Unit 1 Observations

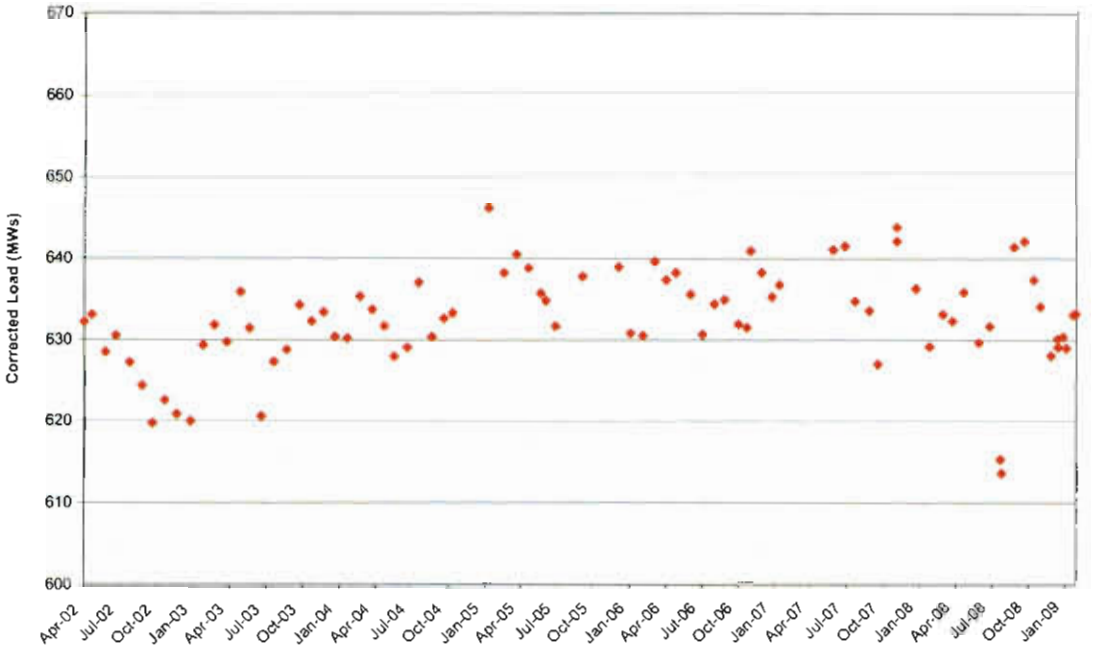
Summary of Performance Report for:

Plant	Rush Island			
Unit	1			
Period				
		Feb-08	Jan-09	Feb-09
Full Load Performance				
Hours of Data		448	530	362
		Averages	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	641.7	639.0	634.7
AUX POWER	MW	31.5	31.6	31.7
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	9845.1	9837.5	9839.1
Boiler Efficiency Actual	%	86.9	87.1	86.9
CONTROL VALVE POSITION LVDT	%	100.0	100.0	100.0
FEEDWATER TEMP TO ECON	degF	496.6	495.7	495.4
FEEDWATER TEMP TO HTR 1	degF	446.7	446.5	446.2
HP Turbine Efficiency Actual	%	84.8	85.1	85.7
IP Turbine Efficiency Corrected	%	91.4	91.0	89.4
Condenser Pressure	inHga	1.6	2.0	2.4
AIRHTR-A GAS OUTLET TEMP	degF	299.3	295.4	294.2
AIRHTR-B GAS OUTLET TEMP	degF	306.2	314.4	313.5
AMBIENT AIR TEMP	degF	33.6	29.3	34.9
CIRC WTR TEMP TO LP CONDB	degF	37.9	35.2	39.4
CIRC WTR TEMP TO LP CONDB	degF	36.4	33.7	37.8
Minimum River Temperature	degF	36.4	33.7	37.8
FWH 1 Temperature Rise	degF	49.9	49.2	49.1
Net Load	MW	610.2	607.4	603.0
Average Exit Gas Temperature	degF	302.7	304.9	303.9
Aux Power	%	4.9	4.9	5.0
Gross Unit Heat Rate	BTU/KW-HR	9361.3	9351.2	9347.6
Gross Turbine Heat Rate	BTU/KW-HR	8135.9	8141.2	8125.3
Measured Feedwater Flow	KPPH	4357.8	4372.9	4316.1
Calc Steam Evaporated	KPPH	4350.8	4367.4	4310.0
Steam Flow From First Stage	KPPH	4125.6	4175.9	4132.4
FW/Steam		1.1	1.0	1.0
Steam/Load		6.4	6.5	6.5
FW/Load		6.8	6.8	6.8
Rolling 12 Month Heat Rate Average			9811.9	9811.4

