CHAPTER A6

POWER SYSTEM ANALYSIS
AND
SYSTEM RELIABILITY STUDIES

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
1	Aguruwella 132	132	AGURU-1
2	Aguruwella 132	33	AGURU-3
3	Ambalangoda 132	132	AMBAL-1
4	Ambalangoda 33	33	AMBAL-3
5	Ampara 132	132	AMPA-1
6	Ampara 33	33	AMPA-3
7	Angoda 132	132	ANGODA-1
8	Angoda 33	33	ANGODA-3
9	Aniyakanda 132	132	ANIYA-1
10	Aniyakanda 33	33	ANIYA-3
11	Anuradhapura 132	132	ANURA-1
12	Anuradhapura 220	220	ANURA-2
13	Anuradhapura 33	33	ANURA-3
14	Athurugiriya 132	132	ATHUR-1
15	Athurugiriya 33	33	ATHUR-3
16	Avissawella 132	132	AVISS-1
17	Avissawella 33	33	AVISS-3
18	Avissawella 66	66	AVISS-6
19	Avissawella T-branch-1	132	AVIS-1T1
20	Avissawella T-branch-1	66	AVIS-6T1
21	Avissawella T-branch-2	132	AVIS-1T2
22	Avissawella T-branch-2	66	AVIS-6T2
23	Badulla 132	132	BADUL-1
24	Badulla 33	33	BADUL-3
25	Badulla 33A	33	BADUL-3A
26	Badulla 33B	33	BADUL-3B
27	Badulla 66	66	BADUL-6
28	Balangoda 132	132	BALAN-1
29	Balangoda 33	33	BALAN-3
30	Baticola 132	132	BATIC-1
31	Baticola 33	33	BATIC-3
32	Biyagama 132	132	BIYAG-1
33	Biyagama 220	220	BIYAG-2
34	Biyagama 33	33	BIYAG-3
35	Bolawatta 132	132	BOLAW-1
36	Bolawatta 33	33	BOLAW-3
37	Bolawatta T-branch-1	132	BOLAW-T1
38	Bolawatta T-branch-2	132	BOLAW-T2
39	Boossa 132	132	BOOS-1
40	Boossa 220	220	BOOS-2
41	Boossa 33	33	BOOS-3
42	Boossa Gen.	11	BOOS-G
43	Bowatenna 132	132	BOWAT-1

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
44	Bowatenna Gen.	12.5	BOWAT-G
45	Canyon 132	132	CANYO-1
46	Canyon Gen.	12.5	CANYO-G
47	Chillaw 132	132	CHILL-1
48	Chillaw 33	33	CHILL-3
49	Chillaw T-branch-1	132	CHILL-T1
50	Chillaw T-branch-2	132	CHILL-T2
51	Chunnakam 132	132	CHUNN-1
52	Chunnakam 33	33	CHUNN-3
53	Chunnakam Gen	11	CHUNN-G
54	Dehiwala 132	132	DEHIWA-1
55	Dehiwala 220	220	DEHIWA-2
56	Dehiwala 33	33	DEHIWA-3
57	Dehiwala Transformer Tertially	33	DEHIW-TT
58	Deniyaya 132	132	DENIY-1
59	Deniyaya 33	33	DENIY-3
60	Deniyaya T-branch-1	132	DENIY-T1
61	Deniyaya T-branch-2	132	DENIY-T2
62	Eheliyagoda 132	132	EHELI-1
63	Eheliyagoda 33	33	EHELI-3
64	Embilipitiya 132	132	EMBIL-1
65	Embilipitiya 33	33	EMBIL-3
66	Fort 11	11	FORT-11
67	Fort 132	132	FORT-1
68	Fort 132 Dummy	132	FORT-D
69	Galle 132	132	GALLE-1
70	Galle 33	33	GALLE-3
71	Galle SVC	5.9	GALLE-SV
72	Gonawala 132	132	GONAWA-1
73	Gonawala 33	33	GONAWA-3
74	Habarana 132	132	HABAR-1
75	Habarana 33	33	HABAR-3
76	Hambantota 132	132	HAMBAN-1
77	Hambantota 33	33	HAMBAN-3
78	Horana 132	132	HORAN-1
79	Horana 33	33	HORAN-3
80	Horana dummy 1	132	HORAN-D1
81	Horana dummy 2	132	HORAN-D2
82	Imbulgoda 132	132	IMBULG-1
83	Imbulgoda 33	33	IMBULG-3
84	Inginiyagara 132	132	INGIN-1
85	Inginiyagara 33	33	INGIN-3
86	Inginiyagara Gen.	6.9	INGIN-G

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
87	Kahawatta 220	220	KAHAWA-2
88	Katana 132	132	KATANA-1
89	Katana 33	33	KATANA-3
90	Kegalla 132	132	KEGAL-1
91	Kegalla 33	33	KEGAL-3
92	Kelanitissa 132	132	KELAN-1
93	Kelanitissa 220	220	KELAN-2
94	Kelanitissa 33	33	KELAN-3
95	Kelanitissa 33A	33	KELAN-3A
96	Kelanitissa 33B	33	KELAN-3B
97	Kelanitissa Gen. Combined Cycle 1	11	KELA-CC1
98	Kelanitissa Gen. Combined Cycle 2	11	KELA-CC2
99	Kelanitissa Gen. Gas (114MW)	15	KELA-GT3
100	Kelanitissa Gen. Gas (26 MW)	11	KELA-GT4
101	Kelanitissa Gen. Gas New	15	KELA-GTN
102	Kelanitissa Gen. Gas-1 (existing)	11	KELA-GT1
103	Kelanitissa Gen. Gas-2 (existing)	11	KELA-GT2
104	Kelanitissa Gen. Gas-3 (existing)	11	KELA-GT3
105	Kelanitissa Gen. Steam	11	KELAN-ST
106	Kelanitissa Transformer Tertiary	33	KELAN-TT
107	Kelaniya 132	132	K-NIYA-1
108	Kelaniya 33	33	K-NIYA-3
109	Kesbewa 132	132	KESBE-1
110	Kesbewa 33	33	KESBE-3
111	Kesbewa dummy 1	132	KESBE-D1
112	Kesbewa dummy 2	132	KESBE-D2
113	Kesbewa dummy 3	132	KESBE-D3
114	Kesbewa dummy 4	132	KESBE-D4
115	KHD Power 132	132	KHD-1
116	KHD Power 33	33	KHD-3
117	KHD Power Gen.		KHD-G
118	Kilinochchi 132	132	KILIN-1
119	Kilinochchi 33	33	KILIN-3
120	Kilinochchi T-branch-1	132	KILIN-T1
121	Kilinochchi T-branch-2	132	KILIN-T2
122	Kiribathkumbura 132	132	KIRIB-1
123	Kiribathkumbura 33	33	KIRIB-3
124	Kollupitiya 11	11	KOLLU-11
125	Kollupitiya 132	132	KOLLU-1
126	Kolonnawa 132	132	KOLON-1
127	Kolonnawa 220	220	KOLON-2
128	Kolonnawa 33	33	KOLON-3
129	Kolonnawa 33A	33	KOLON-3A

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
130	Kolonnawa 33B	33	KOLON-3B
131	Kolonnawa 66	66	KOLON-6
132	Kolonnawa Transformer Tertially	33	KOLON-TT
133	Kotmale 132	132	KOTMA-1
134	Kotmale 220	220	KOTMA-2
135	Kotmale Gen.-1	13.8	KOTMA-G1
136	Kotmale Gen.-2	13.8	KOTMA-G2
137	Kotugoda 132	132	KOTUG-1
138	Kotugoda 220	220	KOTUG-2
139	Kotugoda 33	33	KOTUG-3
140	Kukule 132	132	KUKULE-1
141	Kukule Gen.	11	KUKULE-G
142	Kuliyapitiya 132	132	KULIYA-1
143	Kuliyapitiya 33	33	KULIYA-3
144	Kurunegala 132	132	KURUN-1
145	Kurunegala 33	33	KURUN-3
146	Laxapana 132	132	LAX-1
147	Laxapana 66	66	LAX-6
148	Laxapana Dummy	66	LAX-D1
149	Laxapana Dummy	66	LAX-D2
150	Laxapana Gen.	11	LAX-G
151	Matale 132	132	MATAL-1
152	Matale 220	220	MATAL-2
153	Matara 132	132	MATAR-1
154	Matara 33	33	MATAR-3
155	Matugama 132	132	MATUG-1
156	Matugama 220	220	MATUG-2
157	Matugama 33	33	MATUG-3
158	Matugama Transformer Tertially	33	MATUG-TT
159	Medegama 132	132	MEDEGA-1
160	Medegama 33	33	MEDEGA-3
161	Mewella P/S 220	220	MAWEL-2
162	Mewella P/S Gen.	11	MAWEL-G
163	Muthragawella 220	220	MUTHR-2
164	Muthragawella 33	33	MUTHR-3
165	Muthragawella Gen.	11	MUTHR-G
166	New Anuradhapura 132	132	N-ANUR-1
167	New Anuradhapura 220	220	N-ANUR-2
168	New Chillaw 132	132	N-CHIL-1
169	New Chillaw 220	220	N-CHIL-2
170	New Galle 132	132	N-GALL-1
171	New Galle 132	132	N-GALL-1
172	New Galle 33	33	N-GALL-3

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
173	New Galle 33	33	N-GALL-3
174	New Galle Gen.	11	N-GALL-G
175	New Habarana	220	N-HABA-2
176	New Laxapana 132	132	N-LAX-1
177	New Laxapana Gen.	12.5	N-LAX-G
178	New Polpitiya 132	132	N-POLP-1
179	New Polpitiya 220	220	N-POLP-2
180	Nuwara Eliya 132	132	NUWAR-1
181	Nuwara Eliya 33	33	NUWAR-3
182	Nuwara Eliya 66	66	NUWAR-6
183	Nuwara Eliya T-branch-1	66, 132	NUWAR-T1
184	Nuwara Eliya T-branch-2	66, 132	NUWAR-T2
185	Oruwala 132	132	ORUWA-1
186	Oruwala 33	33	ORUWA-3
187	Oruwala T-branch-1	132	ORUWA-T1
188	Oruwala T-branch-2	132	ORUWA-T2
189	Paddiruppu 132	132	PADDIR-1
190	Paddiruppu 33	33	PADDIR-3
191	Padukka 220	220	PADUK-2
192	Padukka 33	33	PADUK-3
193	Padukka 66	66	PADUK-6
194	Padukka T-branch-1	66	PADUK-T1
195	Padukka T-branch-2	66	PADUK-T2
196	Palekelle 132	132	PALEK-1
197	Palekelle 33	33	PALEK-3
198	Panadura 132	132	PANAD-1
199	Panadura 33	33	PANAD-3
200	Panadura dummy 1	132	PANAD-D1
201	Panadura dummy 2	132	PANAD-D2
202	Panadura dummy 3	132	PANAD-D3
203	Panadura dummy 4	132	PANAD-D4
204	Panadura T-branch-1	132	PANAD-T1
205	Panadura T-branch-2	132	PANAD-T2
206	Pannala 132	132	PANNA-1
207	Pannala 33	33	PANNA-3
208	Pannipitiya 132	132	PANNI-1
209	Pannipitiya 220	220	PANNI-2
210	Pannipitiya 33	33	PANNI-3
211	Pannipitiya Static Capacitor	33	PANNI-SC
212	Polonnaruwa 132	132	POLON-1
213	Polonnaruwa 33	33	POLON-3
214	Polpitiya 132	132	POLPI-1
215	Polpitiya Gen.	12.5	POLPI-G

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
216	Puttalam 132	132	PUTTA-1
217	Puttalam 33	33	PUTTA-3
218	Puttalam P/S 132	132	PUTTA-P1
219	Puttalam P/S 220	220	PUTTA-P2
220	Puttalam P/S Gen.	11	PUTTA-PG
221	Randenigala 220	236	RANDE-2
222	Randenigala Gen.	12.5	RANDE-G
223	Rantembe 132	138	RANTE-1
224	Rantembe 220	220	RANTE-2
225	Rantembe 33	34.5	RANTE-3
226	Rantembe Gen.	12.5	RANTE-G
227	Ratmalana 132	132	RATMA-1
228	Ratmalana 33	33	RATMA-3
229	Ratmalana 33A	33	RATMA-3A
230	Ratmalana 33B	33	RATMA-3B
231	Ratnapura 132	132	RATNA-1
232	Ratnapura 33	33	RATNA-3
233	Samanalawewa 132	132	SAMAN-1
234	Samanalawewa Gen.	10.5	SAMAN-G
235	Sapugaskanda 132	132	SAPUG-1
236	Sapugaskanda 132A	132	SAPUG-1A
237	Sapugaskanda 132B	132	SAPUG-1B
238	Sapugaskanda 33	33	SAPUG-3
239	Sapugaskanda 33A	33	SAPUG-3A
240	Sapugaskanda 33B	33	SAPUG-3B
241	Sapugaskanda Gen. existing	11	SAPUG-G
242	Sapugaskanda Gen. new 1	11	SAPU-GN1
243	Sapugaskanda Gen. new 2	11	SAPU-GN2
244	Sapugaskanda Gen.- 1	11	SAPUG-G1
245	Sapugaskanda Gen.- 2	11	SAPUG-G2
246	Sapugaskanda P/S 132	142	SAPUG-1P
247	Sapugaskanda T-branch-1	132	SAPUG-T1
248	Sapugaskanda T-branch-2	132	SAPUG-T2
249	Sithawakapura 132	132	SITHA-1
250	Sithawakapura 33	33	SITHA-3
251	Sri Jaya'pura 132	132	SRIJA-1
252	Sri Jaya'pura 33	33	SRIJA-3
253	Sub-B 11	11	SUB-B-11
254	Sub-B 132	132	SUB-B-1
255	Thulhiriya 132	132	THULH-1
256	Thulhiriya 33	33	THULH-3
257	Thulhiriya T-branch-1	132	THULH-T1
258	Thulhiriya T-branch-2	132	THULH-T2

Table A6.1.1-1 Abbreviation of Node Name

No.	Node name	Bus Voltage (kV)	Abbreviation
259	Town Hall 132	132	TOWN-1
260	Town Hall 33	33	TOWN-3
261	Trincomalee 132	132	TRINC-1
262	Trincomalee 33	33	TRINC-3
263	Trincomalee P/S 132	132	TRINC-P1
264	Trincomalee P/S 220	220	TRINC-P2
265	Trincomalee P/S Gen.	11	TRINC-G
266	Ukuwela 132	132	UKUWE-1
267	Ukuwela 33	33	UKUWE-3
268	Ukuwela Gen.	12.5	UKUWE-G
269	Valaichchenai 132	132	VALAI-1
270	Valaichchenai 33	33	VALAI-3
271	Vavunia 132	132	VAVUNI-1
272	Vavunia 33	33	VAVUNI-3
273	Veyangoda 132	132	VEYAN-1
274	Veyangoda 132	33	VEYAN-3
275	Veyangoda 220	220	VEYAN-2
276	Victoria 220	236	VICTO-2
277	Victoria Gen.	12.5	VICTO-G
278	Wariyapola Switching Station	220	WARIYA-2
279	Wimalasurendra 132	132	WIMAL-1
280	Wimalasurendra 33	33	WIMAL-3
281	Wimalasurendra Gen.	11	WIMAL-G

Table A6.1.1 - 2 Operating Temperature of Existing Transmission Lines

Ref.	Section	Voltage (kV)	Circuits	Conductors	Max Design Temperature
2L1.	Biyagama - Kotugoda	220	2	Zebra	75
2L2.	Biyagama - Kotmale	220	2	2 x Zebra	75
2L3.	Kotmale - Victoria	220	2	2 x Zebra	75
2L4.	Victoria - Randenigala	220	1	2 x Zebra	75
2L5.	Randenigala - Rantembe	220	1	2 x Zebra	75
1U1.	Kelanitissa - Fort	132	1	UG, (Cu 500)	
1U2.	Fort - Kollupitiya	132	1	UG, (Cu 350)	
1U3.	Kollupitiya - Kolonnawa	132	1	UG, (Cu 500)	
1L1.	Biyagama - Pannipitiya	132	2	Zebra	75
1L2.	Biyagama - Kelanitissa	132	2	2 x Goat	75
1L3.	Biyagama - Sapugaskanda PS	132	2	Lynx	54
1L4.	Kolonnawa - Kelanitissa	132	2	Zebra	54
1L5.	Kolonnawa - Pannipitiya	132	2	Lynx	54
1L6.	Kolonnawa -Sapugaskanda(T)	132	2	Coyote	54
1L7.	Sapugaskanda (T) - Kotugoda	132	2	Coyote	54
1L8.	Sapugaskanda (T) - SS	132	2	Coyote	54
1L9.	Kotugoda - Bolawatta	132	2	Coyote	54
1L10.	Bolawatta - Chilaw (T)	132	2	Lynx	54
1L11.	Chilaw (T) - Puttalam	132	2	Lynx	54
1L12.	Chilaw (T) - SS	132	2	Lynx	75
1L13.	Kolonnawa - Oruwala (T)	132	2	Lynx	54
1L14.	Oruwala (T) - SS	132	2	Lynx	54
1L15.	Oruwala (T) - Thulhiriya (T)	132	2	Lynx	54
1L16.	Thulhiriya (T) - SS	132	2	Lynx	54
1L17.	Thulhiriya (T) - Polpitiya	132	2	Lynx	54
1L18.	Kolonnawa - Avissawella (T)	132	2	Lynx	54
1L19.	Avissawella (T) - SS	132	2	Lynx	75
1L20.	Avissawella (T) - Polpitiya	132	2	Lynx	54
1L21.	Pannipitiya - Ratmalana	132	2	Lynx	54
1L22.	Pannipitiya - Panadura (T)	132	2	Goat	75
1L23.	Panadura (T) - Matugama	132	2	Goat	75
1L24.	Panadura (T) - SS	132	2	Lynx	75
1L25.	Polpitiya - Laxapana	132	2	Lynx	54
1L26.	Laxapana - Wimalasurendra	132	2	Lynx	54
1L27.	Laxapana - New Laxapana	132	2	Lynx	54
1L28.	New Laxapana - Polpitiya	132	2	Lynx	54
1L29.	New Laxapana - Canyon	132	1	Lynx	54
1L30.	Polpitiya - Kotmale	132	1	Lynx	54
1L31.	Kotmale - Kiribatkumbura	132	1	Lynx	54
1L32.	Kiribatkumbura - Anuradhapura	132	1	Lynx	54
1L33.	Polpitiya - Ukuwela	132	1	Lynx	54
1L34.	Ukuwela - Habarana	132	1	Lynx	54
1L35.	Habarana - Anuradhapura	132	1	Lynx	54
1L36.	Ukuwela - Bowatenna	132	1	Lynx	54
1L37.	Kiribathkumbra - Kurunegala	132	2	Lynx	54
1L38.	Habarana - Valaichchenai	132	1	Lynx	75
1L39.	Anuradhapura - Trincomalee	132	2	Lynx	54
1L40.	New Laxapana - Balangoda	132	2	Lynx	54
1L41.	Balangoda - Samanalawewa	132	2	Zebra	75
1L42.	Samanalawewa - Embilipitiya	132	2	Lynx	75
1L43.	Balangoda - Deniyaya (T)	132	2	Tiger	54
1L44.	Deniyaya (T) - Galle	132	2	Tiger	54
1L45.	Rantembe - Badulla	132	1	Lynx	75
1L46.	Badulla - Inginiyagala	132	1	Oriole	54
1L47.	Anuradhapura - Kilinochchi(T)	132	2	Lynx	54
1L48.	Kilinochchi (T) - Chunnakam	132	2	Lynx	54

Table A6.1.1 - 3 Maximum Current Rating of Conductors

Conductors of Existing Lines

Code Name Type		Tiger ACSR	Coyote ACSR	Oriole ACSR	Lynx ACSR	Goat ACSR	Zebra ACSR
Current Rating at 54 °C	Day (A)	178	180	199	204	244	253
	Evening(A)	365	361	432	453	658	750
Current Rating at 75 °C	Day (A)	379	377	444	464	656	726
	Evening(A)	487	483	578	607	882	987
Current Rating at 90 °C	Emergency (A)	554	550	658	690	1005	1112
Fault Current 1sec (kA)		12.7	11.9	16.5	17.8	31.5	34.3

Proposed Conductors for Future Lines

Code Name Type		Lynx ACSR	Bear ACSR	Goat ACSR	Zebra ACSR	Grackle ACSR	Pheasant ACSR	Parrot ACSR
Current Rating at 54 °C	Day (A)	204		244	253			
	Evening(A)	453		658	750			
Current Rating at 75 °C	Day (A)	464	579	656	726	891	928	1029
	Evening(A)	607	771	882	987	1236	1292	1447
Current Rating at 80 °C	Day (A)	505	632	717	793	977	1081	1131
	Evening(A)	636	809	925	1032	1292	1350	1513
Current Rating at 90 °C	Emergency (A)	690	878	1005	1112	1394	1457	1633
Fault Current 1sec (kA)		17.8	23.3	31.5	34.3	48.3	51.5	61.1

Note: Current ratings in the tables were calculated assuming the following conditions ;

		Day	Evening	Emergency
Solar radiation	(W/m^2)	1200	0	0
Ambient temperature	(°C)	35	30	30
Wind Speed	(°C)	0.6	0.6	0.6

