV GIS Reactor bays)	420 KV	80 MVAr	2	4.2	30.6
					296.95
e) Chamkharchhu-I HEP - 770 MW					
400 kV Yangbari -Goling 1xD/C lines out of 2XD/C line (with 2 nos. of 400 kV GIS line bays each at Yangbari & Goling)	400 KV	Twin Moose 1XD/C	60	3.3	242.4
LILO of 400 kV Yangbari - Goling D/C line at Chamkharchhu-I HEP (with 4 nos. of 400 kV GIS line bays at Chamkharchhu)	400 KV	Twin Moose D/C	5	3.3	60.9
400 kV Goling GIS switching station (establishment cost etc.)	400 KV				90
2X80 MVAr bus reactor in Goling switching station (with 2 nos. 400 kV GIS Reactor bays)	420 KV	80 MVAr	2	4.2	30.6

ATS	Voltage	ckt/ MVA/MVAr	Route Length (KM/No)	Unit rate (INR Cr. per kM) Line,ICT,Reactor	Cost (including asso.bays)
1X80 MVAr Reactor at Jigmeling (with 1 nos. 400 kV GIS Reactor bay)	420 KV	80 MVAr	1	4.2	15.3
400/132/33 kV, 4x67 MVA ICT at Chamkhar-I HEP (with 1 no. 400 kV GIS bay + 1 nos. 132 kV AIS bay)	400/132/33 kV	200 MVA	1	6.5	19.6
Stringing of 2nd ckt in 400 kV Goling - Jigmeling 2X(S/C on D/C) line (with 2 nos. of 400 kV GIS line bays each at Goling & Jigmeling))	400 KV	2XS/C	70	0.5	114.4
LILO of 132 kV Nganglam - Tintibi line at Chamkharchhu-I HEP (with 4 nos. of 132 kV AIS line bays at Chamkharchu I)	132 KV	Panther D/C	5	1.15	13.75
					586.95
f) Kholongchhu HEP - 600 MW					
400 kV Kholongchhu HEP - Yangbari 2xS/C on D/C tower lines (with 2 nos. 400 kV GIS bays each at Kholongchhu & Yangbari)	400 KV	Twin Moose 2XS/C	85	2.8	520.4
400/132/33 kV, 4x67 MVA ICT at Kholongchhu (with 1 no. 400 kV GIS bay + 1 nos. 132 kV AIS bay)	400/132 kV	200 MVA	1	6.5	19.6
400 kV Yangbari- Goling 1xD/C (2nd) line (with 2 nos. 400 kV GIS line bays each at Yangbari & Goling) (One additional 400 kV D/C line in between Yangbari and Goling LILOed at Chamkharchhu-I HEP to be built with Chamkharchhu-I HEP)	400 KV	Twin Moose 1XD/C	60	3.3	242.4
LILO of 132 kV Kanglung - Killikhar line at Kholongchhu HEP (with 4 nos. 132 kV AIS bays)	132 KV	Panther D/C	5	1.15	13.75
1x80 MVAr 420kV Bus Reactor at Kholongchhu (with 1 no. 400 kV GIS Reactor bay)	420 KV	80 MVAr	1	4.2	15.3
					811.45
g) Nikachhu HEP - 210 MW					
132 kV Nikachhu-Mangdechhu 2X D/C lines (with 4 nos. 132 kV GIS bays at Nikachu & 4 nos. 132 kV AIS bays)	132 KV	Panther 2X D/C	10	1.15	43
Stringing of 2nd ckt in Mangdechhu-Goling 2XS/C on D/C line (with 2 nos. 400 kV GIS line bays each at Mangdechhu & Goling)	400 KV	Stringing for 2nd ckt	40	0.5	84.4
400/132 kV, 3x67MVA ICT (2nd) at Mangdechhu (with 1 no. 400 kV GIS bay + 1 no. 132 kV AIS bay)	400/132 kV	200 MVA	1	6.5	19.6
					147

ATS	Voltage	ckt/ MVA/MVAr	Route Length (KM/No)	Unit rate (INR Cr. per kM) Line,ICT,Reactor	Cost (including asso.bays)
h) Kuri-Gongri HEP - 1800 MW					
400 kV Kuri-Gongri HEP-Yangbari 2XD/C Lines (with 4 nos. 400 kV GIS line bays each at Kuri Gongi & Yangbari) {3rd D/C line for 3400 MW gen. Capacity }	400 KV	Twin Moose 2XD/C	40	3.3	352.8
400/132/33 kV, 4x67MVA Yangbari pooling station (with 1 no. 400 kV GIS bay + 1 nos. 132 kV AIS bay+ Establishment cost)	400/132/33 kV	200 MVA	1	6.5	119.6
400 kV Yangbari-Rangia/Rowta (Assam) 2x D/C Lines- upto Bhutan border (with 4 nos. 400 kV GIS line bays at Yangbari)	400 KV	Quad Moose 2XD/C	40	2.75	264.4
132 kV Yangbari- Nganglam D/C line (2 nos. 132 kV AIS line bays each at Yangbari & Nganglam)	132 KV	Panther	30	1.15	42.5
2x80 MVAr Reactor at Yangbari (with 2 nos. 400 kV GIS Reactor bays)	420 KV	80 MVAr	2	4.2	30.6
					809.9
i) Amochhu HEP - 540 MW					
LILO of one ckt of 400 kV Tala-Silliguri D/C via Pagli line (with 2 nos. 400 kV GIS line bays at Amochhu)	400 KV	Twin Moose D/C	1	3.3	25.5
1x63 MVAr Reactor at Amochhu HEP (with 1 no. 400 kV GIS Reactor bay)	420 KV	63 MVAr	1	4	15.1
220/11 KV , 2X 10 MVA Amochhu Load Station (GIS) (incl. establishment cost)	220/11 KV	20 MVA	1		50
LILO of 220 kV Malbase-Samtse line at Amochhu LS (with 2 nos. 220 kV GIS bays at Amochhu)	220	D/C	1	1.5	14.5
					105.1
j) Bunakha HEP - 180 MW					
220 KV Bunakha-Malbase 2xS/C lines (with 2 nos. 220 kV AIS bays each at Bunakha & Malbase)	220 KV	2 XS/C	30	1	74
LILO of 220 kV Semtokha - Chukha line (with 2nos. 220 kV AIS bays)	220 KV	D/c	5	1.5	14.5
Additional 400/220kV, 4x67 MVA ICT at Malbase (with 1no. 220 kV AIS bay+1no. 400 kV AIS bay)	400/220 kV	200 MVA	1	6.5	15.5
					104

ATS	Voltage	ckt/ MVA/MVAr	Route Length (KM/No)	Unit rate (INR Cr. per kM) Line,ICT,Reactor	Cost (including asso. bays)
k) Wangchhu HEP - 570 MW					
LILO of one ckt of 400 kV Tala-Khogla/Pugli- Siliguri lines at Wangchhu HEP (with 2 nos. 400 kV GIS line bays at Wangchhu)	400 KV	Twin Moose	5	3.3	38.7
1x63MVAr Reactor at Wangchhu (with 400 kv GIS reactor bay)	420 KV	63 MVAr	1	4	15.1
					53.8
l) Bindu Khola HEP - 13 MW					
Bindu Khola-Sipsu 66 kV D/C line (with 4 nos. 66 kV bays)	66 KV	wolf	5	0.55	4.75
					4.75
TOTAL COST					**4259.55**

Annexure XIV

Estimated cost of the transmission Strengthening in Western, Southern / central and Eastern Bhutan corresponding to 2020

Sl No.	Transmission System	Voltage (kV)	Route length in Km/No.	400kV ACSR Moose/ MVA/MVAr	Unit Cost (Rs. Cr.)	Cost (Rs Cr.)
A						
I	**Western Bhutan**					
	220 KV					
	LILO of 220 kV Chukha-Semtokha S/C line at 220 kV Chumdo substation (2nos. 220 kV GIS bays)	220	5	1xD/c (Zebra)	1.5	20.5
	Upgradation of 66kV Chumdo S/S to 220 kV Chumdo GIS with 2x50 MVA, 220/66kV transformers. (2nos. 220 kV & 66 kV GIS bays each)	220/66	2	2x50 MVA	5.0	34
	66 KV					
	Simtokha-Dechecholing S/C line(2^{nd} ckt.) with asso. bays	66	12	1XS/c (dog)	0.40	5.80
	Jemina-Paro S/C line with asso. bays	66	25	1XS/c (dog)	0.40	11
	Singhigaon-Pasakha D/C line with asso. bays (2^{nd}&3^{rd}ckt)	66	10	1xD/C (dog)	0.55	7.50
	Phuntosholing-Gomtu S/C with asso. bays (2^{nd} ckt)	66	27	1XS/c (dog)	0.40	11.80
	Additional 1x50 MVA,220/66kV Transformer at Singhigoan with asso. bays	220/66	1	50 MVA	5.0	9.00
	Additional 1x50 MVA,220/66kV Transformer at Malbase with asso. bays	220/66	1	50 MVA	5.0	9.00
	Additional 3x50 MVA, 220/66kV Transformers at Samste with asso. bays	220/66	3	3x50 MVA	5.0	27.00
II	**Southern/Central Bhutan**					
	132 KV Jigmeling-Gelephu line with asso. bays	132	15	S/C	0.31	8.65
III	**Eastern Bhutan**					
	Nanglam- Motanga 132kV S/C line on D/C tower with asso. bays	132	70	1XS/c (panther)	0.8	60
	Nangkor-Kanglung 132kV S/C line on D/C tower with asso. bays	132	60	1XS/c	0.8	52
	Augmentation of 132/33 kV Transformer at Motanga with 2x50 MVA ICTs with asso. bays	132/33	2	2x50MVA	5.00	12.30
	Augmentation of 132/33 kV Transformer at Deothang with 1x5 MVA Transformer with asso. bays	132/33	1	5MVA	2.00	4.30
B	**Reactive Power Compensation**					
	Capacitors at 15 nos. Sub-stations	66 & 132	365	365 MVAr		40
	Total Cost (System Strengthening)					**312.85**

Annexure XV

SUMMARY OF ESTIMATED COSTS

Sl No.	Transmission system	Ckt kM	Capacity (MVA/MW/MVAr)	Estimated Cost (Rs. in Crore)
A	**Evacuation system for HEPs (2020 scenario)**			
1	400 kV lines	1416		3241.05
2	220 kV lines	102		141
3	132 kV lines	130		126.75
4	66 kV lines	10		4.75
5	400/220/132 kV S/s		1920	746.00
Sub Total A				**4259.55**
B	**System Strengthening in Bhutan**			
1	220 kV lines	10		20.5
2	132 kV lines	145		120.65
3	66 kV lines	84		36.10
4	220/66 kV S/s		350	79
5	ICT Augmentation (132/66/33 kV)		105	16.6
6	Reactive Power Compensation		365	40.00
Sub Total B				**312.85**
TOTAL				**4572.40**

* Cost of line includes the cost of line bays

* Cost of Substation includes the cost of establishment, cost of reactors and bays

in Nu-Million 45724

TOTAL FUND REQUIREMENT FOR NTGMP (UPTO BHUTAN BORDER) CORRESPONDING TO 2020

Sl No.	System head	Rs. (Crore)
1	ATS for HEPs	4259
2	System Strengthening works	313
	Total*	**4572**

***excluding Costs of ATS for Punatsangchhu I**

Annexure XVI

Base case PSSE input data for 2020 & 2030 scenario

A. PSSE input data - 2020 Scenario (Kuri Gongri 1800 MW)

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60001,'CHUKAG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  34.7757,   1
60002,'TALAG   ',  13.8000,2,     0.000,     0.000,   6,  60,1.00000,  39.9884,   1
60003,'BSOCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  39.8088,   1
60005,'AMCHURG ',  11.0000,2,     0.000,     0.000,   6,  60,1.01000,  39.3881,   1
60006,'BHNKHRG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  34.8576,   1
60007,'WNGCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  37.5167,   1
60008,'SNKHOSG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  44.2156,   1
60009,'PUNCHU1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  48.0501,   1
60010,'PUNTS2G ',  13.8000,2,     0.000,     0.000,   6,  60,1.00000,  47.7300,   1
60011,'MNGDCHUG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  51.0916,   1
60012,'CHMRCHUG',  11.0000,2,     0.000,     0.000,   6,  60,1.01000,  51.2309,   1
60013,'KRIGNGRG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  52.8736,   1
60014,'KHLNGCHG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  52.7514,   1
60015,'KRICHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  52.4302,   1
60016,'BOSCHU1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.6062,   1
60017,'DGACHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  42.8739,   1
60018,'NIKCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  54.5012,   1
60080,'SNKOSLG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  47.3703,   1
60082,'BKHOLAG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00525,  26.4527,   1
60101,'GELPHU1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.94486,  26.8629,   1
60102,'TNTIBI1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99541,  44.6971,   1
60103,'DOTHNG1 ', 132.0000,1,     0.000,     5.000,   6,  60,0.97280,  41.4952,   1
60104,'NANKOR1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.98476,  42.9837,   1
60105,'KLIKHR1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99829,  45.0471,   1
60106,'KNGLNG1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99090,  44.0822,   1
60107,'NGNGLM1 ', 132.0000,1,     0.000,    15.000,   6,  60,0.98542,  42.1677,   1
60108,'JIGMLG1 ', 132.0000,1,     0.000,    60.000,   6,  60,0.94665,  27.4368,   1
60109,'KRICGU1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99899,  45.1843,   1
60110,'TNGMCH1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99531,  44.7804,   1
60111,'YURMU1  ', 132.0000,1,     0.000,     0.000,   6,  60,0.99985,  46.4504,   1
60112,'MOTNGA1 ', 132.0000,1,     0.000,    20.000,   6,  60,0.96891,  41.0162,   1
60113,'MNGDCHU1', 132.0000,1,     0.000,     0.000,   6,  60,1.00047,  46.6418,   1
60114,'NIKCHU1 ', 132.0000,1,     0.000,     0.000,   6,  60,1.00419,  47.3275,   1
60115,'KHLNCHU1', 132.0000,1,     0.000,     0.000,   6,  60,1.00024,  45.0838,   1
60118,'YNGBARI ', 132.0000,1,     0.000,     0.000,   6,  60,0.99436,  42.5786,   1
60201,'CHUKA2  ', 220.0000,1,     0.000,     0.000,   6,  60,0.98264,  27.4527,   1
60202,'MALBSE2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97025,  25.6722,   1
60203,'SNGGON2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.96934,  25.5833,   1
60204,'SMTKHA2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.96098,  29.6488,   1
60205,'JIGMLG2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.95549,  33.0530,   1
60206,'TSIRNG2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97049,  34.5889,   1
60207,'RURCHU2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97451,  33.5843,   1
60208,'SAMSTE2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.96102,  24.5261,   1
60209,'DGACHU2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97419,  35.2372,   1
60211,'BHNKHR2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97608,  27.4821,   1
60213,'CHUMDO  ', 220.0000,1,     0.000,     0.000,   6,  60,0.96542,  28.3790,   1
60214,'PUNTSCH1', 220.0000,1,     0.000,     0.000,   6,  60,0.97928,  35.0301,   1
60239,'SNKOSM2 ', 220.0000,1,     0.000,     0.000,   6,  60,1.00213,  39.7809,   1
60242,'SNKOSL2 ', 220.0000,1,     0.000,     0.000,   6,  60,1.00227,  39.8560,   1
60299,'DAGAPELA', 220.0000,1,     0.000,     0.000,   6,  60,0.97270,  34.9727,   1
60301,'MALBSE3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.95051,  20.4171,   1
60302,'SNGGON3 ',  66.0000,1,     0.000,    40.000,   6,  60,0.93675,  19.3284,   1
60303,'GOMTU3  ',  66.0000,1,     0.000,    13.000,   6,  60,0.91782,  17.2223,   1
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60304,'PHULNG3 ',  66.0000,1,     0.000,    12.000,   6,  60,0.92927,  19.0150,   1
60305,'GEDU3   ',  66.0000,1,     0.000,     0.000,   6,  60,0.93298,  20.6298,   1
60306,'SMTKHA3 ',  66.0000,1,     0.000,    20.000,   6,  60,0.91070,  21.4597,   1
60307,'OLAKHA3 ',  66.0000,1,     0.000,    10.000,   6,  60,0.90764,  21.3012,   1
60308,'DCNCOL3 ',  66.0000,1,     0.000,    15.000,   6,  60,0.87931,  19.7935,   1
60309,'JMINA3  ',  66.0000,1,     0.000,     0.000,   6,  60,0.91590,  22.1941,   1
60310,'PARO3   ',  66.0000,1,     0.000,    10.000,   6,  60,0.90237,  21.4468,   1
60311,'HAA3    ',  66.0000,1,     0.000,     0.000,   6,  60,0.92353,  23.2349,   1
60312,'LOBYS3  ',  66.0000,1,     0.000,    10.000,   6,  60,0.92902,  24.6272,   1
60313,'BKHOLA3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.95087,  18.8780,   1
60314,'CHUMDO3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.94922,  24.0625,   1
60315,'GELPHU3 ',  66.0000,1,     0.000,    10.000,   6,  60,0.92911,  22.8820,   1
60316,'TSRNG3  ',  66.0000,1,     0.000,     5.000,   6,  60,0.95777,  30.7257,   1
60317,'SAMTSE3 ',  66.0000,1,     0.000,    60.000,   6,  60,0.93460,  17.9234,   1
60318,'CHUKHA3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.96022,  23.2230,   1
60319,'RRICHU3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.98242,  29.7057,   1
60320,'BOSCHUU3',  66.0000,1,     0.000,     0.000,   6,  60,0.98790,  30.0964,   1
60321,'PSAKHA3 ',  66.0000,1,     0.000,    70.000,   6,  60,0.93301,  19.2115,   1
60323,'BHUMTH3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.99815,  43.3524,   1
60324,'SIPSU3  ',  66.0000,1,     0.000,     0.000,   6,  60,0.94585,  18.5871,   1
60325,'YURMU3  ',  66.0000,1,     0.000,    15.337,   6,  60,1.00762,  43.7638,   1
60326,'WATCHA3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.95277,  23.4207,   1
60401,'TALA4   ', 400.0000,1,     0.000,     0.000,   6,  60,0.99983,  32.7860,   1
60402,'MALBSE4 ', 400.0000,1,     0.000,     0.000,   6,  60,0.99577,  31.8651,   1
60403,'AMCHUR4 ', 400.0000,1,     0.000,     0.000,   6,  60,0.99746,  31.9858,   1
60404,'WNGCHU4 ', 400.0000,1,     0.000,     0.000,   6,  60,1.00018,  32.9565,   1
60405,'SNKHOS4 ', 400.0000,1,     0.000,     0.000,   6,  60,0.99759,  36.7351,   1
60406,'PUNCHU14', 400.0000,1,     0.000,     0.000,   6,  60,0.99924,  40.8425,   1
60407,'PUNTS24 ', 400.0000,1,     0.000,     0.000,   6,  60,0.99982,  40.5993,   1
60408,'MNGDCHU4', 400.0000,1,     0.000,     0.000,   6,  60,1.00415,  43.9234,   1
60409,'CHMRCHU4', 400.0000,1,     0.000,     0.000,   6,  60,1.00459,  43.8572,   1
60410,'YNGBARI4', 400.0000,1,     0.000,     0.000,   6,  60,1.00313,  43.5674,   1
60411,'KHLNGCH4', 400.0000,1,     0.000,     0.000,   6,  60,1.00471,  46.3825,   1
60412,'JGMELNG4', 400.0000,1,     0.000,     0.000,   6,  60,0.99732,  39.3570,   1
60413,'GOLING4 ', 400.0000,1,     0.000,     0.000,   6,  60,1.00349,  42.8942,   1
60414,'KURIGRI ', 400.0000,1,     0.000,     0.000,   6,  60,1.00335,  45.6956,   1

0  / END OF BUS DATA, BEGIN LOAD DATA

60101,'1 ',1,   6,  60,     0.000,     0.000,     0.000,     0.000,     0.000,
0.000,   1
60102,'1 ',1,   6,  60,    11.000,     5.000,     0.000,     0.000,     0.000,
0.000,   1
60103,'1 ',1,   6,  60,    11.000,     5.000,     0.000,     0.000,     0.000,
0.000,   1
60104,'1 ',1,   6,  60,     6.000,     3.000,     0.000,     0.000,     0.000,
0.000,   1
60105,'1 ',1,   6,  60,     9.000,     4.000,     0.000,     0.000,     0.000,
0.000,   1
60106,'1 ',1,   6,  60,    12.000,     6.000,     0.000,     0.000,     0.000,
0.000,   1
60107,'1 ',1,   6,  60,    40.000,    19.000,     0.000,     0.000,     0.000,
0.000,   1
60108,'1 ',1,   6,  60,   153.000,    74.000,     0.000,     0.000,     0.000,
0.000,   1
60110,'1 ',1,   6,  60,     5.000,     2.000,     0.000,     0.000,     0.000,
0.000,   1
60112,'1 ',1,   6,  60,    61.000,    29.000,     0.000,     0.000,     0.000,
0.000,   1
60202,'1 ',1,   6,  60,     0.000,     0.000,     0.000,     0.000,     0.000,
0.000,   1
60205,'1 ',1,   6,  60,   287.000,   139.000,     0.000,     0.000,     0.000,
0.000,   1
60214,'1 ',1,   6,  60,    25.000,    12.000,     0.000,     0.000,     0.000,
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0.000,   1
60299,'1 ',1,   6,  60,    10.000,     4.000,     0.000,     0.000,     0.000,
0.000,   1
60301,'1 ',1,   6,  60,    49.000,    23.000,     0.000,     0.000,     0.000,
0.000,   1
60302,'1 ',1,   6,  60,   115.000,    55.000,     0.000,     0.000,     0.000,
0.000,   1
60303,'1 ',1,   6,  60,    38.000,    18.000,     0.000,     0.000,     0.000,
0.000,   1
60304,'1 ',1,   6,  60,    32.000,    15.000,     0.000,     0.000,     0.000,
0.000,   1
60305,'1 ',1,   6,  60,     9.000,     4.000,     0.000,     0.000,     0.000,
0.000,   1
60306,'1 ',1,   6,  60,    51.000,    24.000,     0.000,     0.000,     0.000,
0.000,   1
60307,'1 ',1,   6,  60,    23.000,    11.000,     0.000,     0.000,     0.000,
0.000,   1
60308,'1 ',1,   6,  60,    49.000,    23.000,     0.000,     0.000,     0.000,
0.000,   1
60309,'1 ',1,   6,  60,     9.000,     4.000,     0.000,     0.000,     0.000,
0.000,   1
60310,'1 ',1,   6,  60,    25.000,    13.000,     0.000,     0.000,     0.000,
0.000,   1
60311,'1 ',1,   6,  60,     6.000,     3.000,     0.000,     0.000,     0.000,
0.000,   1
60312,'1 ',1,   6,  60,    20.000,     9.000,     0.000,     0.000,     0.000,
0.000,   1
60314,'1 ',1,   6,  60,     3.000,     1.000,     0.000,     0.000,     0.000,
0.000,   1
60315,'1 ',1,   6,  60,    31.000,    15.000,     0.000,     0.000,     0.000,
0.000,   1
60316,'1 ',1,   6,  60,    15.000,     7.000,     0.000,     0.000,     0.000,
0.000,   1
60317,'1 ',1,   6,  60,   153.000,    74.000,     0.000,     0.000,     0.000,
0.000,   1
60318,'1 ',1,   6,  60,    12.000,     6.000,     0.000,     0.000,     0.000,
0.000,   1
60321,'1 ',1,   6,  60,   190.000,    90.000,     0.000,     0.000,     0.000,
0.000,   1
60323,'1 ',1,   6,  60,     3.000,     1.500,     0.000,     0.000,     0.000,
0.000,   1
60324,'1 ',1,   6,  60,     3.000,     1.500,     0.000,     0.000,     0.000,
0.000,   1
60325,'1 ',1,   6,  60,    21.000,    10.000,     0.000,     0.000,     0.000,
0.000,   1
60326,'1 ',1,   6,  60,     3.000,     1.500,     0.000,     0.000,     0.000,
0.000,   1

