PEPSE®'s Use in Cost/Benefit Decision - Case Studies

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PEPSE'S USE IN COST/BENEFIT DECISIONS

CASE STUDIES

by

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PEPSE software was used to provide the thermal benefit for maintenance decisions. Three cases were described for Beebee Unit 12, a General Electric 80 megawatt net machine with a tandem compound, double-flow reheat turbine and a hydrogen-cooled generator. The steam is supplied by a Combustion Engineering tangentially fired, controlled circulation, reheat steam generator. The cases discussed are; make up losses due to isolation leaks, feedwater relief valve leaks to condenser and low pressure feedwater heater repairs.

The Performance Monitoring Services group uses PEPSE Rev57 on the OS2 platform. The model of Unit 12 was created in Rev54 using General Electric turbines and shapers to match a series of A/E heat balances. That base model was modified to reflect any changes made to the turbine cycle since the original design. The model was then converted to Type 8 turbines. This is referred to as the benchmark model. For the studies described, the condenser (190) was replaced by a HEI condenser and the #3 low pressure heater (280) was changed from a performance mode to a simplified design mode heater. The PEPSE benchmark schematic is included in Appendix A as Figure 1.

Makeup Losses

Station operating staff noticed much larger than normal daily makeup water requirement. Three sources of system leaks were found during unit walk downs. These included; boiler circulating water pump seal leaks, girth header drain valve leaks and superheater header vent valve leaks. The station had makeup flow requirements calculated when the unit was isolated. The benchmark flow was calculated to be 1000 pounds/hour. The system leaks were calculated to be 3750 pounds/hour. Maintenance required a cost/benefit analysis to be done to decide when maintenance should be performed.

To model makeup loss, the benchmark model was modified to include a splitter (362), after the #6 feedwater heater (350), connected to a sink. The PEPSE schematic associated with this case is included in Appendix B as Figure 2. This location is essentially at the same state as the water entering the economizer. Unit makeup goes directly into the condenser. A mixer (7) was added to the #1 heater drain line (10) entering the condenser.

The model was run with stacked cases for 0, 1000 and 3750

pounds per hour makeup water requirements. The BTU/Kwh calculated by PEPSE for the 1000 lb/hr case was subtracted from the heat rate calculated for the 3750 lb/hr case (additional makeup required was 12,000 Gal/day). Conversion to dollars per day using the corporate value of cents per million BTU projected a loss of $1000 dollars per day at full load.

This method is not meant to yield an exact value. The shortcuts applied included using the feedwater state entering the economizer and using the full load loss applied as a constant for all loads. To obtain a "real" value, the point of system loss would have to be the liquid saturation enthalpy at the drum pressure. Methods to model the enthalpy difference are available but were not chosen because the split between the girth header leaks and the header vent leaks was not known. This assumption tends toward a conservative answer. The second shortcut of using the PEPSE full load BTU/Kwh loss for the whole load range also adds an error to the analysis. The unit capacity factor during the study period was 10% lower than the PEPSE benchmark model. This assumption tends to give a higher cost to the makeup loss. The two shortcuts applied together would cancel.

The $1000 per day value was used by the Maintenance, Operations and Power Control Groups to evaluate whether it was cost effective to remove the unit from service, and drain the boiler to repair these valves. The work was deferred to a period of economic reserve for repair. The Special Output Table of Specified Variables for the Benchmark and 12000 Gal/Day Makeup cases are in Appendix B along with the .JOB file.

Feedwater Relief Valve Leaks to Condenser

The water side pressure relief valves on numbers 4 and 6 feedwater heaters were noted by plant operators to be leaking. PMS was asked to determine the savings if those leaks were repaired. The model used was the same as in the Makeup study previously discussed. Splitters were added in the feedwater lines entering both #4 and #6 heaters. The flows were diverted to a mixer in the #1 heater drain line to the condenser (points E and F entering 510 in the schematic).

The amount of flow leaking by was not known. The inside diameter of the outlet line was determined from the piping specification. The valve specification noted a smaller internal opening than the line to the reclaim tank (modelled as the mixer 510). The maximum flow through the line was determined using Cameron's Hydraulic Data for the smaller opening and compared to the valve specification flow. Both heater relief valves are identical and the pressure drop between #4 and #6 heater is negligible compared to feedwater pressure; the maximum flow was determined to be 1600 pounds/hour. More complex modelling is possible with PEPSE valves and stream options; however, for this evaluation, that degree of detail was unnecessary. The difference in turbine heat rate between the Benchmark and the leaking case was calculated to be 7 BTU/kWh. The repair was deferred. Shortly after the determination not to derate the unit and repair the relief valves, a leak developed in one of the valves, necessitating a

derating. A comparison of turbine heat rate pre and post repair made to determine the effect of the repair compared to the model. The savings were calculated to be 5 BTU/kw.

Low Pressure Feedwater Heater Repairs

Unit 12's low pressure heaters share a common shell located in the neck of the condenser. The #3 heater has over 15% of its tubes plugged because of leaks. The steam side partition between the #3 and #2 heaters has been known to leak. The test data reduction model routinely used by PMS does not take this leakage into consideration. The Maintenance Group will be doing a major turbine overhaul late in 1993 and needed to evaluate the benefit of retubing the heater. Through eddy current testing, it was determined that an addition 6 tubes should be plugged. PMS was asked to determine the thermal cost associated; with the present number of plugged tubes, and with additional #3 heater surface area reduction to decide the course of action. The need to repair the shell partition was also mentioned as necessary to avoid premature tube failure if the heater were retubed. That benefit also had to be determined.

The PEPSE benchmark model was modified by including the #3 heater simplified design submodel and by changing the condenser from Performance mode to HEI mode. The heater submodel was created from the vendor specification sheet. The #3 heater is a dry, forward draining heater with a desuperheating section. The stacked cases to determine the effect of tubes plugged used actual TTD values with 22 tubes plugged, with an additional 2 degree deviation in TTD (additional 6 tubes plugged) as compared to design. The heater costs 7 BTU/kWh at full load with the 22 plugged tubes. The additional 6 plugs will add 3 BTU/kWh more. The 10 BTU/kWh loss does not include heater shell bypassing or additional auxiliary use required as a result of the increased feedwater pressure differential. The increased auxiliary requirement was felt to be minimal and not calculated.

Identifying the cost of the heater shell partition leak could further reduce the time required to break even. The common bundle for the low pressure heaters does not allow testing to evaluate steam side leaks. The problem becomes more unknowns than equations. To provide PEPSE with data, an energy balance around the #3 and #2 heaters was made. The leak between the heaters was assumed to be small with respect to the extraction flow, which made the calculation of an extraction flow ratio. The design extraction flow ratio was calculated using the full load A/E heat balances and compared to the performance data acquisition scan which calculates a real time turbine heat rate based on feedwater flow. The difference was 9% or 1900 pounds/hour. Another test done during outages is a static pressure test. The #3 heater is flooded, the level is recorded over time and the amount of water used to flood the heater is known. That rate was rounded down to 1000 pounds/hour. The static pressure test was used as a sanity check on the ratio calculation. The higher number was used based on; the higher pressure differential between the heaters during operation compared to the static test, and the density difference between

steam and water.

The model was run with 1900 pounds/hour shell bypassing between #3 and #2 heater. The additional loss was calculated to be 2 BTU/Kwh. The simple payback to retube the heater is less than 3 years. The payback on repairing the shell partition is dependent on the repair cost. The Special Output Table of Specified Variables for the Benchmark, #3 Heater As Is, #3 heater with additional tubes plugged and the shell partition bypassing cases are in Appendix C.

