TEST CYCLE HEAT BALANCE

VALVE POINT VWO 06/22/86 TEST POINT 03
INTERMOUNTAIN PWR PROJECT UNIT #1
820000. KW TC6F-30 IN LSB TURBINE NO 270T150
2400. PSIG 1000./ 1000. F 2.300 IN HG ABS

CALCULATED USING ASME STEAM TABLES

corrected for power factor hi press throttle conditions

COMBINED TURBINE-CYCLE PERFORMANCE

	TEST CONDITIONS	*RATED CONDITIONS
TOTAL LOAD	871725.	870878.
HEAT RATE	7829.9	7837.5
THROTTLE FLOW	6322406.	6307919.

Test Conditions

TURBINE THERMAL PERFORMANCE

	HIGH PRESS TB		REHEAT TB		
			IP TB		LP TB
	THROTTLE	COLD RHT	INLET	EXH	EXH
PRESS	2421.40	583.45	538.06	121.54	3.874
TEMP	1003.30	627.70	1000.09	617.10	124.24
ENTH	1462.37	1309.48	1519.25	1336.71	1026.84
ENTR	1.5333		1.7285	1.7442	
EFF	87.616		91.658		95.038

ABSCISSA PHPX/PT=0.2410 P1STSTG/PT=0.8127 VAN= 507.4

THRU FLOW PERFORMANCE OF CONDENSING SECTION SHAFT NO 1

	TOTAL TB ENERGY BALANCE		LP TB ENERGY BALANCE	
	RHT TB	LP TB	RHT TB	LP TB
AE	518.12	326.43		
H ELEP	1026.84		1026.84	
H UEEP	1036.66		1036.66	
EFF ELEP	95.04	94.93	95.04	94.93
EFF UEEP	93.14	91.92	93.14	91.92
VAN	507.44		507.44	

* LOAD AND HEAT RATE AT RATED POWER FACTOR AND H2 PRESS. FLOW AT RATED THROTTLE PRESS. OF 2412.2 PSIA AND TEMP. OF 1000 F.

IP7006752

T G L PERFORMANCE OF CONDENSING SECTION SHAFT NO 1

	TOTAL TB ENERGY BALANCE		LP TB ENERGY BALANCE	
	RHT TB	LP TB	RHT TB	LP TB
H ELEP	1030.03		1030.03	
H UEEP	1039.82		1039.82	
EFF ELEP	94.42	93.95	94.42	93.95
EFF UEEP	92.53	90.95	92.53	90.95
VAN	509.18		509.18	

STAGE FLOW FUNCTION

STG NO	SHELL PRESS	ONE VEL HD	PCT DELTA P	FLANGE PRESS	NOZ AREA	Q/AP H FLG	QFS	Q/AP H SHL
1	1967.96	0.	0.	0.	86.6	0.	6266234.	1004.1
4	1111.92	4.578	1.30	1097.50	157.4	847.1	5640058.	841.6
RH 1	538.06	0.	0.	0.	350.2	0.	5109396.	789.8
8	527.30	0.	0.	0.	350.2	0.	5121811.	807.8
11	239.25	0.853	1.14	236.52	711.2	783.3	4880585.	770.9
15	121.54	0.	0.	0.	807.6	0.	4365819.	1116.6
15	67.19	0.287	1.24	66.36	1414.8	1074.9	4224181.	1044.5
16	41.20	0.198	1.40	40.62	2021.4	1081.2	3930847.	1052.2
18	12.09	0.075	1.79	11.87	6018.0	1053.5	3765887.	1016.5
19	5.30	0.014	0.76	5.26	12096.0	1075.8	3663735.	1071.7