0 / END OF LOAD DATA, BEGIN GENERATOR DATA

60001,'1 ',   334.000,    67.664,   167.000,   -84.000,1.00000,    0,   212.000,
0.00000,   0.30300,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60002,'1 ',  1015.000,    65.243,   508.000,  -254.000,1.00000,    0,  1000.000,
0.00000,   0.30300,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60003,'1 ',    40.000,    11.826,    20.000,   -10.000,1.00000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60005,'1 ',   537.000,    87.125,   268.000,  -134.000,1.01000,    0,   688.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60006,'1 ',   179.000,    45.709,    90.000,   -45.000,1.00000,    0,   200.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
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1,1.0000
60007,'1 ',   568.000,    21.360,   284.000,  -142.000,1.00000,    0,   688.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60008,'1 ',  2488.000,   208.896,  1244.000,  -622.000,1.00000,    0,  4511.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60009,'1 ',  1194.000,    82.393,   597.000,  -300.000,1.00000,    0,  1333.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60010,'1 ',   985.000,    62.833,   492.000,  -240.000,1.00000,    0,  1111.000,
0.00000,   0.30300,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60011,'1 ',   716.000,    21.157,   358.000,  -179.000,1.00000,    0,   800.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60012,'1 ',   766.000,    81.489,   383.000,  -192.000,1.01000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60013,'1 ',  1791.000,    64.476,   896.000,  -448.000,1.00000,    0,  2000.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60014,'1 ',   596.000,     7.996,   248.000,  -124.000,1.00000,    0,   540.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60015,'1 ',    60.000,     4.279,    30.000,   -15.000,1.00000,    0,    70.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60016,'1 ',    24.000,     3.957,    12.000,    -6.000,1.00000,    0,    30.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60017,'1 ',   125.000,    33.260,    63.000,   -32.000,1.00000,    0,   130.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60018,'1 ',   209.000,     6.126,   104.000,   -53.000,1.00000,    0,   250.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60080,'1 ',    85.000,     4.112,    43.000,   -21.000,1.00000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60082,'1 ',    12.000,     6.000,     6.000,    -3.000,1.01000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000

0 / END OF GENERATOR DATA, BEGIN BRANCH DATA

41224,-60201,'1 ',   0.01410,   0.07040,   0.10800,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
41224,-60201,'2 ',   0.01410,   0.07040,   0.10800,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
41224,-60201,'3 ',   0.01410,   0.07040,   0.10800,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
41224,-60202,'1 ',   0.00496,   0.02640,   0.04544,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45414, 60401,'1 ',   0.00260,   0.02910,   0.77700,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60401,'2 ',   0.00260,   0.02910,   0.77700,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60401,'3 ',   0.00250,   0.02800,   0.74920,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60401,'4 ',   0.00250,   0.02800,   0.74920,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414,-60402,'1 ',   0.00228,   0.02480,   0.66600,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
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45414, 60403,'1 ',   0.00209,   0.02280,   0.61050,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45414, 60403,'2 ',   0.00209,   0.02280,   0.61050,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60404,'1 ',   0.00261,   0.02905,   0.77728,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1, 140.00,   1,1.0000
45414, 60405,'1 ',   0.00247,   0.02690,   0.72150,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60405,'2 ',   0.00247,   0.02690,   0.72150,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60401,'1 ',   0.00095,   0.01040,   0.27750, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  50.00,   1,1.0000
45451,-60401,'2 ',   0.00095,   0.01040,   0.27750, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  50.00,   1,1.0000
45451,-60403,'1 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60403,'2 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451, 60404,'2 ',   0.00084,   0.00934,   0.24984,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60405,'1 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  65.00,   1,1.0000
45451,-60405,'2 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  65.00,   1,1.0000
45451,-60405,'3 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60405,'4 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60412,'1 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1, 120.00,   1,1.0000
45451,-60412,'2 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1, 120.00,   1,1.0000
45451,-60412,'3 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60412,'4 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
51101,-60101,'1 ',   0.05307,   0.12631,   0.02907,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402,-60410,'1 ',   0.00069,   0.01173,   0.48300, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
58402,-60410,'2 ',   0.00069,   0.01173,   0.48300, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
58402,-60410,'3 ',   0.00069,   0.01173,   0.48300, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402,-60410,'4 ',   0.00069,   0.01173,   0.48300, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60001, 60201,'1 ',   0.00000,   0.03750,   0.00000,  373.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60002, 60401,'1 ',   0.00000,   0.01235,   0.00000, 1134.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60003, 60207,'1 ',   0.00000,   0.26415,   0.00000,   53.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60005, 60403,'1 ',   0.00000,   0.02417,   0.00000,  600.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60006, 60211,'1 ',   0.00000,   0.07000,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60007, 60404,'1 ',   0.00000,   0.01400,   0.00000, 1000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60008, 60405,'1 ',   0.00000,   0.00522,   0.00000, 2778.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60009, 60406,'1 ',   0.00000,   0.01050,   0.00000, 1333.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60010, 60407,'1 ',   0.00000,   0.01260,   0.00000, 1111.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
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60011, 60408,'1 ',   0.00000,   0.01750,   0.00000,  800.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60012, 60409,'1 ',   0.00000,   0.01700,   0.00000,  850.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60013, 60414,'1 ',   0.00000,   0.00700,   0.00000, 2000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60014, 60411,'1 ',   0.00000,   0.01870,   0.00000,  667.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60015, 60109,'1 ',   0.00000,   0.21000,   0.00000,   66.66,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60016, 60320,'1 ',   0.00000,   0.46667,   0.00000,   30.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60017, 60209,'1 ',   0.00000,   0.10357,   0.00000,  140.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60018, 60114,'1 ',   0.00000,   0.06000,   0.00000,  233.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60080, 60242,'1 ',   0.00000,   0.15420,   0.00000,   94.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60082, 60313,'1 ',   0.00000,   1.05000,   0.00000,   13.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60108,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60108,'2 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101, 60315,'1 ',   0.00000,   0.19660,   0.00000,   50.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60102, 60111,'1 ',   0.03724,   0.08864,   0.02040,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60102,-60151,'3 ',   0.02793,   0.06648,   0.01530,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  30.00,   1,1.0000
60103,-60104,'1 ',   0.02234,   0.05318,   0.01224,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60103, 60112,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104,-60106,'1 ',   0.03724,   0.08864,   0.02040,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104, 60107,'1 ',   0.03165,   0.07534,   0.01734,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104,-60109,'1 ',   0.03165,   0.07534,   0.01734,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60105,-60109,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60105, 60110,'1 ',   0.04189,   0.09972,   0.02295,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60105,-60115,'1 ',   0.01390,   0.03320,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60106,-60115,'1 ',   0.02320,   0.05540,   0.01275,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60107,-60112,'1 ',   0.03724,   0.08864,   0.02040,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60107, 60118,'1 ',   0.02793,   0.06648,   0.01530,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  30.00,   1,1.0000
60107, 60118,'2 ',   0.02793,   0.06648,   0.01530,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  30.00,   1,1.0000
60107, 60151,'1 ',   0.05121,   0.12188,   0.02805,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  55.00,   1,1.0000
60205, 60108,'1 ',   0.00000,   0.04370,   0.00000,  286.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111,-60113,'1 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111,-60113,'2 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111, 60325,'1 ',   0.00000,   0.19660,   0.00000,   50.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
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60113,-60114,'1 ',   0.00931,   0.02216,   0.00510,  110.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113,-60114,'2 ',   0.00931,   0.02216,   0.00510,  110.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113,-60114,'3 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113,-60114,'4 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60113,'1 ',   0.00000,   0.03120,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60411, 60115,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60118,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60151, 60409,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60201, 60202,'1 ',   0.00496,   0.02640,   0.04544,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60201, 60211,'1 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60201, 60318,'1 ',   0.00000,   0.20800,   0.00000,   60.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60203,'1 ',   0.00031,   0.00165,   0.00284,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60203,'2 ',   0.00046,   0.00248,   0.00426,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60208,'1 ',   0.00635,   0.03384,   0.05822,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  43.00,   1,1.0000
60202, 60208,'2 ',   0.00635,   0.03384,   0.05822,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  43.00,   1,1.0000
60202,-60211,'1 ',   0.00460,   0.02470,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  30.00,   1,1.0000
60202,-60211,'2 ',   0.00460,   0.02470,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60253,'1 ',   0.00232,   0.01237,   0.02130,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60301,'1 ',   0.00000,   0.03550,   0.00000,  352.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60402, 60202,'1 ',   0.00000,   0.03125,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60203, 60302,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60204, 60207,'1 ',   0.00558,   0.02970,   0.05112,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60204,-60213,'1 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60204, 60306,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60205, 60206,'1 ',   0.00773,   0.04124,   0.07100,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  50.00,   1,1.0000
60205, 60206,'2 ',   0.00773,   0.04124,   0.07100,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412, 60205,'1 ',   0.00000,   0.02900,   0.00000,  500.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60206, 60209,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60206, 60214,'1 ',   0.00542,   0.02890,   0.04970,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60206,-60299,'1 ',   0.00464,   0.02475,   0.04260,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60206, 60316,'1 ',   0.00000,   0.41750,   0.00000,   20.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60207,-60214,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
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60207, 60319,'1 ',   0.00000,   0.41750,   0.00000,   20.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60208, 60253,'1 ',   0.00464,   0.02475,   0.04260,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60208, 60317,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60209,-60299,'1 ',   0.00232,   0.01237,   0.02130,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60211,-60213,'1 ',   0.00387,   0.02060,   0.03550,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60213, 60314,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60406, 60214,'1 ',   0.00000,   0.03968,   0.00000,  315.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60242,'1 ',   0.00028,   0.00310,   0.08325,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60242,'2 ',   0.00028,   0.00310,   0.08325,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405, 60239,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60304,'1 ',   0.05656,   0.07640,   0.00090,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60321,'1 ',   0.02828,   0.03820,   0.00045,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60321,'2 ',   0.02828,   0.03820,   0.00045,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60321,'3 ',   0.02828,   0.03820,   0.00045,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60304,'1 ',   0.05656,   0.07640,   0.00090,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60321,'1 ',   0.01202,   0.01623,   0.00019,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60321,'2 ',   0.01202,   0.01623,   0.00019,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60353,'1 ',   0.07042,   0.13913,   0.00204,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60302,-60353,'2 ',   0.07042,   0.13913,   0.00204,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60303,-60304,'1 ',   0.19089,   0.25785,   0.00302,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60303,-60304,'2 ',   0.19089,   0.25785,   0.00302,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60303, 60317,'1 ',   0.07042,   0.13913,   0.00204,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60303, 60317,'2 ',   0.07042,   0.13913,   0.00204,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60304,-60305,'1 ',   0.12019,   0.16235,   0.00190,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60305,-60318,'1 ',   0.14140,   0.19100,   0.00224,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60307,'1 ',   0.01414,   0.01910,   0.00022,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60308,'1 ',   0.08484,   0.11460,   0.00134,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60308,'2 ',   0.08484,   0.11460,   0.00134,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60312,'1 ',   0.16968,   0.22920,   0.00269,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60307,-60309,'1 ',   0.10605,   0.14325,   0.00168,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60309,-60310,'1 ',   0.17675,   0.23875,   0.00280,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60309,-60314,'1 ',   0.10605,   0.14325,   0.00168,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
```

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60310,-60314,'1 ',   0.16968,   0.22920,   0.00269,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60311,-60314,'1 ',   0.24038,   0.32470,   0.00381,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60312, 60319,'1 ',   0.14847,   0.20055,   0.00235,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60313, 60324,'1 ',   0.04695,   0.09275,   0.00136,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60313,-60324,'2 ',   0.04695,   0.09275,   0.00136,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  10.00,   1,1.0000
60314,-60326,'1 ',   0.17675,   0.23875,   0.00280,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60317, 60324,'1 ',   0.14085,   0.27825,   0.00408,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60317, 60324,'2 ',   0.14085,   0.27825,   0.00408,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  30.00,   1,1.0000
60318, 60326,'1 ',   0.10605,   0.14325,   0.00168,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60319, 60320,'1 ',   0.02121,   0.02865,   0.00034,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60323,-60325,'1 ',   0.18240,   0.31670,   0.00503,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60401, 60402,'1 ',   0.00057,   0.00620,   0.16650, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  30.00,   1,1.0000
60401, 60404,'1 ',   0.00019,   0.00208,   0.05552, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  10.00,   1,1.0000
60402, 60403,'1 ',   0.00028,   0.00310,   0.08325,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60405, 60406,'1 ',   0.00175,   0.01914,   0.51078, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  92.00,   1,1.0000
60405, 60406,'2 ',   0.00175,   0.01914,   0.51078, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  92.00,   1,1.0000
60405,-60407,'1 ',   0.00130,   0.01452,   0.38850, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
60405,-60407,'2 ',   0.00130,   0.01452,   0.38850, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
60406, 60407,'1 ',   0.00037,   0.00415,   0.11100, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  20.00,   1,1.0000
60406, 60407,'2 ',   0.00037,   0.00415,   0.11100, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  20.00,   1,1.0000
60407, 60412,'1 ',   0.00149,   0.01660,   0.44416, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  80.00,   1,1.0000
60407, 60412,'2 ',   0.00149,   0.01660,   0.44416, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  80.00,   1,1.0000
60408,-60413,'1 ',   0.00074,   0.00830,   0.22208, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60408, 60413,'2 ',   0.00076,   0.00830,   0.22200, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60413,'3 ',   0.00076,   0.00830,   0.22200, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60413,'4 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60409,-60410,'1 ',   0.00084,   0.00934,   0.24984, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  45.00,   1,1.0000
60409,-60410,'2 ',   0.00084,   0.00934,   0.24984, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  45.00,   1,1.0000
60409,-60413,'1 ',   0.00047,   0.00519,   0.13880, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  25.00,   1,1.0000
60409,-60413,'2 ',   0.00047,   0.00519,   0.13880, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  25.00,   1,1.0000
60410,-60411,'1 ',   0.00158,   0.01764,   0.47192, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  85.00,   1,1.0000
60410,-60411,'2 ',   0.00158,   0.01764,   0.47192, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  85.00,   1,1.0000
```

```
60410, 60413,'1 ',   0.00112,   0.01245,   0.33312, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  60.00,   1,1.0000
60410, 60413,'2 ',   0.00112,   0.01245,   0.33312, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  60.00,   1,1.0000
60410, 60414,'1 ',   0.00074,   0.00830,   0.22208, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60410, 60414,'2 ',   0.00074,   0.00830,   0.22208, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60410, 60414,'3 ',   0.00074,   0.00830,   0.22208, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60410, 60414,'4 ',   0.00074,   0.00830,   0.22208, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60412,-60413,'1 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
60412,-60413,'2 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
60412,-60413,'3 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000
60412,-60413,'4 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  70.00,   1,1.0000

0 / END OF BRANCH DATA, BEGIN TRANSFORMER ADJUSTMENT DATA

0 / END OF TRANSFORMER ADJUSTMENT DATA, BEGIN AREA DATA

0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA

 38,0,   15.0000,   1500.00,    500.00,    400.00,    0.0000,   0.10000,'R',      0.00,
20,   1.00000
60405, 2,17.50,12.50, 0.3840, 9.0000, 400.0,0.54500,0.94641,1.17500,0.87500,0.00010,
0,    0,    0,'1 ', 0.0000
16433, 2,22.00,17.00, 0.3840, 9.0000, 400.0,0.54500,1.06289,1.17500,0.87500,0.00010,
0,    0,    0,'1 ', 0.0000
 39,0,   15.0000,   1500.00,    500.00,    400.00,    0.0000,   0.10000,'R',      0.00,
20,   1.00000
60405, 2,17.50,12.50, 0.3840, 9.0000, 400.0,0.54500,0.94641,1.17500,0.87500,0.00010,
0,    0,    0,'1 ', 0.0000
16433, 2,22.00,17.00, 0.3840, 9.0000, 400.0,0.54500,1.06289,1.17500,0.87500,0.00010,
0,    0,    0,'1 ', 0.0000

0 / END OF TWO-TERMINAL DC DATA, BEGIN SWITCHED SHUNT DATA

0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA

0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA

0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA

0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA

0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA

0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA

0 / END OF OWNER DATA, BEGIN FACTS CONTROL DEVICE DATA

0 / END OF FACTS CONTROL DEVICE DATA
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B. PSSE input data - 2030 Scenario (Kuri Gongri 3400 MW)

```
0,   100.00          / MON, APR 30 2012   4:31

60001,'CHUKAG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  17.8451,   1
60002,'TALAG   ',  13.8000,2,     0.000,     0.000,   6,  60,1.00000,  24.8493,   1
60003,'BSOCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  22.5442,   1
60005,'AMCHURG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  24.9327,   1
60006,'BHNKHRG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  17.6679,   1
60007,'WNGCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  22.4539,   1
60008,'SNKHOSG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  25.2773,   1
60009,'PUNCHU1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  29.4404,   1
60010,'PUNTS2G ',  13.8000,2,     0.000,     0.000,   6,  60,1.00000,  29.1517,   1
60011,'MNGDCHUG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  33.8840,   1
60013,'KRIGNGRG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.6664,   1
60014,'KHLNGCHG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.9878,   1
60015,'KRICHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  37.2127,   1
60016,'BOSCHU1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  22.5401,   1
60017,'DGACHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  24.6303,   1
60018,'NIKCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  40.1046,   1
60020,'AMOCHU1 ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  28.4099,   1
60021,'AMOCHU2 ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  27.7332,   1
60022,'PACHHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  15.8681,   1
60023,'SAMCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  29.2015,   1
60024,'CHRECHUG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  29.1514,   1
60025,'THMPCHU ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.6707,   1
60026,'CHRICHU ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  35.6407,   1
60027,'PROCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  37.0399,   1
60028,'PPNCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  52.9802,   1
60029,'MOCHHU1 ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  33.7956,   1
60030,'MOCHHU2 ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  33.2729,   1
60031,'SICHHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  35.8854,   1
60032,'POCHHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.5620,   1
60033,'DRCHU3G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  54.1317,   1
60034,'CHRCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  31.7469,   1
60035,'DNGCHU1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  34.5510,   1
60036,'DNGCHU2G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  34.2645,   1
60037,'DRCHU1G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  54.9629,   1
60038,'DRCHU2G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  54.8164,   1
60039,'DRCHU4G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  54.2728,   1
60040,'PUNAT3G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  29.0776,   1
60041,'BEMNGCG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  17.1482,   1
60042,'WACHIG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  39.1647,   1
60043,'KRISAG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  39.3626,   1
60044,'BRAGN1G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  38.7218,   1
60045,'BRANG2G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  38.6015,   1
60046,'GHIJAMG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  39.1195,   1
60047,'CHMKR5G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  40.2352,   1
60048,'CHMKHR1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  33.8101,   1
60049,'GUMTHGG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  44.2812,   1
60050,'CHMKR1G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  39.5774,   1
60051,'CHMKR2G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  38.4045,   1
60052,'CHMKR3G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  37.8539,   1
60053,'KHENGG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.9377,   1
60054,'RMGNCG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  37.8108,   1
60055,'THMPCG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  42.1367,   1
60056,'KOMCHG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  45.1235,   1
60057,'NGRGCHG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  44.1786,   1
60058,'KRTHPG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  38.2718,   1
60059,'SHNGRG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.1302,   1
60062,'GBRCHG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  35.3603,   1
60063,'SHRCHG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  41.1828,   1
60064,'GMRCH1G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  41.0048,   1
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60065,'GMRCH2G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  40.8998,   1
60066,'GMRCH3G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  40.7355,   1
60067,'GAMRIG  ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  40.3248,   1
60068,'GMRCH4G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  40.4302,   1
60069,'BOMDLNG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  42.9168,   1
60070,'YNGTSEG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  42.5431,   1
60071,'MANASR1G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  34.0955,   1
60072,'AIECHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  18.3962,   1
60073,'NYERRIG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  36.6482,   1
60074,'DHNSRIG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  38.6070,   1
60075,'HACHHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  16.3329,   1
60076,'SMACHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  52.6901,   1
60077,'SHRGRCG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  37.6538,   1
60078,'BMBCHUG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  44.1870,   1
60079,'JLDHKAG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  12.7102,   1
60080,'SNKSHBRG',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  53.2220,   1
60081,'MANASR2G',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  34.4547,   1
60082,'BKHOLAG ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  12.6034,   1
60083,'DGACHU2 ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  24.4165,   1
60084,'AICHUS  ',  11.0000,2,     0.000,     0.000,   6,  60,1.10000,  15.9923,   1
60085,'NAMRI2G ',  11.0000,2,     0.000,     0.000,   6,  60,1.00000,  33.9613,   1
60101,'GELPHU1 ', 132.0000,1,     0.000,    20.000,   6,  60,1.00019,  12.0225,   1
60102,'TNTIBI1 ', 132.0000,1,     0.000,    10.000,   6,  60,0.99386,  29.8544,   1
60103,'DOTHNG1 ', 132.0000,1,     0.000,     5.000,   6,  60,0.98700,  27.7374,   1
60104,'NANKOR1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99161,  28.4408,   1
60105,'KLIKHR1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99720,  29.6422,   1
60106,'KNGLNG1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99057,  28.7817,   1
60107,'NGNGLM1 ', 132.0000,1,     0.000,    30.000,   6,  60,0.98922,  27.6586,   1
60108,'JIGMLG1 ', 132.0000,1,     0.000,    70.000,   6,  60,0.99459,  12.0548,   1
60109,'KRICGU1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99972,  29.9721,   1
60110,'TNGMCH1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99091,  29.2494,   1
60111,'YURMU1  ', 132.0000,1,     0.000,    20.000,   6,  60,0.99452,  32.0755,   1
60112,'MOTNGA1 ', 132.0000,1,     0.000,    50.000,   6,  60,0.98755,  27.6596,   1
60113,'MNGDCHU1', 132.0000,1,     0.000,     0.000,   6,  60,0.99465,  32.2110,   1
60114,'NIKACH1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99888,  32.8926,   1
60115,'KHLNCHU1', 132.0000,1,     0.000,     0.000,   6,  60,0.99940,  29.5217,   1
60117,'GOLING1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99374,  29.7307,   1
60118,'YNGBARI ', 132.0000,1,     0.000,     0.000,   6,  60,0.99287,  27.0688,   1
60126,'WACHI1  ', 132.0000,1,     0.000,     0.000,   6,  60,0.99978,  32.0507,   1
60127,'KRISA1  ', 132.0000,1,     0.000,     0.000,   6,  60,1.00107,  32.2573,   1
60128,'BRAGN11 ', 132.0000,1,     0.000,     0.000,   6,  60,1.00850,  31.6125,   1
60129,'BRAGN21 ', 132.0000,1,     0.000,     0.000,   6,  60,1.00810,  31.4775,   1
60133,'RMGNC1  ', 132.0000,1,     0.000,     0.000,   6,  60,0.99922,  30.5875,   1
60134,'SHRGRCG ', 132.0000,1,     0.000,     0.000,   6,  60,0.99828,  30.4387,   1
60136,'CHMKR31 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99989,  31.6007,   1
60137,'GHIJAM1 ', 132.0000,1,     0.000,     0.000,   6,  60,1.00192,  31.9445,   1
60140,'AIECHU1 ', 132.0000,1,     0.000,     0.000,   6,  60,1.00317,  12.2912,   1
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60149,'NYERRI1 ', 132.0000,1,     0.000,     0.000,   6,  60,0.99995,  29.5120,   1
60150,'DHNSRI1 ', 132.0000,1,     0.000,     0.000,   6,  60,1.00895,  31.4609,   1
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60155,'THMPOCH1', 132.0000,1,     0.000,     0.000,   6,  60,1.00823,  35.0224,   1
60156,'AICHUS  ', 132.0000,1,     0.000,     0.000,   6,  60,1.00424,  11.9953,   1
60157,'NAMARI21', 132.0000,1,     0.000,     0.000,   6,  60,0.99447,  28.5963,   1
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60202,'MALBSE2 ', 220.0000,1,     0.000,   100.000,   6,  60,0.97615,   8.2616,   1
60203,'SNGGON2 ', 220.0000,1,     0.000,    80.000,   6,  60,0.97185,   7.2746,   1
60204,'SMTKHA2 ', 220.0000,1,     0.000,    50.000,   6,  60,0.97825,  12.4087,   1
60205,'JIGMLG2 ', 220.0000,1,     0.000,   200.000,   6,  60,0.98567,  15.2679,   1
60206,'TSIRNG2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.98986,  16.4666,   1
60207,'RURCHU2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.99085,  16.4228,   1
60208,'SAMSTE2 ', 220.0000,1,     0.000,    80.000,   6,  60,0.96688,   6.4185,   1
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60209,'DGACHU1 ', 220.0000,1,     0.000,     0.000,   6,  60,0.99181,  17.1300,   1
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60213,'CHUMDO  ', 220.0000,1,     0.000,     0.000,   6,  60,0.97919,  11.3894,   1
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60220,'DNGCHU12', 220.0000,1,     0.000,     0.000,   6,  60,1.00476,  27.3952,   1
60221,'DNGCHU22', 220.0000,1,     0.000,     0.000,   6,  60,1.00444,  27.1229,   1
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60224,'DRCHU12 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97746,  47.6120,   1
60225,'DRCHU32 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97249,  46.7204,   1
60226,'DRCHU42 ', 220.0000,1,     0.000,     0.000,   6,  60,0.97315,  46.8876,   1
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60229,'NGRGCH2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.99916,  37.0601,   1
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60231,'GBRCH2  ', 220.0000,1,     0.000,     0.000,   6,  60,1.00137,  28.2008,   1
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60233,'MOCHHU22', 220.0000,1,     0.000,     0.000,   6,  60,0.99298,  28.4890,   1
60234,'POCHHU2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.99443,  29.3388,   1
60238,'YANGBRI2', 220.0000,1,     0.000,     0.000,   6,  60,0.99967,  27.6044,   1
60239,'SNKHSMN2', 220.0000,1,     0.000,     0.000,   6,  60,0.96597,  45.1296,   1
60240,'SMACHU2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.96755,  45.3373,   1
60241,'PPNCHU2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.96896,  45.5327,   1
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60245,'DCNCOL2 ', 220.0000,1,     0.000,     0.000,   6,  60,0.98748,  27.9856,   1
60246,'PARO2   ', 220.0000,1,     0.000,     0.000,   6,  60,0.99141,  27.7806,   1
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60266,'BOMDEL2 ', 220.0000,1,     0.000,     0.000,   6,  60,1.00163,  36.7042,   1
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60268,'KHENG2  ', 220.0000,1,     0.000,     0.000,   6,  60,0.99742,  33.0394,   1
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60301,'MALBSE3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.96089,   3.5700,   1
60302,'SNGGON3 ',  66.0000,1,     0.000,    10.000,   6,  60,0.94384,   2.4836,   1
60303,'GOMTU3  ',  66.0000,1,     0.000,    30.000,   6,  60,0.92500,   0.1410,   1
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60305,'GEDU3   ',  66.0000,1,     0.000,     0.000,   6,  60,0.92610,   3.5215,   1
60306,'SMTKHA3 ',  66.0000,1,     0.000,    20.000,   6,  60,0.94989,  13.2928,   1
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60318,'CHUKHA3 ',  66.0000,1,     0.000,     0.000,   6,  60,0.95818,   6.8655,   1
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60324,'SIPSU3  ',  66.0000,1,     0.000,     0.000,   6,  60,0.97464,   4.5349,   1
60325,'YURMU3  ',  66.0000,1,     0.000,     0.000,   6,  60,0.99129,  31.4981,   1
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0  / END OF BUS DATA, BEGIN LOAD DATA