Table A6.1.1 - 4 Data of Existing Transmission Lines as of November 1995

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
Existing System as of November 28, 1995														
1	2L1	BIYAG-2	KOTUG-2	220	Zebra	19.6	2	1.4818	7.9576	0.0568	0.3061	1.6441	2.7497	
2		BIYAG-2	KOTUG-2	220	Zebra	19.6		1.4818	7.9576	0.0568	0.3061	1.6441	2.7497	
3	2L2	BIYAG-2	KOTMA-2	220	2 x Zebra	70.5	2	2.6649	21.1500	0.2670	0.5506	4.3698	12.9250	
4		BIYAG-2	KOTMA-2	220	2 x Zebra	70.5		2.6649	21.1500	0.2670	0.5506	4.3698	12.9250	
5	2L3	KOTMA-2	VICTO-2	220	2 x Zebra	30.1	2	1.1378	9.1203	0.1127	0.2351	1.8844	5.4563	
6		KOTMA-2	VICTO-2	220	2 x Zebra	30.1		1.1378	9.1203	0.1127	0.2351	1.8844	5.4563	
7	2L4	VICTO-2	RANDE-2	220	2 x Zebra	16.4	1	0.6199	5.1660	0.0590	0.1281	1.0674	2.8553	
8	2L5	RANDE-2	RANTE-2	220	2 x Zebra	3.1	1	0.1172	0.9765	0.0112	0.0242	0.2018	0.5397	
9	1U1	KELAN-1	FORT-1	132	Cu 500	4.9	1	0.1999	0.4645	0.6311	0.1147	0.2666	10.9971	
10	1U2	FORT-1	FORT-D	132	Cu 350	0.0	1				0.0000	0.0500	0.0000	
11		FORT-D	KOLLU-1	132	Cu 350	2.7		0.1509	0.2673	0.0003	0.0866	0.1534	0.0053	
12	1U3	KOLLU-1	KOLON-1	132	Cu 500	5.4	1	0.2203	0.5119	0.6955	0.1265	0.2938	12.1192	
13	1L1	BIYAG-1	PANNI-1	132	Zebra	15.5	2	1.1718	6.2930	0.0438	0.6725	3.6117	0.7629	
14		BIYAG-1	PANNI-1	132	Zebra	15.5		1.1718	6.2930	0.0438	0.6725	3.6117	0.7629	
15	1L2	BIYAG-1	KELAN-1	132	2 x Goat	12.5	2	0.6238	3.7875	0.0468	0.3580	2.1737	0.8157	
16		BIYAG-1	KELAN-1	132	2 x Goat	12.5		0.6238	3.7875	0.0468	0.3580	2.1737	0.8157	
17	1L3	BIYAG-1	SAPUG-1P	132	Lynx	2.1	2	0.3717	0.8547	0.0059	0.2133	0.4905	0.1031	
18		BIYAG-1	SAPUG-1P	132	Lynx	2.1		0.3717	0.8547	0.0059	0.2133	0.4905	0.1031	
19	1L4	KOLON-1	KELAN-1	132	Zebra	2.2	2	0.1663	0.8492	0.0065	0.0955	0.4874	0.1141	
20		KOLON-1	KELAN-1	132	Zebra	2.2		0.1663	0.8492	0.0065	0.0955	0.4874	0.1141	
21	1L5	KOLON-1	PANNI-1	132	Lynx	12.9	2	2.2833	5.2116	0.0365	1.3104	2.9910	0.6367	
22		KOLON-1	PANNI-1	132	Lynx	12.9		2.2833	5.2116	0.0365	1.3104	2.9910	0.6367	
23	1L6	KOLON-1	SAPUG-T1	132	Coyote	6.6	2	1.6170	2.7984	0.0178	0.9280	1.6061	0.3108	
24		KOLON-1	SAPUG-T2	132	Coyote	6.6		1.6170	2.7984	0.0178	0.9280	1.6061	0.3108	
25	1L7	SAPUG-T1	KOTUG-1	132	Coyote	16.7	2	4.0915	7.0808	0.0451	2.3482	4.0638	0.7864	
26		SAPUG-T2	KOTUG-1	132	Coyote	16.7		4.0915	7.0808	0.0451	2.3482	4.0638	0.7864	
27	1L8	SAPUG-T1	SAPUG-1A	132	Lynx	4.6	2	0.8142	1.8584	0.0130	0.4673	1.0666	0.2271	
28		SAPUG-T2	SAPUG-1B	132	Lynx	4.6		0.8142	1.8581	0.0130	0.4673	1.0666	0.2271	
29	1L9	KOTUG-1	BOLAW-T1	132	Coyote	21.0	2	5.1450	8.9040	0.0568	2.9528	5.1102	0.9889	
30		KOTUG-1	BOLAW-T2	132	Coyote	21.0		5.1450	8.9040	0.0568	2.9528	5.1102	0.9889	
31		BOLAW-T1	BOLAW-1	132	Dummy	0.0	2				0.0000	0.0500	0.0000	
32		BOLAW-T2	BOLAW-1	132	Dummy	0.0					0.0000	0.0500	0.0000	
33	1L10	BOLAW-T1	CHILL-T1	132	Lynx	22.6	2	4.0002	9.2434	0.0633	2.2958	5.3050	1.1030	
34		BOLAW-T2	CHILL-T2	132	Lynx	22.6		4.0002	9.2434	0.0633	2.2958	5.3050	1.1030	
35	1L11	CHILL-T1	PUTTA-1	132	Lynx	61.4	2	10.8678	25.1126	0.1720	6.2373	14.4126	2.9967	
36		CHILL-T2	PUTTA-1	132	Lynx	61.4		10.8678	25.1126	0.1720	6.2373	14.4126	2.9967	
37	1L12	CHILL-T1	CHILL-1	132	Lynx	6.8	2	1.2036	2.7880	0.0190	0.6908	1.6001	0.3310	
38		CHILL-T2	CHILL-1	132	Lynx	6.8		1.2036	2.7880	0.0190	0.6908	1.6001	0.3310	
39	1L13	KOLON-1	ORUWA-T1	132	Lynx	14.0	2	2.4780	5.7260	0.0391	1.4222	3.2863	0.6814	
40		KOLON-1	ORUWA-T2	132	Lynx	14.0		2.4780	5.7260	0.0391	1.4222	3.2863	0.6814	
41	1L14	ORUWA-T1	ORUWA-1	132	Lynx	3.4	2	0.6018	1.3906	0.0095	0.3454	0.7981	0.1655	
42		ORUWA-T2	ORUWA-1	132	Lynx	3.4		0.6018	1.3906	0.0095	0.3454	0.7981	0.1655	
43	1L15	ORUWA-T1	THULH-T1	132	Lynx	36.0	2	6.3720	14.7240	0.1006	3.6570	8.4504	1.7521	
44		ORUWA-T2	THULH-T2	132	Lynx	36.0		6.3720	14.7240	0.1006	3.6570	8.4504	1.7521	
45	1L16	THULH-T1	THULH-1	132	Lynx	23.9	2	4.2303	9.6556	0.0677	2.4279	5.5416	1.1797	
46		THULH-T2	THULH-1	132	Lynx	23.9		4.2303	9.6556	0.0677	2.4279	5.5416	1.1797	
47	1L17	THULH-T1	POLPI-1	132	Lynx	28.0	2	4.9560	11.4520	0.0782	2.8444	6.5725	1.3628	
48		THULH-T2	POLPI-1	132	Lynx	28.0		4.9560	11.4520	0.0782	2.8444	6.5725	1.3628	
49	1L18	KOLON-1	AVIS-1T1	132	Lynx	31.9	2	5.6463	12.8876	0.0904	3.2405	7.3965	1.5746	
50		KOLON-1	AVIS-1T2	132	Lynx	31.9		5.6463	12.8876	0.0904	3.2405	7.3965	1.5746	
51	1L19	AVIS-1T1	AVISS-1	132	Lynx	0.5	2	0.0885	0.2050	0.0014	0.0508	0.1177	0.0243	
52		AVIS-1T2	AVISS-1	132	Lynx	0.5		0.0885	0.2050	0.0014	0.0508	0.1177	0.0243	
53	1L20	AVIS-1T1	POLPI-1	132	Lynx	34.4	2	6.0888	13.8976	0.0975	3.4945	7.9761	1.6980	
54		AVIS-1T2	POLPI-1	132	Lynx	34.4		6.0888	13.8976	0.0975	3.4945	7.9761	1.6980	
55	1L21	PANNI-1	RATMA-1	132	Lynx	6.9	2	1.2213	2.7876	0.0195	0.7009	1.5999	0.3406	
56		PANNI-1	RATMA-1	132	Lynx	6.9		1.2213	2.7876	0.0195	0.7009	1.5999	0.3406	
57	1L22	PANNI-1	PANAD-T1	132	Goat	12.3	2	1.2300	4.7970	0.0362	0.7059	2.7531	0.6303	
58		PANNI-1	PANAD-T2	132	Goat	12.3		1.2300	4.7970	0.0362	0.7059	2.7531	0.6303	
59	1L23	PANAD-T1	MATUG-1	132	Goat	29.1	2	2.9100	11.3490	0.0856	1.6701	6.5134	1.4913	
60		PANAD-T2	MATUG-1	132	Goat	29.1		2.9100	11.3490	0.0856	1.6701	6.5134	1.4913	

Note: Shaded branches: Not in operation

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Table A6.1.1 - 4 Data of Existing Transmission Lines as of November 1995

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
61	IL24	PANAD-T1	PANAD-1	132	Lynx	4.7	2	0.8319	1.9270	0.0131	0.4774	1.1059	0.2288	
62		PANAD-T2	PANAD-1	132	Lynx	4.7		0.8319	1.9270	0.0131	0.4774	1.1059	0.2288	
63	IL25	POLPI-1	LAX-1	132	Lynx	8.3	2	1.4691	3.3947	0.0232	0.8431	1.9483	0.4040	
64		POLPI-1	LAX-1	132	Lynx	8.3		1.4691	3.3947	0.0232	0.8431	1.9483	0.4040	
65	IL26	LAX-1	WIMAL-1	132	Lynx	5.1	2	0.9027	2.0859	0.0142	0.5181	1.1971	0.2482	
66		LAX-1	WIMAL-1	132	Lynx	5.1		0.9027	2.0859	0.0142	0.5181	1.1971	0.2482	
67	IL27	LAX-1	N-LAX-1	132	Lynx	0.6	2	0.1062	0.2454	0.0017	0.0610	0.1408	0.0292	
68		LAX-1	N-LAX-1	132	Lynx	0.6		0.1062	0.2454	0.0017	0.0610	0.1408	0.0292	
69	IL28	N-LAX-1	POLPI-1	132	Lynx	8.0	2	1.4160	3.2720	0.0223	0.8127	1.8779	0.3894	
70		N-LAX-1	POLPI-1	132	Lynx	8.0		1.4160	3.2720	0.0223	0.8127	1.8779	0.3894	
71	IL29	N-LAX-1	CANYO-1	132	Lynx	10.0	1	1.7700	4.1600	0.0275	1.0158	2.3875	0.4787	
72	IL30	POLPI-1	KOTMA-1	132	Lynx	29.5	1	5.2215	11.9180	0.0836	2.9967	6.8400	1.4561	
73	IL31	KOTMA-1	KIRIB-1	132	Lynx	22.5	1	3.9825	9.0900	0.0637	2.2856	5.2169	1.1106	
74	IL32	KIRIB-1	ANURA-1	132	Lynx	143.9	1	25.4703	58.1356	0.4076	14.6179	33.3652	7.1029	
75	IL33	POLPI-1	UKUWE-1	132	Lynx	59.3	1	10.4961	23.9572	0.1680	6.0239	13.7495	2.9270	
76	IL34	UKUWE-1	HABAR-1	132	Lynx	82.3	1	14.5671	33.2492	0.2331	8.3604	19.0824	4.0623	
77	IL35	HABAR-1	ANURA-1	132	Lynx	48.9	1	8.6553	19.7556	0.1385	4.9675	11.3382	2.4137	
78	IL36	UKUWE-1	BOWAT-1	132	Lynx	30.0	1	5.3100	12.4500	0.0826	3.0475	7.1453	1.4400	
79	IL37	KIRIB-1	KURUN-1	132	Lynx	34.6	2	6.1242	14.1514	0.0966	3.5148	8.1218	1.6840	
80		KIRIB-1	KURUN-1	132	Lynx	34.6		6.1242	14.1514	0.0966	3.5148	8.1218	1.6840	
81	IL38	HABAR-1	VALAI-1	132	Lynx	99.7	1	17.6469	41.5749	0.2739	10.1279	23.8607	4.7725	
82	IL39	ANURA-1	TRINC-1	132	Lynx	103.3	2	18.2841	42.0431	0.2902	10.4936	24.1294	5.0559	
83		ANURA-1	TRINC-1	132	Lynx	103.3		18.2841	42.0431	0.2902	10.4936	24.1294	5.0559	
84	IL40	N-LAX-1	BALAN-1	132	Lynx	43.9	2	7.7703	17.9551	0.1230	4.4595	10.3048	2.1426	
85		N-LAX-1	BALAN-1	132	Lynx	43.9		7.7703	17.9551	0.1230	4.4595	10.3048	2.1426	
86	IL41	BALAN-1	SAMAN-1	132	Zebra	19.0	2	1.4364	7.4480	0.0557	0.8244	4.2746	0.9708	
87		BALAN-1	SAMAN-1	132	Zebra	19.0		1.4364	7.4480	0.0557	0.8244	4.2746	0.9708	
88	IL42	SAMAN-1	EMBIL-1	132	Lynx	38.0	2	6.7260	15.7700	0.1050	3.8602	9.0507	1.8290	
89		SAMAN-1	EMBIL-1	132	Lynx	38.0		6.7260	15.7700	0.1050	3.8602	9.0507	1.8290	
90	IL43	BALAN-1	DENIY-T1	132	Tiger	44.2	2	10.9174	18.5198	0.1204	6.2657	10.6289	2.0985	
91		BALAN-1	DENIY-T2	132	Tiger	44.2		10.9174	18.5198	0.1204	6.2657	10.6289	2.0985	
92		DENIY-T1	DENIY-1	132	Dummy	0.0	2				0.0000	0.0500	0.0000	
93		DENIY-T2	DENIY-1	132	Dummy	0.0					0.0000	0.0500	0.0000	
94	IL44	DENIY-T1	GALLE-1	132	Tiger	57.3	2	14.1531	24.0087	0.1561	8.1228	13.7791	2.7204	
95		DENIY-T2	GALLE-1	132	Tiger	57.3		14.1531	24.0087	0.1561	8.1228	13.7791	2.7204	
96	IL45	RANTE-1	BADUL-1	132	Lynx	37.0	1	6.5490	15.5770	0.1005	3.7586	8.9400	1.7519	
97	IL46	BADUL-1	INGIN-1	132	Oriole	79.9	1	15.1810	35.0761	0.2075	8.7127	20.1309	3.6160	
98	IL47	ANURA-1	KILIN-T1	132	Lynx	128.8	2	22.7976	52.0352	0.3649	13.0840	29.8641	6.3575	
99		ANURA-1	KILIN-T2	132	Lynx	128.8		22.7976	52.0352	0.3649	13.0840	29.8641	6.3575	
100	IL48	KILIN-T1	CHUNN-1	132	Lynx	67.2	2	11.8944	27.1488	0.1904	6.8264	15.5813	3.3170	
101		KILIN-T2	CHUNN-1	132	Lynx	67.2		11.8944	27.1488	0.1904	6.8264	15.5813	3.3170	
102		BADUL-6	NUWAR-T1	66	Coyote	34.9	2	8.5642	13.8981	0.1001	19.6607	31.9057	0.4358	
103		BADUL-6	NUWAR-T2	66	Coyote	34.9		8.5642	13.8981	0.1001	19.6607	31.9057	0.4358	
104		NUWAR-T1	NUWAR-6	66	Dummy	0.0	2				0.0000	0.0500	0.0000	
105		NUWAR-T2	NUWAR-6	66	Dummy	0.0					0.0000	0.0500	0.0000	
106		NUWAR-T1	LAX-D1	66	Coyote	37.5	2	9.1973	14.9255	0.1074	21.1141	34.2643	0.4680	
107		NUWAR-T2	LAX-6	66	Coyote	37.5		9.1973	14.9255	0.1074	21.1141	34.2643	0.4680	
108		KOLON-6	PADUK-T1	66	Coyote	28.5	2	6.9937	11.3495	0.0817	16.0553	26.0548	0.3559	
109		KOLON-6	PADUK-T2	66	Coyote	28.5		6.9937	11.3495	0.0817	16.0553	26.0548	0.3559	
110		PADUK-T1	PADUK-6	66	Dummy	0.0	2				0.0000	0.0500	0.0000	
111		PADUK-T2	PADUK-6	66	Dummy	0.0					0.0000	0.0500	0.0000	
112		PADUK-T1	AVISS-T1	66	Coyote	19.1	2	4.6870	7.6061	0.0548	10.7598	17.4613	0.2385	
113		PADUK-T2	AVISS-T2	66	Coyote	19.1		4.6870	7.6061	0.0548	10.7598	17.4613	0.2385	
114		AVISS-T1	AVISS-6	66	Dummy	0.0	2				0.0000	0.0500	0.0000	
115		AVISS-T2	AVISS-6	66	Dummy	0.0					0.0000	0.0500	0.0000	
116		AVISS-T1	LAX-6	66	Coyote	36.2	2	8.8832	14.4158	0.1038	20.3930	33.0942	0.4521	
117		AVISS-T2	LAX-D2	66	Coyote	36.2		8.8832	14.4158	0.1038	20.3930	33.0942	0.4521	

Note Shaded branches; Not in operation

Table A6.1.1 - 5 Data of Existing Transformers as of November 1995

No.	Node (H)igh Voltage	Node (L)ow Voltage	Node (M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	L	M	Rated Capacity (MVA) H	L	M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base		Tap (%, nos)	Highest	Lowest	Nos.	
Existing System as of November 28, 1995																			
1	BIYAG-2	BIYAG-3	BIYAG-1	2	220.0	33.0	132.0	250.0	60.0	250.0	H-M	13.80 (250.0)	5.52	**	M	15.0	-5.0	13	**
											H-L	91.30 (250.0)	36.52	**	L	15.0	-5.0	13	**
											M-L	156.30 (250.0)	62.52	**					
2	KOTUG-2	KOTUG-3	KOTUG-1	2	220.0	33.0	132.0	250.0	60.0	250.0	H-M	14.00 (250.0)	5.60	*	M	15.0	-5.0	13	*
											H-L	91.00 (250.0)	36.40	*	L	15.0	-5.0	13	*
											M-L	156.00 (250.0)	62.40	*					
3	RANTE-2		RANTE-1	1	220.0		132.0	105.0		105.0	H-M	12.50 (105.0)	11.90	*	H	15.0	-15.0	21	*
4	RANTE-1	RANTE-G	RANTE-3	2	138.0	12.5	34.5	34.5	34.5	10.0	H-M	12.50 (10.0)	125.00	*	H	7.5	-5.0	6	*
											H-L	12.50 (34.5)	36.23	*	M	5.0	-5.0	5	*
											M-L	8.40 (10.0)	84.00	*					
5	KOTMA-2	KOTMA-G1	KOTMA-1	1	220.0	13.8	132.0	90.0	90.0	90.0	H-M	13.70 (90.0)	15.22		H	15.0	-15.0	21	
											H-L	16.00 (90.0)	17.78		M	15.0	-15.0	21	
											M-L	10.20 (90.0)	11.33						
6	KOTMA-2	KOTMA-G2		2	220.0	13.8		90.0	90.0		H-L	10.50 (90.0)	11.67		H	15.0	-5.0	9	**
7	BOLAW-1	BOLAW-3		2	132.0	33.0		31.5	31.5		H-L	10.84 (31.5)	34.41	*	H	5.0	-15.0	13	*
8	SAPUG-1P	SAPUG-G1		1	142.0	11.0		50.0	50.0		H-L	17.80 (50.0)	35.60	*	H	10.0	-10.0	17	*
9	SAPUG-1P	SAPUG-G2		1	142.0	11.0		50.0	50.0		H-L	17.80 (50.0)	35.60	*	H	10.0	-10.0	17	*
10	SAPUG-1A	SAPUG-3A		2	132.0	33.0		30.0	30.0		H-L	9.90 (30.0)	33.00	**	H	10.0	-15.0	21	**
11	SAPUG-1B	SAPUG-3B		1	132.0	33.0		30.0	30.0		H-L	9.90 (30.0)	33.00	**	H	10.0	-15.0	21	**
12	PUTTA-1	PUTTA-3		2	132.0	33.0		20.0	20.0		H-L	10.00 (20.0)	50.00		H	5.0	-15.0	17	
13	ANURA-1	ANURA-3		2	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00		H	5.0	-15.0	17	
14	TRINC-1	TRINC-3		2	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00	*	H	5.0	-15.0	17	
15	CHUNN-1	CHUNN-3		2	132.0	33.0		30.0	30.0		H-L	10.00 (30.0)	33.33		H	5.0	-15.0	17	
16	CHUNN-1	CHUNN-3		1	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00		H	5.0	-15.0	17	
17	HABAR-1	HABAR-3		3	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00		H	10.0	-15.0	21	*
18	VALAI-1	VALAI-3		2	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00		H	10.0	-15.0	21	
19	KIRIB-1	KIRIB-3		2	132.0	33.0		31.5	31.5		H-L	10.90 (31.9)	34.17	*	H	5.0	-15.0	17	
20	KURUN-1	KURUN-3		2	132.0	33.0		16.5	16.5		H-L	10.80 (16.5)	65.45	*	H	5.0	-15.0	17	

Notes:

1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.1 - 5 Data of Existing Transformers as of November 1995

