

Appendix-2 MCA 点数表

2.1 1次評価の点数表

各ポテンシャル地点の1次評価の点数表を以下に示す。

(1) MCA Score: Technical

表 A 2-1 MCA1 次評価点数表 (Technical - Part 1/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Hydrological risk				Geological risk					5%	5%	5%	Accessibility		5%	Total	Remarks
				30%	30%	30%	10%	15%	25%	25%	25%	10%	100%	100%	80%	20%	100%			
				Ratio catchment area	Recorded period (year)	Density of primary stations	Density of secondary stations	Earthquake Intensity	Slope stability Risk	Weak zone	Permeable & anisotropic rocks	Construction material risk	GLOF risk	Sediment-ation risk	Distance from roadway	Distance from railway station	Transmission line risk			
Amochu Basin																				
A-4	Kunzangling	897	3,928	5	4	3	3	2	3	5	5	4	5	4	2	4	2	76.3		
A-5	Tingma	567	2,483	5	4	3	3	2	3	5	5	2	5	4	2	3	3	75.1		
A-8	Dorokha	573	2,511	5	4	3	3	2	4	4	5	4	5	4	3	5	3	77.1		
A-9	Ngatsa	44	193	1	4	3	3	2	4	5	5	2	5	4	4	5	3	72.4		
A-10	Sanglum	178	779	5	4	3	3	2	4	3	1	4	5	4	4	5	4	67.6		
A-11	Dojengkha	25	108	1	2	3	3	2	4	4	5	3	5	4	4	5	3	64.3		
A-12	Dolepchen	41	177	1	2	3	3	2	3	3	3	4	5	4	5	5	4	59.5		
Total Ar	7	2,324	10,179																	
Wangchhu Basin																				
W-3	Dodennang	61	269	5	5	3	1	2	4	3	4	1	5	4	3	4	3	70.7		
W-6	Chuzom	152	664	5	3	3	1	2	4	5	5	3	5	4	5	4	3	77.7		
W-7	Getsa	37	161	1	5	3	1	2	4	5	3	2	5	4	2	3	2	64.5		
W-8	Zangkhepa	73	320	3	5	3	1	2	4	4	3	2	5	4	5	4	2	67.0		
W-13	Singkar	38	169	1	3	3	1	2	4	5	5	2	5	4	5	4	3	70.0		
W-14	Tsendu Goenpa	75	329	3	3	3	1	2	4	5	5	2	5	4	5	5	3	73.8		
W-19	Pipingchhu	100	436	1	5	3	1	2	4	4	3	5	5	4	3	5	5	66.7		
Total W	7	536	2,347																	
Punatsangchhu Basin																				
P-7	Puna Gom	127	556	5	5	3	2	2	4	5	5	3	3	5	5	3	3	80.7		
P-15	Tamigdamchu	188	824	4	5	3	2	2	4	5	5	2	1	4	3	2	2	72.6		
P-17	Tseykha	170	743	4	5	3	2	2	4	5	5	5	4	4	5	3	3	80.9		
P-18	Jarona	43	187	1	5	3	2	2	4	3	1	2	5	4	4	2	3	58.0		
P-19	Dangchhu	101	444	1	5	3	2	2	4	5	5	3	5	4	5	3	3	74.5		
P-20	Rabuna	33	144	1	5	3	2	2	2	5	5	3	5	4	5	3	3	68.9		
P-26	Thasa	680	2,980	5	2	3	2	2	3	5	5	2	5	4	5	2	5	75.2		
P-28	Kago-1	102	448	1	5	3	2	2	4	5	5	2	5	4	3	1	4	73.0		
P-29	Kago	58	256	1	5	3	2	2	4	4	5	2	5	4	1	2	5	67.6		
P-30	Pinsa	151	662	1	5	3	2	2	2	4	5	2	5	4	3	2	5	66.1		
P-33	Burichhu	40	175	1	2	3	2	2	4	5	5	2	5	4	5	2	5	70.4		
P-34	Darachhu	61	266	1	2	3	2	2	4	5	5	3	5	4	3	1	4	68.1		
P-35	Dagachhu-II	94	413	1	2	3	2	2	4	5	5	2	5	4	5	1	5	70.2		
P-36	Pelichhu	52	227	1	2	3	2	2	4	5	5	2	5	4	5	1	4	68.6		
P-38	Tashiding	81	356	1	2	3	2	2	3	3	5	2	5	4	4	1	5	60.2		
Total Pu	15	1,982	8,680																	
Mangdechhu Basin																				
M-5	Bemji	333	1,458	5	5	3	1	2	4	5	5	3	1	5	3	2	3	76.2		
M-6	Jongthang	170	743	5	5	3	1	2	4	5	5	3	1	5	5	2	3	77.9		
M-11	Wangdigang	446	1,952	5	3	3	1	2	4	5	3	3	2	5	5	3	5	72.5		
M-14	Tingtibi	181	792	5	3	3	1	2	4	5	3	5	3	5	5	4	5	75.7		
M-15	Gomphu	488	2,138	5	3	3	1	2	4	3	2	5	3	5	2	4	3	62.6		
M-17	Buli	67	292	1	3	3	1	2	4	5	5	5	5	5	5	3	4	74.8		
M-18	Nyekhar	43	188	1	3	3	1	2	4	5	5	5	5	5	5	3	5	75.8		
M-19	Sermaling	496	2,171	4	3	3	1	2	5	3	2	5	4	5	5	4	3	68.4		
Total M	8	2,223	9,735																	
Chamkharchhu Basin																				
C-3	Kurjey	89	390	5	5	4	1	2	3	3	5	4	1	5	3	1	4	72.4		
C-4	Chhutoe	29	129	1	5	4	1	2	3	4	5	4	5	5	1	1	3	67.9		
C-7	Chamkharchhu-IV	451	1,974	5	2	4	1	2	4	3	3	3	2	5	5	1	3	64.4		
C-10	Chamkharchhu-II	456	1,997	5	2	4	1	2	4	5	5	4	2	5	3	3	3	73.7		
Total Ch	4	1,025	4,490																	

表 A 2-2 MCA1 次評価点数表 (Technical - Part 2/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Hydrological risk				Geological risk					5%	5%	5%	Accessibility		5%	Total	Remarks
				30%	30%	30%	10%	50%	25%	25%	25%	10%	5%	5%	5%	20%	100%			
				Ratio catchment area	Recorded period (year)	Density of primary stations	Density of secondary stations	Earthquake Intensity	Slope stability Risk	Weak zone	Permeable & anisotropic rocks	Construction material risk	GLOF risk	Sediment-ation risk	Distance from roadway	Distance from railway station	Transmission line risk			
Kurichhu Basin																				
K-13	Minjey	490	2,144	5	2	4	4	1	4	4	1	3	1	4	5	2	2	2	60.0	
K-14	Unggarchhu	28	122	2	5	4	4	1	4	3	3	2	5	4	5	2	4	4	67.3	
K-15	Phawan	502	2,198	5	5	4	4	1	4	5	3	2	2	4	5	2	2	2	72.3	
K-19	Shongarchhu	32	141	4	3	4	4	1	4	3	1	1	5	4	4	2	4	4	60.5	
Total Ku	4	1,052	4,606																	
Drangmechhu Basin:																				
G-3	Tshaling	204	894	5	4	2	1	1	4	4	5	2	5	4	5	2	3	3	72.2	
G-4	Ranya	162	710	5	4	2	1	1	4	5	5	3	5	4	5	2	4	4	77.3	
G-6	Khamdang	494	2,165	5	5	2	1	1	4	5	5	4	5	4	5	2	5	5	80.3	
G-7	Gongri	590	2,582	5	5	2	1	1	4	5	5	5	5	4	5	3	2	2	78.2	
G-9	Gamrichhu-3	123	538	2	4	2	1	1	4	4	3	3	5	4	4	2	3	3	60.9	
G-10	Gamrichhu-2	104	458	4	4	2	1	1	3	5	3	3	5	4	5	3	4	4	67.7	
G-11	Gamrichhu-1	108	474	5	4	2	1	1	3	3	3	3	5	4	5	3	4	4	65.1	
G-12	Rotpa	40	177	4	5	2	1	1	4	3	5	2	5	4	5	3	3	3	69.7	
G-13	Sherichhu	53	230	5	5	2	1	1	3	3	1	2	5	4	5	3	4	4	60.8	
G-14	Uzorong	763	3,343	5	5	2	1	1	3	5	1	2	5	4	5	3	3	3	65.4	
G-16	Jerichhu	40	175	4	3	2	1	1	4	4	3	2	5	4	4	4	4	4	64.8	
G-19	Nagor	53	232	4	3	2	1	1	4	4	1	2	5	4	2	4	3	3	56.0	
G-20	Pramaling	29	126	4	3	2	1	1	4	4	3	2	5	4	1	5	4	4	61.4	
G-22	Panbang	1,100	4,640	5	2	2	1	1	4	4	3	4	5	4	5	4	3	3	66.1	
Total Dr	14	3,863	16,743																	
Aiechhu																				
Ai-1	Aiechhu 2	34	150	1	3	1	1	2	3	5	5	1	5	5	1	5	4	4	61.9	
Ai-3	Pelrithang	30	129	1	3	1	1	2	3	4	2	3	5	5	5	5	4	4	54.7	
Ai-4	Ronggangchhu	51	221	1	3	1	1	2	3	3	2	2	5	5	5	5	4	4	52.4	
Total Ai	3	114	500																	
Jomori																				
J-1	Zangtheri	29	125	3	5	1	1	1	3	3	1	2	5	4	5	1	2	2	52.5	
J-2	Jomori-I	82	360	5	5	1	1	1	3	3	3	2	5	4	5	1	3	3	62.1	
J-3	Maenjiwoong	70	306	5	5	1	1	1	4	4	3	3	5	4	5	1	2	2	67.6	
J-4	Jomotsangkha	68	300	5	5	1	1	1	4	2	4	3	5	4	5	1	2	2	63.4	
Total Jo	4	249	1,090																	
Nyera Amari:																				
N-1	Nyera Amari Kangpara (G)	71	312	4	5	1	1	1	4	3	5	1	5	4	2	2	2	2	63.3	
N-2	Lamai Gonpa	37	161	4	5	1	1	1	4	2	1	1	5	4	2	2	3	3	51.8	
N-3	Paydung-Kangpar	85	374	5	5	1	1	1	4	4	3	3	5	4	5	1	3	3	65.6	
Total Ny	3	193	846																	
Grand	69	13,560	59,217																	

(2) MCA Score: Technical <Sub-Score>

表 A 2-3 MCA1 次評価点数表 (Technical <Sub-Score> – Part 1/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Hydrological risk													Geological risk						GLOF risk		Sedimentation risk		Accessibility				Transmission line risk		Remarks				
				Ratio catchment area				Density of gauging stations									15%	15%	25%	25%	25%	10%	Elongation from Glacier Lake km	Score	Annual sediment volume ton/km2	Score	Distance from roadway km	Score	Distance from roadway km	Score	Distance from railway station km	Score		Distance from railway station km	Score	Distance from Substation km	Score
				catchment area (dam site) km2	catchment area (station) km2	Selected Station	Evaluation	Ratio catchment area	Score Ratio catchment area	Recorded period (year)	Score Recorded period	catchment area (River basin) km2	No. of Primary stations	Density of primary stations	Score Density of primary stations	No. of Secondary stations	Density of secondary stations	Score Density of secondary stations	Earthquake Intensity	Score Earthquake Intensity	Score Slope stability risk	Score Weak zone	Score Permeable & anisotropic rocks	Score Construction material risk	Score	Score	Score	Score	Score	Score	Score	Score		Score	Score	Score	Score
Amochu Basin																																					
A-4	Kunzangling	897	3,928	2,100	3,055	Dorokha	Good	0.69	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	3	5	5	4	200	5	516	4	20	2	150	4	59	2			
A-5	Tingma	567	2,483	2,252	3,055	Dorokha	Good	0.74	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	3	5	5	2	200	5	516	4	20	2	170	3	45	3			
A-8	Dorokha	573	2,511	2,602	3,055	Dorokha	Good	0.85	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	4	4	5	4	200	5	516	4	15	3	80	5	27	3			
A-9	Ngatse	44	193	237	3,055	Dorokha	Good	0.08	1	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	4	5	5	2	200	5	516	4	7	4	80	5	26	3			
A-10	Sanglum	178	779	3,112	3,055	Dorokha	Good	1.02	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	4	3	1	4	200	5	516	4	10	4	70	5	16	4			
A-11	Dojengkha	25	108	95	3,650	Doyayang	Good	0.03	1	9	2	2,323	1	0.0004	3	1	0.0004	3	High	2	4	4	5	3	200	5	516	4	7	4	60	5	22	3			
A-12	Dolepchen	41	177	235	3,650	Doyayang	Good	0.06	1	9	2	2,323	1	0.0004	3	1	0.0004	3	High	2	3	3	3	4	200	5	516	4	5	5	40	5	15	4			
Total Ar	7	2,324	10,179																																		
Wangchhu Basin																																					
W-3	Dodennang	61	269	410	663	Lungtenph	Good	0.62	5	24	5	4,644	2	0.0004	3	0	0.0000	1	High	2	4	3	4	1	200	5	516	4	15	3	140	4	21	3			
W-6	Chuzom	152	664	2,483	2,520	Damchhu/ Tamphu	Good	0.99	5	14	3	4,644	2	0.0004	3	0	0.0000	1	High	2	4	5	5	3	200	5	516	4	0	5	110	4	34	3			
W-7	Getsa	37	161	175	1,101	Paro(closed)	Good	0.16	1	24	5	4,644	2	0.0004	3	0	0.0000	1	High	2	4	5	3	2	200	5	516	4	20	2	160	3	97	2			
W-8	Zangkhepa	73	320	325	1,101	Paro(closed)	Good	0.29	3	24	5	4,644	2	0.0004	3	0	0.0000	1	High	2	4	4	3	2	200	5	516	4	5	5	140	4	81	2			
W-13	Singkhar	38	169	380	2,520	Damchhu/ Tamphu	Good	0.15	1	14	3	4,644	2	0.0004	3	0	0.0000	1	High	2	4	5	5	2	200	5	516	4	0	5	120	4	41	3			
W-14	Tsendu Goempa	75	329	646	2,520	Damchhu/ Tamphu	Good	0.26	3	14	3	4,644	2	0.0004	3	0	0.0000	1	High	2	4	5	5	2	200	5	516	4	0	5	100	5	24	3			
W-19	Pipingchhu	100	436	217	3,573	Chukha/Chimakon	Good	0.06	1	39	5	4,644	2	0.0004	3	0	0.0000	1	High	2	4	4	3	5	200	5	516	4	15	3	90	5	1	5			
Total W	7	536	2,347																																		
Punatsangchhu Basin																																					
P-7	Puna Gom	127	556	2,145	2,320	Yebesa	Good	0.92	5	24	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	3	142	3	437	5	0	5	200	3	39	3			
P-15	Tamigdamchhu	188	824	2,120	6,271	Wangdue/ Wangdura	Good	0.34	4	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	2	24	1	516	4	15	3	220	2	53	2			
P-17	Tseykha	170	743	2,205	6,271	Wangdue/ Wangdura	Good	0.35	4	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	5	158	4	516	4	0	5	200	3	38	3			
P-18	Jarona	43	187	219	6,271	Wangdue/ Wangdura	Good	0.03	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	3	1	2	200	5	516	4	10	4	210	2	43	3			
P-19	Dangchhu	101	444	404	6,271	Wangdue/ Wangdura	Good	0.06	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	3	200	5	516	4	0	5	190	3	29	3			
P-20	Rabuna	33	144	561	6,271	Wangdue/ Wangdura	Good	0.09	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	2	5	5	3	200	5	516	4	0	5	180	3	22	3			
P-26	Thasa	680	2,980	6,102	8,593	Sunkosh/Urutar	Good	0.71	5	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	3	5	5	2	200	5	965	4	0	5	250	2	2	5			
P-28	Kago-1	102	448	250	6,271	Wangdue/ Wangdura	Good	0.04	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	2	200	5	516	4	15	3	260	1	16	4			
P-29	Kago	58	256	377	6,271	Wangdue/ Wangdura	Good	0.06	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	4	5	2	200	5	516	4	30	1	250	2	10	5			
P-30	Pinsa	151	662	427	6,271	Wangdue/ Wangdura	Good	0.07	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	2	4	5	2	200	5	516	4	15	3	230	2	6	5			
P-33	Burichhu	40	175	190	8,593	Sunkosh/Urutar	Good	0.02	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	2	200	5	965	4	3	5	250	2	0	5			
P-34	Darachhu	61	266	220	8,593	Sunkosh/Urutar	Good	0.03	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	3	200	5	965	4	15	3	310	1	18	4			
P-35	Dagachhu-II	94	413	593	8,593	Sunkosh/Urutar	Good	0.07	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	2	200	5	965	4	0	5	300	1	10	5			
P-36	Pelichhu	52	227	211	8,593	Sunkosh/Urutar	Good	0.02	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	2	200	5	965	4	0	5	310	1	16	4			
P-38	Tashiding	81	356	778	8,593	Sunkosh/Urutar	Good	0.09	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	3	3	5	2	200	5	965	4	7	4	280	1	9	5			
Total Pu	15	1,982	8,680																																		
Mangdechhu Basin																																					
M-5	Bemji	333	1,458	1,010	1,390	Bjizam	Good	0.73	5	21	5	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	3	22	1	153	5	15	3	250	2	39	3			
M-6	Jongthang	170	743	1,298	1,390	Bjizam	Good	0.93	5	21	5	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	3	45	1	153	5	0	5	230	2	23	3			
M-11	Wangdigang	446	1,952	2,490	3,322	Tingtibi	Good	0.75	5	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	3	3	85	2	153	5	0	5	190	3	4	5			
M-14	Tingtibi	181	792	2,878	3,322	Tingtibi	Good	0.87	5	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	3	5	102	3	153	5	5	5	150	4	3	5			
M-15	Gomphu	488	2,138	3,328	3,322	Tingtibi	Good	1.00	5	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	3	2	5	121	3	153	5	20	2	150	4	21	3			
M-17	Buli	67	292	216	3,322	Tingtibi	Good	0.07	1	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	5	200	5	153	5	5	5	170	3	10	4			
M-18	Nyekhar	43	188	244	3,322	Tingtibi	Good	0.07	1	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	5	200	5	153	5	5	5	165	3	6	5			
M-19	Sermaling	496	2,171	7,281	3,322	Tingtibi	Good	2.19	4	11	3	4,085	2	0.0005																							

(3) MCA Score: Economic

表 A 2-5 MCA1 次評価点数表 (Economic – Part 1/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Annual Energy excluding E-flow (GWh)	Power plant			Transmission line, substation			Total Cost (million Nu)	Construction Cost per kW (1000 Nu)	Construction Cost per kWh (Nu)	Benefit				Total Benefit (million Nu)	B/C	Score B/C	Remarks
					Construction cost (million Nu)	10.6%	1.0%	Construction cost (million Nu)	10.6%	1.0%				Firm power (MW)	9,775.0	3.0%	4.2				
						Annual expense (million Nu)	O&M expense (million Nu)		Annual expense (million Nu)	O&M expense (million Nu)					kW value (million Nu)	Supply energy (GWh)	kWh value (million Nu)				
Amochu Basin																					
A-4	Kunzangling	897	3,928	3,816	43,519	4,616	435	6,024	639	60	5,751	55.2	13.0	65.0	635	3,702	15,548	16,183	2.81	5.0	
A-5	Tingma	567	2,483	2,413	35,579	3,774	356	5,225	554	52	4,736	72.0	16.9	41.0	401	2,340	9,829	10,230	2.16	5.0	
A-8	Dorokha	573	2,511	2,439	46,103	4,891	461	4,351	462	44	5,857	88.0	20.7	43.5	426	2,366	9,938	10,364	1.77	4.8	
A-9	Ngatse	44	193	170	5,569	591	56	1,252	133	13	792	155.1	40.1	2.3	23	165	693	716	0.90	1.0	
A-10	Sanglum	178	779	779	36,778	3,901	368	2,579	274	26	4,569	221.2	50.5	30.7	300	756	3,175	3,475	0.76	1.0	
A-11	Dojengkha	25	108	105	4,979	528	50	1,168	124	12	714	250.2	58.8	1.4	14	101	426	440	0.62	1.0	
A-12	Dolepchen	41	177	172	6,663	707	67	1,069	113	11	898	190.9	44.8	2.4	23	167	702	726	0.81	1.0	
Total Ar	7	2,324	10,179	9,895																	
Wangchhu Basin																					
W-3	Dodennang	61	269	275	8,719	925	87	1,497	159	15	1,186	166.6	37.1	6.9	67	267	1,121	1,188	1.00	1.0	
W-6	Chuzom	152	664	645	22,813	2,420	228	1,822	193	18	2,860	162.5	38.2	75.9	742	626	2,628	3,370	1.18	1.9	
W-7	Getsa	37	161	152	6,260	664	63	3,151	334	32	1,092	255.6	61.9	3.8	37	147	619	656	0.60	1.0	
W-8	Zangkhepa	73	320	305	6,720	713	67	2,817	299	28	1,107	130.7	31.2	7.6	74	296	1,244	1,318	1.19	2.0	
W-13	Singkar	38	169	165	7,084	751	71	1,926	204	19	1,046	234.2	54.8	5.3	52	160	670	722	0.69	1.0	
W-14	Tsendu Goenpa	75	329	321	12,559	1,332	126	1,569	166	16	1,640	188.0	43.9	8.0	78	312	1,310	1,388	0.85	1.0	
W-19	Pipingchhu	100	436	424	12,486	1,325	125	864	92	9	1,550	134.1	31.5	12.3	120	412	1,729	1,849	1.19	2.0	
Total W	7	536	2,347	2,288																	
Punatsangchhu Basin																					
P-7	Puna Gom	127	556	543	25,896	2,747	259	2,296	244	23	3,273	222.1	51.9	13.9	136	526	2,211	2,347	0.72	1.0	
P-15	Tamigdamchhu	188	824	805	24,033	2,549	240	2,643	280	26	3,097	141.7	33.1	20.7	202	781	3,279	3,480	1.12	1.6	
P-17	Tseykha	170	743	726	26,279	2,788	263	2,312	245	23	3,319	168.5	39.4	18.6	182	704	2,956	3,138	0.95	1.0	
P-18	Jarona	43	187	179	8,484	900	85	1,540	163	15	1,164	234.9	55.9	5.3	52	174	731	783	0.67	1.0	
P-19	Dangchhu	101	444	432	11,155	1,183	112	1,343	142	13	1,451	123.3	28.9	12.9	126	419	1,761	1,887	1.30	2.5	
P-20	Rabuna	33	144	140	6,635	704	66	1,180	125	12	907	237.9	55.8	4.2	41	136	571	612	0.67	1.0	
P-26	Thasa	680	2,980	3,277	73,644	7,812	736	2,842	302	28	8,878	112.4	23.3	123.9	1,211	3,179	13,350	14,561	1.64	4.2	
P-28	Kago-1	102	448	436	6,275	666	63	1,125	119	11	859	72.4	17.0	12.2	119	423	1,777	1,896	2.21	5.0	
P-29	Kago	58	256	249	8,214	871	82	988	105	10	1,068	157.7	37.0	6.9	68	241	1,014	1,082	1.01	1.1	
P-30	Pinsa	151	662	644	10,341	1,097	103	985	105	10	1,315	75.0	17.6	18.0	176	625	2,626	2,801	2.13	5.0	
P-33	Burichhu	40	175	170	8,912	945	89	840	89	8	1,132	244.3	57.3	5.7	56	165	694	749	0.66	1.0	
P-34	Darachhu	61	266	259	7,765	824	78	1,415	150	14	1,066	151.2	35.5	7.7	75	251	1,055	1,130	1.06	1.3	
P-35	Dagachhu-II	94	413	402	11,953	1,268	120	1,260	134	13	1,534	140.3	32.9	12.0	117	390	1,637	1,754	1.14	1.7	
P-36	Pelichhu	52	227	222	7,260	770	73	1,387	147	14	1,004	166.7	38.9	6.6	65	216	905	970	0.97	1.0	
P-38	Tashiding	81	356	347	10,927	1,159	109	1,239	131	12	1,412	149.7	35.1	12.0	117	336	1,413	1,530	1.08	1.4	
Total Pu	15	1,982	8,680	8,831																	

表 A 2-6 MCA1 次評価点数表 (Economic – Part 2/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Annual Energy excluding E-flow (GWh)	Power plant			Transmission line, substation			Total Cost (million Nu)	Construction Cost per kW (1000 Nu)	Construction Cost per kWh (Nu)	Benefit				Total Benefit (million Nu)	B/C	Score B/C	Remarks
					Construction cost (million Nu)	10.6%	1.0%	Construction cost (million Nu)	10.6%	1.0%				Firm power (MW)	9,775.0	3.0%	4.2				
						Annual expense (million Nu)	O&M expense (million Nu)		Annual expense (million Nu)	O&M expense (million Nu)											
Mangdechhu Basin																					
M-5	Bemji	333	1,458	1,425	30,700	3,257	307	3,779	401	38	4,002	103.6	24.2	40.6	397	1,382	5,805	6,202	1.55	3.7	
M-6	Jongthang	170	743	726	30,409	3,226	304	2,887	306	29	3,865	196.3	45.9	22.1	216	704	2,958	3,174	0.82	1.0	
M-11	Wangdigang	446	1,952	1,907	49,274	5,227	493	1,782	189	18	5,927	114.6	26.8	59.0	577	1,850	7,771	8,348	1.41	3.0	
M-14	Tingtibi	181	792	770	33,064	3,507	331	1,589	169	16	4,022	191.6	45.0	27.4	267	747	3,135	3,403	0.85	1.0	
M-15	Gomphu	488	2,138	2,076	72,525	7,693	725	2,918	310	29	8,757	154.6	36.3	105.7	1,033	2,014	8,460	9,492	1.08	1.4	
M-17	Buli	67	292	262	5,793	615	58	1,009	107	10	790	101.9	25.9	9.8	96	254	1,069	1,164	1.47	3.4	
M-18	Nyekhar	43	188	183	6,032	640	60	916	97	9	807	161.8	38.0	5.2	51	177	744	795	0.99	1.0	
M-19	Sermaling	496	2,171	2,171	69,107	7,331	691	3,826	406	38	8,466	147.1	33.6	102.7	1,004	2,106	8,846	9,849	1.16	1.8	
Total M	8	2,223	9,735	9,521																	
Chamkharchhu Basin																					
C-3	Kurjey	89	390	381	24,942	2,646	249	767	81	8	2,984	288.6	67.4	12.6	123	370	1,553	1,676	0.56	1.0	
C-4	Chhutoe	29	129	126	6,518	691	65	828	88	8	853	249.7	58.4	3.1	30	122	513	543	0.64	1.0	
C-7	Chamkharchhu-IV	451	1,974	1,928	37,916	4,022	379	4,157	441	42	4,884	93.4	21.8	65.3	639	1,870	7,855	8,494	1.74	4.7	
C-10	Chamkharchhu-II	456	1,997	1,936	36,121	3,832	361	3,330	353	33	4,579	86.5	20.4	80.0	782	1,878	7,887	8,669	1.89	5.0	
Total Ch	4	1,025	4,490	4,371																	
Kurichhu Basin																					
K-13	Minjey	490	2,144	2,091	81,444	8,640	814	5,941	630	59	10,144	178.5	41.8	80.3	785	2,029	8,520	9,306	0.92	1.0	
K-14	Unggarchhu	28	122	119	4,010	425	40	693	74	7	546	168.4	39.4	3.2	31	116	486	517	0.95	1.0	
K-15	Phawan	502	2,198	2,185	88,255	9,362	883	6,350	674	64	10,982	188.5	43.3	86.3	843	2,119	8,901	9,744	0.89	1.0	
K-19	Shongarchhu	32	141	138	4,926	523	49	711	75	7	654	174.5	40.8	3.4	33	134	562	595	0.91	1.0	
Total Ku	4	1,052	4,606	4,533																	
Drangmechhu Basin:																					
G-3	Tshaling	204	894	876	66,800	7,086	668	2,096	222	21	7,997	337.7	78.7	59.2	578	849	3,567	4,145	0.52	1.0	
G-4	Ranya	162	710	696	45,141	4,789	451	1,861	197	19	5,456	290.0	67.6	22.2	217	675	2,834	3,050	0.56	1.0	
G-6	Khamdang	494	2,165	2,109	56,594	6,003	566	1,950	207	19	6,796	118.5	27.8	69.3	678	2,045	8,591	9,269	1.36	2.8	
G-7	Gongri	590	2,582	2,515	87,004	9,229	870	6,398	679	64	10,842	158.4	37.1	94.7	926	2,440	10,248	11,174	1.03	1.2	
G-9	Gamrichhu-3	123	538	524	10,952	1,162	110	1,971	209	20	1,500	105.3	24.7	14.6	143	508	2,133	2,276	1.52	3.6	
G-10	Gamrichhu-2	104	458	446	11,666	1,238	117	1,776	188	18	1,560	128.6	30.2	15.3	149	432	1,816	1,966	1.26	2.3	
G-11	Gamrichhu-1	108	474	462	23,844	2,529	238	1,710	181	17	2,966	236.0	55.3	19.7	192	448	1,882	2,074	0.70	1.0	
G-12	Rotpa	40	177	172	5,280	560	53	841	89	8	710	151.8	35.6	4.8	47	167	701	748	1.05	1.3	
G-13	Sherichhu	53	230	227	8,293	880	83	753	80	8	1,050	172.2	39.8	6.3	62	220	925	987	0.94	1.0	
G-14	Uzorong	763	3,343	3,257	84,990	9,016	850	5,271	559	53	10,477	118.3	27.7	136.3	1,332	3,159	13,268	14,600	1.39	3.0	
G-16	Jerichhu	40	175	164	5,143	546	51	649	69	6	672	144.7	35.2	4.6	45	160	670	715	1.06	1.3	
G-19	Nagor	53	232	252	7,774	825	78	853	91	9	1,001	162.8	34.3	5.9	58	244	1,026	1,084	1.08	1.4	
G-20	Pramaling	29	126	123	6,760	717	68	693	74	7	865	259.9	60.8	2.9	28	119	500	528	0.61	1.0	
G-22	Panbang	1,100	4,640	4,640	113,900	12,082	1,139	4,563	484	46	13,751	107.7	25.5	204.3	1,997	4,501	18,904	20,901	1.52	3.6	
Total Dr	14	3,863	16,743	16,462																	

表 A 2-7 MCA1 次評価点数表 (Economic – Part 3/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Annual Energy excluding E-flow (GWh)	Power plant			Transmission line, substation			Total Cost (million Nu)	Construction Cost per kW (1000 Nu)	Construction Cost per kWh (Nu)	Benefit				Total Benefit (million Nu)	B/C	Score B/C	Remarks	
					Construction cost (million Nu)	10.6%	1.0%	Construction cost (million Nu)	10.6%	1.0%				Firm power (MW)	9,775.0	3.0%	4.2					
						Annual expense (million Nu)	O&M expense (million Nu)		Annual expense (million Nu)	O&M expense (million Nu)					kWh value (million Nu)	Supply energy (GWh)	kWh value (million Nu)					
Aiechhu																						
Ai-1	Aiechhu 2	34	150	146	4,842	514	48	1,029	109	10	681	171.9	40.3	3.7	36	141	594	630	0.92	1.0		
Ai-3	Pelrithang	30	129	126	9,680	1,027	97	1,022	108	10	1,242	362.7	85.0	4.0	39	122	513	552	0.44	1.0		
Ai-4	Ronggangchhu	51	221	216	7,729	820	77	1,080	115	11	1,023	174.2	40.8	5.5	54	209	879	933	0.91	1.0		
Total Ai	3	114	500	487																		
Jomori																						
J-1	Zangtheri	29	125	121	4,699	498	47	1,717	182	17	745	224.8	52.9	3.7	36	118	494	530	0.71	1.0		
J-2	Jomori-I	82	360	349	9,703	1,029	97	1,658	176	17	1,319	138.3	32.6	12.9	127	338	1,421	1,548	1.17	1.9		
J-3	Maenjiwoong	70	306	296	11,496	1,219	115	1,715	182	17	1,533	189.3	44.6	11.0	108	287	1,207	1,315	0.86	1.0		
J-4	Jomotsangkha	68	300	291	12,498	1,326	125	1,883	200	19	1,669	210.1	49.5	10.8	106	282	1,185	1,290	0.77	1.0		
Total Jo	4	249	1,090	1,057																		
Nyera Amari:																						
N-1	Nyera Amari Kangpara (G)	71	312	304	6,134	651	61	1,814	192	18	923	111.7	26.2	7.8	76	295	1,237	1,313	1.42	3.1		
N-2	Lamai Gonpa	37	161	156	6,438	683	64	1,553	165	16	928	218.1	51.1	4.0	39	152	637	676	0.73	1.0		
N-3	Paydung-Kangpar	85	374	364	13,253	1,406	133	1,336	142	13	1,693	170.9	40.1	11.6	113	353	1,484	1,597	0.94	1.0		
Total Ny	3	193	846	824																		
Grand	69	13,560	59,217	58,270																		

(4) MCA Score: Social environment

表 A 2-8 MCA1 次評価点数表 (Environment- Part 1/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Social					Natural							Development			Remarks
				25%	25%	20%	30%	Total	40%	35%	10%	5%	5%	5%	Total	50%	50%	Total	
				Land Acquisition	Resettlement & asset loss	Living and livelihood means	Cultural Heritage		Located in protected areas	Loss of forest	Loss of wetland	Fish migration	Access road/dam site erosion	Impact on landscape		Improved Access to socio-benefit	Employment and income opportunity		
Amochu Basin																			
A-4	Kunzangling	897	3,928	5	5	5	5	100.0	2	3	5	1	3	2	53.0	2	1	30.0	
A-5	Tingma	567	2,483	5	5	5	5	100.0	5	3	5	1	3	3	78.0	2	1	30.0	
A-8	Dorokha	573	2,511	5	5	5	5	100.0	5	3	5	1	3	3	78.0	5	3	80.0	
A-9	Ngatse	44	193	5	5	5	5	100.0	5	3	5	3	3	3	80.0	2	1	30.0	
A-10	Sanglum	178	779	3	2	3	1	43.0	5	3	5	1	3	4	79.0	5	3	80.0	
A-11	Dojengkha	25	108	5	5	5	5	100.0	5	3	5	2	3	3	79.0	5	3	80.0	
A-12	Dolepchen	41	177	5	5	5	5	100.0	5	3	5	2	3	4	80.0	5	3	80.0	
Total Ar	7	2,324	10,179																
Wangchhu Basin																			
W-3	Dodennang	61	269	5	5	5	5	100.0	2	5	5	3	3	3	70.0	2	1	30.0	
W-6	Chuzom	152	664	4	1	1	1	35.0	5	3	5	3	3	3	80.0	2	1	30.0	
W-7	Getsa	37	161	5	5	5	5	100.0	0	5	5	3	3	2	53.0	5	3	80.0	
W-8	Zangkhepa	73	320	5	5	5	5	100.0	2	5	5	4	3	2	70.0	5	3	80.0	
W-13	Singkhar	38	169	3	3	3	1	48.0	5	4	5	3	3	3	87.0	2	1	30.0	
W-14	Tsendu Goenpa	75	329	3	5	3	1	58.0	5	4	5	4	3	3	88.0	2	1	30.0	
W-19	Pipingchhu	100	436	5	5	5	5	100.0	5	3	5	2	3	5	81.0	5	3	80.0	
Total W	7	536	2,347																
Punatsangchhu Basin																			
P-7	Puna Gom	127	556	5	5	5	5	100.0	2	3	5	4	3	3	57.0	2	1	30.0	
P-15	Tamigdamchu	188	824	5	5	5	5	100.0	2	3	5	4	3	2	56.0	5	3	80.0	
P-17	Tseykha	170	743	5	5	1	5	84.0	2	3	5	4	3	3	57.0	5	3	80.0	
P-18	Jarona	43	187	5	5	5	5	100.0	2	4	5	4	3	3	64.0	2	1	30.0	
P-19	Dangchhu	101	444	3	5	1	5	74.0	2	3	5	4	3	3	57.0	2	1	30.0	
P-20	Rabuna	33	144	5	5	1	5	84.0	5	3	5	4	3	3	81.0	2	1	30.0	
P-26	Thasa	680	2,980	5	5	5	5	100.0	5	3	5	4	3	5	83.0	2	1	30.0	
P-28	Kago-1	102	448	5	5	5	5	100.0	2	3	5	5	3	4	59.0	5	3	80.0	
P-29	Kago	58	256	5	5	5	5	100.0	2	3	5	5	3	5	60.0	2	1	30.0	
P-30	Pinsa	151	662	5	5	5	5	100.0	2	3	5	5	3	5	60.0	2	1	30.0	
P-33	Burichhu	40	175	5	5	5	5	100.0	5	3	5	4	3	5	83.0	5	3	80.0	
P-34	Darachhu	61	266	5	5	5	5	100.0	5	3	5	4	3	4	82.0	2	5	70.0	
P-35	Dagachhu-II	94	413	3	3	3	5	72.0	5	3	5	4	3	5	83.0	2	5	70.0	
P-36	Pelichhu	52	227	3	3	3	1	48.0	5	3	5	4	3	4	82.0	2	5	70.0	
P-38	Tashiding	81	356	5	5	5	5	100.0	5	3	5	3	3	5	82.0	2	5	70.0	
Total Pu	15	1,982	8,680																
Mangdechhu Basin																			
M-5	Bemji	333	1,458	5	5	5	5	100.0	2	4	5	3	3	3	63.0	2	5	70.0	
M-6	Jongthang	170	743	4	3	3	5	77.0	5	3	5	3	3	3	80.0	5	5	100.0	
M-11	Wangdigang	446	1,952	4	3	3	5	77.0	2	3	5	1	3	5	56.0	2	5	70.0	
M-14	Tingtibi	181	792	5	5	5	5	100.0	2	3	5	1	3	5	56.0	2	5	70.0	
M-15	Gomphu	488	2,138	1	2	1	1	25.0	2	3	5	1	3	3	54.0	2	5	70.0	
M-17	Buli	67	292	3	3	3	5	72.0	3	3	5	1	3	4	63.0	2	5	70.0	
M-18	Nyekhar	43	188	5	5	5	5	100.0	3	3	5	2	3	5	65.0	2	5	70.0	
M-19	Sermaling	496	2,171	3	3	1	1	40.0	2	3	5	1	3	3	54.0	5	5	100.0	
Total M	8	2,223	9,735																

表 A 2-9 MCA1 次評価点数表 (Environment- Part 2/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Social					Natural						Development			Remarks
				25%	25%	20%	30%	Total	40%	35%	10%	5%	5%	Total	50%	50%	Total	
				Land Acquisition	Resettlement & asset loss	Living and livelihood means	Cultural Heritage		Located in protected areas	Loss of forest	Loss of wetland	Fish migration	Access road/dam site erosion		Impact on landscape	Improved Access to socio-benefit		
Chamkharchhu Basin																		
C-3	Kurjey	89	390	3	2	3	1	43.0	2	5	5	3	3	4	71.0	5	3	80.0
C-4	Chhutoe	29	129	5	5	5	5	100.0	2	5	5	4	3	3	71.0	2	1	30.0
C-7	Chamkharchhu-IV	451	1,974	3	3	3	5	72.0	5	4	5	3	3	3	87.0	2	1	30.0
C-10	Chamkharchhu-II	456	1,997	3	3	3	5	72.0	5	3	5	3	3	3	80.0	5	5	100.0
Total Ch	4	1,025	4,490															
Kurichhu Basin																		
K-13	Minjey	490	2,144	3	2	3	1	43.0	2	3	4	3	3	2	53.0	2	1	30.0
K-14	Unggarchhu	28	122	5	5	5	5	100.0	3	3	5	5	3	4	67.0	2	1	30.0
K-15	Phawan	502	2,198	3	3	3	1	48.0	3	3	5	4	3	2	64.0	2	1	30.0
K-19	Shongarchhu	32	141	5	5	3	5	92.0	2	3	5	4	3	4	58.0	2	5	70.0
Total Ku	4	1,052	4,606															
Drangmechhu Basin:																		
G-3	Tshaling	204	894	1	2	1	1	25.0	2	3	0	3	3	3	46.0	5	3	80.0
G-4	Ranya	162	710	3	3	3	1	48.0	5	3	5	3	3	4	81.0	2	1	30.0
G-6	Khamdang	494	2,165	3	5	5	5	90.0	5	3	5	4	3	5	83.0	2	1	30.0
G-7	Gongri	590	2,582	3	3	3	1	48.0	5	3	5	3	3	2	79.0	2	1	30.0
G-9	Gamrichhu-3	123	538	5	5	5	1	76.0	0	3	5	4	3	3	41.0	2	1	30.0
G-10	Gamrichhu-2	104	458	3	3	1	1	40.0	5	3	5	4	3	4	82.0	2	1	30.0
G-11	Gamrichhu-1	108	474	3	2	3	1	43.0	5	3	5	3	3	4	81.0	5	3	80.0
G-12	Rotpa	40	177	3	5	3	1	58.0	2	3	5	5	3	3	58.0	2	5	70.0
G-13	Sherichhu	53	230	5	5	5	5	100.0	5	3	5	5	3	4	83.0	2	5	70.0
G-14	Uzorong	763	3,343	3	2	1	5	59.0	5	3	5	3	3	3	80.0	2	5	70.0
G-16	Jerichhu	40	175	5	5	5	5	100.0	5	3	5	4	3	4	82.0	2	5	70.0
G-19	Nagor	53	232	5	5	5	5	100.0	5	3	5	1	3	3	78.0	2	5	70.0
G-20	Pramaling	29	126	5	5	5	5	100.0	5	3	5	3	3	4	81.0	2	5	70.0
G-22	Panbang	1,100	4,640	1	2	1	1	25.0	5	3	5	1	3	3	78.0	5	5	100.0
Total Dr	14	3,863	16,743															
Aiechhu																		
Ai-1	Aiechhu 2	34	150	5	5	5	5	100.0	2	3	5	2	3	4	56.0	2	1	30.0
Ai-3	Pelrithang	30	129	3	3	3	5	72.0	2	3	5	1	3	4	55.0	5	3	80.0
Ai-4	Ronggangchhu	51	221	5	5	5	5	100.0	2	3	5	2	3	4	56.0	2	1	30.0
Total Ai	3	114	500															
Jomori																		
J-1	Zangtheri	29	125	5	5	5	5	100.0	2	3	5	2	3	2	54.0	2	1	30.0
J-2	Jomori-I	82	360	5	5	5	1	76.0	3	3	5	2	3	3	63.0	2	1	30.0
J-3	Maenjiwoong	70	306	5	5	5	5	100.0	3	3	5	2	3	2	62.0	5	3	80.0
J-4	Jomotsangkha	68	300	5	5	5	5	100.0	2	3	5	2	3	2	54.0	5	3	80.0
Total Jo	4	249	1,090															
Nyera Amari:																		
N-1	Nyera Amari Kangpara (G)	71	312	5	5	5	5	100.0	5	3	5	3	3	2	79.0	5	3	80.0
N-2	Lamai Gonpa	37	161	5	5	5	5	100.0	5	3	5	4	3	3	81.0	5	3	80.0
N-3	Paydung-Kangpar	85	374	4	3	3	5	77.0	5	3	5	3	3	3	80.0	5	3	80.0
Total Ny	3	193	846															
Grand	69	13,560	59,217															

(5) MCA Score: Social environment

表 A 2-10 MCA1 次評価点数表 (Social environment- Part 1/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Private land acquisition, Resettlement & asset loss, Negative impact on Living and livelihood means										Cultural heritage		Remarks
				Private land acquisition		Resettlement & asset loss		Negative impact on Living and livelihood means					Cultural heritage			
				Land size (acre)	Score Private land acquisition	No. of Facilities (from Google Earth data)	Score Resettlement & asset loss	1. Damage to crops	2. Forest products	3. Timber products	4. Fishing activities	5. Irrigation	Score Living and livelihood means	No. of affected heritage sites	Score Cultural heritage	
Amochu Basin																
A-4	Kunzangling	897	3,928		5	0	5	No	No	No	No	No	5		5	
A-5	Tingma	567	2,483		5	0	5	No	No	No	No	No	5		5	
A-8	Dorokha	573	2,511		5	0	5	No	No	No	No	No	5		5	
A-9	Ngatse	44	193		5	0	5	No	No	No	No	No	5		5	
A-10	Sanglum	178	779	73.8	3	17	2	Yes	No	No	No	No	3	2	1	
A-11	Dojengkha	25	108		5	0	5	No	No	No	No	No	5		5	
A-12	Dolepchen	41	177		5	0	5	No	No	No	No	No	5		5	
Total Ar	7	2,324	10,179													
Wangchhu Basin																
W-3	Dodennang	61	269		5	0	5	No	No	No	No	No	5		5	
W-6	Chuzom	152	664	14.8	4	220	1	Yes	No	No	No	Yes	1	27	1	
W-7	Getsa	37	161		5	0	5	No	No	No	No	No	5		5	
W-8	Zangkhepa	73	320		5	0	5	No	No	No	No	No	5		5	
W-13	Singkhar	38	169	Partly	3	3	3	Yes	No	No	No	No	3	1	1	
W-14	Tsendu Goenpa	75	329	Partly	3	0	5	Yes	No	No	No	No	3	1	1	
W-19	Pipingchhu	100	436		5	0	5	No	No	No	No	No	5		5	
Total W	7	536	2,347													
Punatsangchhu Basin																
P-7	Puna Gom	127	556		5	0	5	No	No	No	No	No	5		5	
P-15	Tamigdamchu	188	824		5	0	5	No	No	No	No	No	5		5	
P-17	Tseykha	170	743		5	0	5	No	No	No	No	Yes	1		5	
P-18	Jarona	43	187		5	0	5	No	No	No	No	No	5		5	
P-19	Dangchhu	101	444	Partly	3	0	5	Yes	No	No	No	Yes	1		5	
P-20	Rabuna	33	144		5	0	5	No	No	No	No	Yes	1		5	
P-26	Thasa	680	2,980		5	0	5	No	No	No	No	No	5		5	
P-28	Kago-1	102	448		5	0	5	No	No	No	No	No	5		5	
P-29	Kago	58	256		5	0	5	No	No	No	No	No	5		5	
P-30	Pinsa	151	662		5	0	5	No	No	No	No	No	5		5	
P-33	Burichhu	40	175		5	0	5	No	No	No	No	No	5		5	
P-34	Darachhu	61	266		5	0	5	No	No	No	No	No	5		5	
P-35	Dagachhu-II	94	413	Partly	3	Partly	3	Yes	No	No	No	No	3		5	
P-36	Pelichhu	52	227	Partly	3	Partly	3	Yes	No	No	No	No	3	8	1	
P-38	Tashiding	81	356		5	0	5	No	No	No	No	No	5		5	
Total Pu	15	1,982	8,680													
Mangdechhu Basin																
M-5	Bemji	333	1,458		5	0	5	No	No	No	No	No	5		5	
M-6	Jongthang	170	743	17.0	4	2	3	Yes	No	No	No	No	3		5	
M-11	Wangdigang	446	1,952	9.6	4	3	3	Yes	No	No	No	No	3		5	
M-14	Tingtibi	181	792		5	0	5	No	No	No	No	No	5		5	
M-15	Gomphu	488	2,138	277.0	1	43	2	Yes	No	No	No	Yes	1	1	1	
M-17	Buli	67	292	Partly	3	Partly	3	Yes	No	No	No	No	3		5	
M-18	Nyekhar	43	188		5	0	5	No	No	No	No	No	5		5	
M-19	Sermaling	496	2,171	136.0	3	1	3	Yes	No	No	No	Yes	1	3	1	
Total M	8	2,223	9,735													