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60308,'1 ',1,   6,  60,    40.000,    19.000,     0.000,     0.000,     0.000,
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60309,'1 ',1,   6,  60,    15.000,     7.000,     0.000,     0.000,     0.000,
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60310,'1 ',1,   6,  60,    41.000,    20.000,     0.000,     0.000,     0.000,
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60311,'1 ',1,   6,  60,    10.000,     5.000,     0.000,     0.000,     0.000,
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60312,'1 ',1,   6,  60,    33.000,    16.000,     0.000,     0.000,     0.000,
0.000,   1
60314,'1 ',1,   6,  60,    49.000,    25.000,     0.000,     0.000,     0.000,
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60315,'1 ',1,   6,  60,    11.000,     5.000,     0.000,     0.000,     0.000,
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60316,'1 ',1,   6,  60,    67.000,    32.000,     0.000,     0.000,     0.000,
0.000,   1
60317,'1 ',1,   6,  60,    56.000,    28.000,     0.000,     0.000,     0.000,
0.000,   1
60318,'1 ',1,   6,  60,    20.000,    10.000,     0.000,     0.000,     0.000,
0.000,   1
60321,'1 ',1,   6,  60,   132.000,    64.000,     0.000,     0.000,     0.000,
0.000,   1
60323,'1 ',1,   6,  60,     5.000,     2.000,     0.000,     0.000,     0.000,
0.000,   1
60324,'1 ',1,   6,  60,     5.000,     2.000,     0.000,     0.000,     0.000,
0.000,   1
60325,'1 ',1,   6,  60,     0.000,     0.000,     0.000,     0.000,     0.000,
0.000,   1
60326,'1 ',1,   6,  60,     5.000,     2.000,     0.000,     0.000,     0.000,
0.000,   1
60407,'1 ',1,   6,  60,     0.000,     0.000,     0.000,     0.000,     0.000,
0.000,   1

0 / END OF LOAD DATA, BEGIN GENERATOR DATA
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60001,'1 ',   334.000,    52.633,   167.000,   -84.000,1.00000,    0,   212.000,
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60002,'1 ',  1015.000,    61.577,   508.000,  -254.000,1.00000,    0,  1000.000,
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60003,'1 ',    40.000,     5.603,    20.000,   -10.000,1.00000,    0,   100.000,
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60005,'1 ',   537.000,    40.873,   268.000,  -134.000,1.00000,    0,   688.000,
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60006,'1 ',   179.000,    35.362,    90.000,   -45.000,1.00000,    0,   200.000,
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60007,'1 ',   568.000,    15.832,   284.000,  -142.000,1.00000,    0,   688.000,
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60008,'1 ',  2488.000,   162.251,  1244.000,  -622.000,1.00000,    0,  4511.000,
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60009,'1 ',  1194.000,    58.101,   597.000,  -300.000,1.00000,    0,  1333.000,
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60010,'1 ',   985.000,    44.458,   492.000,  -240.000,1.00000,    0,  1111.000,
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60011,'1 ',   716.000,    27.690,   358.000,  -179.000,1.00000,    0,   800.000,
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60013,'1 ',  3400.000,   200.598,  1700.000,  -850.000,1.00000,    0,  2000.000,
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60014,'1 ',   598.000,    28.250,   300.000,  -150.000,1.00000,    0,   540.000,
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60015,'1 ',    60.000,     3.929,    30.000,   -15.000,1.00000,    0,    70.000,
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60016,'1 ',    24.000,     4.861,    12.000,    -6.000,1.00000,    0,    30.000,
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60017,'1 ',   125.000,    16.104,    63.000,   -32.000,1.00000,    0,   130.000,
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60018,'1 ',   209.000,    15.046,   105.000,   -55.000,1.00000,    0,   250.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
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60020,'1 ',   743.265,    44.135,   373.500,  -186.750,1.00000,    0,   100.000,
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60021,'1 ',   497.500,    30.806,   250.000,  -125.000,1.00000,    0,   100.000,
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60022,'1 ',    76.615,    18.599,    38.500,   -19.250,1.00000,    0,   100.000,
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60023,'1 ',    70.645,     4.476,    35.500,   -17.750,1.00000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
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60024,'1 ',    44.775,     2.888,    22.500,   -11.250,1.00000,    0,   100.000,
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60025,'1 ',    56.715,     4.459,    28.500,   -14.250,1.00000,    0,   100.000,
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60026,'1 ',    75.620,     7.955,    38.000,   -19.000,1.00000,    0,   100.000,
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60027,'1 ',   103.000,     6.967,    52.000,   -25.000,1.00000,    0,   100.000,
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60028,'1 ',    54.725,    17.088,    27.500,   -13.750,1.00000,    0,   100.000,
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60029,'1 ',   655.000,    38.062,   327.000,  -164.000,1.00000,    0,   100.000,
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60030,'1 ',   402.000,    25.079,   201.000,  -100.000,1.00000,    0,   100.000,
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60031,'1 ',    77.610,    10.320,    39.000,   -19.500,1.00000,    0,   100.000,
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60032,'1 ',   131.340,    14.136,    66.000,   -33.000,1.00000,    0,   100.000,
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60033,'1 ',   152.235,    43.242,    76.500,   -38.250,1.00000,    0,   100.000,
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60034,'1 ',    24.875,     1.606,    12.500,    -6.250,1.00000,    0,   100.000,
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60035,'1 ',   149.000,     3.650,    74.000,   -37.000,1.00000,    0,   100.000,
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60036,'1 ',    77.610,     2.082,    39.000,   -19.500,1.00000,    0,   100.000,
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60037,'1 ',    78.605,    19.219,    39.500,   -19.750,1.00000,    0,   100.000,
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60038,'1 ',   114.000,    28.768,    57.000,   -28.000,1.00000,    0,   100.000,
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60039,'1 ',   210.940,    58.899,   106.000,   -53.000,1.00000,    0,   100.000,
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60040,'1 ',   592.000,    35.123,   296.000,  -148.000,1.00000,    0,   100.000,
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60041,'1 ',    13.930,     4.868,     7.000,    -3.500,1.00000,    0,   100.000,
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60042,'1 ',    23.880,     1.526,    12.000,    -6.000,1.00000,    0,   100.000,
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60043,'1 ',    31.840,     1.703,    16.000,    -8.000,1.00000,    0,   100.000,
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60044,'1 ',    68.655,    -0.409,    34.500,   -17.250,1.00000,    0,   100.000,
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60045,'1 ',    69.650,    -0.178,    35.000,   -17.500,1.00000,    0,   100.000,
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60046,'1 ',    52.735,     2.496,    26.500,   -13.250,1.00000,    0,   100.000,
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60047,'1 ',   161.190,     9.931,    81.000,   -40.500,1.00000,    0,   100.000,
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60048,'1 ',   666.650,    29.995,   335.000,  -167.500,1.00000,    0,   100.000,
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60049,'1 ',   107.460,     4.651,    54.000,   -27.000,1.00000,    0,   100.000,
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60050,'1 ',    96.515,    -3.272,    48.500,   -24.250,1.00000,    0,   100.000,
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60051,'1 ',   990.000,    52.171,   495.000,  -247.000,1.00000,    0,   100.000,
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60052,'1 ',  1880.000,   101.862,   940.000,  -470.000,1.00000,    0,   100.000,
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60053,'1 ',   567.150,    32.284,   285.000,  -142.500,1.00000,    0,   100.000,
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60054,'1 ',    45.770,     3.175,    23.000,   -11.500,1.00000,    0,   100.000,
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60055,'1 ',    94.525,    -0.352,    47.500,   -23.750,1.00000,    0,   100.000,
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60056,'1 ',   360.000,    19.800,   180.000,   -90.000,1.00000,    0,   100.000,
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60057,'1 ',    23.880,     1.647,    12.000,    -6.000,1.00000,    0,   100.000,
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60058,'1 ',  1224.000,    59.322,   612.000,  -306.000,1.00000,    0,   100.000,
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60059,'1 ',   106.000,     3.844,    53.000,   -27.000,1.00000,    0,   100.000,
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60062,'1 ',    42.785,     2.205,    21.500,   -10.750,1.00000,    0,   100.000,
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60063,'1 ',    35.820,     1.872,    18.000,    -9.000,1.00000,    0,   100.000,
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60064,'1 ',    63.680,     3.899,    32.000,   -16.000,1.00000,    0,   100.000,
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60065,'1 ',    78.605,     4.910,    39.500,   -19.750,1.00000,    0,   100.000,
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60066,'1 ',    79.600,     5.060,    40.000,   -20.000,1.00000,    0,   100.000,
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60067,'1 ',    80.595,     5.595,    40.500,   -20.250,1.00000,    0,   100.000,
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60068,'1 ',    90.000,     5.985,    45.000,   -23.000,1.00000,    0,   100.000,
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60069,'1 ',   129.350,     5.076,    65.000,   -32.500,1.00000,    0,   100.000,
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60070,'1 ',    93.530,     4.101,    47.000,   -23.500,1.00000,    0,   100.000,
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60071,'1 ',  1791.000,   114.072,   900.000,  -450.000,1.00000,    0,   100.000,
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60072,'1 ',    64.000,     1.509,    32.000,   -16.000,1.00000,    0,   100.000,
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60073,'1 ',   140.000,     8.785,    70.000,   -35.000,1.00000,    0,   100.000,
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60074,'1 ',    72.635,    -0.644,    36.500,   -18.250,1.00000,    0,   100.000,
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60075,'1 ',    16.915,     4.515,     8.500,    -4.250,1.00000,    0,   100.000,
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60076,'1 ',    15.920,     5.194,     8.000,    -4.000,1.00000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
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60077,'1 ',    26.865,     2.061,    13.500,    -6.750,1.00000,    0,   100.000,
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60078,'1 ',    21.890,     1.636,    11.000,    -5.500,1.00000,    0,   100.000,
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60079,'1 ',    18.905,     3.634,     9.500,    -4.750,1.00000,    0,   100.000,
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60080,'1 ',    85.000,    26.524,    43.000,   -21.000,1.00000,    0,   100.000,
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60081,'1 ',   995.000,    61.496,   500.000,  -250.000,1.00000,    0,   100.000,
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60082,'1 ',    12.000,     2.426,     6.000,    -3.000,1.00000,    0,   100.000,
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60083,'1 ',   134.000,    16.747,  9999.000, -9999.000,1.00000,    0,   100.000,
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60084,'1 ',    22.000,    30.863,  9999.000, -9999.000,1.10000,    0,   100.000,
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60085,'1 ',   328.000,    17.583,  9999.000, -9999.000,1.00000,    0,   100.000,
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60405,'2 ',     0.000,  3678.892,  9999.000, -9999.000,1.00000,    0,   100.000,
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60410,'2 ',     0.000,  3924.836,  9999.000, -9999.000,1.00000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000
60412,'2 ',     0.000,   -25.061,  9999.000, -9999.000,1.00000,    0,   100.000,
0.00000,   1.00000,   0.00000,   0.00000,1.00000,1,  100.0,  9999.000, -9999.000,
1,1.0000

0 / END OF GENERATOR DATA, BEGIN BRANCH DATA

41224,-60201,'1 ',   0.01410,   0.07040,   0.10800,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
41224,-60201,'2 ',   0.01410,   0.07040,   0.10800,    0.00,    0.00,    0.00,,,
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```
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
41224,-60201,'3 ',   0.01410,   0.07040,   0.10800,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
41224,-60202,'1 ',   0.00496,   0.02640,   0.04544,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45414, 60401,'1 ',   0.00260,   0.02910,   0.77700,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60401,'2 ',   0.00260,   0.02910,   0.77700,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60401,'3 ',   0.00250,   0.02800,   0.74920,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60401,'4 ',   0.00250,   0.02800,   0.74920,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414,-60402,'1 ',   0.00228,   0.02480,   0.66600,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60403,'1 ',   0.00209,   0.02280,   0.61050,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45414, 60403,'2 ',   0.00209,   0.02280,   0.61050,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414,-60404,'1 ',   0.00261,   0.02905,   0.77728,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1, 140.00,   1,1.0000
45414, 60405,'1 ',   0.00247,   0.02690,   0.72150,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414, 60405,'2 ',   0.00247,   0.02690,   0.72150,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414,-60416,'1 ',   0.00237,   0.02590,   0.69375,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45414,-60416,'2 ',   0.00237,   0.02590,   0.69375,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60401,'1 ',   0.00095,   0.01040,   0.27750,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60401,'2 ',   0.00095,   0.01040,   0.27750,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60403,'1 ',   0.00084,   0.00934,   0.24984, 1800.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60403,'2 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60403,'3 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60403,'4 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60405,'1 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60405,'2 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60405,'3 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60405,'4 ',   0.00064,   0.01089,   0.45435, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60412,'1 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60412,'2 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451,-60412,'3 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451,-60412,'4 ',   0.00117,   0.02011,   0.83880, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451, 60413,'1 ',   0.00313,   0.03420,   0.91575,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451, 60413,'2 ',   0.00313,   0.03420,   0.91575,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
45451, 60416,'1 ',   0.00130,   0.01453,   0.38864, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
45451, 60416,'2 ',   0.00130,   0.01453,   0.38864, 1500.00,    0.00,    0.00,,,
```

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0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
51101,-60101,'1 ',   0.05307,   0.12631,   0.02907,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
51102,-60112,'1 ',   0.04655,   0.11080,   0.02550,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58402,-60410,'1 ',   0.00069,   0.01173,   0.48300,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402,-60410,'2 ',   0.00069,   0.01173,   0.48300,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402,-60410,'3 ',   0.00069,   0.01173,   0.48300,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402,-60410,'4 ',   0.00069,   0.01173,   0.48300,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402,-60410,'5 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58402,-60410,'6 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58402,-60410,'7 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58402,-60410,'8 ',   0.00130,   0.01453,   0.38864, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58402, 60423,'1 ',   0.00049,   0.00838,   0.34500,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402, 60423,'2 ',   0.00049,   0.00838,   0.34500,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402, 60423,'3 ',   0.00049,   0.00838,   0.34500,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58402, 60423,'4 ',   0.00049,   0.00838,   0.34500,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
58403, 60405,'1 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58403, 60405,'2 ',   0.00171,   0.01860,   0.49950,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58403, 60412,'1 ',   0.00059,   0.01006,   0.41940, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
58403, 60412,'2 ',   0.00059,   0.01006,   0.41940, 1500.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60001, 60201,'1 ',   0.00000,   0.03750,   0.00000,  373.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60002, 60401,'1 ',   0.00000,   0.01235,   0.00000, 1134.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60003, 60207,'1 ',   0.00000,   0.26415,   0.00000,   53.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60005, 60403,'1 ',   0.00000,   0.02417,   0.00000,  600.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60006, 60211,'1 ',   0.00000,   0.07000,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60007, 60404,'1 ',   0.00000,   0.01400,   0.00000, 1000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60008, 60405,'1 ',   0.00000,   0.00522,   0.00000, 2778.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60009, 60406,'1 ',   0.00000,   0.01050,   0.00000, 1333.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60010, 60407,'1 ',   0.00000,   0.01260,   0.00000, 1111.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60011, 60408,'1 ',   0.00000,   0.01750,   0.00000,  800.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60013, 60414,'1 ',   0.00000,   0.00380,   0.00000, 3778.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60014, 60411,'1 ',   0.00000,   0.02100,   0.00000,  667.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60015, 60109,'1 ',   0.00000,   0.21000,   0.00000,   66.66,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60016, 60320,'1 ',   0.00000,   0.46667,   0.00000,   30.00,    0.00,    0.00,1.00000,
```