No.	Node			No. of	Rated Voltage (kV)			Rated Capacity (MVA)			Impedance Voltage / Unit (%)				Tap (%, nos)				
	(H)igh Voltage	(L)ow Voltage	(M)iddle Voltage	Unit	H	L	M	H	L	M	between	(base MVA)	100 MVA base			Highest	Lowest	Nos.	
21	UKUWE-1	UKUWE-3		2	132.0	33.0		15.0	15.0		H-L	10.05 (15.0)	67.00	*	H	5.0	-15.0	17	*
22	UKUWE-1	UKUWE-G		2	132.0	12.5		27.0	27.0		H-L	12.30 (27.0)	45.56	*	H	7.5	-5.0	6	
23	THULH-1	THULH-3		2	132.0	33.0		31.5	31.5		H-L	10.30 (31.5)	32.70	*	H	10.0	-15.0	16	*
24	KELAN-1	KELAN-3A		1	132.0	33.0		60.0	60.0		H-L	15.00 (60.0)	25.00		H	5.0	-15.0	17	
25	KELAN-1	KELAN-3B		1	132.0	33.0		60.0	60.0		H-L	15.00 (60.0)	25.00		H	10.0	-5.0	17	
26	KELAN-1	KELA-GT1		1	132.0	11.0		28.7	28.7		H-L	11.00 (28.7)	38.33		H	10.0	-5.0	13	
27	KELAN-3A	KELA-GT2		3	33.0	11.0		27.0	27.0		H-L	5.50 (27.0)	20.37		H	10.0	-5.0	7	
28	KELAN-3B	KELA-GT3		2	33.0	11.0		28.7	28.7		H-L	5.50 (27.0)	20.37		H	10.0	-5.0	7	
29	KELAN-1	KELAN-ST		2	132.0	11.0		32.0	32.0		H-L	11.00 (32.0)	34.38		H	5.0	-15.0	13	
30	FORT-1	FORT-11		2	132.0	11.0		30.0	30.0		H-L	11.00 (30.0)	36.67		H	5.0	-15.0	13	*
31	KOLLU-1	KOLLU-11		2	132.0	11.0		30.0	30.0		H-L	11.00 (30.0)	36.67		H	5.0	-15.0	13	*
32	KOLON-1	KOLON-3A		3	132.0	33.0		30.0	30.0		H-L	12.10 (30.0)	40.33		H	5.0	-15.0	17	
33	KOLON-1	KOLON-3	KOLON-6	1	132.0	33.0	66.0	30.0	30.0	30.0	H-M	17.90 (30.0)	59.67	*	M	15.5	-5.5	23	*
											H-L	10.85 (31.5)	34.44	*					
											M-L	6.15 (31.5)	19.52	*					
34	KOLON-6	KOLON-3B		2	66.0	33.0		15.0	15.0		H-L	7.50 (15.0)	50.00		H	5.0	-15.0	17	
35	RATMA-1	RATMA-3A		1	132.0	33.0		30.0	30.0		H-L	10.00 (30.0)	33.33		H	10.0	-15.0	21	
36	RATMA-1	RATMA-3B		2	132.0	33.0		7.5	7.5		H-L	10.00 (7.5)	133.33		H	10.0	-15.0	21	
37	ORUWA-1	ORUWA-3		1	132.0	33.0		6.3	6.3		H-L	10.00 (6.3)	158.73		H	5.0	-15.0	17	
38	PANNI-1	PANNI-3		2	132.0	33.0		30.0	30.0		H-L	9.90 (30.0)	33.00	*	H	10.0	-15.0	21	*
39	PANNI-1	PANNI-3		1	132.0	33.0		31.5	31.5		H-L	9.90 (31.5)	31.43		H	10.0	-15.0	13	
40	MATUG-1	MATUG-3		2	132.0	33.0		31.5	31.5		H-L	9.98 (31.5)	31.68		H	10.0	-15.0	13	*
41	GALLE-1	GALLE-3		2	132.0	33.0		30.0	30.0		H-L	12.10 (30.0)	40.33		H	10.0	-15.0	13	
42	WIMAL-1	WIMAL-G		2	132.0	11.0		32.1	32.1		H-L	12.50 (32.1)	38.94	*	H	10.0	-5.0	13	
43	WIMAL-1	WIMAL-3		2	132.0	33.0		31.5	31.5		H-L	10.30 (31.5)	32.70	*	H	10.0	-15.0	13	
44	BALAN-1	BALAN-3		2	132.0	33.0		10.0	10.0		H-L	11.40 (10.0)	114.00	*	H	10.0	-15.0	21	*
45	DENIY-1	DENIY-3		3	132.0	33.0		10.0	10.0		H-L	10.60 (10.0)	106.00	*	H	10.0	-15.0	21	*
46	EMBIL-1	EMBIL-3		2	132.0	33.0		10.0	10.0		H-L	11.00 (10.0)	110.00	*	H	10.0	-15.0	21	*
47	BADUL-1	BADUL-3A	BADUL-6	2	132.0	33.0	66.0	31.5	31.5	31.5	H-M	17.90 (31.5)	56.83		H	5.0	-15.0	21	*

Notes:

1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value

2) Shaded nodes: Not in operation

Table A6.1.1 - 5 Data of Existing Transformers as of November 1995

No.	Node (H)igh Voltage	(L)ow Voltage	(M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	L	M	Rated Capacity (MVA) H	L	M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base		Tap (%, nos)	Highest	Lowest	Nos.	
											H-L	10.85 (31.5)	34.44						
											M-L	6.15 (31.5)	19.52						
48	BADUL-6	BADUL-3B		4	66.0	33.0		3.0	3.0		H-L	7.50 (3.0)	250.00						
49	INGIN-1	INGIN-3		2	132.0	33.0		15.0	15.0		H-L	11.00 (15.0)	73.33		H	10.0	-15.0	21	
50	INGIN-3	INGIN-G		1	33.0	6.9		10.0	10.0		H-L	5.50 (10.0)	55.00						
51	INGIN-3	INGIN-G		1	33.0	6.9		5.0	5.0		H-L	5.50 (5.0)	110.00						
52	NUWAR-6	NUWAR-3		4	66.0	33.0		3.0	3.0		H-L	9.20 (3.0)	306.67	*					
53	PADUK-6	PADUK-4		4	66.0	33.0		3.0	3.0		H-L	9.20 (3.0)	306.67						
54	VICTO-2	VICTO-G		3	236.0	12.5		96.0	96.0		H-L	15.00 (96.0)	15.63	*	H	10.0	-5.0	7	*
55	PANAD-1	PANAD-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	10.0	-15.0	17	
56	RANDE-2	RANDE-G		2	236.0	12.5		81.0	81.0		H-L	14.50 (81.0)	17.90	*	H	7.5	-5.0	6	*
57	POLPI-1	POLPI-G		2	132.0	12.5		53.7	53.7		H-L	12.10 (53.7)	22.53	*	H	10.0	-5.0	7	
58	SAMAN-1	SAMAN-G		2	138.0	10.5		71.0	71.0		H-L	11.00 (71.0)	15.49	*	H	7.5	-2.5	5	*
59	BOWAT-1	BOWAT-G		1	132.0	12.5		50.0	50.0		H-L	10.00 (50.0)	20.00		H	10.0	-5.0	7	
60	LAX-1	LAX-G		2	132.0	11.0		16.0	16.0		H-L	10.00 (16.0)	62.50	*	H	10.0	-5.0	7	
61	LAX-1	LAX-G		3	132.0	11.0		13.3	13.3		H-L	10.00 (13.3)	75.19		H	10.0	-5.0	7	
62	N-LAX-1	N-LAX-G		2	132.0	12.5		72.0	72.0		H-L	13.50 (72.0)	18.75	*	H	10.0	0.0	5	*
63	CANYO-1	CANYO-G		2	132.0	12.5		38.0	38.0		H-L	10.80 (38.0)	28.42		H	10.0	-5.0	7	
64	AVISS-6	AVISS-3		2	66.0	33.0		6.0	6.0		H-L	7.50 (6.0)	125.00		H	5.0	-15.0	17	

Notes:
1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.1 - 6 Data of Existing Generators as of November 1995

No.	Node	Type	No. of Unit	Rated Voltage (kV)	Rated Capacity (MVA)	Rated Output (MW)	Xd" (%)
Existing System as of November 28, 1995							
1	**Laxapana P/S Total**				**58.80**	**49.99**	
	LAX-G	hydro	3	11.0	9.80	8.33	20.0
	LAX-G	hydro	2	11.0	14.70	12.50	16.0
2	**New Laxapana P/S Total**				**125.00**	**100.00**	
	N-LAX-G	hydro	2	12.5	62.50	50.00	15.0
3	**Wimalasurendra P/S Total**				**62.60**	**50.00**	
	WIMAL-G	hydro	2	11.0	31.30	25.00	14.7
4	**Canyon P/S Total**				**75.00**	**60.00**	
	CANYO-G	hydro	2	12.5	37.50	30.00	18.0
5	**Polpitiya P/S Total**				**93.80**	**75.00**	
	POLPI-G	hydro	2	12.5	46.90	37.50	12.9
6	**Ukuwela P/S Total**				**42.80**	**38.00**	
	UKUWE-G	hydro	2	12.5	21.40	19.00	22.0
7	**Bowatenna P/S Total**				**47.00**	**40.00**	
	BOWAT-G	hydro	1	12.5	47.00	40.00	13.0
8	**Victoria P/S Total**				**247.50**	**210.00**	
	VICTO-G	hydro	3	12.5	82.50	70.00	16.5
9	**Randenigala P/S Total**				**162.00**	**122.00**	
	RANDE-G	hydro	2	12.5	81.00	61.00	18.5
10	**Kotmale P/S Total**				**270.00**	**201.00**	
	KOTMA-G1	hydro	2	13.8	90.00	67.00	17.0
	KOTMA-G2	hydro	1	13.8	90.00	67.00	17.0
11	**Rantembe P/S Total**				**64.00**	**49.00**	
	RANTE-G	hydro	2	12.5	32.00	24.50	18.5
12	**Samanalawewa P/S Total**				**141.20**	**120.00**	
	SAMAN-G	hydro	2	10.5	70.60	60.00	12.0
13	**Inginiyagara P/S Total**				**12.50**	**11.25**	
	INGIN-G	hydro	2	6.9	2.75	2.48	22.0
	INGIN-G	hydro	2	6.9	3.50	3.15	22.0
14	**Kelanitissa P/S Total**				**229.70**	**170.00**	
	KELAN-ST	steam	2	11.0	31.30	25.00	12.0
	KELA-GT1	gas	1	11.0	28.70	20.00	12.0
	KELA-GT2	gas	3	11.0	27.00	20.00	15.0
	KELA-GT3	gas	2	11.0	28.70	20.00	14.7
15	**Sapugaskanda P/S Total**				**102.40**	**72.00**	
	SAPUG-G1	diesel	2	11.0	25.60	18.00	21.0
	SAPUG-G2	diesel	2	11.0	25.60	18.00	21.0
16	**Chunnakam P/S Total**				**18.20**	**14.00**	
	CHUNN-G	diesel	5	11.0	2.60	2.00	22.0
	CHUNN-G	diesel	4	11.0	1.30	1.00	22.0

Table A6.1.1 - 7

Data of Existing Reactive Power Sources as of November 1995

No.	Node	Rated Voltage (kV)	Rated Capacity (MVA)	Remarks
1	ANURA-3	33	20.00	SC
2	KOTUG-3	33	20.00	SC
3	GALLE-3	33	20.00	SC
Total			60.00	

SC: Static Capacitor

Table A6.1.2-1 Data of Planned Transmission Lines by the End of 2000

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
Data modification for the system in 2000 year														
Delete														
1	All 66kV branches													
2	IL30	POLPI-1	KOTMA-1	132	Lynx	29.5	1							
3	IL33	POLPI-1	UKUWE-1	132	Lynx	59.3	1							
4	IL31	KOTMA-1	KIRIB-1	132	Lynx	22.5	1							
5	IL32	KIRIB-1	ANURA-1	132	Lynx	143.9	1							
6	IL9	KOTUG-1	BOLAW-T1	132	Coyote	21.0	2							
7		KOTUG-1	BOLAW-T2	132	Coyote	21.0								
8		BOLAW-T1	BOLAW-1	132	Dummy	0.0	2							
9		BOLAW-T2	BOLAW-1	132	Dummy	0.0								
10	IL10	BOLAW-T1	CHILL-T1	132	Lynx	22.6	2							
11		BOLAW-T2	CHILL-T2	132	Lynx	22.6								
12	IL1	BIYAG-1	PANNI-1	132	Zebra	15.5	2							
13		BIYAG-1	PANNI-1	132	Zebra	15.5								
14	IL2	BIYAG-1	KELAN-1	132	2 x Goat	12.5	2							
15		BIYAG-1	KELAN-1	132	2 x Goat	12.5								
16	IL6	KOLON-1	SAPUG-T1	132	Coyote	6.6	2							
17		KOLON-1	SAPUG-T2	132	Coyote	6.6								
18	IL7	SAPUG-T1	KOTUG-1	132	Coyote	16.7	2							
19		SAPUG-T2	KOTUG-1	132	Coyote	16.7								
20	IL8	SAPUG-T1	SAPUG-1A	132	Lynx	4.6	2							
21		SAPUG-T2	SAPUG-1B	132	Lynx	4.6								
22	IL20	AVIS-1T1	POLPI-1	132	Lynx	34.4	2							
23		AVIS-1T2	POLPI-1	132	Lynx	34.4								
24	IL14	ORUWA-T1	ORUWA-1	132	Lynx	3.4	2							
25		ORUWA-T2	ORUWA-1	132	Lynx	3.4								
26	IL43	BALAN-1	DENIY-T1	132	Tiger	44.2	2							
27		BALAN-1	DENIY-T2	132	Tiger	44.2								
28		DENIY-T1	DENIY-1	132	Dummy	0.0	2							
29		DENIY-T2	DENIY-1	132	Dummy	0.0								
30	IL44	DENIY-T1	GALLE-1	132	Tiger	57.3	2							
31		DENIY-T2	GALLE-1	132	Tiger	57.3								
32	IL5	KOLON-1	PANNI-1	132	Lynx	12.9	2							
33		KOLON-1	PANNI-1	132	Lynx	12.9								
34		BIYAG-1	SAPUG-1P	132	Lynx	2.1	2							
35		BIYAG-1	SAPUG-1P	132	Lynx	2.1								
36		KOLON-1	ORUWA-T1	132	Lynx	14.0	2							
37		KOLON-1	ORUWA-T2	132	Lynx	14.0								
38		ORUWA-T1	THULH-T1	132	Lynx	36.0	2							
39		ORUWA-T2	THULH-T2	132	Lynx	36.0								
Newly Add														
40	IL49	LAX-1	NUWAR-T1	132	Lynx	38.8	2	6.8676	15.9080	0.1084	3.9415	9.1299	1.8884	
41		LAX-1	NUWAR-T2	132	Lynx	38.8		6.8676	15.9080	0.1084	3.9415	9.1299	1.8884	
42	IL50	NUWAR-T1	BADUL-1	132	Lynx	35.4	2	6.2658	14.5140	0.0989	3.5961	8.3299	1.7229	
43		NUWAR-T2	BADUL-1	132	Lynx	35.4		6.2658	14.5140	0.0989	3.5961	8.3299	1.7229	
44		NUWAR-T1	NUWAR-1	132	Lynx	0.0	2					0.0100		Dummy branch

Table A6.1.2-1 Data of Planned Transmission Lines by the End of 2000

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
45		NUWAR-T2	NUWAR-1	132	Lynx	0.0						0.0100		Dummy branch
46	1L51	PUTTA-1	ANURA-1	132	Lynx	75.0	2	13.2750	31.1250	0.2072	7.6188	17.8633	3.6099	
47		PUTTA-1	ANURA-1	132	Lynx	75.0		13.2750	31.1250	0.2072	7.6188	17.8633	3.6099	
48	1L52	EMBIL-1	MATAR-1	132	Lynx	52.0	2	9.2040	21.5800	0.1436	5.2824	12.3852	2.5029	
49		EMBIL-1	MATAR-1	132	Lynx	52.0		9.2040	21.5800	0.1436	5.2824	12.3852	2.5029	
50	1L30	POLPI-1	KOTMA-1	132	Lynx	29.5	2	5.2215	11.9180	0.0836	2.9967	6.8400	1.4561	
51		POLPI-1	KOTMA-1	132	Lynx	29.5		5.2215	11.9180	0.0836	2.9967	6.8400	1.4561	
52	1L31	KOTMA-1	KIRIB-1	132	Lynx	22.5	2	3.9825	9.0900	0.0637	2.2856	5.2169	1.1106	
53		KOTMA-1	KIRIB-1	132	Lynx	22.5		3.9825	9.0900	0.0637	2.2856	5.2169	1.1106	
54	1L32	KIRIB-1	UKUWE-1	132	Lynx	29.9	2	5.2923	12.0796	0.0847	3.0374	6.9327	1.4759	
55		KIRIB-1	UKUWE-1	132	Lynx	29.9		5.2923	12.0796	0.0847	3.0374	6.9327	1.4759	
56	1L33	UKUWE-1	ANURA-1	132	Lynx	131.2	1	23.2224	53.0048	0.3717	13.3278	30.4206	6.4760	
57	1L54	KOTUG-1	BOLAW-1	132	Zebra	22.0	2	1.6607	8.4407	0.0656	0.9531	4.8443	1.1424	
58		KOTUG-1	BOLAW-2	132	Zebra	22.0		1.6607	8.4407	0.0656	0.9531	4.8443	1.1424	
59	1L10	BOLAW-1	CHILL-T1	132	Lynx	22.6	2	4.0002	9.2434	0.0633	2.2958	5.3050	1.1030	
60		BOLAW-1	CHILL-T2	132	Lynx	22.6		4.0002	9.2434	0.0633	2.2958	5.3050	1.1030	
61	1L57	RANTE-1	BADUL-1	132	Lynx	33.0	1	5.8249	13.4533	0.0923	3.3430	7.7212	1.6087	
62	2L6	KOTMA-2	N-ANUR-2	220	Zebra	163.0	2	12.3045	67.3511	0.4497	2.5423	13.9155	21.7653	
63		KOTMA-2	N-ANUR-2	220	Zebra	163.0		12.3045	67.3511	0.4497	2.5423	13.9155	21.7653	
64	1L68	N-ANUR-1	ANURA-1	132	Zebra	1.5	2	0.1132	0.5755	0.0045	0.0650	0.3303	0.0779	
65		N-ANUR-1	ANURA-1	132	Zebra	1.5		0.1132	0.5755	0.0045	0.0650	0.3303	0.0779	
66	2L7	BIYAG-2	KELAN-2	220	2 x Goat	12.5	2	0.6238	3.7971	0.0463	0.1289	0.7845	2.2421	
67		BIYAG-2	KELAN-2	220	2 x Goat	12.5		0.6238	3.7971	0.0463	0.1289	0.7845	2.2421	
68	2L8	BIYAG-2	PANNI-2	220	Zebra	15.5	2	1.1701	6.4046	0.0428	0.2417	1.3233	2.0697	
69		BIYAG-2	PANNI-2	220	Zebra	15.5		1.1701	6.4046	0.0428	0.2417	1.3233	2.0697	
70	1L58	KOTUG-1	VEYAN-1	132	2 x Zebra	20.0	2	0.7549	6.0142	0.0749	0.4332	3.4517	1.3049	220 kV design
71		KOTUG-1	VEYAN-1	132	2 x Zebra	20.0		0.7549	6.0142	0.0749	0.4332	3.4517	1.3049	
72	1L59	KOLON-1	K-NIYA-1	132	Zebra	6.6	2	0.4982	2.5322	0.0197	0.2859	1.4533	0.3427	
73		KOLON-1	K-NIYA-1	132	Zebra	6.6		0.4982	2.5322	0.0197	0.2859	1.4533	0.3427	
74	1L60	ANIYA-1	KOTUG-1	132	Zebra	13.3	2	1.0040	5.1028	0.0396	0.5762	2.9286	0.6907	
75		ANIYA-1	KOTUG-1	132	Zebra	13.3		1.0040	5.1028	0.0396	0.5762	2.9286	0.6907	
76	1L61	KHD-1	SAPUG-1	132	Lynx	1.0	2	0.1765	0.4077	0.0028	0.1013	0.2340	0.0487	
77		KHD-1	SAPUG-1	132	Lynx	1.0		0.1765	0.4077	0.0028	0.1013	0.2340	0.0487	
78		AVIS-1T2	SITHA-1	132	Lynx	10.0	1	1.7651	4.0768	0.0280	1.0130	2.3397	0.4875	
79		AVIS-1T1	AVISS-1	132	Lynx	0.5	2	0.0883	0.2038	0.0014	0.0507	0.1170	0.0244	
80		AVIS-1T2	AVISS-1	132	Lynx	0.5		0.0883	0.2038	0.0014	0.0507	0.1170	0.0244	
81	1L64	SITHA-1	POLPI-1	132	Lynx	24.0	1	4.2363	9.7842	0.0671	2.4313	5.6154	1.1699	
82		AVIS-1T1	POLPI-1	132	Lynx	34.0	1	6.0014	13.8610	0.0951	3.4443	7.9551	1.6574	
83	1L65	INGIN-1	AMPA-1	132	Lynx	25.0	1	4.4128	10.1919	0.0699	2.5326	5.8494	1.2187	
84	1L66	AMPA-1	VALAI-1	132	Lynx	75.0	1	13.2384	30.5758	0.2098	7.5978	17.5481	3.6561	
85	1L43	BALAN-1	DENIY-1	132	Tiger	44.2	1	10.9174	18.5198	0.1204	6.2657	10.6289	2.0985	
86		BIYAG-1	SAPUG-1P	132	Zebra	2.1	2	0.1585	0.8057	0.0063	0.0910	0.4624	0.1091	
87		BIYAG-1	SAPUG-1P	132	Zebra	2.1		0.1585	0.8057	0.0063	0.0910	0.4624	0.1091	
88	1L70	MATUG-1	N-GALL-1	132	Zebra	64.0	2	4.8312	24.5546	0.1907	2.7727	14.0924	3.3234	
89		MATUG-1	N-GALL-1	132	Zebra	64.0		4.8312	24.5546	0.1907	2.7727	14.0924	3.3234	
90	1L43	DENIY-1	N-GALL-1	132	Tiger	47.3	1	11.6831	19.8187	0.1289	6.7052	11.3744	2.2457	
91	1L43	BALAN-1	N-GALL-1	132	Tiger	91.5	1	22.6005	38.3385	0.2493	12.9709	22.0033	4.3441	
92		RATNA-1	BALAN-1	132	Zebra	40.0	2	3.0195	15.3466	0.1192	1.7330	8.8078	2.0771	
93		RATNA-1	BALAN-1	132	Zebra	40.0		3.0195	15.3466	0.1192	1.7330	8.8078	2.0771	