Summary

PEPSE software was used to provide the thermal benefit for maintenance decisions. The cases discussed are; make up losses due to isolation leaks, feedwater relief valve leaks to condenser and low pressure feedwater heater repairs. The methodology used in the analysis and the results were reported.

The author wishes to acknowledge the assistance of Joe Simpson, Don Buehlman, Jack Paris and Tom McColloch in the preparation of this paper.

APPENDIX A

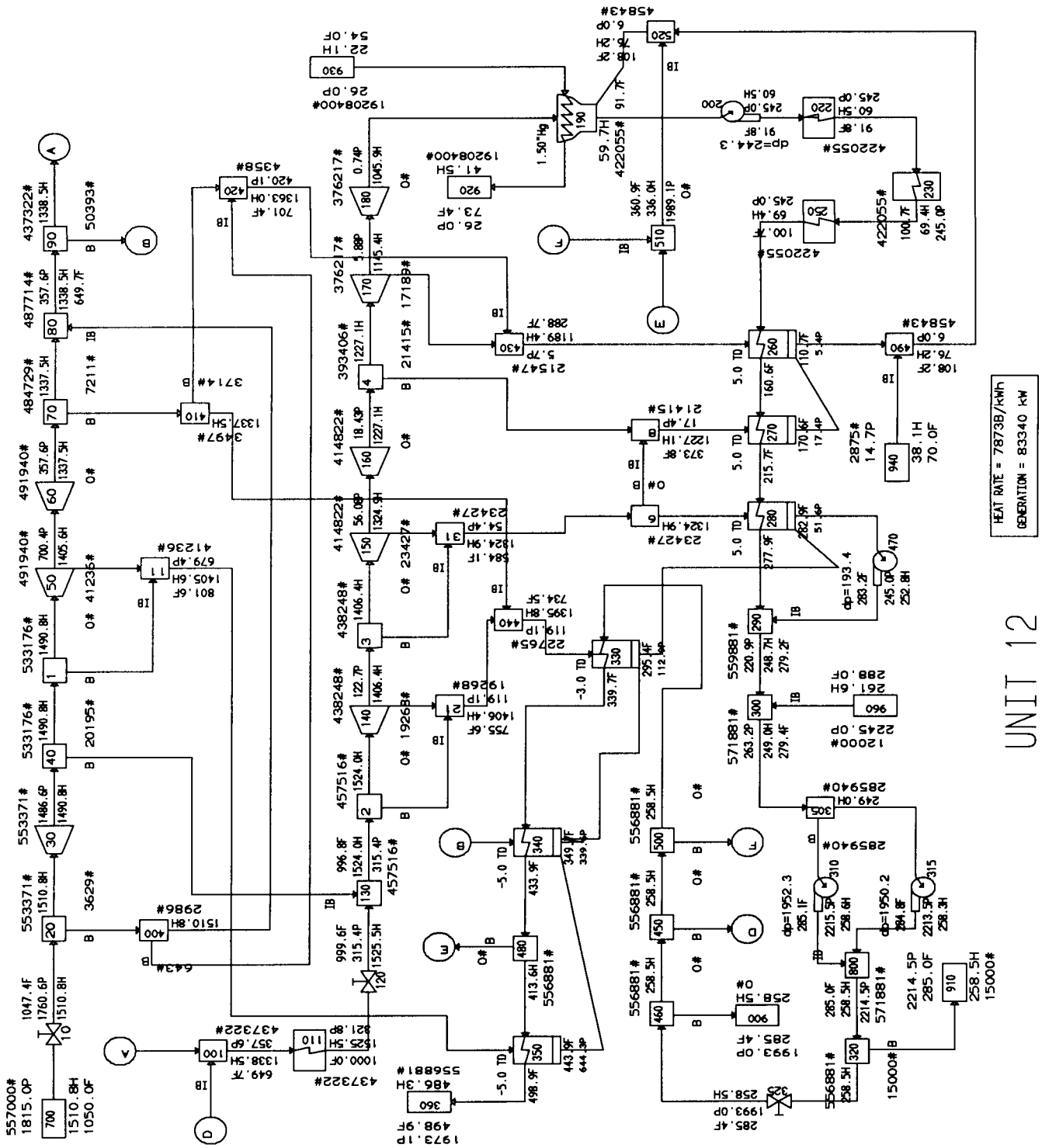

Figure 1. PEPSE Benchmark

APPENDIX B

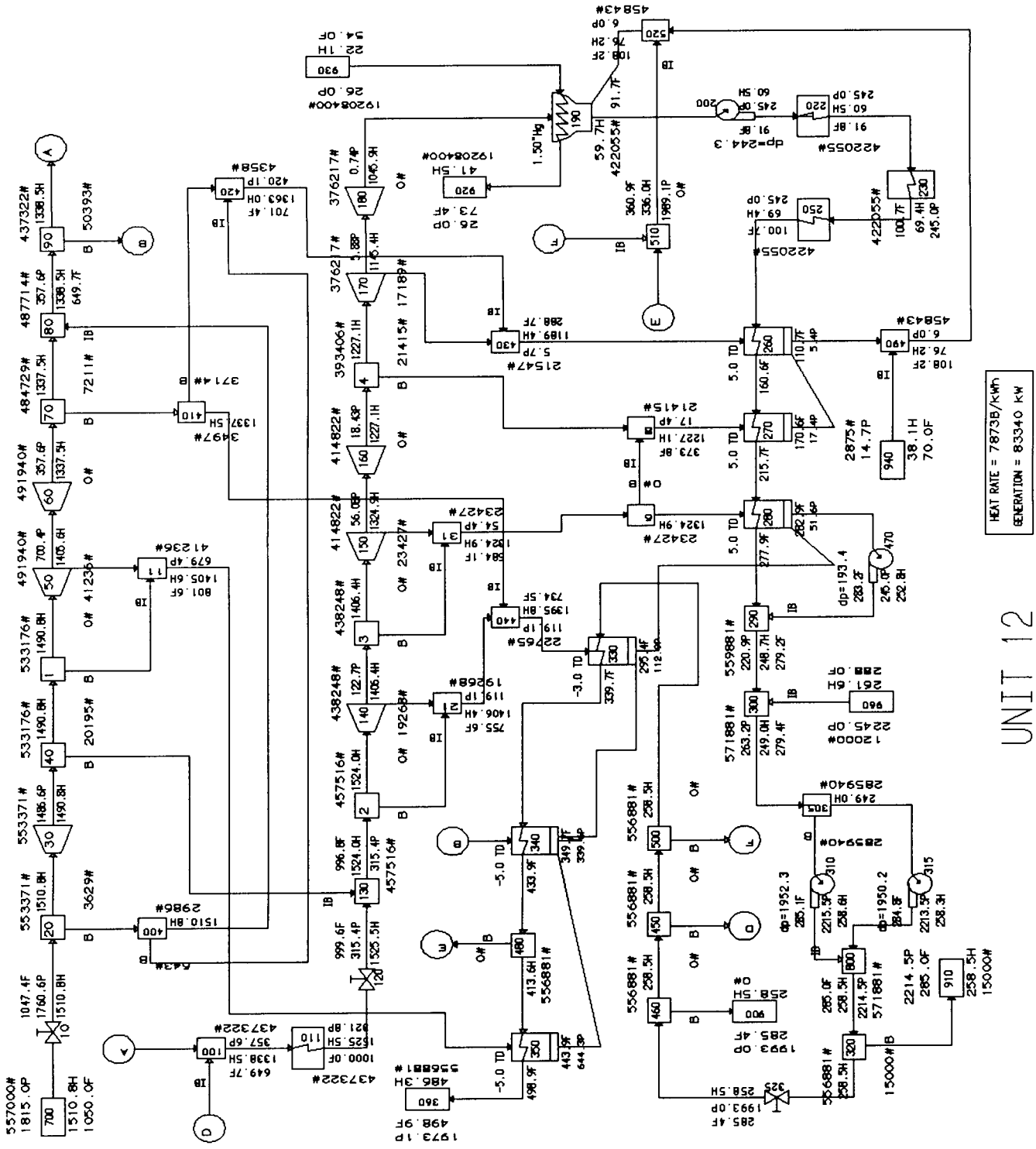

Figure 2. Makeup Loss Case Schematic

SPECIAL OUTPUT TABLE OF SPECIFIED VARIABLES

INDEX	DESCRIPTION	VARIABLE (ID)	VALUE
1	GROSS TURBINE CYCLE POWER OUTPUT (MW)	BKGROS(0)	83.3974
2	GROSS TURBINE CYCLE HEAT RATE (BTU/KWH)	GPVB (16)	7823.3636
3	GROSS TURBINE CYCLE THERMAL EFFIC. (%)	GPVB (35)	43.6147
4	H.P. TURBINE SECTION EFFIC. (%)	GPVB (36)	83.6030
5	I.P. TURBINE SECTION EFFIC. (%)	GPVB (37)	89.0878
6	L.P. TURBINE SECTION EFFIC. (%)	GPVB (38)	76.0634
7	MAIN STEAM FLOW (#/HR)	WW (5)	557000.0000
8	MAIN STEAM PRESSURE (PSIA)	PP (5)	1815.0000
9	MAIN STEAM TEMPERATURE (DEG-F)	TT (5)	1050.0000
10	1ST STAGE PRESSURE (PSIA)	PP (35)	1486.6454
11	10TH STAGE PRESSURE (PSIA)	PP (65)	357.4371
12	COLD REHEAT PRESSURE (PSIA)	PP (95)	357.4371
13	COLD REHEAT TEMPERATURE (DEG-F)	TT (95)	649.6611
14	HOT REHEAT PRESSURE (PSIA)	PP (115)	321.7292
15	HOT REHEAT TEMPERATURE (DEG-F)	TT (115)	1000.0000
16	I.P. INLET PRESSURE (PSIA)	PP (136)	315.2946
17	I.P. EXHAUST PRESSURE (PSIA)	PP (165)	18.4280
18	CONDENSER BACK PRESSURE (IN-HG)	PP (195)	0.4936
19	CIRC. WATER INLET TEMPERATURE (DEG-F)	TT (932)	54.0000
24	#4 FEEDWATER HEATER PRESSURE DROP	PDFW (330)	0.0000