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0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60017, 60209,'1 ',   0.00000,   0.10357,   0.00000,  140.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60018, 60114,'1 ',   0.00000,   0.06000,   0.00000,  233.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60020, 60415,'1 ',   0.00000,   0.01690,   0.00000,  830.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60021, 60416,'1 ',   0.00000,   0.02520,   0.00000,  556.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60022, 60215,'1 ',   0.00000,   0.16280,   0.00000,   86.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60023, 60216,'1 ',   0.00000,   0.17720,   0.00000,   79.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60024, 60243,'1 ',   0.00000,   0.28000,   0.00000,   50.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60025, 60217,'1 ',   0.00000,   0.22220,   0.00000,   63.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60026, 60219,'1 ',   0.00000,   0.16670,   0.00000,   84.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60027, 60218,'1 ',   0.00000,   0.12100,   0.00000,  115.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60028, 60241,'1 ',   0.00000,   0.22950,   0.00000,   61.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60029, 60417,'1 ',   0.00000,   0.01915,   0.00000,  731.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60030, 60418,'1 ',   0.00000,   0.03127,   0.00000,  448.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60031, 60232,'1 ',   0.00000,   0.16090,   0.00000,   87.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60032, 60234,'1 ',   0.00000,   0.09520,   0.00000,  147.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60033, 60225,'1 ',   0.00000,   0.08240,   0.00000,  170.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60034, 60222,'1 ',   0.00000,   0.50000,   0.00000,   28.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60035, 60220,'1 ',   0.00000,   0.08400,   0.00000,  166.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60036, 60221,'1 ',   0.00000,   0.16090,   0.00000,   87.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60037, 60224,'1 ',   0.00000,   0.15910,   0.00000,   88.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60038, 60248,'1 ',   0.00000,   0.11023,   0.00000,  128.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60039, 60226,'1 ',   0.00000,   0.05930,   0.00000,  236.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60040, 60419,'1 ',   0.00000,   0.02117,   0.00000,  661.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60041, 60329,'1 ',   0.00000,   0.87500,   0.00000,   16.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60042, 60126,'1 ',   0.00000,   0.51850,   0.00000,   27.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60043, 60127,'1 ',   0.00000,   0.38890,   0.00000,   36.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60044, 60128,'1 ',   0.00000,   0.18180,   0.00000,   77.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60045, 60129,'1 ',   0.00000,   0.17950,   0.00000,   78.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60046, 60137,'1 ',   0.00000,   0.23730,   0.00000,   59.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60047, 60269,'1 ',   0.00000,   0.06940,   0.00000,  180.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60048, 60422,'1 ',   0.00000,   0.01880,   0.00000,  744.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60049, 60154,'1 ',   0.00000,   0.11670,   0.00000,  120.00,    0.00,    0.00,1.00000,
```

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0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60050, 60259,'1 ',   0.00000,   0.06250,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60051, 60431,'1 ',   0.00000,   0.01270,   0.00000, 1102.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60052, 60420,'1 ',   0.00000,   0.00667,   0.00000, 2100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60053, 60421,'1 ',   0.00000,   0.02210,   0.00000,  633.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60054, 60133,'1 ',   0.00000,   0.27450,   0.00000,   51.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60055, 60155,'1 ',   0.00000,   0.13210,   0.00000,  106.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60056, 60227,'1 ',   0.00000,   0.03480,   0.00000,  402.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60057, 60229,'1 ',   0.00000,   0.51850,   0.00000,   27.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60058, 60426,'1 ',   0.00000,   0.01024,   0.00000, 1367.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60059, 60230,'1 ',   0.00000,   0.11775,   0.00000,  118.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60062, 60231,'1 ',   0.00000,   0.29170,   0.00000,   48.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60063, 60141,'1 ',   0.00000,   0.35000,   0.00000,   40.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60064, 60262,'1 ',   0.00000,   0.17060,   0.00000,   85.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60065, 60263,'1 ',   0.00000,   0.13810,   0.00000,  105.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60066, 60264,'1 ',   0.00000,   0.13550,   0.00000,  107.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60067, 60265,'1 ',   0.00000,   0.13550,   0.00000,  107.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60068, 60261,'1 ',   0.00000,   0.11980,   0.00000,  121.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60069, 60266,'1 ',   0.00000,   0.08380,   0.00000,  173.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60070, 60267,'1 ',   0.00000,   0.11600,   0.00000,  125.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60071, 60423,'1 ',   0.00000,   0.00700,   0.00000, 2000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60072, 60140,'1 ',   0.00000,   0.16670,   0.00000,   75.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60073, 60149,'1 ',   0.00000,   0.08873,   0.00000,  157.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60074, 60150,'1 ',   0.00000,   0.17280,   0.00000,   81.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60075, 60327,'1 ',   0.00000,   0.73680,   0.00000,   19.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60076, 60240,'1 ',   0.00000,   0.77780,   0.00000,   18.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60077, 60134,'1 ',   0.00000,   0.46670,   0.00000,   30.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60078, 60228,'1 ',   0.00000,   0.58330,   0.00000,   24.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60079, 60328,'1 ',   0.00000,   0.66670,   0.00000,   21.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60080, 60242,'1 ',   0.00000,   0.15420,   0.00000,   94.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60081, 60424,'1 ',   0.00000,   0.01260,   0.00000, 1111.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60082, 60313,'1 ',   0.00000,   1.05000,   0.00000,   13.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60083, 60254,'1 ',   0.00000,   0.09333,   0.00000,  150.00,    0.00,    0.00,1.00000,
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0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60084, 60156,'1 ',   0.00000,   0.35000,   0.00000,   25.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60085, 60450,'1 ',   0.00000,   0.03500,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60108,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60108,'2 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60140,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60140,'2 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101,-60156,'1 ',   0.00931,   0.00222,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60101, 60315,'1 ',   0.00000,   0.19660,   0.00000,   50.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60102,-60117,'2 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60102,-60117,'3 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60102, 60126,'1 ',   0.02793,   0.06648,   0.01530,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60103,-60104,'1 ',   0.02234,   0.05318,   0.01224,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60103, 60112,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104,-60106,'1 ',   0.03724,   0.08864,   0.02040,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104, 60107,'1 ',   0.03165,   0.07534,   0.01734,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104,-60109,'1 ',   0.03165,   0.07534,   0.01734,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60104,-60157,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60105,-60109,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60105, 60110,'1 ',   0.04189,   0.09972,   0.02295,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60105,-60115,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60106,-60115,'1 ',   0.02327,   0.05540,   0.01275,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60107,-60112,'1 ',   0.01862,   0.04432,   0.01020,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60107, 60118,'1 ',   0.04189,   0.09972,   0.02295,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60107, 60118,'2 ',   0.04189,   0.09972,   0.02295,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60107,-60151,'2 ',   0.05121,   0.12188,   0.02805,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  55.00,   1,1.0000
60107,-60157,'1 ',   0.01862,   0.04432,   0.01020,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60205, 60108,'1 ',   0.00000,   0.03900,   0.00000,  320.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111,-60113,'1 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111,-60113,'2 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111, 60126,'1 ',   0.01862,   0.04432,   0.01020,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60111, 60325,'1 ',   0.00000,   0.19660,   0.00000,   50.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60112,-60157,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
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0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60112,-60157,'2 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113, 60114,'1 ',   0.00931,   0.02216,   0.00510,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113, 60114,'2 ',   0.00931,   0.02216,   0.00510,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113, 60114,'3 ',   0.00931,   0.02216,   0.00510,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113, 60114,'4 ',   0.00931,   0.02216,   0.00510,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113, 60155,'1 ',   0.04189,   0.09972,   0.02295,  110.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60113, 60155,'2 ',   0.04189,   0.09972,   0.02295,  110.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60408, 60113,'1 ',   0.00000,   0.03625,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60411, 60115,'1 ',   0.00000,   0.02080,   0.00000,  600.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60117,-60134,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60117,-60134,'2 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60117, 60151,'1 ',   0.02327,   0.05540,   0.01275,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  25.00,   1,1.0000
60413, 60117,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60118,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60126,-60127,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60126,-60127,'2 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60128, 60129,'1 ',   0.01397,   0.03324,   0.07650,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60128, 60151,'1 ',   0.01862,   0.04432,   0.01020,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60129, 60151,'1 ',   0.01397,   0.03324,   0.07650,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60133, 60134,'1 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   5.00,   1,1.0000
60133, 60134,'2 ',   0.00465,   0.01108,   0.00255,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   5.00,   1,1.0000
60136,-60137,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60136,-60137,'2 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60420, 60136,'1 ',   0.00000,   0.03130,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60140,-60156,'1 ',   0.00931,   0.02220,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60141, 60152,'1 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60141, 60152,'2 ',   0.01397,   0.03324,   0.00765,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60149, 60157,'1 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60149, 60157,'2 ',   0.00931,   0.02216,   0.00510,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60150,-60157,'1 ',   0.05586,   0.13296,   0.03060,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60150,-60157,'2 ',   0.05586,   0.13296,   0.03060,   75.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60422, 60151,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
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0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60426, 60152,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60154, 60258,'1 ',   0.00000,   0.01500,   0.00000,  150.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60450, 60157,'1 ',   0.00000,   0.03125,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60201, 60202,'1 ',   0.00496,   0.02640,   0.04544,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60201, 60211,'1 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60201, 60318,'1 ',   0.00000,   0.20800,   0.00000,   60.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60203,'1 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60203,'2 ',   0.00310,   0.01650,   0.02480,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60208,'1 ',   0.00635,   0.03384,   0.05822,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60208,'2 ',   0.00635,   0.03384,   0.05822,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202,-60211,'1 ',   0.00460,   0.02470,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202,-60211,'2 ',   0.00460,   0.02470,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60215,'1 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60215,'2 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60253,'1 ',   0.00232,   0.01237,   0.02130,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60202, 60301,'1 ',   0.00000,   0.03550,   0.00000,  352.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60402, 60202,'1 ',   0.00000,   0.03125,   0.00000,  400.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60203, 60302,'1 ',   0.00000,   0.07353,   0.00000,  170.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60204, 60207,'1 ',   0.00696,   0.03712,   0.06390,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  45.00,   1,1.0000
60204,-60213,'1 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60204, 60306,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60205, 60206,'1 ',   0.00773,   0.04124,   0.07100,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  50.00,   1,1.0000
60205, 60206,'2 ',   0.00773,   0.04124,   0.07100,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60205,-60254,'1 ',   0.01083,   0.05774,   0.09940,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60205,-60254,'2 ',   0.01083,   0.05774,   0.09940,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412, 60205,'1 ',   0.00000,   0.02900,   0.00000,  500.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60206, 60209,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60206, 60214,'1 ',   0.00542,   0.02890,   0.04970,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60206, 60299,'1 ',   0.00619,   0.03300,   0.05680,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60206, 60316,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60207,-60214,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60207, 60319,'1 ',   0.00000,   0.41750,   0.00000,   20.00,    0.00,    0.00,1.00000,
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0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60208, 60253,'1 ',   0.00464,   0.02475,   0.04260,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60208, 60317,'1 ',   0.00000,   0.08300,   0.00000,  150.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60209,-60254,'1 ',   0.00155,   0.00825,   0.01420,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60209,-60254,'2 ',   0.00155,   0.00825,   0.01420,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60209,-60299,'2 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60211,-60213,'1 ',   0.00387,   0.02060,   0.03550,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60213, 60314,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60406, 60214,'1 ',   0.00000,   0.03968,   0.00000,  315.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60216,-60247,'1 ',   0.00155,   0.00825,   0.01420,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60216,-60247,'2 ',   0.00155,   0.00825,   0.01420,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60217,-60218,'1 ',   0.00464,   0.02475,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60217,-60219,'1 ',   0.00387,   0.02062,   0.03550,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60218, 60219,'1 ',   0.00696,   0.03712,   0.06390,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60219, 60246,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60430, 60219,'1 ',   0.00000,   0.03970,   0.00000,  315.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60220, 60221,'1 ',   0.00309,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60220, 60223,'1 ',   0.01006,   0.05362,   0.09230,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60221, 60222,'1 ',   0.00773,   0.04124,   0.07100,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  50.00,   1,1.0000
60222, 60223,'1 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60419, 60223,'1 ',   0.00000,   0.01250,   0.00000, 1000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60224, 60248,'1 ',   0.00155,   0.00825,   0.01420,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  10.00,   1,1.0000
60224, 60248,'2 ',   0.00155,   0.00825,   0.01420,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  10.00,   1,1.0000
60225,-60226,'1 ',   0.00063,   0.00688,   0.01679,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60225,-60239,'1 ',   0.00188,   0.02063,   0.05037,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60225,-60239,'2 ',   0.00188,   0.02063,   0.05037,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60225,-60239,'3 ',   0.00188,   0.02063,   0.05037,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60225,-60248,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60225,-60248,'2 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60226, 60239,'2 ',   0.00157,   0.01719,   0.04197,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60227, 60228,'1 ',   0.00464,   0.02475,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60227, 60229,'1 ',   0.00387,   0.02062,   0.03550,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60227,-60256,'1 ',   0.00696,   0.03712,   0.06390,    0.00,    0.00,    0.00,,,
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0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60227, 60256,'2 ',   0.00696,   0.03712,   0.06390,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60228,-60256,'1 ',   0.00387,   0.02062,   0.03550,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  25.00,   1,1.0000
60229,-60256,'1 ',   0.00464,   0.02475,   0.04260,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60230, 60231,'1 ',   0.00619,   0.03300,   0.05680,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  35.00,   1,1.0000
60230, 60238,'1 ',   0.00696,   0.03712,   0.06390,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  40.00,   1,1.0000
60231, 60238,'1 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60232, 60233,'1 ',   0.00465,   0.02490,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60232, 60234,'1 ',   0.00309,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60232,-60245,'1 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60232,-60245,'2 ',   0.00310,   0.01650,   0.02840,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60233,-60234,'1 ',   0.00464,   0.02475,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60418, 60233,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60238,'1 ',   0.00000,   0.01250,   0.00000, 1000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60240,'1 ',   0.00155,   0.00830,   0.01420,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60241,'1 ',   0.00464,   0.02475,   0.04260,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60242,'1 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60242,'2 ',   0.00232,   0.01237,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60239,-60299,'1 ',   0.00030,   0.00344,   0.00840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60239,-60299,'2 ',   0.00030,   0.00344,   0.00840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60239,-60299,'3 ',   0.00030,   0.00344,   0.00840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60239,-60299,'4 ',   0.00030,   0.00344,   0.00840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60405, 60239,'1 ',   0.00000,   0.06250,   0.00000,  200.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60240,-60241,'1 ',   0.00232,   0.01240,   0.02130,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60243, 60247,'1 ',   0.00155,   0.00825,   0.01420,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60243, 60247,'2 ',   0.00155,   0.00825,   0.01420,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60245, 60308,'1 ',   0.00000,   0.12500,   0.00000,  100.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60246,-60310,'1 ',   0.00000,   0.28280,   0.00000,   40.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60416, 60247,'1 ',   0.00000,   0.01980,   0.00000,  630.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60253, 60353,'1 ',   0.00000,   0.16020,   0.00000,   78.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60254, 60299,'1 ',   0.00077,   0.00412,   0.00710,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60254, 60299,'2 ',   0.00077,   0.00412,   0.00710,  190.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60426, 60256,'1 ',   0.00000,   0.01980,   0.00000,  735.00,    0.00,    0.00,1.00000,
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0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60257, 60258,'1 ',   0.00851,   0.04537,   0.07810,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60257,-60259,'1 ',   0.00851,   0.04537,   0.07610,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60431, 60257,'1 ',   0.00000,   0.01980,   0.00000, 1000.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60258,-60259,'1 ',   0.00309,   0.01650,   0.02840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60260,-60261,'1 ',   0.00094,   0.01031,   0.02519,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60260, 60263,'1 ',   0.00126,   0.01375,   0.03358,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60260, 60264,'1 ',   0.00094,   0.01031,   0.02519,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60260, 60265,'1 ',   0.00031,   0.00344,   0.00840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60260,-60266,'1 ',   0.00471,   0.05157,   0.12593,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60260,-60267,'1 ',   0.00314,   0.03438,   0.08395,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60433, 60260,'1 ',   0.00000,   0.01323,   0.00000,  945.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60261, 60265,'1 ',   0.00119,   0.01375,   0.03358,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60262, 60263,'1 ',   0.00063,   0.00688,   0.01679,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60262,-60264,'1 ',   0.00094,   0.01031,   0.02519,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60266, 60267,'1 ',   0.00188,   0.02063,   0.05037,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60268, 60269,'1 ',   0.00309,   0.01650,   0.02840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60268, 60269,'2 ',   0.00309,   0.01650,   0.02840,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60268, 60421,'1 ',   0.00000,   0.03570,   0.00000,  350.00,    0.00,    0.00,1.00000,
0.000,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60304,'1 ',   0.05656,   0.07640,   0.00090,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60321,'1 ',   0.02828,   0.03820,   0.00045,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60321,'2 ',   0.02828,   0.03820,   0.00045,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60301, 60321,'3 ',   0.02828,   0.03820,   0.00045,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60304,'1 ',   0.05656,   0.07640,   0.00090,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60321,'1 ',   0.01202,   0.01623,   0.00019,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60321,'2 ',   0.01202,   0.01623,   0.00019,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60302,-60353,'1 ',   0.07042,   0.13913,   0.00204,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60302,-60353,'2 ',   0.07042,   0.13913,   0.00204,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60303,-60304,'1 ',   0.19089,   0.25785,   0.00302,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60303,-60304,'2 ',   0.19089,   0.25785,   0.00302,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60303, 60317,'1 ',   0.07042,   0.13913,   0.00204,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60303, 60317,'2 ',   0.07042,   0.13913,   0.00204,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  15.00,   1,1.0000
60304,-60305,'1 ',   0.12019,   0.16235,   0.00190,   20.00,    0.00,    0.00,,,
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0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60305,-60318,'1 ',   0.14140,   0.19100,   0.00224,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60307,'1 ',   0.01414,   0.01910,   0.00022,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60308,'1 ',   0.08484,   0.11460,   0.00134,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60308,'2 ',   0.08484,   0.11460,   0.00134,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60306, 60312,'1 ',   0.16968,   0.22920,   0.00269,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60307,-60309,'1 ',   0.10605,   0.14325,   0.00168,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60309,-60310,'1 ',   0.17675,   0.23875,   0.00280,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60309,-60314,'1 ',   0.10605,   0.14325,   0.00168,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60310,-60314,'1 ',   0.16968,   0.22920,   0.00269,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60311,-60314,'1 ',   0.24038,   0.32470,   0.00381,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60312, 60319,'1 ',   0.14847,   0.20055,   0.00235,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60313, 60324,'1 ',   0.04930,   0.08560,   0.00100,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  10.00,   1,1.0000
60313, 60328,'1 ',   0.04930,   0.08560,   0.00100,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60314,-60326,'1 ',   0.17675,   0.23875,   0.00280,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60314, 60329,'1 ',   0.00152,   0.00168,   0.04440,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60314, 60329,'2 ',   0.00152,   0.00168,   0.04440,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60317,-60324,'1 ',   0.17255,   0.29960,   0.00350,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60317,-60324,'2 ',   0.17255,   0.29960,   0.00350,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60318, 60326,'1 ',   0.10605,   0.14325,   0.00168,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60319, 60320,'1 ',   0.02121,   0.02865,   0.00034,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60323,-60325,'1 ',   0.18240,   0.31670,   0.00503,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60324,-60328,'1 ',   0.04930,   0.08560,   0.00100,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60326,-60327,'1 ',   0.05656,   0.07640,   0.00090,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60326,-60327,'2 ',   0.05656,   0.07640,   0.00090,   20.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60401, 60402,'1 ',   0.00057,   0.00620,   0.16650,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60401, 60404,'1 ',   0.00019,   0.00208,   0.05552,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  10.00,   1,1.0000
60402, 60403,'1 ',   0.00028,   0.00310,   0.08325,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60403,-60416,'1 ',   0.00074,   0.00830,   0.22208, 1800.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60404, 60405,'1 ',   0.00056,   0.00623,   0.16656,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60404, 60405,'2 ',   0.00056,   0.00623,   0.16656,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405, 60406,'1 ',   0.00175,   0.01914,   0.51078,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,  92.00,   1,1.0000
60405, 60406,'2 ',   0.00175,   0.01914,   0.51078,  750.00,    0.00,    0.00,,,
```

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0.00000,  0.00000,  0.00000,  0.00000,1,  92.00,   1,1.0000
60405,-60407,'1 ',   0.00130,   0.01452,   0.38850,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405,-60407,'2 ',   0.00130,   0.01452,   0.38850,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405,-60418,'1 ',   0.00139,   0.01978,   0.77510, 1800.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405, 60419,'1 ',   0.00102,   0.01141,   0.30536,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405, 60419,'2 ',   0.00102,   0.01141,   0.30536,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60405, 60430,'1 ',   0.00157,   0.02236,   0.87620,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60406, 60407,'1 ',   0.00037,   0.00415,   0.11100,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60406, 60407,'2 ',   0.00037,   0.00415,   0.11100,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60407,-60419,'1 ',   0.00285,   0.00315,   0.08325,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60407,-60419,'2 ',   0.00285,   0.00315,   0.08325,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60413,'1 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60413,'2 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60413,'3 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60408, 60413,'4 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60411,'1 ',   0.00158,   0.01764,   0.47192,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60413,'1 ',   0.00117,   0.01245,   0.33300,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60413,'2 ',   0.00117,   0.01245,   0.33300,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60414,'1 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60414,'2 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60414,'3 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60414,'4 ',   0.00076,   0.00830,   0.22200,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60414,'5 ',   0.00074,   0.00830,   0.22208,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60414,'6 ',   0.00074,   0.00830,   0.22208,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60420,'1 ',   0.00102,   0.01141,   0.30536,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60420,'2 ',   0.00102,   0.01141,   0.30536,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60420,'3 ',   0.00102,   0.01141,   0.30536,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410,-60420,'4 ',   0.00102,   0.01141,   0.30536,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60421,'1 ',   0.00074,   0.00830,   0.22208,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60421,'2 ',   0.00074,   0.00830,   0.22208,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60422,'1 ',   0.00084,   0.00934,   0.24984,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60422,'2 ',   0.00084,   0.00934,   0.24984,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60433,'1 ',   0.00158,   0.01764,   0.47192, 1100.00,    0.00,    0.00,,,
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0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60410, 60450,'1 ',   0.00102,   0.01141,   0.30536,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60410, 60450,'2 ',   0.00102,   0.01141,   0.30536,    0.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,0,   0.00,   1,1.0000
60411, 60433,'1 ',   0.00037,   0.00415,   0.11104, 1100.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60413,'1 ',   0.00130,   0.01453,   0.38864,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60413,'2 ',   0.00130,   0.01453,   0.38864,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60413,'3 ',   0.00130,   0.01453,   0.38864,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60413,'4 ',   0.00130,   0.01453,   0.38864,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60413,'5 ',   0.00130,   0.01453,   0.38864,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60413,'6 ',   0.00130,   0.01453,   0.38864,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60419,'1 ',   0.00095,   0.01050,   0.27750,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60412,-60419,'2 ',   0.00095,   0.01050,   0.27750,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60413, 60422,'1 ',   0.00047,   0.00519,   0.13880,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60413, 60422,'2 ',   0.00047,   0.00519,   0.13380,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60415, 60416,'1 ',   0.00028,   0.00311,   0.08328,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60415, 60416,'2 ',   0.00028,   0.00311,   0.08328,  750.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60417, 60418,'1 ',   0.00025,   0.00371,   0.11816, 1800.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60417, 60430,'1 ',   0.00050,   0.00743,   0.23632, 1800.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60420, 60421,'1 ',   0.00047,   0.00519,   0.13880, 1800.00,    0.00,    0.00,,,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
60420, 60421,'2 ',   0.00047,   0.00519,   0.13880,  750.00,    0.00,    0.00,,,
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60423, 60424,'4 ',   0.00023,   0.00252,   0.06660,  750.00,    0.00,    0.00,,,
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0 / END OF TRANSFORMER ADJUSTMENT DATA, BEGIN AREA DATA

0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA

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0,    0,    0,'1 ', 0.0000

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0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA

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0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA

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0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA

