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IECO INTERNATIONAL ENGINEERING COMPANY, INC.
220 MONTGOMERY ST. • SAN FRANCISCO • CALIFORNIA 94104

KAJAKAI

161 KV TRANSMISSION LINE STUDY

February, 1971

SUMMARY AND RECOMMENDATIONS

This study has been made in response to a request contained in a letter dated December 21, 1970, from Mr. Hamidullah Hamid, General President of Da Afghanistan Breshna Moassessa, to Mr. Dale Shockley of IECO. Its purpose is to investigate three questions pertaining to the Kajakai transmission line:

1. Whether the new stepdown substation serving the Lashkar Gah - Girishk area can be located at a point called the Junction, where the Kajakai-Kandahar line turns east, approximately 2 km north of the Herat-Kandahar road, with 44 kv feeders to Lashkar Gah and Girishk; or whether the substation should be located closer to the load centers and connected to the Kajakai - Kandahar line with a 161 kv tap.

2. Whether a 44 kv tie from the new substation to the switchyard of the Girishk plant is necessary or desirable.

3. Whether a disconnect switch should be installed on the Kandahar line on the load side of the Lashkar Gah - Girishk substation or tap. During the outage of this line section, this switch would isolate it, thereby enabling Kajakai power to flow to the Lashkar Gah - Girishk area.

In regard to Item 1, above, the most economical location of the substation serving the Lashkar Gah - Girishk area is at the Junction because it involves the least length of high voltage (161 kv) transmission line. Therefore, if

calculations on the electrical network indicate that operating conditions are acceptable with the substation at this location, additional calculations for the substation at other locations are not necessary. To determine what these operating conditions would be, calculations were made for system loads as given in the USAID letter of November 11, 1970, as given in the ABM letter of December 21, 1970, and as given by increasing the loads proportionately up to the practical limit of the 161 kv transmission line.

To investigate both this item and Item 2, above, either extensive hand calculations or digital computer load flow calculations could be used. The latter method was chosen because it is considerably less time consuming, especially when a number of small changes (such as increases in loads) are applied to a single network. The computer calculations culminated in 18 load flow cases which represent realistic operating conditions.

Based on these calculations we make the following recommendations:

- Locate the Lashkar Gah - Girishk substation at the Junction.

- Install the 44 kv tie between the substation and Girishk when the peak load at Girishk reaches about 3 MW.

- Install a second 44 kv circuit between Lashkar Gah and the Junction substation when the load at Lashkar Gah reaches 14 MW.

- Install shunt capacitance in parallel with the loads and change transformer fixed taps as shown on the table on page 12.

In regard to Item 3, above, our recommendation is to install a disconnect switch at the Junction on the line to Kandahar. In case of an outage of the Junction - Kandahar line section, due to a fault, or to repair or maintenance work being performed on the line, this section could be isolated by opening this switch, thereby enabling Kajakai power to be transmitted to the Lashkar Gah - Girishk area. The installed cost of the switch is about $9,000 and, if the substation is located at the Junction, it could be mounted on the substation structure.

On succeeding pages 4 through 9 there is a general discussion of the load flow work followed by a description of each case. Pages 10 and 11 are respectively a plan and a single diagram of the network studied and page 12 contains a table summarizing the load flow data. On appendix pages A1 through A72 are reproduced significant computer printout data referred to in the discussion.

DISCUSSION

General

To determine the feasibility of locating a substation to serve the Lashkar Gah - Girishk area at the Junction and the necessity of a 44 kv tie from the substation to Girishk, a series of digital computer load flow calculations was made. The system, consisting of the Kajakai Powerplant, the 161 kv transmission line, the load centers at Kandahar, Lashkar Gah and Girishk, and the associated 44 kv feeders, was studied under increasing loads up to the practical limit of the 161 kv line.* If operating conditions can be shown to be acceptable throughout this load range, the Junction substation location will have been proven satisfactory.

In Cases 1 and 2, without the tie to Girishk, and Cases 1T and 2T, with the tie, the loads assumed are those given in the USAID and ABM letters,

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*The capacity of the Kajakai - Kandahar circuit as determined from this load flow study is in the order of 115 MW, which is equal to the temporary overload capability of the Kajakai Powerplant at the completion of Phase II of its development. At greater loads than this (see Case 10T, in the table on page 12 and as described below) the power angles are good but the voltage at Kandahar is extremely sensitive to the power factor of the load. Since shunt capacitors are switched in discreet steps, they would not provide adequate control over the receiving end voltage. For greater power transfer over this circuit, either a generator or a synchronous condensor would be required at Kandahar.

respectively. In subsequent cases the loads are increased in even increments of the ratings of the generators at Kajakai (see columns 5 and 9 of the Table, page 12). The load distribution among the three load centers is assumed to continue in approximately the same proportion: Lashkar Gah demand is 1-1/2 times Girishk demand and the Kandahar demand is three times the sum of the other two substations.

In all cases 666.6 MCM ACSR was assumed for the 161 kv line conductor and 266.8 MCM ACSR was assumed for the conductor of the new 44 kv lines.

The operating conditions considered acceptable are as follows:

1. Voltage - Receiving substation voltages may vary from 95% to 105% of the rated value (161 kv, 44 kv and 13.8 kv). For the protection of the equipment, voltages may not exceed 105% of rated value, except on the high voltage side of the Kajakai step-up transformers, which have 5% above-rated voltage taps. The upper limit here is 105% of the tap rating (i.e., 1.05 x 1.05 = 110% of 161 kv) in accordance with NEMA standard C57.12.00, Section 2.4. The minimum voltage at the Kajakai generator terminals is limited to 90% of rated value because of the necessity of maintaining adequate voltage to the plant auxiliaries.

2. Equipment Loading - Transformer capacity is added when the loading exceeds the rating of the installed equipment. The generators are loaded to their rating for 80° C temperature rise (115% of rated capacity at 65° C).

3. The transformer fixed taps used to provide acceptable voltages at peak load may cause over-voltages at minimum load. Therefore, for each incremental peak load which requires a change in tap setting, a minimum load case is investigated. The minimum loads are assumed to be 10% of the peak loads. In all minimum load cases except Case 9TA it is assumed that only one generator is on line at Girishk.

To produce acceptable operating conditions the following system parameters were controlled:

1. The Kajakai generator terminal voltage was varied between 104% or 105% under peak load to from 94% to 90% under minimum load to maintain acceptable voltages at the receiving substations. In practice this would be done either by manually adjusting the voltage regulator rheostats at Kajakai upon receipt of voltage information from Kandahar or automatically by means of Load Drop Compensators connected to the Kajakai voltage regulators.

2. Transformer fixed taps were adjusted. Since the transformer must be de-energized to make this change, it was assumed that the taps can be modified to conform with peak load changes from one year to the next but not to conform to the change in load that occurs from minimum to peak within any given year.

3. Shunt capacitance was added as required to reduce the transmission of reactive power, thereby limiting the voltage drop in the transmission

system. This capacitance is switched on and off incrementally to conform with the requirements of the daily load cycle.

4. Transmission capacity in the form of a 44 kv tie from the Junction substation to Girishk and a second 44 kv circuit from the Junction substation to Lashkar Gah are added when needed.

Load Flow Case 1 (Appendix pages A1-A4)

Load Flow Case 2 (Appendix pages A5-A8)

Load Flow Case 3X (Appendix pages A9-A12)

Load Flow Case 3Y (Appendix pages A13-A16)

These cases investigate the network without the tie from the Junction substation to Girishk. Case 1 is based on the loads projected for 1975 in the USAID letter and Case 2 is based on the 1967 Beck Report projection for 5 years subsequent to Kajakai construction (recommended in the ABM letter). Cases 3X and 3Y represent loads corresponding to 100% loading of two generators at Kajakai.

From the appendix pages and from the summary in the table, it is seen that conditions are acceptable in Cases 1 and 2. In case 3Y, however, excessive over-voltages exist at the Junction. To reduce these voltages, the Kajakai generator terminal voltage was reduced to 104% and the Junction transformer tap was changed from 95% to 97.5% in Case 3Y. The result is to lower the voltages at the Junction within the acceptable limit but also to create an excessive under-voltage at Girishk.

It is therefore evident that when the Girishk load exceeds about 3 MW, some measure other than voltage control at Kajakai or transformer tap changing at the Junction is required to produce acceptable voltages simultaneously at Girishk and at the Junction.

Load Flow Case 1T (Appendix pages A17-A20)

Load Flow Case 2T (Appendix pages A21-A24)

Load Flow Case 3T (Appendix pages A25-A28)

These cases are analagous to Cases 1, 2, 3X and 3Y, above, except that the 44 kv, 13 mile tie between the Junction substation and Girishk has been installed. It can be seen that all the voltages are within acceptable limits.

The tie to Girishk therefore solves the problem indicated in Cases 3X and 3Y. Because this circuit provides a second path for Kajakai power to the entire Lashkar Gah - Girishk area, it increases the reliability of supply to these loads. It may therefore be advisable to install this tie before the time required as indicated by the load flow study.