SPECIAL OUTPUT TABLE OF SPECIFIED VARIABLES

INDEX	DESCRIPTION	VARIABLE (ID)	VALUE
1	GROSS TURBINE CYCLE POWER OUTPUT (MW)	BKGROS(0)	83.2459
2	GROSS TURBINE CYCLE HEAT RATE (BTU/KWH)	GPVB (16)	7836.6362
3	GROSS TURBINE CYCLE THERMAL EFFIC. (%)	GPVB (35)	43.5409
4	H.P. TURBINE SECTION EFFIC. (%)	GPVB (36)	83.6056
5	I.P. TURBINE SECTION EFFIC. (%)	GPVB (37)	89.0889
6	L.P. TURBINE SECTION EFFIC. (%)	GPVB (38)	76.0776
7	MAIN STEAM FLOW (#/HR)	WW (5)	557000.0000
8	MAIN STEAM PRESSURE (PSIA)	PP (5)	1815.0000
9	MAIN STEAM TEMPERATURE (DEG-F)	TT (5)	1050.0000
10	1ST STAGE PRESSURE (PSIA)	PP (35)	1486.6439
11	10TH STAGE PRESSURE (PSIA)	PP (65)	356.8394
12	COLD REHEAT PRESSURE (PSIA)	PP (95)	356.8394
13	COLD REHEAT TEMPERATURE (DEG-F)	TT (95)	649.3070
14	HOT REHEAT PRESSURE (PSIA)	PP (115)	321.1911
15	HOT REHEAT TEMPERATURE (DEG-F)	TT (115)	1000.0000
16	I.P. INLET PRESSURE (PSIA)	PP (136)	314.7673
17	I.P. EXHAUST PRESSURE (PSIA)	PP (165)	18.4280
18	CONDENSER BACK PRESSURE (IN-HG)	PP (195)	0.4931
19	CIRC. WATER INLET TEMPERATURE (DEG-F)	TT (932)	54.0000
24	#4 FEEDWATER HEATER PRESSURE DROP	PDFW (330)	0.0000

```
LISTING OF INPUT DATA FOR CASE  1

010001    132    * 132 column output
*
*        PEPSE USER : ADMIN
*             DATE : 03/29/93
*             TIME : 07:37
*     MODEL FILE ID : BB12
*       JOB FILE ID : \EASEPLUS\DEMO\bb12.JOB
*   RESULTS FILE ID : \EASEPLUS\DEMO\bb12.OUT
*
=     BEEBEE STATION - UNIT # 12 - BENCHMARK FOR TEST  06/15/90 - 83.323
*
*
*
*****************************************************************
*      GENERIC INPUT DATA
*****************************************************************
*
*  CYCLE FLAGS
010200    2     3     1     1     1     0     0.    0.
010201    3
*
*  GENERATOR #1 FLAGS AND DATA
011010    1     2     1     0   3600  96000.  0.85  44.7  44.7    0.
011011  360.  1190.     0.
*
*  CYCLE CONVERGENCE DATA
012000   50    50.   50.    0.    0.    0.    0   100000.
*
*  PEPSE OUTPUT SUPPRESSION CARDS
*
020000  NOPRNT PRINT
020003  PRINT
020006  PRINT
020007  PRINT
020008  PRINT
020009  PRINT
020010  PRINT
020020  PRINT
020023  PRINT
020038  PRINT
020039  PRINT
020076  PRINT
*
*  SPECIAL INPUT/OUTPUT OUTPUT TABLE FORMAT
890000    1     1
*
*
*****************************************************************
*        GEOMETRY CARDS
*****************************************************************
*
500460     1        U    50   I
500470     1        B    11   IB
501360     2        U   140   I
501370     2        B    21   IB
501460     3        U   150   I
501470     3        B    31   IB
501670     4        U   170   I
501570     4        B     8   IA
501560     6        U   280   S
500610     6        B     8   IB
500100     7        U   520   IA
501580     8        U   270   S
500090     9        U     7   IB
500150    10        U    20   I
500540    11        U   350   S
500250    20        U    30   I
500220    20        B   400   I
501440    21        U   440   IA
500350    30        U    40   I
501540    31        U     6   I
500450    40        U     1   I
500420    40        B   130   IB
500550    50        U    60   I
500510    50        E    11   IA
500650    60        U    70   I
500750    70        U    80   IA
500710    70        B   410   I
500850    80        U    90   I
500950    90        U   100   IA
500910    90        B   340   S
501050   100        U   110   I
```

```
 83    501150  110       I   120   I
 84    501250  120       U   130   IA
 85    501350  130       U     2   I
 86    501450  140       U     3   I
 87    501410  140       E    21   IA
 88    501550  150       U   160   I
 89    501510  150       E    31   IA
 90    501650  160       U     4   I
 91    501750  170       U   180   I
 92    501710  170       E   430   IA
 93    501850  180       U   190   S
 94    501920  190       T   920   I
 95    501950  190       D   200   I
 96    502050  200       U   220   T
 97    502250  220       T   230   T
 98    502350  230       T   250   T
 99    502550  250       T   260   T
100    502650  260       T   270   T
101    502690  260       D   490   IA
102    502750  270       T   280   T
103    502790  270       D   260   D
104    502850  280       T   290   IA
105    502890  280       D   470   I
106    502950  290       U   300   IA
107    503050  300       U   305   I
108    503120  305       U   315   I
109    503070  305       B   310   I
110    503130  310       U   800   IB
111    503170  315       U   800   IA
112    503250  320       U   325   I
113    503220  320       B   910   I
114    503260  325       U   460   I
115    503350  330       T   340   T
116    503390  330       D   280   D
117    503450  340       T   480   I
118    503490  340       D   330   D
119    503550  350       T   362   I
120    503590  350       D   340   D
121    503560  362       U   360   I
122    503630  362       B   361   I
123    504020  400       U    80   IB
124    504030  400       B   420   IB
125    504110  410       U   440   IB
126    504120  410       B   420   IA
127    504220  420       U   430   IB
128    504310  430       U   260   S
129    504410  440       U   330   S
130    503280  450       U   500   I
131    504630  450       B   100   IB
132    500070  460       U   450   I
133    504620  460       B   900   I
134    504720  470       U   290   IB
135    503460  480       U   350   T
136    504850  480       B   510   IA
137    504900  490       U     7   IA
138    503290  500       U   330   T
139    505050  500       B   510   IB
140    505150  510       U   520   IB
141    505250  520       U   190   D
142    500050  700       U    10   I
143    503190  800       U   320   I
144    509320  930       U   190   T
145    509420  940       U   490   IB
146    509620  960       U   300   IB
147    *
148    *
149    ***************************************************************
150    *      SPECIAL STREAM SPECIFICATIONS
151    ***************************************************************
152    *
153    ************** STREAM TYPES 1 - 7
154    *
155    *
156    600540  2   0.0516    0.    0.    0.    0.    0.
157    *
158    600910  2   0.0503    0.    0.    0.    0.    0.
159    *
160    601540  2   0.0524    0.    0.    0.    0.    0.
161    *  #2 HEATER EXTRACTION
162    601570  2   0.082     0.    0.    0.    0.    0.
163    *
164    604310  2   0.0521    0.    0.    0.    0.    0.
165    *
166    604410  2   0.0522    0.    0.    0.    0.    0.
167    *
168    ************** STREAM FLOW OPTION
169    *
170    *
```

```
*
*****************************************************************
*      COMPONENT DATA
*****************************************************************
*
*************** TURBINES
*
*
700300    8     1     0     0     1     0
 +   1    3     0.    0.    0.
 +   0.     0     0.    0.    0.    0.
700303  0.77898   10207.9
700309  1760.55   1510.79   553371.      0.    0.    0.    0.    0.    0.
*
700500    8     1     1     1     2     0
 +   1    3   0.03    0.    0.
 +   0.     0     0.    0.    0.    0.
700503  0.81974   18708.3
*
700600    8     1     3     0     2     0
 +   1    1     0.    0.    0.
 +   0.     0     0.    0.    0.    0.
700601  0.83112   357.346
*
701400    8     1     0     1     4     0
 +   1    3   0.03    0.    0.
 +   0.     0     0.    0.    0.    0.
701403  0.87128   95532.6
701409  315.214   1524.01   457225.      0.    0.    0.    0.    0.    0.
*
701500    8     1     1     1     4     0
 +   1    3   0.03    0.    0.
 +   0.     0     0.    0.    0.    0.
701503  0.85763   183621.
*
701600    8     1     3     0     5     0
 +   1    1     0.    0.    0.
 +   0.     0     0.    0.    0.    0.
701601  0.87403   18.428
*
701700    8     1     1     1     4     0
 +   2    3   0.03    0.    0.
 +   0.     0     0.    0.    0.    0.
701703  0.89719   1.257E+6
701709  18.428  1227.16   392716.      0.    0.    0.    0.    0.    0.
*
701800    8     1     3     0     4     0
 +   2    1     0.    0.  26.175
 +   0.     0     0.    0.    0.    0.
701801  0.89413   0.737
*
*************** CONDENSERS AND FEEDWATER HEATERS
*
*  Main Condenser
701900   10     1     5     0.  -1.5
701905    1   0.777   0.875   336.  7020.     2     0.    0
*  #1 Feedwater Heater
702600   16     1   170     2     0.    5.   10.
702601    0.    0.    0.    0.    0.    0.
702602    0.    0.    0.    0.    0.    0.    0.
*  #2 Feedwater Heater
702700   16     0     4     2     0.    5.   10.
702701    0.    0.    0.    0.    0.    0.
702702    0.    0.    0.    0.    0.    0.    0.
*  #3 Feedwater Heater
702800   17     1   150     2     0.    5.