0 / END OF OWNER DATA, BEGIN FACTS CONTROL DEVICE DATA

0 / END OF FACTS CONTROL DEVICE DATA
```
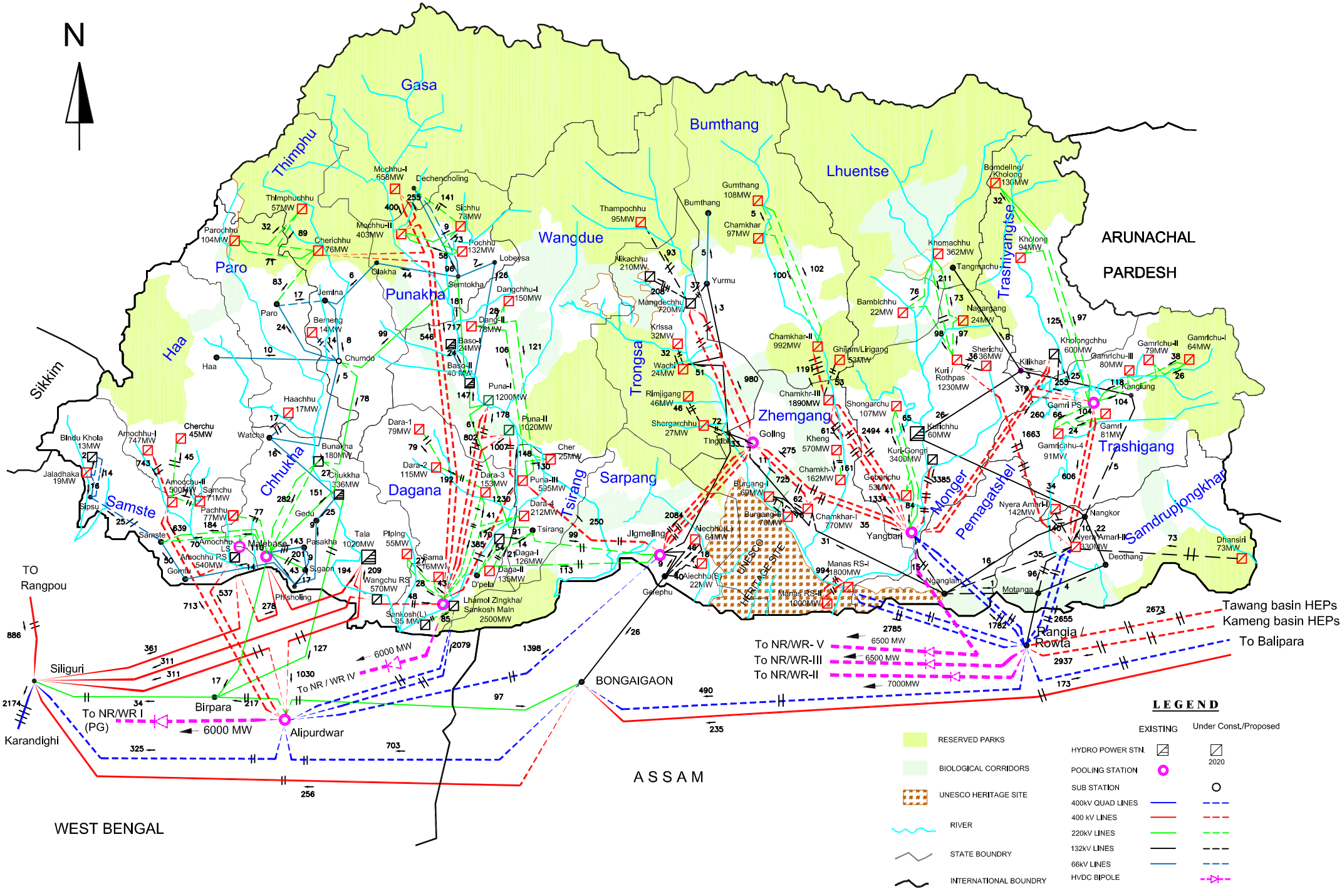

Base Case with full hydro despatch for 2030 scenario

Exhibit-I



Base Case with full hydro despatch & load of 1500 MW in 2020 scenario (Kuri Gongri 1800 MW)

Exhibit-II

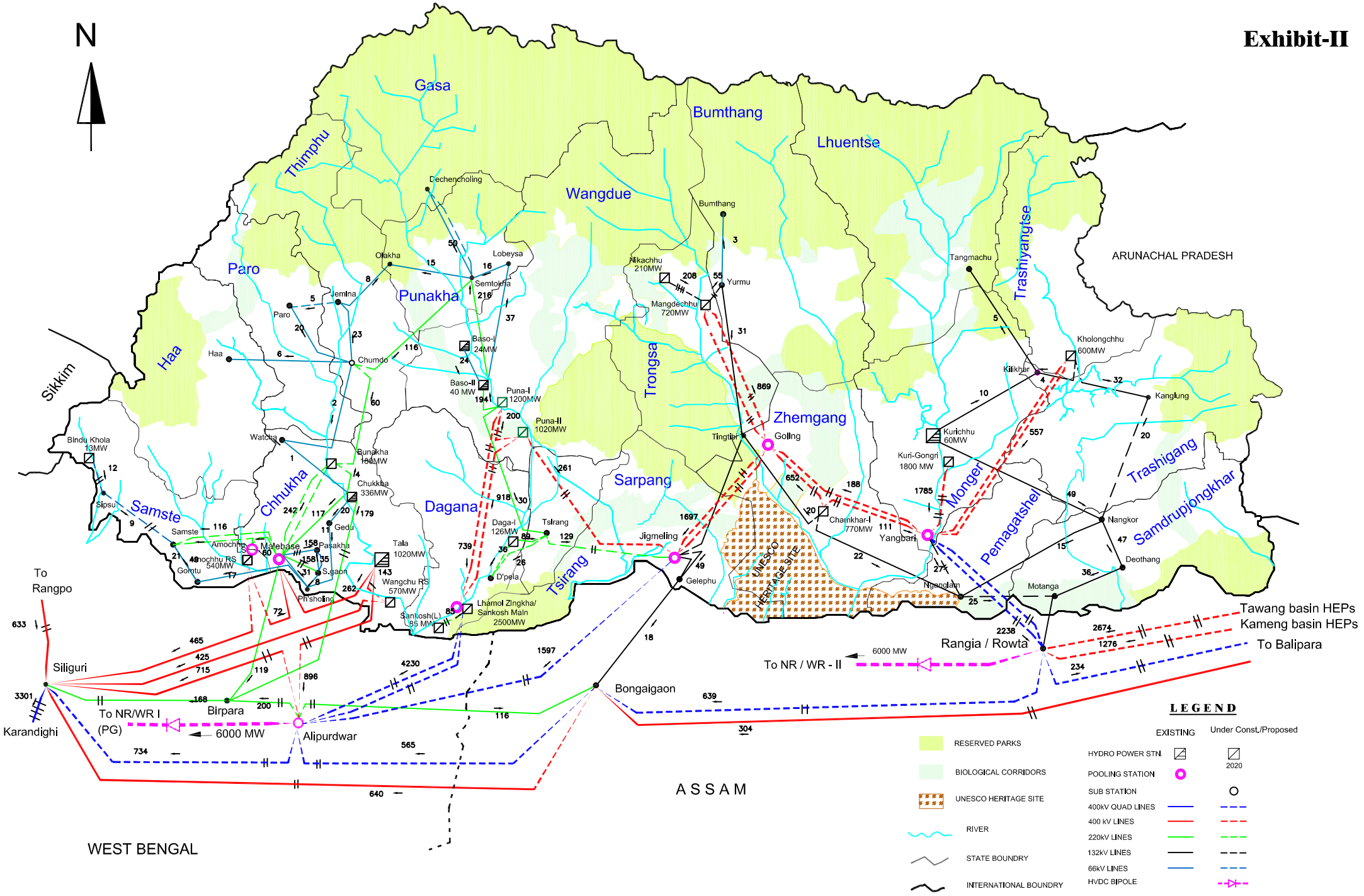
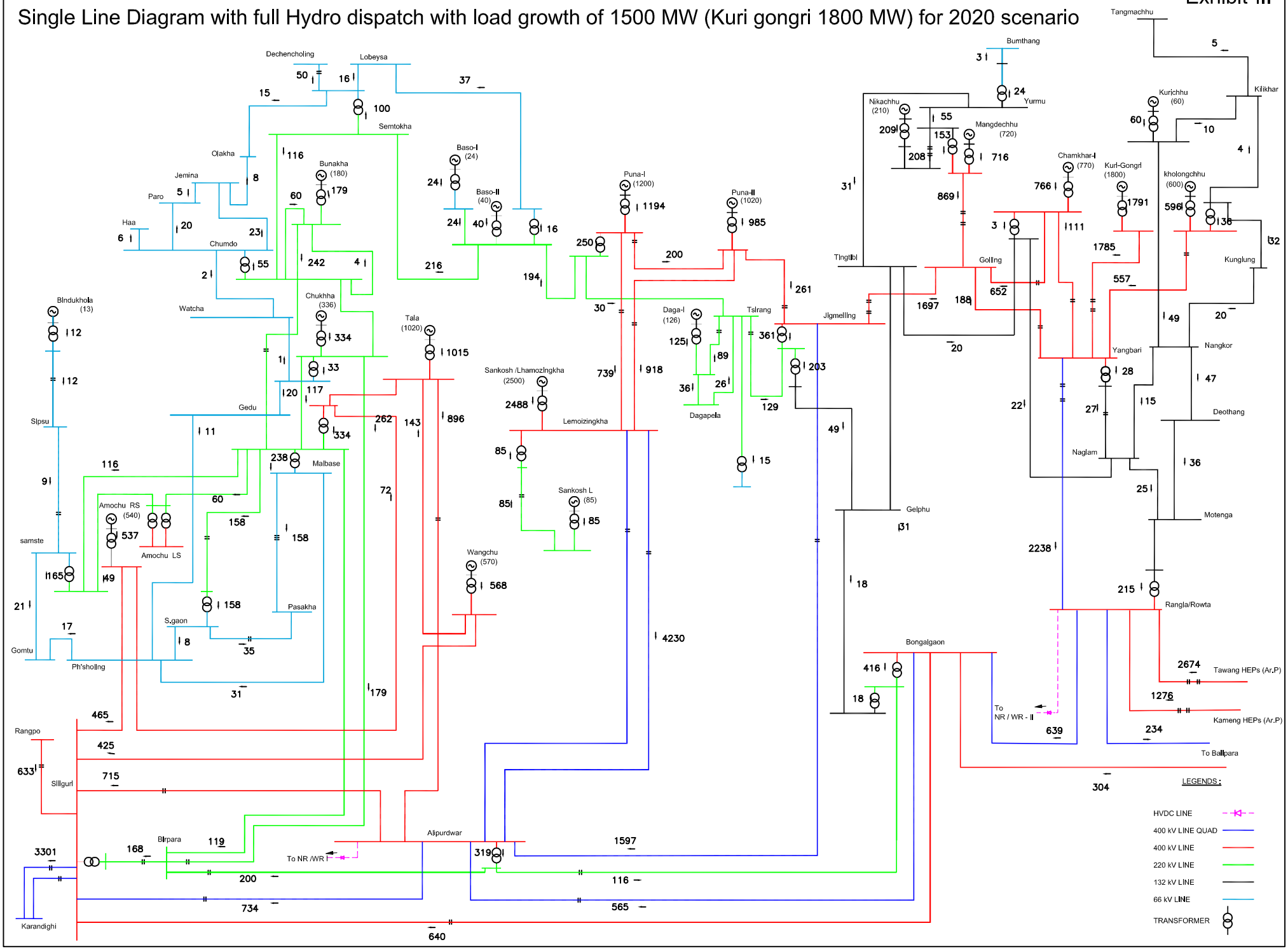


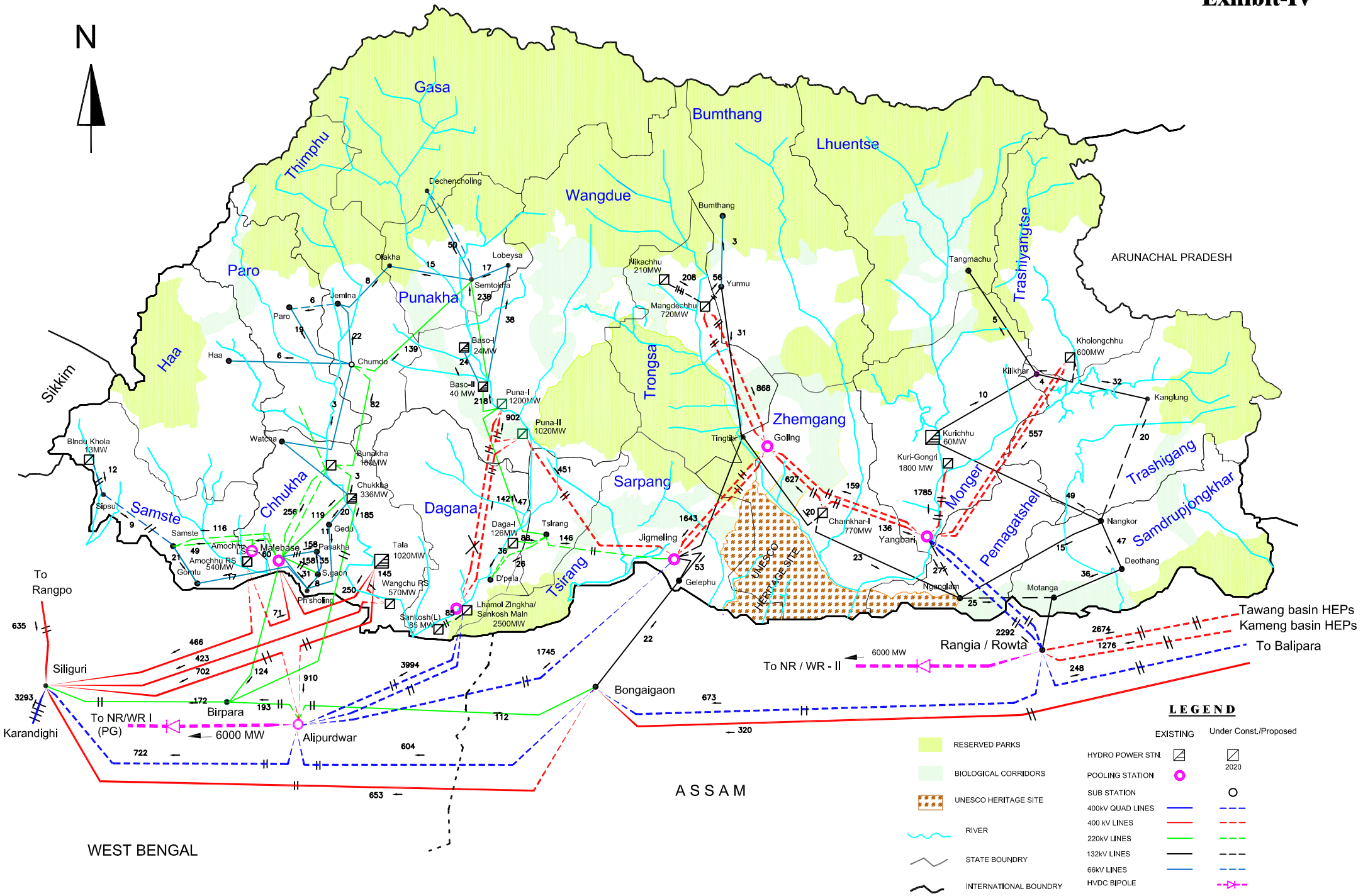
Exhibit-III

Single Line Diagram with full Hydro dispatch with load growth of 1500 MW (Kuri gongri 1800 MW) for 2020 scenario



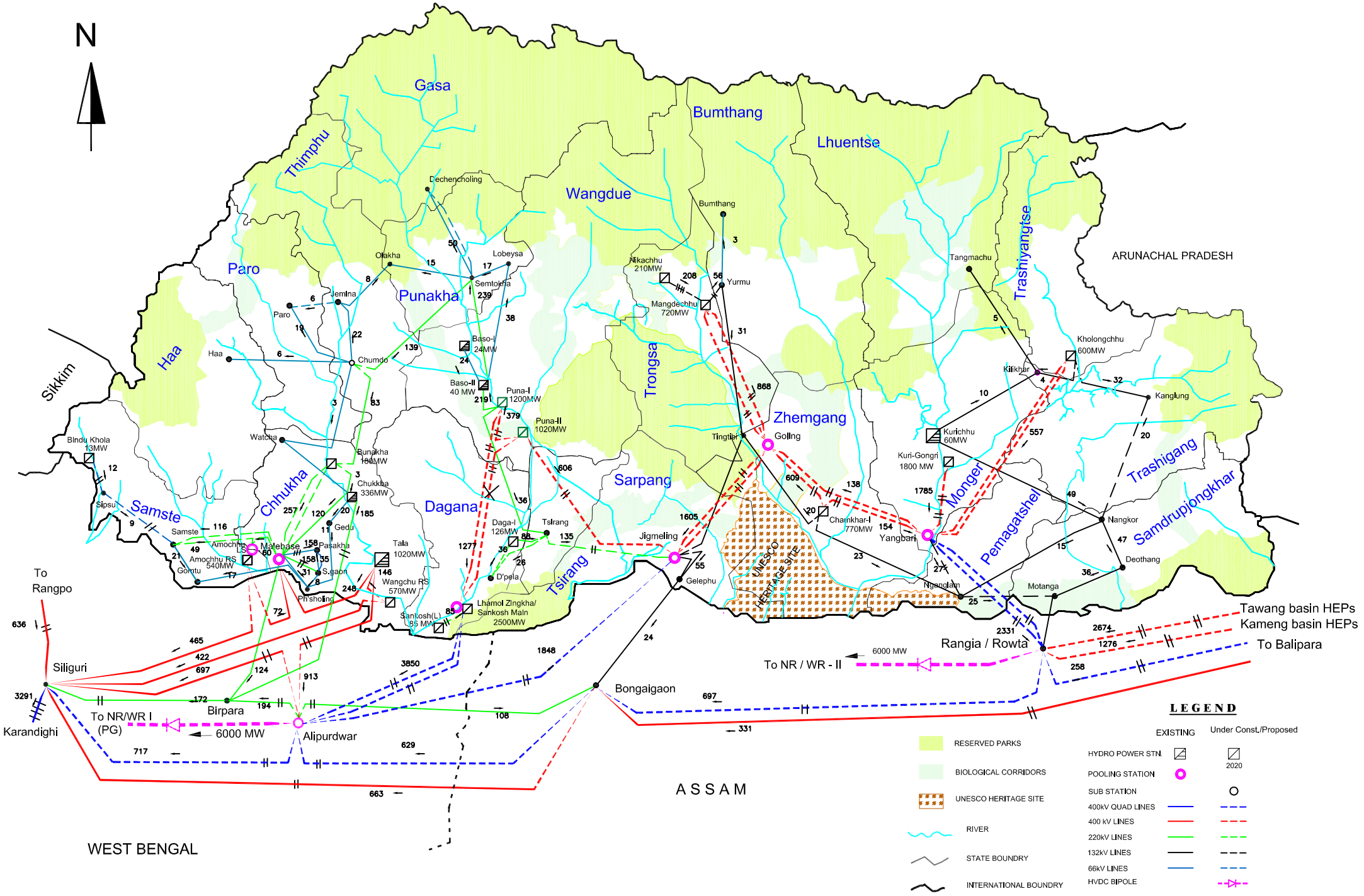
Outage of 400 kV Punatsangchhu-I-Lhamoizingkha D/C line

Exhibit-IV



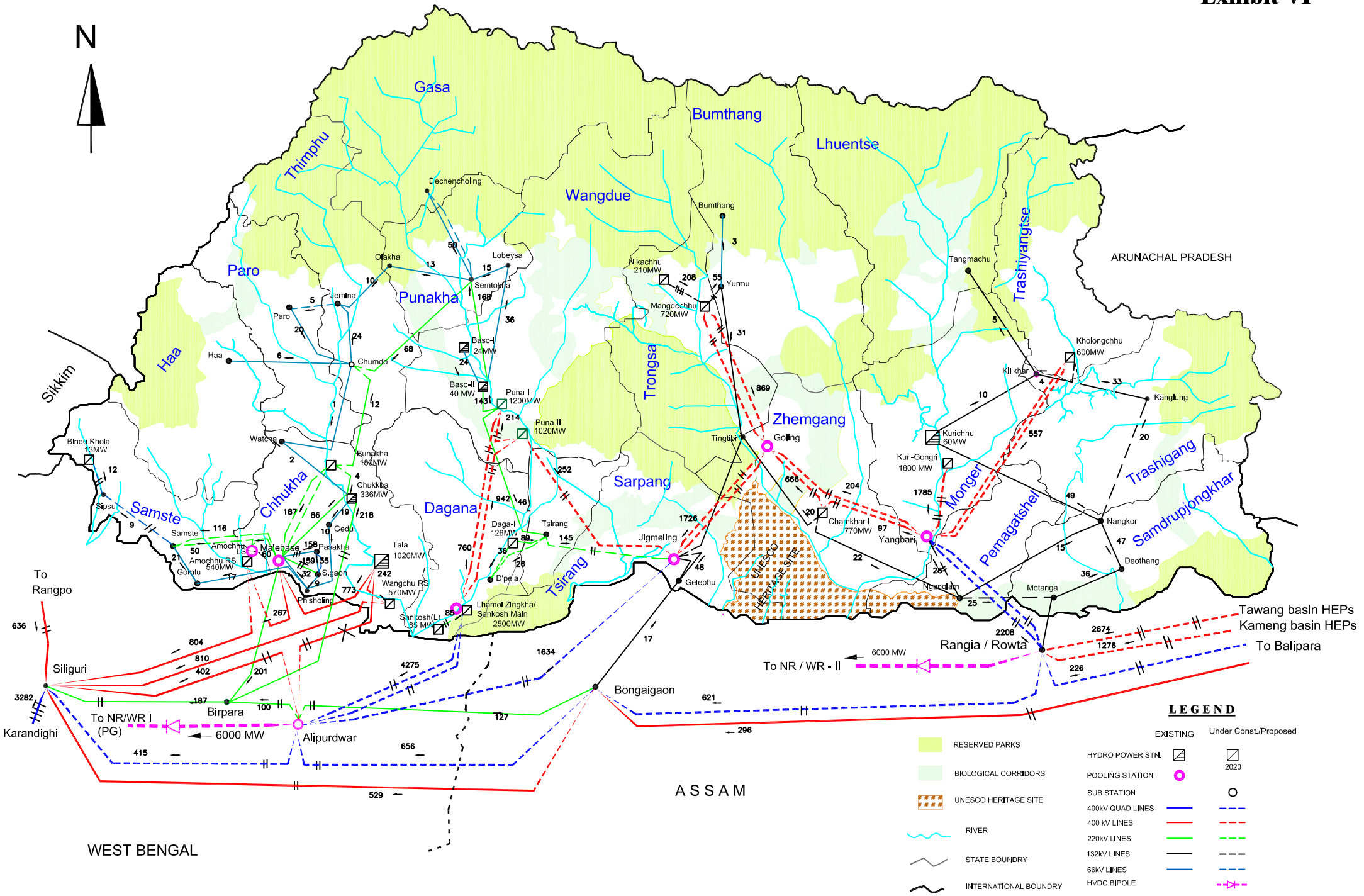
Outage of 400 kV Punatsangchhu-II-Lhamoizingkha D/C line

Exhibit-V



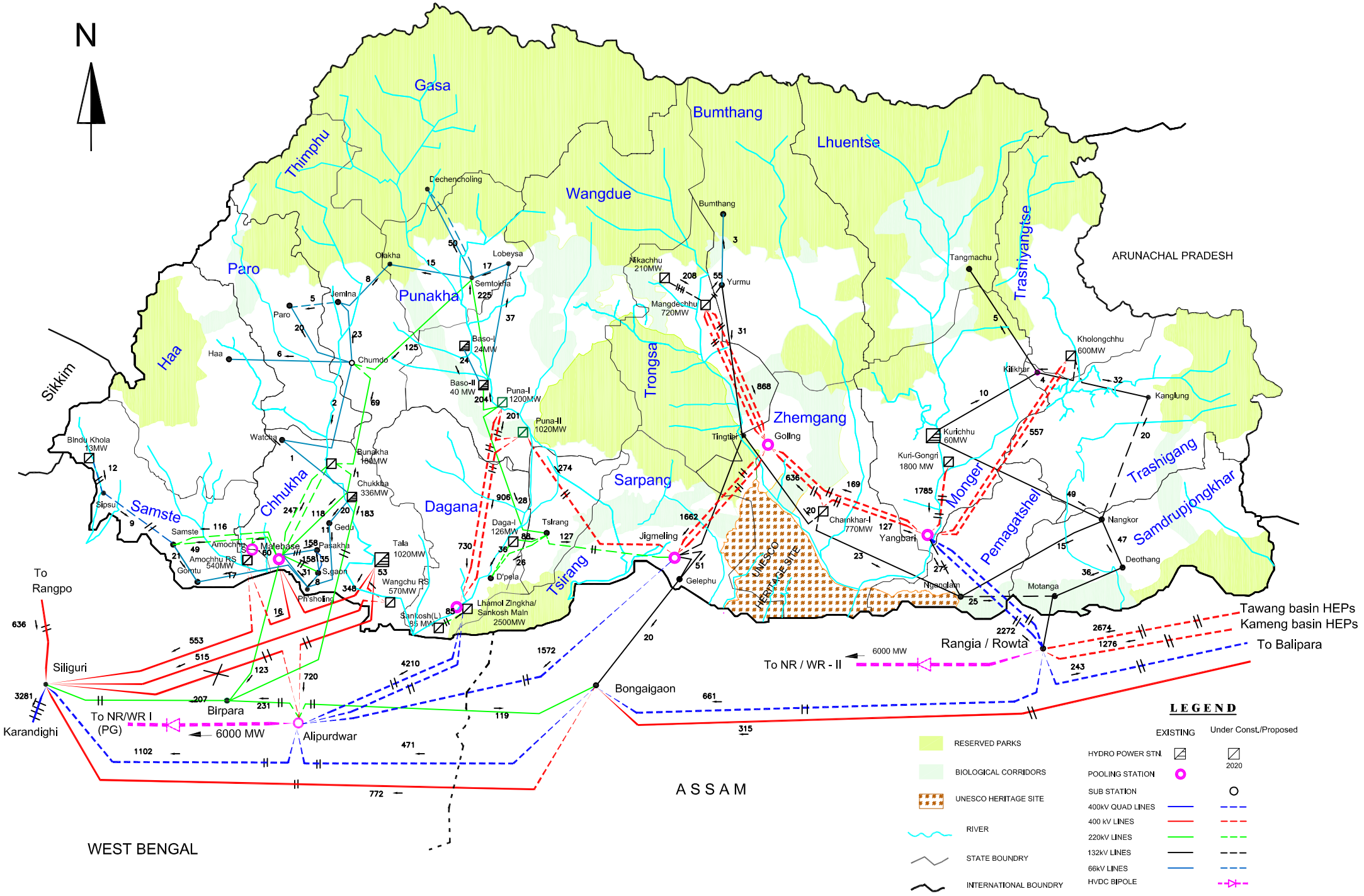
Outage of 400 kV Tala-Alipurduar D/C line

Exhibit-VI



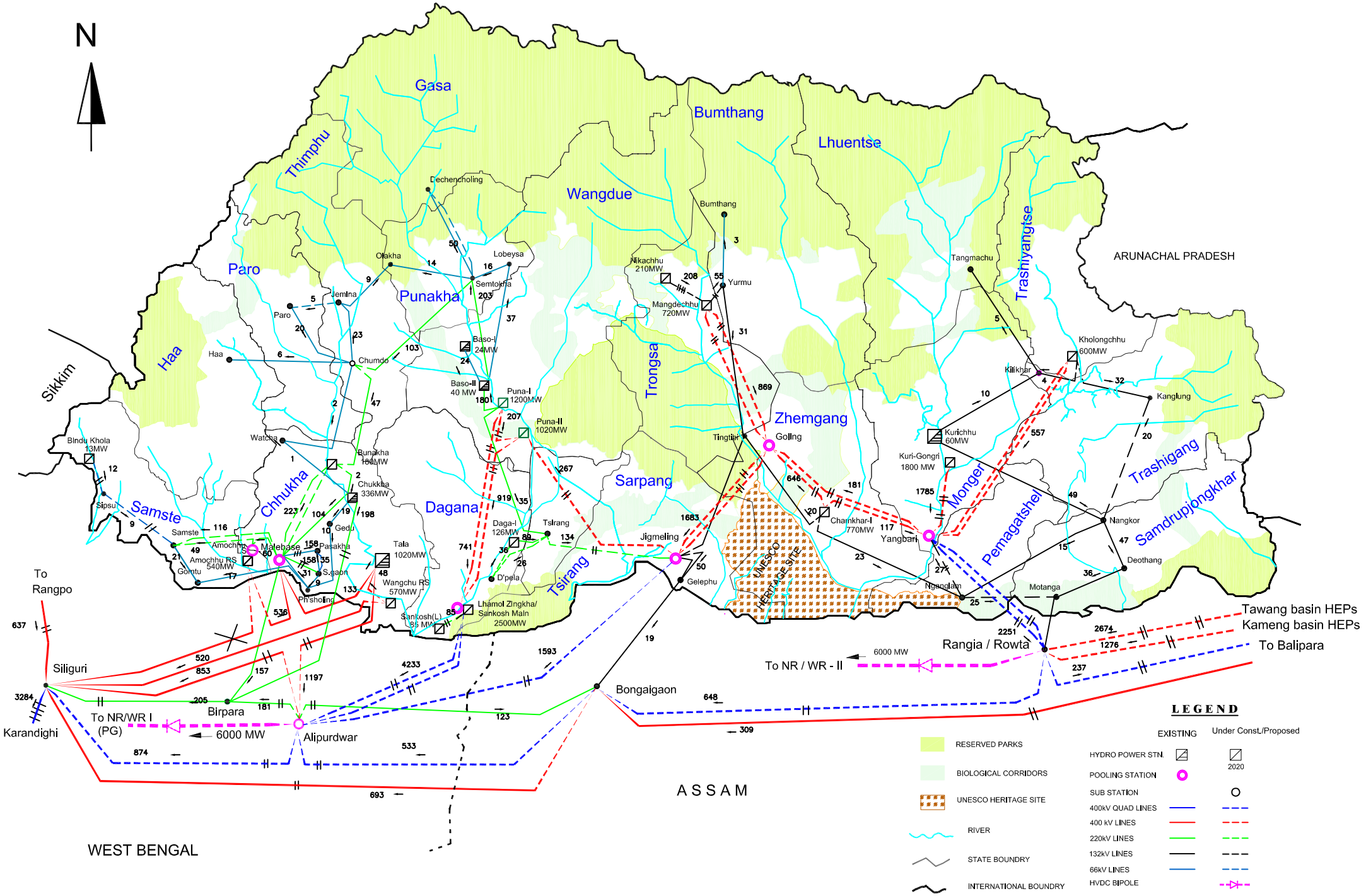