Load Flow Case 4T (Appendix pages A29-A32)

Load Flow Case 5T (Appendix pages A33-A36)

Load Flow Case 6T (Appendix pages A37-A40)

Load Flow Case 7T (Appendix pages A41-A44)

Load Flow Case 8T (Appendix pages A45-A48)

Load Flow Case 9T (Appendix pages A49-A52)

Load Flow Case 10T (Appendix pages A53-A56)

These cases continue the investigation of network performance as loads are progressively increased. Operating conditions are acceptable through Case 10T, which represents Kajakai generation at the maximum capability of Phase II development. Load flow calculations with greater loads were made, but, as stated above, the voltage at Kandahar becomes very sensitive to the power factor of the load (and/or the amount of shunt capacitance connected). Therefore, we consider this a conservative loading limit.

Three points indicated on the table are worthy of note:

1. As the loading is increased, transformer capacity is added and changes are made in the transformer taps.

2. Starting with Case 5T shunt capacitance is added at the loads.

3. When the Lashkar Gah load exceeds 14 MW, Case 8T, a second circuit is required from that substation to the Junction substation.

Load Flow Case 1TA (Appendix pages A57-A60)

Load Flow Case 3TA (Appendix Pages A61-A64)

Load Flow Case 4TA (Appendix pages A65-A68)

Load Flow Case 9TA (Appendix pages A69-A72)

These are the minimum load cases corresponding to the peak load cases having the same numbers. They indicate that the transformer fixed tap settings required for acceptable voltages under peak load conditions do not produce excessive over-voltages under minimum load conditions.

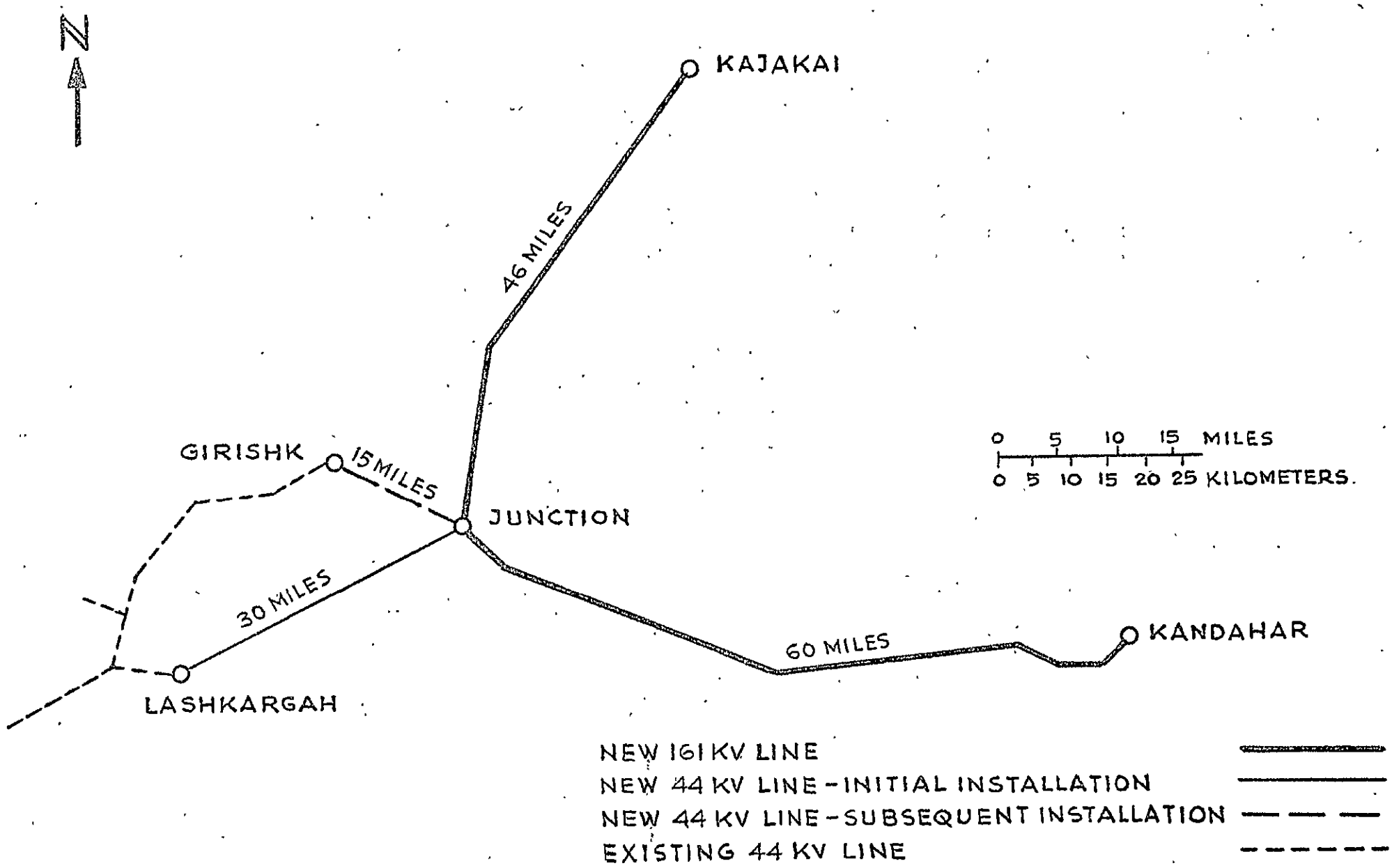

FIGURE 1 : KAJAKAI TRANSMISSION SYSTEM PLAN

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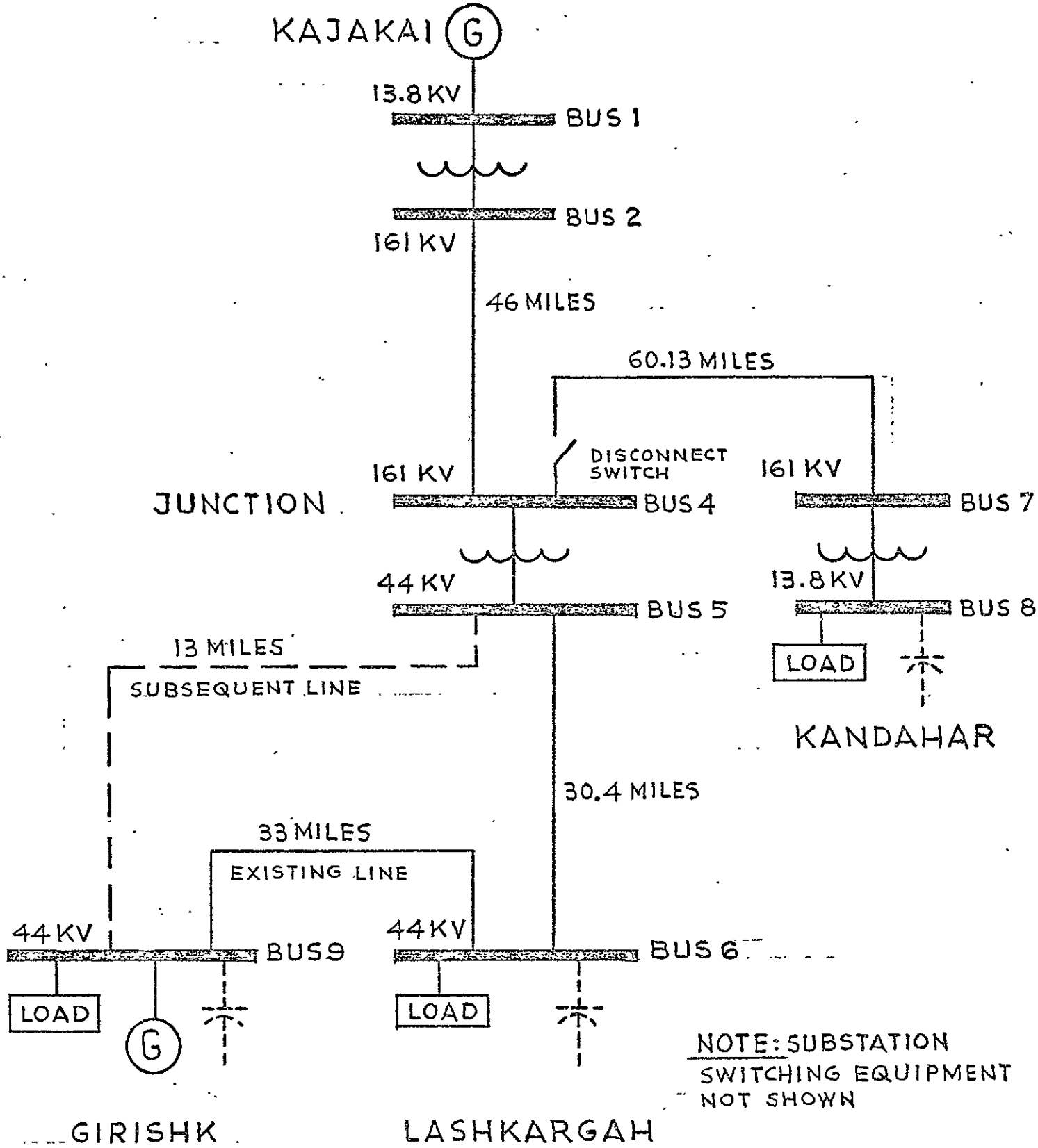