702801    0.    0.    0.    0.    0.    0.
702802    0.    0.    0.    0.    0.    0.    0.
*  #4 Feedwater Heater
703300   18     1   140     2     0.   -3.   10.
703301    0.    0.    0.    0.    0.    0.
703302    0.    0.    0.    0.    0.    0.    0.
*  #5 Feedwater Heater
703400   18     1    90     2     0.   -5.   10.
703401    0.    0.    0.    0.    0.    0.
703402    0.    0.    0.    0.    0.    0.    0.
*  #6 Feedwater Heater
703500   18     0    50     2     0.   -5.   10.
703501    0.    0.    0.    0.    0.    0.
703502    0.    0.    0.    0.    0.    0.    0.
*
*************** HEAT EXCHANGERS
*
*  Reheater
701100   25     2   1000.
701101  0.0999    0.    0.    0.    0.
*
702200   27     0.    0.    0.    0.
```

```
*
702300   27   3.7543E+6        0.    0.    0.
*
702500   27     0.    0.    0.    0.
*
*************** SOURCES, SINKS, AND VALVES
*
*  MAKE UP FLOW
700090   31    85.   15.  1000.     0.    0.    0
*
707000   33  1050.  1815.  557000.     0.    0.    0
*
709300   31    54.   26.  1.92084E+7      0.    0.    0
*
709400   31    70.  14.7  2875.     0.    0.    0
*
709600   31   288.  2245.   12000.    0.    0.    0
*
703600  32
*  blowdown
703610  30
*
709000  30
*
709100  30
*
709200  30
*
700100   35   -2.   -2.   -2.  0.3   1815.   1510.9  557000.
*
701200   34  0.02    0.    0.
*
703250   34  0.1     0.    0.
*
*************** PUMPS, COMPRESSORS, AND FANS
*
*
702000   41  245.    0.    0.    0.
702001    0.    0.    0.    0.    0.    0.
*
703100   41  2208.  0.87    1.  0.7
703101    0.    0.    0.    0.    0.    0.
*
703150   41  2208.  0.87    1.  0.7
703151    0.    0.    0.    0.    0.    0.
*
704700   41  245.    0.    0.    0.
704701    0.    0.    0.    0.    0.    0.
*
*************** MIXERS
*
*  PARTITION LEAKAGE BETWEEN #'S 3 AND 2 HE
700080   50     1     0.
*
700110   50     1     0.
*
700210   50     1     0.
*
700310   50     1     0.
*
701000   50     1     0.
*
701300   50     1     0.
*
704200   50     0     0.
*
704900   50     0     0.
*  RECLAIM TANK
705100   50     0     0.
*  RECLAIM TANK
705200   50     0     0.
*
708000   50     0     0.
*
700070   50     0     0.
*
700800   50     1     0.
*
702900   50     0     0.
*
703000   50     0     0.
*
704300   50     1     0.
*
704400   50     1     0.
*
*************** SPLITTERS
*
```

```
*
703050   63     0.  0.5
*  blowdown
703620   61     0.  1000.
*
704000   68   643.  52.1272     0.
*  #6 HEATER RELIEF VALVE
704800   61     0.    0.
*
700010   61     0.    0.
*
700020   61     0.    0.
*
700030   61     0.    0.
*  #2 EXTRACTION
700040   60     0.  21827.    0.    0     0.
700041    1
*  PARTITION PLATE BY-PASSING FROM #3 TO #2
700060   60     0.    0.    0.    0     0.
*
700200   68   3629.   57.7267     0.
*
700400   64   386.635     0.    0.
*
700700   64   505.519     0.    0.
*
700900   60     0.  50554.    0.    0     0.
*
703200   61     0.  15000.
*
704100   64   783.775     0.    0.
*  REHEAT SPRAY
704500   61     0.    0.
*
704600   61     0.    0.
*  #4 HEATER RELIEF VALVE
705000   61     0.    0.
*
*
*****************************************************************
*      SPECIAL FEATURES
*****************************************************************
*
*************** SCHEDULES
*
*
800100   'H2 COOLER HEAT INPUT VS. THROTTLE FLOW  '
*              X VALUES
810100   139000.  201000.   265000.   328500.   389000.
810101   442000.  500500.   557000.
*              Z AND Y VALUES
810110     0.   388.000000  445.000000  518.000000  596.000000  687.000000
810111   788.000000   959.000000  1100.000000
*            Y, X, AND Z MULTIPLIERS
820100   3412.13    0.    0.
*
800200   'TOT GEN ELEC LOSS VS. GEN GROSS OUTPUT  '
*              X VALUES
810200   21.53  31.823  42.146  51.979  60.963
810201   68.427   76.202  83.27
*              Z AND Y VALUES
810210     0.   478.000000  535.000000  608.000000  686.000000  777.000000
810211   878.000000   1049.000000   1190.000000
*
800300   'GOV. STAGE EFF. VS. EQ. THR. FLOW RATIO '
*              X VALUES
810300   0.36083  0.47572   0.58972   0.69833   0.79347
810301   0.89849    1.
*              Z AND Y VALUES
810310     0.   0.401950  0.454930  0.516480  0.583790  0.647530
810311   0.720250   0.778980
*
800400   '6TH STAGE EFF. VS. EQ. THR. FLOW RATIO  '
*              X VALUES
810400   0.36083  0.47572   0.58972   0.69833   0.79347
810401   0.89849    1.
*              Z AND Y VALUES
810410     0.   0.869180  0.865910  0.851990  0.837010  0.824660
810411   0.817910   0.819740
*
800500   '10TH STAGE EFF. VS. EQ. THR. FLOW RATIO '
*              X VALUES
810500   0.36083  0.47572   0.58972   0.69833   0.79347
810501   0.89849    1.
*              Z AND Y VALUES
810510     0.   0.800480  0.814440  0.822420  0.829060  0.832580
810511   0.833670   0.831120
*
```

```
435    800600   '15TH STAGE EFF. VS. EQ. THR. FLOW RATIO '
436    *             X VALUES
437    810600   0.36083  0.47572   0.58972   0.69833   0.79347
438    810601   0.89849    1.
439    *             Z AND Y VALUES
440    810610     0.   0.887270  0.881460  0.878960  0.875980  0.873630
441    810611   0.871510   0.871290
442    *
443    800700   '18TH STAGE EFF. VS. EQ. THR. FLOW RATIO '
444    *             X VALUES
445    810700   0.36083  0.47572   0.58972   0.69833   0.79347
446    810701   0.89849    1.
447    *             Z AND Y VALUES
448    810710     0.   0.869290  0.867190  0.864450  0.865410  0.865060
449    810711   0.862140   0.857630
450    *
451    800800   '21ST STAGE EFF. VS. EQ. THR. FLOW RATIO '
452    *             X VALUES
453    810800   0.36083  0.47572   0.58972   0.69833   0.79347
454    810801   0.89849    1.
455    *             Z AND Y VALUES
456    810810     0.   0.876040  0.870730  0.870330  0.867480  0.867270
457    810811   0.869380   0.874030
458    *
459    800900   '23RD STAGE EFF. VS. EQ. THR. FLOW RATIO '
460    *             X VALUES
461    810900   0.36083  0.47572   0.58972   0.69833   0.79347
462    810901   0.89849    1.
463    *             Z AND Y VALUES
464    810910     0.   0.897780  0.896280  0.896340  0.895970  0.895980
465    810911   0.896160   0.897190
466    *
467    801000   '25TH STAGE EFF. VS. EQ. THR. FLOW RATIO '
468    *             X VALUES
469    811000   0.36083  0.47572   0.58972   0.69833   0.79347
470    811001   0.89849    1.
471    *             Z AND Y VALUES
472    811010     0.   0.896860  0.895000  0.894550  0.893900  0.893650
473    811011   0.893570   0.894140
474    *
475    801100   '6 EXTR. PRESS. DROP CONST. VS. THR. FLOW'
476    *             X VALUES
477    811100   201000.  265000.   328500.   389000.   442000.
478    811101   500500.  557000.
479    *             Z AND Y VALUES
480    811110     0.   0.055800  0.055100  0.053900  0.052800  0.052000
481    811111   0.051400   0.051600
482    *
483    801200   '5 EXTR. PRESS. DROP CONST. VS. THR. FLOW'
484    *             X VALUES
485    811200   201000.  265000.   328500.   389000.   442000.
486    811201   500500.  557000.
487    *             Z AND Y VALUES
488    811210     0.   0.050200  0.050300  0.050200  0.049600  0.049700
489    811211   0.050000   0.050300
490    *
491    801300   '3 EXTR. PRESS. DROP CONST. VS. THR. FLOW'
492    *             X VALUES
493    811300   201000.  265000.   328500.   389000.   442000.
494    811301   500500.  557000.
495    *             Z AND Y VALUES
496    811310     0.   0.050300  0.051300  0.052600  0.051200  0.051400
497    811311   0.051400   0.052400
498    *
499    801400   '2 EXTR. PRESS. DROP CONST. VS. THR. FLOW'
500    *             X VALUES
501    811400   201000.  265000.   328500.   389000.   442000.
502    811401   500500.  557000.
503    *             Z AND Y VALUES
504    811410     0.   0.052800  0.056200  0.053700  0.049700  0.050200
505    811411   0.052300   0.054900
506    *
507    801500   '1 EXTR. PRESS. DROP CONST. VS. THR. FLOW'
508    *             X VALUES
509    811500   201000.  265000.   328500.   389000.   442000.
510    811501   500500.  557000.
511    *             Z AND Y VALUES
512    811510     0.   0.053100  0.051200  0.056200  0.051400  0.052500
513    811511   0.053200   0.052100
514    *
515    801900   '12-A BFP EFF. VS. PUMP FLOW     '
516    *             X VALUES
517    811900   8967.   112208.   134650.   157092.   179533.
518    811901   201975.  224417.   246858.   269300.   291745.
519    811902   314187.  336629.   359071.   381513.   403955.
520    811903   426397.  448839.
521    *             Z AND Y VALUES
522    811910     0.   0.475000  0.485000  0.532000  0.572000
```