Outage of 400 kV Alipurduar-Siliguri D/C line

Exhibit-VII



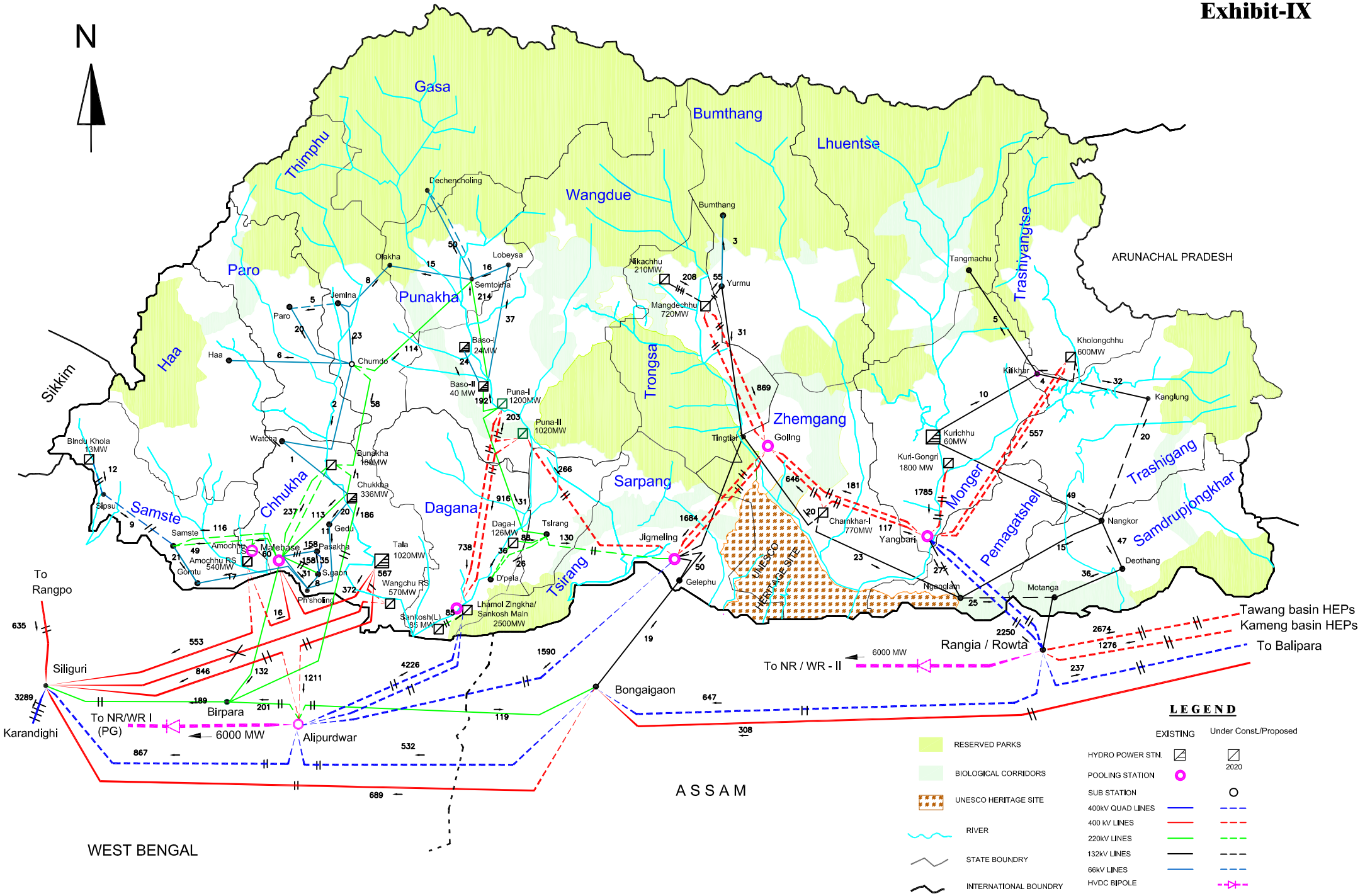
Outage of 400 kV Amochhu-Siliguri line

Exhibit-VIII



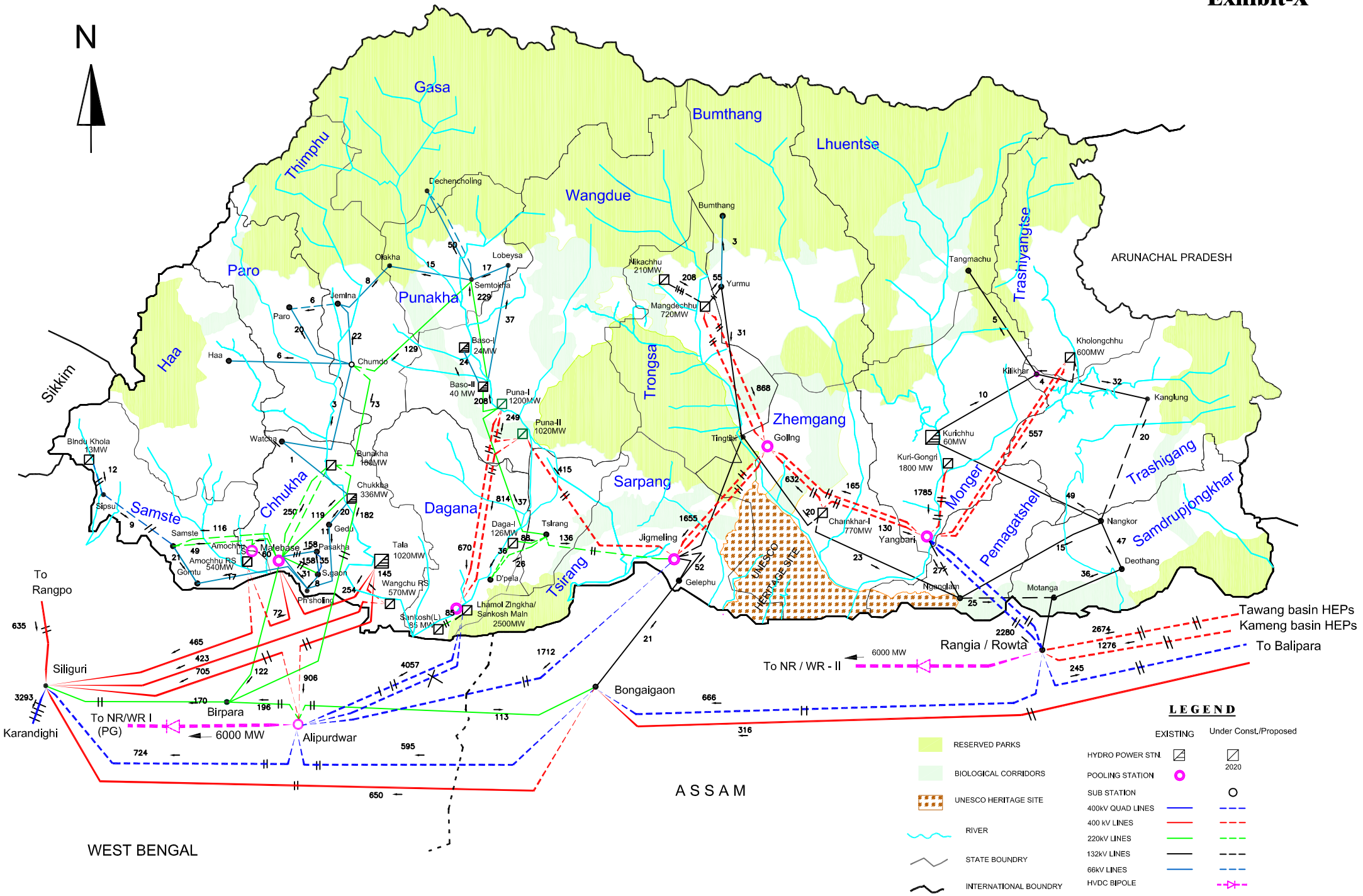
Outage of 400 kV Wangchuu-Siliguri line

Exhibit-IX



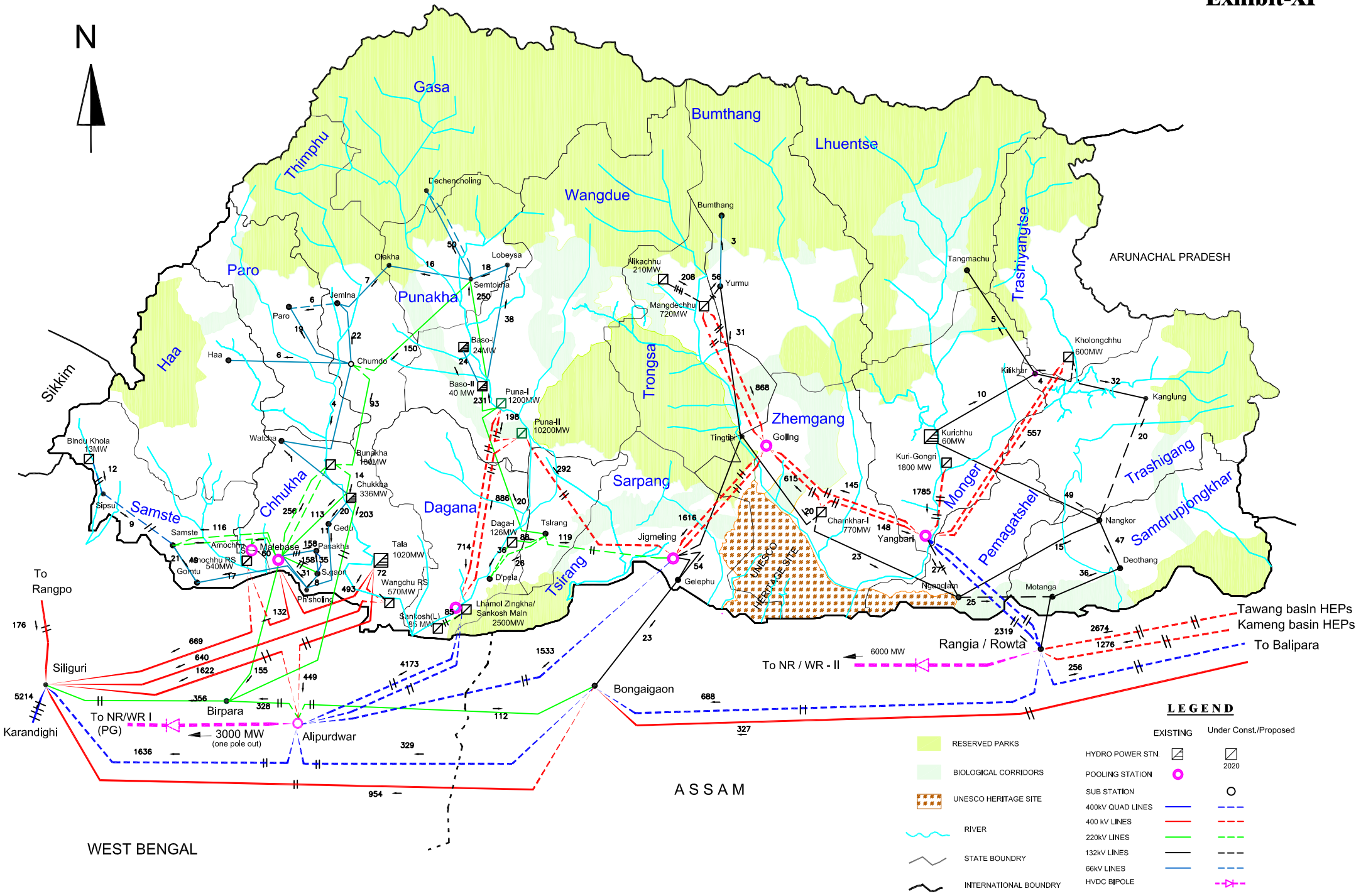
Outage of one ckt of 400 kV Sankosh-Alipurduar D/C Line

Exhibit-X



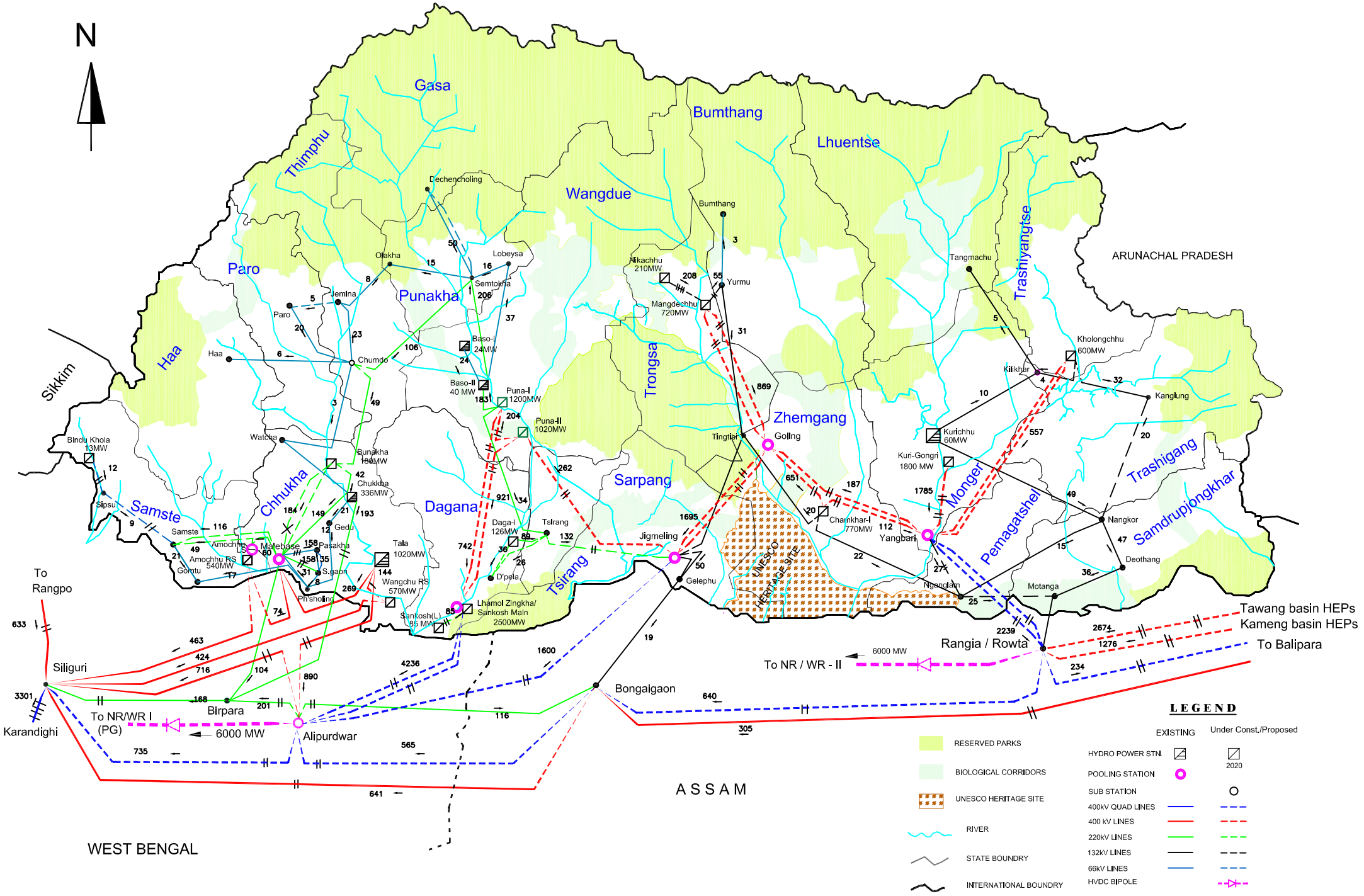
Outage of one pole of ± 800 kV,6000 MW Alipurduar-Agra/NR/WR Bi-pole line

Exhibit-XI



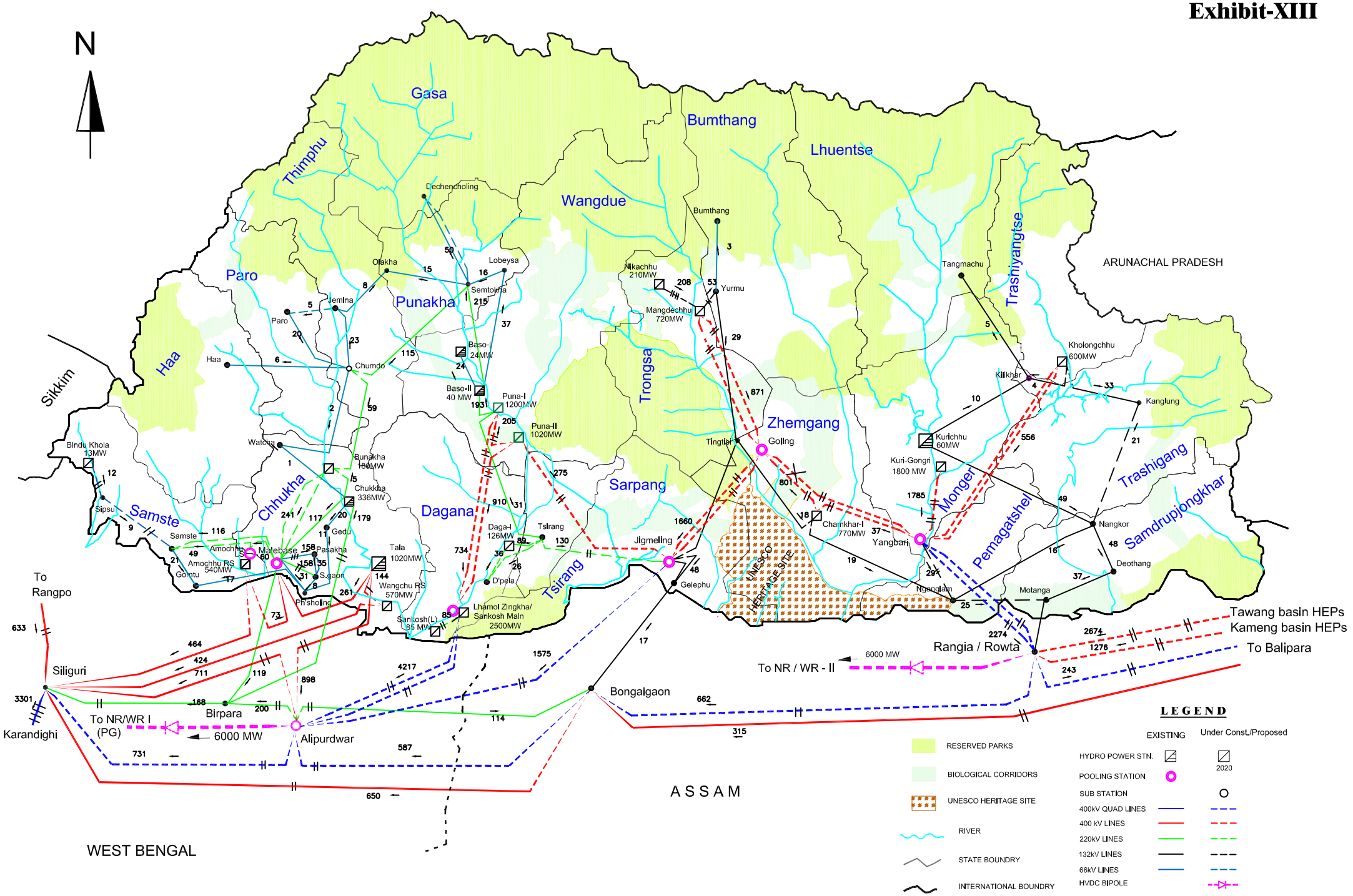
Outage of 220 kV Bunakha-Malbase S/C line

Exhibit-XII



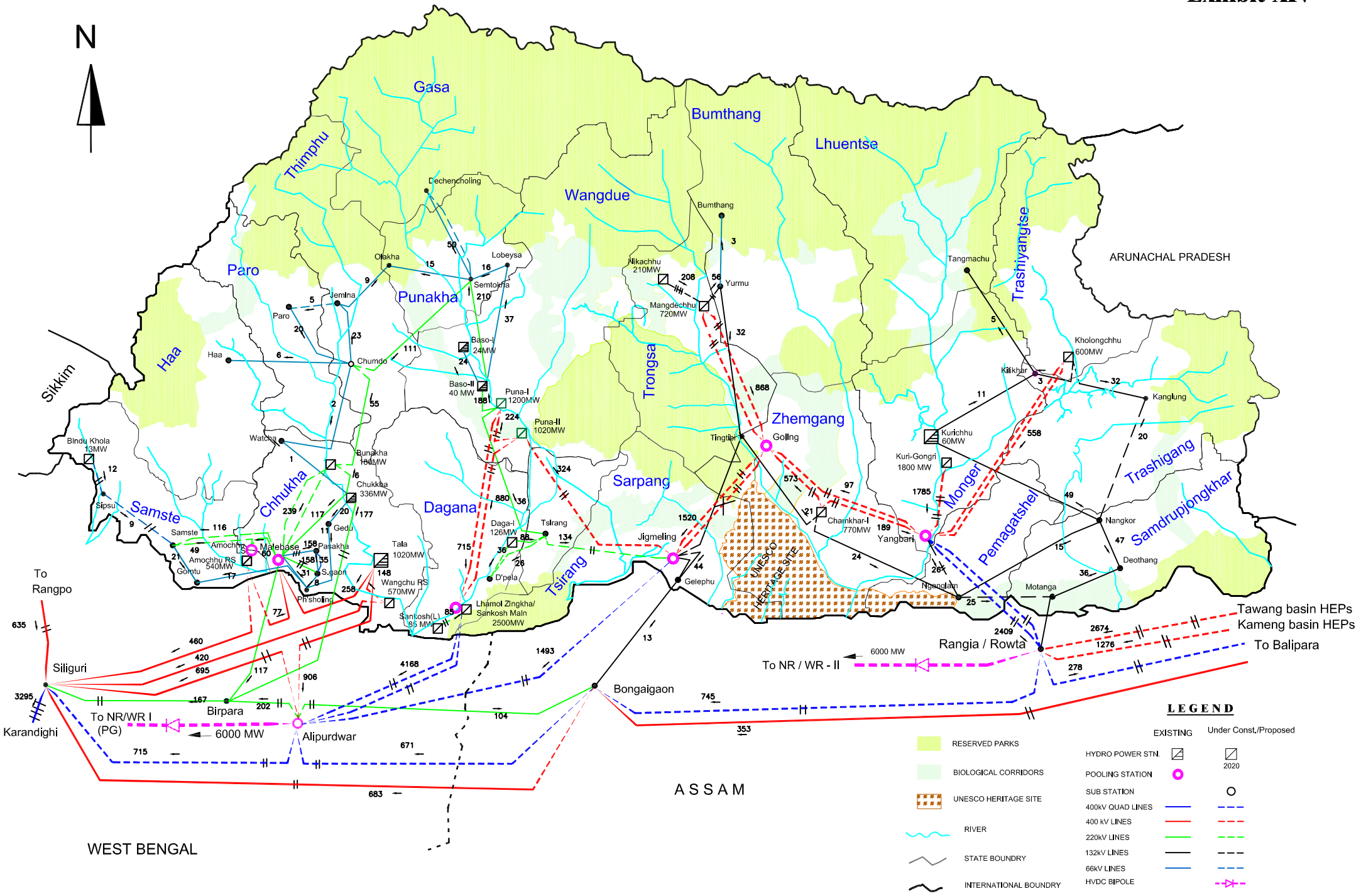
Outage of 400 kV Yangbari-Goling D/C line

Exhibit-XIII



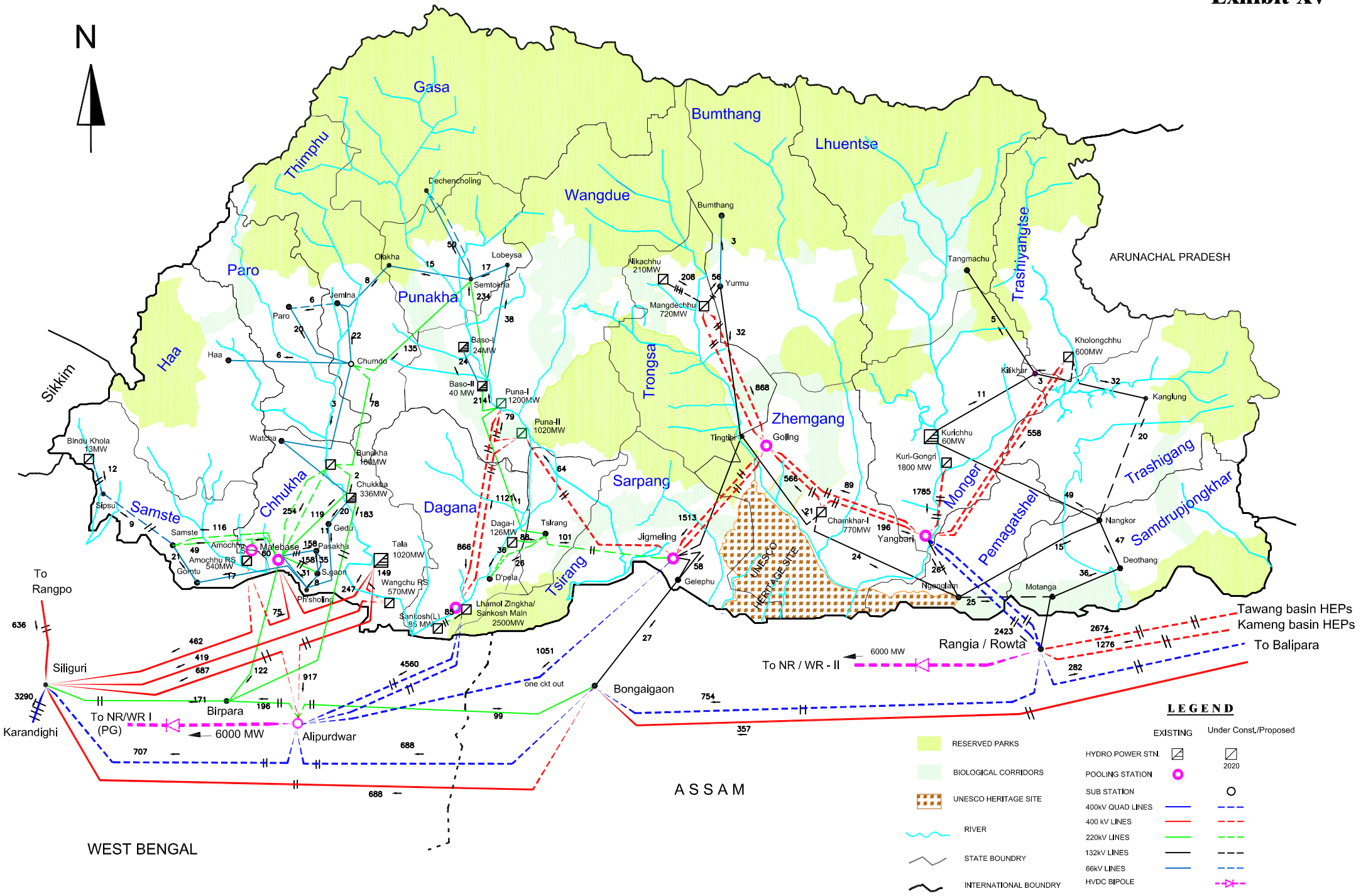
Outage of 400 kV Goling -Jigmeling D/C line

Exhibit-XIV



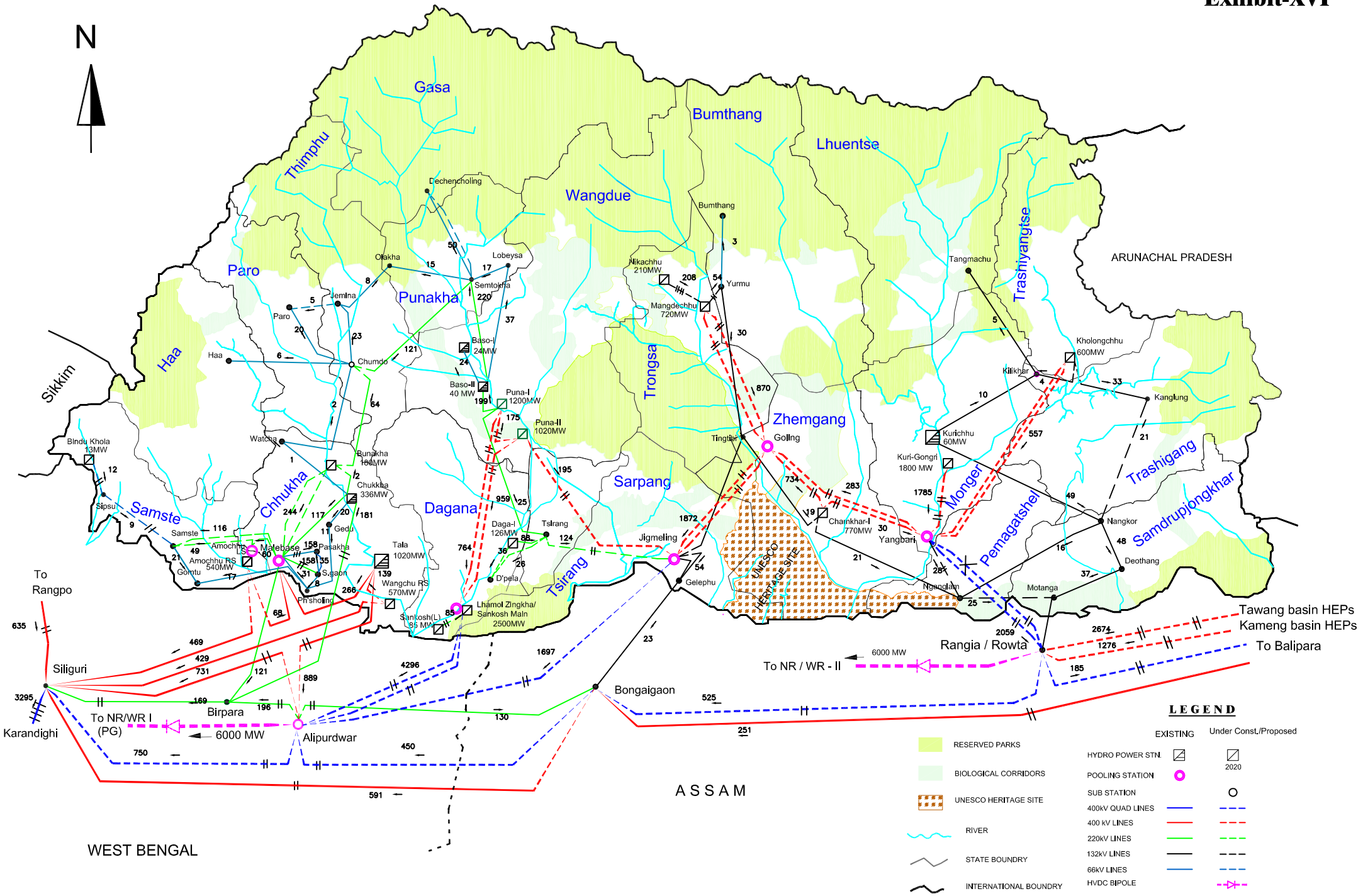
Outage of one ckt of 400 kV Jigmeling-Alipurduar D/C line

Exhibit-XV



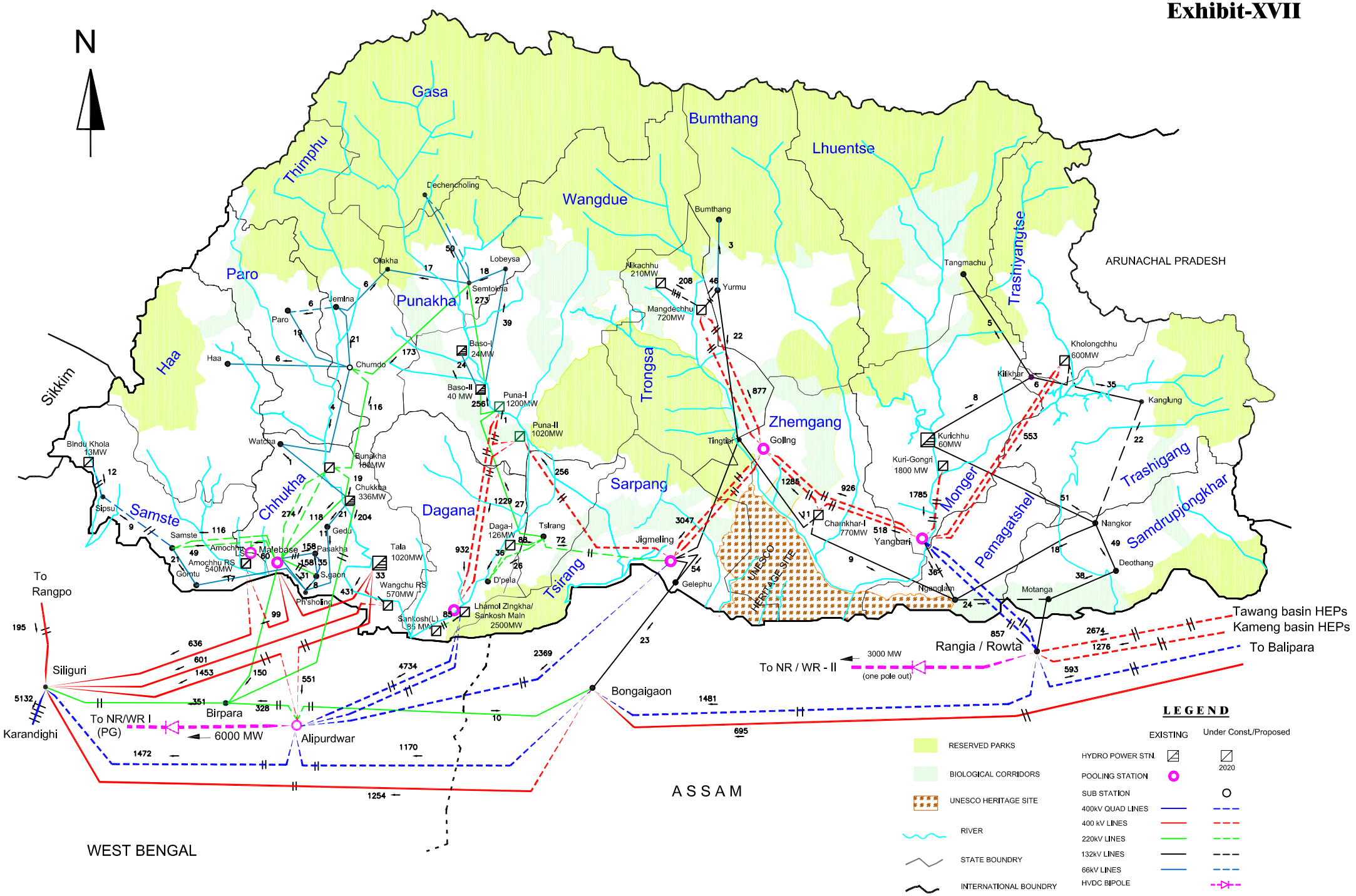