表 A 2-11 MCA1 次評価点数表 (Social environment- Part 2/2)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Private land acquisition, Resettlement & asset loss, Negative impact on Living and livelihood means										Cultural heritage		Remarks
				Private land acquisition		Resettlement & asset loss		Negative impact on Living and livelihood means					No. of affected heritage sites	Score Cultural heritage		
				Land size (acre)	Score Private land acquisition	No. of Facilities (from Google Earth data)	Score Resettlement & asset loss	1. Damage to crops	2. Forest products	3. Timber products	4. Fishing activities	5. Irrigation			Score Living and livelihood means	
Chamkharchhu Basin																
C-3	Kurjey	89	390	42.5	3	17	2	Yes	No	No	No	No	3	2	1	
C-4	Chhutoe	29	129		5	0	5	No	No	No	No	No	5		5	
C-7	Chamkharchhu-IV	451	1,974	38.1	3	Partly	3	Yes	No	No	No	No	3		5	
C-10	Chamkharchhu-II	456	1,997	Partly	3	Partly	3	Yes	No	No	No	No	3		5	
Total Ch	4	1,025	4,490													
Kurichhu Basin																
K-13	Minjey	490	2,144	86.0	3	31	2	Yes	No	No	No	No	3	3	1	
K-14	Unggarchhu	28	122		5	0	5	No	No	No	No	No	5		5	
K-15	Phawan	502	2,198	64.5	3	Partly	3	Yes	No	No	No	No	3	1	1	
K-19	Shongarchhu	32	141		5	0	5	Yes	No	No	No	No	3		5	
Total Ku	4	1,052	4,606													
Drangmechhu Basin:																
G-3	Tshaling	204	894	376.0	1	37	2	Yes	No	No	No	Yes	1	9	1	
G-4	Ranya	162	710	47.4	3	2	3	Yes	No	No	No	No	3	6	1	
G-6	Khamdang	494	2,165	Partly	3	0	5	No	No	No	No	No	5		5	
G-7	Gongri	590	2,582	108.3	3	6	3	Yes	Yes	No	No	No	3	2	1	
G-9	Gamrichhu-3	123	538		5	0	5	No	No	No	No	No	5	1	1	
G-10	Gamrichhu-2	104	458	Partly	3	Partly	3	Yes	No	No	No	Yes	1	3	1	
G-11	Gamrichhu-1	108	474	105.3	3	73	2	Yes	No	No	No	No	3	3	1	
G-12	Rotpa	40	177	Partly	3	0	5	Yes	No	No	No	No	3	1	1	
G-13	Sherichhu	53	230		5	0	5	No	No	No	No	No	5		5	
G-14	Uzorong	763	3,343	110.0	3	28	2	Yes	Yes	Yes	No	Yes	1		5	
G-16	Jerichhu	40	175		5	0	5	No	No	No	No	No	5		5	
G-19	Nagor	53	232		5	0	5	No	No	No	No	No	5		5	
G-20	Pramaling	29	126		5	0	5	No	No	No	No	No	5		5	
G-22	Panbang	1,100	4,640	700.1	1	45	2	Yes	No	No	No	Yes	1	2	1	
Total Dr	14	3,863	16,743													
Aiechhu																
AI-1	Aiechhu 2	34	150		5	0	5	No	No	No	No	No	5		5	
AI-3	Pelrithang	30	129	Partly	3	3	3	Yes	No	No	No	No	3		5	
AI-4	Ronggangchhu	51	221		5	0	5	No	No	No	No	No	5		5	
Total Ai	3	114	500													
Jomori																
J-1	Zangtheri	29	125		5	0	5	No	No	No	No	No	5		5	
J-2	Jomori-I	82	360		5	0	5	No	No	No	No	No	5	1	1	
J-3	Maenjiwoong	70	306		5	0	5	No	No	No	No	No	5		5	
J-4	Jomotsangkha	68	300		5	0	5	No	No	No	No	No	5		5	
Total Jo	4	249	1,090													
Nyera Amari:																
N-1	Nyera Amari Kangpara (G)	71	312		5	0	5	No	No	No	No	No	5		5	
N-2	Lamai Gonpa	37	161		5	0	5	No	No	No	No	No	5		5	
N-3	Paydung-Kangpar	85	374	2.4	4	2	3	Yes	No	No	No	No	3		5	
Total Ny	3	193	846													
Grand	69	13,560	59,217													

(6) MCA Score: Natural environment

表 A 2-12 MCA1 次評価点数表 (Natural environment – Part 1/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Located in protected area				Score Loss of forest	Loss of wetland			Fish migration				Erosion		Impact on landscape		Remarks
				Main component	Sub component	Transmission line	Score Located in protected area		Class of wetland	Affected % of wetland	Score Loss of wetland	Class of river	Dam in the downstream	Possibility of mitigation (Fishway)	Score Fish migration	Possibility of Mitigation	Score Erosion Access road/ Dam site	Distance from Substation km	Score Impact on landscape	
Amochu Basin																				
A-4	Kunzangling	897	3,928	Multiple	No	Multiple	2	3	No		5	Main	No	No	1	No	3	59	2	
A-5	Tingma	567	2,483	No	No	No	5	3	No		5	Main	No	No	1	No	3	45	3	
A-8	Dorokha	573	2,511	No	No	No	5	3	No		5	Main	No	No	1	No	3	27	3	
A-9	Ngatse	44	193	No	No	No	5	3	No		5	Tributary	No	Yes	3	No	3	26	3	
A-10	Sanglum	178	779	No	No	No	5	3	No		5	Main	No	No	1	No	3	16	4	
A-11	Dojengkha	25	108	No	No	No	5	3	No		5	Main	No	Yes	2	No	3	22	3	
A-12	Dolepchen	41	177	No	No	No	5	3	No		5	Main	No	Yes	2	No	3	15	4	
Total Ar	7	2,324	10,179																	
Wangchhu Basin																				
W-3	Dodennang	61	269	Multiple	Multiple	No	2	5	No		5	Main	Yes	No	3	No	3	21	3	
W-6	Chuzom	152	664	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	34	3	
W-7	Getsa	37	161	Core	Buffer	Corridor	0	5	No		5	Main	Yes	No	3	No	3	97	2	
W-8	Zangkhepa	73	320	Multiple	No	No	2	5	No		5	Main	Yes	Yes	4	No	3	81	2	
W-13	Singkhar	38	169	No	No	No	5	4	No		5	Main	Yes	No	3	No	3	41	3	
W-14	Tsendu Goenpa	75	329	No	No	No	5	4	No		5	Main	Yes	Yes	4	No	3	24	3	
W-19	Pipingchhu	100	436	No	No	No	5	3	No		5	Main	No	Yes	2	No	3	1	5	
Total W	7	536	2,347																	
Punatsangchhu Basin																				
P-7	Puna Gom	127	556	Multiple	No	No	2	3	No		5	Main	Yes	Yes	4	No	3	39	3	
P-15	Tamigdamchu	188	824	Multiple	No	No	2	3	No		5	Main	Yes	Yes	4	No	3	53	2	
P-17	Tseykha	170	743	Multiple	No	No	2	3	No		5	Main	Yes	Yes	4	No	3	38	3	
P-18	Jarona	43	187	Corridor	Corridor	No	2	4	No		5	Main	Yes	Yes	4	No	3	43	3	
P-19	Dangchhu	101	444	Corridor	No	No	2	3	No		5	Main	Yes	Yes	4	No	3	29	3	
P-20	Rabuna	33	144	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	22	3	
P-26	Thasa	680	2,980	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	2	5	
P-28	Kago-1	102	448	Multiple	No	No	2	3	No		5	Tributary	Yes	Yes	5	No	3	16	4	
P-29	Kago	58	256	Multiple	No	No	2	3	No		5	Tributary	Yes	Yes	5	No	3	10	5	
P-30	Pinsa	151	662	Multiple	No	No	2	3	No		5	Tributary	Yes	Yes	5	No	3	6	5	
P-33	Burichhu	40	175	No	No	No	5	3	No		5	Tributary	Yes	No	4	No	3	0	5	
P-34	Darachhu	61	266	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	18	4	
P-35	Dagachhu-II	94	413	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	10	5	
P-36	Pelichhu	52	227	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	16	4	
P-38	Tashiding	81	356	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	9	5	
Total Pu	15	1,982	8,680																	

表 A 2-13 MCA1 次評価点数表 (Natural environment – Part 2/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)																	Remarks
				Located in protected area				Score Loss of forest	Loss of wetland			Fish migration				Erosion		Impact on landscape		
				Main component	Sub component	Transmission line	Score Located in protected area		Class of wetland	Affected % of wetland	Score Loss of wetland	Class of river	Dam in the downstream	Possibility of mitigation (Fishway)	Score Fish migration	Possibility of Mitigation	Score Erosion Access road/ Dam site	Distance from Substation km	Score Impact on landscape	
Mangdechhu Basin																				
M-5	Bemji	333	1,458	Multiple	No	No	2	4	No		5	Main	Yes	No	3	No	3	39	3	
M-6	Jongthang	170	743	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	23	3	
M-11	Wangdigang	446	1,952	Multiple	Multiple	No	2	3	No		5	Main	No	No	1	No	3	4	5	
M-14	Tingtibi	181	792	Multiple	No	No	2	3	No		5	Main	No	No	1	No	3	3	5	
M-15	Gomphu	488	2,138	Multiple	Multiple	No	2	3	No		5	Main	No	No	1	No	3	21	3	
M-17	Buli	67	292	No	No	Corridor	3	3	No		5	Main	No	No	1	No	3	10	4	
M-18	Nyekhar	43	188	No	No	Corridor	3	3	No		5	Main	No	Yes	2	No	3	6	5	
M-19	Sermaling	496	2,171	Multiple	Multiple	No	2	3	No		5	Main	No	No	1	No	3	39	3	
Total M	8	2,223	9,735																	
Chamkharchhu Basin																				
C-3	Kurjey	89	390	Multiple	No	No	2	5	No		5	Main	Yes	No	3	No	3	17	4	
C-4	Chhutoe	29	129	Multiple	No	No	2	5	No		5	Main	Yes	Yes	4	No	3	22	3	
C-7	Chamkharchhu-IV	451	1,974	No	No	No	5	4	No		5	Main	Yes	No	3	No	3	46	3	
C-10	Chamkharchhu-II	456	1,997	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	29	3	
Total Ch	4	1,025	4,490																	
Kurichhu Basin																				
K-13	Minjey	490	2,144	Corridor	Corridor	Corridor	2	3	Other	5.0%	4	Main	Yes	No	3	No	3	82	2	
K-14	Unggarchhu	28	122	No	No	Corridor	3	3	No		5	Tributary	Yes	Yes	5	No	3	14	4	
K-15	Phawan	502	2,198	No	No	Corridor	3	3	No		5	Tributary	Yes	No	4	No	3	69	2	
K-19	Shongarchhu	32	141	Multiple	No	No	2	3	No		5	Tributary	Yes	No	4	No	3	15	4	
Total Ku	4	1,052	4,606																	
Drangmechhu Basin:																				
G-3	Tshaling	204	894	Multiple	No	No	2	3	Ramsar	20.0%	0	Main	Yes	No	3	No	3	27	3	
G-4	Ranya	162	710	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	18	4	
G-6	Khamdang	494	2,165	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	1	5	
G-7	Gongri	590	2,582	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	69	2	
G-9	Gamrichhu-3	123	538	Core	Multiple	Multiple	0	3	No		5	Main	Yes	Yes	4	No	3	24	3	
G-10	Gamrichhu-2	104	458	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	16	4	
G-11	Gamrichhu-1	108	474	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	13	4	
G-12	Rotpa	40	177	Multiple	No	No	2	3	No		5	Tributary	Yes	Yes	5	No	3	23	3	
G-13	Sherichhu	53	230	No	No	No	5	3	No		5	Tributary	Yes	Yes	5	No	3	17	4	
G-14	Uzorong	763	3,343	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	45	3	
G-16	Jerichhu	40	175	No	No	No	5	3	No		5	Tributary	Yes	No	4	No	3	11	4	
G-19	Nagor	53	232	No	No	No	5	3	No		5	Main	No	No	1	No	3	23	3	
G-20	Pramaling	29	126	No	No	No	5	3	No		5	Tributary	No	Yes	3	No	3	14	4	
G-22	Panbang	1,100	4,640	No	No	No	5	3	No		5	Main	No	No	1	No	3	28	3	
Total Dr	14	3,863	16,743																	

表 A 2-14 MCA1 次評価点数表 (Natural environment – Part 3/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)																	Remarks
				Located in protected area				Score Loss of forest	Loss of wetland			Fish migration				Erosion		Impact on landscape		
				Main component	Sub component	Transmission line	Score Located in protected area		Class of wetland	Affected % of wetland	Score Loss of wetland	Class of river	Dam in the downstream	Possibility of mitigation (Fishway)	Score Fish migration	Possibility of Mitigation	Score Erosion Access road/ Dam site	Distance from Substation km	Score Impact on landscape	
Aiechhu																				
Ai-1	Aiechhu 2	34	150	No	Corridor	Corridor	2	3	No		5	Main	No	Yes	2	No	3	13	4	
Ai-3	Pelrithang	30	129	Corridor	Corridor	Corridor	2	3	No		5	Main	No	No	1	No	3	13	4	
Ai-4	Ronggangchhu	51	221	Corridor	Corridor	Corridor	2	3	No		5	Main	No	Yes	2	No	3	15	4	
Total Ai	3	114	500																	
Jomori																				
J-1	Zangtheri	29	125	Multiple	No	Corridor	2	3	No		5	Main	No	Yes	2	No	3	54	2	
J-2	Jomori-I	82	360	No	No	Corridor	3	3	No		5	Main	No	Yes	2	No	3	48	3	
J-3	Maenjiwoong	70	306	No	No	Corridor	3	3	No		5	Main	No	Yes	2	No	3	52	2	
J-4	Jomotsangkha	68	300	No	Multiple	Corridor	2	3	No		5	Main	No	Yes	2	No	3	62	2	
Total Jo	4	249	1,090																	
Nyera Amari:																				
N-1	Nyera Amari Kangpara (G)	71	312	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	58	2	
N-2	Lamai Gonpa	37	161	No	No	No	5	3	No		5	Main	Yes	Yes	4	No	3	44	3	
N-3	Paydung-Kangpar	85	374	No	No	No	5	3	No		5	Main	Yes	No	3	No	3	29	3	
Total Ny	3	193	846																	
Grand	69	13,560	59,217																	

(7) MCA Score: Social development

表 A 2-15 MCA1 次評価点数表 (Social development – Part 1/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Improved Access		Employment and potential of income opportunities				Remarks
				Positive impacts on road access and network	Score Improved Access to socio benefits	Dzongkhag (Dam + Power Plant)	Poverty rate of Dzongkhag	Potential for increased sales of local products	Score Employment and potential for income opportunities	
Amochu Basin										
A-4	Kunzangling	897	3,928	No	2	Haa	1.1%	No	1	
A-5	Tingma	567	2,483	No	2	Haa	1.1%	No	1	
A-8	Dorokha	573	2,511	Yes	5	Haa	1.1%	Yes	3	
A-9	Ngatse	44	193	No	2	Haa+Samtse	8.5%	No	1	
A-10	Sanglum	178	779	Yes	5	Samtse	8.5%	Yes	3	
A-11	Dojengkha	25	108	Yes	5	Chukka	2.2%	Yes	3	
A-12	Dolepchen	41	177	Yes	5	Chukka	2.2%	Yes	3	
Total Ar	7	2,324	10,179							
Wangchhu Basin										
W-3	Dodennang	61	269	No	2	Thimphu	0.3%	No	1	
W-6	Chuzom	152	664	No	2	Paro	0.2%	No	1	
W-7	Getsa	37	161	Yes	5	Thimphu + Paro	0.2%	Yes	3	
W-8	Zangkhepa	73	320	Yes	5	Paro	0.2%	Yes	3	
W-13	Singkhar	38	169	No	2	Haa + Paro	1.1%	No	1	
W-14	Tsendu Goenpa	75	329	No	2	Paro	0.2%	No	1	
W-19	Pipingchhu	100	436	Yes	5	Chukka	2.2%	Yes	3	
Total W	7	536	2,347							
Punatsangchhu Basin										
P-7	Puna Gom	127	556	No	2	Punakha	1.8%	No	1	
P-15	Tamigdamchu	188	824	Yes	5	Punakha	1.8%	Yes	3	
P-17	Tseykha	170	743	Yes	5	Punakha	1.8%	Yes	3	
P-18	Jarona	43	187	No	2	Wanduephodrang	3.0%	No	1	
P-19	Dangchhu	101	444	No	2	Wanduephodrang	3.0%	No	1	
P-20	Rabuna	33	144	No	2	Wanduephodrang	3.0%	No	1	
P-26	Thasa	680	2,980	No	2	Wanduephodrang	3.0%	No	1	
P-28	Kago-1	102	448	Yes	5	Wanduephodrang	3.0%	Yes	3	
P-29	Kago	58	256	No	2	Wanduephodrang	3.0%	No	1	
P-30	Pinsa	151	662	No	2	Wanduephodrang	3.0%	No	1	
P-33	Burichhu	40	175	Yes	5	Tsirang	2.6%	Yes	3	
P-34	Darachhu	61	266	No	2	Dagana	23.7%	No	5	
P-35	Dagachhu-II	94	413	No	2	Dagana	23.7%	No	5	
P-36	Pelichhu	52	227	No	2	Dagana	23.7%	No	5	
P-38	Tashiding	81	356	No	2	Dagana	23.7%	No	5	
Total Pu	15	1,982	8,680							

表 A 2-16 MCA1 次評価点数表 (Social development – Part 2/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Improved Access		Employment and potential of income opportunities				Remarks
				Positive impacts on road access and network	Score Improved Access to socio benefits	Dzongkhag (Dam + Power Plant)	Poverty rate of Dzongkhag	Potential for increased sales of local products	Score Employment and potential for income opportunities	
Mangdechhu Basin										
M-5	Bemji	333	1,458	No	2	Trongsa	9.6%	No	5	
M-6	Jongthang	170	743	Yes	5	Trongsa	9.6%	Yes	5	
M-11	Wangdigang	446	1,952	No	2	Trongsa	9.6%	No	5	
M-14	Tingtibi	181	792	No	2	Zhemgang	16.3%	No	5	
M-15	Gomphu	488	2,138	No	2	Zhemgang	16.3%	No	5	
M-17	Buli	67	292	No	2	Zhemgang	16.3%	No	5	
M-18	Nyekhar	43	188	No	2	Zhemgang	16.3%	No	5	
M-19	Sermaling	496	2,171	Yes	5	Zhemgang	16.3%	Yes	5	
Total M	8	2,223	9,735							
Chamkharchhu Basin										
C-3	Kurjey	89	390	Yes	5	Bhutang	1.7%	Yes	3	
C-4	Chhutoe	29	129	No	2	Bhutang	1.7%	No	1	
C-7	Chamkharchhu-IV	451	1,974	No	2	Bhutang	1.7%	No	1	
C-10	Chamkharchhu-II	456	1,997	Yes	5	Zhemgang	16.3%	Yes	5	
Total Ch	4	1,025	4,490							
Kurichhu Basin										
K-13	Minjey	490	2,144	No	2	Lhuentse	5.2%	No	1	
K-14	Unggarchhu	28	122	No	2	Lhuentse	5.2%	No	1	
K-15	Phawan	502	2,198	No	2	Lhuentse	5.2%	No	1	
K-19	Shongarchhu	32	141	No	2	Mongar	14.0%	No	5	
Total Ku	4	1,052	4,606							
Drangmechhu Basin:										
G-3	Tshaling	204	894	Yes	5	Tashi Yantse	8.7%	Yes	3	
G-4	Ranya	162	710	No	2	Tashi Yantse	8.7%	No	1	
G-6	Khamdang	494	2,165	No	2	Tashi Yantse	8.7%	No	1	
G-7	Gongri	590	2,582	No	2	Trashigang	7.8%	No	1	
G-9	Gamrichhu-3	123	538	No	2	Trashigang	7.8%	No	1	
G-10	Gamrichhu-2	104	458	No	2	Trashigang	7.8%	No	1	
G-11	Gamrichhu-1	108	474	Yes	5	Trashigang	7.8%	Yes	3	
G-12	Rotpa	40	177	No	2	Mongar	14.0%	No	5	
G-13	Sherichhu	53	230	No	2	Mongar	14.0%	No	5	
G-14	Uzorong	763	3,343	No	2	Mongar + Trashigang	14.0%	No	5	
G-16	Jerichhu	40	175	No	2	Pemagatsel	10.0%	No	5	
G-19	Nagor	53	232	No	2	Mongar	14.0%	No	5	
G-20	Pramaling	29	126	No	2	Mongar + Zhemgang	16.3%	No	5	
G-22	Panbang	1,100	4,640	Yes	5	Zhemgang	16.3%	Yes	5	
Total Dr	14	3,863	16,743							

表 A 2-17 MCA1 次評価点数表 (Social development – Part 3/3)

Project code	Name of Project/Tributary	Installed Capacity (MW)	Annual Energy (GWh)	Improved Access		Employment and potential of income opportunities				Remarks
				Positive impacts on road access and network	Score Improved Access to socio benefits	Dzongkhag (Dam + Power Plant)	Poverty rate of Dzongkhag	Potential for increased sales of local products	Score Employment and potential for income opportunities	
Aiechhu										
Ai-1	Aiechhu 2	34	150	No	2	Sarpang	8.4%	No	1	
Ai-3	Pelrithang	30	129	Yes	5	Sarpang	8.4%	Yes	3	
Ai-4	Ronggangchhu	51	221	No	2	Sarpang	8.4%	No	1	
Total Ai	3	114	500							
Jomori										
J-1	Zangtheri	29	125	No	2	Trashigang + Samdrupjongkhar	7.8%	No	1	
J-2	Jomori-I	82	360	No	2	Samdrupjongkhar	4.5%	No	1	
J-3	Maenjiwoong	70	306	Yes	5	Samdrupjongkhar	4.5%	Yes	3	
J-4	Jomotsangkha	68	300	Yes	5	Samdrupjongkhar	4.5%	Yes	3	
Total Jo	4	249	1,090							
Nyera Amari:										
N-1	Nyera Amari Kangpara (G)	71	312	Yes	5	Trashigang	7.8%	Yes	3	
N-2	Lamai Gonpa	37	161	Yes	5	Trashigang	7.8%	Yes	3	
N-3	Paydung-Kangpar	85	374	Yes	5	Trashigang	7.8%	Yes	3	
Total Ny	3	193	846							
Grand	69	13,560	59,217							

2.2 2次評価の点数表

各ポテンシャル地点の2次評価の点数表を以下に示す。

(1) MCA Score: Technical

表 A 2-18 MCA2 次評価点数表 (Technical)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Hydrological risk				Geological risk					5%	5%	5%	Accessibility		Total	Remarks	
				30%	30%	30%	10%	15%	25%	25%	25%	10%	100%	100%	80%	20%	100%			
				Ratio catchment area	Recorded period (year)	Density of primary stations	Density of secondary stations	Earthquake Intensity	Slope stability Risk	Weak zone	Permeable & anisotropic rocks	Construction material risk	GLOF risk	Sediment-ation risk	Distance from roadway	Distance from railway station	Transmission line risk			
Amochu Basin																				
A-4	Kunzangling	860	3,766	5	4	3	3	2	3	5	5	4	5	4	2	4	2	2	76.3	
A-5	Tingma	783	3,428	5	4	3	3	2	3	5	5	4	5	4	2	3	3	3	77.1	
A-8	Dorokha	550	2,407	5	4	3	3	2	4	4	5	5	5	4	3	5	3	3	79.3	
Total Ar	3	2,192	9,601																	
Wangchhu Basin																				
W-6	Chuzom	152	664	5	3	3	1	2	4	5	5	3	5	4	5	4	3	3	77.7	
W-8	Zangkhepa	54	236	4	5	3	1	2	4	4	3	4	5	4	5	4	2	2	71.3	
W-19	Pipingchhu	100	436	1	5	3	1	2	3	4	1	5	5	4	3	5	5	5	60.5	
Total W	3	305	1,336																	
Punatsangchhu Basin																				
P-15	Tamigdamchhu	188	824	4	5	3	2	2	4	5	5	5	1	4	3	2	2	2	75.6	
P-17	Tseykha	215	943	4	5	3	2	2	4	5	5	5	4	4	5	3	3	3	80.9	
P-26	Thasa	706	3,094	5	2	3	2	2	4	4	5	5	5	4	5	2	5	5	78.1	
P-28	Kago-1	102	448	1	5	3	2	2	4	5	5	5	5	4	3	1	4	4	76.0	
P-29	Kago	58	255	1	5	3	2	2	5	3	5	5	5	4	1	2	5	5	73.1	
P-30	Pinsa	153	672	1	5	3	2	2	5	5	5	5	5	4	3	2	5	5	79.7	
P-34	Darachhu	89	389	1	2	3	2	2	4	5	5	5	5	4	3	1	4	4	70.6	
P-35	Dagachhu-II	71	311	1	2	3	2	2	4	5	5	5	5	4	5	1	5	5	73.2	
P-38	Tashiding	81	356	1	2	3	2	2	1	2	5	2	5	4	4	1	5	5	53.9	
Total Pu	9	1,665	7,293																	
Mangdechhu Basin																				
M-5	Bemji	333	1,458	5	5	3	1	2	4	5	5	4	1	5	3	2	3	3	77.8	
M-6	Jongthang	227	995	5	5	3	1	2	4	5	5	4	1	5	5	2	3	3	79.4	
M-11	Wangdigang	502	2,200	5	3	3	1	2	4	5	4	4	2	5	5	3	5	5	76.5	
M-17	Buli	69	302	1	3	3	1	2	4	5	5	5	5	5	3	4	4	4	74.8	
M-18	Nyekhar	43	188	1	3	3	1	2	4	5	5	5	5	5	3	5	5	5	75.8	
Total M	5	1,174	5,143																	
Chamkharchhu Basin																				
C-7	Chamkharchhu-IV	451	1,974	5	2	4	1	2	4	3	4	5	2	5	5	1	2	2	67.9	
C-10	Chamkharchhu-II	414	1,814	5	2	4	1	2	4	5	5	4	2	5	3	3	3	3	74.9	
Total Ch	2	865	3,788																	
Kurichhu Basin																				
K-13	Minjey	673	2,948	5	2	4	4	1	4	4	4	3	1	4	5	2	2	2	66.9	
K-15	Phawan	499	2,185	5	5	4	4	1	4	5	3	2	2	4	5	2	2	2	72.3	
Total Ku	2	1,172	5,133																	
Drangmechhu Basin:																				
G-6	Khamdang	512	2,242	5	5	2	1	1	4	5	5	4	5	4	5	2	5	5	80.3	
G-7	Gongri	546	2,392	5	5	2	1	1	4	5	5	5	5	4	5	3	2	2	78.2	
G-9	Gamrichhu-3	123	538	2	4	2	1	1	4	4	3	5	5	4	4	2	3	3	63.4	
G-10	Gamrichhu-2	108	471	4	4	2	1	1	4	5	3	4	5	4	5	3	4	4	71.7	
G-11	Gamrichhu-1	150	656	5	4	2	1	1	4	3	3	4	5	4	5	3	4	4	68.5	
G-13	Sherichhu	58	254	5	5	2	1	1	4	2	1	4	5	4	5	3	4	4	62.8	
G-14	Uzorong	840	3,678	5	5	2	1	1	4	3	4	3	5	4	5	3	3	3	70.8	
G-16	Jerichhu	39	169	4	3	2	1	1	4	3	4	2	5	4	4	4	4	4	64.8	
G-19	Nagor	59	258	4	3	2	1	1	4	2	1	2	5	4	2	4	3	3	52.2	
G-22	Panbang	993	4,349	5	2	2	1	1	1	1	4	4	5	4	5	4	3	3	53.6	
Total Dr	10	3,426	15,005																	
Nyera Amari:																				
N-1	Nyera Amari Kangpara (G)	71	312	4	5	1	1	1	4	3	5	5	5	4	2	2	2	2	67.3	
N-2	Lamai Gonpa	37	161	4	5	1	1	1	4	2	1	4	5	4	2	2	3	3	54.8	
N-3	Paydung-Kangpar	73	319	5	5	1	1	1	4	4	4	4	5	4	5	1	3	3	69.6	
Total Ny	3	181	791																	
Grand	37	10,980	48,091																	

(2) MCA Score: Technical <Sub-Score>

表 A 2-19 MCA2 次評価点数表 (Technical <Sub-Score> – Part 1/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Hydrological risk										Geological risk						GLOF risk		Sedimentation risk		Accessibility				Transmission line risk		Remarks					
				Ratio catchment area				Density of gauging stations						15%	15%	25%	25%	25%	10%					80%		20%									
				catchment area (dam site) km2	catchment area (station) km2	Selected Station	Evaluation	Ratio catchment area	Score Ratio catchment area	Recorded period (year)	Score Recorded period	catchment area (River basin) km2	No. of Primary stations	Density of primary stations	Score Density of primary stations	No. of Secondary stations	Density of secondary stations	Score Density of secondary stations	Earthquake Intensity	Score Earthquake Intensity	Score Slope stability risk	Score Weak zone	Score Permeable, anisotropic rocks	Score Construction material risk	Elongation from Glacier Lake (km)	Score GLOF risk	Annual sediment volume ton/km2	Score Sedimentation risk	Distance from roadway km		Score Distance from roadway	Distance from railway station: km	Score Distance from railway station	Distance from Substation km	Score T/L risk
Amochu Basin																																			
A-4	Kunzangling	860	3,766	2,100	3,055	Dorokha	Good	0.69	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	3	5	5	4	200	5	516	4	20	2	150	4	59.0	2	
A-5	Tingma	783	3,428	2,208	3,055	Dorokha	Good	0.72	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	3	5	5	4	200	5	516	4	20	2	170	3	45.2	3	
A-8	Dorokha	550	2,407	2,602	3,055	Dorokha	Good	0.85	5	19	4	2,323	1	0.0004	3	1	0.0004	3	High	2	4	4	5	5	200	5	516	4	15	3	80	5	27.4	3	
Total Ar	3	2,192	9,601																																
Wangchhu Basin																																			
W-6	Chuzom	152	664	2,483	2,520	Damchhu/Tamchhu	Good	0.99	5	14	3	4,644	2	0.0004	3	0	0.0000	1	High	2	4	5	5	3	200	5	516	4	0	5	110	4	34.4	3	
W-8	Zangkhepa	54	236	471	1,101	Paro(closed)	Good	0.43	4	24	5	4,644	2	0.0004	3	0	0.0000	1	High	2	4	4	3	4	200	5	516	4	5	5	140	4	81.0	2	
W-19	Pipingchhu	100	436	217	3,573	Chukha/Chimako	Good	0.06	1	39	5	4,644	2	0.0004	3	0	0.0000	1	High	2	3	4	1	5	200	5	516	4	15	3	90	5	0.6	5	
Total W	3	305	1,336																																
Punatsangchhu Basin																																			
P-15	Tamigdamchu	188	824	2,120	6,271	Wangdue/Wangdue	Good	0.34	4	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	5	24	1	516	4	15	3	220	2	52.7	2	
P-17	Tseykha	215	943	2,205	6,271	Wangdue/Wangdue	Good	0.35	4	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	5	158	4	516	4	0	5	200	3	38.2	3	
P-26	Thasa	706	3,094	7,040	8,593	Sunkosh/Turitar	Good	0.82	5	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	4	5	5	200	5	965	4	0	5	250	2	2.3	5	
P-28	Kago-1	102	448	250	6,271	Wangdue/Wangdue	Good	0.04	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	5	200	5	516	4	15	3	260	1	16.1	4	
P-29	Kago	58	255	260	6,271	Wangdue/Wangdue	Good	0.04	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	5	3	5	5	200	5	516	4	30	1	250	2	9.6	5	
P-30	Pinsa	153	672	427	6,271	Wangdue/Wangdue	Good	0.07	1	25	5	9,748	4	0.0004	3	3	0.0003	2	High	2	5	5	5	5	200	5	516	4	15	3	230	2	6.1	5	
P-34	Darachhu	89	389	220	8,593	Sunkosh/Turitar	Good	0.03	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	5	200	5	965	4	15	3	310	1	17.5	4	
P-35	Dagachhu-II	71	311	307	8,593	Sunkosh/Turitar	Good	0.04	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	4	5	5	5	200	5	965	4	0	5	300	1	9.8	5	
P-38	Tashiding	81	356	778	8,593	Sunkosh/Turitar	Good	0.09	1	8	2	9,748	4	0.0004	3	3	0.0003	2	High	2	1	2	5	2	200	5	965	4	7	4	280	1	9.1	5	
Total Pu	9	1,665	7,293																																
Mangdechhu Basin																																			
M-5	Bemji	333	1,458	1,010	1,390	Bjizam	Good	0.73	5	21	5	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	4	22	1	153	5	15	3	250	2	39.5	3	
M-6	Jongthang	227	995	1,176	1,390	Bjizam	Good	0.85	5	21	5	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	4	45	1	153	5	0	5	230	2	22.7	3	
M-11	Wangdigang	502	2,200	2,490	3,322	Tingtibi	Good	0.75	5	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	4	4	85	2	153	5	0	5	190	3	4.4	5	
M-17	Buil	69	302	214	3,322	Tingtibi	Good	0.06	1	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	5	200	5	153	5	5	5	170	3	10.4	4	
M-18	Nyekhar	43	188	244	3,322	Tingtibi	Good	0.07	1	11	3	4,085	2	0.0005	3	1	0.0002	1	High	2	4	5	5	5	200	5	153	5	5	5	165	3	6.1	5	
Total M	5	1,174	5,143																																
Chamkharchhu Basin																																			
C-7	Chamkharchhu-IV	451	1,974	2,080	2,728	Shinghar/Bemet bane	Fair	0.76	5	6	2	3,178	2	0.0006	4	0	0.0000	1	High	2	4	3	4	5	69	2	56	5	5	5	280	1	51.6	2	
C-10	Chamkharchhu-II	414	1,814	2,525	2,728	Shinghar/Bemet bane	Fair	0.93	5	6	2	3,178	2	0.0006	4	0	0.0000	1	High	2	4	5	5	4	99	2	56	5	15	3	180	3	48.5	3	
Total Ch	2	865	3,788																																
Kurichhu Basin																																			
K-13	Minjey	673	2,948	8,926	7,270	Sumpa	Fair	1.23	5	8	2	3,837	2	0.0005	4	3	0.0008	4	Very high	1	4	4	4	3	39	1	552	4	0	5	250	2	82.4	2	
K-15	Phawan	499	2,185	9,388	8,547	Autsho	Good	1.10	5	24	5	3,837	2	0.0005	4	3	0.0008	4	Very high	1	4	5	3	2	52	2	552	4	0	5	230	2	68.8	2	
Total Ku	2	1,172	5,133																																

(3) MCA Score: Economic

表 A 2-21 MCA2 次評価点数表 (Economic – Part 1/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Annual Energy excluding E-flow (GWh)	Power plant			Transmission line, substation			Total Cost (million Nu)	Construction Cost per kW (1000 Nu)	Construction Cost per kWh (Nu)	Benefit					Total Benefit (million Nu)	B/C	Score B/C	Remarks			
					Construction cost (million Nu)	10.6%	1.0%	Construction cost (million Nu)	10.6%	1.0%				Firm power (MW)	Firm power Downstream (MW)	kW value (million Nu)	Supply energy (GWh)	kWh value (million Nu)					Ancillary service energy (GWh)	Ancillary service value (million Nu)	
						Annual expense (million Nu)	O&M expense (million Nu)		Annual expense (million Nu)	O&M expense (million Nu)															
Amochu Basin																									
A-4	Kunzangling	860	3,766	3,645	43,519	4,616	435	6,011	638	60	5,749	57.6	13.6	60.0	0.0	586	3,536	14,850	409	1,351	16,787	2.92	5.0	Protected area	
A-5	Tingma	783	3,428	3,318	37,491	3,977	375	5,307	563	53	4,968	54.7	12.9	44.3	0.0	433	3,219	13,518	0	0	13,951	2.81	5.0		
A-8	Dorokha	550	2,407	2,330	46,103	4,891	461	4,341	461	43	5,856	91.8	21.7	40.3	0.0	394	2,260	9,492	263	867	10,753	1.84	5.0		
Total Ar	3	2,192	9,601	9,293																					
Wangchhu Basin																									
W-6	Chuzom	152	664	664	100,041	10,612	1,000	1,822	193	18	11,824	671.8	153.4	79.1	499.3	5,653	644	2,706	220	724	9,083	0.77	1.0		
W-8	Zangkhepa_rev	54	236	229	8,317	882	83	2,808	298	28	1,291	206.8	48.6	5.6	0.0	55	222	933	0	0	987	0.76	1.0		
W-19	Pipingchhu	100	436	422	12,486	1,325	125	864	92	9	1,550	134.1	31.6	12.0	0.0	118	410	1,720	0	0	1,838	1.19	1.9		
Total W	3	305	1,336	1,315																					
Punatsangchhu Basin																									
P-15	Tamigdamchu	188	824	801	24,033	2,549	240	2,643	280	26	3,097	141.7	33.3	20.1	0.0	197	777	3,263	0	0	3,460	1.12	1.6	Protected area	
P-17	Tseykha_rev	215	943	943	21,463	2,277	215	2,340	248	23	2,763	110.5	25.2	31.9	14.0	448	915	3,843	224	738	5,029	1.82	5.0		
P-26	Thasa_rev2	706	3,094	2,997	79,615	8,445	796	2,852	303	29	9,573	116.8	27.5	112.2	13.1	1,225	2,907	12,208	371	1,224	14,656	1.53	3.7		
P-28	Kago-1	102	448	434	6,275	666	63	1,779	189	18	935	78.8	18.6	11.9	0.0	116	421	1,769	0	0	1,885	2.02	5.0	Protected area	
P-29	Kago_Rev	58	255	247	5,116	543	51	988	105	10	709	104.9	24.7	6.8	0.0	66	240	1,007	0	0	1,073	1.51	3.6		
P-30	Pinsa_Rev2	153	672	651	8,947	949	89	1,596	169	16	1,224	68.7	16.2	19.3	0.0	188	632	2,654	0	0	2,842	2.32	5.0		
P-34	Darachhu Rev	89	389	377	8,650	918	87	1,427	151	14	1,170	113.3	26.7	11.0	0.0	108	366	1,537	0	0	1,644	1.41	3.0		
P-35	Dagachhu-II_Rev	71	311	301	7,276	772	73	1,250	133	13	990	120.1	28.3	8.8	0.0	86	292	1,227	0	0	1,313	1.33	2.6		
P-38	Tashiding	81	356	356	10,927	1,159	109	1,239	131	12	1,412	149.7	34.2	13.5	2.9	160	345	1,450	86	284	1,894	1.34	2.7	Geological risk	
Total Pu	9	1,665	7,293	7,108																					
Mangdechhu Basin																									
M-5	Bemji	333	1,458	1,418	30,700	3,257	307	3,779	401	38	4,002	103.6	24.3	39.5	3.4	419	1,376	5,778	167	552	6,749	1.69	4.4	Protected area	
M-6	Jongthang_rev3	227	995	995	22,878	2,427	229	2,913	309	29	2,994	113.5	25.9	31.2	12.3	426	965	4,054	233	769	5,249	1.75	4.8		
M-11	Wangdigang_rev	502	2,200	2,140	49,895	5,293	499	2,877	305	29	6,126	105.1	24.7	64.8	0.0	634	2,075	8,717	255	843	10,193	1.66	4.3		
M-17	Buli_rev	69	302	292	6,070	644	61	1,010	107	10	822	102.7	24.2	8.2	0.0	80	283	1,190	0	0	1,270	1.55	3.7		
M18	Nyekhar	43	188	182	6,032	640	60	916	97	9	807	161.8	38.2	5.1	0.0	50	177	741	0	0	791	0.98	1.0		
Total M	5	1,174	5,143	5,027																					

表 A 2-22 MCA2 次評価点数表 (Economic – Part 2/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Annual Energy excluding E-flow (GWh)	Power plant			Transmission line, substation			Total Cost (million Nu)	Construction Cost per kW (1000 Nu)	Construction Cost per kWh (Nu)	Benefit					Total Benefit (million Nu)	B/C	Score B/C	Remarks		
					Construction cost (million Nu)	10.6%	1.0%	Construction cost (million Nu)	10.6%	1.0%				Firm power (MW)	Firm power Downstream (MW)	kW value (million Nu)	Supply energy (GWh)	kWh value (million Nu)					Ancillary service energy (GWh)	Ancillary service value (million Nu)
						Annual expense (million Nu)	O&M expense (million Nu)		Annual expense (million Nu)	O&M expense (million Nu)														
Chamkharchhu Basin																								
C-7	Chamkharchhu-IV	451	1,974	1,920	37,916	4,022	379	4,416	468	44	4,914	93.9	22.0	64.0	14.1	763	1,863	7,823	232	767	9,352	1.90	5.0	
C-10	Chamkharchhu-II_Rev	414	1,814	1,814	34,377	3,647	344	4,251	451	43	4,484	93.3	21.3	81.8	21.9	1,014	1,760	7,391	452	1,493	9,898	2.21	5.0	
Total Ch	2	865	3,788	3,734																				
Kurichhu Basin																								
K-13	Minjey_rev2	673	2,948	2,863	61,276	6,500	613	7,089	752	71	7,936	101.6	23.9	93.1	35.4	1,256	2,777	11,663	346	1,141	14,060	1.77	4.9	
K-15	Phawan	499	2,185	2,185	88,255	9,362	883	5,273	559	53	10,857	187.5	42.8	86.3	83.3	1,658	2,119	8,901	531	1,754	12,312	1.13	1.7	
Total Ku	2	1,172	5,133	5,047																				
Drangmechhu Basin:																								
G-6	Khamdang_rev	512	2,242	2,173	55,549	5,893	555	3,032	322	30	6,800	114.4	27.0	70.2	2.8	713	2,108	8,855	263	867	10,434	1.53	3.7	Near border
G-7	Gongri_rev	546	2,392	2,319	61,560	6,530	616	6,380	677	64	7,886	124.4	29.3	82.1	16.7	966	2,249	9,446	284	937	11,349	1.44	3.2	
G-9	Gamrichhu-3	123	538	521	10,952	1,162	110	1,971	209	20	1,500	105.3	24.8	14.2	0.0	139	506	2,123	0	0	2,262	1.51	3.5	Protected area
G-10	Gamrichhu-2_rev2	108	471	457	10,552	1,119	106	1,778	189	18	1,431	114.6	27.0	15.3	0.4	154	443	1,861	56	183	2,198	1.54	3.7	
G-11	Gamrichhu-1_rev2	150	656	636	13,642	1,447	136	1,739	184	17	1,785	102.7	24.2	17.4	0.0	170	617	2,592	0	0	2,762	1.55	3.7	
G-13	Sherichhu_rev	58	254	246	8,430	894	84	755	80	8	1,066	158.6	37.3	6.7	0.0	66	239	1,002	0	0	1,068	1.00	1.0	
G-14	Uzorong_rev2	840	3,678	3,678	78,776	8,356	788	5,298	562	53	9,759	100.1	22.9	165.8	75.6	2,359	3,568	14,984	917	3,027	20,370	2.09	5.0	
G-16	Jerichhu	39	169	164	5,143	546	51	648	69	6	672	150.2	35.4	4.5	0.0	44	159	667	0	0	711	1.06	1.3	
G-19	Nagor	59	258	251	7,774	825	78	855	91	9	1,002	146.6	34.4	5.8	0.0	56	243	1,021	0	0	1,077	1.08	1.4	
G-22	Panbang	993	4,349	4,349	113,900	12,082	1,139	4,528	480	45	13,747	119.3	27.2	184.9	0.0	1,807	4,218	17,716	536	1,769	21,292	1.55	3.7	Geological risk
Total Dr	10	3,426	15,005	14,793																				
Nyera Amari:																								
N-1	Nyera Amari Kangpara (G)	71	312	302	6,134	651	61	1,814	192	18	923	111.7	26.3	9.6	0.0	94	293	1,231	0	0	1,325	1.44	3.2	
N-2	Lamai Gonpa	37	161	156	6,438	683	64	1,553	165	16	928	218.1	51.3	4.9	0.0	48	151	634	0	0	682	0.74	1.0	
N-3	Paydung-Kangpar_rev2	73	319	319	8,049	854	80	1,327	141	13	1,088	128.8	29.4	11.1	0.0	109	309	1,299	0	0	1,408	1.29	2.5	
Total Ny	3	181	791	777																				
Grand	37	10,980	48,091	47,095																				