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811911   0.610000   0.645000  0.675000  0.695000  0.713000
811912   0.723000   0.730000  0.736000  0.730000  0.726000
811913   0.722000   0.720000
*
802000   '12-A BFP HEAD VS. PUMP FLOW     '
*              X VALUES
812000   89767.   112208.   134650.   157092.   179533.
812001   201975.  224417.   246858.   269300.   291745.
812002   314187.  336629.   359071.   381513.   403955.
812003   426397.  448839.
*              Z AND Y VALUES
812010     0.   2394.000000   2380.000000   2373.000000   2363.000000
+         2352.000000
812011   2332.000000  2303.000000   2270.000000   2237.000000   2208.000000
812012   2156.000000  2105.000000   2053.000000   1991.000000   1940.000000
812013   1868.000000  1795.000000
*
802100   '12-B BFP EFF. VS. PUMP FLOW     '
*              X VALUES
812100     0.   22442.  44884.  67326.  89767.
812101   112208.  134650.   157092.   179533.   201975.
812102   224417.  246858.   269300.   291745.   314187.
812103   336629.  359071.   381513.   403955.   426397.
*              Z AND Y VALUES
812110     0.   0.000000  0.110000  0.205000  0.290000  0.370000
812111   0.435000   0.495000  0.550000  0.595000  0.630000
812112   0.660000   0.680000  0.700000  0.715000  0.725000
812113   0.730000   0.738000  0.740000  0.742000  0.740000
*
802200   '12-B BFP HEAD VS. PUMP FLOW     '
*              X VALUES
812200   44883.   67325.  89767.  112208.   134650.
812201   157092.  179533.   201975.   224417.   246858.
812202   269300.  291745.   314187.   336629.   359071.
812203   381513.  403955.   426397.
*              Z AND Y VALUES
812210     0.   2404.000000   2394.000000   2390.000000   2383.000000
+         2380.000000
812211   2361.000000  2252.000000   2332.000000   2303.000000   2270.000000
812212   2229.000000  2208.000000   2163.000000   2117.000000   2043.000000
812213   1981.000000  1909.000000   1816.000000
*
*************** SCHEDULE VARIABLES
*
*
*
830100     1  BBHXGR    230   WW          5
*
*
830200     2  BKELEI      1   BKGRO       1
*
*
830300     3  EFFTRE     30   EQTFR      10
*
*
830400     4  EFFTRE     50   EQTFR      10
*
*
830500     5  EFFTRE     60   EQTFR      10
*
*
830600     6  EFFTRE    140   EQTFR      10
*
*
830700     7  EFFTRE    150   EQTFR      10
*
*
830800     8  EFFTRE    160   EQTFR      10
*
*
830900     9  EFFTRE    170   EQTFR      10
*
*
831000    10  EFFTRE    180   EQTFR      10
*
*
831100    11  PFAC1      54   WW          5
*
*
831200    12  PFAC1      91   WW          5
*
*
831300    13  PFAC1     154   WW          5
*
*
831400    14  PFAC1     157   WW          5
*
*
```

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611    831500    15  PPAGI     431   WW          5
612    *
613    *
614    831900    19  EFFPMP    310   WW        313
615    *
616    *
617    832000    20  PMPDIS    310   WW        313
618    *
619    *
620    832100    21  EFFPMP    315   WW        317
621    *
622    *
623    832200    22  PMPDIS    315   WW        317
624    *
625    ************** OPERATIONAL VARIABLES
626    *
627    *
628    870080   1000.
629    *
630    870330   3412.14
631    *
632    870980   100.
633    *
634    ************** OPERATIONS
635    *
636    *
637    880010   HH         5      SUB    HH       355     OPVB     10
638    *
639    880020   OPVB      10      MUL    WW         5     OPVB     11
640    *
641    880030   HH        115      SUB    HH       105     OPVB     12
642    *
643    880040   OPVB      12      MUL    WW       115     OPVB     13
644    *
645    880050   OPVB      11      ADD    OPVB      13     OPVB     14
646    *
647    880060   OPVB      14      DIV    BKGROS     1     OPVB     15
648    *
649    880070   OPVB      15      DIV    OPVB       8     OPVB     16
650    *
651    880080   OPVB      33      DIV    OPVB      16     OPVB     34
652    *
653    880090   OPVB      34      MUL    OPVB      98     OPVB     35
654    *
655    880100   HH        115      SUB    HH       165     OPVB     39
656    *
657    880110   PP        -165     PSH    SS       115     OPVB     40
658    *
659    880120   HH        115      SUB-   OPVB      40     OPVB     41
660    *
661    880130   OPVB      39      DIV    OPVB      41     OPVB     42
662    *
663    880140   HH        165      SUB    HH       185     OPVB     43
664    *
665    880150   PP        -185     PSH    SS       165     OPVB     44
666    *
667    880160   HH        165      SUB    OPVB      44     OPVB     45
668    *
669    880170   OPVB      43      DIV    OPVB      45     OPVB     46
670    *
671    880180   EFFSEC    60      MUL    OPVB      98     OPVB     36
672    *
673    880190   OPVB      42      MUL    OPVB      98     OPVB     37
674    *
675    880200   OPVB      46      MUL    OPVB      98     OPVB     38
676    *
677    ************** SPECIAL INPUT/OUTPUT
678    *
679    890010      'GROSS TURBINE CYCLE POWER OUTPUT   (MW) '
680    890011      BKGROS          0
681    890020      'GROSS TURBINE CYCLE HEAT RATE (BTU/KWH) '
682    890021      OPVB           16
683    890030      'GROSS TURBINE CYCLE THERMAL EFFIC.  (%) '
684    890031      OPVB           35
685    890040      'H.P. TURBINE SECTION EFFIC.         (%) '
686    890041      OPVB           36
687    890050      'I.P. TURBINE SECTION EFFIC.         (%) '
688    890051      OPVB           37
689    890060      'L.P. TURBINE SECTION EFFIC.         (%) '
690    890061      OPVB           38
691    890070      'MAIN STEAM FLOW                  (#/HR) '
692    890071      WW              5
693    890080      'MAIN STEAM PRESSURE              (PSIA) '
694    890081      PP              5
695    890090      'MAIN STEAM TEMPERATURE           (DEG-F) '
696    890091      TT              5
697    890100      '1ST STAGE PRESSURE               (PSIA) '
698    890101      PP              5
```