Outage of one D/C of 400 kV Yangbari-Rangia 2XD/C line

Exhibit-XVI



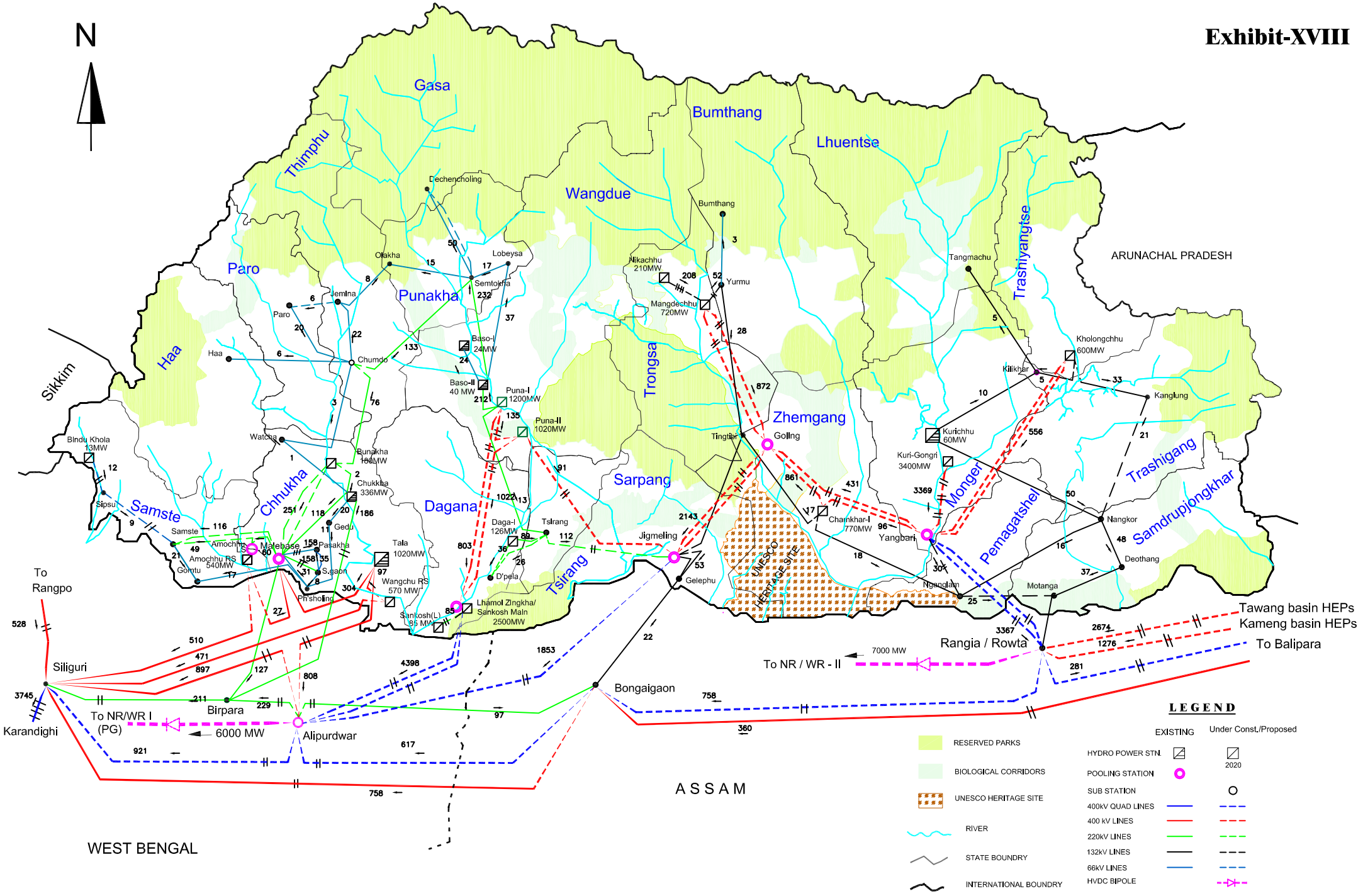
Outage of one pole of ± 800 kV Rangia -NR/WR Bi-pole line

Exhibit-XVII



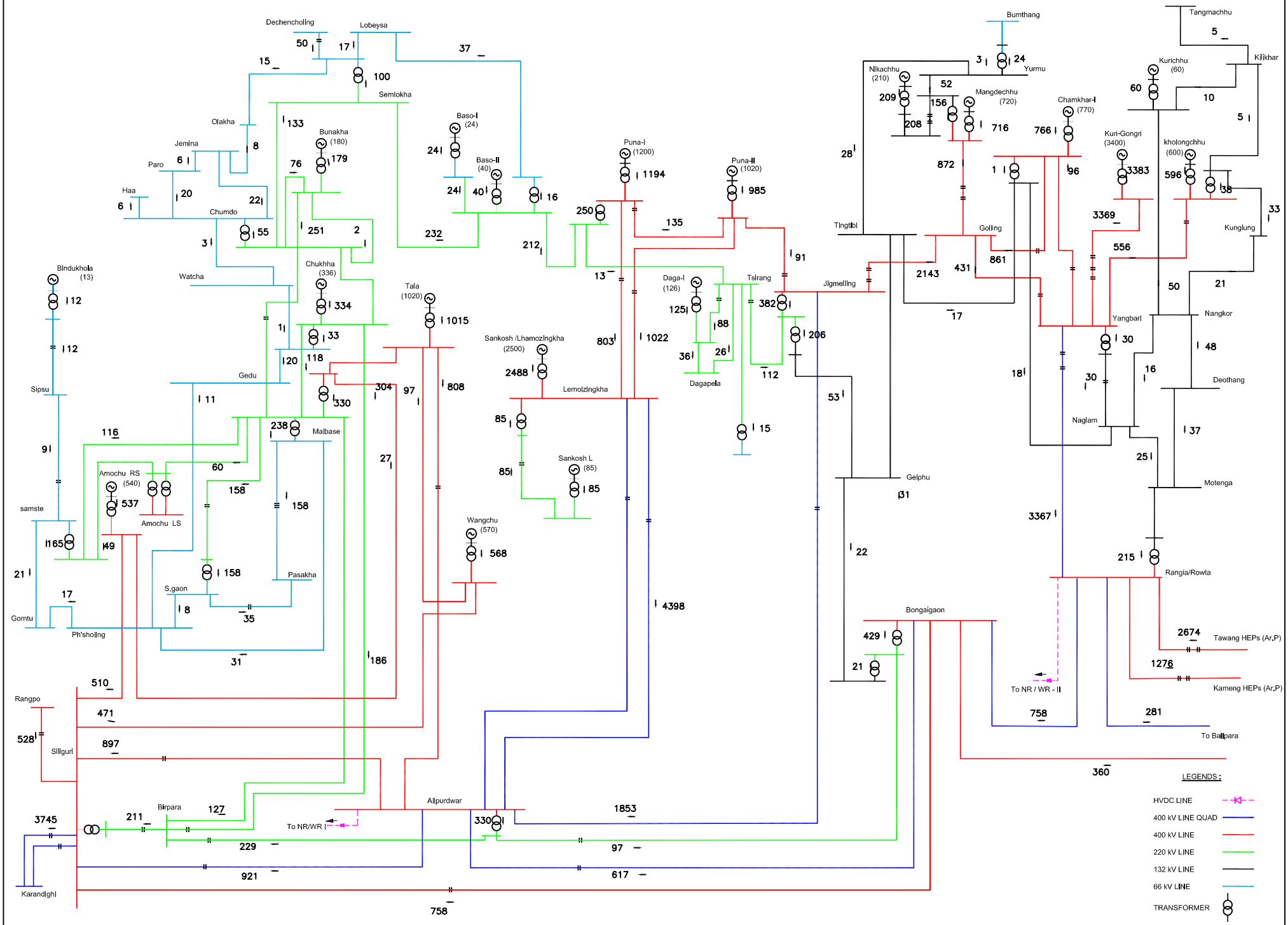
Base Case with full Hydro Dispatch for 2020 Scenario with load of 1500 MW (Kuri Gongri 3400 MW)

Exhibit-XVIII



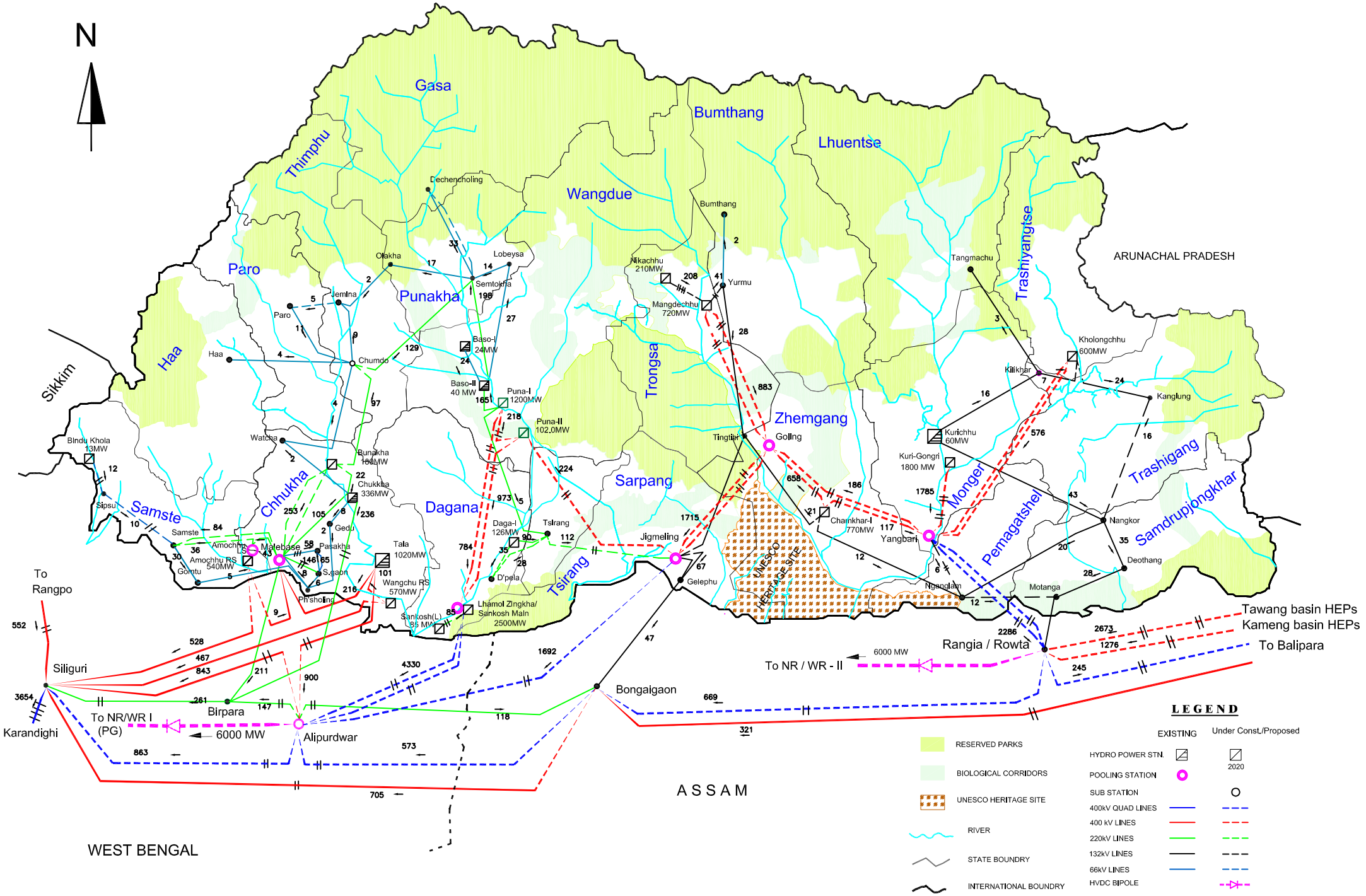
Single Line Diagram with full Hydro dispatch with load growth of 1500 MW (Kuri gongri 3400 MW) for 2020 scenario

Exhibit-XIX



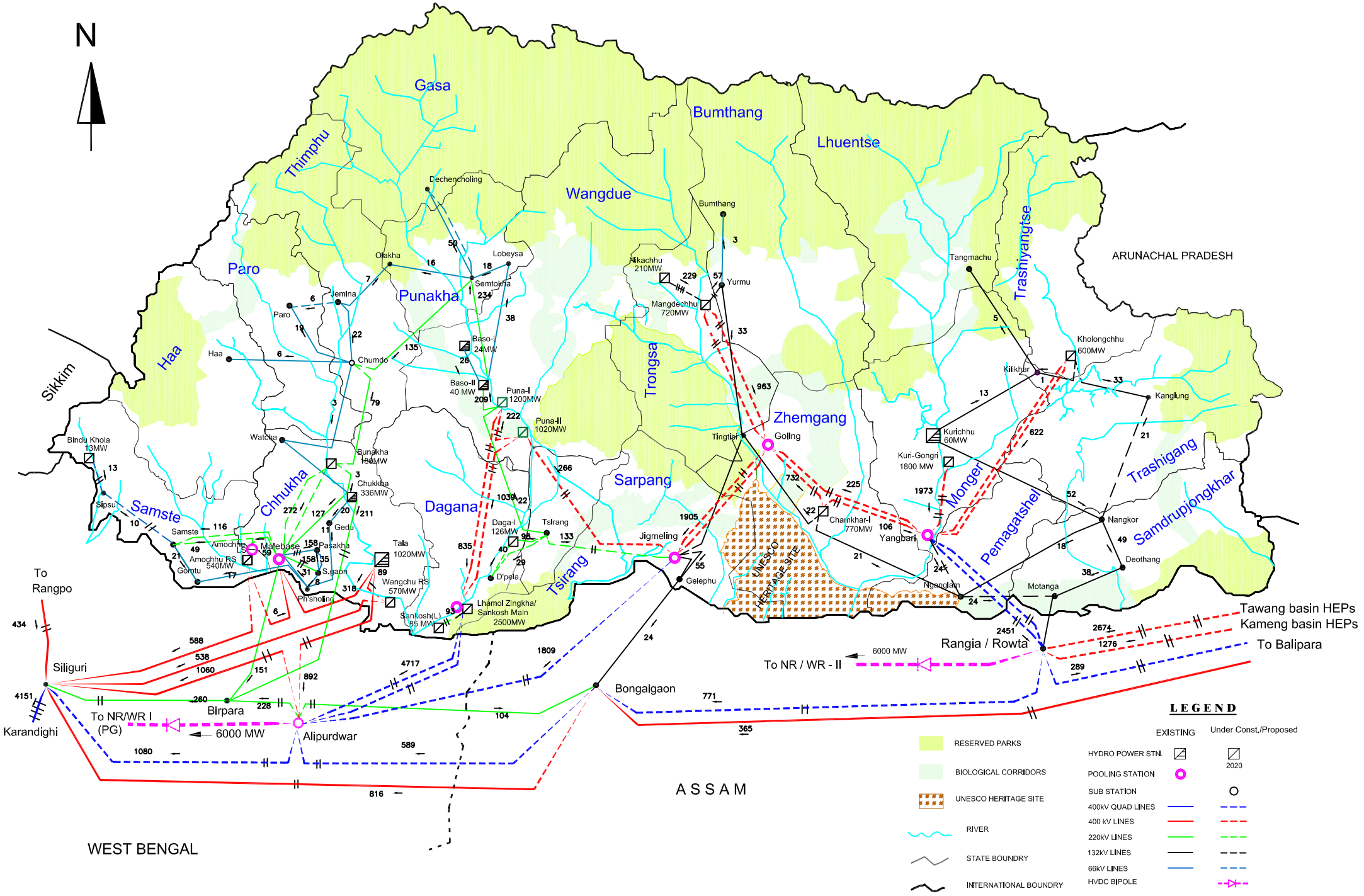
Case study with full Hydro Dispatch with load growth of 978 MW for 2020 Scenario

Exhibit-XX



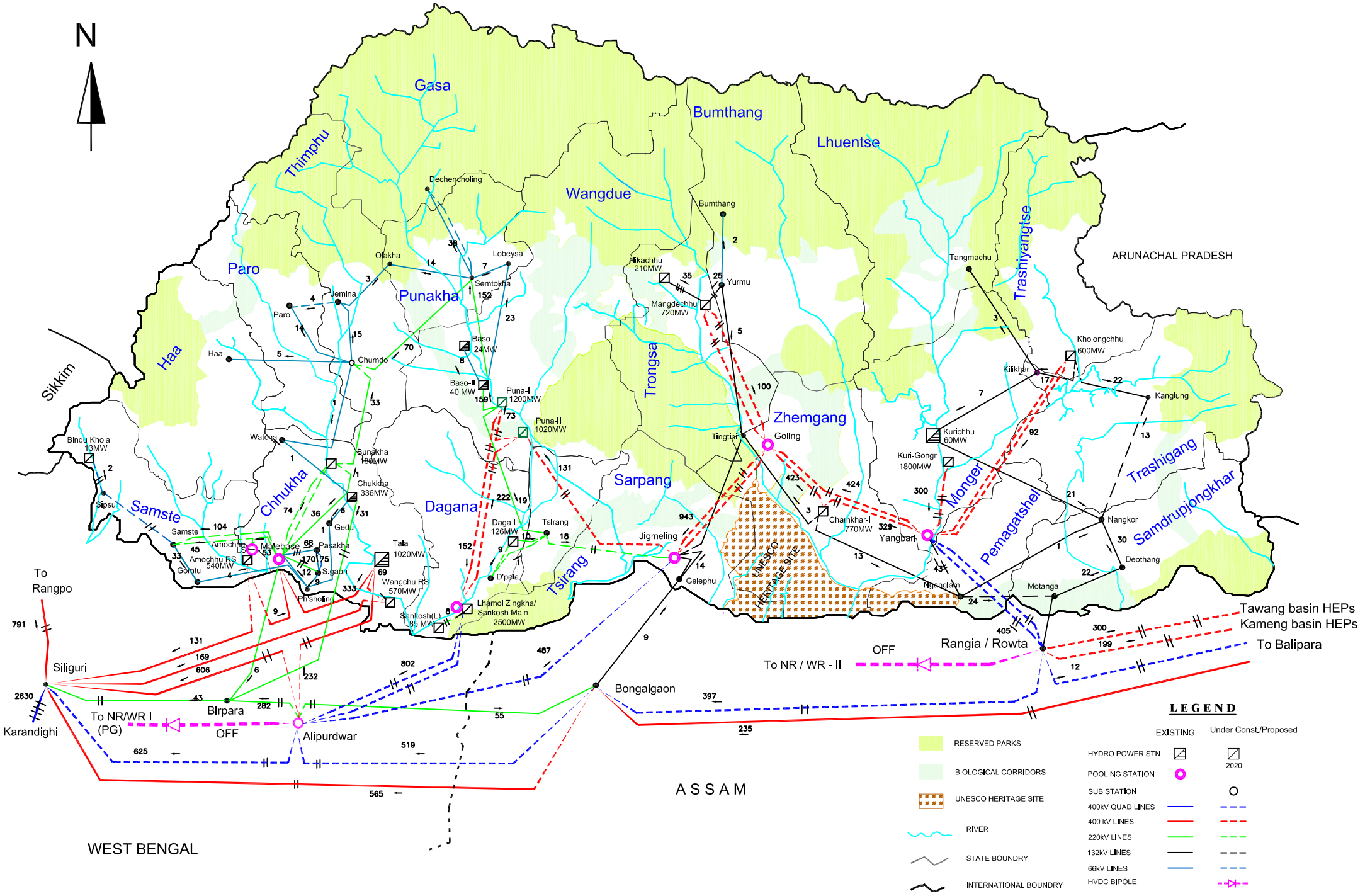
Case study with 10 % high Hydro Dispatch in monsoon for 2020 scenario

Exhibit-XXI



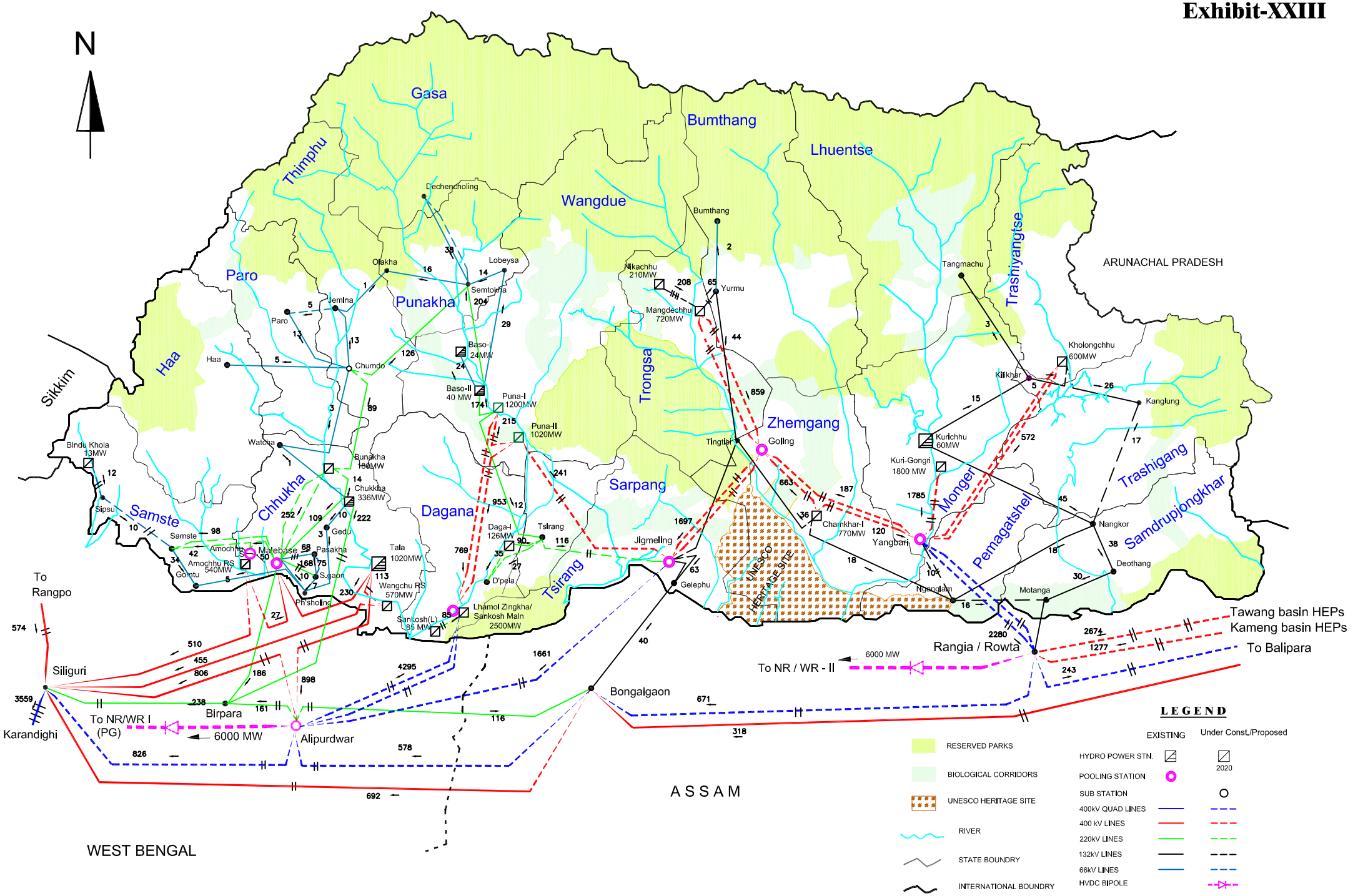
Case study for minimum hydro dispatch with minimum load for 2020 scenario

Exhibit-XXII



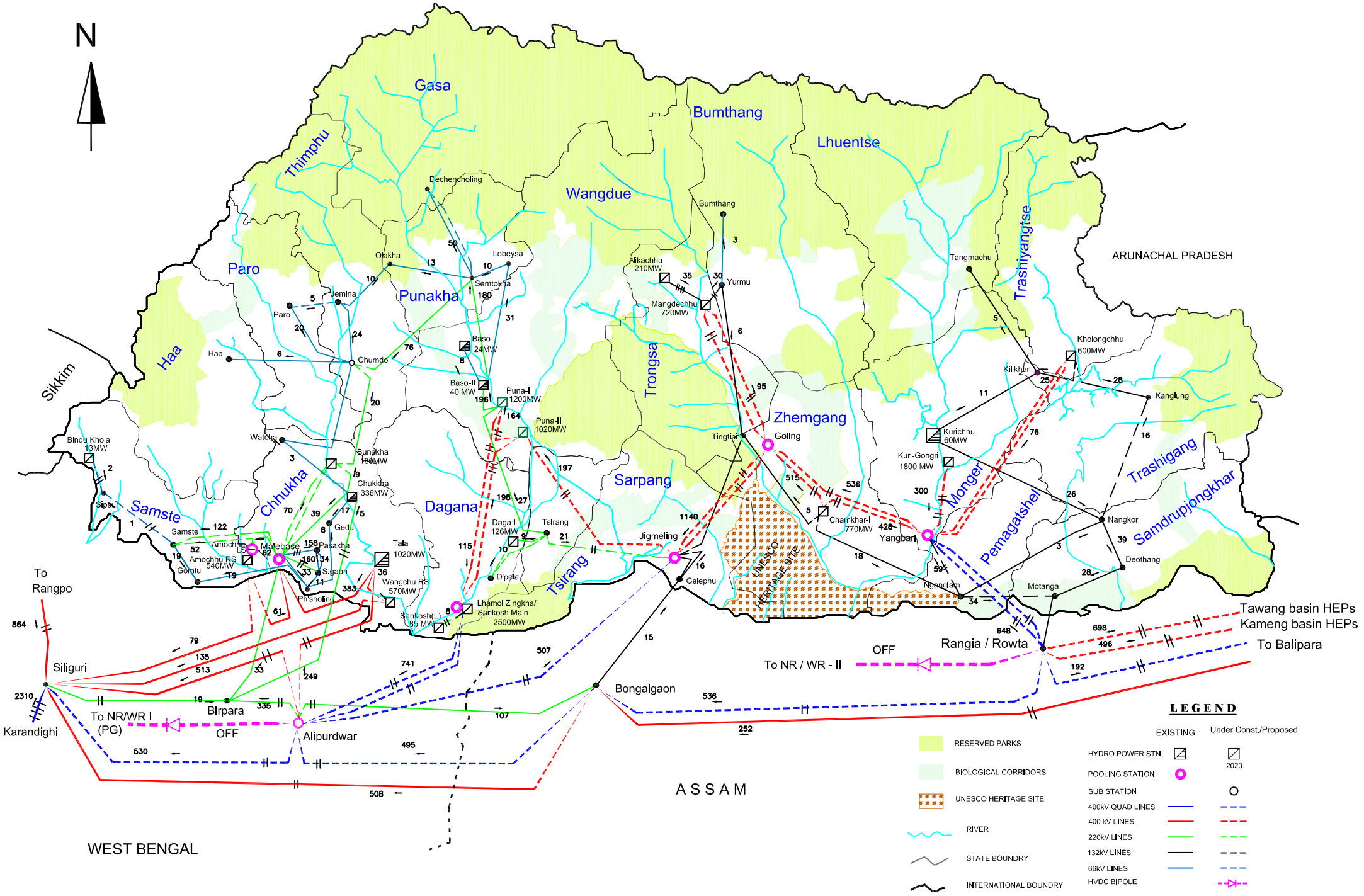