FIGURE 2 : KAJAKAI TRANSMISSION SYSTEM SIMPLIFIED SINGLE LINE DIAGRAM

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TABLE

SUMMARY OF LOAD FLOW STUDY

CASE	PRINTOUT NO PW	DATE	LINE VOLTAGE KV	GEN UNITS	KAJAKAI GENERATING CAPACITY MW	MVAR	MVA	GEN % CAPACITY	ACTUAL GENERATION MW+MVAR	P.F.	TRANSFORMER CAPACITY MVA	TAP SETTING	JUNCTION TRANSFORMER CAPACITY MVA	TAP SETTING	KANDAHAR TRANSFORMER CAPACITY MVA	TAP SETTING	LOAD 0.85 P.F. MW+MVAR	SH. CAP. MVAC	LASHKARG LOAD 0.85 P.F. MW+MVAR	SH. CAP MVAC	GIRISHK ACTUAL GENERATION MW+MVAR	LOAD 0.85 P.F. MW+MVAR	SH. CAP MVAC	ACTUAL GENERATION TOTAL KAJAKAI+GIRISHK MW+MVAR	SYSTEM LOSS MW	% GEN.	PER UNIT BUS VOLTAGES KAJAKAI B1 LV	B2 HV	B4 HV	B5 LV	B6	JUNCTION B9	LASH. B7 HV	GIR. B8 LV	KANDAHAR	NOTES
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
WITHOUT JUNCTION - GIRISHK TIE																																					
1	810	1-19	161/44	2				60	17.34-1.31	0.997	54/72	1.050	7.5/9.375	1.000	21/28	1.000	14.40+8.92		3.00+1.86		2.40+1.80	2.00+1.24		19.74+0.49	0.34	1.72	1.000	1.051	1.045	1.034	1.011	1.030	1.031	0.989	NO.1
2				2				80	24.38+8.39	0.976				1.000		1.000	19.20+11.90		4.12+2.55		2.40+1.80	2.75+1.70		26.78+7.19	0.71	2.66	1.020	1.061	1.047	1.018	0.971	0.964	1.024	0.966	NO.2
3X	810	1-19		2	33.00	24.75	41.25	100	31.40+11.98	0.934				0.950		0.950	24.00+14.87		5.15+3.18		2.40+1.80	3.44+2.12		33.80+13.78	1.21	3.58	1.050	1.082	1.060	1.073	1.009	0.977	1.030	1.014	
3Y	320	2-25	161/44	2	33.00	24.75	41.25	100	31.47+12.72	0.927	54/72	1.050	7.5/9.375	0.975	21/28	0.950	24.00+14.87		5.15+3.18		2.40+1.80	3.44+2.12		33.87+14.52	1.28	3.80	1.040	1.070	1.047	1.028	0.960	0.926	1.016	0.999	
WITH JUNCTION - GIRISHK TIE																																					
1T	810	1-19	161/44	2				60	17.34-1.47	0.996	54/72	1.050	7.5/9.375	1.000	21/28	1.000	14.40+8.92		3.00+1.86		2.40+1.80	2.00+1.24		19.74+0.33	0.34	1.72	1.000	1.051	1.046	1.036	1.012	1.037	1.031	0.989	
1TA	320	2-25		2				6	0.80-12.56	0.063							1.44+0.89		0.30+0.19		1.20+0.90	0.20+0.12		2.00-11.66	0.06	3.00	0.930	0.999	1.010	1.026	1.027	1.032	1.014	1.010	
2T	810	1-19		2				80	24.34+5.09	0.975				1.000		1.000	19.20+11.90		4.12+2.55		2.40+1.80	2.75+1.70		26.74+6.89	0.67	2.60	1.020	1.061	1.047	1.021	0.984	1.018	1.025	0.967	
3T	320	2-25		2	33.00	24.75	41.25	100	31.30+12.12	0.932				0.975		0.950	24.00+14.87		5.15+3.18		2.40+1.80	3.44+2.12		33.70+13.92	1.11	3.28	1.040	1.071	1.049	1.035	0.958	1.027	1.018	1.001	
3TA	320	2-25		2				10	2.11-11.45	0.181			7.5/9.375	0.975	21/28		2.40+1.49		0.52+0.32		1.20+0.90	0.34+0.21		3.31-10.55	0.05	1.51	0.920	0.986	0.997	1.035	1.034	1.040	0.999	1.045	
4T	810	1-19		3	49.50	37.12	61.87	100	48.17+31.21	0.839			15/18.75	0.950	42/56		36.00+22.31		7.20+4.47		2.40+1.80	4.80+2.97		50.57+33.01	2.57	5.08	1.050	1.052	1.008	1.024	0.954	1.008	0.956	0.931	
4TA	320	2-25		3				10	3.64-10.07	0.338	54/72			0.950		0.950	3.60+2.23		0.72+0.45		1.20+0.52	0.48+0.30		4.84-9.55	0.04	0.84	0.920	0.984	0.992	1.047	1.043	1.050	0.992	1.040	
5T	750	1-27		5				60	58.60+21.34	0.940	108/144		15/18.75	0.975	42/56	0.975	43.20+26.80	12.3	9.00+5.58	2.7	2.40+1.80	6.00+3.72	—	61.00+23.14	2.80	4.60	1.050	1.084	1.047	1.039	0.966	1.018	1.006	0.993	NO.3
6T	750	1-27		5				80	79.88+19.64	0.971			22.5/28.12		63/84		57.60+35.70	28.2	12.00+7.44	7.2	2.40+1.80	8.00+4.96	4.2	82.28+21.44	4.68	5.67	1.020	1.054	1.017	1.034	0.960	1.020	0.975	0.980	
7T	210	2-8		5	99.50	74.62	124.37	100	100.05+25.10	0.970							72.00+44.62	42.0	14.00+8.68	8.1	2.40+1.80	9.60+5.95	5.1	102.45+26.90	6.85	6.67	1.046	1.077	1.034	1.047	0.956	1.027	0.992	1.004	
8T				5				105	105.42+38.73	0.935							75.60+46.90	42.0	14.70+9.11	8.1	2.40+1.80	10.08+6.25	5.1	107.82+40.53	7.44	6.90	1.050	1.071	1.013	1.025	0.976	1.006	0.985	0.954	NO.4
9T				5				110	110.56+33.95	0.956						0.950	79.20+49.10	46.2	15.42+9.55	8.1	2.40+1.80	10.56+6.55	5.1	112.96+35.75	7.78	6.90	1.050	1.075	1.022	1.031	0.978	1.009	0.974	1.010	
9TA				5				11	8.21-7.18	0.725							7.92+4.91		1.54+0.96		2.40+1.80	1.06+0.66		10.61-5.58	0.09	0.85	0.940	0.994	0.997	1.026	1.016	1.033	0.992	1.037	
10T	210	2-8	161/44	5				115	116.01+33.64	0.961	108/144	1.050	22.5/28.12	0.975	63/84	0.950	82.80+51.32	50.7	16.12+10.02	9.0	2.40+1.80	11.04+6.85	6.0	118.41+35.44	8.45	7.13	1.050	1.075	1.023	1.035	0.982	1.015	0.976	1.016	

NOTES :
1. LASHKARG AND GIRISHK LOADS PER LETTER OF USAID (NOV.11 1970)
2. LASHKARG AND GIRISHK LOADS PER LETTER OF ABM (DEC.21 1970)
3. SHUNT CAPACITANCE ADDED ON THIS AND SUCCEEDING CASES
4. SECOND LINE ADDED FROM BUS5 TO BUS6 (JUNCTION-LASHKARGAH)

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	MW (GEN/LOAD)	MVAR (GEN/LOAD)	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.000	30.0	17.34	-1.31S								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	17.34	-1.31	17			5
				SHNT	0.00	0.00								
				RESD	0.00	.00								
2	KAJAKAI	0	1.051	28.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-17.31	1.79	17		1.050	5
				SHNT	0.00	0.00	4	JUNCTION	17.31	-1.79	17	7		1
				RESD	.00	-.00								
4	JUNCTION	0	1.045	27.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-17.24	-3.76	18	7		1
				SHNT	0.00	0.00	5	JUNCTION	2.67	.82	3		1.000	6
				RESD	.00	-.00	7	KANDAHAR	14.57	2.95	15	6		2
5	JUNCTION	0	1.034	25.8	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-2.66	-.74	3			6
				SHNT	0.00	0.00	6	LASHKARG	2.66	.74	3	7		3
				RESD	-.00	-.00								
6	LASHKARG	0	1.011	24.9	.00	.00								
		-0		LOAD	3.00	1.86	5	JUNCTION	-2.62	-1.00	3	8		3
				SHNT	0.00	0.00	9	GIRISHK	-.38	-.86	1	6		4
				RESD	-.00	-.00								
7	KANDAHAR	0	1.031	26.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-14.48	-10.11	18	7		2
				SHNT	0.00	0.00	8	KANDAHAR	14.48	10.11	18		1.000	7
				RESD	.00	-.00								
8	KANDAHAR	0	.989	23.2	.00	.00								
		-0		LOAD	14.40	8.92	7	KANDAHAR	-14.40	-8.92	17			7
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