Table A6.1.2-1 Data of Planned Transmission Lines by the End of 2000

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
94	IL43	N-GALL-1	GALLE-1	132	Tiger	10.0	2	2.4700	4.1900	0.0272	1.4176	2.4047	0.4748	
95		N-GALL-1	GALLE-1	132	Tiger	10.0		2.4700	4.1900	0.0272	1.4176	2.4047	0.4748	
96		KOLON-1	ATHUR-1	132	Lynx	14.0	2	2.4712	5.7075	0.0392	1.4183	3.2756	0.6825	
97		KOLON-1	ATHUR-1	132	Lynx	14.0		2.4712	5.7075	0.0392	1.4183	3.2756	0.6825	
98		ATHUR-1	THULH-T1	132	Lynx	28.0	2	4.9423	11.4150	0.0783	2.8365	6.5513	1.3649	
99		ATHUR-1	THULH-T2	132	Lynx	28.0		4.9423	11.4150	0.0783	2.8365	6.5513	1.3649	
100		ATHUR-1	ORUWA-1	132	Lynx	3.4	2	0.6001	1.3861	0.0095	0.3444	0.7955	0.1657	
101		ATHUR-1	ORUWA-1	132	Lynx	3.4		0.6001	1.3861	0.0095	0.3444	0.7955	0.1657	
102		KOTUG-2	MUTHR-2	220	2 x Zebra	18.0	2	0.6794	5.4128	0.0674	0.1404	1.1184	3.2623	
103		KOTUG-2	MUTHR-2	220	2 x Zebra	18.0		0.6794	5.4128	0.0674	0.1404	1.1184	3.2623	
104		ANIYA-1	K-NIYA-1	132	Zebra	10.8	2	0.8153	4.1436	0.0322	0.4679	2.3781	0.5608	
105		ANIYA-1	K-NIYA-1	132	Zebra	10.8		0.8153	4.1436	0.0322	0.4679	2.3781	0.5608	
106		K-NIYA-1	SAPUG-1	132	Zebra	4.6	2	0.3472	1.7649	0.0137	0.1993	1.0129	0.2389	
107		K-NIYA-1	SAPUG-1	132	Zebra	4.6		0.3472	1.7649	0.0137	0.1993	1.0129	0.2389	
108		SAPUG-1	SAPUG-1P	132	Zebra	1.5	2	0.1132	0.5755	0.0045	0.0650	0.3303	0.0779	
109		SAPUG-1	SAPUG-1P	132	Zebra	1.5		0.1132	0.5755	0.0045	0.0650	0.3303	0.0779	
110		KOLON-1	SRIJA-1	132	Zebra	6.0	2	0.4529	2.3020	0.0179	0.2599	1.3212	0.3116	
111		KOLON-1	SRIJA-1	132	Zebra	6.0		0.4529	2.3020	0.0179	0.2599	1.3212	0.3116	
112		SRIJA-1	PANNI-1	132	Zebra	7.0	2	0.5284	2.6857	0.0209	0.3033	1.5414	0.3635	
113		SRIJA-1	PANNI-1	132	Zebra	7.0		0.5284	2.6857	0.0209	0.3033	1.5414	0.3635	
114		PANNI-1	DEHIWA-1	132	2 x Zebra	7.5	2	0.2831	2.2553	0.0281	0.1625	1.2944	0.4893	220kV design
115		PANNI-1	DEHIWA-1	132	2 x Zebra	7.5		0.2831	2.2553	0.0281	0.1625	1.2944	0.4893	220kV design

Table A6.1.2 - 2 Data of Planned Transformers by the End of 2000

No.	Node (H)igh Voltage	(L)ow Voltage	(M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	L	M	Rated Capacity (MVA) H	L	M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base	Tap (%, nos)	Highest	Lowest	Nos.	
Data modification for the system in 2000 year																		
Delete																		
1	All 66kV Transformers																	
Newly Add (new construction)																		
1	AMPA-1	AMPA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
2	NUWAR-1	NUWAR-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
3	MATAR-1	MATAR-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
4	SITHA-1	SITHA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
5	AVISS-1	AVISS-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
6	ATHUR-1	ATHUR-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
7	SRIJA-1	SRIJA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
8	ANIYA-1	ANIYA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
9	VEYAN-1	VEYAN-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
10	CHILL-1	CHILL-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	10.5	-15.0	18	*
11	RATNA-1	RATNA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17	
12	N-ANUR-2		N-ANUR-1	2	220.0		132.0	150.0		150.0	H-M	12.00	(150.0)	8.00	H	15.0	-15.0	21	
13	PANNI-2	PANNI-SC	PANNI-1	2	220.0	33.0	132.0	250.0	80.0	250.0	H-M	6.00	(250.0)	2.40	H	15.0	-15.0	21	
											H-L	6.00	(80.0)	7.50					
											M-L	4.00	(80.0)	5.00					
14	KELAN-2	KELAN-TT	KELAN-1	2	220.0	33.0	132.0	150.0	60.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21	
											H-L	6.00	(60.0)	10.00					
											M-L	4.00	(60.0)	6.67					
15	KHD-1	KHD-G		2	132.0	11.0		36.0	36.0		H-M	10.00	(36.0)	27.78	H	10.0	-5.0	13	
16	SAPUG-1P	SAPU-GN1		1	142.0	11.0		50.0	50.0		H-L	17.80	(50.0)	35.60	H	10.0	-10.0	17	

Notes:
1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.2 - 2 Data of Planned Transformers by the End of 2000

No.	Node (H)igh Voltage	Node (L)ow Voltage	Node (M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	Rated Voltage (kV) L	Rated Voltage (kV) M	Rated Capacity (MVA) H	Rated Capacity (MVA) L	Rated Capacity (MVA) M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base		Tap (%, nos)	Highest	Lowest	Nos.	
17	SAPUG-1P	SAPU-GN2		1	142.0	11.0		50.0	50.0		H-L	17.80 (50.0)	35.60		H	10.0	-10.0	17	
18	MUTHR-2	MUTHR-G		1	220.0	11.0		175.0	175.0		H-L	13.00 (175.0)	7.43		H	10.0	-5.0	13	
19	KELAN-2	KELA-CC2		1	220.0	11.0		175.0	175.0		H-L	13.00 (175.0)	7.43		H	10.0	-5.0	13	
20	KELAN-1	KELA-GT3		1	132.0	15.0		140.0	140.0		H-L	10.00 (140.0)	7.14		H	10.0	-5.0	13	
21	KELAN-1	KELA-GT4		1	132.0	11.0		30.0	30.0		H-L	10.00 (30.0)	33.33		H	10.0	-5.0	13	
22	BADUL-1	BADUL-3		3	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
23	VALAI-1	VALAI-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
24	THULH-1	THULH-3		3	132.0	33.0		31.5	31.5		H-L	10.30 (31.5)	32.70		H	10.0	-15.0	16	
25	N-GALL-1	N-GALL-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
26	GALLE-1	GALLE-SV		1	132.0	5.9		20.0	20.0		H-L	10.00 (20.0)	50.00						
27	DEHIWA-2	DEHIWA-3		2	220.0	33.0		63.0	63.0		H-L	13.00 (63.0)	20.63		H	5.0	-15.0	17	
28	K-NIYA-1	K-NIYA-3		2	132.0	11.0		63.0	63.0		H-L	10.00 (63.0)	15.87		H	5.0	-15.0	17	
Replacement or Augmentation																			
29	EMBIL-1	EMBIL-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
30	BALAN-1	BALAN-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
31	UKUWE-1	UKUWE-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
32	HABAR-1	HABAR-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
33	TRINC-1	TRINC-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
34	ANURA-1	ANURA-3		2	132.0	33.0		31.5	31.5		H-L	10.60 (31.5)	33.65	*	H	5.0	-15.0	17	
35	KURUN-1	KURUN-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	17	
36	PUTTA-1	PUTTA-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	*	H	5.0	-15.0	17	*
37	KIRIB-1	KIRIB-3		3	132.0	33.0		31.5	31.5		H-L	10.90 (31.9)	34.17	*	H	5.0	-15.0	17	
38	BOLAW-1	BOLAW-3		3	132.0	33.0		31.5	31.5		H-L	10.84 (31.5)	34.41	*	H	5.0	-15.0	13	*
39	KOLON-1	KOLON-3		3	132.0	33.0		30.0	30.0		H-L	12.10 (30.0)	40.33	*	H	5.0	-15.0	17	

Notes:
1) Sources: * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes: Not in operation

Table A6.1.2 - 2 Data of Planned Transformers by the End of 2000

No.	Node (H)igh Voltage	(L)ow Voltage	(M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	L	M	Rated Capacity (MVA) H	L	M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base		Tap (%, nos)	Highest	Lowest	Nos.	
40	KOLON-1	KOLON-3		2	132.0	33.0		31.5	31.5		H-L	12.10 (30.0)	40.33		H	5.0	-15.0	17	
41	MATUG-1	MATUG-3		3	132.0	33.0		31.5	31.5		H-L	9.98 (31.5)	31.68		H	10.0	-15.0	13	*
42	RATMA-1	RATMA-3		2	132.0	33.0		30.0	30.0		H-L	10.00 (30.0)	33.33		H	5.0	-15.0	13	
43	RATMA-1	RATMA-3		1	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	5.0	-15.0	13	
44	SAPUG-1	SAPUG-3		3	132.0	33.0		30.0	30.0		H-L	9.90 (30.0)	33.00	**	H	10.0	-15.0	21	**
45	SAPUG-1	SAPUG-3		1	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75		H	10.0	-15.0	21	
46	FORT-1	FORT-11		3	132.0	11.0		30.0	30.0		H-L	11.00 (30.0)	36.67		H	5.0	-15.0	13	*
47	KOLLU-1	KOLLU-11		3	132.0	11.0		30.0	30.0		H-L	11.00 (30.0)	36.67		H	5.0	-15.0	13	*
48	CHUNN-3	CHUNN-G		3	33.0	11.0		12.5	12.5		H-L	5.50 (12.5)	44.00		H	10.0	-5.0	7	
Changing node name only																			
from	SAPUG-1P	SAPUG-G1		1	142.0	11.0		50.0	50.0										
	SAPUG-1P	SAPUG-G2		1	142.0	11.0		50.0	50.0										
to	SAPUG-1P	SAPUG-G		2	142.0	11.0		50.0	50.0										
form	KELAN-1	KELAN-3A		1	132.0	33.0		60.0	60.0										
	KELAN-1	KELAN-3B		1	132.0	33.0		60.0	60.0										
to	KELAN-1	KELAN-3		2	132.0	33.0		60.0	60.0										
from	KELAN-3A	KELA-GT2		3	33.0	11.0		27.0	27.0										
	KELAN-3B	KELA-GT3		2	33.0	11.0		28.7	28.7										
to	KELAN-3	KELA-GT2		3	33.0	11.0		27.0	27.0										
	KELAN-3	KELA-GT2		2	33.0	11.0		28.7	28.7										

Notes:
1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.2 - 3 Data of Planned Generators by the End of 2000

No.	Node	Type	No. of Unit	Rated Voltage (kV)	Rated Capacity (MVA)	Rated Output (MW)	Xd" (%)
Data modification for the system in 2000 year							
Delete							
	Inginiyagara P/S						
Newly Add (new construction) and replacement							
1	**Kelanitissa P/S Total**				**342.00**	**290.00**	
	KELA-CC1	gas	1	11.0	118.00	100.00	16.0
	KELA-CC1	steam	1	11.0	59.00	50.00	16.0
	KELA-GT3	gas	1	15.0	135.00	115.00	16.0
	KELA-GT4	gas	1	11.0	30.00	25.00	16.0
2	**Muthragawella P/S Total**				**177.00**	**150.00**	
	MUTHR-G	gas	1	11.0	118.00	100.00	16.0
	MUTHR-G	steam	1	11.0	59.00	50.00	16.0
3	**Sapugaskanda P/S Total**				**157.20**	**131.04**	
	SAPU-GN1	diesel	1	11.0	47.00	40.00	16.0
	SAPU-GN2	diesel	1	11.0	47.00	40.00	16.0
	KHD-G	diesel	8		7.90	6.38	16.0
4	**Chunnakam P/S Total**				**37.50**	**30.00**	
	CHUNN-G	diesel	3	11.0	12.50	10.00	16.0
	(replacement)						

Table A6.1.2-4

Data of Planned Reactive Power Sources by the End of 2000

No.	Node	Rated Voltage (kV)	Rated Capacity (MVA)	Remarks
Data modification for the system in 2000 year				
Newly Add				
1	KIRIB-3	33	10.00	
2	KURUN-3	33	10.00	
3	HABAR-3	33	10.00	
4	KELAN-TT	33	60.00	
5	GALLE-SV	5.9	20.00	SVC; -20 to +20 MVA
6	PANNI-SC	33	100.00	
Total			210.00	

SVC : Static Var Compensator

Table A6.1.2-5 Generator Output Schedule for 2000 System

No.	Node	Type	Scheduled Output (MW)		Max Output *4) (MW)
			Rainy Season *2)	Dry Season *3)	
1	LAX-G	hydro	50.00	33.00	50.00
2	N-LAX-G	hydro	100.00	65.00	100.00
3	WIMAL-G	hydro	50.00	33.00	50.00
4	CANYO-G	hydro	60.00	30.00	60.00
5	POLPI-G	hydro	75.00	49.00	75.00
6	UKUWE-G	hydro	38.00	25.00	38.00
7	BOWAT-G	hydro	40.00	26.00	40.00
8	VICTO-G *1)	hydro	210.00	120.00	210.00
9	RANDE-G	hydro	122.00	79.00	122.00
10	KOTMA-G1	hydro	134.00	131.00	134.00
11	KOTMA-G2	hydro	67.00	0.00	67.00
12	RANTE-G	hydro	49.00	32.00	49.00
13	SAMAN-G	hydro	120.00	78.00	120.00
14	KELAN-ST	steam	0.00	45.00	45.00
15	KELA-GT1	gas	0.00	18.00	18.00
16	KELA-GT2	gas	0.00	90.00	90.00
17	KELA-GT3	gas	97.00	102.60	102.60
18	KELA-GT4	gas	0.00	23.40	23.40
19	KELA-CC1 *1)	c.c.	128.00	135.00	135.00
20	MUTHR-G	c.c.	0.00	135.00	135.00
21	SAPUG-G	diesel	0.00	64.80	64.80
22	SAPU-GN1	diesel	34.00	36.00	36.00
23	SAPU-GN2	diesel	34.00	36.00	36.00
24	KHD-G	diesel	34.00	46.00	46.00
25	CHUNN-G	diesel	18.00	27.00	27.00
Hydro total			1115.00	701.00	1115.00
Thermal total			345.00	758.80	758.80
Total of system			**1460.00**	**1459.80**	**1873.80**

Notes :

*1) Slack node: VICTO-G for rainy season, KELA-CC1 for dry season

*2) Scheduled output = Maximum output, for hydro stations

*3) Scheduled output = Maximum output, for thermal stations

*4) Maximum output = Rated output, for hydro stations
Maximum output = Rated output x 0.9, for thermal stations

Table A6.1.2-6 Dynamic Stability Data for 2000 System Oct. 3, 1996

Condition of Dynamic Stability Analysis

for the CASE 2000, Rainy Season

1. Fault and Fault Location

Three phase fault on the Kotamale - Biyagama 220 kV ... ıale side.

2. Reclosing

Three phase reclosing of single ... .0 kV line.

Reclosing sequence

Fault -------- trip signal to C ... ıme) -- CB reclose
80 ms ... s

1) Successful Reclosing
Fault --- (160 ms) --- CBs trip ... ıng fault and CBs Close

2) Unsuccessful Reclosing
Fault -- (160 ms) -- CBs trip -- ... s Close -- (160 ms) -- CBs trip

3. Generators to be Observed

1) Kotmale (KOTMA-G1)
2) Victoria (VICTO-G)
3) Kelanitissa (KELA-CC1)
4) New Laxapana (N-LAX-G)

4. Factors to be Observed

1) Phase Angle (reference generator : Chunnakam)
2) Terminal Voltage
3) Output Power

5. Integration Time Step

0.001 sec

6. Duration of the Calculation

3.0 sec

① ω < MUA < 50

(200

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

FII POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (ZBUS,IH,KOURT,J,K)

LAX-1

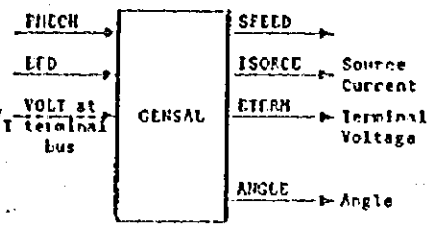
This model is located at system bus # 1100 IBUS,

machine # 1 IH.

This model uses counter # KOURT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 59 for each of

1 units = 59 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.

CONs	#	Value	Description
J	X	5.2	T'_{do} (>0) (sec)
J+1	✓	0.068	T''_{do} (>0) (sec)
J+2	✓	0.12	T''_{qo} (>0) (sec)
J+3	✓	3.0	Inertia H
J+4	✓	0.5	Speed Damping D
J+5	✓	1.1	X_d
J+6	✓	0.66	X_q
J+7	✓	0.32	X'_d
J+8	✓	0.16	$X''_d = X''_q$
J+9	0.10	~~0.17~~	X_L
J+10	✓	0.03	S(1.0)
J+11	✓	0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ϕ_{kd}
K+2		ϕ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.034$

$x'_d = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_L, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

$T_g'' = T_d''$ (突極機 凸極是線角)

$T_{do}'' = \frac{x'_d}{x_d''} T_d''$

$T_{go}'' = \frac{x'_q}{x_q''} T_g''$

Source : 電気学会技術報告
(Ⅱ) 193号
3.1 表 (H)

for "H"
Same as Left
図 3.9
(同期機+(水車)

(2) 50 ≤ MVA < 100 (2000)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IH,KOUNT,J,K)

N-LAX-1

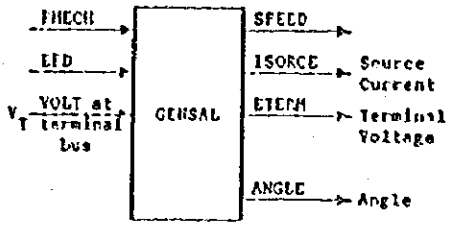
This model is located at system bus # 1110 IBUS,

machine # 1 IH.

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 125 for each of

1 units = 125 MBASE.

ZSORCE for this machine is 0 + j 0.15 on

the above MBASE.

CONs	#	Value	Description
J	✓	6.7	T'_{do} (>0) (sec)
J+1	✓	0.056	T''_{do} (>0) (sec)
J+2	✓	0.12	T''_{qo} (>0) (sec)
J+3	✓	4.3	Inertia H
J+4	✓	0.5	Speed Damping D
J+5	✓	1.03	X_d
J+6	✓	0.63	X_q
J+7	✓	0.29	X'_d
J+8	✓	0.25	$X''_d = X''_q$
J+9	0.10	0.15	X_ℓ
J+10	✓	0.03	S(1.0)
J+11	✓	0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_{d}'' = 0.029$

$X'_{\ell} = 0.64$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2000

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IH,XOUNIT,J,K)

WIMAL-1

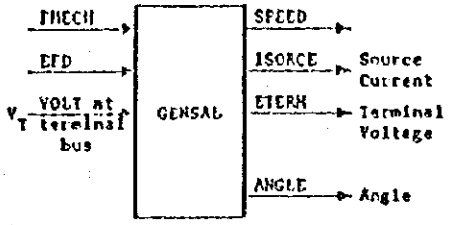
This model is located at system bus #11120 IBUS,

machine #1 IH.

This model uses counter #_____ XOUNIT,

and CONs starting with #_____ J,

and STATEs starting with #_____ K.



The machine MVA base is 63 for each of

1 units = 63 MBASE.

ZSORCE for this machine is 0 + j0.147 on the above MBASE.

CONs	#	Value	Description
J		5.2	T'_{do} (>0) (sec)
J+1		0.074	T''_{do} (>0) (sec)
J+2		0.13	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.147	$X''_d = X''_q$
J+9	0.10	~~0.14~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T''_d = 0.034$

$X'_d = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2000)

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,II,KOUNT,J,K)

POLPZ - 1

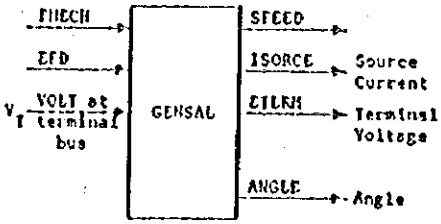
This model is located at system bus I 1130 IBUS,

machine I 1 II,

This model uses counter I KOUNT,

and CONs starting with I J,

and STATEs starting with I K.



The machine MVA base is 94 for each of

1 units = 94 MBASE.

ZSORCE for this machine is 0 + j0.129 on the above MBASE.

CONs	#	Value	Description
J		5.2	T'_{do} (>0) (sec)
J+1		0.084	T''_{do} (>0) (sec)
J+2		0.15	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.129	$X'_d = X''_q$
J+9	0.10	0.14	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.034$

$X'_\ell = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_J.

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,ID,KOUNT,J,K)

CANYO - 1

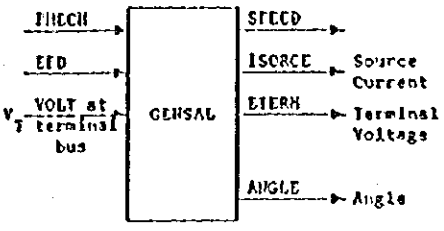
This model is located at system bus # 1140 IBUS,

machine # 1 ID,

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

and STATEs starting with # _____ K.



The machine MVA base is 75 for each of

1 units = 75 MBASE,

ZSORCE for this machine is 0 + j 0.18 on

the above MBASE.

CONs	#	Value	Description
J		5.2	T'_{do} (>0) (sec)
J+1	✓	0.060	T''_{do} (>0) (sec)
J+2	✓	0.11	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.18	$X''_d = X''_q$
J+9	0.10	~~0.14~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_{d0}'' = 0.034$

$x_d' = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2000)

(2)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IM,KOUNT,J,K)

SAMAN-1

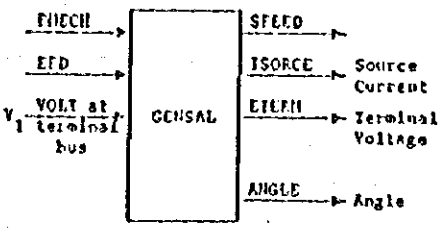
This model is located at system bus #1170 IBUS,

machine #1 IM.

This model uses counter #_____ KOUNT,

and CONs starting with #_____ J,

and STATEs starting with #_____ K.



The machine MVA base is 141 for each of

1 units = 141 MBASE.

ZSORCE for this machine is 0 + j 0.12 on

the above MBASE.

CONs	#	Value	Description
J	✓	6.7	T'_{do} (>0) (sec)
J+1	✓	0.070	T''_{do} (>0) (sec)
J+2	✓	0.15	T''_{qo} (>0) (sec)
J+3		4.3	Inertia H
J+4		0.5	Speed Damping D
J+5		1.03	X_d
J+6		0.63	X_q
J+7		0.29	X'_d
J+8		0.12	$X''_d = X''_q$
J+9	0.10	~~0.13~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.029$

$X_\ell' = 0.64$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IH,KOUNT,J,K)

UKUWE-1

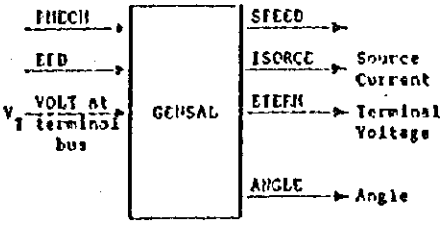
This model is located at system bus # 1200 IBUS,

machine # 1 IH,

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 43 for each of

1 units = 43 MBASE,

ZSORCE for this machine is 0 + j0.177 on

the above MBASE.