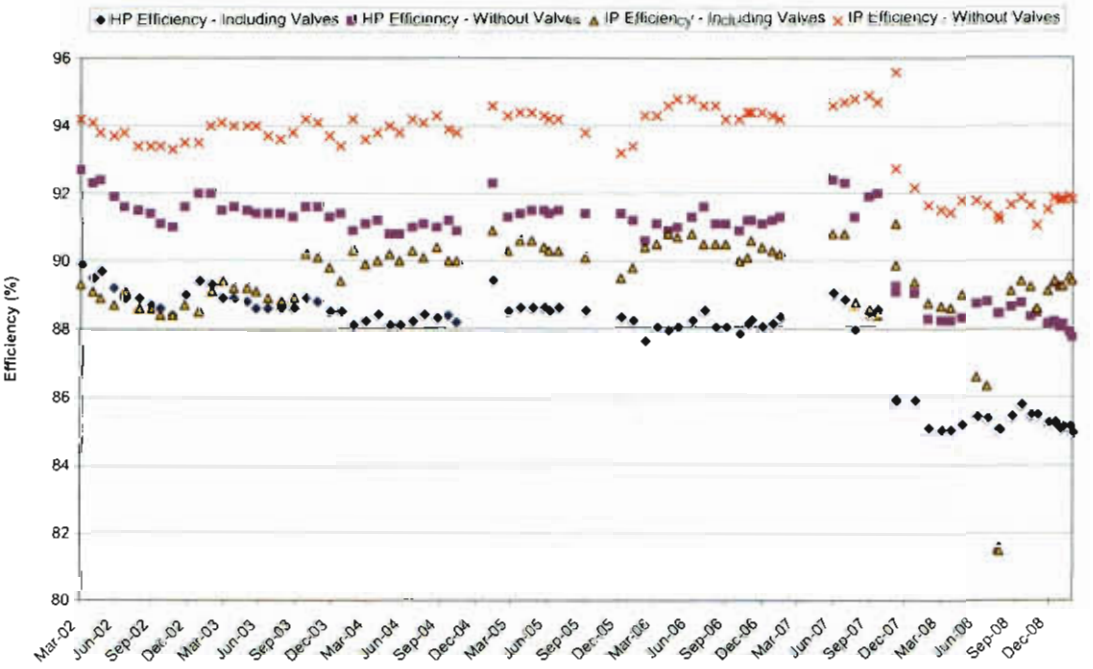
Conatins some bad quality data for CRH temp Tag 1pmn15051

The only performance concern for this unit from the previous table and following trends is the continuing degradation in HP efficiency. The bad cold reheat temps mentioned above would cause the apparent efficiency to be high and are not a factor in the efficiency trends below. These efficiencies are now at the lowest point since the replacement HP/IP retrofitted rotor was installed. No obvious reason can found from the cursory review of the data for this calculation that is part of this report's QA efforts. If the trend continues a detailed analysis of all data used in this efficiency calculation will be made and a request for calibration will be made if appropriate.