A1

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4. SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.030	24.0	2.40	1.80H								
		-0		LOAD	2.00	1.24	6	LASHKARG	.40	.56	1	4		4
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A2

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.077	.087	.045	.018	.024	.007	.080		
		-5.550	-7.161	-.260	-.305	.476	.081	1.189		

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
19.74	.49	19.40	12.02	.34	-11.53	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

VV

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.020	30.0	24.38	5.39S								
		0		LOAD	-0.00	-0.00	2	KAJAKAI	24.38	5.39	25			5
				SHNT	0.00	0.00								
				RESD	-.00	.00								
2	KAJAKAI	0	1.061	27.9	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-24.34	-4.45	25		1.050	5
				SHNT	0.00	0.00	4	JUNCTION	24.34	4.45	25	11		1
				RESD	.00	-.00								
4	JUNCTION	0	1.047	26.5	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-24.17	-9.71	26	11		1
				SHNT	0.00	0.00	5	JUNCTION	4.65	2.37	5		1.000	6
				RESD	.00	-.00	7	KANDAHAR	19.52	7.34	21	9		2
5	JUNCTION	0	1.018	23.8	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-4.63	-2.09	5			6
				SHNT	0.00	0.00	6	LASHKARG	4.63	2.09	5	14		3
				RESD	.00	-.00								
6	LASHKARG	0	.971	22.3	.00	.00								
		0		LOAD	4.12	2.55	5	JUNCTION	-4.48	-2.17	5	14		3
				SHNT	0.00	0.00	9	GIRISHK	.36	-.38	1	3		4
				RESD	-.00	-.00								
7	KANDAHAR	0	1.024	25.2	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-19.35	-14.12	24	10		2
				SHNT	0.00	0.00	8	KANDAHAR	19.35	14.12	24		1.000	7
				RESD	.00	-.00								
8	KANDAHAR	0	.966	20.8	.00	.00								
		0		LOAD	19.20	11.90	7	KANDAHAR	-19.20	-11.90	23			7
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	.964	21.6	2.40	1.80H								
		0		LOAD	2.75	1.70	6	LASHKARG	-.35	.10	0	2		4
				SHNT	0.00	0.00								
				RESD	-.00	.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

Ar

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.162	.170	.155	.005	.048	.025	.148		
		-5.261	-6.779	-.083	-.279	.943	.282	2.215		

A7

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
26.78	7.19	26.07	16.15	.71	-8.96	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A8

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	MW (GEN/LOAD)	MVAR (GEN/LOAD)	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.050	30.0	31.40	11.98S								
		0		LOAD	-0.00	-0.00	2	KAJAKAI	31.40	11.98	34			5
				SHNT	0.00	0.00								
				RESD	.00	.00								
2	KAJAKAI	0	1.082	27.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-31.32	-10.37	33		1.050	5
				SHNT	0.00	0.00	4	JUNCTION	31.32	10.37	33	14		1
				RESD	.00	-.00								
4	JUNCTION	0	1.060	25.8	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-31.04	-15.34	35	15		1
				SHNT	0.00	0.00	5	JUNCTION	6.55	3.82	8		.950	6
				RESD	.00	-.00	7	KANDAHAR	24.49	11.52	27	12		2
5	JUNCTION	0	1.073	22.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-6.51	-3.29	7			6
				SHNT	0.00	0.00	6	LASHKARG	6.51	3.29	7	20		3
				RESD	-.00	-.00								
6	LASHKARG	0	1.009	20.5	.00	.00								
		0		LOAD	5.15	3.18	5	JUNCTION	-6.22	-3.22	7	20		3
				SHNT	0.00	0.00	9	GIRISHK	1.07	.04	1	7		4
				RESD	-.00	-.00								
7	KANDAHAR	0	1.030	24.1	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-24.21	-18.01	30	13		2
				SHNT	0.00	0.00	8	KANDAHAR	24.21	18.01	30		.950	7
				RESD	.00	-.00								
8	KANDAHAR	0	1.014	19.3	.00	.00								
		0		LOAD	24.00	14.87	7	KANDAHAR	-24.00	-14.87	28			7
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

A9

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	.977	20.1	2.40	1.80H								
		0		LOAD	3.44	2.12	6	LASHKARG	-1.04	-.32	1	7		4
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A10

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.280	.275	.286	.032	.082	.046	.210		
		-4.971	-6.487	.077	-.282	1.613	.524	3.137		

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
33.80	13.78	32.59	20.17	1.21	-6.39	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A2

KAJAKAI HYDROELECTRIC PROJECT - CASE 3.
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP	L	TAP	BR. NO.
1	KAJAKAI	0	1.040	30.0	31.47	12.72S									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	31.47	12.72	34				5
				SHNT	0.00	0.00									
				RESD	.00	.00									
2	KAJAKAI	0	1.070	27.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-31.39	-11.05	33			1.050	5
				SHNT	0.00	0.00	4	JUNCTION	31.39	11.05	33	14			1
				RESD	.00	-.00									
4	JUNCTION	0	1.047	25.7	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-31.10	-15.83	35	15			1
				SHNT	0.00	0.00	5	JUNCTION	6.59	3.98	8			.975	6
				RESD	.00	-.00	7	KANDAHAR	24.50	11.85	27	12			2
5	JUNCTION	0	1.028	22.0	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-6.54	-3.40	7				6
				SHNT	0.00	0.00	6	LASHKARG	6.54	3.40	7	21			3
				RESD	.00	-.00									
6	LASHKARG	0	.960	20.0	.00	.00									
		-0		LOAD	5.15	3.18	5	JUNCTION	-6.23	-3.25	7	20			3
				SHNT	0.00	0.00	9	GIRISHK	1.08	.07	1	7			4
				RESD	-.00	-.00									
7	KANDAHAR	0	1.016	24.0	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-24.22	-18.10	30	13			2
				SHNT	0.00	0.00	8	KANDAHAR	24.22	18.10	30			.950	7
				RESD	.00	-.00									
8	KANDAHAR	0	.999	19.0	.00	.00									
		-0		LOAD	24.00	14.87	7	KANDAHAR	-24.00	-14.87	28				7
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

A13

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP	L	TAP	BR. NO.
9	GIPISHK	0	.926	19.5	2.40	1.80H									
		-0		LOAD	3.44	2.12	6	LASHKARG	-1.04	-.32		1	7		4
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A14

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.291	.285	.318	.036	.085	.051	.216		
		-4.784	-6.258	.152	-.251	1.677	.583	3.234		

KAJAKAI HYDROELECTRIC PROJECT - CASE 3.
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI AT FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
33.87	14.52	32.59	20.17	1.28	-5.65	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.001	-.000
MVAR	.001	-.001

A16

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP	L	TAP	BR. NO.
1	KAJAKAI	0	1.000	30.0	17.34	-1.47S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	17.34	-1.47	17				5
				SHNT	0.00	0.00									
				RESD	.00	.00									
2	KAJAKAI	0	1.051	28.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-17.31	1.95	17			1.050	5
				SHNT	0.00	0.00	4	JUNCTION	17.31	-1.95	17	7			1
				RESD	.00	-.00									
4	JUNCTION	0	1.046	27.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-17.23	-3.60	18	7			1
				SHNT	0.00	0.00	5	JUNCTION	2.67	.67	3			1.000	6
				RESD	.00	-.00	7	KANDAHAR	14.57	2.94	15	6			2
5	JUNCTION	0	1.036	25.8	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-2.66	-.59	3				6
				SHNT	0.00	0.00	6	LASHKARG	2.16	1.29	3	7			3
				RESD	-.00	.00	9	GIRISHK	.51	-.70	1	2			8
6	LASHKARG	0	1.012	25.3	.00	.00									
		0		LOAD	3.00	1.86	5	JUNCTION	-2.12	-1.56	3	7			3
				SHNT	0.00	0.00	9	GIRISHK	-.88	-.30	1	6			4
				RESD	-.00	-.00									
7	KANDAHAR	0	1.031	26.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-14.48	-10.11	18	7			2
				SHNT	0.00	0.00	8	KANDAHAR	14.48	10.11	18			1.000	7
				RESD	.00	-.00									
8	KANDAHAR	0	.989	23.2	.00	.00									
		0		LOAD	14.40	8.92	7	KANDAHAR	-14.40	-8.92	17				7
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