(4) MCA Score: Environment

表 A 2-23 MCA2 次評価点数表 (Environment)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Social					Natural							Development			Remarks	
				25%	25%	20%	30%	Total	35%	30%	10%	10%	5%	5%	5%	Total	50%	50%		Total
				Land Acquisition	Resettlement & asset loss	Living and livelihood means	Cultural Heritage		Located in protected areas	Loss of forest	Loss of wetland	Loss of endangered species	Fish migration	Access road/dam site erosion	Impact on landscape		Improved Access to socio-benefit	Employment and income opportunity		
Amochu Basin																				
A-4	Kunzangling	860	3,766	5	5	5	5	100.0	0	3	5	1	1	3	1	35.0	4.2	2.0	62.0	
A-5	Tingma	783	3,428	5	5	5	5	100.0	5	3	5	2	1	3	2	73.0	5.0	2.0	70.0	
A-8	Dorokha	550	2,407	5	5	5	5	100.0	5	3	5	2	1	3	2	73.0	3.2	3.0	62.0	
Total Ar	3	2,192	9,601																	
Wangchhu Basin																				
W-6	Chuzom	152	664	1	1	1	1	20.0	5	3	5	5	3	3	3	82.0	1.0	2.0	30.0	
W-8	Zangkhepa	54	236	5	5	5	1	76.0	2	5	5	3	4	3	2	69.0	1.4	1.0	24.0	
W-19	Pipingchhu	100	436	5	5	1	5	84.0	5	3	5	2	2	3	5	77.0	2.8	4.0	68.0	
Total W	3	305	1,336																	
Punatsangchhu Basin																				
P-15	Tamigdamchu	188	824	5	5	5	5	100.0	0	3	5	3	4	3	2	43.0	2.6	3.0	56.0	
P-17	Tseykha	215	943	5	5	1	1	60.0	2	3	5	2	4	3	3	56.0	1.8	3.0	48.0	
P-26	Thasa	706	3,094	4	3	5	5	85.0	5	3	5	1	4	3	4	76.0	1.8	4.0	58.0	
P-28	Kago-1	102	448	5	5	5	5	100.0	0	3	5	1	5	3	4	42.0	3.8	4.0	78.0	
P-29	Kago	58	255	5	5	5	5	100.0	2	3	5	3	5	3	5	61.0	3.4	4.0	74.0	
P-30	Pinsa	153	672	5	5	5	5	100.0	2	3	5	1	5	3	5	57.0	2.0	4.0	60.0	
P-34	Darachhu	89	389	5	5	1	5	84.0	5	3	5	1	4	3	4	76.0	2.4	4.0	64.0	
P-35	Dagachhu-II	71	311	5	5	5	5	100.0	5	3	5	1	4	3	5	77.0	1.6	4.0	56.0	
P-38	Tashiding	81	356	5	5	5	5	100.0	5	3	5	1	3	3	5	76.0	2.6	3.3	59.0	
Total Pu	9	1,665	7,293																	
Mangdechhu Basin																				
M-5	Bernji	333	1,458	5	5	5	5	100.0	0	4	5	2	3	3	2	46.0	2.3	3.0	53.0	
M-6	Jongthang	227	995	3	5	1	5	74.0	5	3	5	3	3	3	2	77.0	2.4	3.0	54.0	
M-11	Wangdigang	502	2,200	4	3	1	1	45.0	2	3	5	1	1	3	4	52.0	1.4	1.0	24.0	
M-17	Buli	69	302	5	5	5	5	100.0	3	3	5	2	1	3	5	62.0	2.8	4.0	68.0	
M-18	Nyekhar	43	188	5	5	5	5	100.0	3	3	5	1	2	3	5	61.0	3.0	4.0	70.0	
Total M	5	1,174	5,143																	
Chamkharchhu Basin																				
C-7	Chamkharchhu-IV	451	1,974	3	5	1	1	50.0	5	4	5	2	3	3	1	80.0	1.8	3.0	48.0	
C-10	Chamkharchhu-II	414	1,814	5	5	5	5	100.0	5	3	5	2	3	3	2	75.0	5.0	4.0	90.0	
Total Ch	2	865	3,788																	
Kurichhu Basin																				
K-13	Minjey	673	2,948	3	3	1	1	40.0	2	3	4	2	3	3	1	51.0	1.6	4.0	56.0	
K-15	Phawan	499	2,185	4	5	1	3	67.0	3	3	5	2	4	3	1	61.0	2.2	4.0	62.0	
Total Ku	2	1,172	5,133																	
Drangmechhu Basin:																				
G-6	Khamdang	512	2,242	4	5	1	5	79.0	5	3	5	2	4	3	4	78.0	2.1	3.3	54.0	
G-7	Gongri	546	2,392	2	3	1	1	35.0	5	3	5	3	3	3	1	76.0	1.0	4.0	50.0	
G-9	Gamrichhu-3	123	538	5	5	5	5	100.0	0	3	5	2	4	3	3	42.0	2.4	3.7	61.0	
G-10	Gamrichhu-2	108	471	5	5	5	5	100.0	5	3	5	2	4	3	4	78.0	1.7	3.7	54.0	
G-11	Gamrichhu-1	150	656	5	5	5	3	88.0	5	3	5	2	3	3	4	77.0	1.0	4.0	50.0	
G-13	Sherichhu	58	254	5	5	5	5	100.0	5	3	5	2	5	3	5	80.0	2.1	4.0	61.0	
G-14	Uzorong	840	3,678	2	2	1	3	42.0	5	3	5	2	3	3	2	75.0	2.8	3.7	65.0	
G-16	Jerichhu	39	169	5	5	5	5	100.0	5	3	5	3	4	3	5	81.0	2.5	3.0	55.0	
G-19	Nagor	59	258	5	5	5	3	88.0	5	3	5	2	1	3	4	75.0	3.7	4.0	77.0	
G-22	Panbang	993	4,349	1	2	1	2	31.0	5	3	5	2	1	3	2	73.0	2.2	3.6	58.0	
Total Dr	10	3,426	15,005																	
Nyera Amari:																				
N-1	Nyera Amari Kangpara (G)	71	312	5	5	5	5	100.0	5	3	5	2	3	3	3	76.0	1.0	4.0	50.0	
N-2	Lamai Gonpa	37	161	5	5	5	5	100.0	5	3	5	2	4	3	4	78.0	2.8	4.0	68.0	
N-3	Paydung-Kangpar	73	319	5	5	5	3	88.0	5	3	5	2	3	3	4	77.0	1.7	4.0	57.0	
Total Ny	3	181	791																	
Grand	37	10,980	48,091																	

(5) MCA Score: Social environment

表 A 2-24 MCA2 次評価点数表 (Social environment – Part 1/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Private land acquisition		Resettlement & asset loss		Negative impact on Living and livelihood means					Cultural heritage			Remarks
				Land size (acre)	Score Private land acquisition	No. of Facilities (from Google Earth data)	Score Resettlement & asset loss	1. Agriculture	2. Forest products or Timber products	3. Livestock	4. local business	Score Living and livelihood means	No. of affected heritage sites within 500m	If any heritage is of National importance	Score Cultural heritage	
Amochu Basin																
A-4	Kunzangling	860	3,766		5		5	No	No	No	No	5	0	No	5	
A-5	Tingma	783	3,428		5		5	No	No	No	No	5	0	No	5	
A-8	Dorokha	550	2,407		5		5	No	No	No	No	5	0	No	5	
Total Ar	3	2,192	9,601													
Wangchhu Basin																
W-6	Chuzom	152	664	600.8	1	221	1	Yes	No	No	No	1	28	No	1	
W-8	Zangkhepa	54	236		5		5	No	No	No	No	5	2	Yes	1	
W-19	Pipingchhu	100	436		5		5	Yes	Yes	Yes	No	1	0	No	5	
Total W	3	305	1,336													
Punatsangchhu Basin																
P-15	Tamigdamchu	188	824		5		5	No	No	No	No	5	0	No	5	
P-17	Tseykha	215	943		5		5	Yes	No	No	No	1	3	Yes	1	
P-26	Thasa	706	3,094	3.0	4	3	3	No	No	No	No	5	0	No	5	
P-28	Kago-1	102	448		5		5	No	No	No	No	5	0	No	5	
P-29	Kago	58	255		5		5	No	No	No	No	5	0	No	5	
P-30	Pinsa	153	672		5		5	No	No	No	No	5	0	No	5	
P-34	Darachhu	89	389		5		5	Yes	No	No	No	1	0	No	5	
P-35	Dagachhu-II	71	311		5		5	No	No	No	No	5	0	No	5	
P-38	Tashiding	81	356		5		5	No	No	No	No	5	0	No	5	
Total Pu	9	1,665	7,293													
Mangdechhu Basin																
M-5	Bemji	333	1,458		5		5	No	No	No	No	5	0	No	5	
M-6	Jongthang	227	995	25.5	3		5	Yes	No	Yes	No	1	0	No	5	
M-11	Wangdigang	502	2,200	9.1	4	3	3	Yes	No	No	No	1	3	Yes	1	
M-17	Buli	69	302		5		5	No	No	No	No	5	0	No	5	
M-18	Nyekhar	43	188		5		5	No	No	No	No	5	0	No	5	
Total M	5	1,174	5,143													
Chamkharchhu Basin																
C-7	Chamkharchhu-IV	451	1,974	38.1	3		5	Yes	No	Yes	No	1	11	Yes	1	
C-10	Chamkharchhu-II	414	1,814	0.0	5		5	No	No	No	No	5	0	No	5	
Total Ch	2	865	3,788													
Kurichhu Basin																
K-13	Minjey	673	2,948	31.1	3	17	3	Yes	No	No	No	1	10	Yes	1	
K-15	Phawan	499	2,185	15.7	4		5	Yes	No	No	No	1	1	No	3	
Total Ku	2	1,172	5,133													

表 A 2-25 MCA2 次評価点数表 (Social environment – Part 2/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Social environment									Remarks		
				Private land acquisition		Resettlement & asset loss		Negative impact on Living and livelihood means						Cultural heritage	
				Land size (acre)	Score Private land acquisition	No. of Facilities (from Google Earth data)	Score Resettlement & asset loss	1. Agriculture	2. Forest products or Timber products	3. Livestock	4. local business	Score Living and livelihood means		No. of affected heritage sites within 500m	If any heritage is of National importance
Drangmechhu Basin:															
G-6	Khamdang	512	2,242	2.54	4		5	Yes	Yes	Yes	No	1	0	No	5
G-7	Gongri	546	2,392	65.5	2	5	3	Yes	Yes	No	No	1	6	Yes	1
G-9	Gamrichhu-3	123	538		5		5	No	No	No	No	5	0	No	5
G-10	Gamrichhu-2	108	471		5		5	No	No	No	No	5	0	No	5
G-11	Gamrichhu-1	150	656		5		5	No	No	No	No	5	1	No	3
G-13	Sherichhu	58	254		5		5	No	No	No	No	5	0	No	5
G-14	Uzorong	840	3,678	96.4	2	35	2	Yes	Yes	Yes	No	1	1	No	3
G-16	Jerichhu	39	169		5		5	No	No	No	No	5	0	No	5
G-19	Nagor	59	258		5		5	No	No	No	No	5	1	No	3
G-22	Panbang	993	4,349	679.0	1	46	2	Yes	No	No	No	1	2	No	2
Total Dr	10	3,426	15,005												
Nyera Amari:															
N-1	Nyera Amari Kangpara (G)	71	312		5		5	No	No	No	No	5	0	No	5
N-2	Lamai Gonpa	37	161		5		5	No	No	No	No	5	0	No	5
N-3	Paydung-Kangpar	73	319		5		5	No	No	No	No	5	1	No	3
Total Ny	3	181	791												
Grand	37	10,980	48,091												

(6) MCA Score: Natural environment

表 A 2-26 MCA2 次評価点数表 (Natural environment – Part 1/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Located in protected area				Score Loss of forest	Loss of wetland			Loss of endangered species		Fish migration				Erosion		Impact on landscape			Remarks
				Main component	Sub component	Transmission line	Score Located in protected area		Class of wetland	Affected % of wetland	Score Loss of wetland	Category of Endangered Species	Score Loss of endangered species	Class of river	Dam in the downstream	Possibility of mitigation (Fishway)	Score Fish migration	Possibility of Mitigation	Score Erosion Access road/ Dam site	Distance from Substation km	Voltage kV	Score Impact on landscape	
Amochu Basin																							
A-4	Kunzangling	860	3,766	Core	No	Multiple	0	3	No		5	CR	1	Main	No	No	1	No	3	59.0	400	1	
A-5	Tingma	783	3,428	No	No	No	5	3	No		5	EN	2	Main	No	No	1	No	3	45.2	400	2	
A-8	Dorokha	550	2,407	No	No	No	5	3	No		5	EN	2	Main	No	No	1	No	3	27.4	400	2	
Total Ar	3	2,192	9,601																				
Wangchhu Basin																							
W-6	Chuzom	152	664	No	No	No	5	3	No		5	No	5	Main	Yes	No	3	No	3	34.4	220	3	
W-8	Zangkhepa	54	236	Multiple	No	No	2	5	No		5	VU	3	Main	Yes	Yes	4	No	3	81.0	220	2	
W-19	Pipingchhu	100	436	No	No	No	5	3	No		5	EN	2	Main	No	Yes	2	No	3	0.6	132	5	
Total W	3	305	1,336																				
Punatsangchhu Basin																							
P-15	Tamigdamchu	188	824	Core	No	No	0	3	No		5	VU	3	Main	Yes	Yes	4	No	3	52.7	220	2	
P-17	Tseykha	215	943	Multiple	No	No	2	3	No		5	EN	2	Main	Yes	Yes	4	No	3	38.2	220	3	
P-26	Thasa	706	3,094	No	No	No	5	3	No		5	CR	1	Main	Yes	Yes	4	No	3	2.3	400	4	
P-28	Kago-1	102	448	Core	No	No	0	3	No		5	CR	1	Tributary	Yes	Yes	5	No	3	16.1	220	4	
P-29	Kago	58	255	Multiple	No	No	2	3	No		5	VU	3	Tributary	Yes	Yes	5	No	3	9.6	132	5	
P-30	Pinsa	153	672	Multiple	No	No	2	3	No		5	CR	1	Tributary	Yes	Yes	5	No	3	6.1	220	5	
P-34	Darachhu	89	389	No	No	No	5	3	No		5	CR	1	Main	Yes	Yes	4	No	3	17.5	220	4	
P-35	Dagachhu-II	71	311	No	No	No	5	3	No		5	CR	1	Main	Yes	Yes	4	No	3	9.8	220	5	
P-38	Tashiding	81	356	No	No	No	5	3	No		5	CR	1	Main	Yes	No	3	No	3	9.1	220	5	
Total Pu	9	1,665	7,293																				
Mangdechhu Basin																							
M-5	Bemji	333	1,458	Core	No	No	0	4	No		5	EN	2	Main	Yes	No	3	No	3	39.5	400	2	
M-6	Jongthang	227	995	No	No	No	5	3	No		5	VU	3	Main	Yes	No	3	No	3	22.7	400	2	
M-11	Wangdigang	502	2,200	Multiple	Multiple	No	2	3	No		5	CR	1	Main	No	No	1	No	3	4.4	400	4	
M-17	Buli	69	302	No	No	Corridor	3	3	No		5	EN	2	Main	No	No	1	No	3	10.4	132	5	
M-18	Nyekhar	43	188	No	No	Corridor	3	3	No		5	CR	1	Main	No	Yes	2	No	3	6.1	132	5	
Total M	5	1,174	5,143																				

表 A 2-27 MCA2 次評価点数表 (Natural environment – Part 2/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Located in protected area			Score Loss of forest	Loss of wetland			Loss of endangered species		Fish migration			Erosion		Impact on landscape			Remarks		
				Main component	Sub component	Transmission line		Score Located in protected area	Class of wetland	Affected % of wetland	Score Loss of wetland	Category of Endangered Species	Score Loss of endangered species	Class of river	Dam in the downstream	Possibility of mitigation (Fishway)	Score Fish migration	Possibility of Mitigation	Score Erosion Access road/ Dam site	Distance from Substation km		Voltage kV	Score Impact on landscape
Chamkharchhu Basin																							
C-7	Chamkharchhu-IV	451	1,974	No	No	No	5	4	No		5	EN	2	Main	Yes	No	3	No	3	51.6	400	1	
C-10	Chamkharchhu-II	414	1,814	No	No	No	5	3	No		5	EN	2	Main	Yes	No	3	No	3	48.5	400	2	
Total Ch	2	865	3,788																				
Kurichhu Basin																							
K-13	Minjey	673	2,948	Corridor	Corridor	Corridor	2	3	Other	5.0%	4	EN	2	Main	Yes	No	3	No	3	82.4	400	1	
K-15	Phawan	499	2,185	No	No	Corridor	3	3	No		5	EN	2	Tributary	Yes	No	4	No	3	68.8	400	1	
Total Ku	2	1,172	5,133																				
Drangmechhu Basin:																							
G-6	Khamdang	512	2,242	No	No	No	5	3	No		5	EN	2	Main	Yes	Yes	4	No	3	1.0	400	4	
G-7	Gongri	546	2,392	No	No	No	5	3	No		5	VU	3	Main	Yes	No	3	No	3	69.0	400	1	
G-9	Gamrichhu-3	123	538	Core	Multiple	Multiple	0	3	No		5	EN	2	Main	Yes	Yes	4	No	3	24.1	220	3	
G-10	Gamrichhu-2	108	471	No	No	No	5	3	No		5	EN	2	Main	Yes	Yes	4	No	3	15.8	220	4	
G-11	Gamrichhu-1	150	656	No	No	No	5	3	No		5	EN	2	Main	Yes	No	3	No	3	12.7	220	4	
G-13	Sherichhu	58	254	No	No	No	5	3	No		5	EN	2	Tributary	Yes	Yes	5	No	3	17.2	132	5	
G-14	Uzorong	840	3,678	No	No	No	5	3	No		5	EN	2	Main	Yes	No	3	No	3	44.6	400	2	
G-16	Jerichhu	39	169	No	No	No	5	3	No		5	VU	3	Tributary	Yes	No	4	No	3	11.3	132	5	
G-19	Nagor	59	258	No	No	No	5	3	No		5	EN	2	Main	No	No	1	No	3	23.0	132	4	
G-22	Panbang	993	4,349	No	No	No	5	3	No		5	EN	2	Main	No	No	1	No	3	27.8	400	2	
Total Dr	10	3,426	15,005																				
Nyera Amari:																							
N-1	Nyera Amari Kangpara (G)	71	312	No	No	No	5	3	No		5	EN	2	Main	Yes	No	3	No	3	57.6	132	3	
N-2	Lamai Gonpa	37	161	No	No	No	5	3	No		5	EN	2	Main	Yes	Yes	4	No	3	43.9	132	4	
N-3	Paydung-Kangpar	73	319	No	No	No	5	3	No		5	EN	2	Main	Yes	No	3	No	3	28.9	132	4	
Total Ny	3	181	791																				
Grand	37	10,980	48,091																				

(7) MCA Score: Social development

表 A 2-28 MCA2 次評価点数表 (Social development – Part 1/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Improved Access to socio benefits									Income opportunity for Low-income Area						Remarks	
				Conectivity improvement			Education Facility Access			Health Facility Access			Dam (30%)			Powerhouse (70%)				
				Dam (50%)	Powerhouse (50%)	Score Conectivity improvement	Dam (50%)	Powerhouse (50%)	Score Education Facility Access	Dam (50%)	Powerhouse (50%)	Score Health Facility Access	Score Improved Access to socio benefits	Gewog name	Gewog per capita (1000Nu)	Score Income opportunity (Dam area)	Gewog name	Gewog per capita (1000Nu)		Score Income opportunity (PH area)
Amochu Basin																				
A-4	Kunzangling	860	3,766	1	5	3	5	5	5	5	5	5	4.2	Sombaykha	75.8	2	Sombaykha	75.8	2	2.0
A-5	Tingma	783	3,428	5	5	5	5	5	5	5	5	5	5.0	Sombaykha	75.8	2	Sombaykha	75.8	2	2.0
A-8	Dorokha	550	2,407	1	3	2	5	1	3	5	5	5	3.2	Gakiling	55.6	3	Gakiling	55.6	3	3.0
Total Ar	3	2,192	9,601																	
Wangchhu Basin																				
W-6	Chuzom	152	664	1	1	1	1	1	1	1	1	1	1.0	Doga	66.1	2	Doga	66.1	2	2.0
W-8	Zangkhepa	54	236	3	1	2	1	1	1	1	1	1	1.4	Tsento	83.3	1	Tsento	83.3	1	1.0
W-19	Pipingchhu	100	436	5	3	4	1	3	2	1	3	2	2.8	Getana	32.3	4	Bongo	30.5	4	4.0
Total W	3	305	1,336																	
Punatsangchhu Basin																				
P-15	Tamigdamchu	188	824	5	5	5	1	1	1	1	1	1	2.6	Towewang	43.4	3	Towewang	43.4	3	3.0
P-17	Tseykha	215	943	5	1	3	1	1	1	1	1	1	1.8	Towewang	43.4	3	Dzoma	47.5	3	3.0
P-26	Thasa	706	3,094	3	3	3	1	1	1	1	1	1	1.8	Athang	25.7	4	Patakla	26.9	4	4.0
P-28	Kago-1	102	448	5	5	5	3	3	3	3	3	3	3.8	Athang	25.7	4	Athang	25.7	4	4.0
P-29	Kago	58	255	5	3	4	3	3	3	3	3	3	3.4	Athang	25.7	4	Athang	25.7	4	4.0
P-30	Pinsa	153	672	3	1	2	3	1	2	3	1	2	2.0	Athang	25.7	4	Athang	25.7	4	4.0
P-34	Darachhu	89	389	5	1	3	1	1	1	3	3	3	2.4	Tseza	36.2	4	Tseza	37.1	4	4.0
P-35	Dagachhu-II	71	311	1	1	1	1	1	1	3	3	3	1.6	Tseza	36.2	4	Kalidzingkha	30.8	4	4.0
P-38	Tashiding	81	356	5	5	5	1	1	1	1	1	1	2.6	Khebisa	30.8	4	Tashiding	42.6	3	3.3
Total Pu	9	1,665	7,293																	
Mangdechhu Basin																				
M-5	Bemji	333	1,458	1	3	2	3	3	3	3	1	2	2.3	Nubi	55.2	3	Nubi	55.2	3	3.0
M-6	Jongthang	227	995	5	1	3	3	1	2	3	1	2	2.4	Nubi	55.2	3	Nubi	55.2	3	3.0
M-11	Wangdigang	502	2,200	3	1	2	1	1	1	1	1	1	1.4	Lanthil	100.4	1	Lanthil	100.4	1	1.0
M-17	Buli	69	302	3	5	4	1	1	1	3	3	3	2.8	Nangkor	39.3	4	Nangkor	39.3	4	4.0
M-18	Nyekhar	43	188	5	1	3	1	1	1	5	5	5	3.0	Nangkor	39.3	4	Nangkor	39.3	4	4.0
Total M	5	1,174	5,143																	
Chamkharchhu Basin																				
C-7	Chamkharchhu-IV	451	1,974	1	5	3	1	1	1	1	1	1	1.8	Tang	50.5	3	Ura	52.2	3	3.0
C-10	Chamkharchhu-II	414	1,814	5	5	5	5	5	5	5	5	5	5.0	Shingkar	27.4	4	Shingkar	27.4	4	4.0
Total Ch	2	865	3,788																	

表 A 2-29 MCA2 次評価点数表 (Social development – Part 2/2)

Project code	Name of Project	Installed Capacity (MW)	Annual Energy (GWh)	Improved Access to socio benefits									Income opportunity for Low-income Area						Remarks	
				Conectivity Improvement			Education Facility Access			Health Facility Access			Score Improved Access to socio benefits	Dam (30%)			Powerhouse (70%)			
				Dam (50%)	Powerhouse (50%)	Score Conectivity improvement	Dam (50%)	Powerhouse (50%)	Score Education Facility Access	Dam (50%)	Powerhouse (50%)	Score Health Facility Access		Gewog name	Gewog per capita (1000Nu)	Score Income opportunity (Dam area)	Gewog name	Gewog per capita (1000Nu)		Score Income opportunity (PH area)
Kurichhu Basin																				
K-13	Minjey	673	2,948	1	1	1	1	3	2	1	3	2	1.6	Menbi	21.3	4	Metscho	36.9	4	4.0
K-15	Phawan	499	2,185	1	1	1	3	3	3	3	3	3	2.2	Tsenkhar	29.6	4	Jaray	34.3	4	4.0
Total Ku	2	1,172	5,133																	
Drangmechhu Basin:																				
G-6	Khamdang	512	2,242	5	1	3	1	1	1	3	1	2	2.1	Toetsho	38.8	4	Khamdang	40.5	3	3.3
G-7	Gongri	546	2,392	1	1	1	1	1	1	1	1	1	1.0	Tomzhangtshen	29.7	4	Bartsham	37.2	4	4.0
G-9	Gamrichhu-3	123	538	3	3	3	1	1	1	3	3	3	2.4	Sakteng	42.2	3	Phongme	30.3	4	3.7
G-10	Gamrichhu-2	108	471	3	1	2	1	1	1	3	1	2	1.7	Sakteng	42.2	3	Radi	35.1	4	3.7
G-11	Gamrichhu-1	150	656	1	1	1	1	1	1	1	1	1	1.0	Radi	35.1	4	Bartsham	37.2	4	4.0
G-13	Sherichhu	58	254	3	3	3	1	1	1	3	1	2	2.1	Shermung	34.5	4	Drametse	26.9	4	4.0
G-14	Uzorong	840	3,678	3	5	4	1	1	1	3	3	3	2.8	Chaskhar	41.3	3	Udzorong	29.7	4	3.7
G-16	Jerichhu	39	169	3	5	4	1	1	1	3	1	2	2.5	Shumer	43.8	3	Shumer	43.8	3	3.0
G-19	Nagor	59	258	5	3	4	1	3	2	5	5	5	3.7	Silambi	21.3	4	Gongdue	27.7	4	4.0
G-22	Panbang	993	4,349	1	1	1	1	1	1	5	5	5	2.2	Chhimung	13.7	5	Ngangla	42.4	3	3.6
Total Dr	10	3,426	15,005																	
Nyera Amari:																				
N-1	Nyera Amari Kangpara (G)	71	312	1	1	1	1	1	1	1	1	1	1.0	Kangpara	32.8	4	Kangpara	32.8	4	4.0
N-2	Lamai Gonpa	37	161	5	3	4	1	3	2	1	3	2	2.8	Kangpara	32.8	4	Kangpara	32.8	4	4.0
N-3	Paydung-Kangpar	73	319	3	1	2	1	1	1	3	1	2	1.7	Kangpara	32.8	4	Thrimshing	38.8	4	4.0
Total Ny	3	181	791																	
Grand	37	10,980	48,091																	

Appendix-3 環境社会配慮

3.1 環境基準

表 A 3-1 Ambient Air Quality Standards

(Unit: $\mu\text{g}/\text{m}^3$)

Parameter	Industrial Area	Mixes Area ^{*1}	Sensitive Area ^{*2}
Total Suspended Particulate Matter			
24 Hour Average	500	200	100
Yearly Average	360	140	70
Respirable Particulate Matter (PM10)			
24 Hour Average	200	100	75
Yearly Average	120	60	50
Sulfur Dioxide			
24 Hour Average	120	80	30
Yearly Average	80	60	15
Nitrogen Oxides			
24 Hour Average	120	80	30
Yearly Average	80	60	15
Carbon Monoxide			
8 Hour Average	5,000	2,000	1,000
1 Hour Average	10,000	4,000	2,000

Source: National Environment Commission (NEC) 2010.

Note 1: Mixed area means the area where residential, commercial or both activities take place.

Note 2: Sensitive area describes where sensitive targets are in place like hospitals, schools and sensitive ecosystems.

表 A 3-2 Noise Level Limits

(Unit: dB(A))

	Industrial Area	Mixes Area	Sensitive Area	IFC/WB Guideline	
				Industrial Area	Mixes Area
Day	75	65	55	70	55
Night	65	55	45	70	45

Source: National Environment Commission (NEC) 2010, and IFC/WB (Environmental Health and Safety Guideline (2007)).

表 A 3-3 Urban Drinking Water Supply (Water Quality Standard)

No	Parameter	Unit	Maximum permissible Limit	WHO Guideline
1	Colour (TCU)	Hazens Unit	15	15
2	Odour	-	non-objectionable	-
3	pH	-	Acceptable range 6.5 – 8.5	-
4	Taste	-	non-objectionable	-
5	Turbidity	NTU	5	-
6	Calcium	mg/L	No permissible limit but recommended < 75	-
7	Free Residual Chlorine	mg/L	Target range 0.2 – 0.5	-
8	Iron	mg/L	No permissible limit but recommended < 0.3	-
9	Manganese	mg/L	0.4 Maximum permissible limit	-
10	Sulphate	mg/L	No permissible limit but recommended < 250	-

No	Parameter	Unit	Maximum permissible Limit	WHO Guideline
11	Fluoride	mg/L	1.5	1.5
12	Nitrates	mg/L	50	50
13	Arsenic	mg/L	0.01	0.01
14	Lead	mg/L	0.01	0.01
15	Mercury	mg/L	0.006	0.001
16	E.Coli	CFU/100ml sample	0	0

Source: National Environment Commission (NEC), 2016, and WHO Guideline for Drinking-Water Quality (2014).

3.2 絶滅危惧種

IUCN レッドリストに基づくブータンの絶滅危惧種⁴は、次に示すとおり。

表 A 3-4 哺乳類：25 種

No.	学名	英名	状況
1	<i>Ailurus fulgens</i>	Red Panda	Endangered
2	<i>Aonyx cinereus</i>	Asian Small-clawed Otter	Vulnerable
3	<i>Arctictis binturong</i>	Binturong	Vulnerable
4	<i>Axis porcinus</i>	Hog Deer	Endangered
5	<i>Bos gaurus</i>	Gaur	Vulnerable
6	<i>Bos mutus</i>	Wild Yak	Vulnerable
7	<i>Bubalus arnee</i>	Wild Water Buffalo	Endangered
8	<i>Budorcas taxicolor</i>	Takin	Vulnerable
9	<i>Cuon alpinus</i>	Dhole	Endangered
10	<i>Dicerorhinus sumatrensis</i>	Sumatran Rhinoceros	Critically Endangered
11	<i>Elephas maximus</i>	Asian Elephant	Endangered
12	<i>Lutrogale perspicillata</i>	Smooth-coated Otter	Vulnerable
13	<i>Manis pentadactyla</i>	Chinese Pangolin	Critically Endangered
14	<i>Moschus chrysogaster</i>	Alpine Musk Deer	Endangered
15	<i>Moschus fuscus</i>	Black Musk Deer	Endangered
16	<i>Moschus leucogaster</i>	Himalayan Muskdeer	Endangered
17	<i>Neofelis nebulosa</i>	Clouded Leopard	Vulnerable
18	<i>Panthera pardus</i>	Leopard	Vulnerable
19	<i>Panthera tigris</i>	Tiger	Endangered
20	<i>Panthera uncia</i>	Snow Leopard	Vulnerable
21	<i>Rhinoceros unicornis</i>	Indian Rhinoceros	Vulnerable
22	<i>Rusa unicolor</i>	Sambar	Vulnerable
23	<i>Trachypithecus geei</i>	Gee's Golden Langur	Endangered
24	<i>Trachypithecus pileatus</i>	Capped Langur	Vulnerable
25	<i>Ursus thibetanus</i>	Asiatic Black Bear	Vulnerable

表 A 3-5 鳥類：19 種

No.	学名	英名	状況
1	<i>Aceros nipalensis</i>	Rufous-necked Hornbill	Vulnerable
2	<i>Apus acuticauda</i>	Dark-rumped Swift	Vulnerable
3	<i>Aquila heliaca</i>	Eastern Imperial Eagle	Vulnerable
4	<i>Aquila nipalensis</i>	Steppe Eagle	Endangered
5	<i>Arborophila mandellii</i>	Chestnut-breasted Partridge	Vulnerable
6	<i>Ardea insignis</i>	White-bellied Heron	Critically Endangered
7	<i>Aythya ferina</i>	Common Pochard	Vulnerable
8	<i>Ciconia episcopus</i>	Asian Woollyneck	Vulnerable
9	<i>Clanga clanga</i>	Greater Spotted Eagle	Vulnerable
10	<i>Gallinago nemoricola</i>	Wood Snipe	Vulnerable
11	<i>Grus nigricollis</i>	Black-necked Crane	Vulnerable

⁴ : <http://www.iucnredlist.org/> (2018 年 3 月アクセス)

No.	学名	英名	状況
12	<i>Gyps bengalensis</i>	White-rumped Vulture	Critically Endangered
13	<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle	Endangered
14	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	Vulnerable
15	<i>Prinia cinereocapilla</i>	Grey-crowned Prinia	Vulnerable
16	<i>Sarcogyps calvus</i>	Red-headed Vulture	Critically Endangered
17	<i>Saxicola insignis</i>	White-throated Bushchat	Vulnerable
18	<i>Sitta formosa</i>	Beautiful Nuthatch	Vulnerable
19	<i>Tragopan blythii</i>	Blyth's Tragopan	Vulnerable

表 A 3-6 爬虫類：3 種

No.	学名	英名	状況
1	<i>Crocodylus palustris</i>	Mugger	Vulnerable
2	<i>Gavialis gangeticus</i>	Gharial	Critically Endangered
3	<i>Ophiophagus hannah</i>	King Cobra	Vulnerable

表 A 3-7 両生類：1 種

No.	学名	英名	状況
1	<i>Ingerana borealis</i>	Rotung Oriental Frog	Vulnerable

表 A 3-8 他の無脊椎動物：1 種

No.	学名	英名	状況
1	<i>Bhutanitis ludlowi</i>	Ludlow's Bhutan Swallowtail	Vulnerable

表 A 3-9 植物：43 種

No.	学名	英名 (空欄は英名なし)	状況
1	<i>Aglaia perviridis</i>		Vulnerable
2	<i>Andrewsianthus ferrugineus</i>		Endangered
3	<i>Androsace hemisphaerica</i>		Endangered
4	<i>Aquilaria malaccensis</i>	Lign-aloes	Vulnerable
5	<i>Astragalus paroensis</i>		Critically Endangered
6	<i>Bambusa clavata</i>		Vulnerable
7	<i>Bazzania bhutanica</i>		Critically Endangered
8	<i>Bistorta griersonii</i>		Endangered
9	<i>Buddleja bhutanica</i>		Vulnerable
10	<i>Ceropegia bhutanica</i>		Endangered
11	<i>Ceropegia dorjei</i>		Critically Endangered
12	<i>Cheirostylis sherriffii</i>		Critically Endangered
13	<i>Corallodiscus cooperi</i>		Vulnerable
14	<i>Cycas pectinata</i>		Vulnerable
15	<i>Cymbopogon bhutanicus</i>		Vulnerable
16	<i>Cypripedium cordigerum</i>	Heart-Shaped Lip Cypripedium	Vulnerable
17	<i>Cypripedium elegans</i>	Elegant Cypripedium	Endangered
18	<i>Cypripedium himalaicum</i>	Himalayan Cypripedium	Endangered
19	<i>Drepanostachyum annulatum</i>		Vulnerable
20	<i>Hoya bhutanica</i>		Endangered
21	<i>Hypericum sherriffii</i>		Endangered
22	<i>Illicium griffithii</i>		Endangered
23	<i>Isodon atroruber</i>		Endangered
24	<i>Malaxis muscifera</i>		Vulnerable
25	<i>Meconopsis bhutanica</i>		Critically Endangered

No.	学名	英名 (空欄は英名なし)	状況
26	<i>Meconopsis superba</i>		Endangered
27	<i>Nardostachys jatamansi</i>		Critically Endangered
28	<i>Neopicrorhiza minima</i>		Endangered
29	<i>Onosma griersonii</i>		Critically Endangered
30	<i>Ophiorrhiza longii</i>		Critically Endangered
31	<i>Oreorchis sanguinea</i>		Critically Endangered
32	<i>Paphiopedilum fairrieianum</i>	Fairrie's Paphiopedilum	Critically Endangered
33	<i>Paphiopedilum spicerianum</i>	Spicer's Paphiopedilum	Endangered
34	<i>Paphiopedilum venustum</i>	Charming Paphiopedilum	Endangered
35	<i>Pedicularis griniformis</i>		Vulnerable
36	<i>Pedicularis sanguilimbata</i>		Endangered
37	<i>Picea likiangensis</i>	Likiang Spruce	Vulnerable
38	<i>Saxifraga vacillans</i>		Vulnerable
39	<i>Scaphophyllum speciosum</i>		Vulnerable
40	<i>Schistochila macrodonta</i>		Endangered
41	<i>Sorbus lingshiensis</i>		Critically Endangered
42	<i>Sorbus rinzenii</i>		Endangered
43	<i>Taxus wallichiana</i>	East Himalayan Yew	Endangered

Appendix-4 系統解析結果

4.1 系統解析結果

PSS/E 解析結果（2035 年、2040 年、2050 年）を以下に示す。

BASECASE WITH FULL HYDRO DISPATCH-2035
 THU SEP 05 2019 17:26

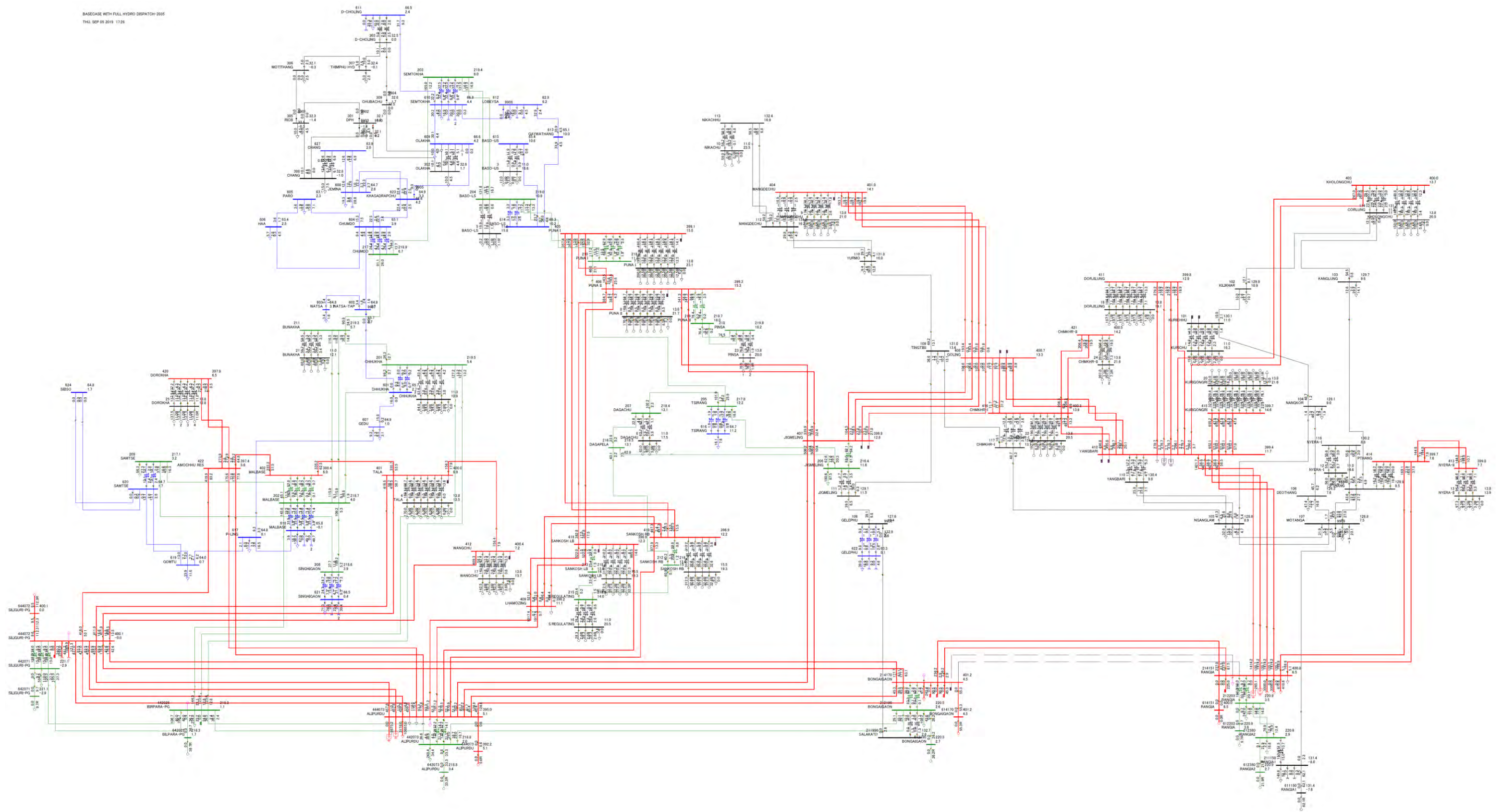


図 A 4-1 PSS/E 解析結果 (2035年-Base)

(出典：JICA 調査団)

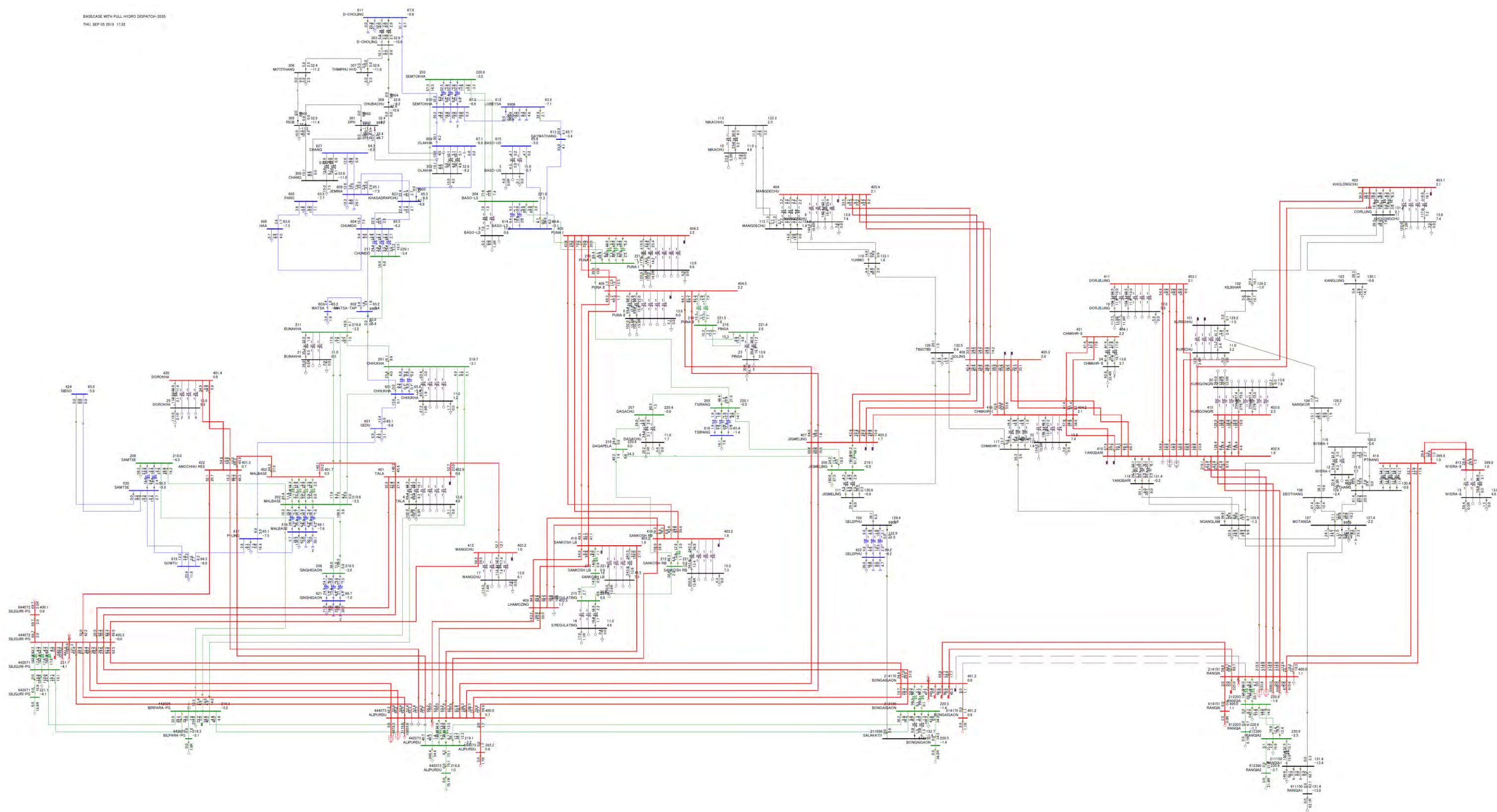


図 A 4-2 PSS/E 解析結果 (2035 年- Dry Season)

(出典：JICA 調査団)