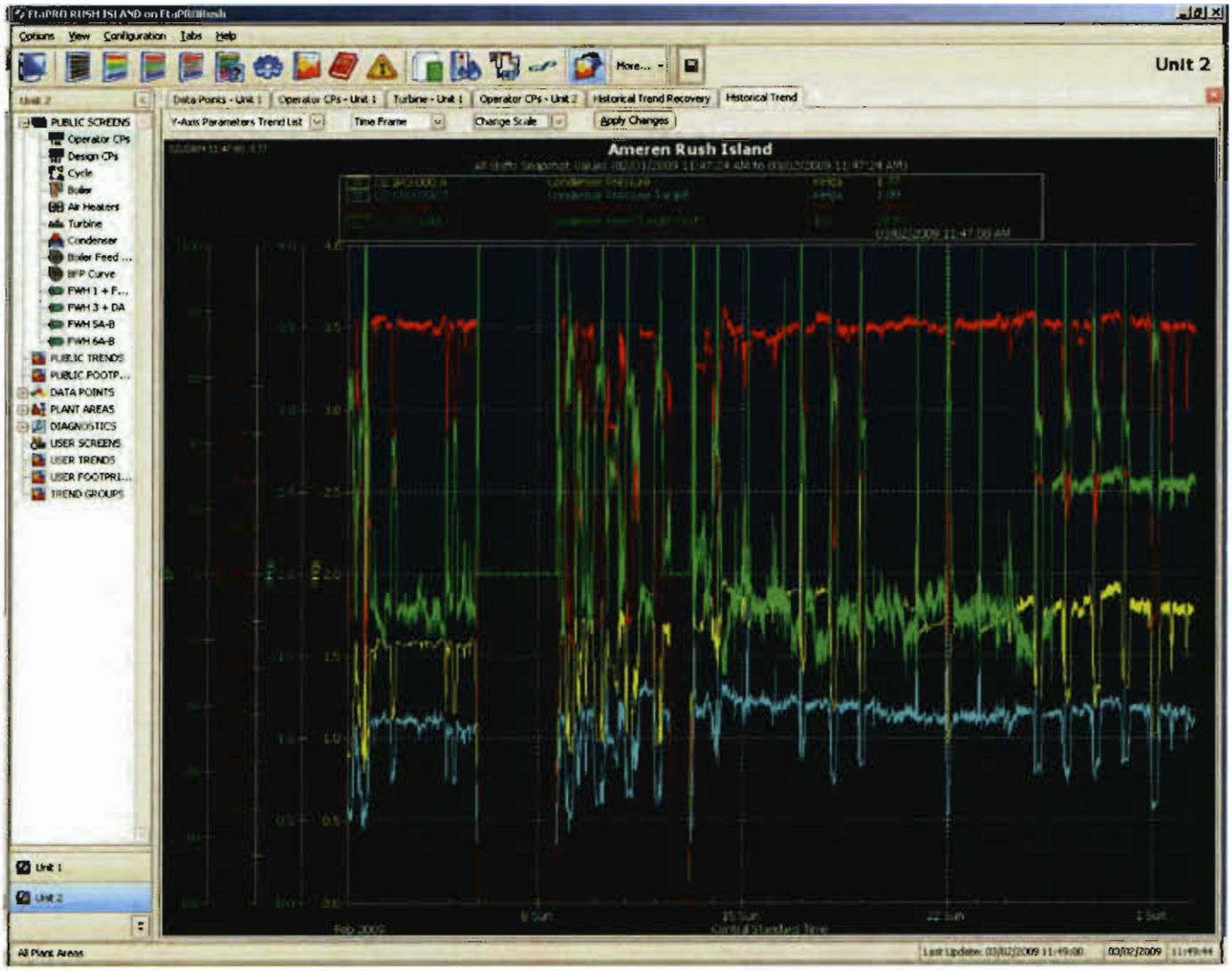
Rush Island Unit 1 - Corrected Load



Rush Island Unit 1 - HP and IP Efficiencies

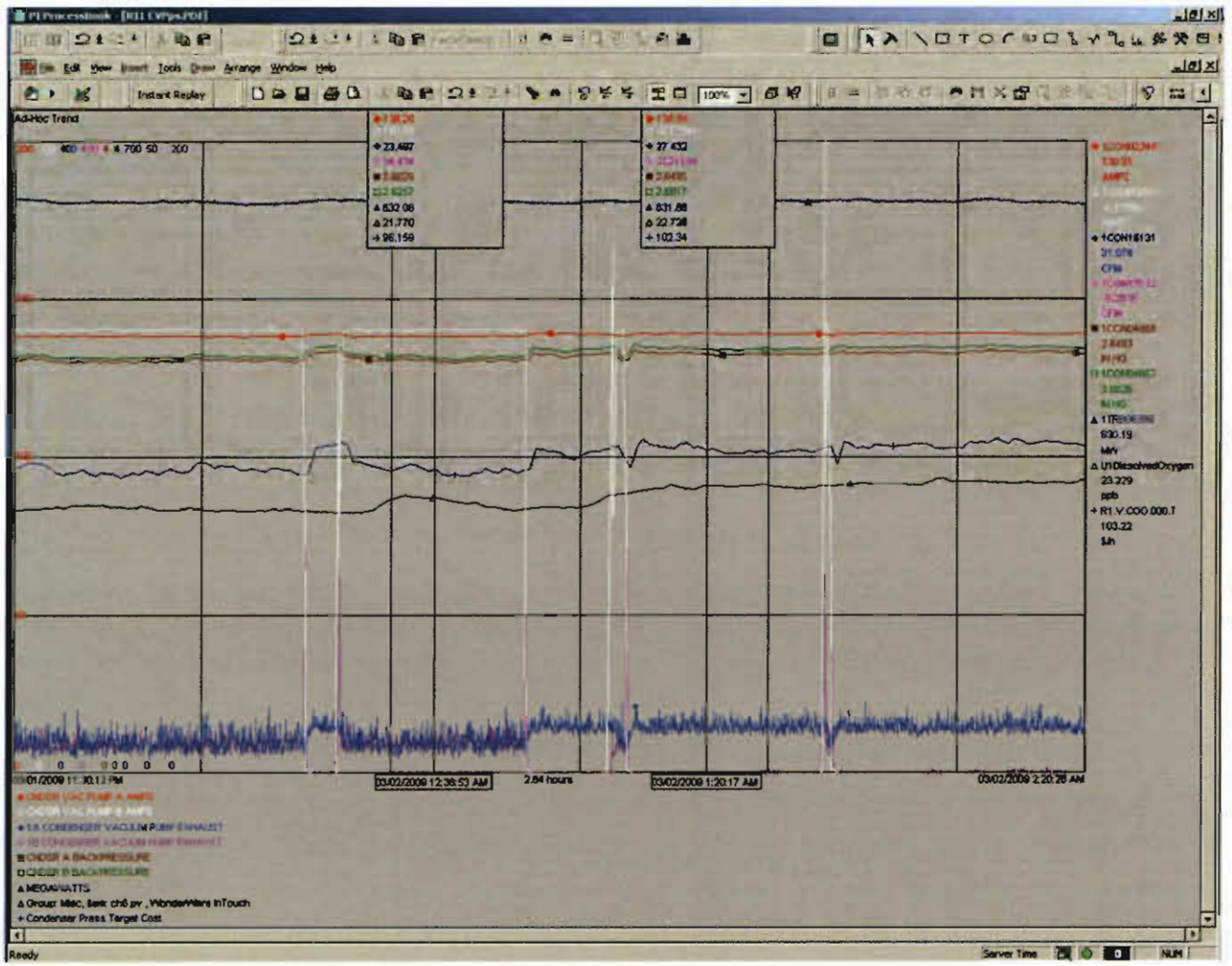


Relatively high backpressures for this time of year drew attention to the calculated loss from target backpressure. It was found that the backpressure correction curves in EtaPRO were incorrectly configured and indicated losses went negative at high loads even for backpressures substantially higher than targets. Note the majority of negative losses in the following trend. This was true for both units and corrected in late February.