A17

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.037	25.6	2.40	1.80H								
		0		LOAD	2.00	1.24	5	JUNCTION	-.50	.57	1	2		8
				SHNT	0.00	0.00	6	LASHKARG	.90	-.01	1	6		4
				RESD	-.00	-.00								

NOTE # UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A/3

KAJAKAI HYDROELECTRIC PROJECT - CASE 1
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.077	.087	.038	.022	.024	.007	.079	.002	
		-5.555	-7.168	-.270	-.306	.476	.078	1.187	-.137	

KAJAKAI HYDROELECTRIC PROJECT - CASE 1

161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.6 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
19.74	.33	19.40	12.02	.34	-11.69	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A2n

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.020	30.0	24.34	5.09S								
		0		LOAD	-0.00	-0.00	2	KAJAKAI	24.34	5.09	25			5
				SHNT	0.00	0.00								
				RESD	.00	.00								
2	KAJAKAI	0	1.061	27.9	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-24.30	-4.16	25		1.050	5
				SHNT	0.00	0.00	4	JUNCTION	24.30	4.16	25	11		1
				RESD	.00	-.00								
4	JUNCTION	0	1.047	26.5	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-24.14	-9.43	26	11		1
				SHNT	0.00	0.00	5	JUNCTION	4.62	2.11	5		1.000	6
				RESD	.00	-.00	7	KANDAHAR	19.52	7.32	21	9		2
5	JUNCTION	0	1.021	23.8	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-4.59	-1.85	5			6
				SHNT	0.00	0.00	6	LASHKARG	3.09	2.02	4	10		3
				RESD	-.00	.00	9	GIRISHK	1.50	-.18	2	4		8
6	LASHKARG	0	.984	23.1	.00	.00								
		0		LOAD	4.12	2.55	5	JUNCTION	-3.01	-2.21	4	10		3
				SHNT	0.00	0.00	9	GIRISHK	-1.11	-.34	1	8		4
				RESD	-.00	-.00								
7	KANDAHAR	0	1.025	25.2	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-19.35	-14.11	24	10		2
				SHNT	0.00	0.00	8	KANDAHAR	19.35	14.11	24		1.000	7
				RESD	.00	-.00								
8	KANDAHAR	0	.967	20.9	.00	.00								
		0		LOAD	19.20	11.90	7	KANDAHAR	-19.20	-11.90	23			7
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
9	GIRISHK	0	1.018	23.5	2.40	1.80H									
		0		LOAD	2.75	1.70	5	JUNCTION	-1.50	.05	1	4			8
				SHNT	0.00	0.00	6	LASHKARG	1.15	.05	1	8			4
				RESD	-.00	-.00									

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A72

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.161	.170	.083	.036	.048	.024	.148	.006	
		-5.275	-6.793	-.192	-.285	.936	.266	2.211	-.127	

KAJAKAI HYDROELECTRIC PROJECT - CASE 2
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.8 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
26.74	6.89	26.07	16.15	.67	-9.26	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

174

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI-FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP	E	TAP	BR. NO.
1	KAJAKAI	0	1.040	30.0	31.30	12.12S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	31.30	12.12	34				5
				SHNT	0.00	0.00									
				RESD	.00	.00									
2	KAJAKAI	0	1.071	27.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-31.22	-10.48	33			1.050	5
				SHNT	0.00	0.00	4	JUNCTION	31.22	10.48	33	14			1
				RESD	.00	-.00									
4	JUNCTION	0	1.049	25.7	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-30.94	-15.31	35	15			1
				SHNT	0.00	0.00	5	JUNCTION	6.44	3.50	7			.975	6
				RESD	.00	-.00	7	KANDAHAR	24.50	11.80	27	12			2
5	JUNCTION	0	1.035	22.2	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-6.39	-2.98	7				6
				SHNT	0.00	0.00	6	LASHKARG	3.97	2.68	5	13			3
				RESD	-.00	-.00	9	GIRISHK	2.42	.30	2	6			8
6	LASHKARG	0	.988	21.2	.00	.00									
		0		LOAD	5.15	3.18	5	JUNCTION	-3.83	-2.80	5	13			3
				SHNT	0.00	0.00	9	GIRISHK	-1.32	-.38	1	9			4
				RESD	-.00	-.00									
7	KANDAHAR	0	1.018	24.0	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-24.22	-18.09	30	13			2
				SHNT	0.00	0.00	8	KANDAHAR	24.22	18.09	30			.950	7
				RESD	.00	-.00									
8	KANDAHAR	0	1.001	19.1	.00	.00									
		0		LOAD	24.00	14.87	7	KANDAHAR	-24.00	-14.87	28				7
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

A25

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI-FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4. SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.027	21.7	2.40	1.80H								
		0		LOAD	3.44	2.12	5	JUNCTION	-2.41	-.41	2	6		8
				SHNT	0.00	0.00	6	LASHKARG	1.37	.09	1	9		4
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A 26

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI-FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.285	.283	.135	.051	.083	.046	.216	.015	
		-4.827	-6.287	-.123	-.283	1.640	.526	3.221	-.117	

A27

KAJAKAI HYDROELECTRIC PROJECT - CASE 3
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI-FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
33.70	13.92	32.59	20.17	1.11	-6.25	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A78

KAJAKAI HYDROELECTRIC PROJECT - CASE 4
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI-FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.050	30.0	48.17	31.21S								
		0		LOAD	-0.00	-0.00	2	KAJAKAI	48.17	31.21	57			5
				SHNT	0.00	0.00								
				RESD	-.00	.00								
2	KAJAKAI	0	1.052	26.0	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-47.93	-26.50	55		1.050	5
				SHNT	0.00	0.00	4	JUNCTION	47.93	26.50	55	24		1
				RESD	.00	-.00								
4	JUNCTION	0	1.008	23.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-47.12	-28.84	55	24		1
				SHNT	0.00	0.00	5	JUNCTION	10.11	6.16	12		.950	6
				RESD	.00	-.00	7	KANDAHAR	37.02	22.68	43	19		2
5	JUNCTION	0	1.024	20.6	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-10.04	-5.46	11			6
				SHNT	0.00	0.00	6	LASHKARG	5.75	4.14	7	20		3
				RESD	-.00	-.00	9	GIRISHK	4.29	1.31	4	12		8
6	LASHKARG	0	.954	19.2	.00	.00								
		0		LOAD	7.20	4.47	5	JUNCTION	-5.46	-4.02	7	19		3
				SHNT	0.00	0.00	9	GIRISHK	-1.74	-.45	2	12		4
				RESD	-.00	-.00								
7	KANDAHAR	0	.956	20.7	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-36.27	-26.33	45	20		2
				SHNT	0.00	0.00	8	KANDAHAR	36.27	26.33	45		.950	7
				RESD	.00	-.00								
8	KANDAHAR	0	.951	16.5	.00	.00								
		0		LOAD	36.00	22.31	7	KANDAHAR	-36.00	-22.31	42			7
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

KAJAKAI HYDROELECTRIC PROJECT - CASE 4
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI-FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4. SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT O CAP L	TAP	BR. NO.
9	GIRISHK	0	1.008	19.9	2.40	1.80H								
		0		LOAD	4.80	2.97	5	JUNCTION	-4.24	-1.38	4	12		8
				SHNT	0.00	0.00	6	LASHKARG	1.84	.21	2	13		4
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A30

KAJAKAI HYDROELECTRIC PROJECT - CASE 4
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI-FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.806	.748	.298	.095	.239	.062	.270	.050	
		-2.338	-3.648	.127	-.247	4.703	.706	4.018	-.062	

KAJAKAI HYDROELECTRIC PROJECT - CASE 4
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI-FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
50.57	33.01	48.00	29.75	2.57	3.26	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

KAJAKAI HYDROELECTRIC PROJECT - CASE 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.6 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.050	30.0	58.60	21.34S								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	58.60	21.34	62			6
				SHNT	0.00	0.00								
				RESD	-.00	.00								
2	KAJAKAI	0	1.084	27.6	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-58.46	-18.57	61		1.050	6
				SHNT	0.00	0.00	4	JUNCTION	58.46	18.57	61	27		1
				RESD	.00	-.00								
4	JUNCTION	0	1.047	24.5	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-57.53	-20.78	61	27		1
				SHNT	0.00	0.00	5	JUNCTION	13.27	6.00	15		.975	7
				RESD	.00	-.00	7	KANDAHAR	44.26	14.79	47	20		2
5	JUNCTION	0	1.039	20.8	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-13.17	-4.96	14			7
				SHNT	0.00	0.00	6	LASHKARG	7.50	3.34	8	23		3
				RESD	-.00	-.00	9	GIRISHK	5.68	1.61	6	16		4
6	LASHKARG	0	.966	18.2	.00	.00								
		-0		LOAD	9.00	5.58	5	JUNCTION	-7.11	-3.10	8	22		3
				SHNT	0.00	2.52	9	GIRISHK	-1.89	.04	2	13		5
				RESD	-.00	-.00								
7	KANDAHAR	0	1.006	21.2	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-43.49	-18.95	47	21		2
				SHNT	0.00	0.00	8	KANDAHAR	43.49	18.95	47		.975	8
				RESD	.00	-.00								
8	KANDAHAR	0	.993	16.4	.00	.00								
		-0		LOAD	43.20	26.80	7	KANDAHAR	-43.20	-14.68	46			8
				SHNT	0.00	12.12								
				RESD	-.00	-.00								