BASECASE WITH FULL HYDRO DISPATCH-2035
 THU SEP 05 2019 17:30

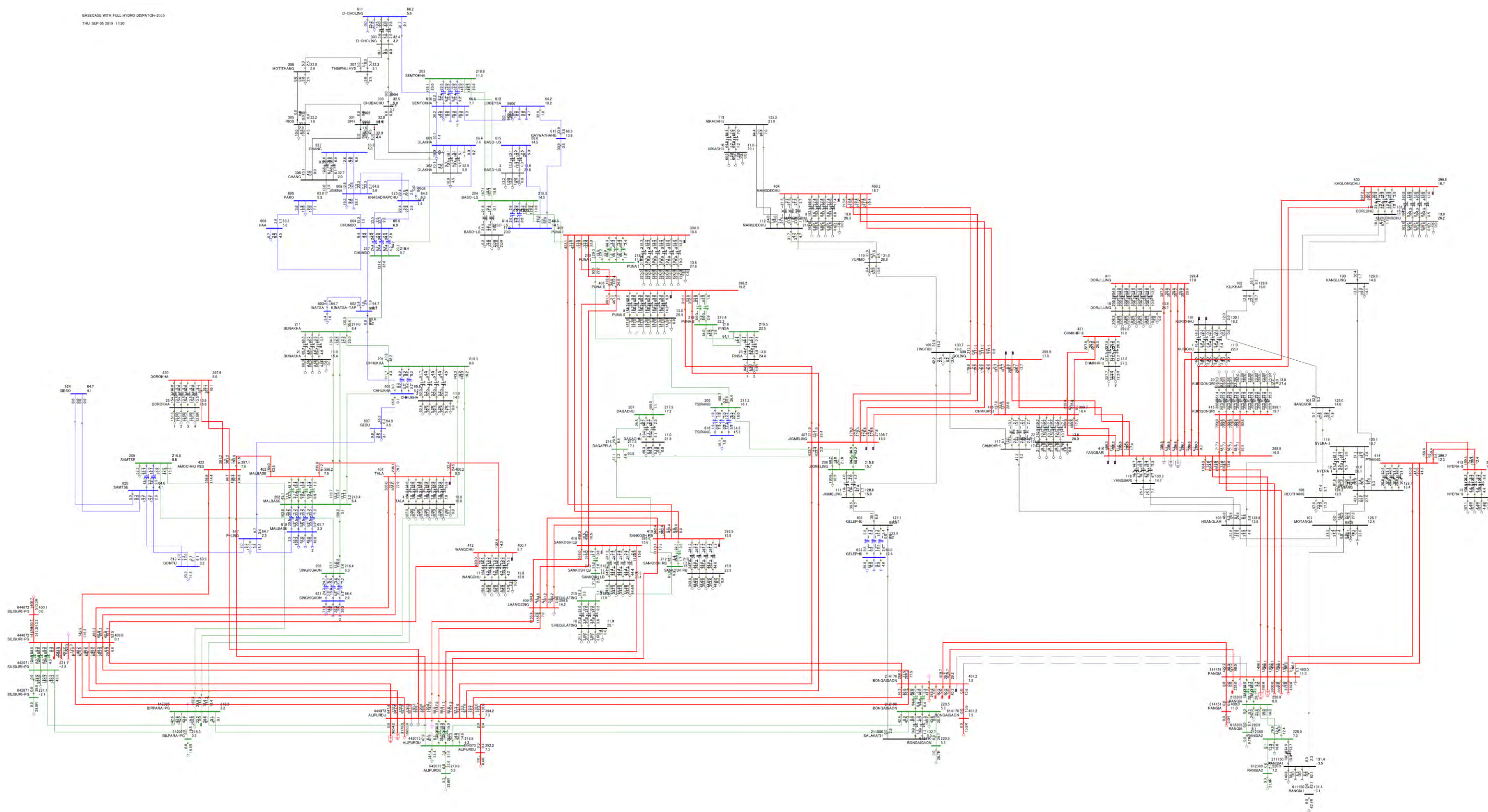


図 A 4-3 PSS/E 解析結果 (2035 年-110%)

(出典 : JICA 調査団)

BASECASE WITH FULL HYDRO DISPATCH-2040
 THU, SEP 05 2019 17:37

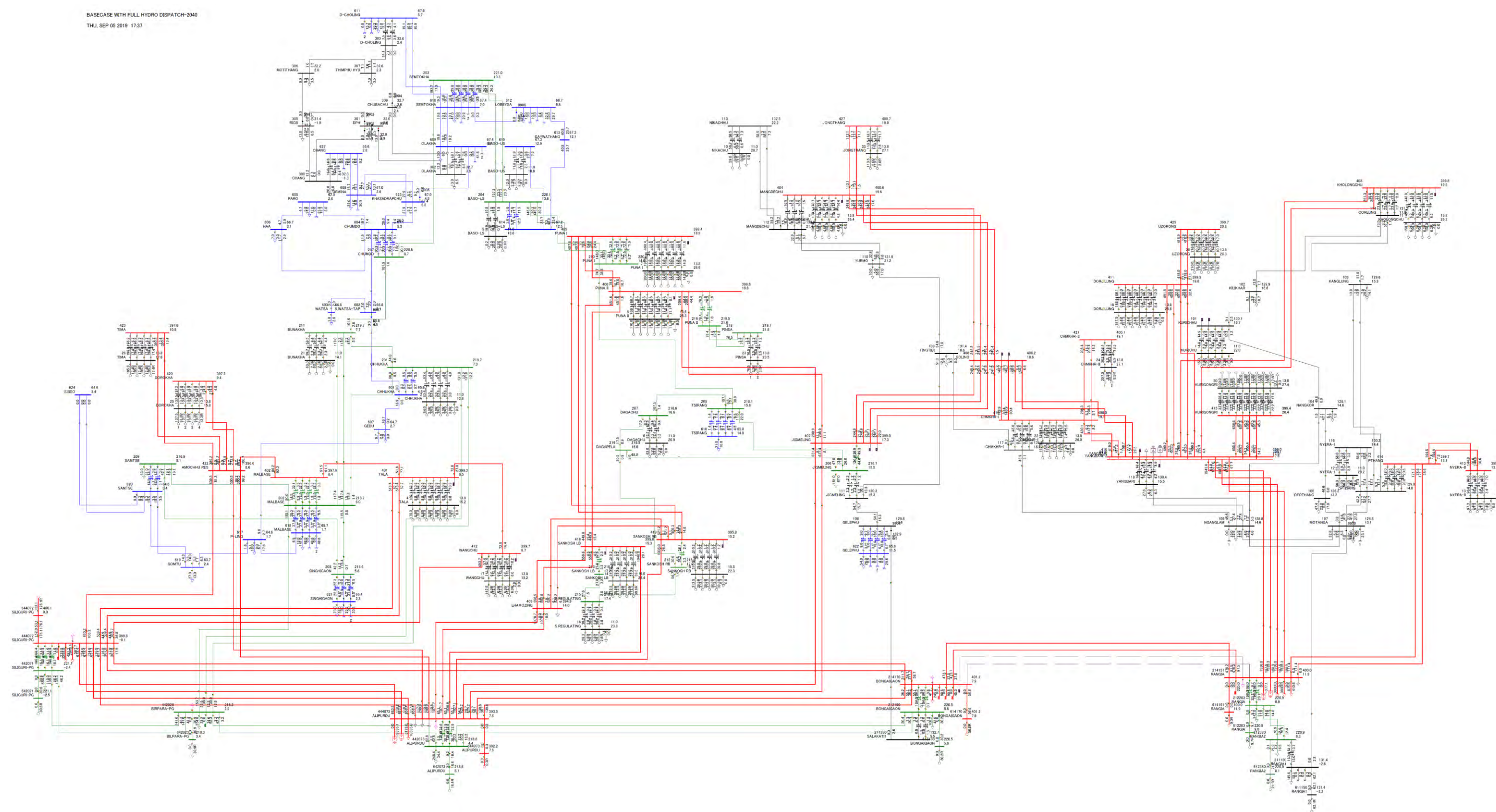


図 A 4-4 PSS/E 解析結果 (2040 年-Base)

(出典：JICA 調査団)

BASECASE WITH FULL HYDRO DISPATCH-2040
 THU_SEP 05 2019 17:41

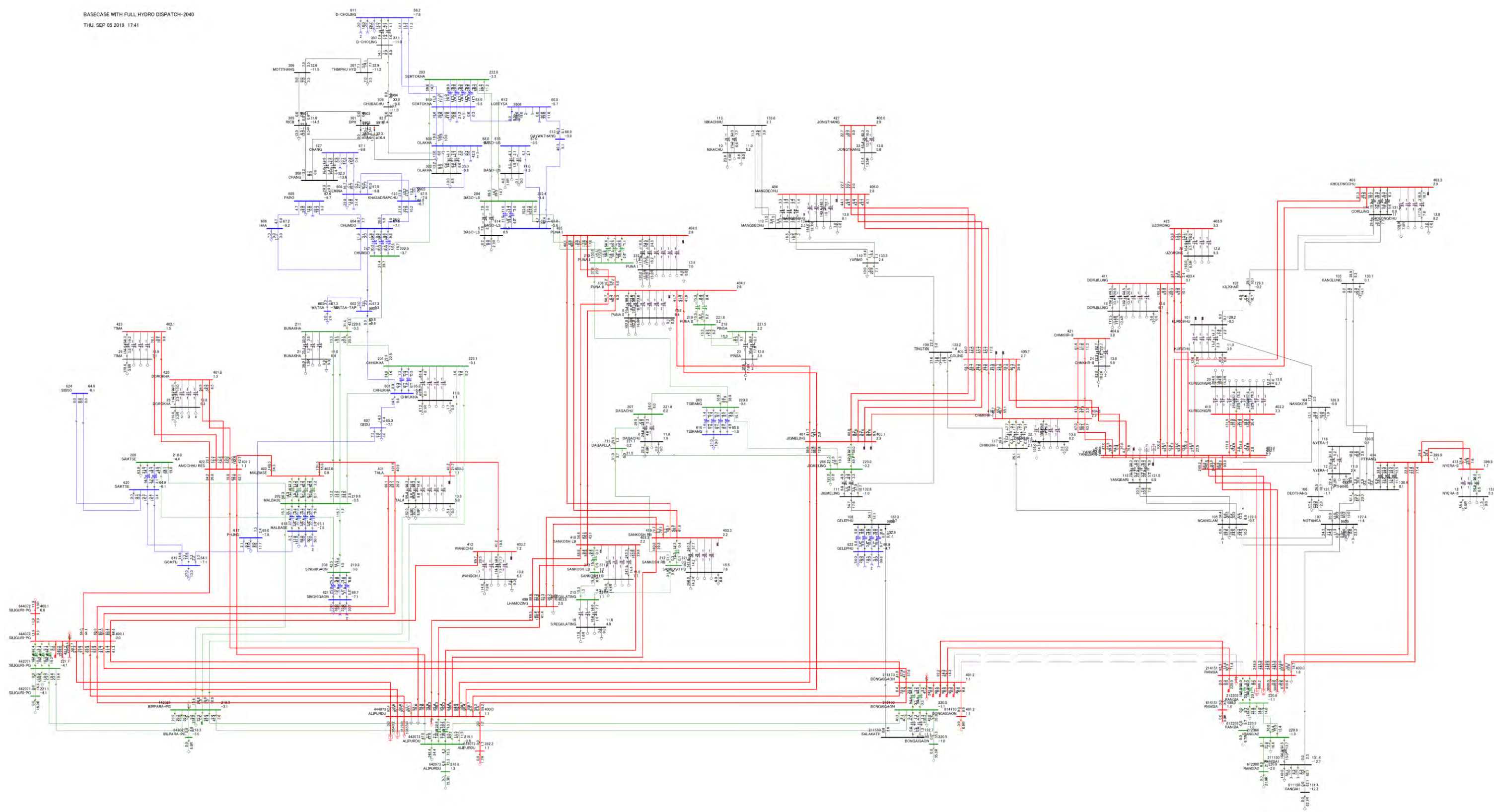


図 A 4-5 PSS/E 解析結果 (2040 年- Dry Season)

(出典 : JICA 調査団)

BASECASE WITH FULL HYDRO DISPATCH-2040
 THU SEP 05 2019 17:39

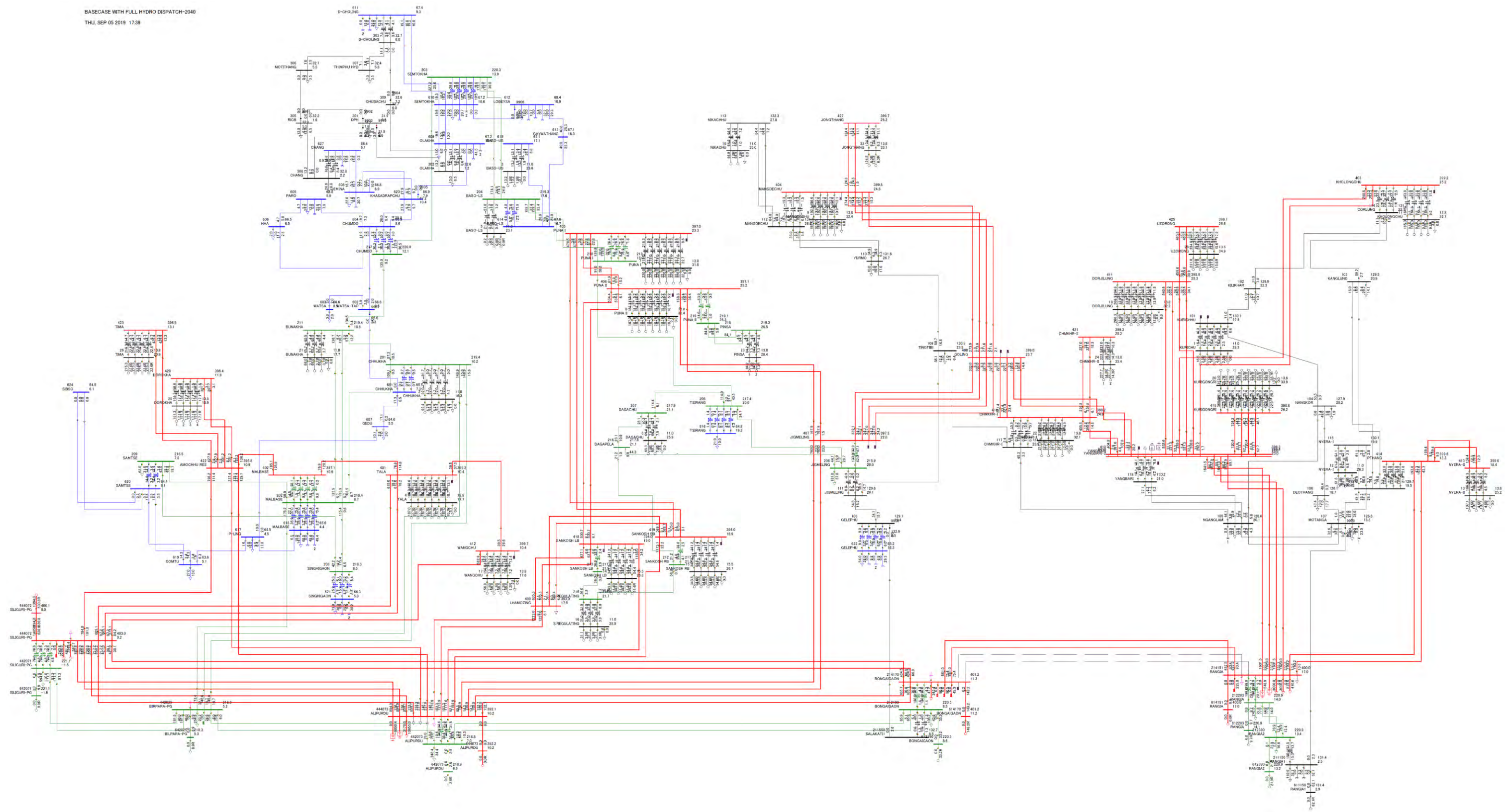


図 A-4-6 PSS/E 解析結果 (2040年-110%)

(出典: JICA 調査団)

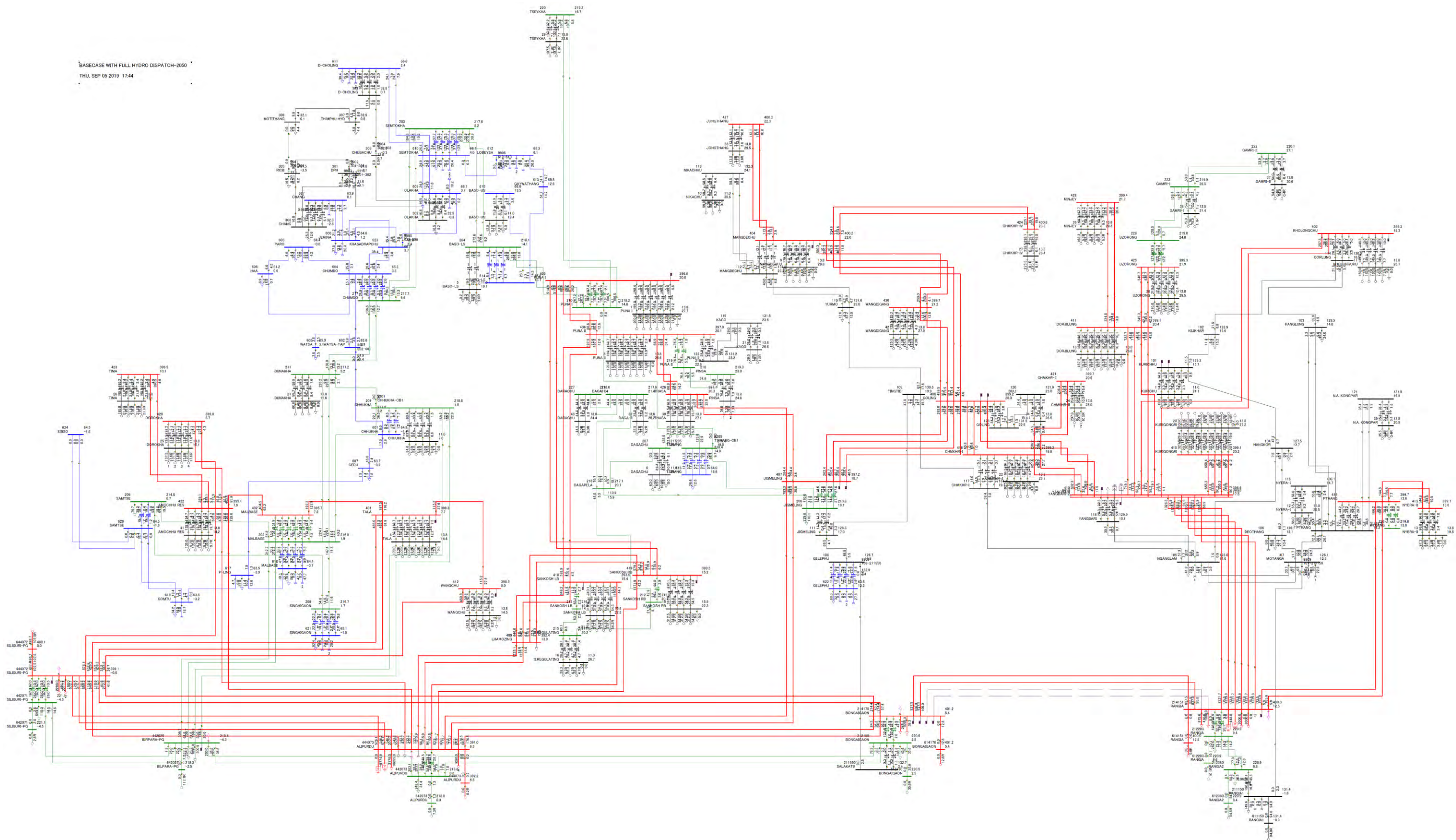
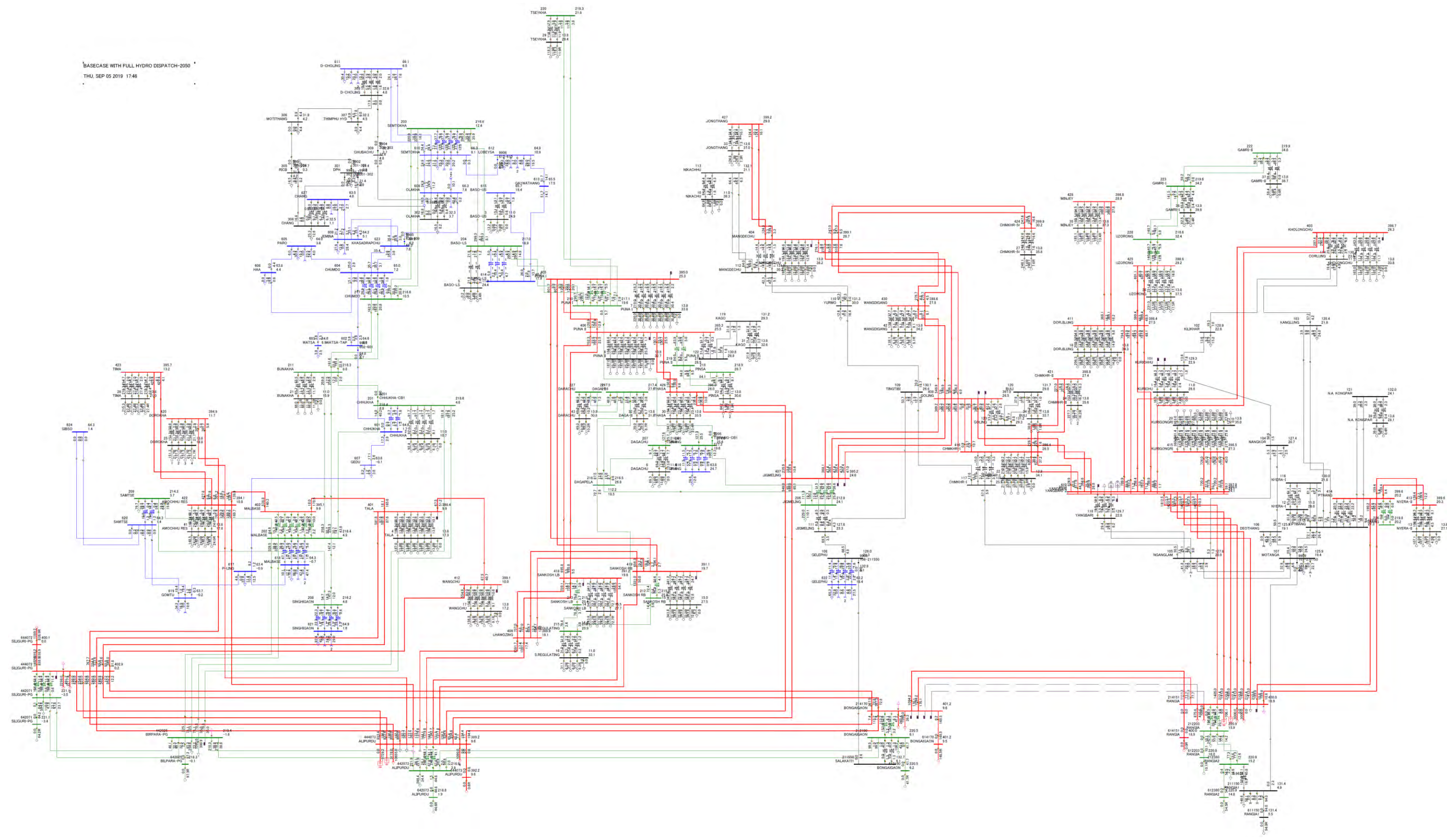


図 A 4-7 PSS/E 解析結果 (2050 年-Base)

(出典：JICA 調査団)



BASECASE WITH FULL HYDRO DISPATCH-2050
 THU, SEP 05 2019 17:48

図 A 4-9 PSS/E 解析結果 (2050 年-110%)

(出典: JICA 調査団)

4.2 系統図

系統図（2035 年、2040 年、2050 年）を以下に示す。

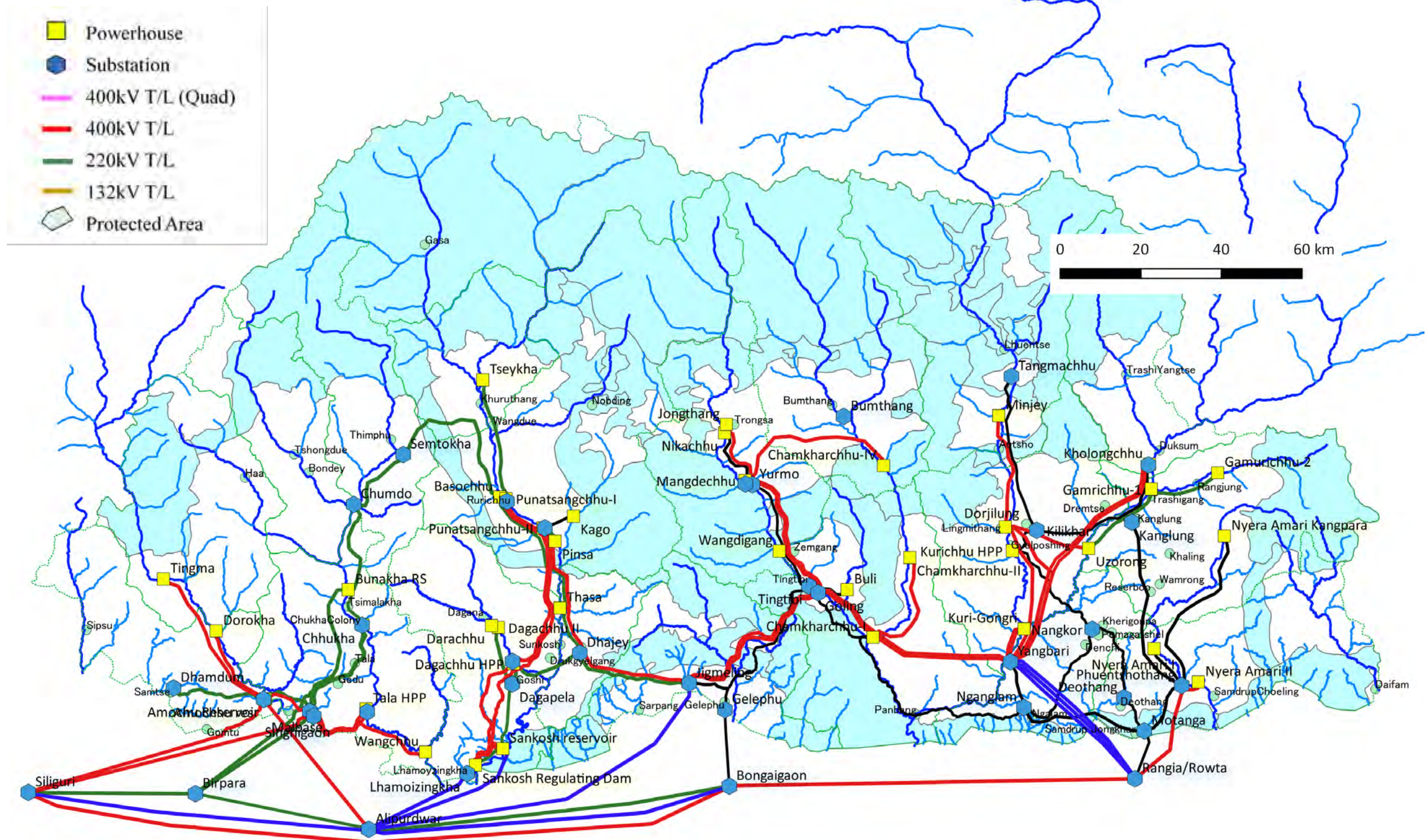


図 A 4-10 系統計画の将来構想 (2050 年)

(出典：JICA 調査団)

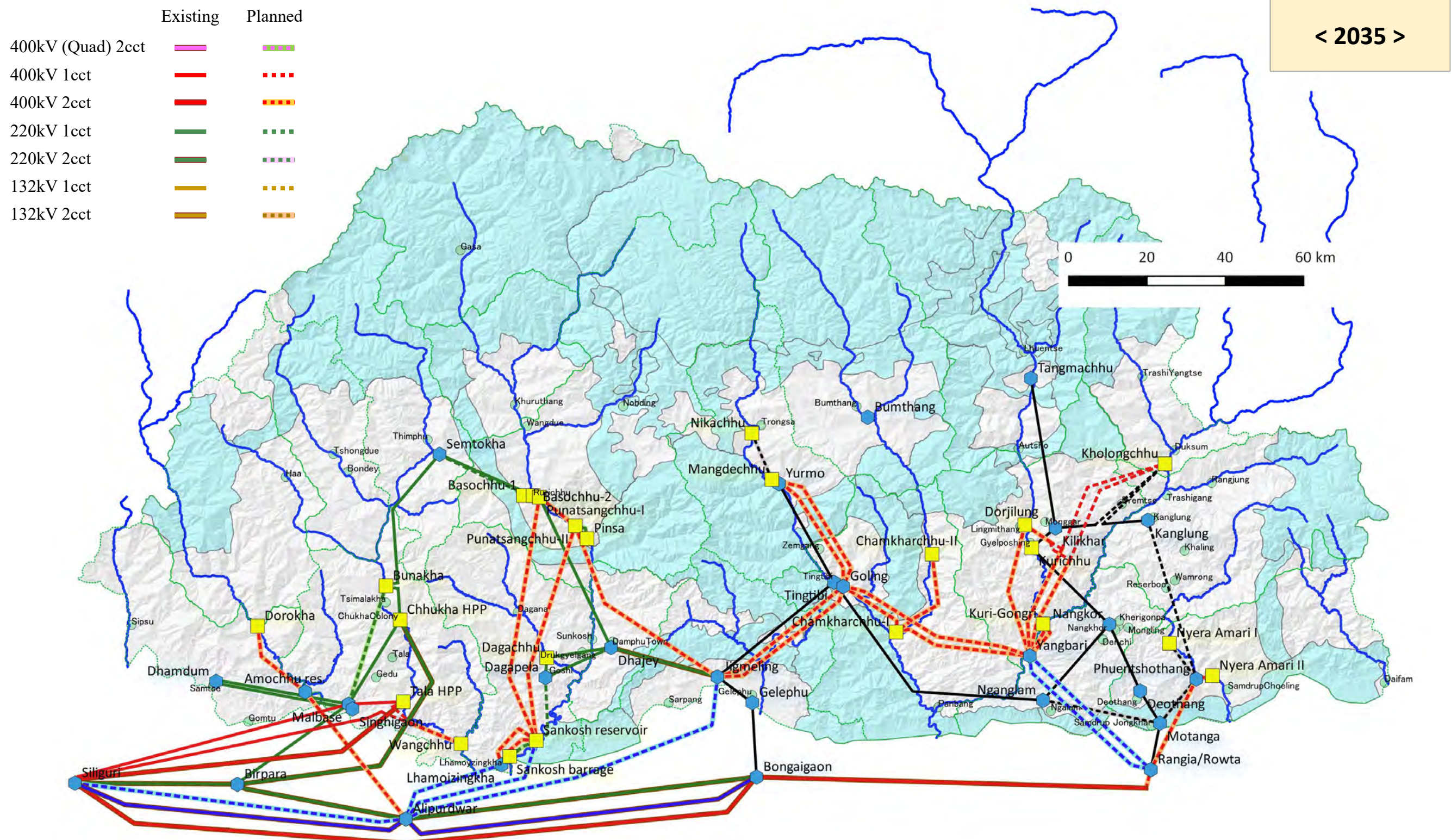


図 A 4-11 系統図 (2035 年)

(出典: JICA 調査団)

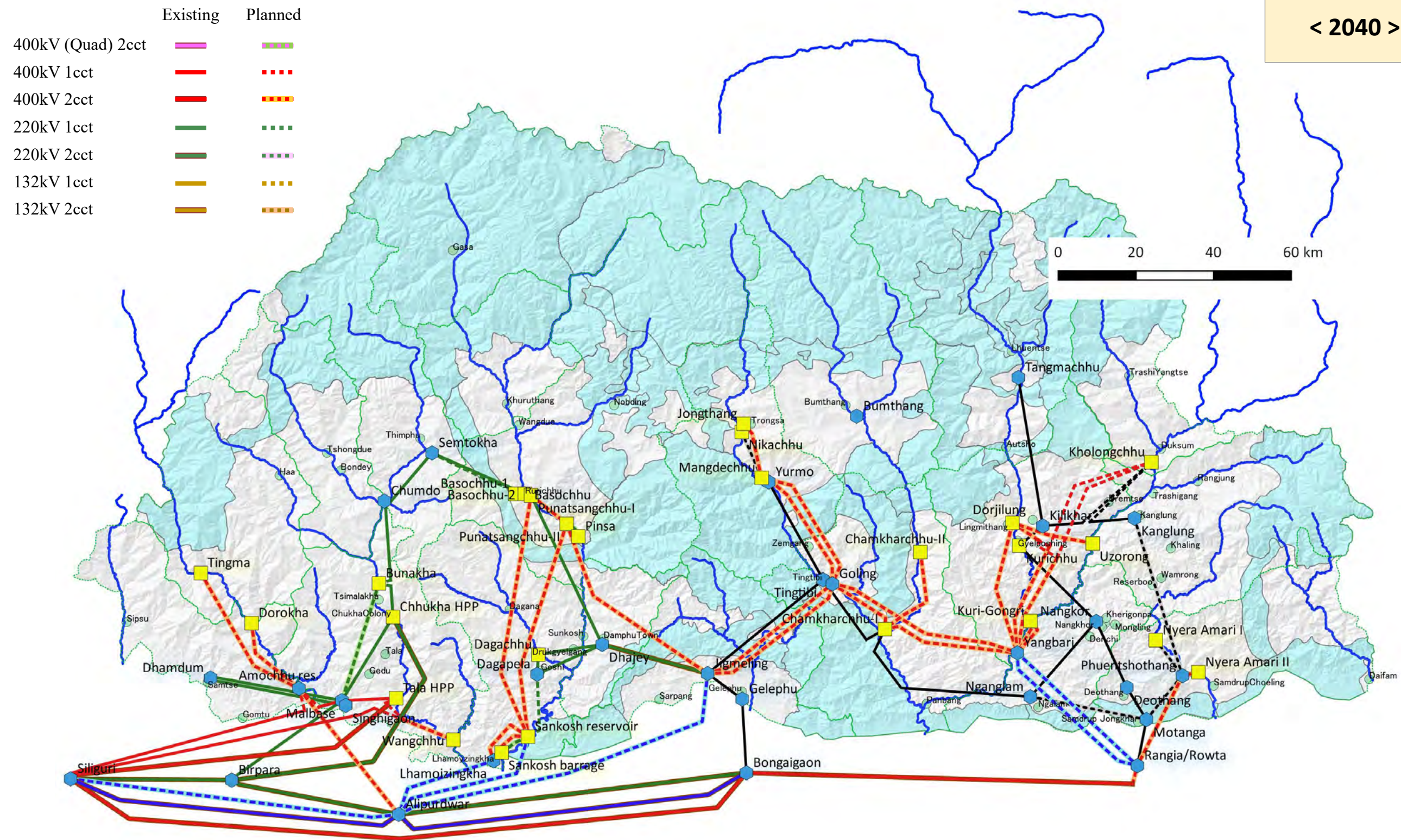


図 A 4-12 系統図 (2040 年)

(出典：JICA 調査団)

4.3 単線結線図

単線結線図（2030 年、2035 年、2040 年、2050 年）を以下に示す。

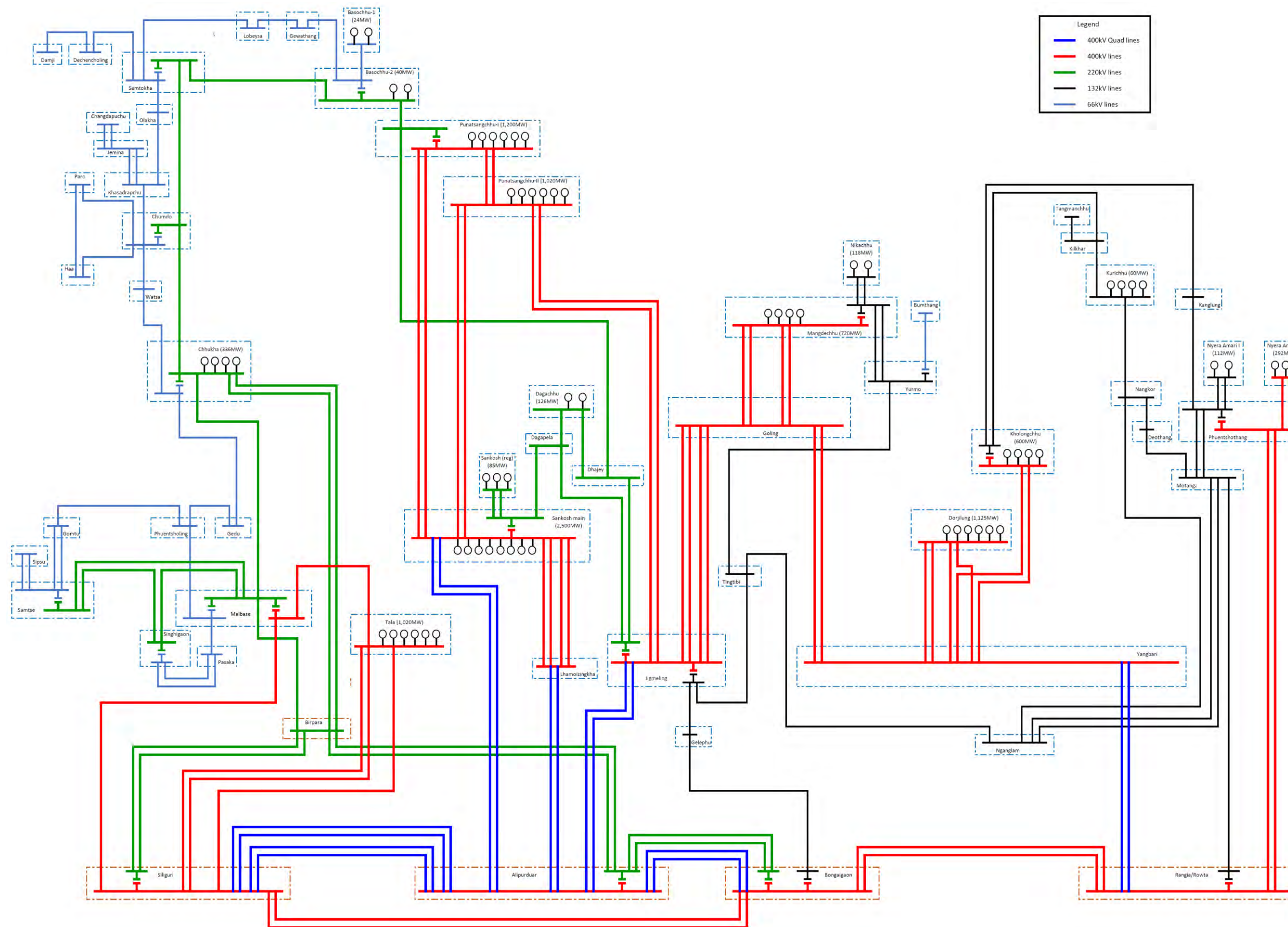


図 A 4-14 単線結線図 (2030 年)

(出典：JICA 調査団)

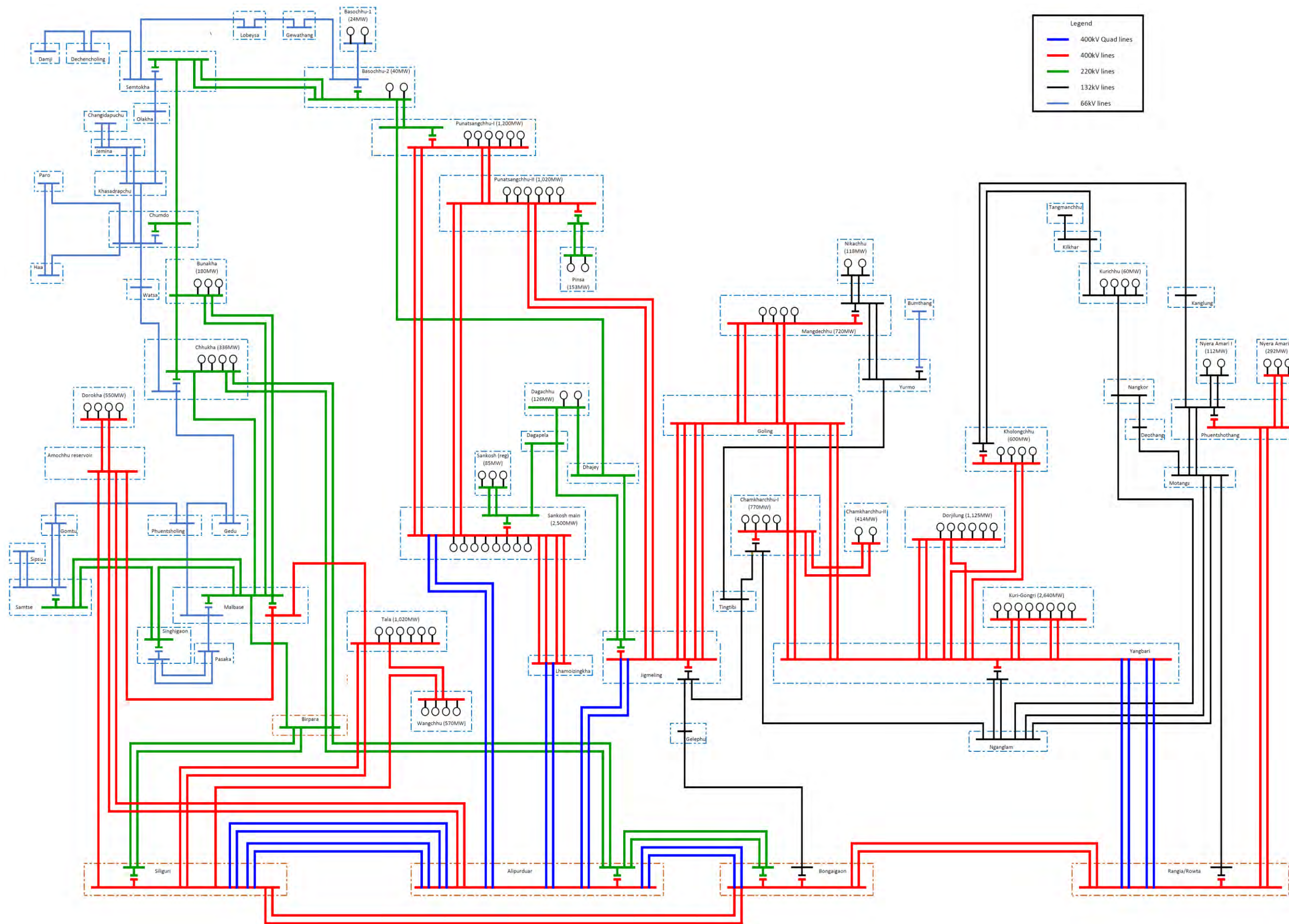


図 A 4-15 単線結線図 (2035 年)

(出典：JICA 調査団)

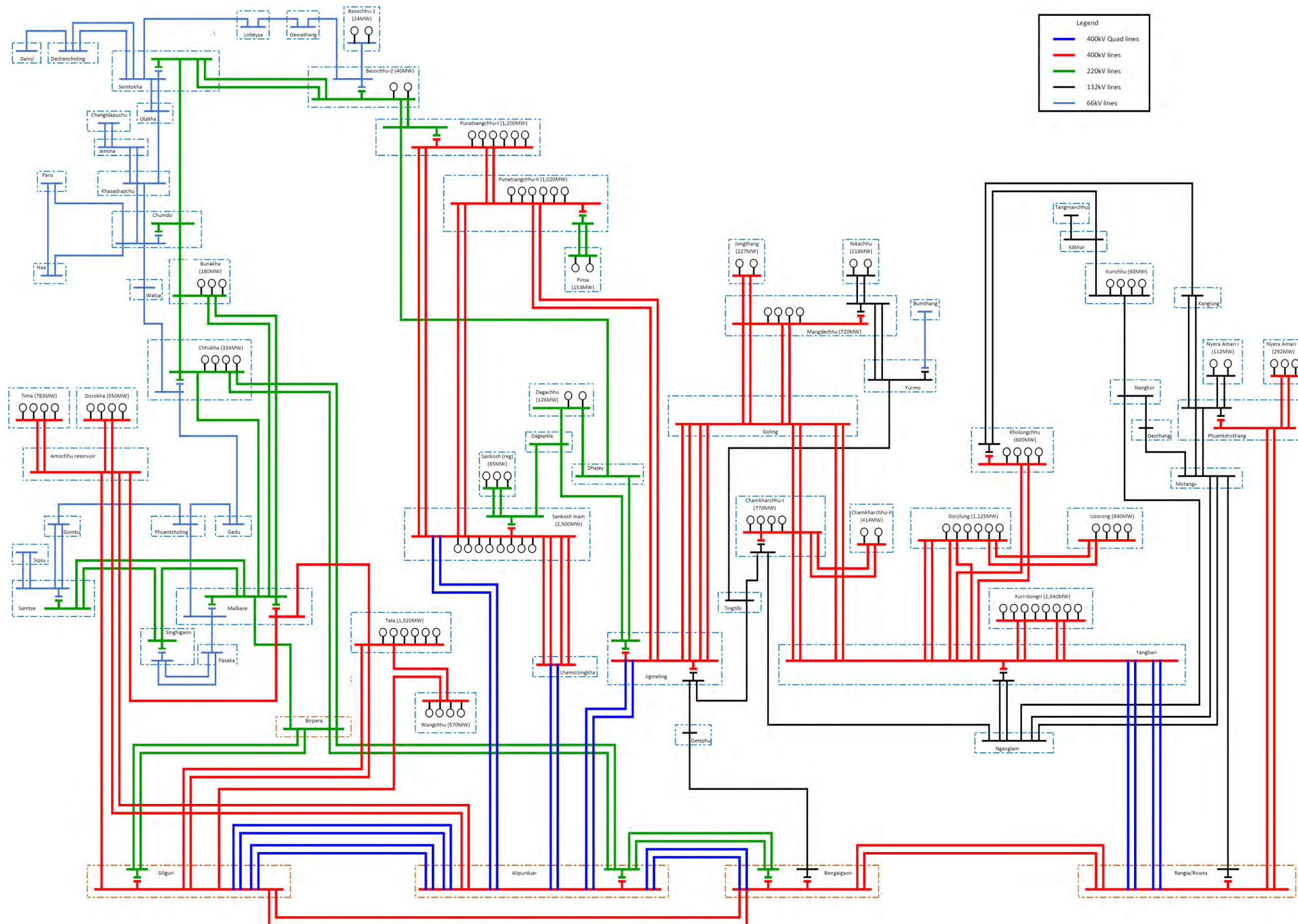


図 A 4-16 単線結線図 (2040 年)