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699    890110      '10TH STAGE PRESSURE              (PSIA) '
700    890111      PP          65
701    890120      'COLD REHEAT PRESSURE             (PSIA) '
702    890121      PP          95
703    890130      'COLD REHEAT TEMPERATURE          (DEG-F) '
704    890131      TT          95
705    890140      'HOT REHEAT PRESSURE              (PSIA) '
706    890141      PP          115
707    890150      'HOT REHEAT TEMPERATURE           (DEG-F) '
708    890151      TT          115
709    890160      'I.P. INLET PRESSURE              (PSIA) '
710    890161      PP          136
711    890170      'I.P. EXHAUST PRESSURE            (PSIA) '
712    890171      PP          165
713    890180      'CONDENSER BACK PRESSURE          (IN-HG) '
714    890181      PP          195
715    890190      'CIRC. WATER INLET TEMPERATURE    (DEG-F) '
716    890191      TT          932
717    890200      '12-A BFP MOTOR POWER    '
718    890201      BKPMOT      310       929.                  I
719    890210      '12-B BFP MOTOR POWER    '
720    890211      BKPMOT      315       895.                  I
721    890220      '#6 FFEDWATER HEATER PRESSURE DROP       '
722    890221      PDFW        350       12.                   I
723    890230      '#5 FEEDWATER HEATER PRESSURE DROP       '
724    890231      PDFW        340       7.9                   I
725    890240      '#4 FEEDWATER HEATER PRESSURE DROP       '
726    890241      PDFW        330
727    890250      '#3 FEEDWATER HEATER PRESSURE DROP       '
728    890251      PDFW        280       11.6                  I
729    890260      '#2 FEEDWATER HEATER PRESSURE DROP       '
730    890261      PDFW        270       14.4                  I
731    890270      '#1 FEEDWATER HEATER PRESSURE DROP       '
732    890271      PDFW        260       6.                    I
733    *
734    *
735    *
736    *
737    ******************************************
738    *   END OF BASE DECK
739    ******************************************
740    *
741    *
742    /
```

LISTING OF INPUT DATA FOR CASE 2