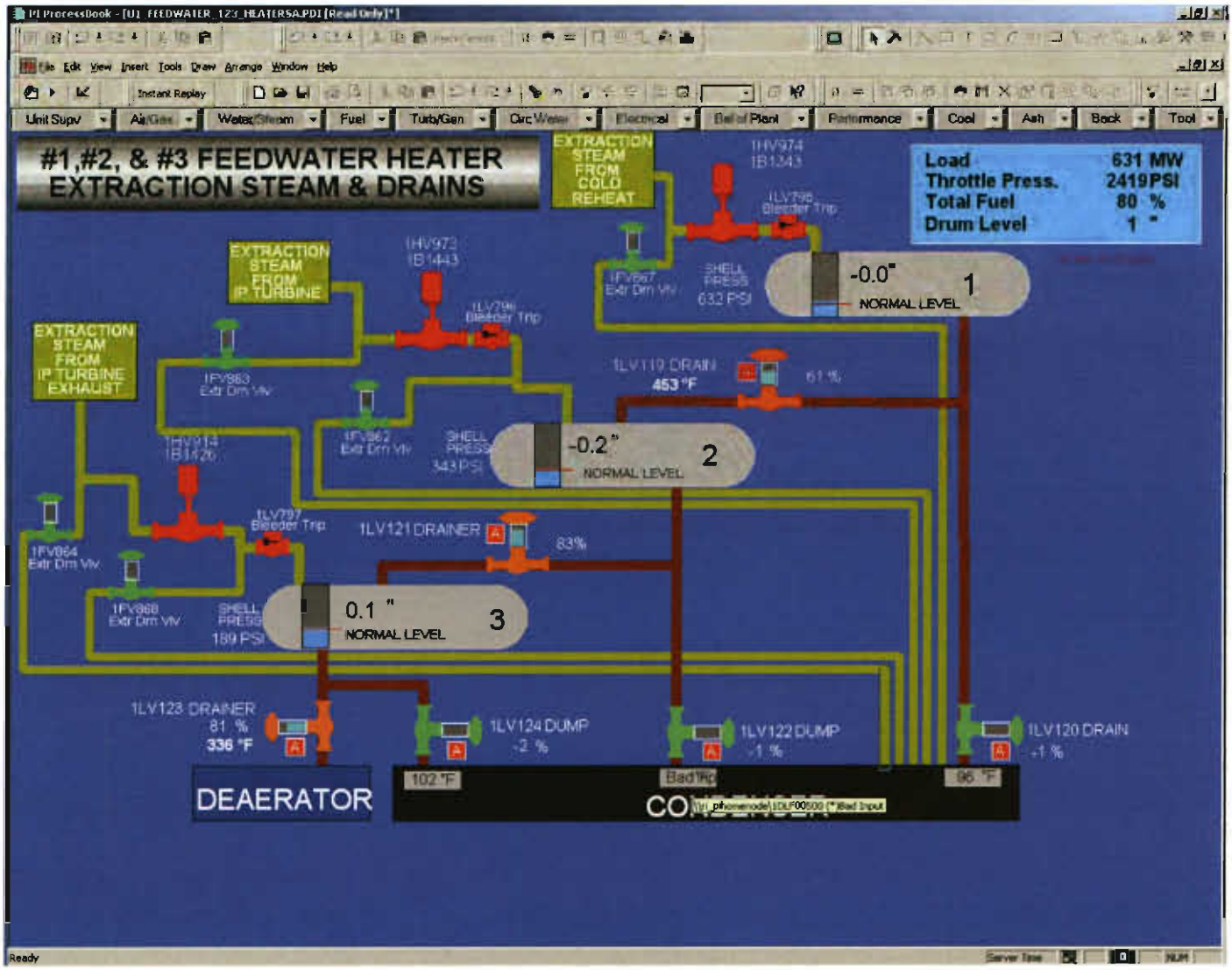


Performance Engineering is copied on the Rush Island Evening Notes email and is greatly appreciated. For quite a while now, a reference is made for both units concerning high dissolved oxygen and the need to run two condenser vacuum pumps. Recently there was also an entry concerning trying to take one CVPp off on unit 1 to see what happens. The following Pi trend would indicate that a decrease in DO on the order of 1 ppb is effected by running 2 CVPs. Backpressure also goes up slightly with an associated cost of about 6 $/hr. Assuming each pump uses about 0.1MW of auxiliary load, this would equate to about $2/hr fuel costs. Including a replacement power cost of about $40/MW-HR implies running the pump is a breakeven trade-off

concerning backpressure. Whether the 1ppb DO is a significant improvement is best answered by the Chem. E. Another interesting thing from the trend, is the change in total air-leakage flow from 2 to 1 CVPp operation. Although the flow on the in service pump does go up, it does not go to the sum of flows when two pumps are running. This may be an indication of measurement of leakage other than in the condenser. Pump seal or packing for instance. On the other hand it may be just an indication of the expected sensitivity of the leakage measurement. One thing to help analyze this would be to toggle between pumps off at the next convenient opportunity (i.e. A&B on, A off B on, B off A on).