(出典: JICA 調査団)

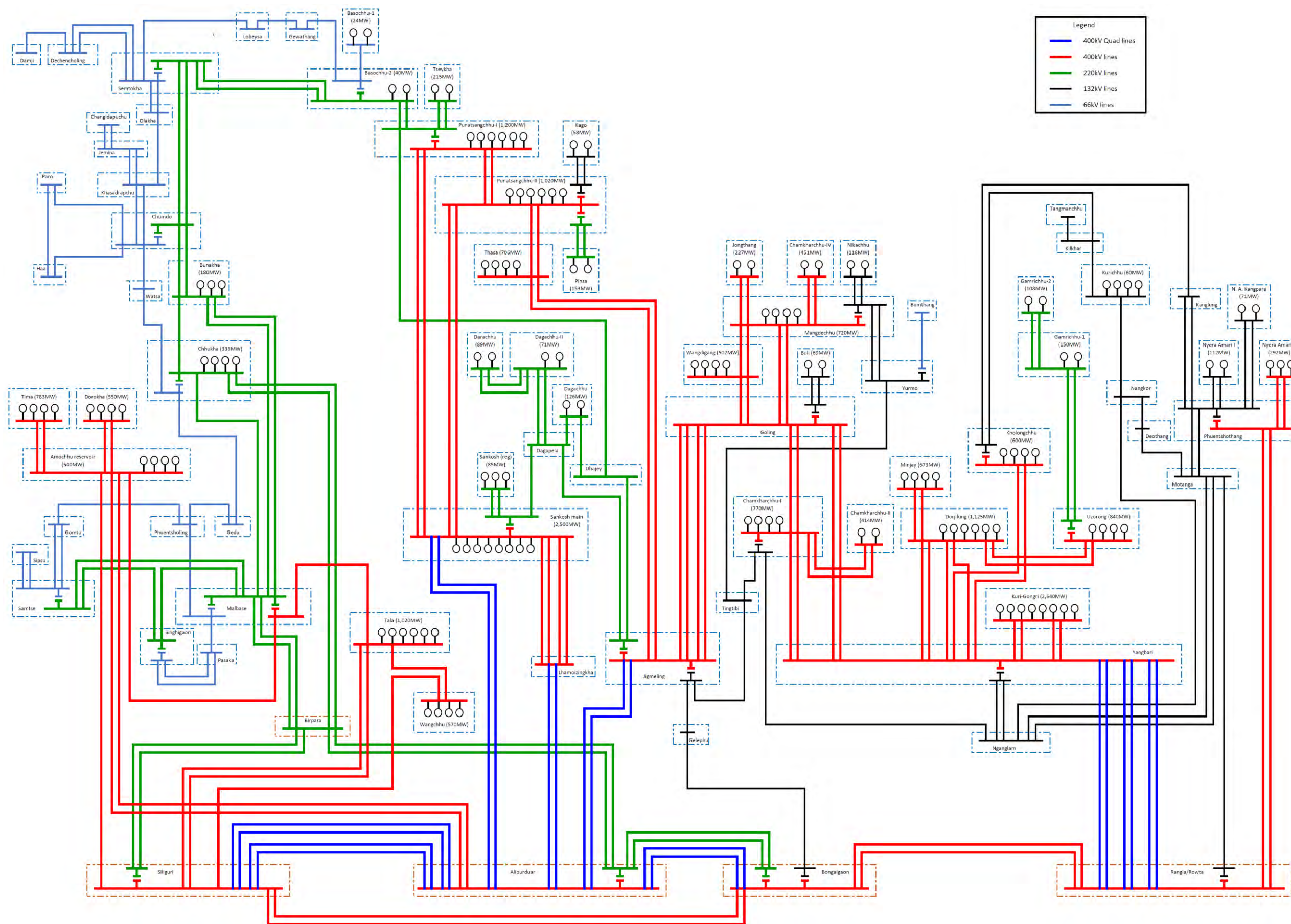


図 A 4-17 単線結線図 (2050 年)

(出典：JICA 調査団)

Appendix-5 優先開発地点設計図

3 優先開発地点（A-8 : Dorokha, P-30 : Pinsa, C-10 : Chamkharchhu II）について以下の概念設計図を示す。

- 一般平面図
- 取水ダムおよび取水口平面図
- 取水ダム断面図
- 発電所、放水口および開閉所平面図

5.1 Dorokha (A-8)

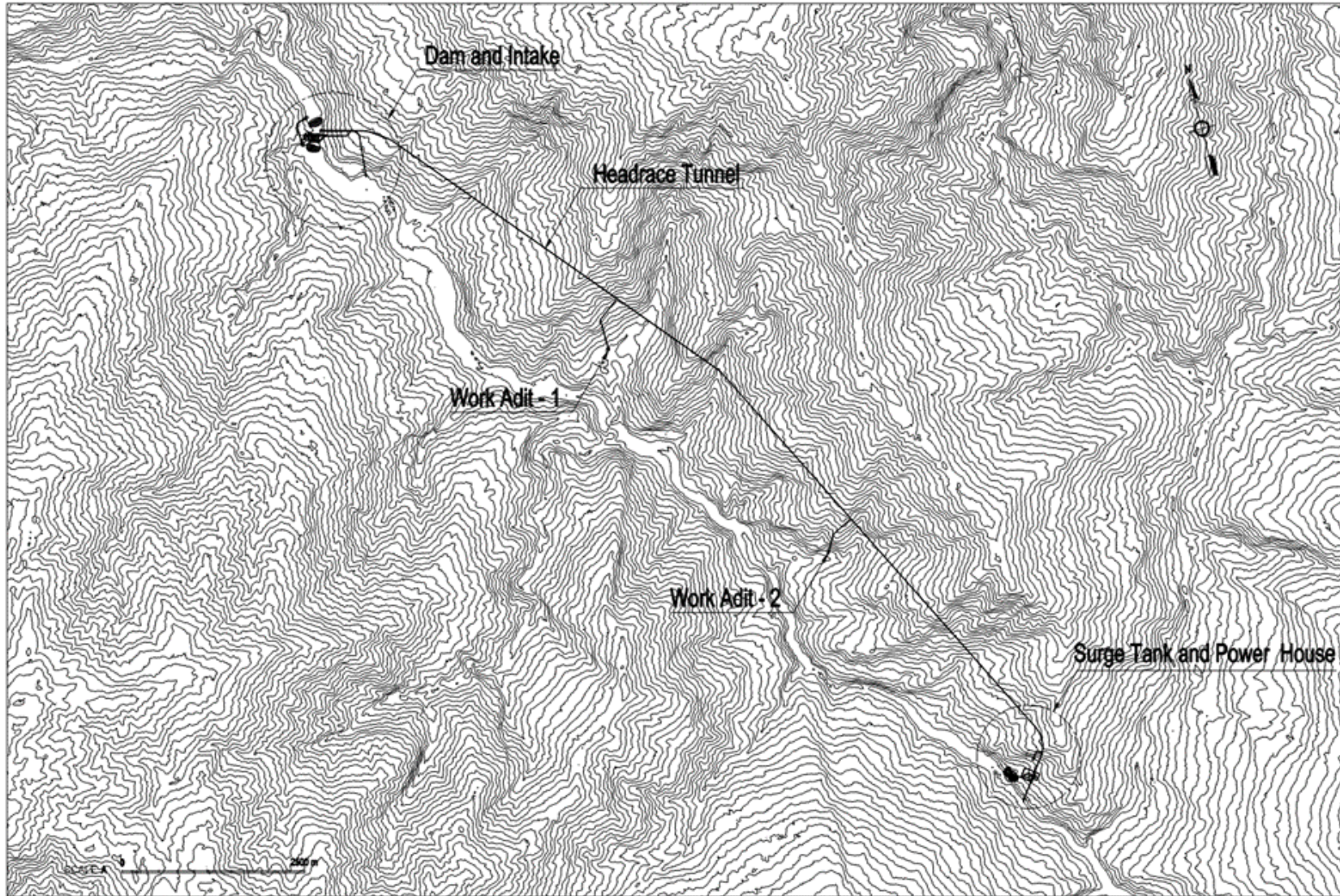


図 A 5-1 一般平面図 Dorokha (A-8)

(出典：JICA 調査団)

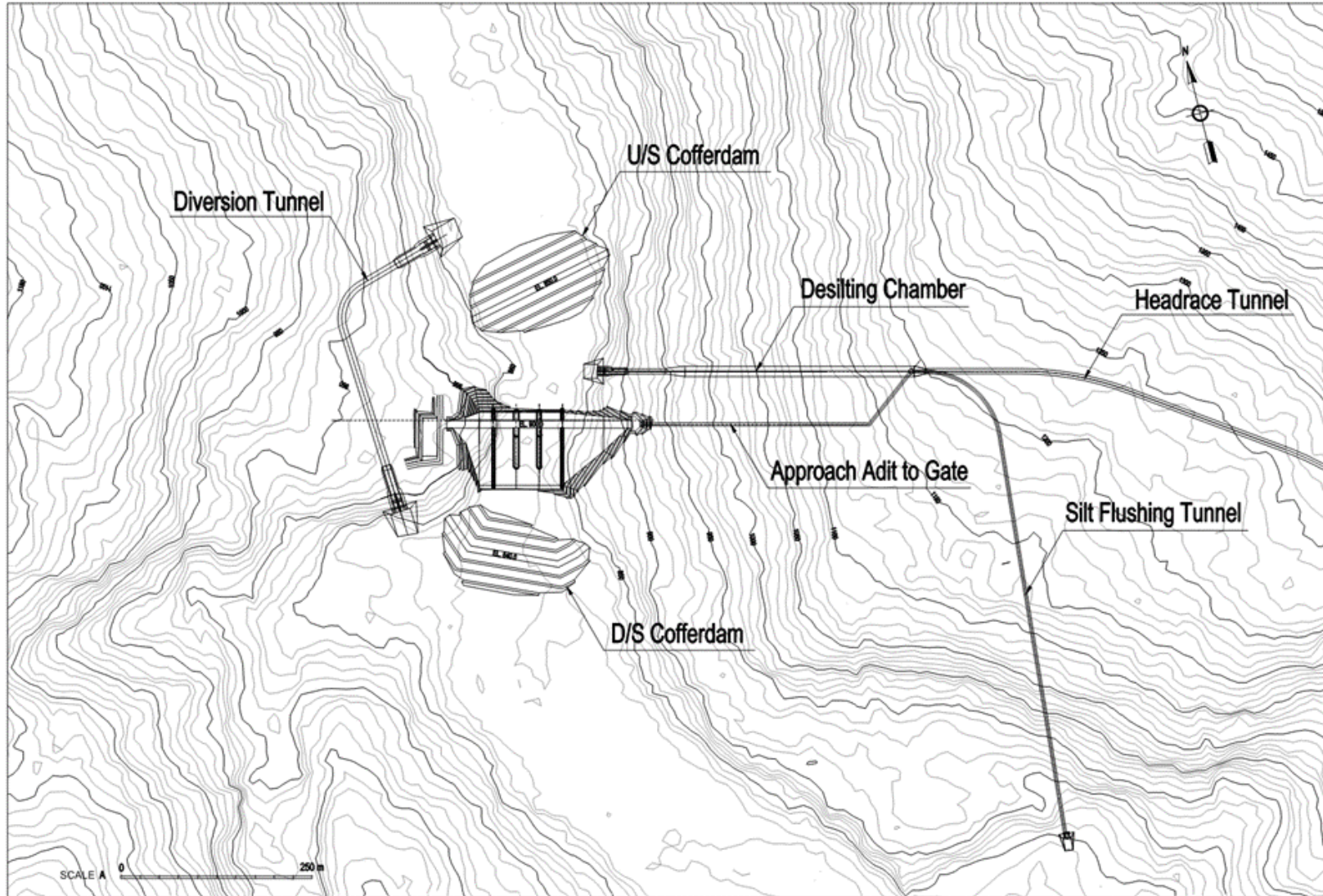


図 A 5-2 取水ダムおよび取水口平面図 Dorokha (A-8)

(出典：JICA 調査団)

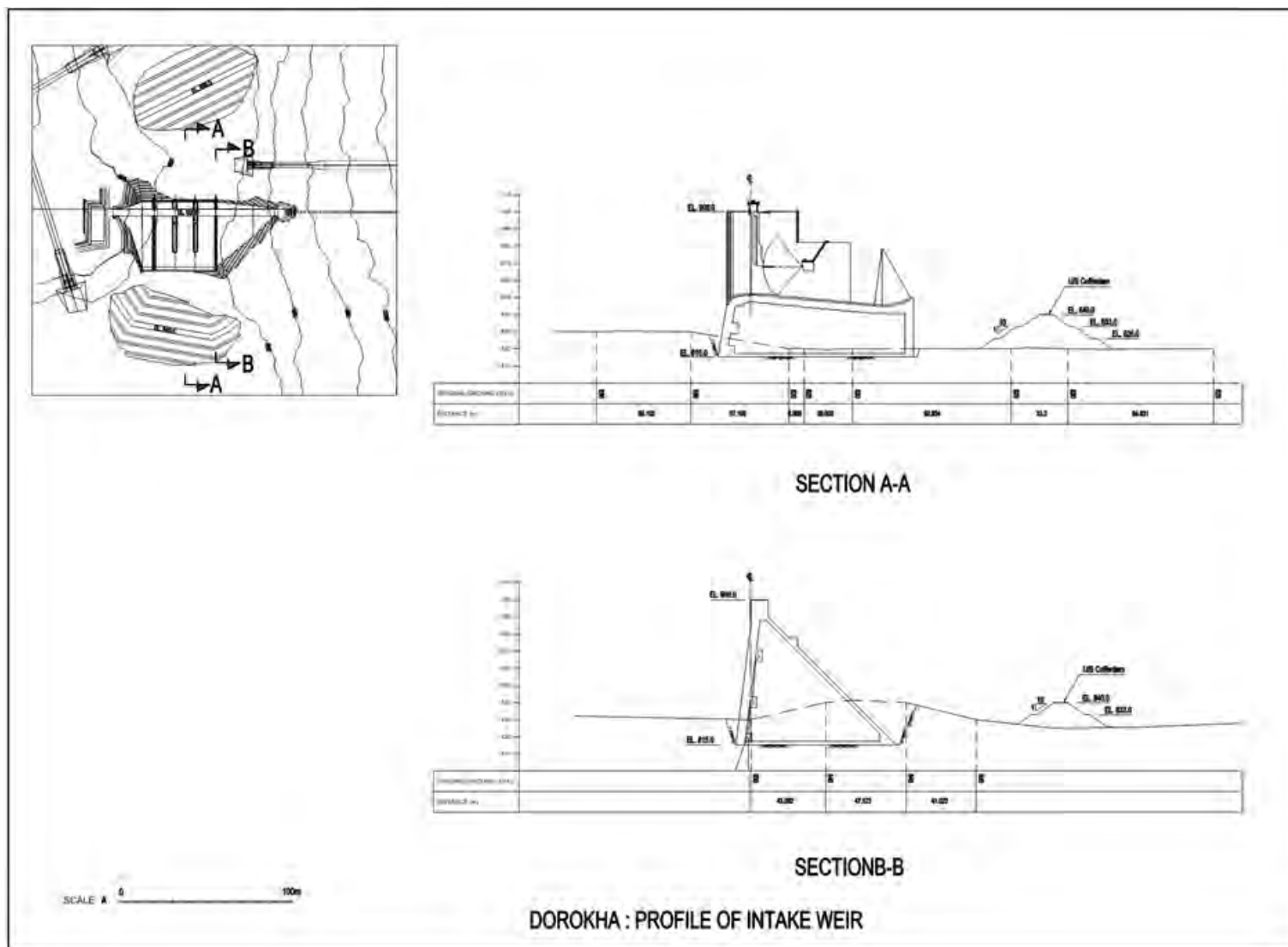


図 A 5-3 取水ダム断面図 Dorokha (A-8)

(出典：JICA 調査団)

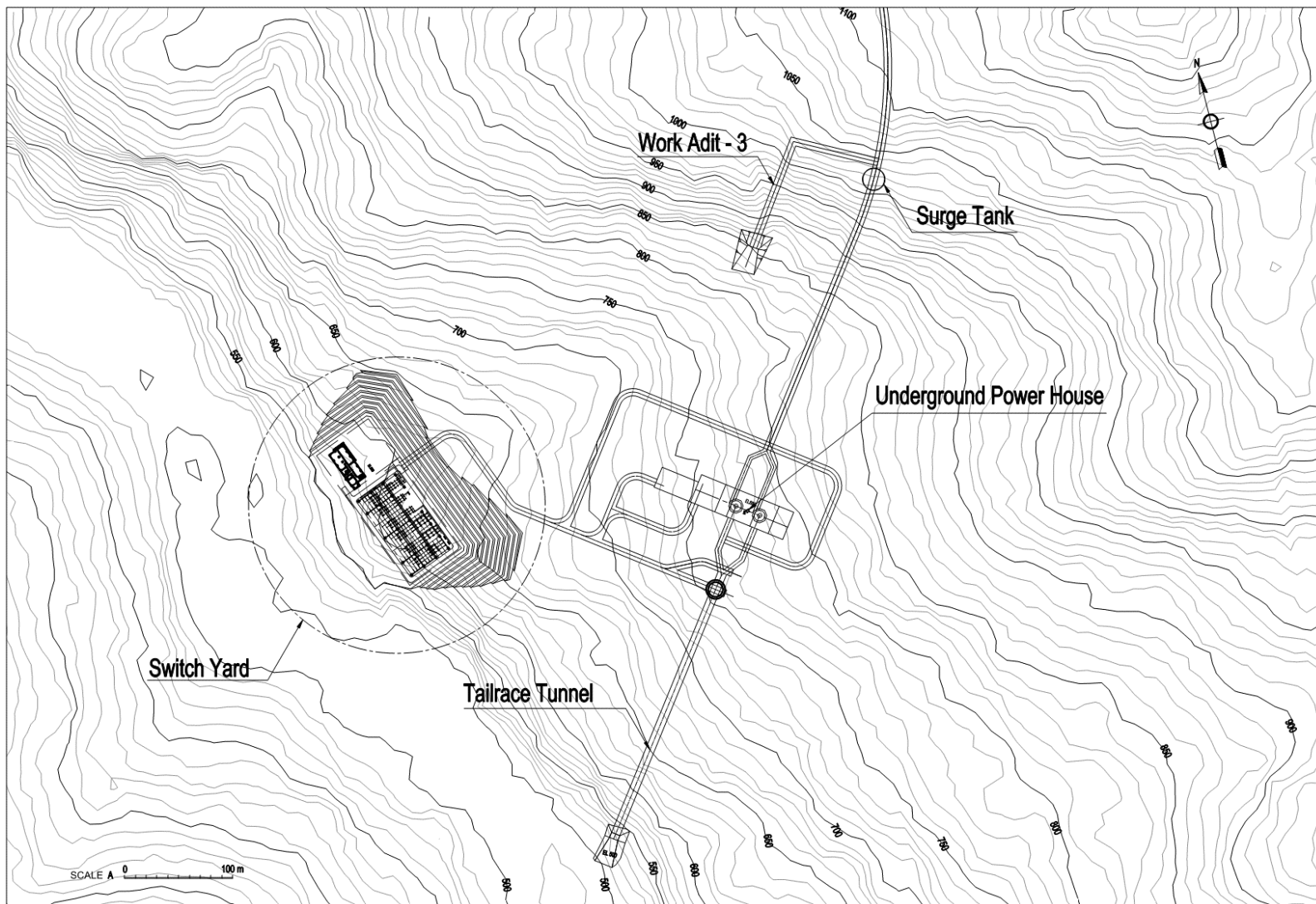


図 A 5-4 発電所、放水口および開閉所平面図 Dorokha (A-8)

(出典：JICA 調査団)

5.2 Pinsa (P-30)

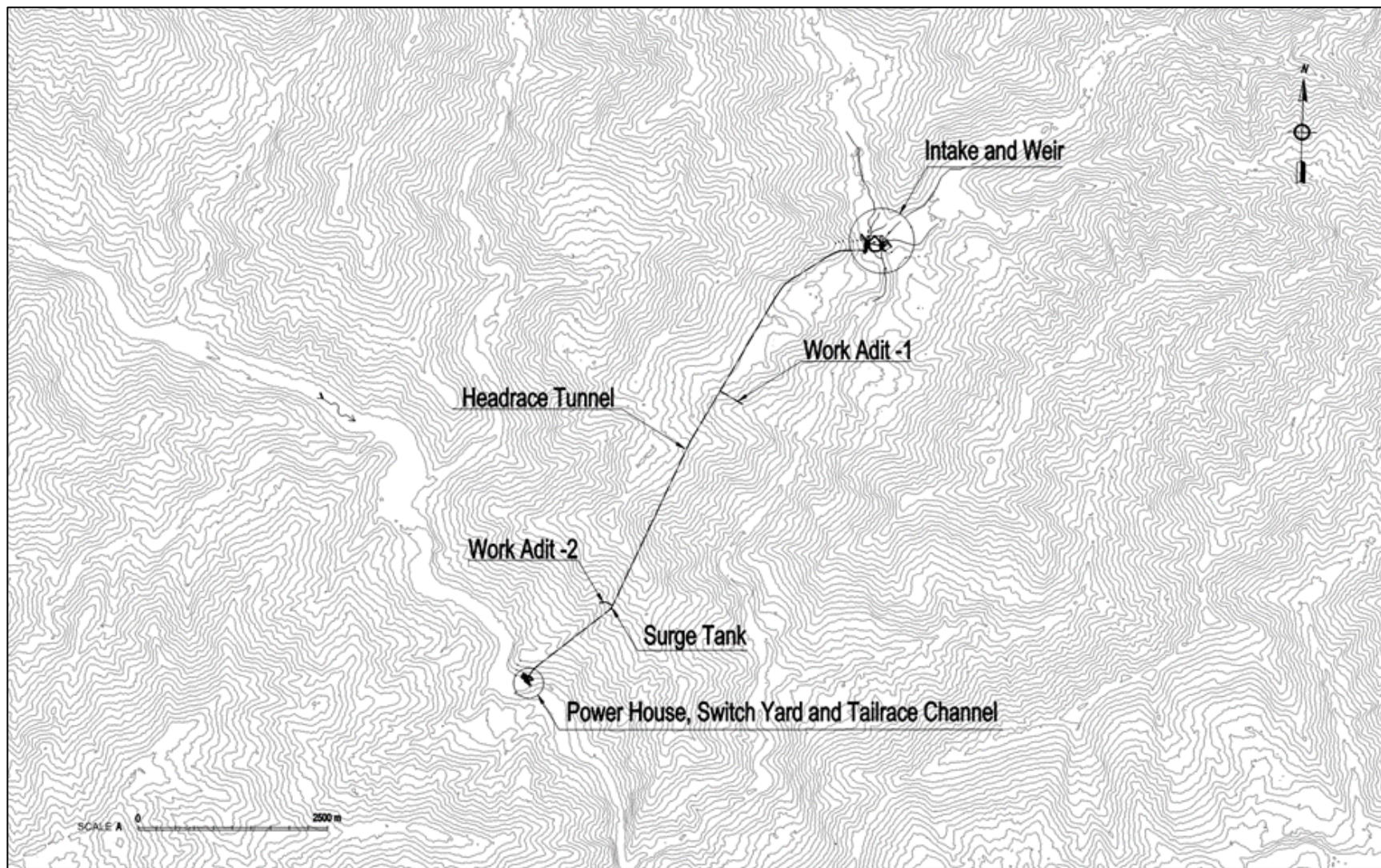


図 A 5-5 一般平面図 Pinsa (P-30)

(出典：JICA 調査団)

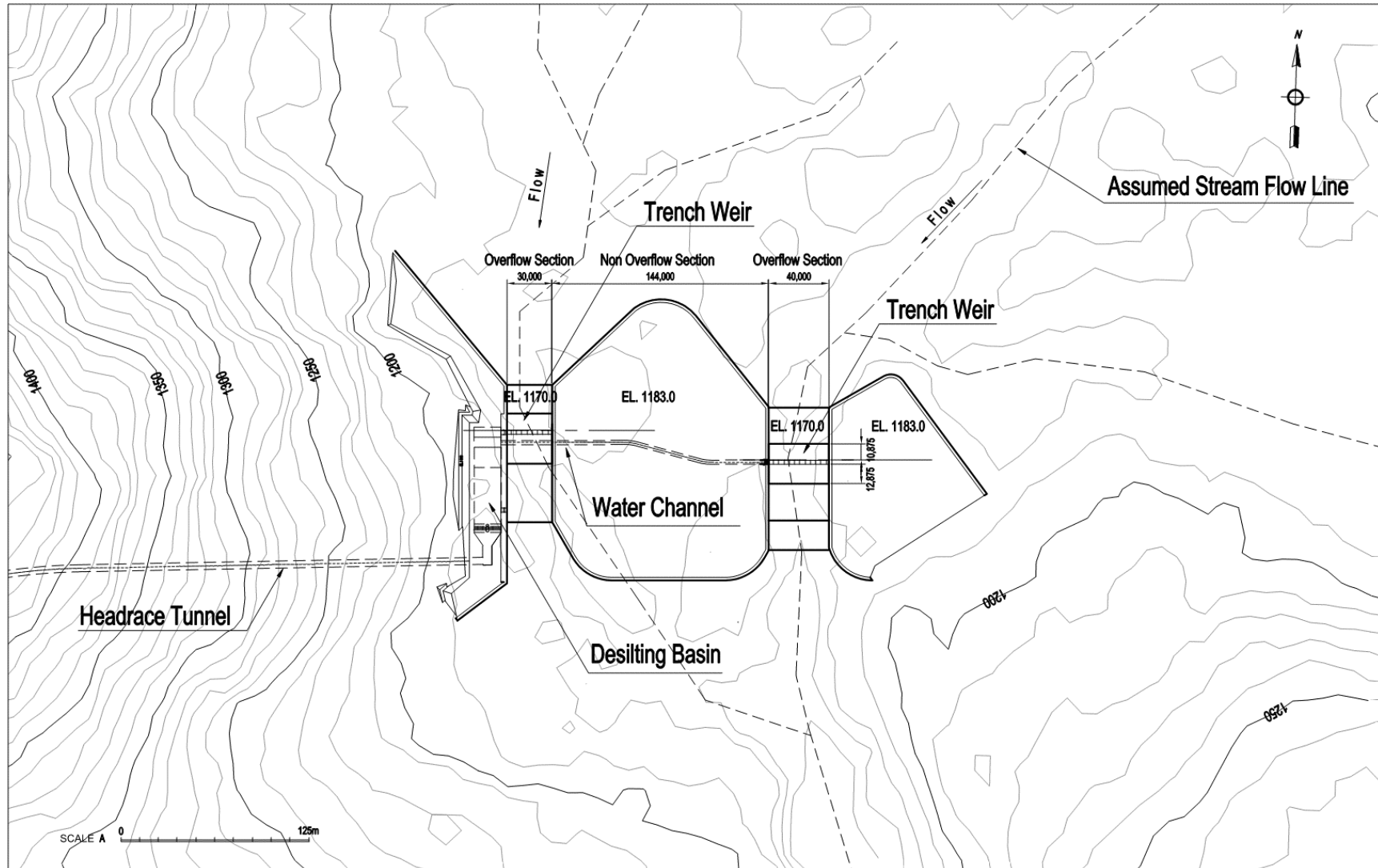


図 A 5-6 取水ダムおよび取水口平面図 Pinsa (P-30)

(出典：JICA 調査団)

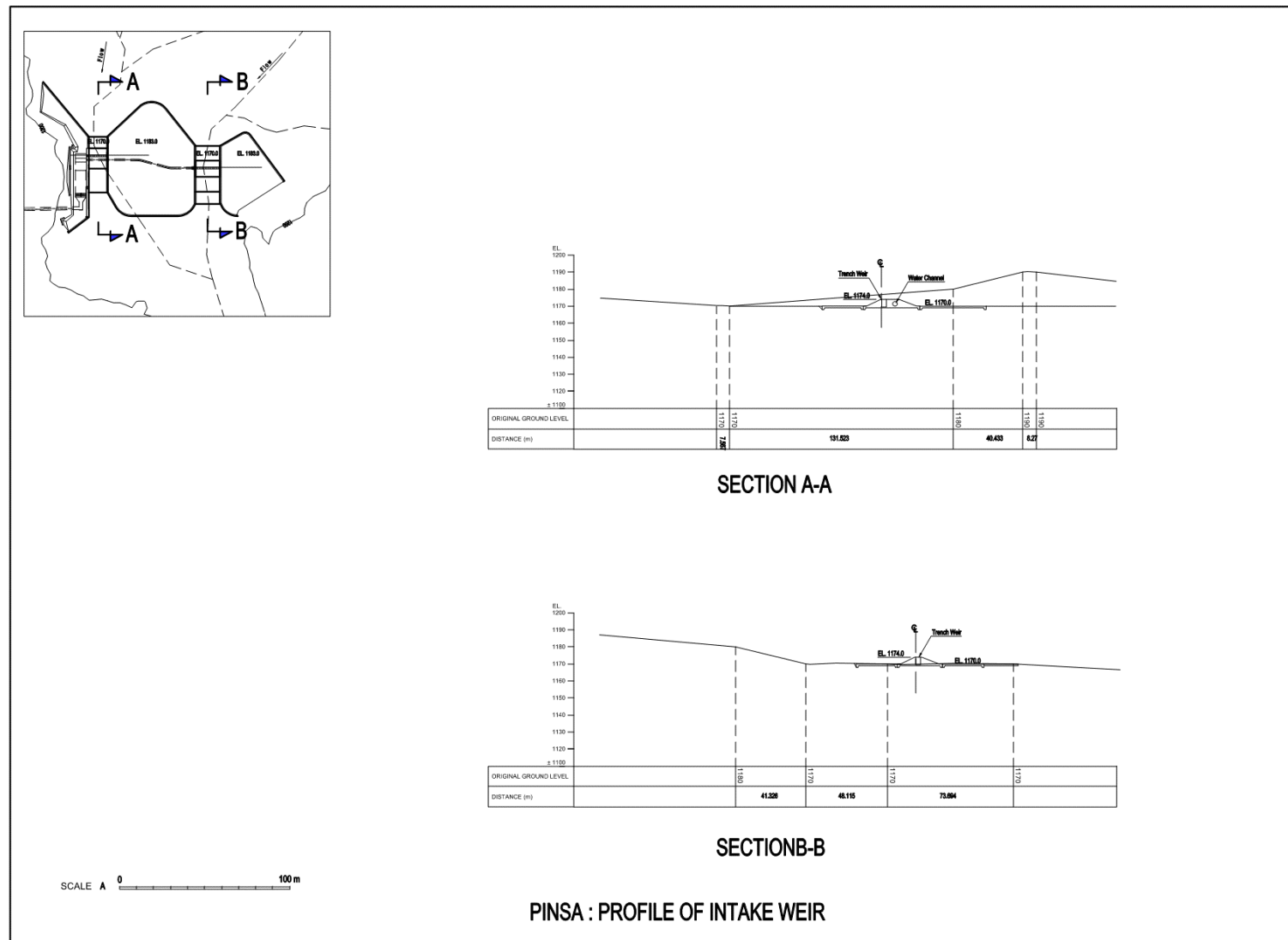


図 A 5-7 取水ダム断面図 Pinsa (P-30)

(出典：JICA 調査団)

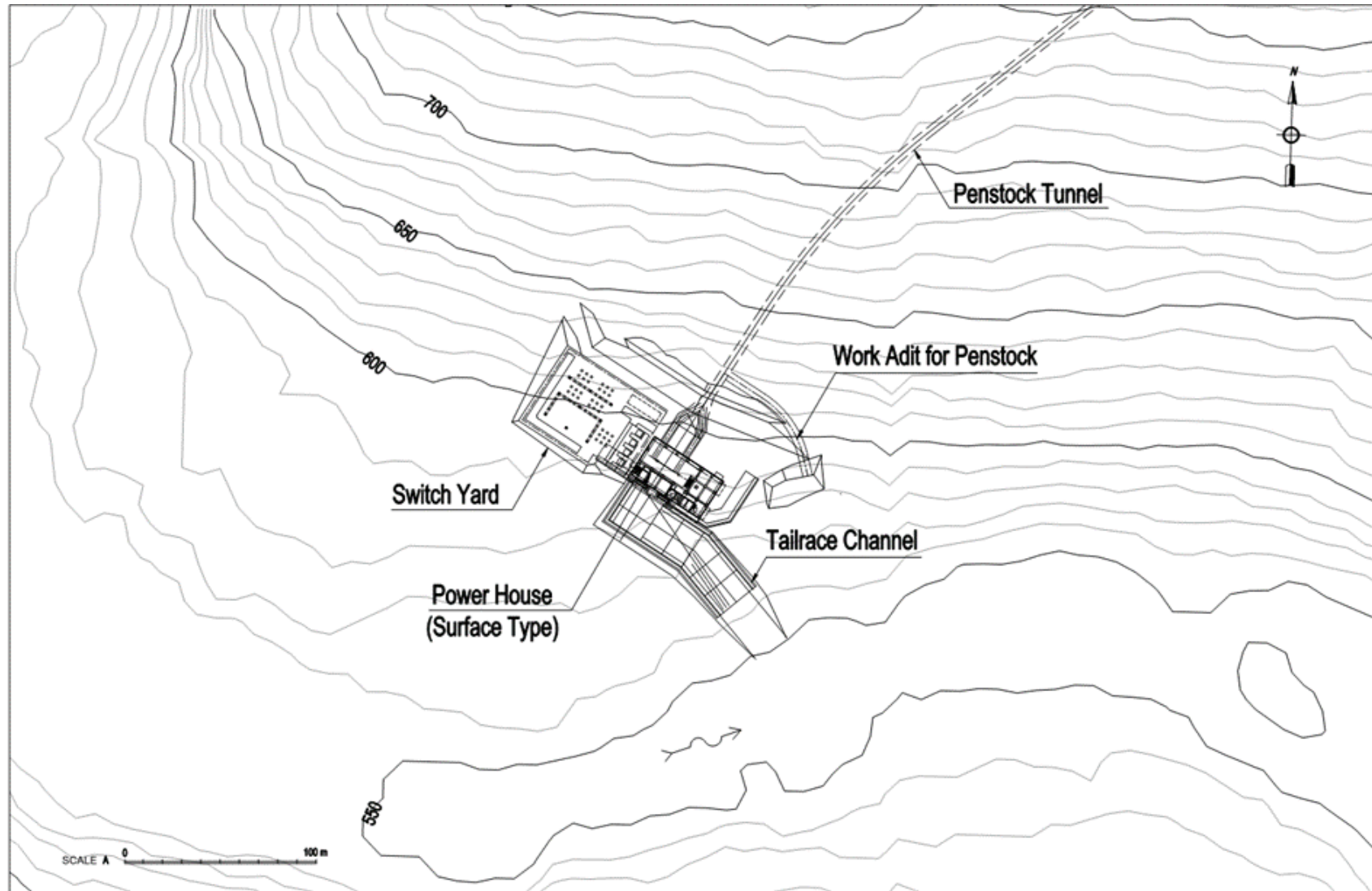


図 A 5-8 発電所、放水口および開閉所平面図 Pinsa (P-30)

(出典：JICA 調査団)

5.3 Chamkharchhu-II (C-10)

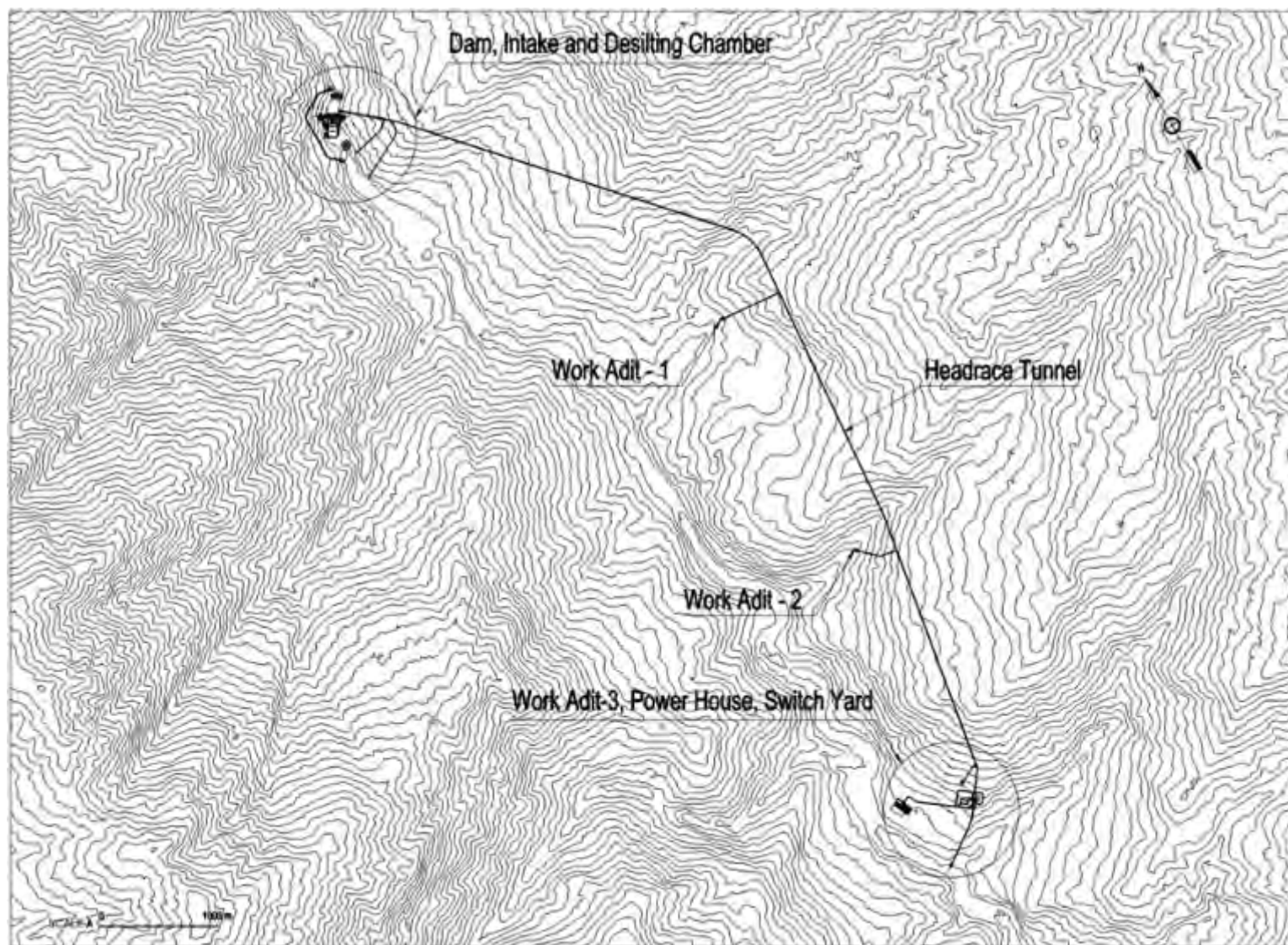


図 A 5-9 一般平面図 Chamkharchhu-II (C-10)

(出典：JICA 調査団)

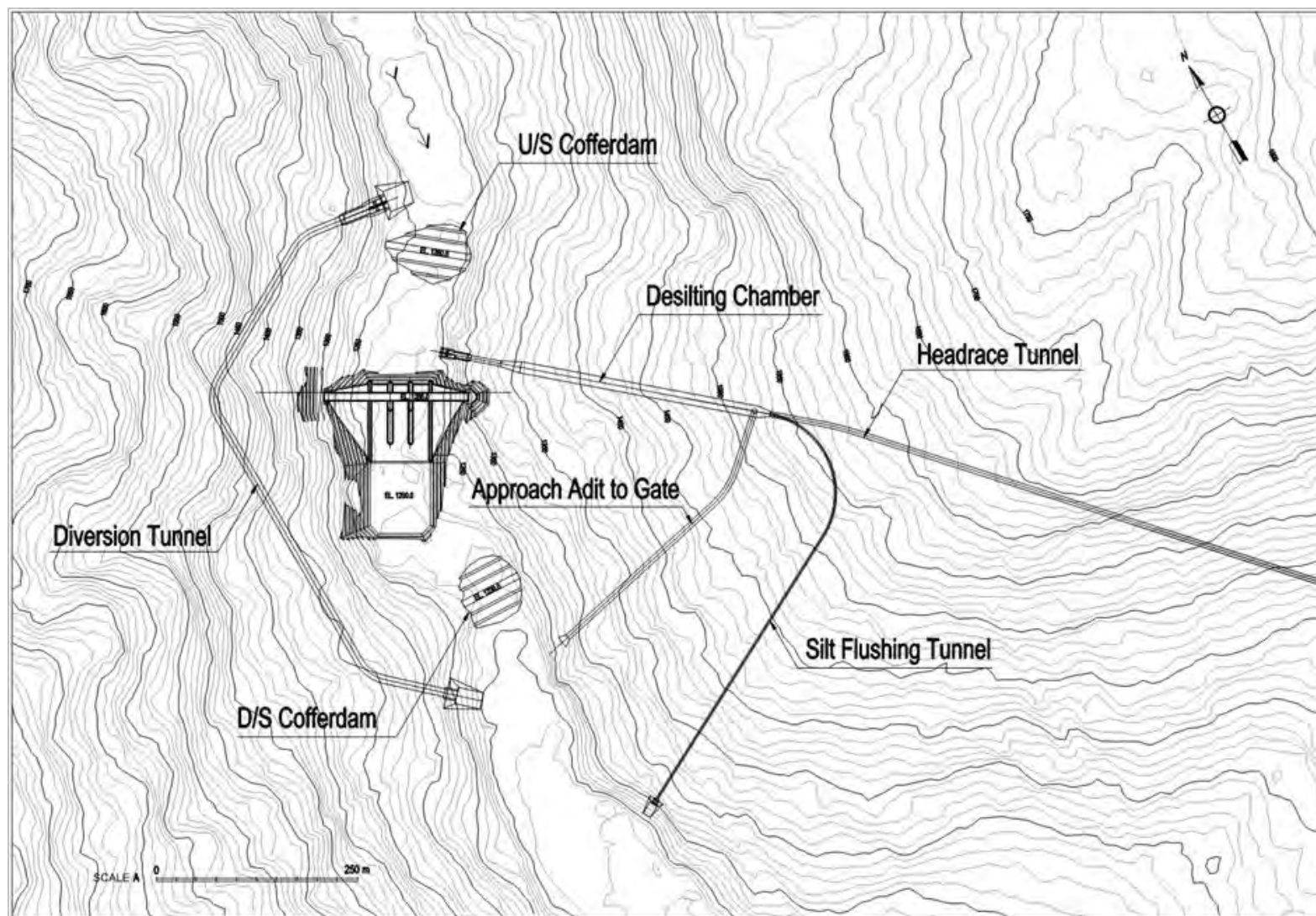


図 A 5-10 取水ダムおよび取水口平面図 Chamkharchhu-II (C-10)

(出典：JICA 調査団)

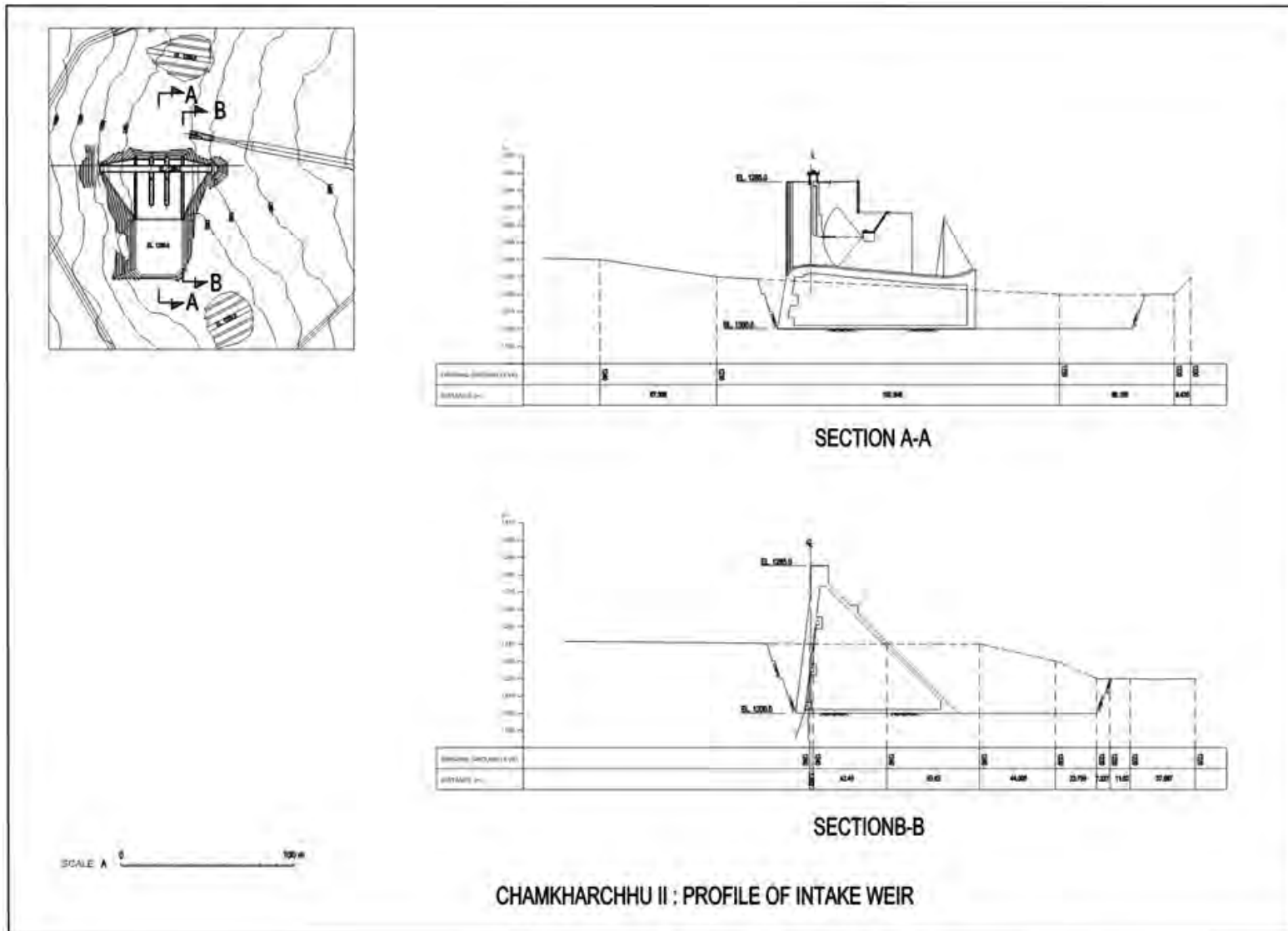


図 A 5-11 取水ダム断面図 Chamkharchhu-II (C-10)