```
1    *
2    =   BEEBEE UNIT 12 - 12000 GAL/DAY MAKEUP
3    *
4    *
5    *
6    ****************************************************************
7    *      GENERIC INPUT DATA
8    ****************************************************************
9    *
10   *  CYCLE FLAGS
11   010200    2     3     1     5     1     0     0.    0.
12   *
13   *  PEPSE OUTPUT SUPPRESSION CARDS
14   *
15   020000  NOPRNT PRINT
16   020003  PRINT
17   020006  PRINT
18   020007  PRINT
19   020008  PRINT
20   020009  PRINT
21   020010  PRINT
22   020020  PRINT
23   020023  PRINT
24   020038  PRINT
25   020039  PRINT
26   020040  PRINT
27   020076  PRINT
28   *
29   *
30   ****************************************************************
31   *      SPECIAL STREAM SPECIFICATIONS
32   ****************************************************************
33   *
34   *************** STREAM CLOSURES
35   *
36   * RADIAL SPILL STRIP LEAKAGE
37   601476  CLOSE
38   *
39   *
40   ****************************************************************
41   *      COMPONENT DATA
42   ****************************************************************
43   *
44   *************** CONDENSERS AND FEEDWATER HEATERS
45   *
46   *  #3 Feedwater Heater
47   702800   17     1   150     3     0.   17.
48   702801    0.    0.    0.    0.    0.    0.
49   702802    0.    0.    0.    0.    0.    0.    0.
50   *
51   *************** SOURCES, SINKS, AND VALVES
52   *
53   *  MAKE UP FLOW
54   700090   31    95.   15.  3750.     0.    0.    0
55   *
56   *************** SPLITTERS
57   *
58   *  blowdown
59   703620   61     0.  3750.
60   *
61   *
62   ****************************************************************
63   *      SPECIAL FEATURES
64   ****************************************************************
```

*** THIS CARD IS A REPLACEMENT CARD. ***

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65   *
66   ************** SCHEDULES
67   *
68   *
69   802100   '12-B BFP EFF. VS. PUMP FLOW                                    *** THIS CARD IS A REPLACEMENT CARD. ***
70   *             X VALUES
71   812100     0.   22442.  44884.  67326.  89767.                          *** THIS CARD IS A REPLACEMENT CARD. ***
72   812101   112208.  134650.   157092.   179533.   201975.                 *** THIS CARD IS A REPLACEMENT CARD. ***
73   812102   224417.  246858.   269300.   291745.   314187.                 *** THIS CARD IS A REPLACEMENT CARD. ***
74   812103   336629.  359071.   381513.   403955.   426397.                 *** THIS CARD IS A REPLACEMENT CARD. ***
75   *             Z AND Y VALUES
76   812110     0.   0.000000  0.110000  0.205000  0.290000  0.370000        *** THIS CARD IS A REPLACEMENT CARD. ***
77   812111   0.435000   0.495000  0.550000  0.595000  0.630000              *** THIS CARD IS A REPLACEMENT CARD. ***
78   812112   0.660000   0.680000  0.700000  0.715000  0.725000              *** THIS CARD IS A REPLACEMENT CARD. ***
79   812113   0.730000   0.738000  0.740000  0.742000  0.740000              *** THIS CARD IS A REPLACEMENT CARD. ***
80   *
81   802200   '12-B BFP HEAD VS. PUMP FLOW                                   *** THIS CARD IS A REPLACEMENT CARD. ***
82   *             X VALUES
83   812200   44883.   67325.  89767.  112208.   134650.                    *** THIS CARD IS A REPLACEMENT CARD. ***
84   812201   157092.  179533.  201975.  224417.  246858.                    *** THIS CARD IS A REPLACEMENT CARD. ***
85   812202   269300.  291745.  314187.  336629.  359071.                    *** THIS CARD IS A REPLACEMENT CARD. ***
86   812203   381513.  403955.  426397.                                      *** THIS CARD IS A REPLACEMENT CARD. ***
87   *             Z AND Y VALUES
88   812210     0.   2404.000000   2394.000000   2390.000000   2383.000000
89   +         2380.000000                                                  *** THIS CARD IS A REPLACEMENT CARD. ***
90   812211   2361.000000  2252.000000   2332.000000   2303.000000   2270.000000  *** THIS CARD IS A REPLACEMENT CARD. ***
91   812212   2229.000000  2208.000000   2163.000000   2117.000000.  2043.000000  *** THIS CARD IS A REPLACEMENT CARD. ***
92   812213   1981.000000  1909.000000   1816.000000                          *** THIS CARD IS A REPLACEMENT CARD. ***
93   *
94   *************** SCHEDULE VARIABLES
95   *
96   *
97   *
98   830300     3  EFFTRE     30   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
99   830308   DELETE
100  *
101  *
102  830400     4  EFFTRE     50   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
103  830408   DELETE
104  *
105  *
106  830500     5  EFFTRE     60   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
107  830508   DELETE
108  *
109  *
110  830600     6  EFFTRE    140   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
111  830608   DELETE
112  *
113  *
114  830700     7  EFFTRE    150   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
115  830708   DELETE
116  *
117  *
118  830800     8  EFFTRE    160   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
119  830808   DELETE
120  *
121  *
122  830900     9  EFFTRE    170   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
123  830908   DELETE
124  *
125  *
126  831000    10  EFFTRE    180   EQTFR      10                             *** THIS CARD IS A REPLACEMENT CARD. ***