A33

KAJAKAI HYDROELECTRIC PROJECT - CASE 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.6 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP	L	TAP	BR. NO.
9	GIRISHK	0	1.018	19.9	2.40	1.80H									
		-0		LOAD	6.00	3.72	5	JUNCTION	-5.59	-1.63		6	16		4
				SHNT	0.00	0.00	6	LASHKARG	1.99	-.29		2	14		5
				RESD	-.00	-.00									

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A34

KAJAKAI HYDROELECTRIC PROJECT - CASE 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.6 OF FULL LOAD

SUMMARY OF LINE LOSSES == LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.933	.776	.384	.084	.106	.141	.092	.287	
		-2.218	-4.166	.243	-.016	-.249	2.777	1.041	4.275	

A35

KAJAKAI HYDROELECTRIC PROJECT - CASE 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.6 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
61.00	23.14	58.20	36.10	2.80	1.69	0.00	14.64

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A31

KAJAKAI HYDROELECTRIC PROJECT - CASE 6.
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.8 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	1.020	30.0	79.88	19.64S								
		0		LOAD	-0.00	-0.00	2	KAJAKAI	79.88	19.64	82			6
				SHNT	0.00	0.00								
				RESD	.00	.00								
2	KAJAKAI	0	1.054	26.5	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-79.62	-14.52	81		1.050	6
				SHNT	0.00	0.00	4	JUNCTION	79.62	14.52	81	36		1
				RESD	.00	-.00								
4	JUNCTION	0	1.017	21.8	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-77.93	-13.28	79	35		1
				SHNT	0.00	0.00	5	JUNCTION	18.67	1.30	19		.975	7
				RESD	.00	-.00	7	KANDAHAR	59.26	11.98	60	27		2
5	JUNCTION	0	-1.034	18.1	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-18.57	-.08	19			7
				SHNT	0.00	0.00	6	LASHKARG	10.31	1.85	10	29		3
				RESD	-.00	-.00	9	GIRISHK	8.26	-1.77	8	24		4
6	LASHKARG	0	.960	13.6	.00	.00								
		0		LOAD	12.00	7.44	5	JUNCTION	-9.68	-1.25	10	27		3
				SHNT	0.00	6.63	9	GIRISHK	-2.32	.45	2	16		5
				RESD	-.00	-.00								
7	KANDAHAR	0	.975	16.9	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-57.92	-13.38	59	26		2
				SHNT	0.00	0.00	8	KANDAHAR	57.92	13.38	59		.975	8
				RESD	.00	-.00								
8	KANDAHAR	0	.980	12.4	.00	.00								
		0		LOAD	57.60	35.70	7	KANDAHAR	-57.60	-8.62	58			8
				SHNT	0.00	27.08								
				RESD	-.00	-.00								

A37

KAJAKAI HYDROELECTRIC PROJECT - CASE 6
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.8 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.020	16.2	2.40	1.80H								
		0		LOAD	8.00	4.96	5	JUNCTION	-8.09	1.88	8	23		4
				SHNT	0.00	4.37	6	LASHKARG	2.49	-.67	3	18		5
				RFSD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A38

KAJAKAI HYDROELECTRIC PROJECT - CASE 6
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.8 OF FULL LOAD

SUMMARY OF LINE LOSSES == LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		1.688	1.341	.624	.173	.171	.260	.107	.318	
		1.243	-1.399	.593	.112	-.220	5.119	1.218	4.765	

A29

KAJAKAI HYDROELECTRIC PROJECT - CASE 6
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.8 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
82.28	21.44	77.60	48.10	4.68	11.43	0.00	38.09

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

KAJAKAI HYDROELECTRIC PROJECT - CASE 7
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI-FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
1	KAJAKAI	0	1.046	30.0	100.05	25.10S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	100.05	25.10	103				6
				SHNT	0.00	0.00									
				RESD	0.00	.00									
2	KAJAKAI	0	1.077	25.8	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-99.67	-17.44	101			1.050	6
				SHNT	0.00	0.00	4	JUNCTION	99.67	17.44	101	45			1
				RESD	.00	-.00									
4	JUNCTION	0	1.034	20.2	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-97.15	-13.01	98	43			1
				SHNT	0.00	0.00	5	JUNCTION	22.71	2.77	23			.975	7
				RESD	.00	-.00	7	KANDAHAR	74.44	10.24	75	33			2
5	JUNCTION	0	1.047	15.8	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-22.55	-1.01	23				7
				SHNT	0.00	0.00	6	LASHKARG	12.19	2.66	12	35			3
				RESD	-.00	-.00	9	GIRISHK	10.36	-1.65	10	29			4
6	LASHKARG	0	.956	10.7	.00	.00									
		0		LOAD	14.00	8.68	5	JUNCTION	-11.33	-1.73	11	32			3
				SHNT	0.00	7.41	9	GIRISHK	-2.67	.46	3	19			5
				RESD	-.00	-.00									
7	KANDAHAR	0	.992	14.1	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-72.46	-9.25	73	32			2
				SHNT	0.00	0.00	8	KANDAHAR	72.46	9.25	73			.975	8
				RESD	.00	-.00									
8	KANDAHAR	0	1.004	8.7	.00	.00									
		0		LOAD	72.00	44.62	7	KANDAHAR	-72.00	-2.30	72				8
				SHNT	0.00	42.32									
				RESD	-.00	-.00									

A41

KAJAKAI HYDROELECTRIC PROJECT - CASE 7
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI-FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4. SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.027	13.5	2.40	1.80H								
		0		LOAD	9.60	5.95	5	JUNCTION	-10.10	1.89	10	29		4
				SHNT	0.00	5.38	6	LASHKARG	2.90	-.65	3	21		5
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A42

KAJAKAI HYDROELECTRIC PROJECT - CASE 7
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI-FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		2.516	1.980	.864	.260	.227	.389	.155	.464	
		4.432	.991	.937	.236	-.197	7.654	1.757	6.948	

A43

KAJAKAI HYDROELECTRIC PROJECT - CASE 7
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI-FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
102.45	26.90	95.60	59.25	6.85	22.76	0.00	55.11

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

KAJAKAI HYDROELECTRIC PROJECT - CASE 8
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.05 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 3, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
1	KAJAKAI	0	1.050	30.0	105.42	38.735									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	105.42	38.73	112				6
				SHNT	0.00	0.00									
				RESD	.00	.00									
2	KAJAKAI	0	1.071	25.6	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-104.96	-29.72	109			1.050	6
				SHNT	0.00	0.00	4	JUNCTION	104.96	29.72	109	48			1
				RESD	.00	-.00									
4	JUNCTION	0	1.013	19.7	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-101.99	-23.25	105	46			1
				SHNT	0.00	0.00	5	JUNCTION	23.38	2.73	24			.975	7
				RESD	.00	-.00	7	KANDAHAR	78.60	20.52	81	36			2
5	JUNCTION	0	1.025	15.0	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-23.21	-.79	23				7
				SHNT	0.00	0.00	6	LASHKARG	7.07	.85	7	20			3
				RESD	-.00	-.00	6	LASHKARG	7.07	.85	7	20			9
							9	GIRISHK	9.07	-.92	9	26			4
6	LASHKARG	0	.976	11.8	.00	.00									
		0		LOAD	14.70	9.11	5	JUNCTION	-6.78	-.74	7	19			3
				SHNT	0.00	7.72	5	JUNCTION	-6.78	-.74	7	19			9
				RESD	-.00	-.00	9	GIRISHK	-1.14	.09	1	8			5
7	KANDAHAR	0	.955	13.1	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-76.17	-17.27	78	35			2
				SHNT	0.00	0.00	8	KANDAHAR	76.17	17.27	78			.975	8
				RESD	.00	-.00									
8	KANDAHAR	0	.954	6.9	.00	.00									
		0		LOAD	75.60	46.90	7	KANDAHAR	-75.60	-8.68	76				8
				SHNT	0.00	38.22									
				RESD	-.00	-.00									

A45

KAJAKAI HYDROELECTRIC PROJECT - CASE 8

161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.05 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 3, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L.	TAP	BR. NO.
9	GIRISHK	0	1.006	12.9	2.40	1.80H								
		0		LOAD	10.08	6.25	5	JUNCTION	-8.86	1.08	9	25		4
				SHNT	0.00	5.16	6	LASHKARG	1.18	-.37	1	8		5
				RESD	-.00	.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A46