(出典：JICA 調査団)

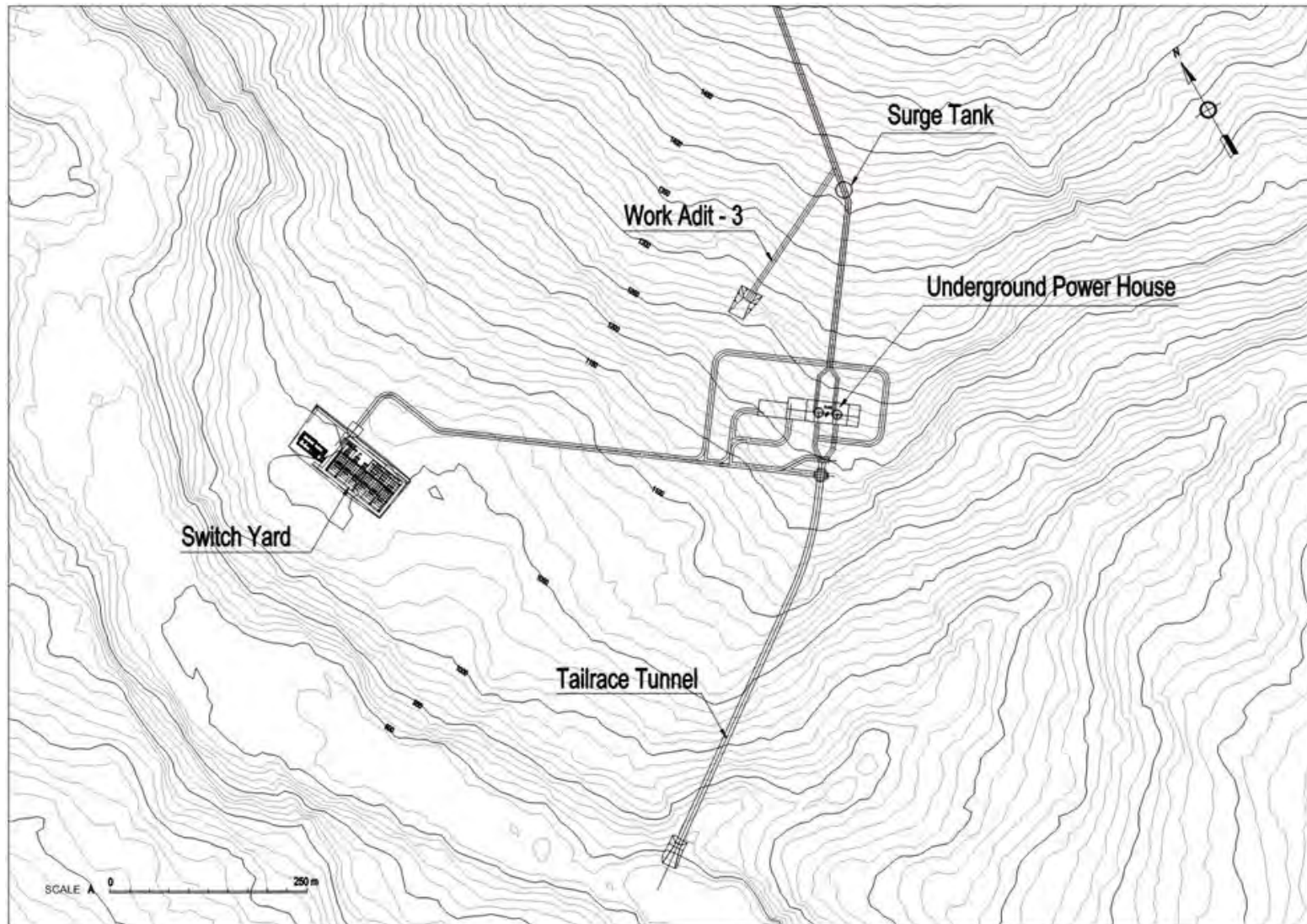


図 A 5-12 発電所、放水口および開閉所平面 Chamkharchhu-II (C-10)

(出典：JICA 調査団)

Appendix-6 揚水式水力の調査

6.1 調査内容

DHPS から揚水発電所開発の要望が示されたことから、Google Earth ならびに QGIS の地形データを基に有望素材地点を抽出し、概略計画を策定した。さらに、環境・地質条件を確認するために現地調査を行った。

6.2 有望素材地点の抽出条件

有望地点抽出のための洗い出し条件は以下の通りとした。

表 A 6-1 揚水開発地点の抽出基準

区 分	基準項目	基準値	適用	
環境面	発電計画	<ul style="list-style-type: none"> ピーク運転時間 (池時間) 発電出力 	<ul style="list-style-type: none"> 7hrs 1,200 MW 	○ ○
	製作限界	<ul style="list-style-type: none"> 設計落差 変動落差比 (Hpmax / Hgmin) 最大利用水深 	<ul style="list-style-type: none"> 最小 500 m 最大 800 m (総落差) 最大 1.25-1.4 最大 30m (全面フェーシングの場合は 40m) 	○ ○ ○
	計画位置 /レイアウト	<ul style="list-style-type: none"> 下部調整池集水面積 下部ダム堤頂長 ダム高 水路長 水路長 / 落差 (L/H) 地下発電所被り厚 	<ul style="list-style-type: none"> 50 km² 以上 500 m 以下 150 m 以下 8 km 以下 10 以下 500 m 以下 	○ ○ ○ ○ ○ ○
	地質条件	<ul style="list-style-type: none"> 活断層(第四紀断層) 断層及び破碎帯 地すべり地域 上部調整池周辺の透水性 	<ul style="list-style-type: none"> 活断層からの距離 10km 以上 大規模断層または破碎帯の回避 大規模地すべり地帯の回避 石灰岩 / 第四紀岩の回避 	● ● ● ●
環境面	自然環境	<ul style="list-style-type: none"> 保護地域 (e.g. 自然公園等) 絶滅危惧種 	<ul style="list-style-type: none"> 保護地域の回避 (国立公園、自然公園、ラムサール条約指定地) 重要な動植物の棲息地の回避 	○ ●
	社会環境	<ul style="list-style-type: none"> 鉱山採掘権設定地 歴史的・文化的遺跡 住民移転 	<ul style="list-style-type: none"> 鉱山権設定地域の回避 遺跡の水没の回避 50 戸以下 	● ● ●

○ : 第一次地点選定時に考慮 ● : 地点調査時に確認

6.3 机上調査結果

上記洗い出し条件を基に机上調査した結果、以下の3地点を抽出した。

- ✓ Pangbang PSPP : Manaschhu の中流域の右岸側に上池を設け、G-22 Pangbang 地点の調整池を下池として利用する計画
- ✓ Jerichhu PSPP : G-16 Jerichhu 地点の取水ダムの上流に上池を設け、G-14 Uzorong Rev 地点の調整池を下池として利用する計画
- ✓ Basochhu PSPP : 既設 Basochhu stage 1 発電所の取水堰地点下流に上ダムを設置し、Punatsangchhu I の取水ダムの約 3.5 km 下流に新たに下ダムを設置する計画

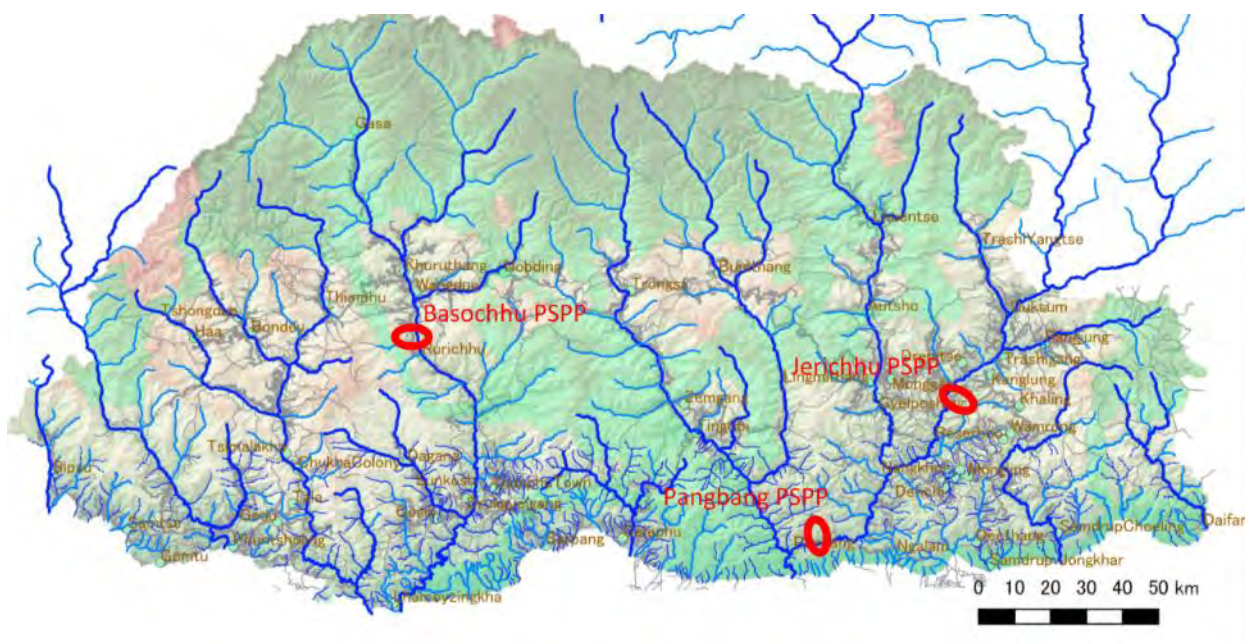


図 A 6-1 揚水素材地点位置図

(出典：JICA 調査団)

6.4 現地調査結果

(1) Pangbang PSPP

G-22 Pangbang 地点の現地調査の結果、Manaschhu 沿いの右岸側斜面には数本の連続する熱水変質帯があり、これを起因とする大規模崩壊地が複数存在することから、Pangbang PSPP は技術的に開発困難と評価された（Appendix-1 の G-22 Pangbang の現地調査結果報告書を参照）。



図 A 6-2 平面レイアウト (Pangbang PSPP) (出典：JICA 調査団)

(2) Jerichhu PSPP

主要データ	地点名	Jerichhu PSPP Rev2		調査日	23, 25/01/2019		
	水系名	Manaschhu		河川名	上ダム： Jerichhu 下ダム： Manaschhu		
	上部ダム	緯度： 27° 11' 19.42" N		経度： 91° 26' 48.02" E			
	下部ダム	緯度： 27° 13' 56.04" N		経度： 91° 23' 29.64" E			
	発電所	緯度： 27° 13' 0.51" N		経度： 91° 24' 0.28" E			
	タイプ	純揚水式		基本諸元	上ダム 河床標高	EL 1275m	
	主要諸元	設備出力	1,800 MW		上ダム高さ 下ダム高さ	90 (10) m 168 (23) m	
最大使用水量		330 m ³ /s			上ダム堤頂長 下ダム堤頂長	210 m 330 m	
有効落差		648.9 m			水平水路延長	7,660 m	
集水面積		km ²			上池有効貯水 容量	10.0 MCM	
アクセス	既設道路からの 離隔距離		上部ダム： 既設村道から 10 km 下部ダム： 既設基幹道路から 4 km 発電所： 下部ダムから 3km				
地形・地質	地質概要		<p>Long 他(2011) に記載されている調査地の地相は以下の通り 調査地の地質は、ほとんどが新原生代 Daling-Shumar 層群 Shumar 累層 (pCs)の分布域にある。 淡灰～白色、褐色風化、極細粒、中～高層厚、急崖を成す珪岩。薄～厚層、緑色、上部に行くほど普遍的になる変形し引き摺り変形した石英のレンズを有する白雲母-黒雲母片岩および千枚岩と互層する。 上部調整池と取水口は、レッサーヒマラヤ帯の新原生代～カンブリア[?] 紀の Baxa 層群 Manas 累層 (Pzm) の分布域にある。本層は、Shumar 累層 (pCs)より新しく、両者の境界は Shumar 衝上断層 (ST)で接する。 灰～白色、中～厚層厚、中～粗粒、部分的に斜交層理をもつトラフ内堆積物相の礫岩質珪岩、暗灰色～暗緑色の薄層～薄い層状の千枚岩、 および中粒の灰色苦灰岩で構成される (Bhargava, 1995;Tangri, 1995a; Long et al., 2011A)。</p> <ul style="list-style-type: none"> ➤ Jerichhu 村の北で石灰質岩石からの溶出物が林道掘削法面を被っているのが確認された。当露頭は、おそらく石灰質岩石を含有する Daling 累層 (pCd)である。Daling 累層 (pCd)は Shumar 累層 (pCs)に被さり、Shumar 累層 (pCs)と同等の層相であるが、片岩と千枚岩が卓越する。珪岩は細～中層厚、中粒の灰色石灰岩を稀に挟む。下位では Shumar 累層に漸移する。 ➤ Jerichhu 集落の西端部で層状珪岩の露頭も確認したことから、当計画は Shumar 累層 (pCs)分布域にあると判断される。 				

	上部ダム地点	<ul style="list-style-type: none"> ➤ 上部調整池周辺の斜面は青松と広葉樹の林である。村人へのインタビューにより、以下の重要な情報を得た。 <ul style="list-style-type: none"> ✓ 川幅および水深はそれぞれ雨季で 15m と 1.5m、乾季で 7m と 0.5m (約 3.0 m³/s)である。 ✓ 川には腕ぐらいの太さの淡水魚が生息している。 ➤ 上述のような情報から、当河川は枯渇することがなく、地下水に関して致命的な問題はないであろうと想定される。
	下部ダム地点	<ul style="list-style-type: none"> ➤ 以前に DHPS が実施した“Uzorong Project”のダムサイトの現地調査の結果、「硬質、密実、灰色から白色、薄～厚層厚、節理の発達する珪岩がダム地点の左右岸に分布している。岩盤は弱風化、中程度に節理が発達している。下流側ではわずかに千枚岩が挟在し、地層は上流側へ傾斜している。」とのことである。
	水路経過地	<ul style="list-style-type: none"> ➤ 導水路沿いの岩級は、RMR 値 ; 44、Class-III と想定される。
	地下発電所	<ul style="list-style-type: none"> ➤ 発電所および放水口地点は特に問題はないと想定される。
自然 / 社会環境	自然公園 / 保護区域	<ul style="list-style-type: none"> ➤ プロジェクト地域は保護区外に位置している。
	貴重動植物	<ul style="list-style-type: none"> ➤ プロジェクト地域は亜熱帯広葉樹林に覆われている（調査団は取水口地域のみ訪問）。 ➤ 取水口近くの集落の村人によるとヒョウ（VU）が生息している。
	移転 / 補償物件	<p><下ダムサイト > G 14 Uzorong Project の情報を参照</p> <p><発電所、上ダムサイト> NLC の GIS データとウゾロン地区役場によると</p> <ul style="list-style-type: none"> ➤ 住民移転なし ➤ 私有地の用地取得はなし
	歴史的 / 文化的遺産	<p><下ダムサイト > G 14 Uzorong Project の情報を参照</p> <p><発電所、上ダムサイト> NLC の GIS データおよびウゾロン地区役場によると文化遺産はない。</p>
	その他	<p>下ダムサイトについては、G 14 Uzorong Project の情報を参照</p>



Photo 1 下部ダム地点 (PSPP 専用)



Photo 2 Uzorong Rev ダム地点



Photo 3 上部ダム地点 (下流案)

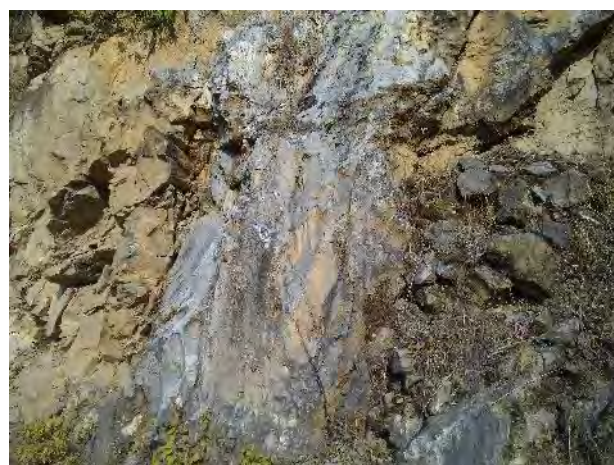


Photo 4 上部ダム近傍の道路沿いの石灰岩露頭



Photo 5 Jerichhu 村の西端 (Photo 1 近く) に露岩する中程度風化 (MW) 珪岩



Photo 6 下部ダム地点の左岸にある上流傾斜の珪岩 (出典: DHPS)

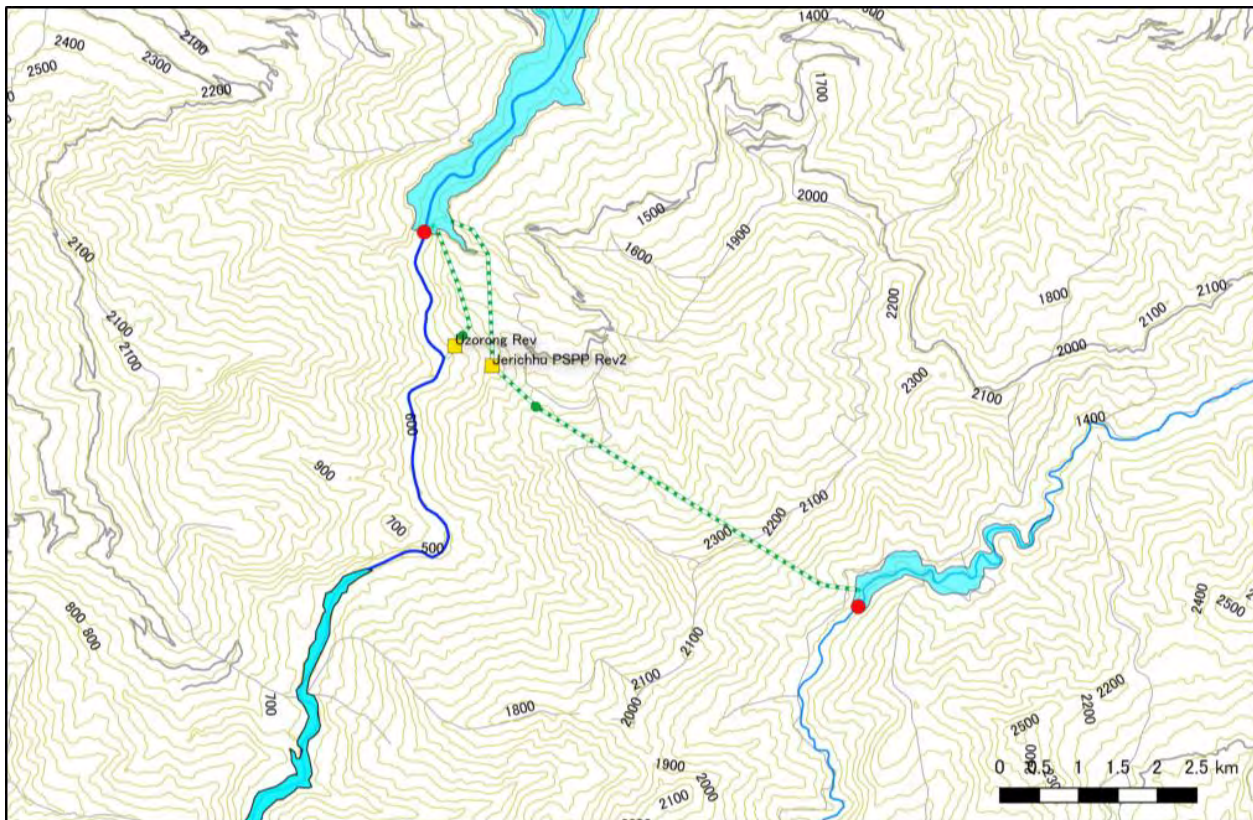


図 A 6-3 平面レイアウト (Jerichhu PSPP)

(出典：JICA 調査団)

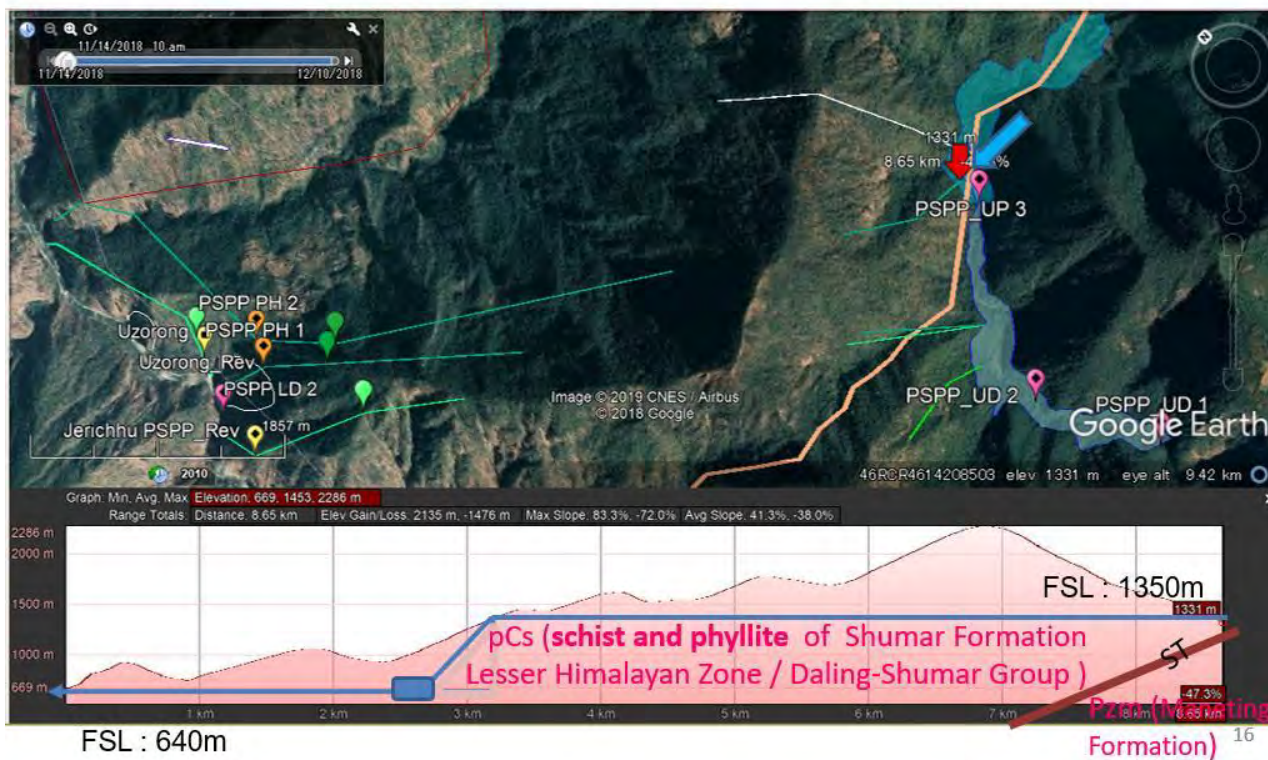


図 A 6-4 水路縦断面図 (Jerichhu PSPP)

(出典：JICA 調査団)

(3) Basochhu PSPP

主要データ	地点名	Basochhu PSPP		調査日	18, 29/01/2019	
	水系名	Punatsangchhu		河川名	上ダム： Basochhu 下ダム： Punatsangchhu	
	上部ダム	緯度： 27° 22' 7.58" N		経度： 89° 52' 50.40" E		
	下部ダム	緯度： 27° 22' 24.20" N		経度： 89° 54' 33.59" E		
	発電所	緯度： 27° 22' 36.21" N		経度： 89° 54' 18.32" E		
	タイプ	Pumped Storage			上ダム河床標高	EL 1785m
	主要諸元	設備出力	1,800 MW		下ダム河床標高	EL 1025m
最大使用水量		304 m ³ /s		上ダム高さ	80 (10) m	
有効落差		707.2 m		下ダム高さ	129 (29) m	
集水面積		km ²		上ダム堤頂長	190 m	
地形・地質	既設道路からの 離隔距離	上部ダム地点： 0 km				
		下部ダム地点： 0 km				
		発電所地点： 下ダム地点から 1km				
		<p>Long 他(2011) に記載されている地相は以下の通り。 計画地点の地質は、グレートヒマラヤ帯のうち構造上下位のグレートヒマラヤユニットの上部変成岩群に属するカンブリア～オルドビス [?] 紀の正片麻岩ユニット (GHlo) に属する。</p> <ul style="list-style-type: none"> ➤ 崖を形成する、塊状で風化した花崗岩起源の正片麻岩；一般に優白質で眼球状長石を欠く。準片麻岩、片岩および珪岩が繰り返すが、局所的には離れて分布する。 				
		<ul style="list-style-type: none"> ➤ ダム地点の基盤は、堅硬な片麻岩である。 ➤ 急崖を形成する片麻岩が左右岸アバットに露岩する。しかし、堅硬な岩盤の分布がダムサイト付近に限らないかどうか、広範囲に地形地質を注意深く調査する必要がある。 				
上部ダム地点	<ul style="list-style-type: none"> ➤ ダム地域の基盤は、堅硬な片麻岩である。 ➤ ダム地点は両岸とも急峻で、右岸はほぼ直壁、左岸は傾斜 45° である。最大直径が約 20m の 3 個の巨大な転石が、河床に堆積している。 					
下部ダム地点	<ul style="list-style-type: none"> ➤ 導水路トンネル沿いには片麻岩が分布する。 ➤ 導水路トンネル沿いの岩級は主に RMR 値；70、Class-II の岩盤と想定される。 					
水路経過地	<ul style="list-style-type: none"> ➤ 発電所および放水口は基幹道路近傍に位置する。発電所は地下式で、地山被りは約 300 m である。 ➤ 地下発電所周辺の岩盤は堅硬で塊状の片麻岩であると想定される。 					
地下発電所						

	建設材料	<ul style="list-style-type: none"> ➤ 上部ダム地点から約 1.6km 上流の湛水池内のなだらかな丘を、堤体材料候補地として調査するのが望ましい。 ➤ Punatsangchhu I & II 水力発電所が建設中である。ここで用いられている原石山を下部ダムの建設材料として利用すべきである。また、河床に散在する巨大な転石も材料として有望である。
自然 / 社会環境	自然公園 / 保護区域	<ul style="list-style-type: none"> ➤ プロジェクト地域は保護区外に位置している。
	貴重動植物	<ul style="list-style-type: none"> ➤ 計画地点は松林に覆われている。
	移転 / 補償物件	<ul style="list-style-type: none"> ➤ 上ダムサイトで 1 軒の住民移転が必要となる。 ➤ 上ダムサイトで農業その他の私有地の用地取得が必要となる。 ➤ 湛水域の施設：Punatsangchhu I 水力開発プロジェクトのための一時的な施設
	歴史的 / 文化的遺産	<ul style="list-style-type: none"> ➤ なし。
	その他	<ul style="list-style-type: none"> ➤ 上ダムサイトで 1 軒の住民移転が必要となる。 ➤ 上ダムサイトで農業その他の私有地の用地取得が必要となる。 ➤ 湛水域の施設：Punatsangchhu I 水力開発プロジェクトのための一時的な施設
特記事項		<ul style="list-style-type: none"> ➤ 下部ダムの HWL は EL. 1120m であり、Punatsangchhu I 取水ダムの河床標高より 25m 低い。



Photo 1 上部調整池



Photo 2 上部ダム右岸の露頭



Photo 3 上部ダム左岸の露頭



Photo 4 下部ダム右岸の急崖を形成する珪岩露頭



Photo 5 下部ダム左岸

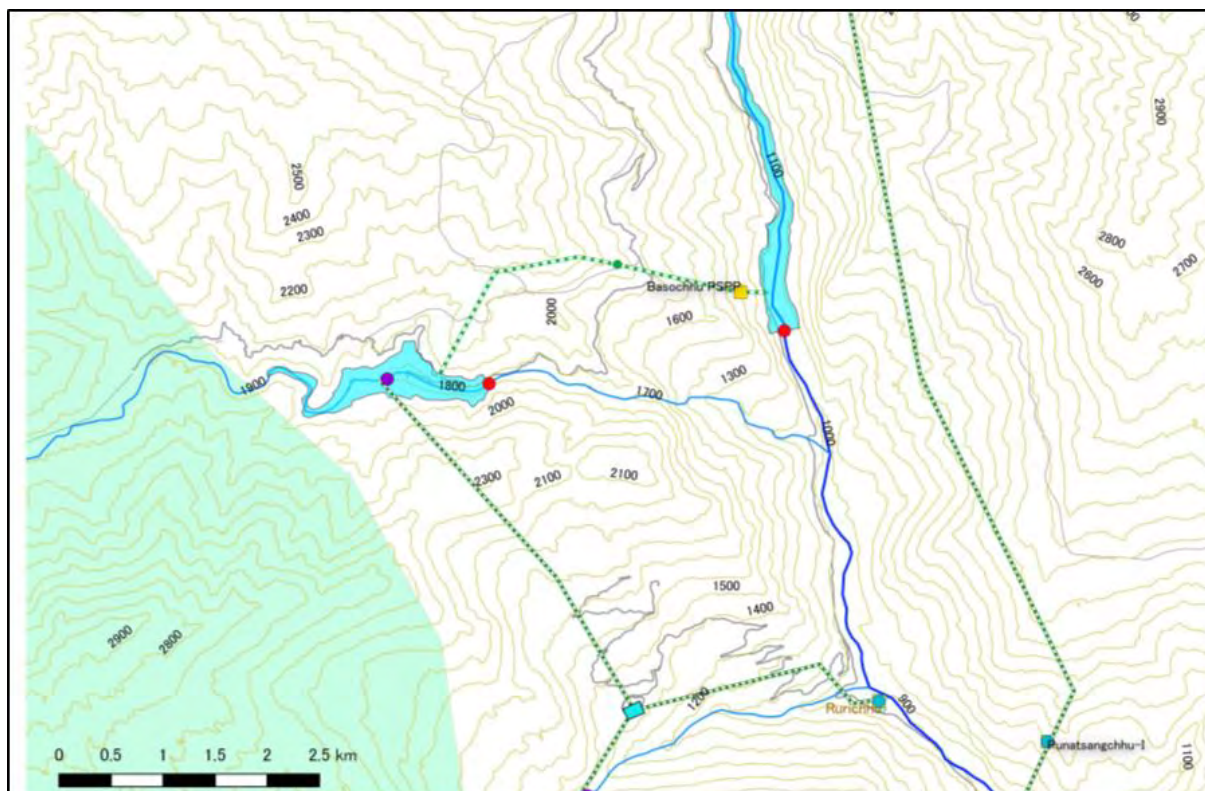


図 A 6-5 平面レイアウト (Basochhu PSPP) (出典：JICA 調査団)



図 A 6-6 水路縦断図 (Basochhu PSPP) (出典：JICA 調査団)

Appendix-7 財務分析数表

各種財務分析数表を以下に示す。

表 A 7-1 財務分析数表 (G-G Scheme)

G-G Scheme (Mangdechhu scheme)		Project Period																																				
Grant:30% Loan: 70% (Interest rate: 10%)		Operation Period																																				
Grace period: repayment starts after COD, Repayment: 15 years		Year																																				
Energy share: 100% RGoB		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	
Cash Flow of SPC																																						
Investment (excluding IDC)																																						
Construction	-29,355 BTN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148
Replacement and overhaul	-13,715 BTN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydromechanical Work	-3,491 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work	-515 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation	-1,920 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overhaul at the end of operation	-1,056 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydromechanical Work	-12,148 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work	-1,791 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation	-6,682 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overhaul at the end of operation	-3,675 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Operation																																						
Energy Sold	19,918 GWh	0	0	0	0	0	0	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664		
Tariff	4.20 BTN/kWh	4.92	5.02	5.12	5.22	5.33	5.43	5.54	5.65	5.77	5.88	6.00	6.12	6.24	6.37	6.49	6.62	6.76	6.89	7.03	7.17	7.31	7.46	7.61	7.76	7.92	8.07	8.23	8.40	8.57	8.74	8.91	9.09	9.27	9.46	9.65	9.84	
Sales Revenue	149,267 BTN mn	0	0	0	0	0	0	3,679	3,753	3,828	3,905	3,983	4,062	4,144	4,226	4,311	4,397	4,485	4,575	4,666	4,760	4,855	4,952	5,051	5,152	5,255	5,360	5,467	5,577	5,688	5,802	5,918	6,036	6,157	6,280	6,406	6,534	
Operation and Maintenance Cost	-7,556 BTN mn	0	0	0	0	0	0	-128	-134	-139	-145	-152	-158	-165	-172	-179	-187	-195	-204	-212	-221	-231	-241	-251	-262	-273	-285	-297	-310	-323	-337	-352	-367	-383	-399	-416	-434	
Gross Income	141,711 BTN mn	0	0	0	0	0	0	3,551	3,619	3,689	3,759	3,831	3,904	3,979	4,054	4,132	4,210	4,290	4,371	4,454	4,538	4,624	4,711	4,800	4,890	4,982	5,075	5,170	5,267	5,365	5,465	5,566	5,669	5,774	5,881	5,990	6,100	
Depreciation Expense	-15,461 BTN mn	0	0	0	0	0	0	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	
Interest Expense	-8,851 BTN mn	0	0	0	0	0	0	-1,141	-1,062	-983	-905	-826	-747	-669	-590	-511	-433	-354	-275	-197	-118	-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	117,399 BTN mn	0	0	0	0	0	0	1,953	2,100	2,248	2,397	2,548	2,700	2,853	3,007	3,163	3,320	3,479	3,639	3,800	3,963	4,127	4,138	4,226	4,316	4,408	4,502	4,597	4,693	4,791	4,891	4,993	5,096	5,201	5,308	5,416	5,526	
Income Tax	-35,220 BTN mn	0	0	0	0	0	0	-586	-630	-674	-719	-764	-810	-856	-902	-949	-996	-1,044	-1,092	-1,140	-1,189	-1,238	-1,241	-1,268	-1,295	-1,322	-1,350	-1,379	-1,408	-1,437	-1,467	-1,498	-1,529	-1,560	-1,592	-1,625	-1,658	
Net Profit	82,179 BTN mn	0	0	0	0	0	0	1,367	1,470	1,574	1,678	1,784	1,890	1,997	2,105	2,214	2,324	2,435	2,547	2,660	2,774	2,889	2,896	2,958	3,022	3,086	3,151	3,218	3,285	3,354	3,424	3,495	3,567	3,641	3,715	3,791	3,868	
Net Cash Flow from Operation	106,491 BTN mn	0	0	0	0	0	0	2,965	2,989	3,014	3,040	3,067	3,094	3,123	3,152	3,183	3,214	3,246	3,280	3,314	3,349	3,386	3,470	3,532	3,595	3,659	3,725	3,791	3,859	3,927	3,997	4,068	4,141	4,214	4,289	4,365	4,442	
Project Net Cash Flow	77,136 BTN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	2,965	2,989	3,014	3,040	3,067	3,094	3,123	3,152	3,183	3,214	3,246	3,280	3,314	3,349	-105	3,470	3,532	3,595	3,659	3,725	3,791	3,859	3,927	3,997	4,068	4,141	4,214	4,289	4,365	-7,706	
Project FIRR	15.41%																																					
Financing																																						
30% Equity Grant																																						
Outstanding at Beginning	0 BTN mn	0	314	963	1,769	2,950	3,742	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057		
Equity Proceeds	5,057 BTN mn	314	649	806	1,182	792	1,315	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115		
Construction	4,115 BTN mn	314	649	806	1,182	792	1,315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Equity Contribution to IDC	943 BTN mn	0	0	0	0	0	943	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at End	5,057 BTN mn	314	963	1,769	2,950	3,742	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057		
70% G-G Loan																																						
Outstanding at beginning	0 BTN mn	0	769	2,436	4,654	8,014	10,755	11,801	11,014	10,227	9,441	8,654	7,867	7,080	6,294	5,507	4,720	3,934	3,147	2,360	1,573	787	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Loan Proceeds (Construction and IDC)	11,801 BTN mn	769	1,667	2,218	3,360	2,741	1,045	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601	9,601		
Construction	9,601 BTN mn	769	1,667	2,218	2,757	1,847	869	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143	3,143		
Interest During Construction	3,143 BTN mn	37	153	338	603	894	1,119	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	-943	
Equity Contribution to IDC	-943 BTN mn	0	0	0	0	0	-943	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repayment	-11,801 BTN mn	0	0	0	0	0	0	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	-787	
Outstanding at end	11,801 BTN mn	769	2,436	4,654	8,014	10,755	11,801	11,014	10,227	9,441	8,654	7,867	7,080	6,294	5,507	4,720	3,934	3,147	2,360	1,573	787	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Interest Payment	-8,851 BTN mn	0	0	0	0	0	0	-1,141	-1,062	-983	-905	-826	-747	-669	-590	-511	-433	-354	-275	-197	-118	-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Debt Service	-20,651 BTN mn	0	0	0	0	0	0	-1,927	-1,849	-1,770	-1,691	-1,613	-1,534	-1,455	-1,377	-1,298	-1,219	-1,141	-1,062	-983	-905	-826	-747	-669	-590	-511	-433	-354	-275	-197	-118	-39	0	0	0	0	0	
Net Cash Flow from Financing	-9,993 BTN mn	1,046	2,164	2,687	3,939	2,639	2,185	-1,927	-1,849	-1,770	-1,691	-1,613	-1,534	-1,455	-1,377	-1,298	-1,219	-1,141	-1,062	-983	-905	-826	-747	-669	-590	-511	-433	-354										

表 A 7-2 財務分析数表 (ODA Scheme)

ODA Scheme Equity:30%		ODA Loan: 85% (Interest rate: 0.9%, Grace period: 10 years, Repayment: 20 years)		Own funds: 15% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)		Energy share: 100% RGOB		Project Period		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
		Year		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Construction		-29,355	-13,715	-3,491	-515	-1,920	-1,056	-12,148	-1,791	-6,682	-3,675																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Energy Sold		19,918	4.20	149,267	-7,556	141,711	-15,461	-1,501	124,748	-37,425	87,324	104,286																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Tariff		4.20	5.02	5.12	5.22	5.33	5.43	5.54	5.65	5.77	5.88	6.00	6.12	6.24	6.37	6.49	6.62	6.76	6.89	7.03	7.17	7.31	7.46	7.61	7.76	7.92	8.07	8.23	8.40	8.57	8.74	8.91	9.09	9.27	9.46	9.65	9.84	10.03	10.23	10.43	10.64	10.85	11.06	11.28	11.50	11.73	11.96	12.19	12.43	12.67	12.91	13.15	13.40	13.65	13.90	14.15	14.40	14.66	14.91	15.17	15.43	15.69	15.95	16.21	16.48	16.74	17.01	17.28	17.55	17.82	18.09	18.36	18.63	18.91	19.18	19.46	19.73	20.01	20.29	20.57	20.85	21.13	21.41	21.69	21.97	22.25	22.53	22.81	23.09	23.37	23.65	23.93	24.21	24.49	24.77	25.05	25.33	25.61	25.89	26.17	26.45	26.73	27.01	27.29	27.57	27.85	28.13	28.41	28.69	28.97	29.25	29.53	29.81	30.09	30.37	30.65	30.93	31.21	31.49	31.77	32.05	32.33	32.61	32.89	33.17	33.45	33.73	34.01	34.29	34.57	34.85	35.13	35.41	35.69	35.97	36.25	36.53	36.81	37.09	37.37	37.65	37.93	38.21	38.49	38.77	39.05	39.33	39.61	39.89	40.17	40.45	40.73	41.01	41.29	41.57	41.85	42.13	42.41	42.69	42.97	43.25	43.53	43.81	44.09	44.37	44.65	44.93	45.21	45.49	45.77	46.05	46.33	46.61	46.89	47.17	47.45	47.73	48.01	48.29	48.57	48.85	49.13	49.41	49.69	49.97	50.25	50.53	50.81	51.09	51.37	51.65	51.93	52.21	52.49	52.77	53.05	53.33	53.61	53.89	54.17	54.45	54.73	55.01	55.29	55.57	55.85	56.13	56.41	56.69	56.97	57.25	57.53	57.81	58.09	58.37	58.65	58.93	59.21	59.49	59.77	60.05	60.33	60.61	60.89	61.17	61.45	61.73	62.01	62.29	62.57	62.85	63.13	63.41	63.69	63.97	64.25	64.53	64.81	65.09	65.37	65.65	65.93	66.21	66.49	66.77	67.05	67.33	67.61	67.89	68.17	68.45	68.73	69.01	69.29	69.57	69.85	70.13	70.41	70.69	70.97	71.25	71.53	71.81	72.09	72.37	72.65	72.93	73.21	73.49	73.77	74.05	74.33	74.61	74.89	75.17	75.45	75.73	76.01	76.29	76.57	76.85	77.13	77.41	77.69	77.97	78.25	78.53	78.81	79.09	79.37	79.65	79.93	80.21	80.49	80.77	81.05	81.33	81.61	81.89	82.17	82.45	82.73	83.01	83.29	83.57	83.85	84.13	84.41	84.69	84.97	85.25	85.53	85.81	86.09	86.37	86.65	86.93	87.21	87.49	87.77	88.05	88.33	88.61	88.89	89.17	89.45	89.73	90.01	90.29	90.57	90.85	91.13	91.41	91.69	91.97	92.25	92.53	92.81	93.09	93.37	93.65	93.93	94.21	94.49	94.77	95.05	95.33	95.61	95.89	96.17	96.45	96.73	97.01	97.29	97.57	97.85	98.13	98.41	98.69	98.97	99.25	99.53	99.81	100.09	100.37	100.65	100.93	101.21	101.49	101.77	102.05	102.33	102.61	102.89	103.17	103.45	103.73	104.01	104.29	104.57	104.85	105.13	105.41	105.69	105.97	106.25	106.53	106.81	107.09	107.37	107.65	107.93	108.21	108.49	108.77	109.05	109.33	109.61	109.89	110.17	110.45	110.73	111.01	111.29	111.57	111.85	112.13	112.41	112.69	112.97	113.25	113.53	113.81	114.09	114.37	114.65	114.93	115.21	115.49	115.77	116.05	116.33	116.61	116.89	117.17	117.45	117.73	118.01	118.29	118.57	118.85	119.13	119.41	119.69	119.97	120.25	120.53	120.81	121.09	121.37	121.65	121.93	122.21	122.49	122.77	123.05	123.33	123.61	123.89	124.17	124.45	124.73	125.01	125.29	125.57	125.85	126.13	126.41	126.69	126.97	127.25	127.53	127.81	128.09	128.37	128.65	128.93	129.21	129.49	129.77	130.05	130.33	130.61	130.89	131.17	131.45	131.73	132.01	132.29	132.57	132.85	133.13	133.41	133.69	133.97	134.25	134.53	134.81	135.09	135.37	135.65	135.93	136.21	136.49	136.77	137.05	137.33	137.61	137.89	138.17	138.45	138.73	139.01	139.29	139.57	139.85	140.13	140.41	140.69	140.97	141.25	141.53	141.81	142.09	142.37	142.65	142.93	143.21	143.49	143.77	144.05	144.33	144.61	144.89	145.17	145.45	145.73	146.01	146.29	146.57	146.85	147.13	147.41	147.69	147.97	148.25	148.53	148.81	149.09	149.37	149.65	149.93	150.21	150.49	150.77	151.05	151.33	151.61	151.89	152.17	152.45	152.73	153.01	153.29	153.57	153.85	154.13	154.41	154.69	154.97	155.25	155.53	155.81	156.09	156.37	156.65	156.93	157.21	157.49	157.77	158.05	158.33	158.61	158.89	159.17	159.45	159.73	160.01	160.29	160.57	160.85	161.13	161.41	161.69	161.97	162.25	162.53	162.81	163.09	163.37	163.65	163.93	164.21	164.49	164.77	165.05	165.33	165.61	165.89	166.17	166.45	166.73	167.01	167.29	167.57	167.85	168.13	168.41	168.69	168.97	169.25	169.53	169.81	170.09	170.37	170.65	170.93	171.21	171.49	171.77	172.05	172.33	172.61	172.89	173.17	173.45	173.73	174.01	174.29	174.57	174.85	175.13	175.41	175.69	175.97	176.25	176.53	176.81	177.09	177.37	177.65	177.93	178.21	178.49	178.77	179.05	179.33	179.61	179.89	180.17	180.45	180.73	181.01	181.29	181.57	181.85	182.13	182.41	182.69	182.97	183.25	183.53	183.81	184.09	184.37	184.65	184.93	185.21	185.49	185.77	186.05	186.33	186.61	186.89	187.17	187.45	187.73	188.01	188.29	188.57	188.85	189.13	189.41	189.69	189.97	190.25	190.53	190.81	191.09	191.37	191.65	191.93	192.21	192.49	192.77	193.05	193.33	193.61	193.89	194.17	194.45	194.73	195.01	195.29	195.57	195.85	196.13	196.41	196.69	196.97	197.25	197.53	197.81	198.09	198.37	198.65	198.93	199.21	199.49	199.77	200.05	200.33	200.61	200.89	201.17	201.45	201.73	202.01	202.29	202.57	202.85	203.13	203.41	203.69	203.97	204.25	204.53	204.81	205.09	205.37	205.65	205.93	206.21	206.49	206.77	207.05	207.33	207.61	207.89	208.17	208.45	208.73	209.01	209.29	209.57	209.85	210.13	210.41	210.69	210.97	211.25	211.53	211.81	212.09	212.37	212.65	212.93	213.21	213.49	213.77	214.05	214.33	214.61	214.89	215.17	215.45	215.73	216.01	216.29	216.57	216.85	217.13	217.41	217.69	217.97	218.25	218.53	218.81	219.09	219.37	219.65	219.93	220.21	220.49	220.77	221.05	221.33	221.61	221.89	222.17	222.45	222.73	223.01	223.29	223.57	223.85	224.13	224.41	224.69	224.97	225.25	225.53	225.81	226.09	226.37	226.65	226.93	227.21	227.49	227.77	228.05	228.33	228.61	228.89	229.17	229.45	229.73	230.01	230.29	230.57	230.85	231.13	231.41	231.69	231.97	232.25	232.53	232.81	233.09	233.37	233.65	233.93	234.21	234.49	234.77	235.05	235.33	235.61	235.89	236.17	236.45	236.73	237.01	237.29	237.57	237.85	238.13	238.41	238.69	238.97	239.25	239.53	239.81	240.09	240.37	240.65	240.93	241.21	241.49	241.77	242.05	242.33	242.61	242.89	243.17	243.45	243.73	244.01	244.29	244.57	244.85	245.13	245.41	245.69	245.97	246.25	246.53	246.81	247.09	247.37	247.65	247.93	248.21	248.49	248.77	249.05	249.33	249.61	249.89	250.17	250.45	250.73	251.01	251.29	251.57	251.85	252.13	252.41	252.69	252.97	253.25	253.53	253.81	254.09	254