```

```
831008   DELETE
*
*
831100    11  PFAC1      54   WW          5
831108   DELETE
*
*
831200    12  PFAC1      91   WW          5
831208   DELETE
*
*
831300    13  PFAC1     154   WW          5
831308   DELETE
*
*
831400    14  PFAC1     157   WW          5
831408   DELETE
*
*
831500    15  PFAC1     431   WW          5
831508   DELETE
*
*
831608   DELETE
*
*
831708   DELETE
*
*
831808   DELETE
*
*
831900    19  EFFPMP    310   WW        313
831908   DELETE
*
*
832000    20  PMPDIS    310   WW        313
832008   DELETE
*
*
832100    21  EFFPMP    315   WW        317
832108   DELETE
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832200    22  PMPDIS    315   WW        317
832208   DELETE
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APPENDIX C

SPECIAL OUTPUT TABLE OF SPECIFIED VARIABLES

INDEX	DESCRIPTION		VARIABLE (ID)	VALUE
1	GROSS TURBINE CYCLE POWER OUTPUT	(MW)	BKGROS(0)	83.4238
2	GROSS TURBINE CYCLE HEAT RATE	(BTU/KWH)	CPVB (16)	7820.4954
3	GROSS TURBINE CYCLE THERMAL EFFIC.	(%)	CPVB (35)	43.6307
4	H.P. TURBINE SECTION EFFIC.	(%)	CPVB (36)	83.6026
5	I.P. TURBINE SECTION EFFIC.	(%)	CPVB (37)	89.0880
6	L.P. TURBINE SECTION EFFIC.	(%)	CPVB (38)	76.0670
7	MAIN STEAM FLOW	(#/HR)	WW (5)	557000.0000
8	MAIN STEAM PRESSURE	(PSIA)	PP (5)	1815.0000
9	MAIN STEAM TEMPERATURE	(DEG-F)	TT (5)	1050.0000
10	1ST STAGE PRESSURE	(PSIA)	PP (35)	1486.6454
11	10TH STAGE PRESSURE	(PSIA)	PP (65)	357.5645
12	COLD REHEAT PRESSURE	(PSIA)	PP (95)	357.5645
13	COLD REHEAT TEMPERATURE	(DEG-F)	TT (95)	649.7359
14	HOT REHEAT PRESSURE	(PSIA)	PP (115)	321.8438
15	HOT REHEAT TEMPERATURE	(DEG-F)	TT (115)	1000.0000
16	I.P. INLET PRESSURE	(PSIA)	PP (136)	315.4069
17	I.P. EXHAUST PRESSURE	(PSIA)	PP (165)	18.4280
18	CONDENSER BACK PRESSURE	(IN-HG)	PP (195)	0.4941
19	CIRC. WATER INLET TEMPERATURE	(DEG-F)	TT (932)	54.0000
24	#4 FEEDWATER HEATER PRESSURE DROP		PDFW (330)	0.0000

SPECIAL OUTPUT TABLE OF SPECIFIED VARIABLES

INDEX	DESCRIPTION		VARIABLE (ID)	VALUE
1	GROSS TURBINE CYCLE POWER OUTPUT	(MW)	BKGROS(0)	83.3520
2	GROSS TURBINE CYCLE HEAT RATE	(BTU/KWH)	CPVB (16)	7826.9764
3	GROSS TURBINE CYCLE THERMAL EFFIC.	(%)	CPVB (35)	43.5946
4	H.P. TURBINE SECTION EFFIC.	(%)	CPVB (36)	83.6040
5	I.P. TURBINE SECTION EFFIC.	(%)	CPVB (37)	89.0898
6	L.P. TURBINE SECTION EFFIC.	(%)	CPVB (38)	76.0598
7	MAIN STEAM FLOW	(#/HR)	WW (5)	557000.0000
8	MAIN STEAM PRESSURE	(PSIA)	PP (5)	1815.0000
9	MAIN STEAM TEMPERATURE	(DEG-F)	TT (5)	1050.0000
10	1ST STAGE PRESSURE	(PSIA)	PP (35)	1486.6439
11	10TH STAGE PRESSURE	(PSIA)	PP (65)	357.3300
12	COLD REHEAT PRESSURE	(PSIA)	PP (95)	357.3300
13	COLD REHEAT TEMPERATURE	(DEG-F)	TT (95)	649.5953
14	HOT REHEAT PRESSURE	(PSIA)	PP (115)	321.6328
15	HOT REHEAT TEMPERATURE	(DEG-F)	TT (115)	1000.0000
16	I.P. INLET PRESSURE	(PSIA)	PP (136)	315.2001
17	I.P. EXHAUST PRESSURE	(PSIA)	PP (165)	18.4280
18	CONDENSER BACK PRESSURE	(IN-HG)	PP (195)	0.4945
19	CIRC. WATER INLET TEMPERATURE	(DEG-F)	TT (932)	54.0000
24	#4 FEEDWATER HEATER PRESSURE DROP		PDFW (330)	0.0000

SPECIAL OUTPUT TABLE OF SPECIFIED VARIABLES

INDEX	DESCRIPTION		VARIABLE (ID)	VALUE
1	GROSS TURBINE CYCLE POWER OUTPUT	(MW)	BKGROS(0)	83.3132
2	GROSS TURBINE CYCLE HEAT RATE (BTU/KWH)		OPVB (16)	7830.5634
3	GROSS TURBINE CYCLE THERMAL EFFIC.	(%)	OPVB (35)	43.5746
4	H.P. TURBINE SECTION EFFIC.	(%)	OPVB (36)	83.6043
5	I.P. TURBINE SECTION EFFIC.	(%)	OPVB (37)	89.0898
6	L.P. TURBINE SECTION EFFIC.	(%)	OPVB (38)	76.0567
7	MAIN STEAM FLOW	(#/HR)	WW (5)	557000.0000
8	MAIN STEAM PRESSURE	(PSIA)	PP (5)	1815.0000
9	MAIN STEAM TEMPERATURE	(DEG-F)	TT (5)	1050.0000
10	1ST STAGE PRESSURE	(PSIA)	PP (35)	1486.6439
11	10TH STAGE PRESSURE	(PSIA)	PP (65)	357.2693
12	COLD REHEAT PRESSURE	(PSIA)	PP (95)	357.2693
13	COLD REHEAT TEMPERATURE	(DEG-F)	TT (95)	649.5593
14	HOT REHEAT PRESSURE	(PSIA)	PP (115)	321.5781
15	HOT REHEAT TEMPERATURE	(DEG-F)	TT (115)	1000.0000
16	I.P. INLET PRESSURE	(PSIA)	PP (136)	315.1465
17	I.P. EXHAUST PRESSURE	(PSIA)	PP (165)	18.4280
18	CONDENSER BACK PRESSURE	(IN-HG)	PP (195)	0.4946
19	CIRC. WATER INLET TEMPERATURE	(DEG-F)	TT (932)	54.0000
24	#4 FEEDWATER HEATER PRESSURE DROP		PDFW (330)	0.0000

SPECIAL OUTPUT TABLE OF SPECIFIED VARIABLES

INDEX	DESCRIPTION		VARIABLE (ID)	VALUE
1	GROSS TURBINE CYCLE POWER OUTPUT	(MW)	BKGROS(0)	83.2910
2	GROSS TURBINE CYCLE HEAT RATE (BTU/KWH)		OPVB (16)	7832.6467
3	GROSS TURBINE CYCLE THERMAL EFFIC.	(%)	OPVB (35)	43.5631
4	H.P. TURBINE SECTION EFFIC.	(%)	OPVB (36)	83.6043
5	I.P. TURBINE SECTION EFFIC.	(%)	OPVB (37)	89.0893
6	L.P. TURBINE SECTION EFFIC.	(%)	OPVB (38)	76.0551
7	MAIN STEAM FLOW	(#/HR)	WW (5)	557000.0000
8	MAIN STEAM PRESSURE	(PSIA)	PP (5)	1815.0000
9	MAIN STEAM TEMPERATURE	(DEG-F)	TT (5)	1050.0000
10	1ST STAGE PRESSURE	(PSIA)	PP (35)	1486.6439
11	10TH STAGE PRESSURE	(PSIA)	PP (65)	357.2656
12	COLD REHEAT PRESSURE	(PSIA)	PP (95)	357.2656
13	COLD REHEAT TEMPERATURE	(DEG-F)	TT (95)	649.5571
14	HOT REHEAT PRESSURE	(PSIA)	PP (115)	321.5748
15	HOT REHEAT TEMPERATURE	(DEG-F)	TT (115)	1000.0000
16	I.P. INLET PRESSURE	(PSIA)	PP (136)	315.1433
17	I.P. EXHAUST PRESSURE	(PSIA)	PP (165)	18.4280
18	CONDENSER BACK PRESSURE	(IN-HG)	PP (195)	0.4947
19	CIRC. WATER INLET TEMPERATURE	(DEG-F)	TT (932)	54.0000
24	#4 FEEDWATER HEATER PRESSURE DROP		PDFW (330)	0.0000