Case study for peak hydro dispatch with minimum load during monsoon for 2020 scenario

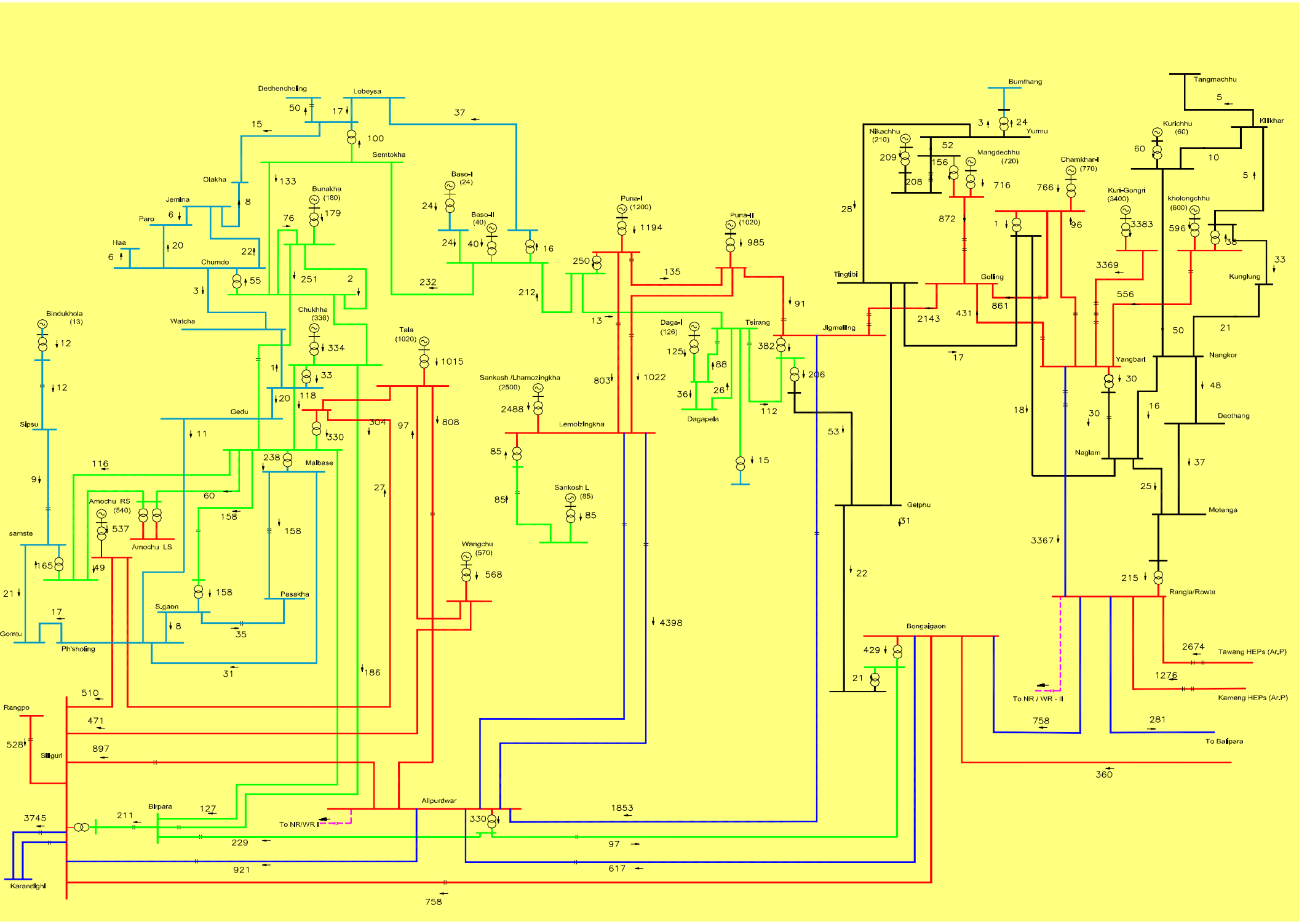
Exhibit-XXIII



Case study for minimum hydro dispatch with maximum load for 2020 scenario

Exhibit-XXIV




Dechencholing
Lobeysa
Semtokha
Olakha
Jemina
Paro
Haa
Chumdo
Bunakha (180)
Baso-I (24)
Baso-II (40)
Puna-I (1200)
Puna-II (1020)
Watcha
Chukhha (336)
Tala (1020)
Gedu
Bindukhola (13)
Sipsu
samste
Gomtu
Ph'sholing
Amochu RS (540)
Amochu LS
Malbase
Pasakha
S.gaon
Sankosh /Lhamozingkha (2500)
Sankosh L (85)
Lemolzingkha
Wangchu (570)
Daga-I (126)
Dagapela
Tsirang
Jigmelling
Gelphu
Bongaigaon
Bumthang
Yurmu
Nikachhu (210)
Mangdechhu (720)
Chamkhar-I (770)
Tingtibi
Goling
Kuri-Gongri (3400)
Kurichhu (60)
kholongchhu (600)
Tangmachhu
Killkhar
Kunglung
Yangbari
Nangkor
Deothang
Naglam
Motenga
Rangla/Rowta
Tawang HEPs (Ar.P)
Kameng HEPs (Ar.P)
To Balipara
To NR / WR - II
Rangpo
Siliguri
Birpara
Karandighi
Allpurdwar
To NR/WR I