KAJAKAI HYDROELECTRIC PROJECT - CASE 8
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.05 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		2.973	2.430	.294	.205	.039	.458	.171	.573	.294
		6.469	3.254	.114	.162	-.278	9.003	1.939	8.585	.114

A47

KAJAKAI HYDROELECTRIC PROJECT - CASE 8
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.05 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
107.82	40.53	100.38	62.26	7.44	29.36	0.00	51.10

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A48

KAJAKAI HYDROELECTRIC PROJECT - CASE 9

161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.1 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
					-- GEN/LOAD --									
1	KAJAKAI	0	1.050	30.0	110.56	33.955								
		0		LOAD	-0.00	-0.00	2	KAJAKAI	110.56	33.95	116			6
				SHNT	0.00	0.00								
				RESD	.00	.00								
2	KAJAKAI	0	1.075	25.4	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-110.07	-24.40	113		1.050	6
				SHNT	0.00	0.00	4	JUNCTION	110.07	24.40	113	50		1
				RESD	.00	-.00								
4	JUNCTION	0	1.022	19.1	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-106.93	-17.30	108	48		1
				SHNT	0.00	0.00	5	JUNCTION	24.69	3.72	25		.975	7
				RESD	.00	-.00	7	KANDAHAR	82.25	13.59	83	37		2
5	JUNCTION	0	1.031	14.3	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-24.50	-1.57	25			7
				SHNT	0.00	0.00	6	LASHKARG	7.44	1.09	8	21		3
				RESD	-.00	-.00	6	LASHKARG	7.44	1.09	8	21		9
							9	GIRISHK	9.62	-.61	10	27		4
6	LASHKARG	0	.978	11.0	.00	.00								
		0		LOAD	15.42	9.55	5	JUNCTION	-7.11	-.94	7	20		3
				SHNT	0.00	7.75	5	JUNCTION	-7.11	-.94	7	20		9
				RESD	-.00	-.00	9	GIRISHK	-1.19	.08	1	8		5
7	KANDAHAR	0	.974	12.3	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-79.75	-10.27	80	36		2
				SHNT	0.00	0.00	8	KANDAHAR	79.75	10.27	80		.950	8
				RESD	.00	-.00								
8	KANDAHAR	0	1.010	6.4	.00	.00								
		0		LOAD	79.20	49.10	7	KANDAHAR	-79.20	-1.97	79			8
				SHNT	0.00	47.13								
				RESD	-.00	-.00								

A49

KAJAKAI HYDROELECTRIC PROJECT - CASE 9
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.1 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2. SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS.	ANGLE	MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP	L	TAP	BR. NO.
					-- GEN/LOAD --										
9	GIRISHK	0	1.009	12.2	2.40	1.80H									
		0		LOAD	10.56	6.55	5	JUNCTION	-9.40	.81		9	26		4
				SHNT	0.00	5.20	6	LASHKARG	1.24	-.36		1	9		5
				RESD	-.00	-.00									

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A50

KAJAKAI HYDROELECTRIC PROJECT - CASE 9

161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.1 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		3.142	2.493	.324	.227	.043	.485	.189	.554	.324
		7.096	3.320	.155	.192	-.278	9.548	2.142	8.299	.155

A5

KAJAKAI HYDROELECTRIC PROJECT - CASE 9
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.1 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
112.96	35.75	105.18	65.20	7.78	30.63	0.00	60.08

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.002	-.000
MVAR	.001	-.001

A57

KAJAKAI HYDROELECTRIC PROJECT - CASE 10 - 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.15 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
1	KAJAKAI	0	1.050	30.0	116.01	33.64S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	116.01	33.64	121				6
				SHNT	0.00	0.00									
				RESD	.00	.00									
2	KAJAKAI	0	1.075	25.2	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-115.48	-23.23	118			1.050	6
				SHNT	0.00	0.00	4	JUNCTION	115.48	23.23	118	52			1
				RESD	.00	-.00									
4	JUNCTION	0	1.023	18.6	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-112.06	-14.98	113	50			1
				SHNT	0.00	0.00	5	JUNCTION	25.96	2.88	26			.975	7
				RESD	.00	-.00	7	KANDAHAR	86.10	12.10	87	38			2
5	JUNCTION	0	1.035	13.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-25.76	-.54	26				7
				SHNT	0.00	0.00	6	LASHKARG	7.79	.90	8	22			3
				RESD	-.00	-.00	6	LASHKARG	7.79	.90	8	22			9
							9	GIRISHK	10.18	-1.26	10	29			4
6	LASHKARG	0	.982	10.0	.00	.00									
		0		LOAD	16.12	10.02	5	JUNCTION	-7.44	-.71	7	21			3
				SHNT	0.00	8.68	5	JUNCTION	-7.44	-.71	7	21			9
				RESD	-.00	-.00	9	GIRISHK	-1.24	.08	1	8			5
7	KANDAHAR	0	.976	11.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-83.40	-7.95	84	37			2
				SHNT	0.00	0.00	8	KANDAHAR	83.40	7.95	84			.950	8
				RESD	.00	-.00									
8	KANDAHAR	0	1.016	5.2	.00	.00									
		0		LOAD	82.80	51.32	7	KANDAHAR	-82.80	1.01	83				8
				SHNT	0.00	52.33									
				RESD	-.00	-.00									

A53

KAJAKAI HYDROELECTRIC PROJECT - CASE 10 - 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.15 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.015	11.2	2.40	1.80H								
		0		LOAD	11.04	6.85	5	JUNCTION	-9.92	1.49	10	28		4
				SHNT	0.00	6.18	6	LASHKARG	1.28	-.36	1	9		5
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

KAJAKAI HYDROELECTRIC PROJECT - CASE 10 - 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.15 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		3.422	2.700	.349	.254	.045	.529	.206	.598	.349
		8.245	4.148	.188	.231	-.279	10.415	2.341	8.962	.188

KAJAKAI HYDROELECTRIC PROJECT - CASE 10 - 5
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 1.15 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
118.41	35.44	109.96	68.19	8.45	34.44	0.00	67.19

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.001	-.000
MVAR	.000	-.000

A5

KAJAKAI HYDROELECTRIC PROJECT - CASE 1A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.06 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
1	KAJAKAI	0	.930	30.0	.80	-12.56S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	.80	-12.56	13				5
				SHNT	0.00	0.00									
				RESD	-.00	.00									
2	KAJAKAI	0	.999	29.9	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-.78	12.84	13			1.050	5
				SHNT	0.00	0.00	4	JUNCTION	.78	-12.84	13		5		1
				RESD	-.00	.00									
4	JUNCTION	0	1.010	29.6	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-.75	7.58	8		3		1
				SHNT	0.00	0.00	5	JUNCTION	-.69	-1.34	2			1.000	6
				RESD	.00	-.00	7	KANDAHAR	1.44	-6.24	6		2		2
5	JUNCTION	0	1.026	30.0	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	.69	1.37	2				6
				SHNT	0.00	0.00	6	LASHKARG	.11	-.30	0		0		3
				RESD	-.00	.00	9	GIRISHK	-.80	-1.07	1		3		8
6	LASHKARG	0	1.027	29.9	.00	.00									
		0		LOAD	.30	.19	5	JUNCTION	-.11	-.03	0		0		3
				SHNT	0.00	0.00	9	GIRISHK	-.19	-.16	0		1		4
				RESD	-.00	-.00									
7	KANDAHAR	0	1.014	29.5	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-1.44	-.90	2		0		2
				SHNT	0.00	0.00	8	KANDAHAR	1.44	.90	2			1.000	7
				RESD	.00	-.00									
8	KANDAHAR	0	1.010	29.1	.00	.00									
		0		LOAD	1.44	.89	7	KANDAHAR	-1.44	-.89	2				7
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

KAJAKAI HYDROELECTRIC PROJECT - CASE 1A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.06 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	0	1.032	30.0	1.20	.90H								
		0		LOAD	.20	.12	5	JUNCTION	.81	.94	1	3		8
				SHNT	0.00	0.00	6	LASHKARG	.19	-.16	0	1		4
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

KAJAKAI HYDROELECTRIC PROJECT - CASE 1A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.06 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.029	.003	.000	.001	.015	.002	.001	.004	
		-5.267	-7.137	-.326	-.317	.288	.025	.011	-.132	

A5

KAJAKAI HYDROELECTRIC PROJECT - CASE 1A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.06 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
2.00	-11.66	1.94	1.20	.06	-12.86	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A60