IP7006753

TL		PRESS	TEMP	ENTH	FLOW		

F E E D W A T E R C Y C L E

						HEATER	8
4	FW IN	2792.00	481.40	466.49	6299616.9	CLOSED	
2	EXTR	1090.77	800.40	1385.43	605416.7	TD =	-0.8
3	DRAIN	1090.77	490.60	476.75	605416.7	DC =	9.2
						HEATER	7
7	FW IN	2792.00	396.90	374.93	6299616.9	CLOSED	
5	EXTR	573.48	626.70	1309.64	557710.9	TD =	-0.0
6	DRAIN	573.48	404.40	380.21	1163127.6	DC =	7.5
3	ENTRY	1090.77	490.60	476.75	605416.7		
						HEATER	6
10	FW IN	2929.60	347.04	323.18	6299616.9	CLOSED	
8	EXTR	233.43	799.80	1424.00	241225.3	TD =	-1.9
9	DRAIN	233.43	355.20	327.37	1404352.9	DC =	8.2
6	ENTRY	573.48	404.40	380.21	1163127.6		
						PUMP	
11	FW IN	0.	0.	0.	6260159.6		
86	SEAL INJ	0.	0.	0.	145165.7		
30	SEAL RET	0.	0.	0.	70562.0		
32	LEAKAGE	0.	0.	0.	0.		
24	EXTR	1500.00	200.00	171.47	0.		
35	FW OUT	2929.60	347.04	323.18	6334763.3		
						HEATER	5
13	FW IN	137.70	297.90	267.69	4605624.0	OPEN	
12	EXTR	121.25	619.90	1338.14	250585.7	STD =	90.0
111	DRAIN	121.25	342.10	313.46	6811741.3	SC =	-0.1
109	ENTRY	0.	0.	290.16	1955934.6		
						HEATER	4
17	FW IN	177.10	266.40	235.55	4605624.4	CLOSED	
15	EXTR	64.83	513.50	1289.38	141637.6	TD =	-0.1
16	DRAIN	64.83	273.10	242.16	141637.6	DC =	6.7
						HEATER	3
20	FW IN	177.10	196.90	165.35	4605624.4	CLOSED	
18	EXTR	39.27	412.80	1242.75	293333.8	TD =	-0.3
19	DRAIN	39.27	205.40	173.58	434971.4	DC =	8.5
16	ENTRY	64.83	273.10	242.16	141637.6		
						HEATER	2
23	FW IN	177.10	156.10	124.47	4605624.4	CLOSED	
21	EXTR	11.17	230.50	1160.61	164960.0	TD =	1.6
22	DRAIN	11.17	163.20	131.18	599931.4	DC =	7.1
19	ENTRY	39.27	205.40	173.58	434971.4		

IP7006754

TL		PRESS	TEMP	ENTH	FLOW	
						STM SEAL REG
88	FLOW TO	0.	0.	0.	6953.7	CALCULATED
70	TDV	6.13	599.20	1335.42	3477.7	TO HEATER
68	TDV	6.63	682.00	1375.43	3476.0	TO CONDENSER
	NOT CODED FOR MU		MEAS TOTAL FLOW =		0.	

						HEATER	1
26	FW IN	227.30	129.40	97.92	4605624.4	CLOSED	
25	EXTR	5.32	0.	1084.65	102152.3	TD =	8.8
123	DRAIN	5.32	133.90	101.86	705561.4	DC =	4.5
22	ENTRY	11.17	163.20	131.18	599931.4		
70	ENTRY	6.13	599.20	1335.42	3477.7		

						PUMP
33	FW IN	0.	0.	0.	4750790.1	
87	LEAKAGE	0.	0.	0.	0.	
27	FW OUT	0.	0.	0.	4750790.1	

FW TO BOILER

1	FW IN	2792.00	556.03	553.82	6299616.9	S+L = -12357.

T U R B I N E E X P A N S I O N

						MAIN STEAM LINE
71	EXIT	0.	0.	1462.37	0.	
36	THROTTLE	2421.40	1003.30	1462.37	6322406.3	
						VALVE STEM LKG
						SQRT P/V = 87.085
37	LO NO 1	538.26	879.80	1454.30	2838.0	C = 55.610
						SQRT P/V = 19.393
38	LO NO 2	0.	0.	0.	2004.8	C = 103.374