CONs	#	Value	Description
J		5.2	T'_{do} (>0) (sec)
J+1	✓	0.061	T''_{do} (>0) (sec)
J+2	✓	0.11	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.177	$X''_d = X''_q$
J+9	0.10	~~0.14~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.034$

$x_d' = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2000)

(17)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

ETC POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,1H,KOUNT,J,K)

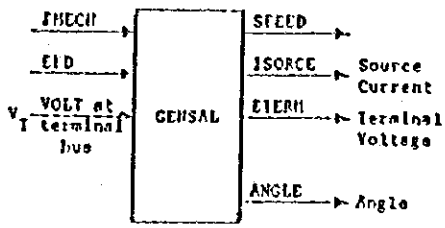
This model is located at system bus # 1260 IBUS, BOWAT - 1

machine # 1 1H,

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 47 for each of

1 units = 47 MBASE.

ZSORCE for this machine is 0 + j0.149 on the above MBASE.

CONs	#	Value	Description
J		5.2	T'_{do} (>0) (sec)
J+1		0.073	T''_{do} (>0) (sec)
J+2		0.13	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.149	$X''_d = X''_q$
J+9	0.10	~~0.134~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		E''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T_d' = 0.034$

$x_\ell' = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

Table A6.1.2-6 Dynamic Stability Data for 2000 System

(2)

(200

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,ID,KOUNT,J,K)

KITMA - 2

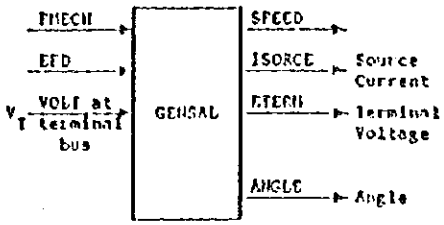
This model is located at system bus # 2220 IBUS,

machine # 1 ID.

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 180 for each of

1 units = 180 MBASE.

ZSORCE for this machine is 0 + j 0.17 on

the above MBASE.

CONs	#	Value	Description
J	1	6.7	T'_{do} (>0) (sec)
J+1	1	0.049	T''_{do} (>0) (sec)
J+2	1	0.11	T''_{qo} (>0) (sec)
J+3		4.3	Inertia H
J+4		0.5	Speed Damping D
J+5		1.03	X_d
J+6		0.63	X_q
J+7		0.29	X'_d
J+8		0.17	$X''_d = X''_q$
J+9	0.10	~~0.13~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.029$

$X_d' = 0.64$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2)

(2000)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IH,KOUNT,J,K)

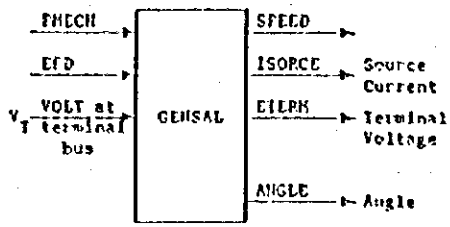
This model is located at system bus #2220 (KOTMA-2) IBUS,

machine # 2 IH.

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 90 for each of

1 units = 90 MBASE.

ZSORCE for this machine is 0 + j0.177 on

the above MBASE.

CONs	#	Value	Description
J	1	6.7	T'_{do} (>0) (sec)
J+1	1	0.048	T''_{do} (>0) (sec)
J+2	1	0.10	T''_{qo} (>0) (sec)
J+3		4.3	Inertia H
J+4		0.5	Speed Damping D
J+5		1.03	X_d
J+6		0.63	X_q
J+7		0.29	X'_d
J+8		0.177	$X''_d = X''_q$
J+9	0.10	~~0.13~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.029$

$x_d' = 0.64$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,II,XOUNT,J,K)

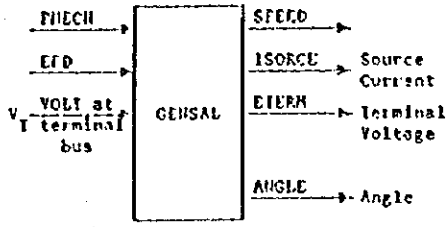
This model is located at system bus VICTO-2 12230 IBUS,

machine 1 1 II.

This model uses counter 1 XOUNT,

and CONs starting with 1 J,

and STATEs starting with 1 K.



The machine MVA base is 248 for each of

1 units = 248 MBASE.

ZSORCE for this machine is 0 + j 0.165 on

the above MBASE.

CONs	J	Value	Description
J	x	6.7	T'_{do} (>0) (sec)
J+1	✓	0.051	T''_{do} (>0) (sec)
J+2	✓	0.11	T''_{qo} (>0) (sec)
J+3		4.3	Inertia H
J+4		0.5	Speed Damping D
J+5		1.03	X_d
J+6		0.63	X_q
J+7		0.29	X'_d
J+8		0.165	$X''_d = X''_q$
J+9	0.10	~~0.17~~	X_L
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	J	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.029$

$X_d' = 0.64$

X_d, X_q, X'_d, X''_d, X''_q, X_L, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2000)

(2)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,ID,KOUNT,J,K)

RANGE - 2

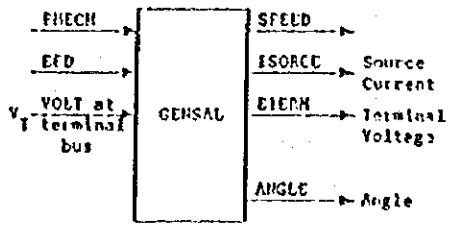
This model is located at system bus #2240 IBUS,

machine # 1 ID.

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 162 for each of

1 units = 162 MBASE.

ZSORCE for this machine is 0 + j0.21 on

the above MBASE.

CONs	#	Value	Description
J		6.7	T'_{do} (>0) (sec)
J+1		0.040	T''_{do} (>0) (sec)
J+2		0.088	T''_{qo} (>0) (sec)
J+3		4.3	Inertia H
J+4		0.5	Speed Damping D
J+5		1.03	X_d
J+6		0.63	X_q
J+7		0.29	X'_d
J+8		0.21	$X''_d = X''_q$
J+9	0.10	~~0.73~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		Δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.029$

$X_\ell' = 0.64$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IM,KOUNT,J,K)

RANTE-G1

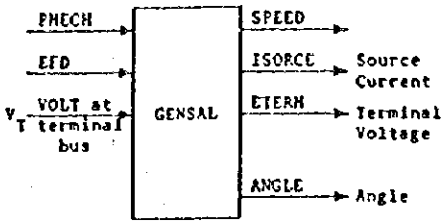
This model is located at system bus #4425 IBUS,

machine # 1 IM.

This model uses counter # KOUNT,

and CONs starting with # J,

and STATEs starting with # K.



The machine MVA base is 32 for each of

1 units = 32 MBASE.

ZSORCE for this machine is 0 + j 0.185 on

the above MBASE.

CONs	#	Value	Description
J	✓	5.2	T'_{do} (>0) (sec)
J+1	✓	0.059	T''_{do} (>0) (sec)
J+2	✓	0.10	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.185	$X''_d = X''_q$
J+9	0.10	~~0.17~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T_d' = 0.034$

$X_d' = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IH,KOUNT,J,K)

RANGE - 92

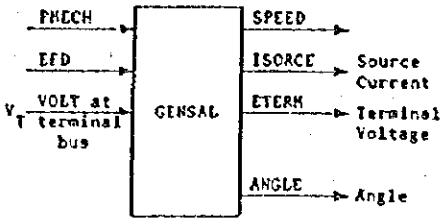
This model is located at system bus # 42521 IBUS,

machine # _____ IH.

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

and STATEs starting with # _____ K.



The machine MVA base is 32 for each of

1 units = 32 MBASE.

ZSORCE for this machine is 0 + j0.185 on

the above MBASE.

CONs	#	Value	Description
J	"	5.2	T'_{do} (>0) (sec)
J+1	"	0.059	T''_{do} (>0) (sec)
J+2	"	0.10	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.185	$X''_d = X''_q$
J+9	0.10	~~0.14~~	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.034$

$X_d'' = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

① $10 \leq MVA < 100$

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT STEAM

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

KBLAN-1

This model is located at system bus #1301 IBUS,

machine # 2 IH.

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

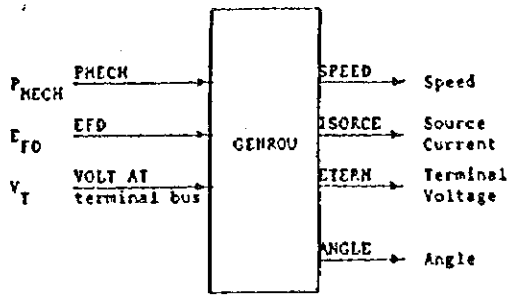
and STATEs starting with # _____ K.

The machine MVA base is 63 for each of

1 units = 63 MBASE.

ZSORCE for this machine is 0 + j 0.12 on

the above MBASE.



	CONs	#	Value	Description
	J	✓	6.97	T'_{do} (sec.>0)
X	J+1	0.036	~~0.073~~	T''_{do} (sec.>0)
X	J+2	1.09	~~2.26~~	T'_{qo} (sec.>0)
X	J+3	0.19	~~0.38~~	T''_{qo} (sec.>0)
	J+4	✓	4.0	Inertia H
	J+5	✓	0.5	Speed Damping D
	J+6	✓	1.79	X_d
	J+7	✓	1.72	X_q
	J+8	✓	0.23	X'_d
	J+9	✓	1.20	X'_q
	J+10	✓	0.12	$X''_d = X''_q$
X	J+11	0.10	~~0.13~~	X_ℓ
	J+12	✓	0.03	S(1.0)
	J+13	✓	0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

T'_ℓ = ~~1.58~~ 0.76

T''_d = ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

$T_{\ell}' = T_d''$ $\quad T_{qo}' = \frac{X_\ell}{X_q'} T_q'$

$T_{qo}'' = \frac{X_\ell'}{X_q''} T_q''$

$T_{do}'' = \frac{X_d'}{X_d''} T_d''$

Source : 電気学会技術報告 (II) 143号 3.6表

for "H" 電力系統技術計算の (P33K)

(1)

(2000)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT GAS

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,ID,KOUNT,J,K)

KELAN-1

This model is located at system bus #1300 IBUS,

machine #1 ID.

This model uses counter #_____ KOUNT,

and CONs starting with #_____ J,

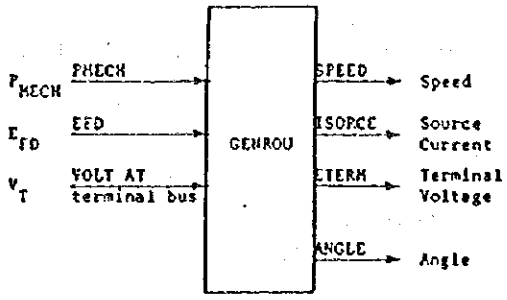
and STATEs starting with #_____ K.

The machine MVA base is 29 for each of

1 units * 29 MBASE.

ZSORCE for this machine is 0 + j0.147 on

the above MBASE.



CONs	#	Value	Description
J	✓	6.97	T'_{do} (sec.>0)
J+1	0.030	~~0.059~~	T''_{do} (sec.>0)
J+2	1.09	~~2.26~~	T'_{qo} (sec.>0)
J+3	0.16	~~0.34~~	T''_{qo} (sec.>0)
J+4	✓	4.5	Inertia H
J+5	✓	0.5	Speed Damping D
J+6	✓	1.79	X_d
J+7	1.✓	1.72	X_q
J+8	✓	0.23	X'_d
J+9	✓	1.20	X'_q
J+10	✓	0.147	$X''_d = X''_q$
J+11	0.10	~~0.13~~	X_ℓ
J+12	✓	0.03	S(1.0)
J+13	✓	0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		Ψkd
K+3		Ψkq
K+4		δ Speed (p.u.)
K+5		Angle (radians)

$T_d' = $ ~~1.58~~ 0.76

$T_d'' = $ ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2) 100 ≤ MVA

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT GAS

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

This model is located at system bus KPLAN-1 / 1300 IBUS,

machine / 3 IH.

This model uses counter / _____ KOUNT,

and CONs starting with / _____ J,

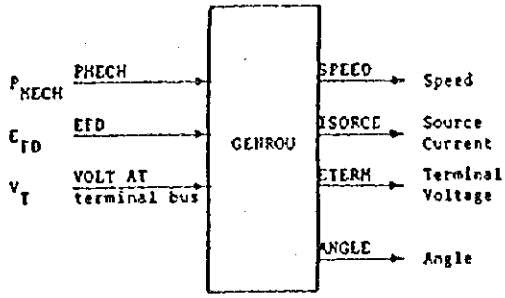
and STATEs starting with / _____ K.

The machine MVA base is 134 for each of

1 units = 134 MBASE.

ZSORCE for this machine is 0 + j0.16 on

the above MBASE.



CONs	I	Value	Description
J	✓	6.85	T'_{do} (sec.>0)
J+1	0.032	~~0.059~~	T''_{do} (sec.>0)
J+2	✓	1.00	T'_{qo} (sec.>0)
J+3	0.16	~~0.27~~	T''_{qo} (sec.>0)
J+4	✓	4.5	Inertia H
J+5	✓	0.5	Speed Damping D
J+6	✓	1.95	X_d
J+7	✓	1.72	X_q
J+8	✓	0.27	X'_d
J+9	✓	1.31	X'_q
J+10	✓	0.16	$X''_d = X''_q$
J+11	0.10	~~0.15~~	X_ℓ
J+12	✓	0.03	S(1.0)
J+13	✓	0.40	S(1.2)

STATEs	I	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

$T_{q0}' = 0.76$

$T_d'' = $ ~~0.035~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2000)

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT GAS

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

This model is located at system bus KBLAN-1 1300 IBUS,

machine 1 4 IH.

This model uses counter 1 _____ KOUNT,

and CONs starting with 1 _____ J,

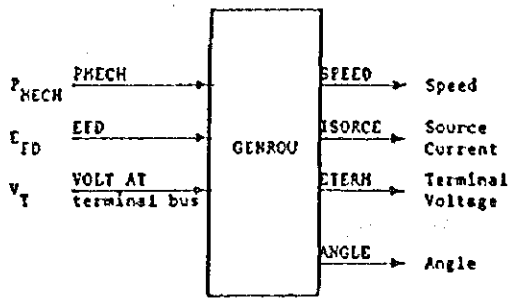
and STATEs starting with 1 _____ K.

The machine MVA base is 31 for each of

1 units = 31 MBASE.

ZSORCE for this machine is 0 + j0.16 on

the above MBASE.



CONs	#	Value	Description
J	✓	6.97	T'_{do} (sec.>0)
J+1	0.07	~~0.055~~	T''_{do} (sec.>0)
J+2	1.09	~~2.76~~	T'_{qo} (sec.>0)
J+3	0.14	~~0.29~~	T''_{qo} (sec.>0)
J+4	✓	4.5	Inertia H
J+5	-	0.5	Speed Damping D
J+6	-	1.79	X_d
J+7	✓	1.72	X_q
J+8	-	0.23	X'_d
J+9	✓	1.20	X'_q
J+10	✓	0.16	$X''_d = X''_q$
J+11	0.10	~~0.13~~	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		δ Speed (p.u.)
K+5		Angle (radians)

$T_{\delta}' = $ ~~0.58~~ 0.76

$T_d' = $ ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT C. C.

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

KELAN-2

This model is located at system bus #12300 IBUS,

machine #1 IH,

This model uses counter #_____ KOUNT,

and CONs starting with #_____ J,

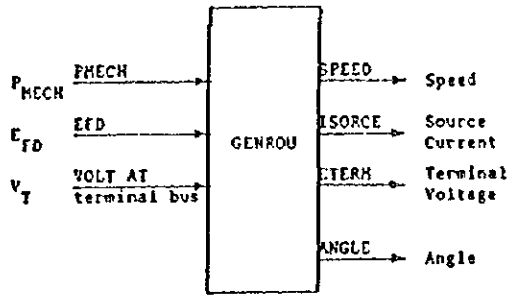
and STATEs starting with #_____ K.

The machine MVA base is 177 for each of

1 units =177 MBASE.

ZSORCE for this machine is 0 + j0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.85	T'_{do} (sec.>0)
J+1	0.032	~~0.059~~	T''_{do} (sec.>0)
J+2	↓	1.00	T'_{qo} (sec.>0)
J+3	0.16	~~0.29~~	T''_{qo} (sec.>0)
J+4		4.0	Inertia H
J+5		0.5	Speed Damping D
J+6		1.75	X_d
J+7	↓	1.72	X_q
J+8		0.27	X'_d
J+9		1.31	X'_q
J+10		0.16	$X''_d = X''_q$
J+11	0.10	~~0.15~~	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

T'_d = 0.76

T''_d = ~~0.035~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT GAS

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

KEWAUNEE-3

This model is located at system bus I 3301 IBUS,

machine I 1 IH.

This model uses counter I _____ KOUNT,

and CONs starting with I _____ J,

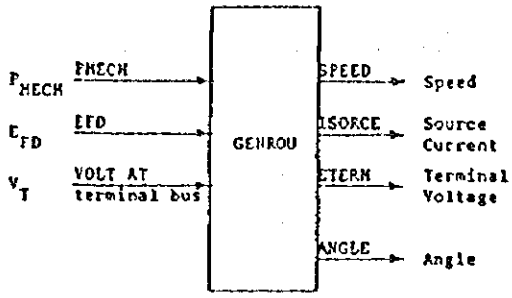
and STATEs starting with I _____ K.

The machine MVA base is 138 for each of

1 units = 138 MBASE.

ZSORCE for this machine is 0 + j 0.149 on

the above MBASE.



CONs	I	Value	Description
J		6.97	T'_{do} (sec.>0)
J+1	0.029	~~0.057~~	T''_{do} (sec.>0)
J+2	1.09	~~2.26~~	T'_{qo} (sec.>0)
J+3	0.15	~~0.37~~	T''_{qo} (sec.>0)
J+4		4.5	Inertia H
J+5		0.5	Speed Damping D
J+6		1.79	X_d
J+7		1.72	X_q
J+8		0.23	X'_d
J+9		1.20	X'_q
J+10		0.149	$X''_d = X''_q$
J+11	0.10	~~0.13~~	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	I	Description
K		E'_q
K+1		E'_d
K+2		Ψ_{kd}
K+3		Ψ_{kq}
K+4		δ Speed (p.u.)
K+5		Angle (radians)

$T_8' = $ ~~1.58~~ 0.76

$T_J'' = $ ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(1)

(2

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT DG

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IM,KOUNT,J,K)

CHANN-3

This model is located at system bus # 3730 IBUS,

machine # / IM.

This model uses counter # KOUNT,

and CONs starting with # J,

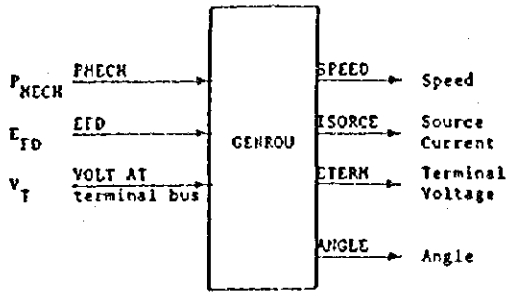
and STATEs starting with # K.

The machine MVA base is 38 for each of

1 units = 38 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.97	T'_{do} (sec.>0)
J+1	0.027	~~0.055~~	T''_{do} (sec.>0)
J+2	1.09	~~2.26~~	T'_{qo} (sec.>0)
J+3	0.14	~~0.29~~	T''_{qo} (sec.>0)
J+4		4.0	Inertia H
J+5		0.5	Speed Damping D
J+6		1.79	X_d
J+7		1.72	X_q
J+8		0.23	X'_d
J+9		1.20	X'_q
J+10		0.16	$X''_d = X''_q$
J+11	0.10	~~0.13~~	X_t
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		δ Speed (p.u.)
K+5		Angle (radians)

T_{d0}' : ~~6.58~~ 6.76

T_{d0}'' : ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_t, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2)

[2000]

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT C. C.

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

KRLAW-G

This model is located at system bus # 4305 IBUS,

machine # 1 IH.

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

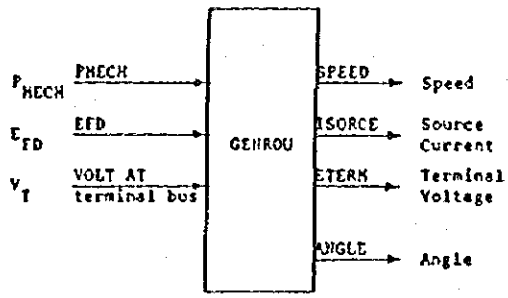
and STATEs starting with # _____ K.

The machine MVA base is 177 for each of

1 units = 177 MBASE.

ZSORCE for this machine is 0 + j0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.85	T'_{do} (sec.>0)
J+1	0.032	~~0.059~~	T''_{do} (sec.>0)
J+2	✓	1.00	T'_{qo} (sec.>0)
J+3	0.16	~~0.29~~	T''_{qo} (sec.>0)
J+4		4.0	Inertia H
J+5		0.5	Speed Damping D
J+6		1.75	X_d
J+7		1.72	X_q
J+8		0.27	X'_d
J+9		1.31	X'_q
J+10		0.16	$X''_d = X''_q$
J+11	0.10	~~0.15~~	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		Ykd
K+3		Ykq
K+4		δ Speed (p.u.)
K+5		Angle (radians)

$T_{\ell}' = 0.76$

$T_d'' = $ ~~0.035~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT 9 6T

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

This model is located at system bus SAIU - GN2 14311 IBUS,

machine 1 IH.

This model uses counter / KOUNT,

and CONs starting with / J,

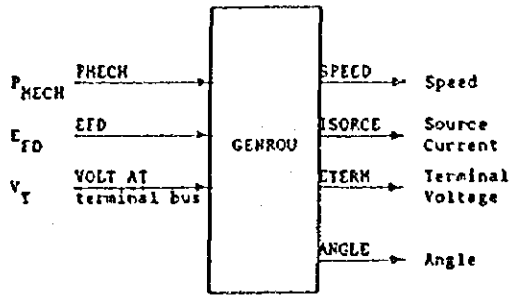
and STATEs starting with / K.