表 A 7-3 財務分析数表 (PPP Scheme - Part1/2)

PPP Scheme Equity:30% (EBF for RGoB 15%, Private 15%)																																							
EBF Loan: 15% (Interest rate: 0.9%, Grace period: 10 years, Repayment: 20 years)																																							
PSIF Loan: 35% (Interest rate: 3.5%, Grace period: 4 years, Repayment: 16 years)																																							
Commercial Loan: 50% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)																																							
Cash Flow of SPC																																							
Project Period																																							
Operation Period																																							
Year																																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061		
Investment (excluding IDC)	-29,355 BTN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148
Construction	-13,715 BTN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement and overhaul	-3,491 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydromechanical Work	-515 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work	-1,920 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation	-1,056 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overhaul at the end of operation	-12,148 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydromechanical Work	-1,791 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work	-6,682 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation	-3,675 BTN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Operation																																							
Energy Sold	19,918 GWh	0	0	0	0	0	0	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	
Tariff Export Tariff to Bangladesh	4.60 BTN/kWh	5.39	5.49	5.60	5.72	5.83	5.95	6.07	6.19	6.31	6.44	6.57	6.70	6.83	6.97	7.11	7.25	7.40	7.54	7.69	7.85	8.00	8.16	8.33	8.49	8.66	8.84	9.01	9.20	9.38	9.57	9.76	9.95	10.15	10.36	10.56	10.77		
Sales Revenue	163,403 BTN mn	0	0	0	0	0	0	4,028	4,108	4,191	4,274	4,360	4,447	4,536	4,627	4,719	4,814	4,910	5,008	5,108	5,210	5,315	5,421	5,529	5,640	5,753	5,868	5,985	6,105	6,227	6,352	6,479	6,608	6,740	6,875	7,013	7,153		
Operation and Maintenance Cost	-7,556 BTN mn	0	0	0	0	0	0	-128	-134	-139	-145	-152	-158	-165	-172	-179	-187	-195	-204	-212	-221	-231	-241	-251	-262	-273	-285	-297	-310	-323	-337	-352	-367	-383	-399	-416	-434		
Gross Income	155,848 BTN mn	0	0	0	0	0	0	3,900	3,975	4,051	4,129	4,208	4,289	4,371	4,455	4,540	4,627	4,715	4,805	4,896	4,989	5,084	5,180	5,278	5,378	5,479	5,583	5,688	5,795	5,904	6,014	6,127	6,241	6,358	6,476	6,596	6,719		
Depreciation Expense	-15,461 BTN mn	0	0	0	0	0	0	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457		
Interest Expense	-4,410 BTN mn	0	0	0	0	0	0	-738	-668	-597	-526	-456	-385	-315	-244	-174	-103	-62	-51	-40	-28	-17	-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Profit before Tax	135,977 BTN mn	0	0	0	0	0	0	2,705	2,850	2,997	3,145	3,295	3,446	3,599	3,753	3,909	4,066	4,195	4,297	4,399	4,504	4,610	4,601	4,705	4,804	4,906	5,009	5,114	5,221	5,330	5,441	5,553	5,668	5,784	5,902	6,023	6,145		
Income Tax	-40,793 BTN mn	0	0	0	0	0	0	-811	-855	-899	-944	-989	-1,034	-1,080	-1,126	-1,173	-1,220	-1,259	-1,308	-1,320	-1,351	-1,383	-1,380	-1,411	-1,441	-1,472	-1,503	-1,534	-1,566	-1,599	-1,632	-1,666	-1,700	-1,735	-1,771	-1,807	-1,844		
Net Profit	95,184 BTN mn	0	0	0	0	0	0	1,893	1,995	2,098	2,202	2,307	2,413	2,519	2,627	2,736	2,846	2,937	3,008	3,079	3,153	3,227	3,221	3,293	3,363	3,434	3,506	3,580	3,655	3,731	3,808	3,887	3,967	4,049	4,132	4,216	4,302		
Net Cash Flow from Operation	115,055 BTN mn	0	0	0	0	0	0	3,088	3,120	3,152	3,185	3,220	3,255	3,291	3,329	3,367	3,407	3,456	3,516	3,576	3,638	3,701	3,800	3,867	3,937	4,008	4,080	4,154	4,228	4,305	4,382	4,461	4,541	4,622	4,705	4,789	4,875		
Project Net Cash Flow	85,700 BTN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	3,088	3,120	3,152	3,185	3,220	3,255	3,291	3,329	3,367	3,407	3,456	3,516	3,576	3,638	3,701	3,800	3,867	3,937	4,008	4,080	4,154	4,228	4,305	4,382	4,461	4,541	4,622	4,705	4,789	-7,273		
Project FIRR	16.09%																																						
Financing																																							
15% Equity Investment (RGoB)																																							
Outstanding at Beginning	BTN mn	0	523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057		
Equity Proceeds for Construction	2,057 BTN mn	523	1,082	453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at End	BTN mn	523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057		
15% Equity Investment (Private)																																							
Outstanding at Beginning	BTN mn	0	523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057		
Equity Proceeds for Construction	2,057 BTN mn	523	1,082	453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at End	BTN mn	523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057		
Total Equity Investment																																							
Outstanding at Beginning	BTN mn	0	1,046	3,209	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115			
Equity Proceeds for Construction	4,115 BTN mn	1,046	2,164	905	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at End	BTN mn	1,046	3,209	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115		
35% PSIF Loan																																							
Outstanding at beginning	BTN mn	0	0	0	906	2,942	4,387	5,173	4,849	4,526	4,203	3,879	3,556	3,233	2,910	2,586	2,263	1,940	1,616	1,293	970	647	323	0	0	0													

表 A 7-4 財務分析数表 (PPP Scheme - Part2/2)

PPP Scheme Equity:30%(EBF for RGoB 15%, Private 15%)																																					
EBF Loan: 15% (Interest rate: 0.9%, Grace period: 10 years, Repayment: 20 years)																																					
PSIF Loan: 35% (Interest rate: 3.5%, Grace period: 4 years, Repayment: 16 years)																																					
Commercial Loan: 50% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)																																					
Project Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Operation Period	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	
Cash Flow of RGoB																																					
Equity Back Financing (ODA Loan)																																					
Outstanding at beginning	BTN mn	0	525	1,617	2,086	2,105	2,124	2,143	2,162	2,181	2,201	2,221	2,110	1,999	1,888	1,777	1,666	1,555	1,444	1,333	1,221	1,110	999	888	777	666	555	444	333	222	111	0	0	0	0	0	0
Loan Proceeds	2,057 BTN mn	523	1,082	453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repayment	-2,221 BTN mn	0	0	0	0	0	0	0	0	0	0	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111
Interest During Construction	164 BTN mn	2	10	17	19	19	19	19	19	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outstanding at end	BTN mn	525	1,617	2,086	2,105	2,124	2,143	2,162	2,181	2,201	2,221	2,110	1,999	1,888	1,777	1,666	1,555	1,444	1,333	1,221	1,110	999	888	777	666	555	444	333	222	111	0	0	0	0	0	0	
Interest Payment	-200 BTN mn	0	0	0	0	0	0	0	0	0	0	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	-0	-0	-0	-0	-0	-0	
Total Debt Service	-2,421 BTN mn	0	0	0	0	0	0	0	0	0	0	-131	-130	-129	-128	-127	-126	-125	-124	-123	-122	-121	-120	-119	-118	-117	-116	-115	-114	-113	-112	-111	-110	-109	-108	-107	
Sales and Operation (RGoB portion)																																					
Royalty share							12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
Sales Revenue (Royalty)	26,171 BTN mn	0	0	0	0	0	483	493	503	513	523	534	544	555	566	578	589	601	613	624	635	646	657	668	679	690	701	712	723	734	745	756	767	778	789	800	
Sales Revenue (RGoB share)	68,616 BTN mn	0	0	0	0	0	1,772	1,808	1,844	1,881	1,918	1,957	1,996	2,036	2,076	2,118	2,160	2,204	2,249	2,294	2,340	2,387	2,434	2,481	2,529	2,577	2,625	2,673	2,721	2,769	2,817	2,865	2,913	2,961	3,009		
Operation and maintenance cost (RGoB share)	-3,778 BTN mn	0	0	0	0	0	-64	-67	-70	-73	-76	-79	-82	-86	-90	-94	-98	-102	-106	-111	-115	-120	-126	-131	-137	-143	-149	-155	-162	-169	-176	-184	-191	-200	-208		
Income tax (RGoB share)	-20,397 BTN mn	0	0	0	0	0	-406	-428	-450	-472	-494	-517	-540	-563	-586	-610	-634	-658	-682	-706	-730	-754	-778	-802	-826	-850	-874	-898	-922	-946	-970	-994	-1,018	-1,042	-1,066		
Cash Flow from Operation (RGoB share)	70,613 BTN mn	0	0	0	0	0	1,786	1,806	1,827	1,849	1,871	1,894	1,918	1,942	1,967	1,992	2,023	2,058	2,248	2,288	2,329	2,388	2,431	2,476	2,522	2,568	2,615	2,664	2,713	2,763	2,813	2,865	2,918	2,971	3,026		
Cash Flow of RGoB																																					
Equity Back Financing (ODA Loan) Proceeds																																					
Loan Proceeds (PSIF and Commercial Loans - RGoB share)	4,800 BTN mn	0	0	891	1,969	1,319	621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cash Flow from Operation (RGoB share)	70,613 BTN mn	0	0	0	0	0	1,786	1,806	1,827	1,849	1,871	1,894	1,918	1,942	1,967	1,992	2,023	2,058	2,248	2,288	2,329	2,388	2,431	2,476	2,522	2,568	2,615	2,664	2,713	2,763	2,813	2,865	2,918	2,971	3,026		
Investment (RGoB share)	-14,677 BTN mn	-523	-1,082	-1,343	-1,969	-1,319	-621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Debt Service (PSIF and Commercial Loans - RGoB share)	-10,173 BTN mn	0	0	0	0	0	-827	-792	-756	-721	-686	-650	-615	-580	-545	-509	-474	-439	-404	-369	-334	-299	-264	-229	-194	-159	-124	-89	-54	-19	16	51	86	121			
Net Cash Flow	BTN mn	0	0	-10	0	0	959	1,015	1,071	1,128	1,055	1,114	1,174	1,235	1,296	1,357	1,418	1,479	1,540	1,601	1,662	1,723	1,784	1,845	1,906	1,967	2,028	2,089	2,150	2,211	2,272	2,333	2,394	2,455			
NPV at Discount Rate for RGoB	10.0%						7,558																														
Cash Flow of Private Investor																																					
Sales and Operation (Private Investor portion)																																					
Sales Revenue (Private Investor share)	68,616 BTN mn	0	0	0	0	0	1,772	1,808	1,844	1,881	1,918	1,957	1,996	2,036	2,076	2,118	2,160	2,204	2,249	2,294	2,340	2,387	2,434	2,481	2,529	2,577	2,625	2,673	2,721	2,769	2,817	2,865	2,913	2,961			
Operation and maintenance cost (PI share)	-3,778 BTN mn	0	0	0	0	0	-64	-67	-70	-73	-76	-79	-82	-86	-90	-94	-98	-102	-106	-111	-115	-120	-126	-131	-137	-143	-149	-155	-162	-169	-176	-184	-191	-200			
Income tax (Private Investor share)	-20,397 BTN mn	0	0	0	0	0	-406	-428	-450	-472	-494	-517	-540	-563	-586	-610	-634	-658	-682	-706	-730	-754	-778	-802	-826	-850	-874	-898	-922	-946	-970	-994	-1,018	-1,042			
Cash Flow from Operation (PI share)	44,442 BTN mn	0	0	0	0	0	1,303	1,313	1,325	1,336	1,348	1,361	1,374	1,387	1,400	1,415	1,433	1,457	1,328	1,350	1,372	1,412	1,436	1,461	1,486	1,512	1,538	1,565	1,592	1,619	1,647	1,676	1,705	1,734			
Cash Flow of Private Investor																																					
Cash Flow from Operation (Private Investor share)	44,442 BTN mn	0	0	0	0	0	1,303	1,313	1,325	1,336	1,348	1,361	1,374	1,387	1,400	1,415	1,433	1,457	1,328	1,350	1,372	1,412	1,436	1,461	1,486	1,512	1,538	1,565	1,592	1,619	1,647	1,676	1,705	1,734			
Investment (Private Investor share)	-14,677 BTN mn	-523	-1,082	-1,343	-1,969	-1,319	-621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Loan Proceeds (PSIF and Commercial Loans - PI share)	4,800 BTN mn	0	0	891	1,969	1,319	621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Debt Service (PSIF and Commercial Loans - PI share)	-7,753 BTN mn	0	0	0	0	0	-827	-792	-756	-721	-686	-650	-615	-580	-545	-509	-474	-439	-404	-369	-334	-299	-264	-229	-194	-159	-124	-89	-54	-19	16	51	86	121			
Net Cash Flow	BTN mn	-523	-1,082	-453	0	0	476	522	568	615	663	710	758	807	856	905	1,241	1,270	1,147	1,174	-544	1,248	1,436	1,461	1,486	1,512	1,538	1,565	1,592	1,619	1,647	1,676	1,705				
Levelized Cost Estimation																																					
SPC Outgoing Cost During Operation																																					
Operation and maintenance cost	7,556 BTN mn						128	134	139	145	152	158	165	172	179	187	195	204	212	221	231	241	251	262	273	285	297	310	323	337	352	367	383	399			
Income tax	40,793 BTN mn						811	855	899	944	989	1,034	1,080	1,126	1,173	1,220	1,269	1,320	1,351	1,383	1,380	1,411	1,441	1,472	1,503	1,534	1,566	1,599	1,632	1,666	1,700	1,735	1,771	1,807			
Debt service	15,505 BTN mn						1,654	1,583	1,513	1,442	1,371	1,301	1,230	1,160	1,089	1,019	948	877	806	735	664	593	522	451	380	309	238	167	96	25	-46	-117	-188	-259			
Reinvestment and Overhaul at end of operation)	15,639 BTN mn						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Energy Sold	gWh						664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664			
Levelized Cost	3.72	BTN/kWh at Cost of Equity	15.0%				Present Value of Outgoing Cost	16,198	2,593	2,572	2,551	2,531	2,512	2,493	2,475	2,458	2,441	2,426	1,839	1,867	1,895	1,924	5,445	1,950	1,663	1,703	1,745	1,788	1,832	1,876	1,922	1,970	2,018	2,067			
							Present Value of Energy Sold	4,359	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	
							Levelized Cost	3.72																													

表 A 7-7 財務分析数表 (IPP Scheme – 3)

IPP Scheme - 3 (UK case)																																							
Free equity: 27%, Free energy: 12% of energy																																							
Royalty (former 15 years) Capacity Royalty: 400NPR, Energy Royalty: 7.5%																																							
(latter 15 years) Capacity Royalty: 1,800NPR, Energy Royalty: 12%																																							
		Project Period		Operation Period																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
		Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	
Cash Flow of SPC																																							
Investment (excluding IDC)		-17,207	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148	
Construction		-13,715	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Replacement and overhaul		-3,491	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydromechanical Work		-515	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work		-1,920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation		-1,056	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overhaul at the end of operation		-12,148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148	
Hydromechanical Work		-1,791	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1,791	
Electrical Work		-6,682	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6,682	
Transmission Line and Substation		-3,675	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-3,675	
Operation																																							
Energy Sold		19,918	0	0	0	0	0	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	
Tariff Export Tariff to Bangladesh		4.60	5.39	5.49	5.60	5.72	5.83	5.95	6.07	6.19	6.31	6.44	6.57	6.70	6.83	6.97	7.11	7.25	7.40	7.54	7.69	7.85	8.00	8.16	8.33	8.49	8.66	8.84	9.01	9.20	9.38	9.57	9.76	9.95	10.15	10.36	10.56	10.77	
Sales Revenue (Total)		163,403	0	0	0	0	0	4,028	4,108	4,191	4,274	4,360	4,447	4,536	4,627	4,719	4,814	4,910	5,008	5,108	5,210	5,315	5,421	5,529	5,640	5,753	5,868	5,985	6,105	6,227	6,352	6,479	6,608	6,740	6,875	7,013	7,153		
Sales Revenue (Private SPC Share)		124,191	0	0	0	0	0	3,204	3,269	3,335	3,403	3,472	3,542	3,614	3,687	3,761	3,837	3,915	3,994	4,074	4,157	4,240	4,324	4,410	4,501	4,596	4,695	4,799	4,907	5,019	5,136	5,257	5,382	5,511	5,644	5,781	5,922		
Operation and Maintenance Cost		-7,556	0	0	0	0	0	-128	-134	-139	-145	-152	-158	-165	-172	-179	-187	-195	-204	-212	-221	-231	-241	-251	-262	-273	-285	-297	-310	-323	-337	-352	-367	-383	-399	-416	-434		
Gross Income		116,635	0	0	0	0	0	3,076	3,136	3,196	3,258	3,320	3,384	3,449	3,515	3,582	3,650	3,719	3,790	3,862	3,935	4,009	4,084	4,160	4,238	4,318	4,400	4,484	4,569	4,656	4,746	4,838	4,932	5,028	5,126	5,226	5,328	5,432	
Depreciation Expense		-15,461	0	0	0	0	0	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457		
Interest Expense		-4,410	0	0	0	0	0	-738	-668	-597	-526	-456	-385	-315	-244	-174	-103	-62	-51	-40	-28	-17	-6	-0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Profit Before Tax		96,764	0	0	0	0	0	1,881	2,011	2,142	2,274	2,407	2,541	2,677	2,813	2,951	3,090	3,200	3,282	3,365	3,450	3,535	3,620	3,707	3,797	3,889	3,983	4,079	4,177	4,277	4,379	4,483	4,589	4,697	4,807	4,918	5,031	5,146	
Income Tax		-29,029	0	0	0	0	0	-564	-603	-643	-682	-722	-762	-803	-844	-885	-927	-969	-985	-1,010	-1,035	-1,061	-1,087	-1,113	-1,139	-1,165	-1,191	-1,217	-1,243	-1,269	-1,295	-1,321	-1,347	-1,373	-1,399	-1,425	-1,451		
Net Profit		67,735	0	0	0	0	0	1,317	1,408	1,499	1,592	1,685	1,779	1,874	1,969	2,066	2,163	2,240	2,297	2,356	2,415	2,475	2,535	2,596	2,657	2,718	2,780	2,842	2,904	2,966	3,028	3,090	3,152	3,214	3,276	3,338	3,400	3,462	
Net Cash Flow from Operation		87,606	0	0	0	0	0	2,512	2,532	2,554	2,575	2,598	2,621	2,646	2,671	2,696	2,723	2,750	2,805	2,852	2,900	2,949	2,999	3,049	3,099	3,149	3,199	3,249	3,299	3,349	3,399	3,449	3,499	3,549	3,599	3,649	3,699	3,749	
Project Net Cash Flow		58,251	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	2,512	2,532	2,554	2,575	2,598	2,621	2,646	2,671	2,696	2,723	2,750	2,805	2,852	2,900	2,949	2,999	3,049	3,099	3,149	3,199	3,249	3,299	3,349	3,399	3,449	3,499	3,549	3,599	3,649		
Project FIRR		13.39%																																					
Financing																																							
30% Equity Investment (Private)																																							
Outstanding at beginning		0	1,046	3,209	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115		
Equity Proceeds for Construction		4,115	2,164	905	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at end		1,046	3,209	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115		
35% PSIF Loan																																							
Outstanding at beginning		0	0	0	906	2,942	4,387	5,173	4,849	4,526	4,203	3,879	3,556	3,233	2,910	2,586	2,263	1,940	1,616	1,293	970	647	323	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Loan Proceeds (Construction)		4,800	891	1,969	1,319	621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Repayment		-5,173	0	0	0	0	0	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323	-323		
Interest During Construction		372	0	16	66	126	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at end		0	906	2,942	4,387	5,173	4,849	4,526	4,203	3,879	3,556	3,233	2,910	2,586	2,263	1,940	1,616	1,293	970	647	323	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Interest Payment		-1,448	0	0	0	0	0	-175	-164	-153	-141	-130	-119	-107	-96	-85	-74	-62	-51	-40	-28	-17	-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Debt Service		-6,621	0	0	0	0	0	-499	-487	-476	-465	-454	-442	-431	-419	-408	-397	-386	-374	-363	-352	-340	-329	-0	0	0	0												

表 A 7-11 財務分析数表 (PPP Scheme (Delay) - Part2/2)

PPP Scheme Equity:30% (EBF for RGoB 15%, Private 15%) EBF Loan: 15% (Interest rate: 0.9%, Grace period: 10 years, Repayment: 20 years) PSIF Loan: 35% (Interest rate: 3.5%, Grace period: 4 years, Repayment: 16 years) Commercial Loan: 50% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)		Project Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
Operation Period		Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061		
Cash Flow of RGoB																																								
Equity Back Financing (ODA Loan)																																								
Outstanding at beginning	BTN mn		0	525	1,617	2,541	2,564	2,587	2,610	2,634	2,658	2,681	2,706	2,570	2,435	2,300	2,165	2,029	1,894	1,759	1,623	1,488	1,353	1,218	1,082	947	812	676	541	406	271	135	0	0	0	0	0			
Loan Proceeds	BTN mn		523	1,082	906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Repayment	BTN mn		-2,706	0	0	0	0	0	0	0	0	0	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135	-135			
Interest During Construction	BTN mn		195	10	19	23	23	23	23	24	24	24	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at end	BTN mn		525	1,617	2,541	2,564	2,587	2,610	2,634	2,658	2,681	2,706	2,570	2,435	2,300	2,165	2,029	1,894	1,759	1,623	1,488	1,353	1,218	1,082	947	812	676	541	406	271	135	0	0	0	0	0	0			
Interest Payment	BTN mn		-244	0	0	0	0	0	0	0	0	0	-24	-23	-21	-20	-19	-18	-16	-15	-14	-13	-12	-10	-9	-8	-7	-5	-4	-3	-2	-1	-1	-1	-1	-1	-1			
Total Debt Service	BTN mn		-2,949	0	0	0	0	0	0	0	0	0	-159	-158	-157	-155	-154	-153	-152	-151	-149	-148	-147	-146	-144	-143	-142	-141	-140	-138	-137	-136	-136	-136	-136	-136	-136			
Sales and Operation (RGoB portion)																																								
Royalty share	BTN mn											12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%		
Sales Revenue (Royalty)	BTN mn		23,754	0	0	0	0	0	0	0	0	513	523	534	544	555	566	578	589	601	613	625	638	650	662	674	686	698	710	722	734	746	758	770	782	794	806	818		
Sales Revenue (RGoB share)	BTN mn		63,661	0	0	0	0	0	0	0	0	1,881	1,918	1,957	1,996	2,036	2,076	2,118	2,160	2,204	2,248	2,293	2,338	2,223	2,267	2,312	2,359	2,406	2,454	2,503	2,553	2,604	2,656	2,709	2,764	2,819	2,875	2,933		
Operation and maintenance cost (RGoB share)	BTN mn		-3,577	0	0	0	0	0	0	0	0	-73	-76	-79	-82	-86	-90	-94	-98	-102	-106	-111	-115	-120	-126	-131	-137	-143	-149	-155	-162	-169	-176	-184	-191	-200	-208	-217		
Income tax (RGoB share)	BTN mn		-18,210	0	0	0	0	0	0	0	0	-387	-413	-439	-466	-493	-520	-547	-575	-603	-631	-659	-686	-703	-720	-734	-750	-766	-782	-799	-816	-833	-850	-868	-886	-905	-924			
Cash Flow from Operation (RGoB share)	BTN mn		65,627	0	0	0	0	0	0	0	0	1,934	1,953	1,972	1,992	2,012	2,033	2,055	2,077	2,100	2,124	2,154	2,192	2,392	2,434	2,477	2,540	2,585	2,633	2,681	2,730	2,780	2,831	2,882	2,935	2,988	3,043	3,098		
Cash Flow of RGoB																																								
Equity Back Financing (ODA Loan) Proceeds	BTN mn		2,511	1,082	906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Loan Proceeds (PSIF and Commercial Loans - RGoB share)	BTN mn		5,858	0	214	811	840	1,117	1,799	732	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cash Flow from Operation (RGoB share)	BTN mn		65,627	0	0	0	0	0	0	0	0	1,934	1,953	1,972	1,992	2,012	2,033	2,055	2,077	2,100	2,124	2,154	2,192	2,392	2,434	2,477	2,540	2,585	2,633	2,681	2,730	2,780	2,831	2,882	2,935	2,988	3,043	3,098		
Investment (RGoB share)	BTN mn		-16,389	-523	-1,082	-1,120	-811	-840	-1,117	-1,799	-732	-345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6,074	
Total Debt Service (PSIF and Commercial Loans - RGoB share)	BTN mn		-13,241	0	0	0	0	0	0	0	0	-1,108	-1,219	-1,170	-1,121	-1,072	-1,023	-974	-925	-876	-827	-393	-385	-376	-368	-359	-351	-141	-140	-138	-137	-136	-136	-136	-136	-136	-136			
Net Cash Flow	BTN mn		0	0	0	-90	-90	0	0	0	0	826	734	802	871	940	1,010	1,081	1,152	1,224	1,296	1,761	1,807	2,016	2,066	1,71	2,189	2,444	2,493	2,542	2,593	2,644	2,831	2,882	2,935	2,988	3,043	-2,976		
NPV at Discount Rate for RGoB	BTN mn		10.0%									5,097																												
Cash Flow of Private Investor																																								
Sales and Operation (Private Investor portion)																																								
Sales Revenue (Private Investor share)	BTN mn		63,661	0	0	0	0	0	0	0	0	1,881	1,918	1,957	1,996	2,036	2,076	2,118	2,160	2,204	2,248	2,293	2,338	2,223	2,267	2,312	2,359	2,406	2,454	2,503	2,553	2,604	2,656	2,709	2,764	2,819	2,875	2,933		
Operation and maintenance cost (PI share)	BTN mn		-3,577	0	0	0	0	0	0	0	0	-73	-76	-79	-82	-86	-90	-94	-98	-102	-106	-111	-115	-120	-126	-131	-137	-143	-149	-155	-162	-169	-176	-184	-191	-200	-208	-217		
Income tax (Private Investor share)	BTN mn		-18,210	0	0	0	0	0	0	0	0	-387	-413	-439	-466	-493	-520	-547	-575	-603	-631	-659	-686	-703	-720	-734	-750	-766	-782	-799	-816	-833	-850	-868	-886	-905	-924			
Cash Flow from Operation (PI share)	BTN mn		41,873	0	0	0	0	0	0	0	0	1,421	1,430	1,438	1,447	1,457	1,467	1,477	1,488	1,499	1,511	1,529	1,554	1,416	1,439	1,462	1,504	1,529	1,555	1,582	1,609	1,636	1,664	1,693	1,722	1,751	1,781	1,811		
Cash Flow of Private Investor																																								
Cash Flow from Operation (Private investor share)	BTN mn		41,873	0	0	0	0	0	0	0	0	1,421	1,430	1,438	1,447	1,457	1,467	1,477	1,488	1,499	1,511	1,529	1,554	1,416	1,439	1,462	1,504	1,529	1,555	1,582	1,609	1,636	1,664	1,693	1,722	1,751	1,781	1,811		
Investment (Private Investor share)	BTN mn		-16,389	-523	-1,082	-1,120	-811	-840	-1,117	-1,799	-732	-345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6,074	
Loan Proceeds (PSIF and Commercial Loans - PI share)	BTN mn		5,858	0	0	214	811	840	1,117	1,799	732	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Debt Service (PSIF and Commercial Loans - PI share)	BTN mn		-10,292	0	0	0	0	0	0	0	0	-1,108	-1,060	-1,012	-965	-917	-869	-821	-774	-726	-678	-245	-238	-231	-223	-216	-209	-209	-209	-209	-209	-209	-209	-209	-209	-209	-209			
Net Cash Flow	BTN mn		-2,976	-1,082	-906	-90	-90	0	0	0	0	313	369	426	483	540	598	656	714	773	833	1,284	1,316	1,186	1,215	-701	1,295	1,529	1,555	1,582	1,609	1,636	1,664	1,693	1,722	1,751	1,781	-4,263		
Levelized Cost Estimation																																								
SPC Outgoing Cost During Operation	BTN mn																																							
Operation and maintenance cost	BTN mn		7,154	0	0	0	0	0	0	0	0	145	152	158	165	172	179	187	195	204	212	221	231	241	251	262	273	285	297	310	323	337	352	367	383	399	416	434		
Income tax	BTN mn		36,421	0	0	0	0	0	0	0	0	773	826	879	932	986	1,040	1,094	1,150	1,205	1,261	1,306	1,338	1,372	1,405	1,440	1,435	1,469	1,500	1,532	1,565	1,598	1,632	1,666	1,701	1,736	1,773	1,809		
Debt service	BTN mn		20,584	0	0	0	0	0	0	0	0	2,216	2,120	2,025	1,929	1,834	1,738	1,643	1,547	1,452	1,356	490	475																	

表 A 7-13 財務分析数表 (IPP Scheme - 2 (Delay))

IPP Scheme - 2 (Arun III case)																																							
Free equity: 0%																																							
Free energy: 21.8% of energy																																							
Royalty: 12%																																							
Project Period		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
Operation Period		Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	
Cash Flow of SPC																																							
Investment (excluding IDC)		-20,631 BtN mn	-1,046	-2,164	-2,239	-1,622	-1,679	-2,235	-3,598	-1,464	-689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148
Construction		-16,737 BtN mn	-1,046	-2,164	-2,239	-1,622	-1,679	-2,235	-3,598	-1,464	-689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement and overhaul		-3,894 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydromechanical Work		-574 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work		-2,142 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation		-1,178 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overhaul at the end of operation		-12,148 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydromechanical Work		-1,791 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work		-6,682 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation		-3,675 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Operation																																							
Energy Sold		17,926 GWh	0	0	0	0	0	0	0	0	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664		
Tariff Export Tariff to Bangladesh		4,500 BtN/kWh	5.39	5.49	5.60	5.72	5.83	5.95	6.07	6.19	6.31	6.44	6.57	6.70	6.83	6.97	7.11	7.25	7.40	7.54	7.69	7.85	8.00	8.16	8.33	8.49	8.66	8.84	9.01	9.20	9.38	9.57	9.76	9.95	10.15	10.36	10.56		
Sales Revenue (Total)		151,076 BtN mn	0	0	0	0	0	0	0	0	4,274	4,360	4,447	4,536	4,627	4,719	4,814	4,910	5,008	5,108	5,210	5,315	5,421	5,529	5,640	5,753	5,868	5,985	6,105	6,227	6,352	6,479	6,608	6,740	6,875	7,013	7,153		
Sales Revenue (Private SPC Share)		100,013 BtN mn	0	0	0	0	0	0	0	0	2,830	2,886	2,944	3,003	3,063	3,124	3,187	3,250	3,315	3,382	3,449	3,518	3,589	3,660	3,734	3,808	3,885	3,962	4,041	4,122	4,205	4,289	4,375	4,462	4,551	4,642	4,735		
Operation and Maintenance Cost		-7,154 BtN mn	0	0	0	0	0	0	0	0	-145	-152	-158	-165	-172	-179	-187	-195	-204	-212	-221	-231	-241	-251	-262	-273	-285	-297	-310	-323	-337	-352	-367	-383	-399	-416	-434		
Gross Income		92,558 BtN mn	0	0	0	0	0	0	0	0	2,684	2,735	2,786	2,838	2,891	2,945	3,000	3,055	3,112	3,169	3,228	3,287	3,348	3,409	3,472	3,535	3,599	3,665	3,731	3,799	3,867	3,937	4,008	4,079	4,152	4,226	4,301		
Depreciation Expense		-15,063 BtN mn	0	0	0	0	0	0	0	0	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558	-558		
Interest Expense		-5,898 BtN mn	0	0	0	0	0	0	0	0	-994	-898	-803	-707	-612	-516	-421	-325	-230	-134	-79	-65	-50	-36	-22	-7	-0	0	0	0	0	0	0	0	0	0	0		
Profit Before Tax		71,897 BtN mn	0	0	0	0	0	0	0	0	1,133	1,279	1,425	1,573	1,721	1,871	2,021	2,172	2,324	2,477	2,591	2,665	2,740	2,815	2,892	2,970	3,048	3,107	3,173	3,241	3,309	3,379	3,450	3,521	3,594	3,668	3,743		
Income Tax		-21,559 BtN mn	0	0	0	0	0	0	0	0	-340	-384	-428	-472	-516	-561	-606	-652	-697	-743	-777	-799	-822	-845	-868	-891	-912	-932	-952	-973	-993	-1,014	-1,035	-1,056	-1,078	-1,100	-1,123		
Net Profit		50,328 BtN mn	0	0	0	0	0	0	0	0	793	895	998	1,101	1,205	1,310	1,415	1,521	1,627	1,734	1,814	1,865	1,918	1,971	2,025	2,079	2,129	2,175	2,221	2,269	2,317	2,365	2,415	2,465	2,516	2,568	2,620		
Net Cash Flow from Operation		71,897 BtN mn	0	0	0	0	0	0	0	0	2,345	2,351	2,358	2,366	2,375	2,384	2,393	2,404	2,415	2,426	2,435	2,448	2,456	2,466	2,475	2,485	2,495	2,505	2,515	2,525	2,535	2,545	2,555	2,565	2,575	2,585	2,595		
Project Net Cash Flow		38,510 BtN mn	-1,046	-2,164	-2,239	-1,622	-1,679	-2,235	-3,598	-1,464	-689	2,345	2,351	2,358	2,366	2,375	2,384	2,393	2,404	2,415	2,426	2,435	2,448	2,456	2,466	2,475	2,485	2,495	2,505	2,515	2,525	2,535	2,545	2,555	2,565	2,575			
Project FIRR		8.51%																																					
Financing																																							
30% Equity Investment (Private)																																							
Outstanding at Beginning		BtN mn	0	1,046	3,209	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021			
Equity Proceeds for Construction		5,021 BtN mn	1,046	2,164	1,812	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at End		BtN mn	1,046	3,209	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021	5,021			
35% PSIF Loan																																							
Outstanding at beginning		BtN mn	0	0	0	218	1,051	1,942	3,147	5,087	6,010	6,571	6,161	5,750	5,339	4,929	4,518	4,107	3,696	3,286	2,875	2,464	2,054	1,643	1,232	821	411	0	0	0	0	0	0	0	0	0			
Loan Proceeds (Construction)		5,858 BtN mn	0	0	214	811	840	1,117	1,799	732	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Repayment		-6,571 BtN mn	0	0	0	0	0	0	0	0	0	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411	-411			
Interest During Construction		713 BtN mn	0	0	4	22	51	88	142	191	216	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at end		BtN mn	0	0	218	1,051	1,942	3,147	5,087	6,010	6,571	6,161	5,750	5,339	4,929	4,518	4,107	3,696	3,286	2,875	2,464	2,054	1,643	1,232	821	411	0	0	0	0	0	0	0	0	0	0			
Interest Payment		-1,840 BtN mn	0	0	0	0	0	0	0	0	-223	-208	-194	-180	-165	-151	-137	-122	-108	-93	-79	-65	-50	-36	-22	-7	-0	0	0	0	0	0	0	0	0	0			
Total Debt Service		-8,411 BtN mn	0	0	0	0	0	0	0	0	-634	-619	-605	-590	-576	-562	-547	-533	-519	-504	-490	-475	-461	-447	-432	-418	-403	-389	-375	-361	-347	-333	-319	-305	-291	-277			
35% Commercial Loan																																							
Outstanding at beginning		BtN mn	0	0	0	225	1,099	2,090	3,473	5,709	7,049	8,115	7,304	6,492	5,681	4,869	4,058	3,246	2,435	1,623	812	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Loan Proceeds (Construction)		5,858 BtN mn	0	0	214	811	840	1,117	1,799	732	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Repayment		-8,115 BtN mn	0	0	0	0	0	0	0	0	0	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812	-812		
Interest During Construction		2,257 BtN mn	0	0	11	63	152	265	437	607	722	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at end		BtN mn	0	0	225	1,099	2,090	3,473	5,709	7,049	8,115	7,304	6,492																										

表 A 7-15 財務分析数表 (ODA Scheme (RP))

ODA Scheme Equity:30%																																								
ODA Loan: 85% (Interest rate: 0.9%, Grace period: 10 years, Repayment: 20 years)																																								
Own fund: 15% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)																																								
Energy share: 100% RGoB																																								
		Project Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
		Operation Period	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
		Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061		
Cash Flow of Project																																								
Investment (excluding IDC)		-29,355 BtN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148
Construction		-13,715 BtN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement and overhaul		-3,491 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydromechanical Work		-515 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Electrical Work		-1,920 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Transmission Line and Substation		-1,056 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Overhaul at the end of operation		-12,148 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148	
Hydromechanical Work		-1,791 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Electrical Work		-6,682 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6,682	
Transmission Line and Substation		-3,675 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Operation																																								
Energy Sold		19,918 GWh	0	0	0	0	0	0	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664		
Tariff		4.20 BtN/kWh	4.92	5.02	5.12	5.22	5.33	5.43	5.54	5.65	5.77	5.88	6.00	6.12	6.24	6.37	6.49	6.62	6.76	6.89	7.03	7.17	7.31	7.46	7.61	7.76	7.92	8.07	8.23	8.40	8.57	8.74	8.91	9.09	9.27	9.46	9.65	9.84		
Sales Revenue		149,267 BtN mn	0	0	0	0	0	0	3,679	3,753	3,828	3,905	3,983	4,062	4,144	4,226	4,311	4,397	4,485	4,575	4,666	4,760	4,855	4,952	5,051	5,152	5,255	5,360	5,467	5,577	5,688	5,802	5,918	6,036	6,157	6,280	6,406	6,534		
Operation and Maintenance Cost		-7,556 BtN mn	0	0	0	0	0	0	-128	-134	-139	-145	-152	-158	-165	-172	-179	-187	-195	-204	-212	-221	-231	-241	-251	-262	-273	-285	-297	-310	-323	-337	-352	-367	-383	-399	-416	-434		
Gross Income		141,711 BtN mn	0	0	0	0	0	0	3,551	3,619	3,689	3,759	3,831	3,904	3,979	4,054	4,132	4,210	4,290	4,371	4,454	4,538	4,624	4,711	4,800	4,890	4,982	5,075	5,170	5,267	5,365	5,465	5,566	5,669	5,774	5,881	5,990	6,100		
Depreciation Expense		-15,461 BtN mn	0	0	0	0	0	0	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457		
Interest Expense		-13,308 BtN mn	0	0	0	0	0	0	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951	-951		
Profit Before Tax		112,942 BtN mn	0	0	0	0	0	0	2,144	2,212	2,281	2,352	2,447	2,568	2,690	2,813	2,938	3,064	3,191	3,320	3,450	3,582	3,715	3,734	3,870	4,008	4,147	4,288	4,430	4,574	4,720	4,867	4,993	5,096	5,201	5,308	5,416	5,526		
Income Tax		-33,863 BtN mn	0	0	0	0	0	0	-643	-663	-684	-705	-724	-770	-807	-844	-881	-919	-957	-995	-1,035	-1,075	-1,115	-1,120	-1,161	-1,202	-1,244	-1,286	-1,329	-1,372	-1,416	-1,460	-1,498	-1,529	-1,560	-1,592	-1,625	-1,658		
Net Profit		79,059 BtN mn	0	0	0	0	0	0	1,500	1,548	1,597	1,646	1,713	1,797	1,883	1,969	2,056	2,145	2,234	2,324	2,415	2,507	2,601	2,613	2,709	2,805	2,903	3,001	3,101	3,202	3,304	3,407	3,495	3,567	3,641	3,715	3,791	3,868		
Net Cash Flow from Operation		107,828 BtN mn	0	0	0	0	0	0	2,908	2,956	3,004	3,054	3,097	3,134	3,172	3,211	3,250	3,291	3,333	3,375	3,419	3,464	3,509	3,551	3,639	3,688	3,738	3,789	3,841	3,894	3,949	4,004	4,068	4,141	4,214	4,289	4,365	4,442		
Project Net Cash Flow		78,474 BtN mn	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	2,908	2,956	3,004	3,054	3,097	3,134	3,172	3,211	3,250	3,291	3,333	3,375	3,419	3,464	3,509	3,551	3,639	3,688	3,738	3,789	3,841	3,894	3,949	4,004	4,068	4,141	4,214	4,289	4,365	-7,706		
Project FIRR		15.50%																																						
Financing																																								
15% Own Fund (Equity)																																								
Outstanding at Beginning		BtN mn	0	158	486	896	1,499	1,912	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119			
Own Fund Proceeds		2,119 BtN mn	158	328	410	603	413	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Construction		2,057 BtN mn	157	325	403	591	396	186	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.90% Interest During Construction		62 BtN mn	1	3	7	12	18	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at End		BtN mn	158	486	896	1,499	1,912	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119	2,119			
85% ODA Loan																																								
Outstanding at beginning		BtN mn	0	915	2,862	5,380	9,142	11,987	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776			
Loan Proceeds (Construction)		11,658 BtN mn	889	1,839	2,284	3,348	2,243	1,056	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Repayment		-13,776 BtN mn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6.90% Interest During Construction		2,118 BtN mn	26	108	235	414	602	734	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outstanding at end		BtN mn	915	2,862	5,380	9,142	11,987	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776	13,776			
6.90% Interest Payment		-13,308 BtN mn	0	0	0	0	0	0	-95																															

表 A 7-16 財務分析数表 (PPP Scheme (RP) - Part1/2)