						EXP TO STG 1
40	SHELL	1967.96	944.73	1439.76	6266234.0	
112	EXTR	0.	0.	1439.76	51329.4	

not Leakage
&
cooling steam
-12,414.6 CS
38,914.8 to 1st exhaust

IP7006755

TL	PRESS	TEMP	ENTH	FLOW	
					PACKING NO 2
					SQRT P/V =.115E 19
42 LO NO 1	127.55	780.70	1418.86	16553.9	C = 0.000
					SQRT P/V = 4.717
43 LO NO 2	17.96	774.40	1420.31	3583.6	C = 891.471
					SQRT P/V = 0.663
100 LO NO 3	0.	0.	0.	621.8	C = 1759.359
					EXP TO STG 4
41 SHELL	1111.92	0.	1385.90	5640058.0	
79 EXTR	1097.50	801.70	1385.90	605416.7	
					PACKING NO 1
					SQRT P/V = 23.996
46 LO NO 1	126.25	605.60	1330.71	8569.8	C = 612.765
					SQRT P/V = 5.059
47 LO NO 2	18.20	587.80	1329.13	5512.3	C = 1212.450
					SQRT P/V = 0.730
100 LO NO 3	0.	0.	0.	621.8	C = 1759.359
				5625, 54.2 int leak from 1st sta + 36,914.8	EXPAND TO EXHAUST
49 EXH	583.45	627.70	1309.48	5664268.9	
80 EXTR	583.45	627.70	1309.48	557710.9	
50 TO RHT	583.45	627.70	1309.48	5106558.0	
					REHEATER 1
BEFORE LO	0.08	0.	1519.51	0.	
37 ENTRY					
84 AFTER LO	538.06	1000.50	1519.47	5109396.0	PCTDP = 7.780
	↓ -2.0% cal				EXPAND TO BOWL
51 ENTRY	527.30	999.50	1519.25	5121810.6	
125 ENTRY	537.73	828.60	1426.87	12414.6	— TP cooling stream
					EXP TO STG 11
52 SHELL	239.25	0.	1411.63	4880585.4	
53 EXTR	236.52	801.90	1424.95	241225.3	

Tip leakage

9.51 ?

-13.3

IP7006756

TL	PRESS	TEMP	ENTH	FLOW	
				PACKING NO	3
				SQRT P/V =	4.842
57 LO NO 1	18.08	637.00	1352.93	2566.7	C = 1330.139
				SQRT P/V =	0.708
58 LO NO 2	18.00	631.10	1350.07	2629.5	C = 5468.188
				SQRT P/V =	0.707
100 LO NO 3	0.	0.	0.	621.8	C = 1759.359
				SQRT P/V =	0.
100 LO NO 4	0.	0.	0.	621.8	C = 1759.359
				EXPAND TO EXHAUST	
56 EXH	121.54	617.10	1336.71	4365818.7	
55 EXTR	124.78	618.94	1337.43	508326.7	
				EXPAND TO BOWL	
59 ENTRY	121.54	617.10	1336.71	4365818.7	
				EXP TO STG	15
61 SHELL	67.19	0.	1273.22	4224181.1	
60 EXTR	66.36	523.70	1294.27	141637.6	
				EXP TO STG	16
63 SHELL	41.20	0.	1229.07	3930847.3	
62 EXTR	40.62	420.00	1246.08	293333.8	
				EXP TO STG	18
65 SHELL	12.09	0.	1137.03	3765887.3	
64 EXTR	11.87	230.40	1160.33	164960.0	
				EXP TO STG	19
107 SHELL	5.30	0.	1084.86	3663735.0	
106 EXTR	5.26	0.	1084.65	102152.3	
				CONDENSER	
				SHAFT	1
108 TB EXH	1.90	124.24	1036.6632	3663735.0	LEVL =-12760.0
76 ENTRY	0.	0.	0.	1074295.5	
122 DRAIN	0.	0.	0.	4750790.4	
				GENERATOR	1
				SHAFT	1