The machine MVA base is 47 for each of

1 units = 47 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



	CONs	#	Value	Description
	J		6.97	T'_{do} (sec.>0)
X	J+1	0.029	~~0.055~~	T''_{do} (sec.>0)
X	J+2	1.09	~~2.26~~	T'_{qo} (sec.>0)
Y	J+3	0.14	~~0.69~~	T''_{qo} (sec.>0)
	J+4		4.0	Inertia H
	J+5		0.5	Speed Damping D
	J+6		1.79	X_d
	J+7		1.72	X_q
	J+8		0.23	X'_d
	J+9		1.20	X'_q
	J+10		0.16	$X''_d = X''_q$
	J+11	0.10	~~0.13~~	X_ℓ
	J+12		0.03	S(1.0)
	J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

T'_d = ~~1.58~~ 0.76

T''_d = ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2060)

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT DG

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,ID,KOUNT,J,K)

This model is located at system bus SAPU-GN1 14312 IBUS,

machine 1 ID.

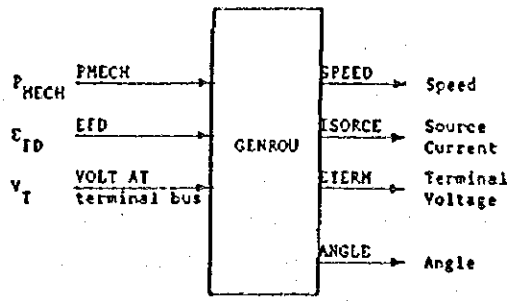
This model uses counter I KOUNT,

and CONs starting with I J,

and STATEs starting with I K.

The machine MVA base is 47 for each of 1 units = 47 MBASE.

ZSORCE for this machine is 0 + j0.16 on the above MBASE.



	CONs	I	Value	Description
	J		6.97	T'_{do} (sec.>0)
X	J+1	0.027	~~0.035~~ 0.032	T''_{do} (sec.>0)
X	J+2	1.09	~~2.36~~ 0.76	T'_{qo} (sec.>0)
X	J+3	0.14	~~0.29~~ 0.019	T''_{qo} (sec.>0)
	J+4		4.0	Inertia H
	J+5		0.5	Speed Damping D
	J+6		1.79	X_d
	J+7		1.72	X_q
	J+8		0.23	X'_d
	J+9		1.20	X'_q
	J+10		0.16	$X''_d = X''_q$
	J+11	0.10	~~0.13~~	X_ℓ
	J+12		0.03	S(1.0)
	J+13		0.40	S(1.2)

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

STATEs	I	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		δ Speed (p.u.)
K+5		Angle (radians)

T_{do}' = ~~1.58~~ 0.76

T_{qo}'' = ~~0.038~~ 0.019

C20C

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT 9 Gq

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IM,KOUNT,J,K)

SAPUG-G1

This model is located at system bus # 4313 IBUS,

machine # 1 IM.

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

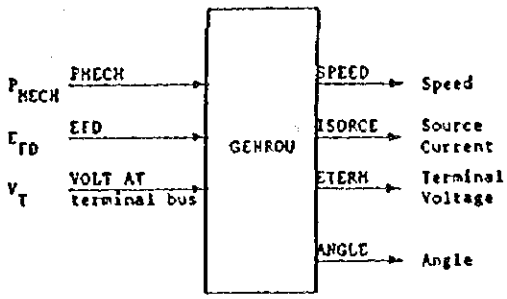
and STATEs starting with # _____ K.

The machine MVA base is 94 for each of

1 units = 94 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.97	T'_{do} (sec.>0)
J+1	0.027	~~0.055~~	T''_{do} (sec.>0)
J+2 ✓	1.09	~~2.26~~	T'_{qo} (sec.>0)
J+3 ✗	0.14	0.29	T''_{qo} (sec.>0)
J+4		4.0	Inertia H
J+5		0.5	Speed Damping D
J+6		1.79	X_d
J+7		1.72	X_q
J+8		0.23	X'_d
J+9		1.20	X'_q
J+10		0.16	$X''_d = X''_q$
J+11	0.10	~~0.13~~	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		δ Speed (p.u.)
K+5		Angle (radians)

T'_d = ~~1.59~~ 0.76

T''_d = ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X'_q must be equal to X''_d.

(1)

Table A6.1.2-6 Dynamic Stability Data for 2000 System

PLANT DGT

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IM,KOUNT,J,K)

This model is located at system bus KHD-G #4595 IBUS,

machine # 1 IM.

This model uses counter # KOUNT,

and CONs starting with # J,

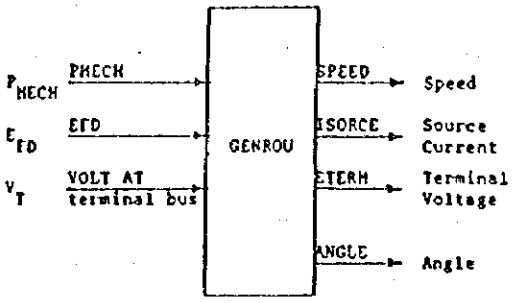
and STATEs starting with # K.

The machine MVA base is 63 for each of

1 units * 63 MBASE.

ZSORCE for this machine is 0 + j0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.97	T'_{do} (sec.>0)
J+1	0.027	~~0.055~~	T''_{do} (sec.>0)
J+2	1.09	~~2.26~~	T'_{qo} (sec.>0)
J+3	0.14	~~0.29~~	T''_{qo} (sec.>0)
J+4		4.0	Inertia H
J+5		0.5	Speed Damping D
J+6		1.79	X_d
J+7		1.72	X_q
J+8		0.23	X'_d
J+9		1.20	X'_q
J+10		0.16	$X''_d = X''_q$
J+11	0.10	~~0.13~~	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

T'_d = ~~1.58~~ 0.76

T''_d = ~~0.038~~ 0.019

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X'_q must be equal to X''_d.

for all the generators

Table A6.1.2-6 Dynamic Stability Data for 2000 System

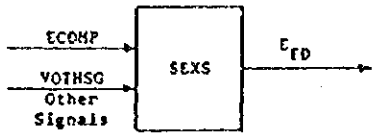
PTI POWER SYSTEM SIMULATOR

SEXS

(Simplified Excitation System)

CALL SEXS (IBUS,IH,KOUNT,J,K)

This model is connected at system bus #_____IBUS,
machine #_____IH.
This model uses counter #_____KOUNT,
and CONs starting at #_____J,
and STATEs starting at #_____K.



CONs	#	Value	Description
J		0.1	T_A/T_B
J+1		10	T_B (>0) (sec)
J+2	*	200	K
J+3		0.05	T_E (sec)
J+4		0	E_{MIN} (p.u. EFD base)
J+5		3	E_{MAX} (p.u. EFD base)

STATEs	#	Description
K		First integrator
K+1		Second integrator

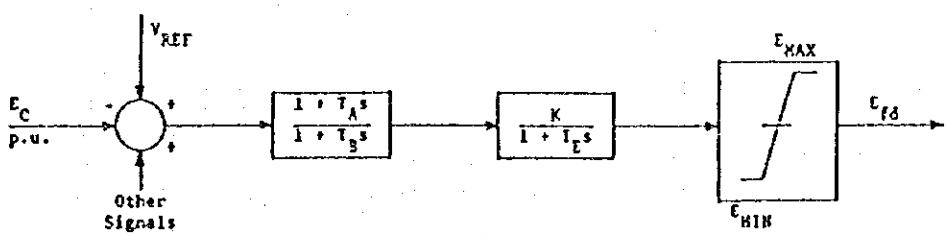


Table A6.1.3 - 1 Data of Planned Transmission Lines by the End of 2005

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R (100 MVA Base %)	X (100 MVA Base %)	Y (100 MVA Base %)	Note
Data modification for the system in 2005 year														
Newly Add														
1		EMBIL-1	HAMBAN-1	132	Bear	23.1	2	2.8278	9.1519	0.0666	1.6229	5.2524	1.1601	
2		EMBIL-1	HAMBAN-1	132	Bear	23.1		2.8278	9.1519	0.0666	1.6229	5.2524	1.1601	
3		N-GALL-1	MATAR-1	132	Bear	34.1	2	4.1744	13.5099	0.0983	2.3958	7.7536	1.7125	
4		N-GALL-1	MATAR-1	132	Bear	34.1		4.1744	13.5099	0.0983	2.3958	7.7536	1.7125	
5		MATUG-1	KUKULE-1	132	Zebra	26.4	2	1.9929	10.1288	0.0787	1.1438	5.8131	1.3709	
6		MATUG-1	KUKULE-1	132	Zebra	26.4		1.9929	10.1288	0.0787	1.1438	5.8131	1.3709	
7		KUKULE-1	RATNA-1	132	Zebra	24.2	2	1.8268	9.2847	0.0721	1.0484	5.3287	1.2567	
8		KUKULE-1	RATNA-1	132	Zebra	24.2		1.8268	9.2847	0.0721	1.0484	5.3287	1.2567	
9		UKUWE-1	PALEK-1	132	Zebra	16.8	2	1.2682	6.4456	0.0501	0.7278	3.6993	0.8724	
10		UKUWE-1	PALEK-1	132	Zebra	16.8		1.2682	6.4456	0.0501	0.7278	3.6993	0.8724	
11		THULH-1	KEGAL-1	132	Zebra	18.7	2	1.4116	7.1746	0.0557	0.8102	4.1176	0.9711	
12		THULH-1	KEGAL-1	132	Zebra	18.7		1.4116	7.1746	0.0557	0.8102	4.1176	0.9711	
13		THULH-1	VEYAN-1	132	Zebra	24.2	2	1.8268	9.2847	0.0721	1.0484	5.3287	1.2567	
14		THULH-1	VEYAN-1	132	Zebra	24.2		1.8268	9.2847	0.0721	1.0484	5.3287	1.2567	
15		VEYAN-2	N-CHIL-2	220	3 x Zebra	42.0	2	1.0568	11.0551	0.1785	0.2184	2.2841	8.6410	
16		VEYAN-2	N-CHIL-2	220	3 x Zebra	42.0		1.0568	11.0551	0.1785	0.2184	2.2841	8.6410	
17		N-CHIL-2	PUTTA-P2	220	3 x Zebra	43.0	2	1.0820	11.3183	0.1828	0.2236	2.3385	8.8467	
18		N-CHIL-2	PUTTA-P2	220	3 x Zebra	43.0		1.0820	11.3183	0.1828	0.2236	2.3385	8.8467	
19		PUTTA-P1	PUTTA-1	132	2 x Zebra	21.5	2	0.8115	5.8304	0.0895	0.4657	3.3462	1.5601	
20		PUTTA-P1	PUTTA-1	132	2 x Zebra	21.5		0.8115	5.8304	0.0895	0.4657	3.3462	1.5601	
21		N-CHIL-1	KULIYA-1	132	Zebra	18.0	2	1.3588	6.9060	0.0536	0.7798	3.9635	0.9347	
22		N-CHIL-1	KULIYA-1	132	Zebra	18.0		1.3588	6.9060	0.0536	0.7798	3.9635	0.9347	
23		HORAN-D1	HORAN-1	132	Bear	11.0	1	1.3466	4.3580	0.0317	0.7728	2.5012	0.5524	
24		HORAN-D2	HORAN-1	132	Bear	11.0	1	1.3466	4.3580	0.0317	0.7728	2.5012	0.5524	
25		PANAD-D3	PANAD-1	132	Lynx	4.7	1	0.8296	1.9161	0.0131	0.4761	1.0997	0.2291	
26		PANAD-D4	PANAD-1	132	Lynx	4.7	1	0.8296	1.9161	0.0131	0.4761	1.0997	0.2291	
27		KOLON-1	TOWN-1	132	Cu 500	4.2	1	0.1714	0.3982	0.5410	0.0984	0.2285	9.4261	
Modification														
28		BADUL-1	MEDEGA-1	132	Oriole	28.0	1	5.3124	11.4792	0.0779	3.0489	6.5881	1.3570	replace "BADUL-1 -
29		MEDEGA-1	INGIN-1	132	Oriole	51.9	1	9.8469	21.2775	0.1444	5.6513	12.2116	2.5153	INGIN-1" line
30		VALAI-1	POLON-1	132	Lynx	55.8	1	9.8494	22.7484	0.1561	5.6528	13.0558	2.7201	replace "VALAI-1 -
31		POLON-1	HABAR-1	132	Lynx	43.9	1	7.7489	17.8970	0.1228	4.4472	10.2715	2.1400	HABAR-1" line
32		MATUG-1	AMBAL-1	132	Bear	28.0	2	3.4276	11.0932	0.0807	1.9672	6.3666	1.4062	replace "MATUG-1 -
33		MATUG-1	AMBAL-1	132	Bear	28.0		3.4276	11.0932	0.0807	1.9672	6.3666	1.4062	N-GALL-1" line
34		AMBAL-1	N-GALL-1	132	Bear	36.0	2	4.4070	14.2626	0.1038	2.5293	8.1856	1.8079	
35		AMBAL-1	N-GALL-1	132	Bear	36.0		4.4070	14.2626	0.1038	2.5293	8.1856	1.8079	
36		PANNI-1	PANAD-D1	132	Goat	12.3	2	1.2277	4.7942	0.0361	0.7046	2.7515	0.6283	replace "PANNI-1 -
37		PANNI-1	PANAD-D2	132	Goat	12.3		1.2277	4.7942	0.0361	0.7046	2.7515	0.6283	PANAD-T1, T2" lines
38		PANAD-D1	PANAD-1	132	Lynx	4.7	2	0.8296	1.9161	0.0131	0.4761	1.0997	0.2291	replace "PANAD-T1, T2
39		PANAD-D2	PANAD-1	132	Lynx	4.7		0.8296	1.9161	0.0131	0.4761	1.0997	0.2291	PANAD-1" lines
40		PANAD-1	PANAD-D3	132	Lynx	4.7	2	0.8296	1.9161	0.0131	0.4761	1.0997	0.2291	- ditto -
41		PANAD-1	PANAD-D4	132	Lynx	4.7		0.8296	1.9161	0.0131	0.4761	1.0997	0.2291	- ditto -
42		PANAD-D3	HORAN-D1	132	Goat	1.0	1	0.0998	0.3898	0.0029	0.0573	0.2237	0.0511	replace "PANAD-T1, T2
43		PANAD-D4	MATUG-1	132	Goat	29.1	1	2.9046	11.3423	0.0853	1.6670	6.5096	1.4865	- MATUG-1" lines

Table A6.1.3 - 1 Data of Planned Transmission Lines by the End of 2005

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
44		HORAN-D2	MATUG-1	132	Goat	28.1	1	2.8048	10.9526	0.0824	1.6097	6.2859	1.4354	
45		KOLON-1	TOWN-1	132	Cu 500	4.2	1	0.1714	0.3982	0.5410	0.0984	0.2285	9.4261	replace "KOLON-1 -
46		TOWN-1	KOLLU-1	132	Cu 500	1.2	1	0.0490	0.1138	0.1546	0.0281	0.0653	2.6932	KOLLU-1" lines
47		KELAN-2	KOLON-2	220	2xGoat	2.2	2	0.1098	0.6683	0.0082	0.0227	0.1381	0.3946	upgrade 132 kV line to
48		KELAN-2	KOLON-2	220	2xGoat	2.2		0.1098	0.6683	0.0082	0.0227	0.1381	0.3946	220 kV line
49		KOTUG-1	KATANA-1	132	Zebra	11.3	2	0.8530	4.3354	0.0337	0.4896	2.4882	0.5868	replace "KOTUG-1 -
50		KOTUG-1	KATANA-1	132	Zebra	11.3		0.8530	4.3354	0.0337	0.4896	2.4882	0.5868	BOLAW-1" lines
51		KATANA-1	BOLAW-1	132	Zebra	10.7	2	0.8077	4.1052	0.0319	0.4636	2.3561	0.5556	
52		KATANA-1	BOLAW-1	132	Zebra	10.7		0.8077	4.1052	0.0319	0.4636	2.3561	0.5556	
53		BOLAW-1	N-CHIL-1	132	Lynx	22.6	2	3.9892	9.2135	0.0632	2.2895	5.2878	1.1017	replace "BOLAW-1 -
54		BOLAW-1	N-CHIL-1	132	Lynx	22.6		3.9892	9.2135	0.0632	2.2895	5.2878	1.1017	PUTTA-1" lines
55		N-CHIL-1	PUTTA-1	132	Lynx	61.4	2	10.8378	25.0314	0.1718	6.2201	14.3660	2.9931	
56		N-CHIL-1	PUTTA-1	132	Lynx	61.4		10.8378	25.0314	0.1718	6.2201	14.3660	2.9931	
57		N-CHIL-1	CHILL-1	132	Lynx	6.8	2	1.2003	2.7722	0.0190	0.6889	1.5910	0.3315	replace "CHILL-T1, T2 -
58		N-CHIL-1	CHILL-1	132	Lynx	6.8		1.2003	2.7722	0.0190	0.6889	1.5910	0.3315	CHILL-1" lines
59		KOTUG-2	VEYAN-2	220	2 x Zebra	20.0	2	0.7549	6.0142	0.0749	0.1560	1.2426	3.6247	upgrade 132 kV line to
60		KOTUG-2	VEYAN-2	220	2 x Zebra	20.0		0.7549	6.0142	0.0749	0.1560	1.2426	3.6247	220 kV line
61		ANURA-1	VAVUNI-1	132	Lynx	54.7	2	9.6552	22.2999	0.1530	5.5413	12.7984	2.6665	replace "ANURA-1 -
62		ANURA-1	VAVUNI-1	132	Lynx	54.7		9.6552	22.2999	0.1530	5.5413	12.7984	2.6665	KILIN-T1, T2" lines
63		VAVUNI-1	KILIN-T1	132	Lynx	74.3	2	13.0795	30.2089	0.2073	7.5066	17.3375	3.6122	
64		VAVUNI-1	KILIN-T2	132	Lynx	74.3		13.0795	30.2089	0.2073	7.5066	17.3375	3.6122	
65		POLPI-1	AVISS-1	132	Lynx	34.5	1	6.0897	14.0649	0.0965	3.4950	8.0721	1.6818	replace "POLPI-1 -
66		AVISS-1	KOTMA-1	132	Lynx	32.4	1	5.7190	13.2087	0.0906	3.2822	7.5808	1.5794	AVIS-1T1 - KOLOW-1"
67		K-NIYA-1	GONAWA-1	132	Zebra	2.3	2	0.1736	0.8824	0.0069	0.0996	0.5064	0.1194	replace "K-NIYA-1
68		K-NIYA-1	GONAWA-1	132	Zebra	2.3		0.1736	0.8824	0.0069	0.0996	0.5064	0.1194	SAPUG-1"
69		GONAWA-1	SAPUG-1	132	Zebra	2.3	2	0.1736	0.8824	0.0069	0.0996	0.5064	0.1194	replace "K-NIYA-1
70		GONAWA-1	SAPUG-1	132	Zebra	2.3		0.1736	0.8824	0.0069	0.0996	0.5061	0.1194	SAPUG-1"

Table A6.1.3 - 2 Data of Planned Transformers by the End of 2005

No.	Node (H)igh Voltage	(L)ow Voltage	(M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	L	M	Rated Capacity (MVA) H	L	M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base	Tap (%, nos)	Highest	Lowest	Nos.
Data modification for the system in 2005 year																	
Newly Add (new construction)																	
1	HAMBAN-1	HAMBAN-3		2	132.0	33.0		10.0	10.0		H-L	10.00	(10.0)	100.00	H	5.0	-15.0	17
2	MEDEGA-1	MEDEGA-3		2	132.0	33.0		10.0	10.0		H-L	10.00	(10.0)	100.00	H	5.0	-15.0	17
3	VAVUNI-1	VAVUNI-3		1	132.0	33.0		10.0	10.0		H-L	10.00	(10.0)	100.00	H	5.0	-15.0	17
4	POLON-1	POLON-3		2	132.0	33.0		16.0	16.0		H-L	10.00	(16.0)	62.50	H	5.0	-15.0	17
5	PALEK-1	PALEK-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
6	KEGAL-1	KEGAL-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
7	AMBAL-1	AMBAL-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
8	HORAN-1	HORAN-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
9	KATANA-1	KATANA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
10	KULIYA-1	KULIYA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
11	GONAWA-1	GONAWA-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
12	TOWN-1	TOWN-3		2	132.0	33.0		63.0	63.0		H-L	10.00	(63.0)	15.87	H	5.0	-15.0	17
13	KOLON-2	KOLON-TT	KOLON-1	2	220.0	33.0	132.0	250.0	80.0	250.0	H-M	6.00	(250.0)	2.40	H	15.0	-15.0	21
											H-L	6.00	(80.0)	7.50				
											M-L	5.00	(80.0)	6.25				
14	VEYAN-2		VEYAN-1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
15	N-CHIL-2		N-CHIL-1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
16	PUTTA-P2		PUTTA-P1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
17	N-GALL-1	N-GALL-G		1	132.0	11.0		82.0	82.0		H-L	10.00	(82.0)	12.20	H	10.0	-5.0	13
18	KUKULE-1	KUKULE-G		2	132.0	11.0		46.0	46.0		H-L	10.00	(46.0)	21.74	H	10.0	-5.0	13
19	PUTTA-P2	PUTTA-PG		2	220.0	11.0		175.0	175.0		H-L	13.00	(175.0)	7.43	H	10.0	-5.0	13
20	PUTTA-P2	PUTTA-PG		2	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
21	MUTHR-2	MUTHR-3		2	220.0	33.0		63.0	63.0		H-L	13.00	(63.0)	20.63	H	5.0	-15.0	17

Notes:
1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

1/2 page

Table A6.1.3 - 2 Data of Planned Transformers by the End of 2005

No.	Node (H)igh Voltage	Node (L)ow Voltage	Node (M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	Rated Voltage (kV) L	Rated Voltage (kV) M	Rated Capacity (MVA) H	Rated Capacity (MVA) L	Rated Capacity (MVA) M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base	Tap (%, nos)	Highest	Lowest	Nos.
Replacement or Augmentation																	
22	N-GALL-1	N-GALL-3		3	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
23	GALLE-1	GALLE-3		2	132.0	33.0		30.0	30.0		H-L	12.10 (30.0)	40.33	H	10.0	-15.0	13
24	GALLE-1	GALLE-3		1	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
25	SRIJA-1	SRIJA-3		4	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
26	KILIN-1	KILIN-3		2	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00	H	5.0	-15.0	17
27	KOLON-1	KOLON-3		5	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
28	PANNI-1	PANNI-3		2	132.0	33.0		30.0	30.0		H-L	10.00 (30.0)	33.33	H	5.0	-15.0	17
29	PANNI-1	PANNI-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
30	RATMA-1	RATMA-3		2	132.0	33.0		30.0	30.0		H-L	10.00 (30.0)	33.33	H	5.0	-15.0	17
31	RATMA-1	RATMA-3		2	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
Retirements																	
	SAPUG-1P	SAPUG-G		1	142.0	11.0		50.0	50.0		H-L	17.80 (50.0)	35.60				
	KELAN-1	KELAN-ST		2	132.0	11.0		32.0	32.0		H-L	11.00 (32.0)	34.38				