PPP Scheme Equity:30% (EBF for RGoB 15%, Private 15%)																																											
EBF Loan: 15% (Interest rate: 0.9%, Grace period: 10 years, Repayment: 20 years)																																											
PSIF Loan: 35% (Interest rate: 3.5%, Grace period: 4 years, Repayment: 16 years)																																											
Commercial Loan: 50% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)																																											
Project Period		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36						
Operation Period		-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Year		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061						
Cash Flow of SPC																																											
Investment (excluding IDC)		-29,355	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12,148	
Construction		-13,715	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement and overhaul		-3,491	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydromechanical Work		-515	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work		-1,920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation		-1,056	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overhaul at the end of operation		-12,148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydromechanical Work		-1,791	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Electrical Work		-6,582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Transmission Line and Substation		-3,675	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Operation																																											
Energy Sold		19,918	0	0	0	0	0	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664	664		
Tariff Export Tariff to Bangladesh		4.60	5.39	5.49	5.60	5.72	5.83	5.95	6.07	6.19	6.31	6.44	6.57	6.70	6.83	6.97	7.11	7.25	7.40	7.54	7.69	7.85	8.00	8.16	8.33	8.49	8.66	8.84	9.01	9.20	9.38	9.57	9.76	9.95	10.15	10.36	10.56	10.77					
Sales Revenue		163,403	0	0	0	0	0	4,028	4,108	4,191	4,274	4,360	4,447	4,536	4,627	4,719	4,814	4,910	5,008	5,108	5,210	5,315	5,421	5,529	5,640	5,753	5,868	5,985	6,105	6,227	6,352	6,479	6,608	6,740	6,875	7,013	7,153						
Operation and Maintenance Cost		-7,556	0	0	0	0	0	-128	-134	-139	-145	-152	-158	-165	-172	-179	-187	-195	-204	-212	-221	-231	-241	-251	-262	-273	-285	-297	-310	-323	-337	-352	-367	-383	-399	-416	-434						
Gross Income		155,848	0	0	0	0	0	3,900	3,975	4,051	4,129	4,208	4,289	4,371	4,455	4,540	4,627	4,715	4,805	4,896	4,989	5,084	5,180	5,278	5,378	5,479	5,583	5,688	5,795	5,904	6,014	6,127	6,241	6,358	6,476	6,596	6,719						
Depreciation Expense		-15,461	0	0	0	0	0	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457	-457			
Interest Expense		-7,417	0	0	0	0	0	-1,102	-1,008	-914	-820	-726	-632	-538	-444	-350	-256	-191	-157	-122	-87	-52	-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Profit Before Tax		132,970	0	0	0	0	0	2,340	2,509	2,680	2,852	3,025	3,200	3,376	3,554	3,733	3,914	4,066	4,191	4,317	4,445	4,574	4,589	4,705	4,804	4,906	5,009	5,114	5,221	5,330	5,441	5,553	5,668	5,784	5,902	6,023	6,145						
Income Tax		-39,891	0	0	0	0	0	-702	-753	-804	-856	-908	-960	-1,013	-1,066	-1,120	-1,174	-1,220	-1,257	-1,295	-1,333	-1,372	-1,377	-1,411	-1,441	-1,472	-1,503	-1,534	-1,566	-1,599	-1,632	-1,666	-1,700	-1,735	-1,771	-1,807	-1,844						
Net Profit		93,079	0	0	0	0	0	1,638	1,757	1,876	1,996	2,118	2,240	2,363	2,488	2,613	2,739	2,846	2,934	3,022	3,111	3,202	3,212	3,293	3,363	3,434	3,506	3,580	3,655	3,731	3,808	3,887	3,967	4,049	4,132	4,216	4,302						
Net Cash Flow from Operation		115,957	0	0	0	0	0	3,198	3,222	3,247	3,274	3,301	3,329	3,358	3,389	3,420	3,453	3,495	3,547	3,601	3,656	220	3,803	3,867	3,937	4,008	4,080	4,154	4,228	4,305	4,382	4,461	4,541	4,622	4,705	4,789	4,875						
Project Net Cash Flow		86,602	-1,046	-2,164	-2,687	-3,939	-2,639	-1,242	3,198	3,222	3,247	3,274	3,301	3,329	3,358	3,389	3,420	3,453	3,495	3,547	3,601	3,656	220	3,803	3,867	3,937	4,008	4,080	4,154	4,228	4,305	4,382	4,461	4,541	4,622	4,705	4,789	-7,273					
Project FIRR		16.35%																																									
Financing																																											
15% Equity Investment (RGoB)																																											
Outstanding at Beginning		0	523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057				
Equity Proceeds for Construction		2,057	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at End		523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057				
15% Equity Investment (Private)																																											
Outstanding at Beginning		0	523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057				
Equity Proceeds for Construction		2,057	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at End		523	1,605	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057				
Total Equity Investment																																											
Outstanding at Beginning		0	1,046	3,209	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115				
Equity Proceeds for Construction		4,115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Outstanding at End		1,046	3,209	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115	4,115				
35% PSIF Loan																																											
Outstanding at beginning		0	0	0	933	3,085	4,760	5,862	5,496	5,129	4,763	4,397	4,030	3,664	3,298	2,931	2,565	2,198	1,832	1,466	1,099	733	366	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Loan Proceeds (Construction)		4,800	0	0	891	1,969	1,319	621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Repayment		-5,862	0	0	0	0	0	-366																																			

表 A 7-17 財務分析数表 (PPP Scheme (RP) - Part2/2)

PPP Scheme Equity:30% (EBF for RGoB 15%, Private 15%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
EBF Loan: 15% (Interest rate: 0.5%, Grace period: 10 years, Repayment: 20 years)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
PSIF Loan: 35% (Interest rate: 3.5%, Grace period: 4 years, Repayment: 16 years)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Commercial Loan: 50% (Interest rate: 10%, Grace period: 6 years, Repayment: 10 years)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Project Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																																																																																																																																																																																																																																																																																																																																																																																																																																													
Operation Period	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																																																																																																																																																																																																																																																																																																																																																																																																																																							
Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061																																																																																																																																																																																																																																																																																																																																																																																																																																													
Cash Flow of RGoB																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Equity Back Financing (ODA Loan)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Outstanding at beginning	BTN mn	0	541	1,697	2,283	2,440	2,609	2,789	2,981	3,187	3,407	3,642	3,460	3,277	3,095	2,913	2,731	2,549	2,367	2,185	2,003	1,821	1,639	1,457	1,275	1,092	910	728	546	364	182	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																									
Loan Proceeds	BTN mn	2,057	1,082	453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																						
Repayment	BTN mn	-3,642	0	0	0	0	0	0	0	0	0	0	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182	-182																																																																																																																																																																																																																																																																																																																																																																																																																																					
6.90% Interest During Construction	BTN mn	1,584	18	75	133	158	168	180	192	206	220	235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																				
6.90% Outstanding at end	BTN mn	541	1,697	2,283	2,440	2,609	2,789	2,981	3,187	3,407	3,642	3,460	3,277	3,095	2,913	2,731	2,549	2,367	2,185	2,003	1,821	1,639	1,457	1,275	1,092	910	728	546	364	182	0	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																						
6.90% Interest Payment	BTN mn	-2,513	0	0	0	0	0	0	0	0	0	0	-245	-232	-220	-207	-195	-182	-170	-157	-144	-132	-119	-107	-94	-82	-69	-57	-44	-31	-19	-6	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																					
Total Debt Service	BTN mn	-6,154	0	0	0	0	0	0	0	0	0	0	-427	-415	-402	-389	-377	-364	-352	-339	-327	-314	-301	-289	-276	-264	-251	-239	-226	-213	-201	-188	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																					
Sales and Operation (RGoB portion)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Royalty share																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Sales Revenue (Royalty)	BTN mn	0	0	0	0	0	483	493	503	513	523	534	544	555	566	578	589	601	611	622	633	644	655	666	677	688	699	710	721	732	743	754	765	776	787	798	809	820	831	842	853	864	875	886	897																																																																																																																																																																																																																																																																																																																																																																																																																																				
Sales Revenue (RGoB share)	BTN mn	0	0	0	0	0	1,772	1,808	1,844	1,881	1,918	1,957	1,996	2,036	2,076	2,118	2,160	2,204	2,249	2,293	2,337	2,381	2,425	2,469	2,513	2,557	2,601	2,645	2,689	2,733	2,777	2,821	2,865	2,909	2,953	2,997	3,041	3,085	3,129	3,173	3,217	3,261	3,305	3,349	3,393	3,437																																																																																																																																																																																																																																																																																																																																																																																																																																			
Operation and maintenance cost (RGoB share)	BTN mn	-3,778	0	0	0	0	-64	-67	-70	-73	-76	-79	-82	-86	-90	-94	-98	-102	-106	-111	-115	-120	-126	-131	-137	-143	-149	-155	-162	-169	-176	-184	-191	-200	-208	-217	-226	-235	-244	-253	-262	-271	-280	-289	-298	-307	-316																																																																																																																																																																																																																																																																																																																																																																																																																																		
Income tax (RGoB share)	BTN mn	-19,945	0	0	0	0	-351	-376	-402	-428	-454	-480	-506	-533	-560	-587	-610	-629	-648	-667	-686	-706	-721	-736	-751	-767	-783	-800	-816	-833	-850	-868	-885	-903	-922	-941	-960	-979	-998	-1,017	-1,036	-1,055	-1,074	-1,093	-1,112	-1,131	-1,150																																																																																																																																																																																																																																																																																																																																																																																																																																		
Cash Flow from Operation (RGoB share)	BTN mn	71,064	0	0	0	0	1,840	1,857	1,875	1,893	1,912	1,931	1,951	1,972	1,993	2,015	2,042	2,074	2,260	2,297	2,334	2,390	2,431	2,476	2,522	2,568	2,615	2,664	2,713	2,763	2,813	2,865	2,918	2,971	3,026	3,081	3,136	3,191	3,246	3,301	3,356	3,411	3,466	3,521	3,576	3,631	3,686																																																																																																																																																																																																																																																																																																																																																																																																																																		
Cash Flow of RGoB																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Equity Back Financing (ODA Loan) Proceeds																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Loan Proceeds (PSIF and Commercial Loans - RGoB share)	BTN mn	4,800	0	891	1,969	1,319	621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																		
Cash Flow from Operation (RGoB share)	BTN mn	71,064	0	0	0	0	1,840	1,857	1,875	1,893	1,912	1,931	1,951	1,972	1,993	2,015	2,042	2,074	2,260	2,297	2,334	2,390	2,431	2,476	2,522	2,568	2,615	2,664	2,713	2,763	2,813	2,865	2,918	2,971	3,026	3,081	3,136	3,191	3,246	3,301	3,356	3,411	3,466	3,521	3,576	3,631	3,686																																																																																																																																																																																																																																																																																																																																																																																																																																		
Investment (RGoB share)	BTN mn	-14,677	-523	-1,082	-1,343	-1,969	-1,319	-621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																																																																																																																																																	
Total Debt Service (PSIF and Commercial Loans - RGoB share)	BTN mn	-15,755	0	0	0	0	-1,030	-983	-936	-889	-842	-795	-748	-701	-654	-607	-579	-542	-505	-468	-431	-394	-357	-320	-283	-246	-209	-172	-135	-98	-61	-24	13	50	87	124	161	198	235	272	309	346	383	420	457	494	531																																																																																																																																																																																																																																																																																																																																																																																																																																		
Net Cash Flow	BTN mn	10.0%	6,375	0	0	0	810	874	939	1,004	643	721	801	881	962	1,044	1,411	1,474	1,690	1,756	1,909	2,155	2,212	2,270	2,329	2,389	2,450	2,512	2,574	2,636	2,698	2,760	2,822	2,884	2,946	3,008	3,070	3,132	3,194	3,256	3,318	3,380	3,442	3,504	3,566	3,628	3,690	3,752	3,814	3,876	3,938	4,000	4,062	4,124	4,186	4,248	4,310	4,372	4,434	4,496	4,558	4,620	4,682	4,744	4,806	4,868	4,930	4,992	5,054	5,116	5,178	5,240	5,302	5,364	5,426	5,488	5,550	5,612	5,674	5,736	5,798	5,860	5,922	5,984	6,046	6,108	6,170	6,232	6,294	6,356	6,418	6,480	6,542	6,604	6,666	6,728	6,790	6,852	6,914	6,976	7,038	7,100	7,162	7,224	7,286	7,348	7,410	7,472	7,534	7,596	7,658	7,720	7,782	7,844	7,906	7,968	8,030	8,092	8,154	8,216	8,278	8,340	8,402	8,464	8,526	8,588	8,650	8,712	8,774	8,836	8,898	8,960	9,022	9,084	9,146	9,208	9,270	9,332	9,394	9,456	9,518	9,580	9,642	9,704	9,766	9,828	9,890	9,952	10,014	10,076	10,138	10,200	10,262	10,324	10,386	10,448	10,510	10,572	10,634	10,696	10,758	10,820	10,882	10,944	11,006	11,068	11,130	11,192	11,254	11,316	11,378	11,440	11,502	11,564	11,626	11,688	11,750	11,812	11,874	11,936	12,000	12,062	12,124	12,186	12,248	12,310	12,372	12,434	12,496	12,558	12,620	12,682	12,744	12,806	12,868	12,930	12,992	13,054	13,116	13,178	13,240	13,302	13,364	13,426	13,488	13,550	13,612	13,674	13,736	13,798	13,860	13,922	13,984	14,046	14,108	14,170	14,232	14,294	14,356	14,418	14,480	14,542	14,604	14,666	14,728	14,790	14,852	14,914	14,976	15,038	15,100	15,162	15,224	15,286	15,348	15,410	15,472	15,534	15,596	15,658	15,720	15,782	15,844	15,906	15,968	16,030	16,092	16,154	16,216	16,278	16,340	16,402	16,464	16,526	16,588	16,650	16,712	16,774	16,836	16,898	16,960	17,022	17,084	17,146	17,208	17,270	17,332	17,394	17,456	17,518	17,580	17,642	17,704	17,766	17,828	17,890	17,952	18,014	18,076	18,138	18,200	18,262	18,324	18,386	18,448	18,510	18,572	18,634	18,696	18,758	18,820	18,882	18,944	19,006	19,068	19,130	19,192	19,254	19,316	19,378	19,440	19,502	19,564	19,626	19,688	19,750	19,812	19,874	19,936	20,000	20,062	20,124	20,186	20,248	20,310	20,372	20,434	20,496	20,558	20,620	20,682	20,744	20,806	20,868	20,930	20,992	21,054	21,116	21,178	21,240	21,302	21,364	21,426	21,488	21,550	21,612	21,674	21,736	21,798	21,860	21,922	21,984	22,046	22,108	22,170	22,232	22,294	22,356	22,418	22,480	22,542	22,604	22,666	22,728	22,790	22,852	22,914	22,976	23,038	23,100	23,162	23,224	23,286	23,348	23,410	23,472	23,534	23,596	23,658	23,720	23,782	23,844	23,906	23,968	24,030	24,092	24,154	24,216	24,278	24,340	24,402	24,464	24,526	24,588	24,650	24,712	24,774	24,836	24,898	24,960	25,022	25,084	25,146	25,208	25,270	25,332	25,394	25,456	25,518	25,580	25,642	25,704	25,766	25,828	25,890	25,952	26,014	26,076	26,138	26,200	26,262	26,324	26,386	26,448	26,510	26,572	26,634	26,696	26,758	26,820	26,882	26,944	27,006	27,068	27,130	27,192	27,254	27,316	27,378	27,440	27,502	27,564	27,626	27,688	27,750	27,812	27,874	27,936	28,000	28,062	28,124	28,186	28,248	28,310	28,372	28,434	28,496	28,558	28,620	28,682	28,744	28,806	28,868	28,930	28,992	29,054	29,116	29,178	29,240	29,302	29,364	29,426	29,488	29,550	29,6

Appendix-8 拡大図集

メインレポートの拡大図を以下に示す。

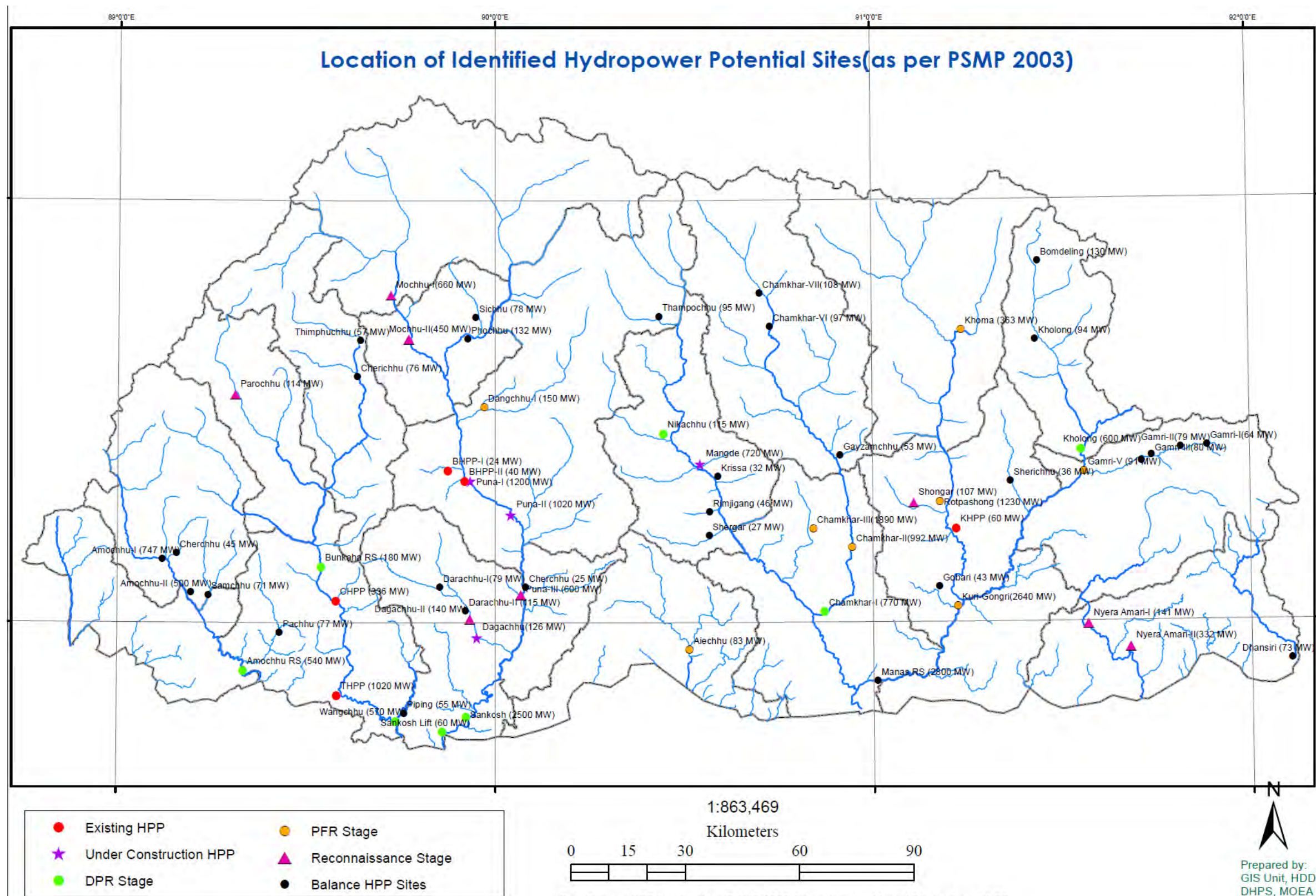


図 A 8-1 拡大図 (図 5-18)

(出典：PSMP2003、2017 改訂版)

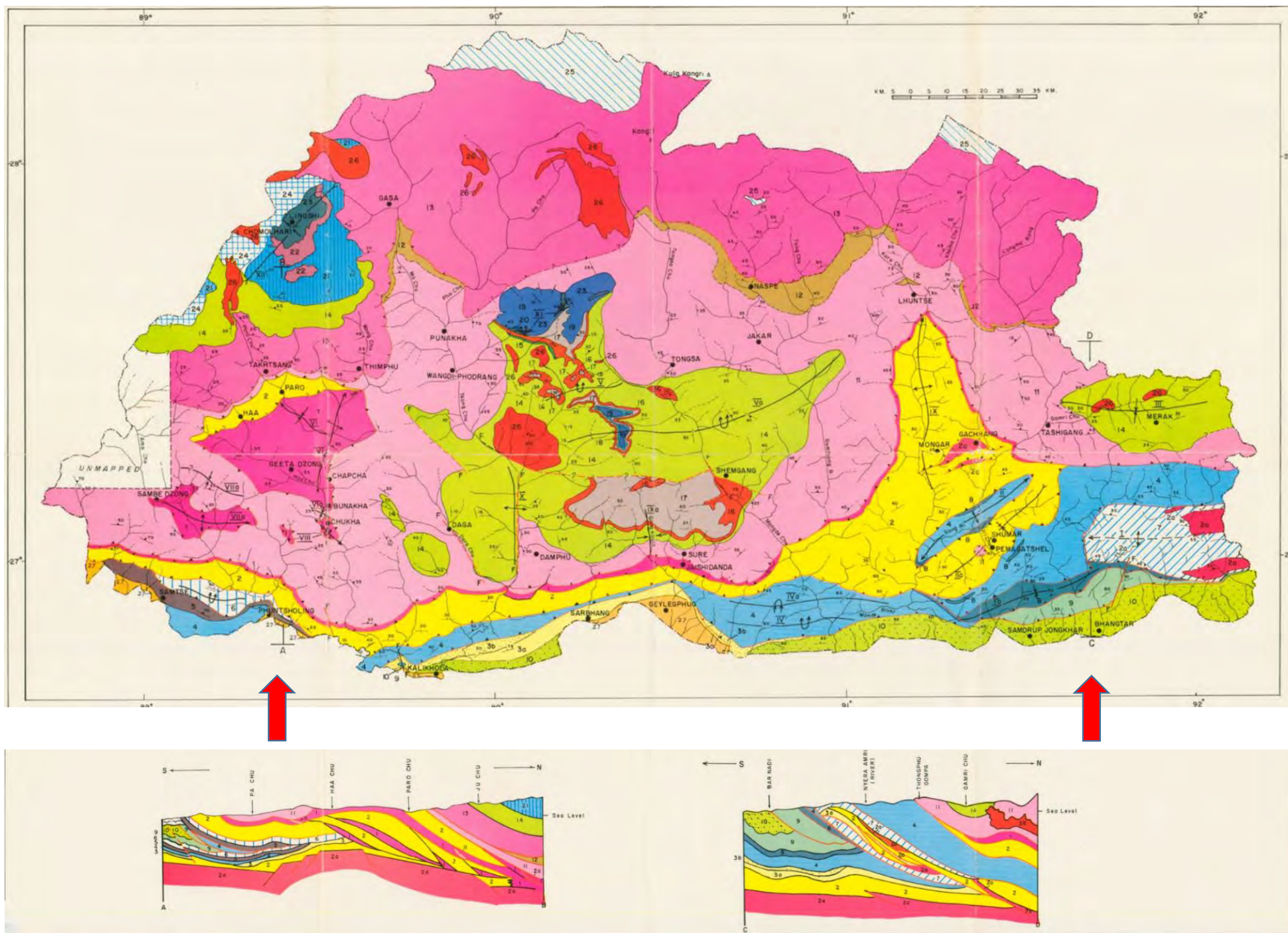


図 A 8-2 拡大図 (図 5-19)

(出典 : Bhargava,1995)

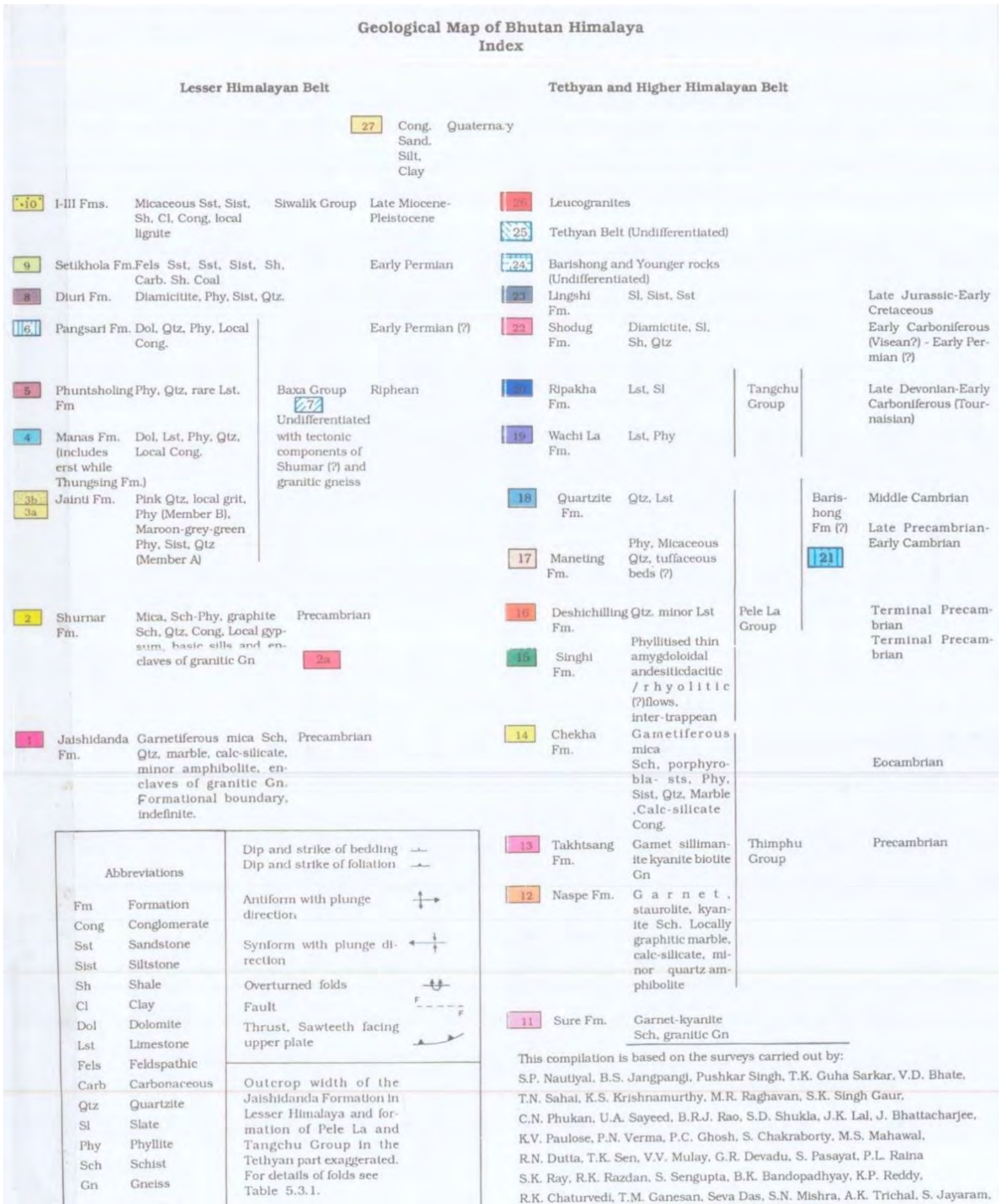
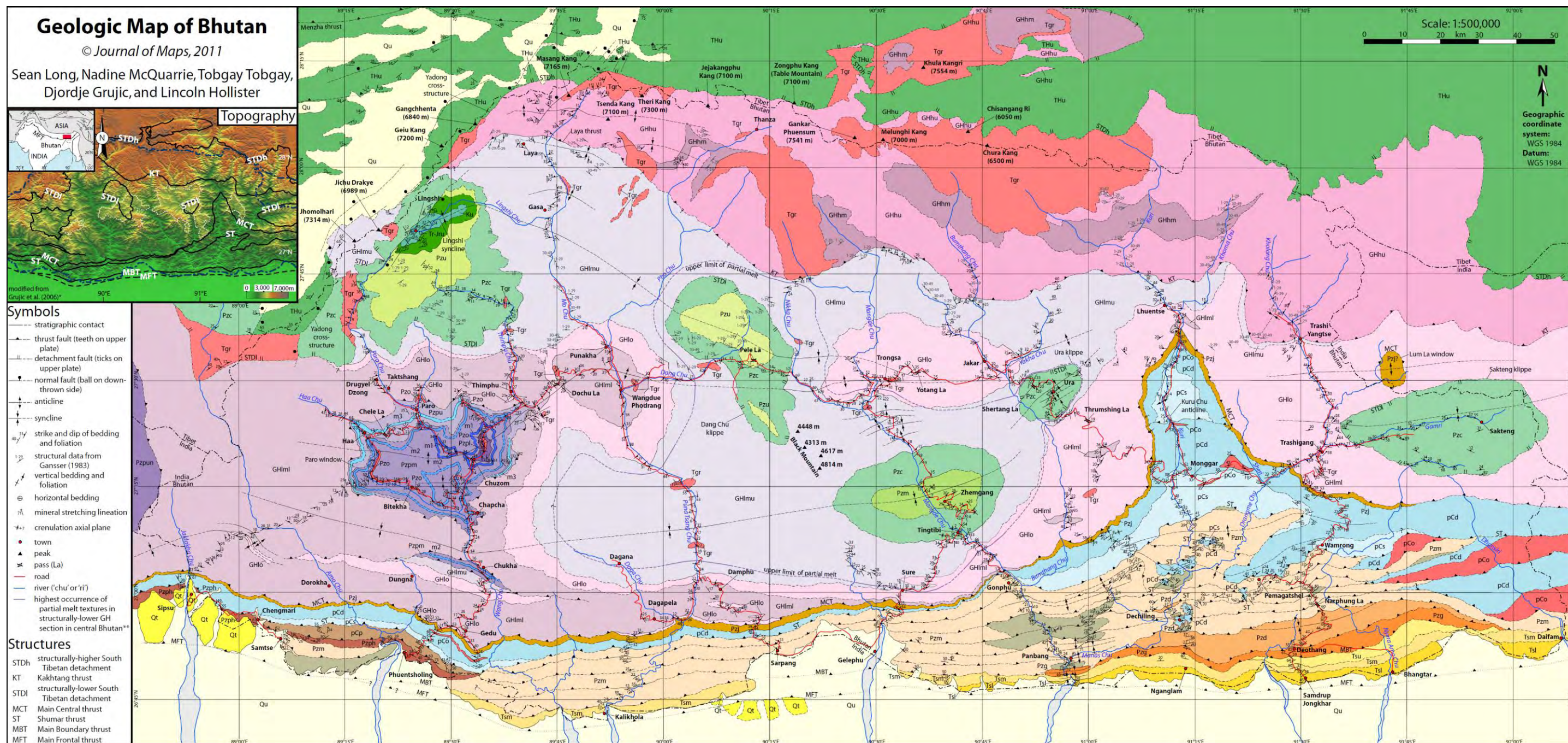


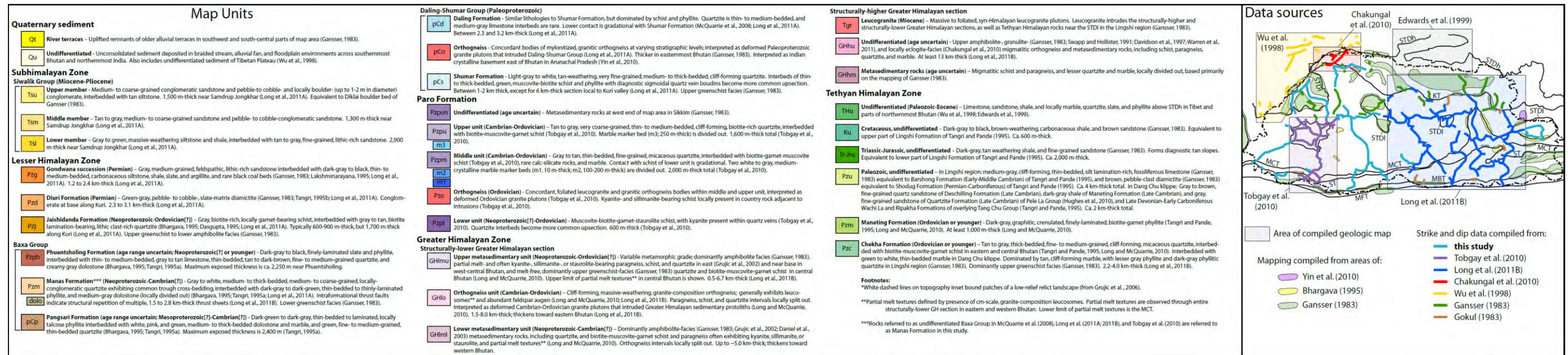
図 A 8-3 拡大図 (図 5-20)

(出典 : Bhargava, 1995)



(出典 : http://www.pitt.edu/~nmcq/Long_etal_2011_JOM_Bhutan_Map_1-500k.pdf#search=%27long+et+al%2C+bhutan%27)

図 A 8-4 拡大図 (図 5-21)



(出典 : http://www.pitt.edu/~nmcq/Long_etal_2011_JOM_Bhutan_Map_1-500k.pdf#search=%27long+et+al%2C+bhutan%27)

図 A 8-5 拡大図 (図 5-22)

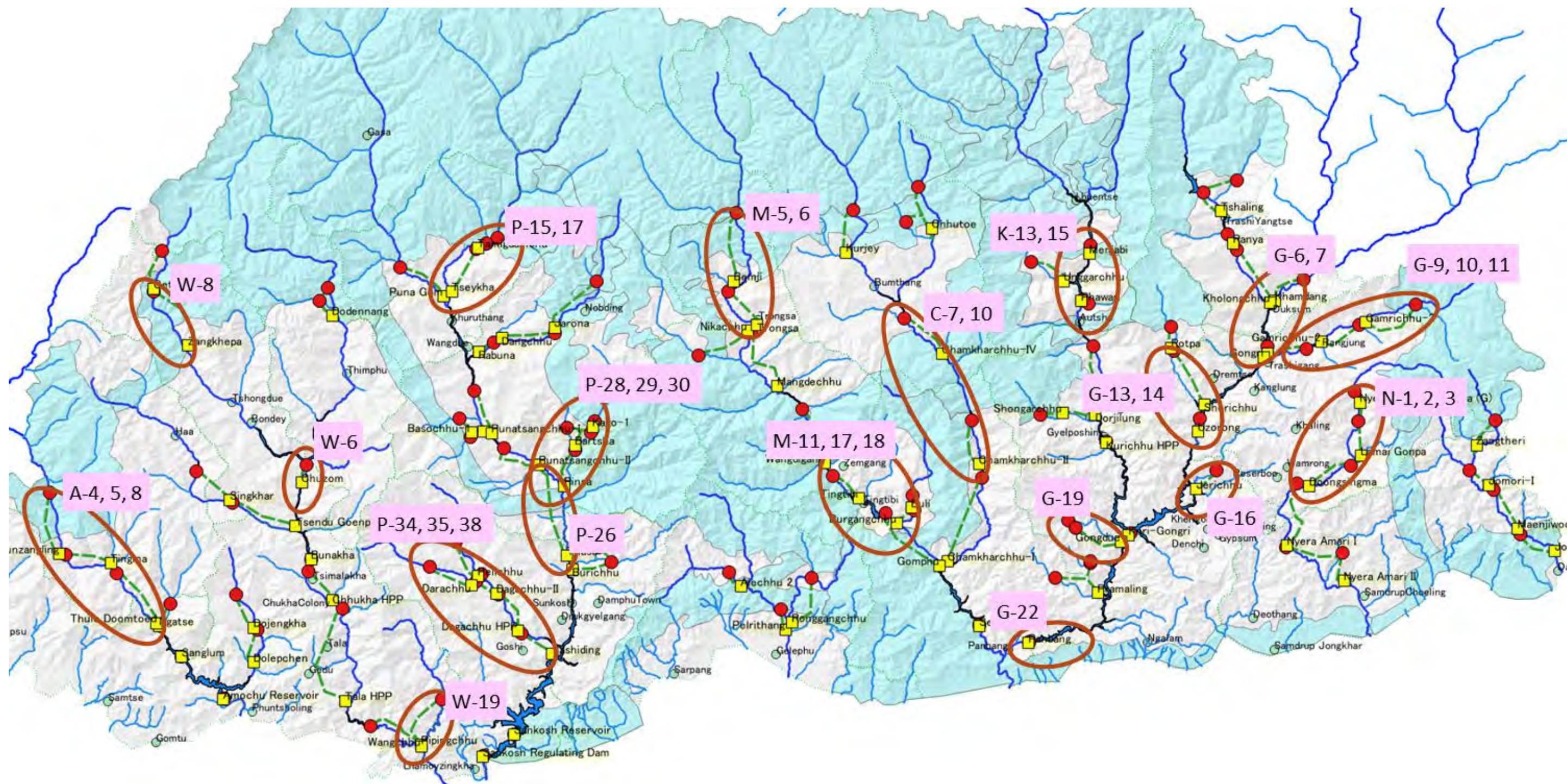
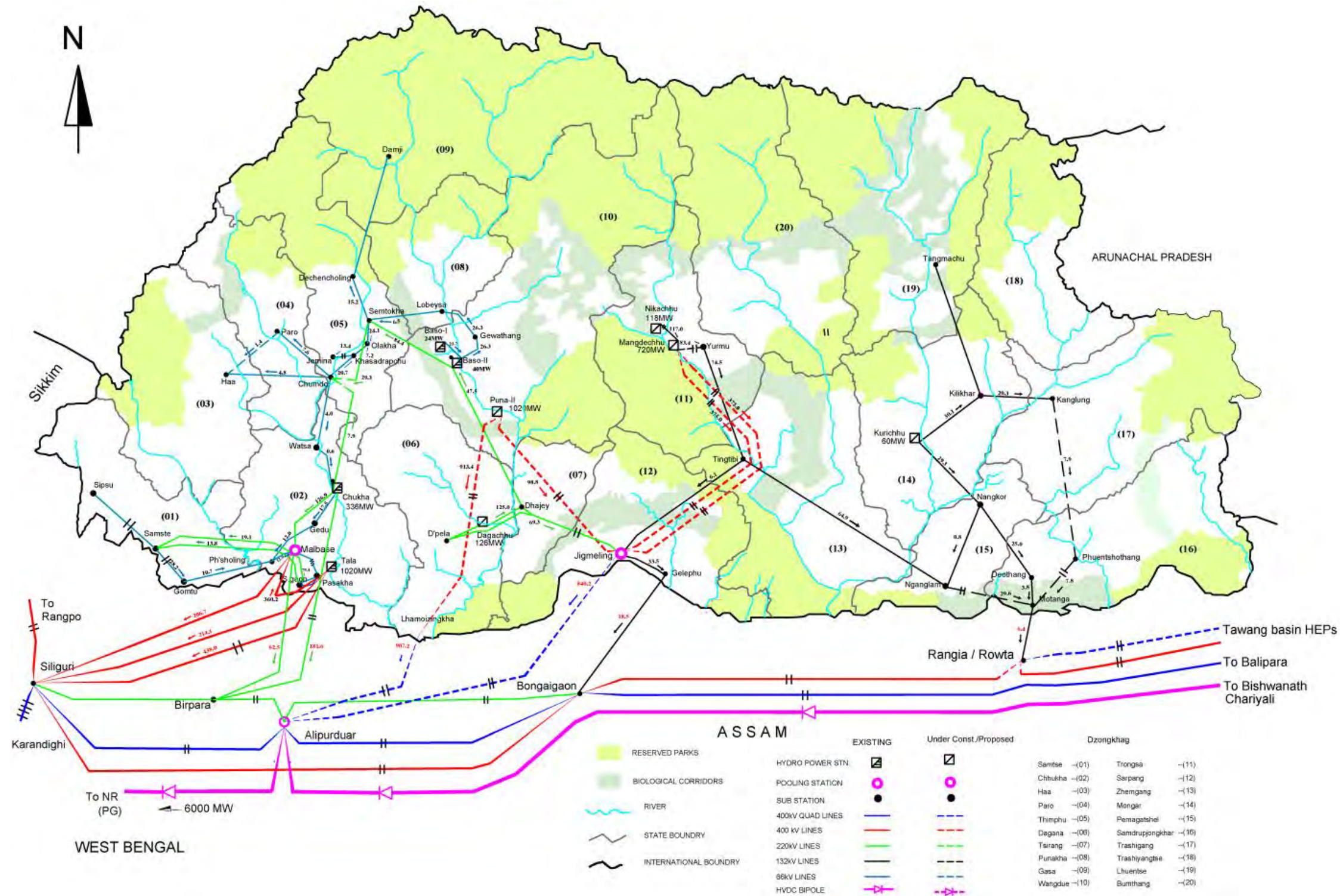
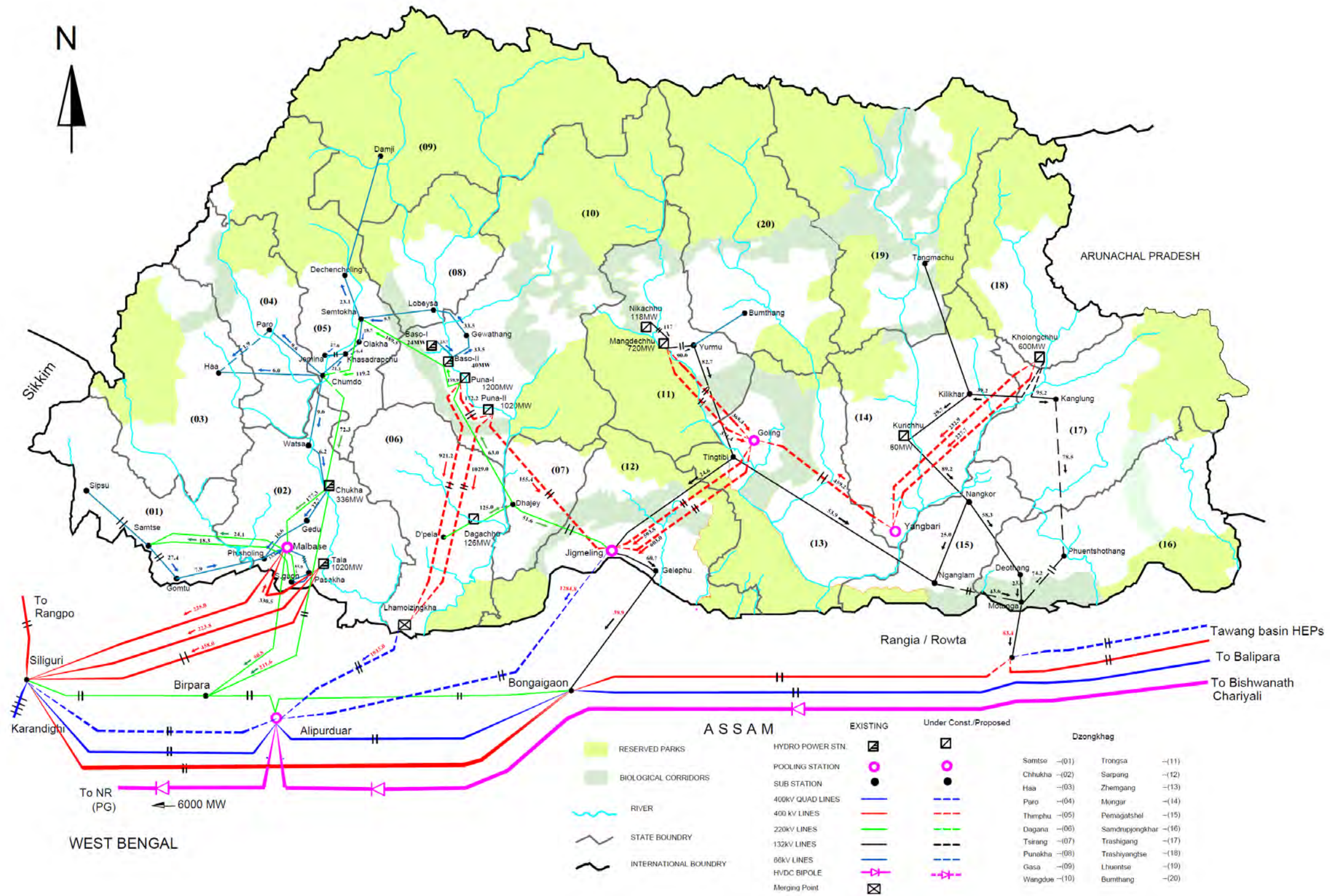


図 A 8-6 拡大図 (図 7-4)



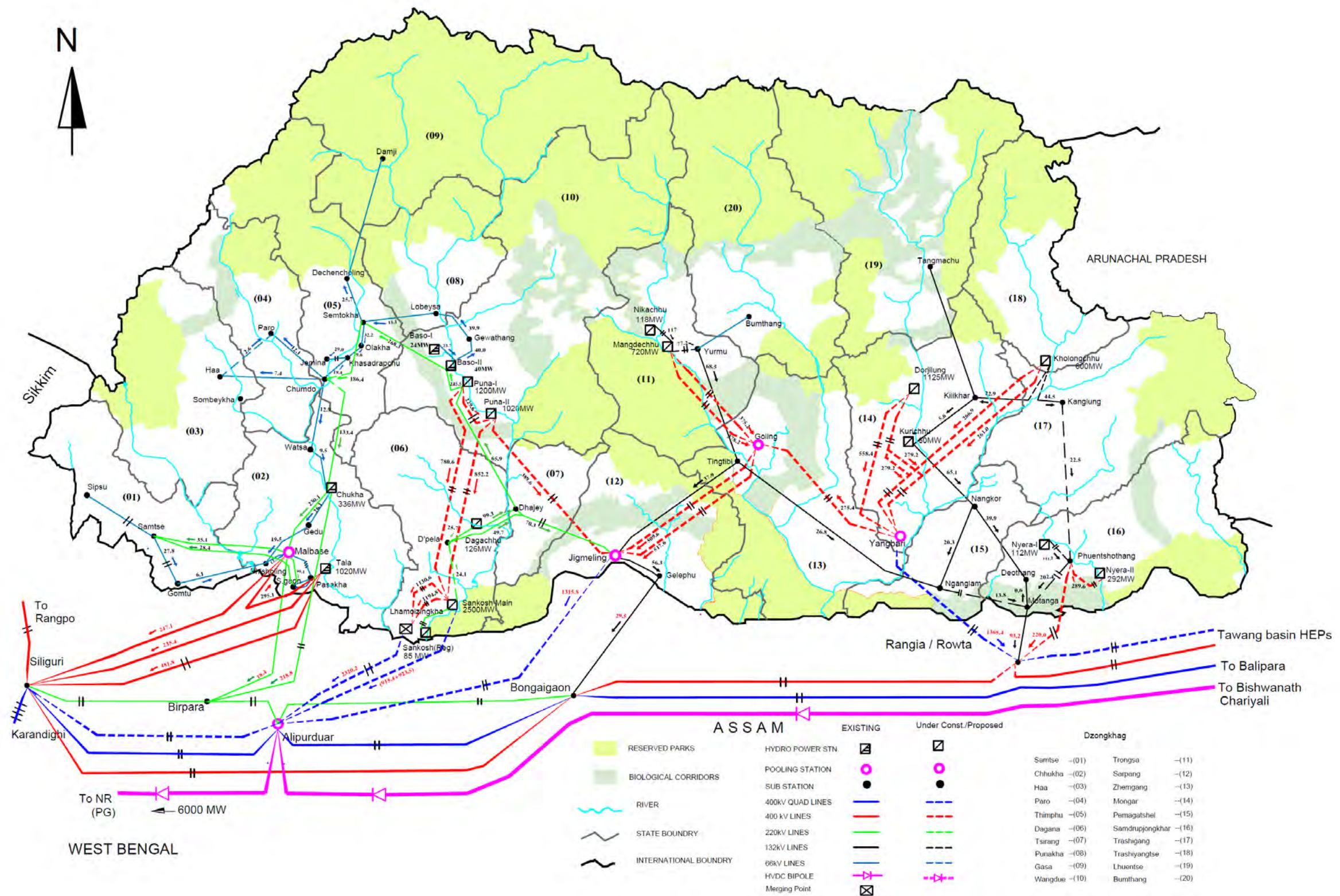
(出典: NTGMP of Bhutan-2018)

図 A 8-7 拡大図 (図 9-8)



(出典: NTGMP of Bhutan-2018)

図 A 8-8 拡大図 (図 9-13)



(出典: NTGMP of Bhutan-2018)

図 A 8-9 拡大図 (図 9-26)