KAJAKAI HYDROELECTRIC PROJECT - CASE 3A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.1 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
1	KAJAKAI	0	.920	30.0	2.11	-11.45S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	2.11	-11.45	12				5
				SHNT	0.00	0.00									
				RESD	.00	.00									
2	KAJAKAI	0	.986	29.7	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-2.10	11.70	12			1.050	5
				SHNT	0.00	0.00	4	JUNCTION	2.10	-11.70	12	5			1
				RESD	-.00	.00									
4	JUNCTION	0	.997	29.4	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-2.07	6.56	7	3			1
				SHNT	0.00	0.00	5	JUNCTION	-.33	-1.14	1			.975	6
				RESD	.00	-.00	7	KANDAHAR	2.41	-5.41	6	2			2
5	JUNCTION	0	1.035	29.6	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	.34	1.16	1				6
				SHNT	0.00	0.00	6	LASHKARG	.29	-.18	0	0			3
				RESD	-.00	.00	9	GIRISHK	-.62	-.98	1	3			8
6	LASHKARG	0	1.034	29.4	.00	.00									
		0		LOAD	.52	.32	5	JUNCTION	-.29	-.15	0	0			3
				SHNT	0.00	0.00	9	GIRISHK	-.23	-.17	0	2			4
				RESD	-.00	-.00									
7	KANDAHAR	0	.999	29.2	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-2.40	-1.52	3	1			2
				SHNT	0.00	0.00	8	KANDAHAR	2.40	1.52	3			.950	7
				RESD	.00	-.00									
8	KANDAHAR	0	1.045	28.7	.00	.00									
		0		LOAD	2.40	1.49	7	KANDAHAR	-2.40	-1.49	3				7
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

KAJAKAI HYDROELECTRIC PROJECT - CASE 3A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.1 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIRISHK	.0	1.040	29.6	1.20	.90H								
		0		LOAD	.34	.21	5	JUNCTION	.62	.84	1	2		8
				SHNT	0.00	0.00	6	LASHKARG	.24	-.15	0	2		4
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A62

KAJAKAI HYDROELECTRIC PROJECT - CASE 3A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.1 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.025	.004	.000	.001	.013	.001	.002	.003	
		-5.145	-6.932	-.331	-.322	.252	.015	.030	-.136	

A63

KAJAKAI HYDROELECTRIC PROJECT - CASE 3A
161KV TRANSMISSION LINE-2 UNITS AT KAJAKAI 0.1 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
3.31	-10.55	3.26	2.02	.05	-12.57	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A64

KAJAKAI HYDROELECTRIC PROJECT - CASE 4A
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI 0.1 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
1	KAJAKAI	0	.920	30.0	3.64	-10.07S									
		0		LOAD	-0.00	-0.00	2	KAJAKAI	3.64	-10.07	11				5
				SHNT	0.00	0.00									
				RESD	-.00	.00									
2	KAJAKAI	0	.984	29.6	0.00	0.00									
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-3.63	10.28	11			1.050	5
				SHNT	0.00	0.00	4	JUNCTION	3.63	-10.28	11	4			1
				RESD	.00	-.00									
4	JUNCTION	0	.992	29.2	0.00	0.00									
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-3.61	5.16	6	2			1
				SHNT	0.00	0.00	5	JUNCTION	.00	-.57	1			.950	6
				RESD	-.00	-.00	7	KANDAHAR	3.61	-4.58	6	2			2
5	JUNCTION	0	1.047	29.2	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-.00	.57	1				6
				SHNT	0.00	0.00	6	LASHKARG	.46	-.03	0	1			3
				RESD	-.00	-.00	9	GIRISHK	-.46	-.54	1	2			8
6	LASHKARG	0	1.043	29.0	.00	.00									
		0		LOAD	.72	.45	5	JUNCTION	-.46	-.31	1	1			3
				SHNT	0.00	0.00	9	GIRISHK	-.26	-.14	0	2			4
				RESD	-.00	.00									
7	KANDAHAR	0	.992	28.8	0.00	0.00									
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-3.60	-2.26	4	1			2
				SHNT	0.00	0.00	8	KANDAHAR	3.60	2.26	4			.950	7
				RESD	-.00	-.00									
8	KANDAHAR	0	1.040	28.5	.00	.00									
		0		LOAD	3.60	2.23	7	KANDAHAR	-3.60	-2.23	4				7
				SHNT	0.00	0.00									
				RESD	-.00	-.00									

A 65

KAJAKAI HYDROELECTRIC PROJECT - CASE 4A
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI 0.1 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 2, SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT CAP	0 L	TAP	BR. NO.
9	GIRISHK	0	1.050	29.2	1.20	.52R									
		0		LOAD	.48	.30	5	JUNCTION	.46	.40		1	1		8
				SHNT	0.00	0.00	6	LASHKARG	.26	-.18		0	2		4
				RESO	-.00	-.00									

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A66

KAJAKAI HYDROELECTRIC PROJECT - CASE 4A
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI 0.1 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.021	.005	.001	.002	.011	.000	.002	.001	
		-5.124	-6.848	-.337	-.328	.213	.002	.034	-.141	

A57

KAJAKAI HYDROELECTRIC PROJECT - CASE 4A
161KV TRANSMISSION LINE-3 UNITS AT KAJAKAI 0.1 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
4.84	-9.55	4.80	2.98	.04	-12.53	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A/8

KAJAKAI HYDROELECTRIC PROJECT - CASE 9A
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.11 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4. SWING BUS = 1.

FROM BUS	NAME	AC	VOLTS	ANGLE	GEN/LOAD MW	GEN/LOAD MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
1	KAJAKAI	0	.940	30.0	8.21	-7.785								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	8.21	-7.78	11			6
				SHNT	0.00	0.00								
				RESD	-.00	.00								
2	KAJAKAI	0	.994	29.6	0.00	0.00								
		-0		LOAD	-0.00	-0.00	1	KAJAKAI	-8.20	7.90	11		1.050	6
				SHNT	0.00	0.00	4	JUNCTION	8.20	-7.90	11	5		1
				RESD	.00	-.00								
4	JUNCTION	0	.997	28.9	0.00	0.00								
		-0		LOAD	-0.00	-0.00	2	KAJAKAI	-8.17	2.72	9	3		1
				SHNT	0.00	0.00	5	JUNCTION	.22	-.93	1		.975	7
				RESD	.00	-.00	7	KANDAHAR	7.95	-1.79	8	3		2
5	JUNCTION	0	1.026	28.9	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-.22	.93	1			7
				SHNT	0.00	0.00	6	LASHKARG	.96	.40	1	2		3
				RESD	-.00	-.00	9	GIRISHK	-.74	-1.34	2	4		4
6	LASHKARG	0	1.016	28.6	.00	.00								
		-0		LOAD	1.54	.96	5	JUNCTION	-.96	-.71	1	3		3
				SHNT	0.00	0.00	9	GIRISHK	-.58	-.25	1	4		5
				RESD	-.00	-.00								
7	KANDAHAR	0	.992	28.3	0.00	0.00								
		-0		LOAD	-0.00	-0.00	4	JUNCTION	-7.93	-5.02	9	4		2
				SHNT	0.00	0.00	8	KANDAHAR	7.93	5.02	9		.950	8
				RESD	.00	-.00								
8	KANDAHAR	0	1.037	27.7	.00	.00								
		-0		LOAD	7.92	4.91	7	KANDAHAR	-7.92	-4.91	9			8
				SHNT	0.00	0.00								
				RESD	-.00	-.00								

A69

KAJAKAI HYDROELECTRIC PROJECT - CASE 9A
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.11 OF FULL LOAD

REPORT OF LOAD-FLOW CALCULATION TOTAL ITERATIONS = 4, SWING BUS = 1.

X---------- B U S D A T A ----------X

FROM BUS	NAME	AC	VOLTS	ANGLE	-- GEN/LOAD -- MW	MVAR	TO BUS	NAME	MW	MVAR	LDG	PCT 0 CAP L	TAP	BR. NO.
9	GIPISHK	0	1.033	28.8	2.40	1.80H								
		-0		LOAD	1.06	.66	5	JUNCTION	.75	1.21	1	4		4
				SHNT	0.00	0.00	6	LASHKARG	.59	-.07	1	4		5
				RESD	-.00	-.00								

NOTE * UNDER OL COLUMN INDICATES LINE S PCT. CAP. IS GREATER THAN 100 P.C.

A70

KAJAKAI HYDROELECTRIC PROJECT - CASE 9A
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.11 OF FULL LOAD

SUMMARY OF LINE LOSSES -- LINE 1 = MW, LINE 2 = MVAR

BRANCH	--0	--1	--2	--3	--4	--5	--6	--7	--8	--9
0-		.027	.025	.007	.005	.009	.006	.000	.007	
		-5.180	-6.805	-.313	-.130	-.311	.114	.003	.109	

KAJAKAI HYDROELECTRIC PROJECT - CASE 9A
161KV TRANSMISSION LINE-5 UNITS AT KAJAKAI 0.11 OF FULL LOAD

GENERATION		LOAD		LOSSES		SHUNT	
MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR
10.61	-5.98	10.52	6.53	.09	-12.51	0.00	0.00

MISMATCH TOTALS FOR SYSTEM

	ABSOLUTE TOTAL	ALGEBRAIC TOTAL
MW	.000	-.000
MVAR	.000	-.000

A77