Notes:
1) Sources: * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.3 - 3 Data of Planned Generators by the End of 2005

No.	Node	Type	No. of Unit	Rated Voltage (kV)	Rated Capacity (MVA)	Rated Output (MW)	Xd" (%)
Data modification for the system in 2005 year							
Newly Add (new construction)							
1	**New Galle P/S Total**				**82.35**	**70.00**	
	N-GALL-G	gas	1	11.0	82.35	70.00	16.0
2	**Kukule P/S Total**				**92.00**	**78.20**	
	KUKULE-G	hydro	2	11.0	46.00	39.10	16.0
3	**Puttalam P/S Total**				**1058.82**	**900.00**	
	PUTTA-PG	steam	2	11.0	176.47	150.00	16.0
	PUTTA-PG	steam	2	11.0	352.94	300.00	16.0
Retirement							
1	**Sapugaskanda P/S Total**				**51.20**	**36.00**	
	SAPUG-G1	diesel	2	11.0	25.60	18.00	
2	**Kelanitissa P/S Total**				**62.60**	**50.00**	
	KELAN-ST	steam	2	11.0	31.30	25.00	

Table A6.1.3 - 4

Data of Planned Reactive Power Sources by the End of 2005

No.	Node	Rated Voltage (kV)	Rated Capacity (MVA)	Remarks
Data modification for the system in 2005 year				
Newly Add				
1	CHUNN-3	33	20.00	
Total			20.00	

Table A6.1.3 - 5 Generator Output Schedule for 2005 System

No.	Node	Type	Scheduled Output (MW)		Max Output *4)
			Rainy Season *2)	Dry Season *3)	(MW)
1	LAX-G	hydro	50.00	30.00	50.00
2	N-LAX-G	hydro	100.00	60.00	100.00
3	WIMAL-G	hydro	50.00	30.00	50.00
4	CANYO-G	hydro	60.00	36.00	60.00
5	POLPI-G	hydro	75.00	45.00	75.00
6	UKUWE-G	hydro	38.00	23.00	38.00
7	BOWAT-G	hydro	40.00	24.00	40.00
8	VICTO-G	hydro	210.00	126.00	210.00
9	RANDE-G	hydro	122.00	73.00	122.00
10	KOTMA-G1	hydro	134.00	80.00	134.00
11	KOTMA-G2	hydro	67.00	40.00	67.00
12	RANTE-G	hydro	49.00	29.00	49.00
13	SAMAN-G	hydro	120.00	72.00	120.00
14	KUKULE-G	hydro	78.20	47.00	78.20
15	KELA-GT1	gas	0.00	18.00	18.00
16	KELA-GT2	gas	0.00	90.00	90.00
17	KELA-GT3	gas	97.00	102.60	102.60
18	KELA-GT4	gas	22.00	23.40	23.40
19	KELA-CC1	c.c.	128.00	135.00	135.00
20	MUTHR-G	c.c.	128.00	135.00	135.00
21	N-GALL-G	gas	60.00	63.00	63.00
22	SAPUG-G	diesel	0.00	32.40	32.40
23	SAPU-GN1	diesel	29.00	36.00	36.00
24	SAPU-GN2	diesel	29.00	36.00	36.00
25	KHD-G	diesel	0.00	46.00	46.00
26	CHUNN-G	diesel	18.00	27.00	27.00
27	PUTTA-PG *1)	steam	567.00	810.00	810.00
Hydro total			1193.20	715.00	1193.20
Thermal total			1078.00	1554.40	1554.40
Total of system			**2271.20**	**2269.40**	**2747.60**

Notes :

*1) Slack node

*2) Scheduled output = Maximum output, for hydro stations

*3) Scheduled output = Maximum output, for thermal stations

*4) Maximum output = Rated output, for hydro stations
Maximum output = Rated output x 0.9, for thermal stations

Table A6.1.3-6 Dynamic Stability Data for 2005 System

Oct. 4, 1996

Condition of Dynamic Stability Analysis

for the CASE 2005, Rainy and Dry Seasons

1. Fault and Fault Location

Rainy Season
Three phase fault on the Kotmale - Biyagama 220 kV line at Kotmale side.

Dry Season
Three phase fault on the Puttalam P/S - New Chillaw 220 kV line at Puttalam side.

2. Reclosing

Three phase reclosing of single circuit of the Kotmale - Biyagama 220 kV line for rainy season and of the Puttalam P/S - New Chillaw 220 kV line for dry season.

Reclosing sequence

Fault -------- trip signal to CB ---------- CB trip -- (no voltage time) -- CB reclose
80 ms 80 ms 500 ms

1) Successful Reclosing
Fault --- (160 ms) --- CBs trip --- (500 ms) --- clearing fault and CBs Close

2) Unsuccessful Reclosing
Pault -- (160 ms) -- CBs trip -- (500 ms) -- CBs Close -- (160 ms) -- CBs trip

3. Generators to be Observed

1) Puttalam (PUTTA-PG)
2) Victoria (VICTO-G)
3) Kelanitissa (KELA-CC1)
4) New Laxapana (N-LAX-G)

4. Factors to be Observed

1) Phase Angle (reference generator : Chunnakam)
2) Terminal Voltage
3) Output Power

5. Integration Time Step

0.001 sec

6. Duration of the Calculation

3.0 sec

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PLANT HYDRO

PTI POWER SYSTEM SIMULATOR

GENSAL

(Salient Pole Generator Model)

CALL GENSAL (IBUS,IM,KOUNT,J,K)

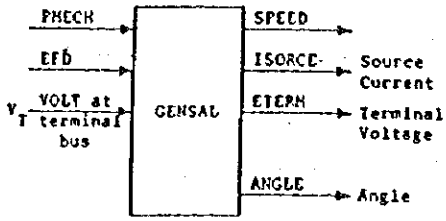
This model is located at system bus # 1410 IBUS, KOKOLE-6

machine # 1 IM.

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

and STATEs starting with # _____ K.



The machine MVA base is 92 for each of

1 units = 92 MBASE.

ZSORCE for this machine is 0 + j 0.16 on the above MBASE.

CONs	#	Value	Description
J		5.2	T'_{do} (>0) (sec)
J+1		0.068	T''_{do} (>0) (sec)
J+2		0.12	T''_{qo} (>0) (sec)
J+3		3.0	Inertia H
J+4		0.5	Speed Damping D
J+5		1.1	X_d
J+6		0.66	X_q
J+7		0.32	X'_d
J+8		0.16	$X''_d = X''_q$
J+9		0.10	X_ℓ
J+10		0.03	S(1.0)
J+11		0.25	S(1.2)

STATEs	#	Description
K		E'_q
K+1		ψ_{kd}
K+2		ψ''_q
K+3		δ Speed (p.u.)
K+4		Angle (radians)

$T_d'' = 0.034$

$X_d' = 0.57$

X_d, X_q, X'_d, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

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Power Technologies, Inc.

PLANT GAS.

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

N-GAU-G

This model is located at system bus #1655 IBUS,

machine # 1 IH.

This model uses counter # KOUNT,

and CONs starting with # J,

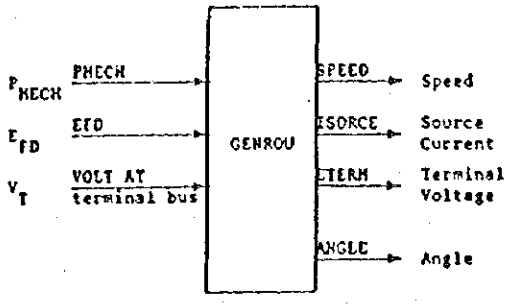
and STATEs starting with # K.

The machine MVA base is 82 for each of

1 units = 82 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.97	T'_{do} (sec.>0)
J+1		0.027	T''_{do} (sec.>0)
J+2		1.09	T'_{qo} (sec.>0)
J+3		0.14	T''_{qo} (sec.>0)
J+4		4.0	Inertia H
J+5		0.5	Speed Damping D
J+6		1.79	X_d
J+7		1.72	X_q
J+8		0.23	X'_d
J+9		1.20	X'_q
J+10		0.16	$X''_d = X''_q$
J+11		0.10	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		δ Speed (p.u.)
K+5		Angle (radians)

$T_{q0}' = 0.76$

$T_{d}'' = 0.018$

Table A6.1.3-6 Dynamic Stability Data for 2005 System

(2005)

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PLANT STEAM

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

PUTTA-PG (Rainy Season)

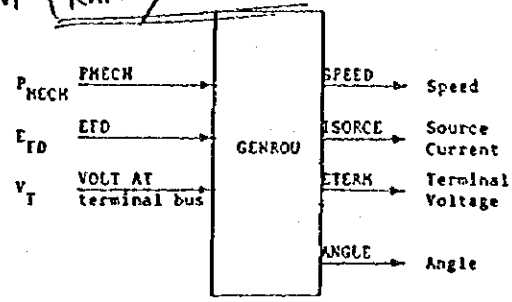
This model is located at system bus #2805 IBUS,

machine #_____ IH.

This model uses counter #_____ KOUNT,

and CONs starting with #_____ J,

and STATEs starting with #_____ K.



The machine MVA base is 706 for each of

1 units = 706 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.

CONs	#	Value	Description
J		6.85	T'_{do} (sec.>0)
J+1		0.032	T''_{do} (sec.>0)
J+2		1.00	T'_{qo} (sec.>0)
J+3		0.16	T''_{qo} (sec.>0)
J+4		4.5	Inertia H
J+5		0.5	Speed Damping D
J+6		1.75	X_d
J+7		1.72	X_q
J+8		0.27	X'_d
J+9		1.31	X'_q
J+10		0.16	$X_l = X''_q$
J+11		0.10	X_l
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		Ψ_{kd}
K+3		Ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_l, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

$T'_d = 0.76$

$T''_d = 0.019$

Table A6.1.3-6 Dynamic Stability Data for 2005 System

(2005)

Power Technologies, Inc.

Power
Technologies,
Inc.

PLANT STEAM

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IH,KOUNT,J,K)

PUTTA-PGT (Dy Slason)

This model is located at system bus #2805 IBUS,

machine # IH,

This model uses counter # KOUNT,

and CONs starting with # J,

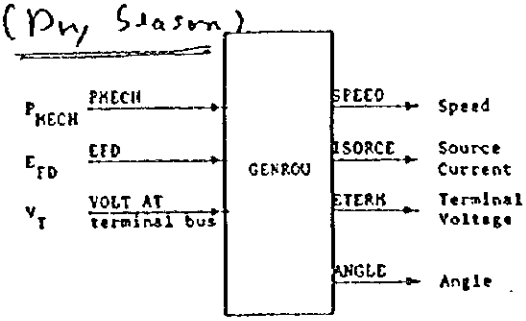
and STATEs starting with # K.

The machine MVA base is 1060 for each of

1 units * 1060 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.85	T'_{do} (sec.>0)
J+1		0.032	T''_{do} (sec.>0)
J+2		1.00	T'_{qo} (sec.>0)
J+3		0.16	T''_{qo} (sec.>0)
J+4		4.5	Inertia H
J+5		0.5	Speed Damping D
J+6		1.75	X_d
J+7		1.72	X_q
J+8		0.27	X'_d
J+9		1.31	X'_q
J+10		0.16	$X''_d = X''_q$
J+11		0.10	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		Ψkd
K+3		Ψkq
K+4		δ Speed (p.u.)
K+5		Angle (radians)

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

$T'_d = 0.76$

$T''_d = 0.019$

Table A6.1.3-6 Dynamic Stability Data for 2005 System

for all the generators

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Power
Technologies,
Inc.

PTI POWER SYSTEM SIMULATOR

SEXS

(Simplified Excitation System)

CALL SEXS (IBUS,IM,KOUNT,J,K)

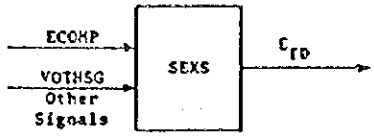
This model is connected at system bus #_____IBUS,

machine #_____IM.

This model uses counter #_____KOUNT,

and CONs starting at #_____J,

and STATEs starting at #_____K.



CONs	#	Value	Description
J		0.1	T_A/T_B
J+1		10	T_B (>0) (sec)
J+2		200	K
J+3		0.05	T_E (sec)
J+4		0	E_{MIN} (p.u. EFD base)
J+5		3	E_{MAX} (p.u. EFD base)

STATEs	#	Description
K		First integrator
K+1		Second integrator

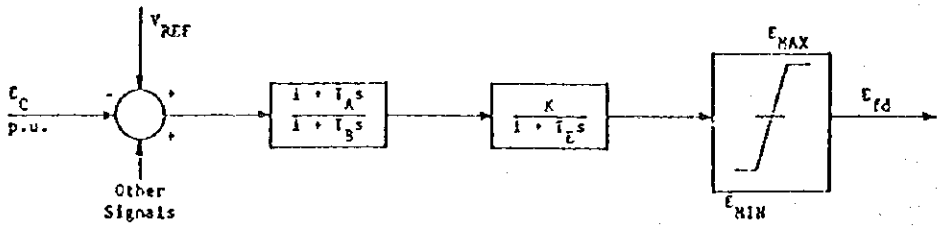


Table A6.1.4 - 1 Data of Planned Transmission Lines by the End of 2010

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
Data modification for the system in 2010 year														
Newly Add														
1		AVISS-1	EHELI-1	132	Bear	17.0	2	2.0811	6.7351	0.0490	1.1944	3.8654	0.8538	
2		AVISS-1	EHELI-1	132	Bear	17.0		2.0811	6.7351	0.0490	1.1944	3.8654	0.8538	
3		EHELI-1	RATNA-1	132	Bear	25.0	2	3.0604	9.9046	0.0721	1.7564	5.6845	1.2563	
4		EHELI-1	RATNA-1	132	Bear	25.0		3.0604	9.9046	0.0721	1.7564	5.6845	1.2563	
5		TRINC-1	KILIN-1	132	Lynx	140.0	2	24.7117	57.0748	0.3917	14.1826	32.7564	6.8250	
6		TRINC-1	KILIN-1	132	Lynx	140.0		24.7117	57.0748	0.3917	14.1826	32.7564	6.8250	
7		KESBE-D1	KESBE-1	132	Lynx	1.0	2	0.1765	0.4077	0.0028	0.1013	0.2340	0.0488	
8		KESBE-D2	KESBE-1	132	Lynx	1.0		0.1765	0.4077	0.0028	0.1013	0.2340	0.0488	
9		KESBE-D3	KESBE-1	132	Lynx	1.0	2	0.1765	0.4077	0.0028	0.1013	0.2340	0.0488	
10		KESBE-D4	KESBE-1	132	Lynx	1.0		0.1765	0.4077	0.0028	0.1013	0.2340	0.0488	
11		BIYAG-1	IMBULG-1	132	Zebra	12.0	2	0.9059	4.6040	0.0358	0.5199	2.6423	0.6238	
12		BIYAG-1	IMBULG-1	132	Zebra	12.0		0.9059	4.6040	0.0358	0.5199	2.6423	0.6238	
13		VEYAN-1	PANNA-1	132	Zebra	20.0	2	1.5098	7.6733	0.0596	0.8665	4.4039	1.0385	
14		VEYAN-1	PANNA-1	132	Zebra	20.0		1.5098	7.6733	0.0596	0.8665	4.4039	1.0385	
15		TRINC-P2	N-HABA-2	220	4 x Zebra	95.0	2	1.7928	23.2247	0.4331	0.3704	4.7985	20.9620	
16		TRINC-P2	N-HABA-2	220	4 x Zebra	95.0		1.7928	23.2247	0.4331	0.3704	4.7985	20.9620	
17		N-GALL-1	BOOS-1	132	2 x Zebra	12.0	2	0.4529	3.2542	0.0500	0.2599	1.8677	0.8712	
18		N-GALL-1	BOOS-1	132	2 x Zebra	12.0	2	0.4529	3.2542	0.0500	0.2599	1.8677	0.8712	
19		N-GALL-1	BOOS-1	132	2 x Zebra	12.0		0.4529	3.2542	0.0500	0.2599	1.8677	0.8712	
20		TRINC-P1	TRINC-1	132	2 x Zebra	2.0	2	0.0755	0.5424	0.0083	0.0433	0.3113	0.1446	
21		TRINC-P1	TRINC-1	132	2 x Zebra	2.0		0.0755	0.5424	0.0083	0.0433	0.3113	0.1446	
22		N-HABA-2	WARIYA-2	220	4 x Zebra	80.0	2	1.5098	19.5576	0.3647	0.3119	4.0408	17.6515	
23		N-HABA-2	WARIYA-2	220	4 x Zebra	80.0		1.5098	19.5576	0.3647	0.3119	4.0408	17.6515	
24		WARIYA-2	VEYAN-2	220	4 x Zebra	65.0	2	1.2267	15.8906	0.2963	0.2535	3.2832	14.3409	
25		WARIYA-2	VEYAN-2	220	4 x Zebra	65.0		1.2267	15.8906	0.2963	0.2535	3.2832	14.3409	
26		VEYAN-2	PADUK-2	220	2 x Zebra	37.4	2	1.4116	11.2466	0.1400	0.2917	2.3237	6.7760	
27		VEYAN-2	PADUK-2	220	2 x Zebra	37.4		1.4116	11.2466	0.1400	0.2917	2.3237	6.7760	
28		VICTO-2	N-POLP-2	220	2 x Zebra	40.0	2	1.5098	12.0285	0.1498	0.3119	2.4852	7.2503	
29		VICTO-2	N-POLP-2	220	2 x Zebra	40.0		1.5098	12.0285	0.1498	0.3119	2.4852	7.2503	
30		N-POLP-2	PADUK-2	220	2 x Zebra	60.0	2	2.2646	18.0427	0.2247	0.4679	3.7278	10.8755	
31		N-POLP-2	PADUK-2	220	2 x Zebra	60.0		2.2646	18.0427	0.2247	0.4679	3.7278	10.8755	
32		PADUK-2	PANNI-2	220	4 x Zebra	18.0	2	0.3397	4.4005	0.0821	0.0702	0.9092	3.9736	
33		PADUK-2	PANNI-2	220	4 x Zebra	18.0		0.3397	4.4005	0.0821	0.0702	0.9092	3.9736	
34		MATUG-2	PANNI-2	220	2 x Zebra	45.0	2	1.6985	13.5320	0.1685	0.3509	2.7959	8.1554	
35		MATUG-2	PANNI-2	220	2 x Zebra	45.0		1.6985	13.5320	0.1685	0.3509	2.7959	8.1554	
36		BOOS-2	MATUG-2	220	2 x Zebra	53.7	2	2.0269	16.1482	0.2011	0.4188	3.3364	9.7332	
37		BOOS-2	MATUG-2	220	2 x Zebra	53.7		2.0269	16.1482	0.2011	0.4188	3.3364	9.7332	
38		KELAN-1	SUB-B-1	132	Cu 500	3.5	1	0.1428	0.3318	0.4508	0.0820	0.1904	7.8547	
39		N-POLP-1	POLPI-1	132	2 x Zebra	4.0	2	0.1510	1.0847	0.0167	0.0867	0.6225	0.2910	
40		N-POLP-1	POLPI-1	132	2 x Zebra	4.0		0.1510	1.0847	0.0167	0.0867	0.6225	0.2910	

Table A6.1.4 - 1 Data of Planned Transmission Lines by the End of 2010

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R (100 MVA Base (%))	X (100 MVA Base (%))	Y (100 MVA Base (%))	Note
Modification														
41		PANNI-1	KESBE-D1	132	Goat	6.0	2	0.5989	2.3386	0.0176	0.3437	1.3422	0.3067	Replacement of
42		PANNI-1	KESBE-D2	132	Goat	6.0		0.5989	2.3386	0.0176	0.3437	1.3422	0.3067	PANAD-D1 & 2 to
43		KESBE-D3	PANAD-D1	132	Goat	6.3	2	0.6288	2.4556	0.0185	0.3609	1.4093	0.3223	PANNI-1 lines
44		KESBE-D4	PANAD-D2	132	Goat	6.3		0.6288	2.4556	0.0185	0.3609	1.4093	0.3223	
45		KELAN-1	SUB-B-1	132	Cu 500	3.5	1	0.1428	0.3318	0.4508	0.0820	0.1904	7.8547	Replacement of
46		SUB-B-1	FORT-1	132	Cu 500	1.4	1	0.0571	0.1327	0.1803	0.0328	0.0762	3.1415	KELAN-1 - FORT-1 line
47		N-HABA-2	N-ANUR-2	220	Zebra	50.0	2	3.7744	20.6599	0.1379	0.7798	4.2686	6.6744	
48		N-HABA-2	N-ANUR-2	220	Zebra	50.0		3.7744	20.6599	0.1379	0.7798	4.2686	6.6744	
49		N-HABA-2	MATAL-2	220	Zebra	60.0	2	4.5293	24.7918	0.1655	0.9358	5.1223	8.0102	
50		N-HABA-2	MATAL-2	220	Zebra	60.0		4.5293	24.7918	0.1655	0.9358	5.1223	8.0102	
51		MATAL-2	KOTMA-2	220	Zebra	53.0	2	4.0009	21.8994	0.1462	0.8266	4.5247	7.0761	
52		MATAL-2	KOTMA-2	220	Zebra	53.0		4.0009	21.8994	0.1462	0.8266	4.5247	7.0761	
53		MATAL-1	UKUWE-1	132	Lynx	26.0	2	4.5893	10.5996	0.0727	2.6339	6.0833	1.2667	Replacement of
54		MATAL-1	UKUWE-1	132	Lynx	26.0		4.5893	10.5996	0.0727	2.6339	6.0833	1.2667	UKUWE-1 - HABAR-1
55		MATAL-1	HABAR-1	132	Lynx	56.3	1	9.9376	22.9522	0.1575	5.7034	13.1728	2.7443	UKUWE-1 - ANURA-1
56		MATAL-1	ANURA-1	132	Lynx	105.2	1	18.5691	42.8876	0.2943	10.6572	24.6141	5.1279	lines
57		ANGODA-1	AVISS-1	132	Lynx	25.4	2	4.4834	10.3550	0.0711	2.5731	5.9430	1.2388	
58		ANGODA-1	AVISS-1	132	Lynx	25.4		4.4834	10.3550	0.0711	2.5731	5.9430	1.2388	
59		AVISS-1	N-POLP-1	132	Lynx	39.0	1	6.8840	15.8994	0.1091	3.9509	9.1250	1.9010	Replacement of
60		AVISS-1	SITHA-1	132	Lynx	10.0	1	1.7651	4.0768	0.0280	1.0130	2.3398	0.4879	
61		SITHA-1	N-POLP-1	132	Lynx	29.0	1	5.1188	11.8226	0.0811	2.9378	6.7852	1.4131	SITHA-1 - POLPI-1
62		ANGODA-1	KOLON-1	132	Lynx	6.5	2	1.1473	2.6499	0.0182	0.6585	1.5208	0.3171	AVIS-1T1 -POLPI-1 lines
63		ANGODA-1	KOLON-1	132	Lynx	6.5		1.1473	2.6499	0.0182	0.6585	1.5208	0.3171	
		Node name "THULH-T1" and "THULH-T2" shall be replaced by "AGURU-1".												
		Node name "KILIN-T1" and "KILIN-T2" shall be replaced by "KILIN-1"												