MEASURED LOAD = 871725.0 PF = 0.978 H2 = 61.00
SHAFT 1 KW = 883767.7 FL =4353.0 GL = 7689.7

IP7006757

TEST CYCLE HEAT BALANCE

P E R F O R M A N C E

TRUNKLINE OUTPUT

TL	P	T	H	Q	SV	SP	PV	TR
1	2792.0	556.0	553.8	6299617.	0.0213	0.	0.	-12357.0
2	1090.8	800.4	1385.4	605417.	0.6249	555.232	-0.798	245.2
3	1090.8	490.6	476.7	605417.	0.0201	0.	9.200	0.
4	2792.0	481.4	466.5	6299617.	0.	0.	0.	0.
5	573.5	626.7	1309.6	557711.	1.0314	481.366	-0.034	145.3
6	573.5	404.4	380.2	1163128.	0.0187	0.	7.500	0.
7	2792.0	396.9	374.9	6299617.	0.	0.	0.	0.
8	233.4	799.8	1424.0	241225.	3.1536	394.979	-1.921	404.8
9	233.4	355.2	327.4	1404353.	0.0180	0.	8.160	0.
10	2929.6	347.0	323.2	6299617.	0.0177	0.	0.	0.
11	0.	0.	0.	6260160.	0.	0.	0.	0.
12	121.3	619.9	1338.1	250586.	5.2121	342.045	90.000	277.9
13	137.7	297.9	267.7	4605624.	0.0174	0.	0.	0.
14	177.1	297.9	267.8	4605624.	0.0174	1.014	0.	177.1
15	64.8	513.5	1289.4	141638.	8.8196	297.805	-0.095	215.7
16	64.8	273.1	242.2	141638.	0.0172	0.	6.700	0.
17	177.1	266.4	235.6	4605624.	0.	0.	0.	0.
18	39.3	412.8	1242.7	293334.	13.0633	266.144	-0.256	146.7
19	39.3	205.4	173.6	434971.	0.0167	0.	8.500	0.
20	177.1	196.9	165.3	4605624.	0.	0.	0.	0.
21	11.2	230.5	1160.6	164960.	36.4277	198.482	1.582	32.0
22	11.2	163.2	131.2	599931.	0.0164	0.	7.100	0.
23	177.1	156.1	124.5	4605624.	0.	0.	0.	0.
24	1500.0	200.0	171.5	0.	0.0166	0.	0.	0.
25	5.3	0.	1084.7	102152.	0.	164.887	8.787	-164.9
26	227.3	129.4	97.9	4605624.	0.0162	0.	0.	0.
27	0.	0.	0.	4750790.	0.	0.	0.	0.
28	0.	0.	0.	19292.	0.	0.	0.	0.
29	0.	0.	0.	51270.	0.	0.	0.	0.
30	0.	0.	0.	70562.	0.	0.	0.	0.
31	2929.6	328.7	304.3	35146.	0.0175	1.001	0.	2929.6
33	0.	0.	0.	4750790.	0.	0.	0.	0.
34	0.	0.	0.	-12357.	0.	0.	0.	0.
35	2929.6	347.0	323.2	6334763.	0.0177	0.	0.	0.
36	2421.4	1003.3	1462.4	6322406.	0.31930	.133E 37	87.085	0.
37	538.3	879.8	1454.3	2838.	1.4311	0.780	19.393	55.6
38	0.	0.	0.	2005.	0.	0.	0.	103.4
39	2421.4	0.	1462.4	6317563.	0.3193	0.	87.085	0.
40	1968.0	944.7	1439.8	6266234.	0.3789	147.083	72.064	0.
41	1111.9	0.	1385.9	5640058.	0.6134	557.936	42.575	841.6
42	127.5	780.7	1418.9	16554.	5.7313	0.779	4.717	0.0
43	18.0	774.4	1420.3	3584.	40.8713	0.	0.663	891.5
45	0.	0.	0.	38915.	0.	0.	0.	0.
46	126.2	605.6	1330.7	8570.	4.9322	0.703	5.059	612.8
47	18.2	587.8	1329.1	5512.	34.1811	0.	0.730	1212.5
48	0.	0.	0.	5678973.	0.	0.	0.	0.
49	583.4	627.7	1309.5	5664269.	1.0133	483.204	23.996	0.
50	583.4	627.7	1309.5	5106558.	0.	0.	0.	0.
51	527.3	999.5	1519.2	5121811.	1.6091	0.	18.106	0.