Table A6.1.4 - 2 Data of Planned Transformers by the End of 2010

No.	Node (H)igh Voltage	Node (L)ow Voltage	Node (M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	Rated Voltage (kV) L	Rated Voltage (kV) M	Rated Capacity (MVA) H	Rated Capacity (MVA) L	Rated Capacity (MVA) M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base		Tap (%, nos) Highest	Tap (%, nos) Lowest	Tap (%, nos) Nos.
Data modification for the system in 2010 year																	
Newly Add (new construction)																	
1	PANNA-1	PANNA-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
2	IMBULG-1	IMBULG-3		4	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
3	ANGODA-1	ANGODA-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
4	KESBE-1	KESBE-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
5	AGURU-1	AGURU-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
6	EHELI-1	EHELI-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
7	SUB-B-1	SUB-B-11		2	132.0	11.0		63.0	63.0		H-L	10.00	(63.0)	15.87	H	5.0	-15.0	17
8	TRINC-P2	TRINC-G		3	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
9	TRINC-P2		TRINC-P1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
10	MATAL-2		MATAL-1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
11	MATUG-2	MATUG-TT	MATUG-1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
											H-L	6.00	(50.0)	12.00				
											M-L	5.00	(50.0)	10.00				
12	BOOS-2		BOOS-1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00	(150.0)	4.00	H	15.0	-15.0	21
13	BOOS-1	BOOS-3		2	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
14	BOOS-2	BOOS-G		1	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
15	N-POLP-2		N-POLP-1	2	220.0	33.0	132.0	150.0	50.0	150.0	H-L	6.00	(150.0)	4.00	H	15.0	-15.0	21
Replacement or Augmentation																	
16	CHUNN-1	CHUNN-3		1	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
17	CHUNN-1	CHUNN-3		2	132.0	33.0		30.0	30.0		H-L	10.00	(30.0)	33.33	H	5.0	-15.0	17
18	CHILL-1	CHILL-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	10.5	-15.0	18
19	KULIYA-1	KULIYA-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
20	KATANA-1	KATANA-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
21	ANIYA-1	ANIYA-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
22	K-NIYA-1	K-NIYA-3		3	132.0	11.0		63.0	63.0		H-L	10.00	(63.0)	15.87	H	5.0	-15.0	17
23	GONAWA-1	GONAWA-3		4	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17
24	ATHUR-1	ATHUR-3		3	132.0	33.0		31.5	31.5		H-L	10.00	(31.5)	31.75	H	5.0	-15.0	17

Notes:
1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.4 - 2 Data of Planned Transformers by the End of 2010

No.	Node (H)igh Voltage	Node (L)ow Voltage	Node (M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	Rated Voltage (kV) L	Rated Voltage (kV) M	Rated Capacity (MVA) H	Rated Capacity (MVA) L	Rated Capacity (MVA) M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base	Tap (%, nos)	Highest	Lowest	Nos.
25	KEGAL-1	KEGAL-3		3	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
26	DEHIWA-2	DEHIWA-3		3	220.0	33.0		63.0	63.0		H-L	13.00 (63.0)	20.63	H	5.0	-15.0	17
27	MATAR-1	MATAR-3		3	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
28	RATNA-1	RATNA-3		3	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
29	DENIY-1	DENIY-3		1	132.0	33.0		10.0	10.0		H-L	10.60 (10.0)	106.00	H	10.0	-15.0	21
30	DENIY-1	DENIY-3		1	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	5.0	-15.0	17
31	PANAD-1	PANAD-3		3	132.0	33.0		31.5	31.5		H-L	10.00 (31.5)	31.75	H	10.0	-15.0	17
32	PANNI-2	PANNI-SC	PANNI-1	3	220.0	33.0	132.0	250.0	80.0	250.0	H-M	6.00 (250.0)	2.40	H	15.0	-15.0	21
											H-L	6.00 (80.0)	7.50				
											M-L	5.00 (250.0)	2.00				
33	VEYAN-2		VEYAN-1	3	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00 (150.0)	4.00	H	15.0	-15.0	21
34	KOTUG-2	KOTUG-3	KOTUG-1	3	220.0	33.0	132.0	250.0	60.0	250.0	H-M	14.00 (250.0)	5.60	H	15.0	-5.0	13
											H-L	91.00 (250.0)	36.40				
											M-L	156.00 (250.0)	62.40				
35	N-CHIL-2		N-CHIL-1	3	220.0	33.0	132.0	150.0	50.0	150.0	H-M	6.00 (150.0)	4.00	H	15.0	-15.0	21
36	BIYAG-2	BIYAG-3	BIYAG-1	3	220.0	33.0	132.0	250.0	60.0	250.0	H-M	13.80 (250.0)	5.52	H	15.0	-5.0	13
											H-L	91.30 (250.0)	36.52				
											M-L	156.30 (250.0)	62.52				
37	VAVUNI-1	VAVUNI-3		2	132.0	33.0		10.0	10.0		H-L	10.00 (10.0)	100.00	H	5.0	-15.0	17
38	MUTHR-2	MUTHR-3		2	220.0	33.0		63.0	63.0		H-L	13.00 (63.0)	20.63	H	5.0	-15.0	17
Retirements																	
	SAPUG-1P	SAPUG-G		1	142.0	11.0		50.0	50.0		H-L	17.80 (50.0)	35.60				

Notes:
1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value
2) Shaded nodes; Not in operation

Table A6.1.4 - 3 Data of Planned Generators by the End of 2010

No.	Node	Type	No. of Unit	Rated Voltage (kV)	Rated Capacity (MVA)	Rated Output (MW)	Xd" (%)
Data modification for the system in 2010 year							
Newly Add (new construction)							
1	**Trincolalee P/S Total**				**1058.82**	**900.00**	
	TRINC-G	coal	3	11.0	352.94	300.00	16.0
2	**Boosa P/S Total**				**352.94**	**300.00**	
	BOOS-G	c. c.	1	11.0	352.94	300.00	16.0
Retirement							
1	**Sapugaskanda P/S**				**51.20**	**36.00**	
	SAPUG-G2	diesel	2	11.0	25.60	18.00	

Table A6.1.4 - 4

Data of Planned Reactive Power Sources by the End of 2010

No.	Node	Rated Voltage (kV)	Rated Capacity (MVA)	Remarks
Data modification for the system in 2010 year				
Newly Add				
1	VALAI-3	33	10.00	
2	AMPA-3	33	10.00	
3	THULH-3	33	40.00	
4	KEGAL-3	33	20.00	
5	DEHIWA-3	33	60.00	
6	INGIN-3	33	10.00	
7	K-NIYA-3	33	60.00	
8	KOTUG-3	33	40.00	Total : 60 MVA
9	BIYAG-3	33	60.00	
10	KOLON-TT	33	120.00	
11	MATUG-TT	33	80.00	
12	CHUNN-3	33	20.00	Total : 40 MVA
Total			530.00	

Table A6.1.4 - 5

Generator Output Schedule for 2010 System

No.	Node	Type	Scheduled Output (MW)	Max Output *2) (MW)
1	LAX-G	hydro	45.00	50.00
2	N-LAX-G	hydro	90.00	100.00
3	WIMAL-G	hydro	45.00	50.00
4	CANYO-G	hydro	54.00	60.00
5	POLPI-G	hydro	68.00	75.00
6	UKUWE-G	hydro	34.00	38.00
7	BOWAT-G	hydro	36.00	40.00
8	VICTO-G	hydro	189.00	210.00
9	RANDE-G	hydro	110.00	122.00
10	KOTMA-G1	hydro	121.00	134.00
11	KOTMA-G2	hydro	60.00	67.00
12	RANTE-G	hydro	44.00	49.00
13	SAMAN-G	hydro	108.00	120.00
14	KUKULE-G	hydro	70.00	78.20
15	KELA-GT1	gas	14.00	18.00
16	KELA-GT2	gas	72.00	90.00
17	KELA-GT3	gas	82.00	102.60
18	KELA-GT4	gas	19.00	23.40
19	KELA-CC1	c.c.	135.00	135.00
20	MUTHR-G	c.c.	135.00	135.00
21	N-GALL-G	gas	50.00	63.00
22	SAPU-GN1	diesel	29.00	36.00
23	SAPU-GN2	diesel	29.00	36.00
24	KHD-G	diesel	37.00	46.00
25	CHUNN-G	diesel	22.00	27.00
26	PUTTA-PG *1)	steam	540.00	540.00
27	TRINC-G	steam	810.00	810.00
28	BOOS-G	c. c.	270.00	270.00
Hydro total			1074.00	1193.20
Thermal total			2244.00	2332.00
Total of Generation			**3318.00**	**3525.20**

Notes :

*1) Slack node and one unit under maintenance

*2) Maximum output = Rated output, for hydro stations
Maximum output = Rated output x 0.9, for thermal stations

Total Demand	=	3214 (MW)
Maintenance	=	300 (MW)
Total Reserve	=	6.45 (%)
Spinning Res.	=	3.71 (%)
Hot Reserve	=	2.74 (%)

Net supply (MW) = 3218.46
(considering 3% loss of generation)

Table A6.1.4-6 Dynamic Stability Data for 2010 System

Oct. 7, 1996

Condition of Dynamic Stability Analysis

for the CASE 2010 (low A3)

1. Fault and Fault Location

Three phase fault on ; CASE NAME

1) the Trincomalee P/S - New Habarana 220 kV line at Trincomalee side, (S1, S2)
2) the Victoria - New Polpitiya 220 kV line at Victoria side, and (S3, S4)
3) the Boossa - Matugama 220 kV line at Boossa side. (S5, S6)

2. Reclosing

Three phase reclosing of single circuit of the above 220 kV lines.

Reclosing sequence

Fault -------- trip signal to CB ---------- CB trip -- (no voltage time) -- CB reclose
80 ms 80 ms 500 ms

1) Successful Reclosing
Fault --- (160 ms) --- CBs trip --- (500 ms) --- clearing fault and CBs Close

2) Unsuccessful Reclosing
Fault -- (160 ms) -- CBs trip -- (500 ms) -- CBs Close -- (160 ms) -- CBs trip

3. Generators to be Observed

1) Puttalam (PUTTA-PG)
2) Victoria (VICTO-G)
3) Kelanitissa (KELA-CC1)
4) Trincomalee (TRINC-G)
5) Boossa (BOOS-G)

4. Factors to be Observed

1) Phase Angle (reference generator : Chunnakam)
2) Terminal Voltage
3) Output Power

5. Integration Time Step

0.001 sec

6. Duration of the Calculation

3.0 sec

for all the generators

Power Technologies, Inc.

Power
Technologies,
Inc.

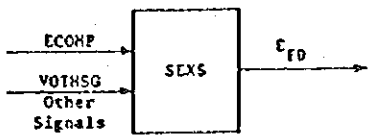
PTI POWER SYSTEM SIMULATOR

SEXS

(Simplified Excitation System)

CALL SEXS (IBUS,IH,KOUNT,J,K)

This model is connected at system bus #_____IBUS,
machine #_____IH.
This model uses counter #_____KOUNT,
and CONs starting at #_____J,
and STATEs starting at #_____K.



CONs	#	Value	Description
J		0.1	T_A/T_B
J+1		10	T_B (>0) (sec)
J+2	1	200	K
J+3		0.05	T_E (sec)
J+4		0	E_{MIN} (p.u. EFD base)
J+5		3	E_{MAX} (p.u. EFD base)

STATEs	#	Description
K		First integrator
K+1		Second integrator

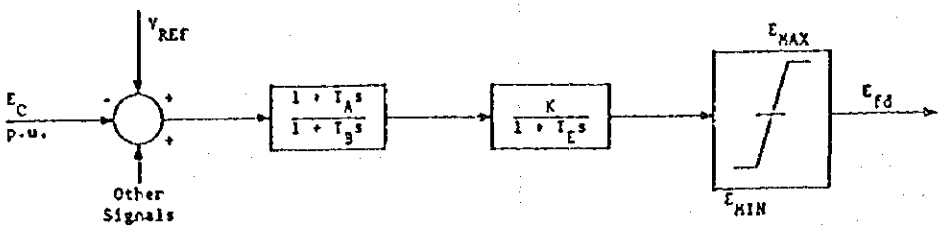


Table A6.1.4-6 Dynamic Stability Data for 2010 System

(2010)

Power Technologies, Inc.

Power Technologies, Inc.

PLANT STEAM

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IM,KOUNT,J,K)

TRINC-P2

This model is located at system bus # 12015 IBUS,

machine # _____ IM.

This model uses counter # _____ KOUNT,

and CONs starting with # _____ J,

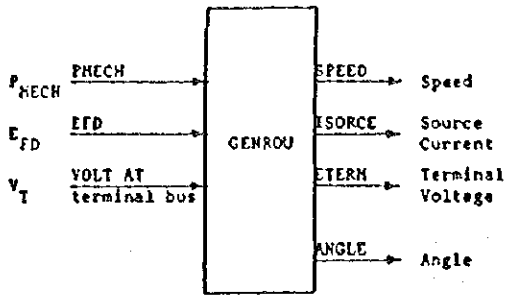
and STATEs starting with # _____ K.

The machine MVA base is 1059 for each of

1 units = 1059 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



CONs	#	Value	Description
J		6.85	T'_{do} (sec.>0)
J+1		0.032	T''_{do} (sec.>0)
J+2		1.00	T'_{qo} (sec.>0)
J+3		0.16	T''_{qo} (sec.>0)
J+4		4.5	Inertia H
J+5		0.5	Speed Damping D
J+6		1.75	X_d
J+7		1.72	X_q
J+8		0.27	X'_d
J+9		1.31	X'_q
J+10		0.16	$X''_d = X''_q$
J+11		0.10	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

STATEs	#	Description
K		E'_q
K+1		E'_d
K+2		Ψ_{kd}
K+3		Ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

$T_{d}' = 0.76$

$T_{d}'' = 0.019$

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

(2010)

Table A6.1.4-6 Dynamic Stability Data for 2010 System

(2)

Power Technologies, Inc.

Power
Technologies,
Inc.

PLANT C. C.

PTI POWER SYSTEM SIMULATOR

GENROU

(Round Rotor Generator Model)

CALL GENROU (IBUS,IM,KOUNT,J,K)

B005 - 2

This model is located at system bus I 12360 IBUS,

machine I 1 IM.

This model uses counter I _____ KOUNT,

and CONs starting with I _____ J,

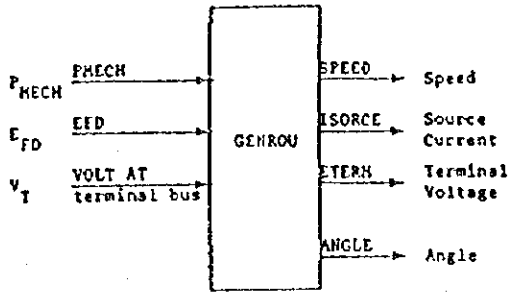
and STATEs starting with I _____ K.

The machine MVA base is 353 for each of

1 units = 353 MBASE.

ZSORCE for this machine is 0 + j 0.16 on

the above MBASE.



CONs	I	Value	Description
J		6.85	T'_{do} (sec.>0)
J+1		0.032	T''_{do} (sec.>0)
J+2		1.00	T'_{qo} (sec.>0)
J+3		0.16	T''_{qo} (sec.>0)
J+4		4.5	Inertia H
J+5		0.5	Speed Damping D
J+6		1.75	X_d
J+7		1.72	X_q
J+8		0.27	X'_d
J+9		1.31	X'_q
J+10		0.16	$X'_d = X''_q$
J+11		0.10	X_ℓ
J+12		0.03	S(1.0)
J+13		0.40	S(1.2)

X_d, X_q, X'_d, X'_q, X''_d, X''_q, X_ℓ, H, and D are in p.u., machine MVA base. X''_q must be equal to X''_d.

STATEs	I	Description
K		E'_q
K+1		E'_d
K+2		ψ_{kd}
K+3		ψ_{kq}
K+4		Δ Speed (p.u.)
K+5		Angle (radians)

$T'_d = 0.76$

$T''_d = 0.019$

Table A6.1.5 - 1 Data of Planned Transmission Lines by the End of 2015

No.	T/L Ref.	Branch from	Branch to	Voltage (kV)	Conductor	Length (km)	cct	R (Ω)	X (Ω)	Y (mS)	R 100 MVA Base (%)	X 100 MVA Base (%)	Y 100 MVA Base (%)	Note
Data modification for the system in 2015 year														
Newly Add														
1		PADUK-2	KAHAWA-2	220	4 x Zebra	90.0	2	1.6985	22.0023	0.4103	0.3509	4.5459	19.8588	
2		PADUK-2	KAHAWA-2	220	4 x Zebra	90.0		1.6985	22.0023	0.4103	0.3509	4.5459	19.8588	
3		KAHAWA-2	MAWEL-2	220	4 x Zebra	100.0	2	1.8872	24.4470	0.4559	0.3899	5.0510	22.0653	
4		KAHAWA-2	MAWEL-2	220	4 x Zebra	100.0		1.8872	24.4470	0.4559	0.3899	5.0510	22.0653	
5		BOOS-2	MAWEL-2	220	2 x Zebra	70.0	2	2.6421	18.9827	0.2915	0.5459	3.9220	14.1093	
6		BOOS-2	MAWEL-2	220	2 x Zebra	70.0		2.6421	18.9827	0.2915	0.5459	3.9220	14.1093	

Table A6.1.5 - 2 Data of Planned Transformers by the End of 2015

No.	Node (H)igh Voltage	(L)ow Voltage	(M)iddle Voltage	No. of Unit	Rated Voltage (kV) H	L	M	Rated Capacity (MVA) H	L	M	Impedance Voltage / Unit (%) between	(base MVA)	100 MVA base		Tap (%, nos) Highest	Lowest	Nos.
Data modification for the system in 2015 year																	
Newly Add																	
1	MAWEL-2	MAWEL-G		2	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
2	BALAN-1	BALAN-G		1	132.0	11.0		82.0	82.0		H-L	10.00	(82.0)	12.20	H	10.0	-5.0	7
3	ATHUR-1	ATHUR-G		1	132.0	11.0		82.0	82.0		H-L	10.00	(82.0)	12.20	H	10.0	-5.0	7
Augmentation																	
4	BOOS-2	BOOS-G		2	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
5	TRINC-P2	TRINC-G		4	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
6	CHUNN-3	CHUNN-G		1	33.0	11.0		82.0	82.0		H-L	5.50	(82.0)	6.71	H	10.0	-5.0	7
7	CHUNN-3	CHUNN-G		3	33.0	11.0		12.5	12.5		H-L	5.50	(12.5)	44.00	H	10.0	-5.0	7
8	MUTHR-2	MUTHR-G		1	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
9	MUTHR-2	MUTHR-G		1	220.0	11.0		175.0	175.0		H-L	13.00	(175.0)	7.43	H	10.0	-5.0	13
10	KELAN-2	KELA-CC1		1	220.0	11.0		350.0	350.0		H-L	13.00	(350.0)	3.71	H	10.0	-5.0	13
11	KELAN-2	KELA-CC1		1	220.0	11.0		175.0	175.0		H-L	13.00	(175.0)	7.43	H	10.0	-5.0	13
	(hereinafter total transformers capacity)																
12	ATHUR-1	ATHUR-3		1	132.0	33.0		126.0	126.0		H-L	10.00	(126.0)	7.94	H	5.0	-15.0	17
13	POLON-1	POLON-3		1	132.0	33.0		63.0	63.0		H-L	10.00	(63.0)	15.87	H	5.0	-15.0	17
14	CHUNN-1	CHUNN-3		1	132.0	33.0		123.0	123.0		H-L	10.00	(123.0)	8.13	H	5.0	-15.0	17
15	KILIN-1	KILIN-3		1	132.0	33.0		30.0	30.0		H-L	10.00	(30.0)	33.33	H	5.0	-15.0	17
16	UKUWE-1	UKUWE-3		1	132.0	33.0		94.5	94.5		H-L	10.00	(94.5)	10.58	H	5.0	-15.0	17
17	KURUN-1	KURUN-3		1	132.0	33.0		94.5	94.5		H-L	10.00	(94.5)	10.58	H	5.0	-15.0	17
18	PUTTA-1	PUTTA-3		1	132.0	33.0		94.5	94.5		H-L	10.00	(94.5)	10.58	H	5.0	-15.0	17
19	BOLAW-1	BOLAW-3		1	132.0	33.0		126.0	126.0		H-L	10.00	(126.0)	7.94	H	5.0	-15.0	17
20	CHILL-1	CHILL-3		1	132.0	33.0		126.0	126.0		H-L	10.00	(126.0)	7.94	H	5.0	-15.0	17
21	KULIYA-1	KULIYA-3		1	132.0	33.0		126.0	126.0		H-L	10.00	(126.0)	7.94	H	5.0	-15.0	17
22	PANNA-1	PANNA-3		1	132.0	33.0		126.0	126.0		H-L	10.00	(126.0)	7.94	H	5.0	-15.0	17
23	SAPUG-1	SAPUG-3		1	132.0	33.0		220.5	220.5		H-L	10.00	(220.5)	4.54	H	5.0	-15.0	17

Notes:

1) Sources; * : CEB's record, ** : Name plate at the site, none : Assumed value