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TL	P	T	H	Q	SV	SP	PV	TR
52	239.3	0.	1411.6	4880585.	3.0191	397.503	8.902	770.9
53	236.5	801.9	1425.0	241225.	3.1171	396.120	8.711	0.
54	121.5	617.1	1336.7	4874145.	5.1850	0.	4.842	0.
55	124.8	618.9	1337.4	508327.	5.0572	344.213	0.	0.
56	121.5	617.1	1336.7	4365819.	5.1850	342.225	0.	0.
57	18.1	637.0	1352.9	2567.	36.0408	0.	0.708	1330.1
58	18.0	631.1	1350.1	2630.	36.0149	0.	0.707	5468.2
59	121.5	617.1	1336.7	4365819.	5.1851	0.	4.842	0.
60	66.4	523.7	1294.3	141638.	8.7089	299.353	2.760	0.
61	67.2	0.	1273.2	4224181.	8.2235	300.313	2.858	1044.5
62	40.6	420.0	1246.1	293334.	12.7345	268.180	1.786	0.
63	41.2	0.	1229.1	3930847.	12.0606	269.183	1.848	1052.2
64	11.9	230.4	1160.3	164960.	34.2513	201.422	0.589	0.
65	12.1	0.	1137.0	3765887.	31.8910	202.546	0.616	1016.5
66	17.5	651.8	1360.1	9343.	37.7405	0.	0.	0.
67	125.0	347.5	1193.0	0.	3.6046	0.	0.	0.
68	6.6	682.0	1375.4	3476.	102.5425	0.	0.	0.
69	6.1	599.2	1335.4	8262.	102.7657	0.	0.	0.
70	6.1	599.2	1335.4	3478.	102.7657	0.	0.	0.
71	0.	0.	1462.4	0.	0.	0.	0.	0.
72	0.	0.	0.	90.	0.	0.	0.	0.
73	0.	0.	0.	-12760.	0.	0.	0.	0.
75	0.	0.	0.	5612.	0.	0.	0.	0.
76	0.	0.	0.	1074295.	0.	0.	0.	0.
79	1097.5	801.7	1385.9	605417.	0.6216	555.994	42.020	0.
80	583.4	627.7	1309.5	557711.	0.	0.	0.	0.
81	17.4	484.6	1279.8	0.	32.1353	0.	0.	0.
82	0.	0.	0.	5106558.	0.	0.	0.	0.
83	121.3	342.0	1190.6	313.	0.	0.	0.	0.
84	538.1	1000.5	1519.5	5109396.	1.5768	7.780	18.473	789.8
86	0.	0.	0.	145166.	0.	0.	0.	0.
88	0.	0.	0.	6954.	0.	0.	0.	0.
90	125.0	342.1	313.5	0.	0.0179	0.	0.	0.
91	207.3	226.7	195.4	551582.	0.0168	0.647	0.	207.3
95	1.9	124.2	1026.8	3663735.	166.3386	1036.663	3.874	507.4
99	0.	0.	0.	6841.	0.	0.	0.	0.
100	0.	0.	0.	622.	0.	0.	0.	1759.4
104	2792.0	556.0	553.8	6383857.	0.0213	1.026	0.	2792.0
106	5.3	0.	1084.7	102152.	66.8259	164.371	0.281	0.
107	5.3	0.	1084.9	3663735.	66.3370	0.	0.283	1071.7
108	1.9	124.2	1036.7	3663735.	182.0962	1036.663	3.874	-12760.0
109	0.	0.	290.2	1955935.	0.	0.	0.	0.
111	121.3	342.1	313.5	6811741.	3.6914	0.	-0.055	0.
112	0.	0.	1439.8	51329.	0.	0.	0.	0.
113	0.	0.	0.	6245475.	0.	0.	0.115E 19	0.
114	227.3	129.4	97.9	14792.	0.0162	0.624	0.	227.3
115	227.3	129.4	97.9	17249.	0.0162	0.623	0.	227.3
116	227.3	129.4	97.9	26213.	0.0162	0.623	0.	227.3
117	227.3	129.4	97.9	35052.	0.0162	0.660	0.	227.3
118	227.3	129.4	97.9	28279.	0.0162	0.660	0.	227.3
119	227.3	129.4	97.9	23581.	0.0162	0.660	0.	227.3
120	0.	0.	0.	4843.	0.	0.	0.	0.
122	0.	0.	0.	4750790.	0.	0.	0.	0.
123	5.3	133.9	101.9	705561.	0.0163	0.	4.500	0.
125	537.7	828.6	1426.9	12415.	1.3704	0.628	0.	531.2
130	0.	0.	0.	282865.	0.	0.	0.	0.
131	120.4	619.6	1338.0	149608.	5.2484	1.018	0.	120.4
132	121.0	618.4	1337.4	133256.	5.2153	1.020	0.	121.0
133	0.	0.	0.	282243.	0.	0.	0.	0.

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