One of the new items on the instrument issue spreadsheet is a 1DLF00500 FWH 2 DUMP TEMP. The existence of these dump lines temperatures was unknown. Is the actual temperature measurement at the condenser as shown? Do the lines enter the condenser above or below the hotwell level?


#1,#2, & #3 FEEDWATER HEATER
EXTRACTION STEAM & DRAINS
EXTRACTION STEAM FROM COLD REHEAT
EXTRACTION STEAM FROM IP TURBINE
EXTRACTION STEAM FROM IP TURBINE EXHAUST
1HV974
1B1243
1HV973
1B1443
1HV914
1B1426
Load 631 MW
Throttle Press. 2419PSI
Total Fuel 80 %
Drum Level 1 "
-0.0" 1
NORMAL LEVEL
SHELL PRESS 632 PSI
1LV119 DRAIN
453 °F
61 %
-0.2" 2
NORMAL LEVEL
SHELL PRESS 343 PSI
1LV121 DRAINER
83%
0.1 " 3
NORMAL LEVEL
SHELL PRESS 189 PSI
1LV123 DRAINER
81 %
336 °F
1LV124 DUMP
-2 %
1LV122 DUMP
-1 %
1LV120 DRAIN
+1 %
DEAERATOR
102 °F
96 °F
Ready

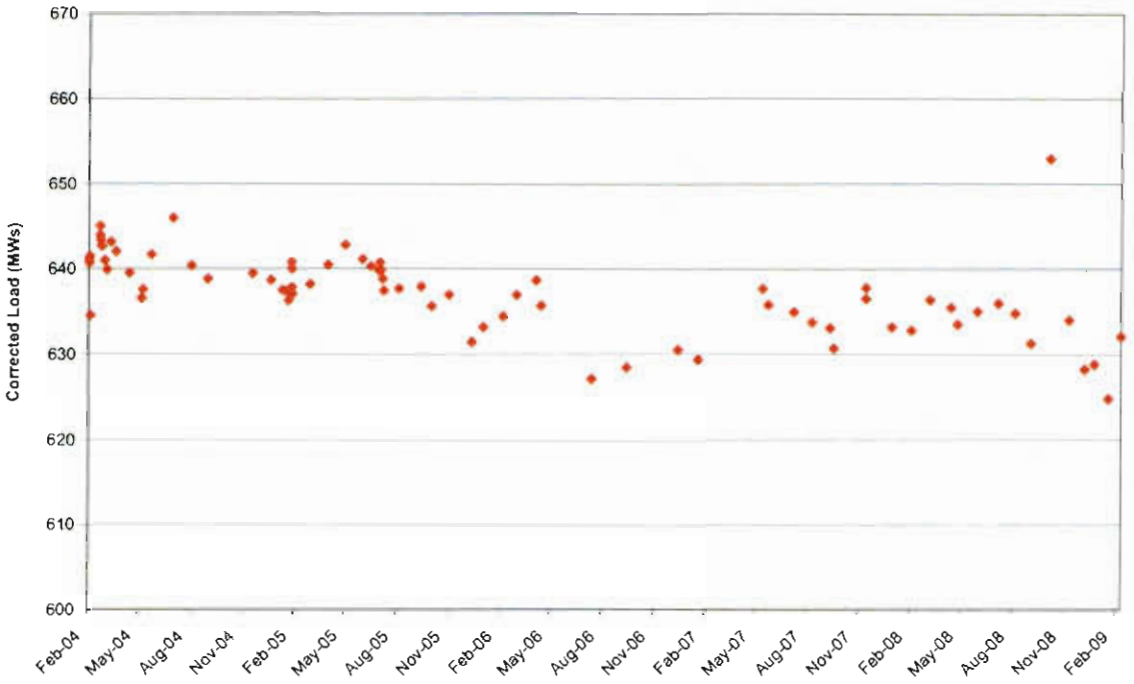
Unit 2 Observations

Summary of Performance Report for:

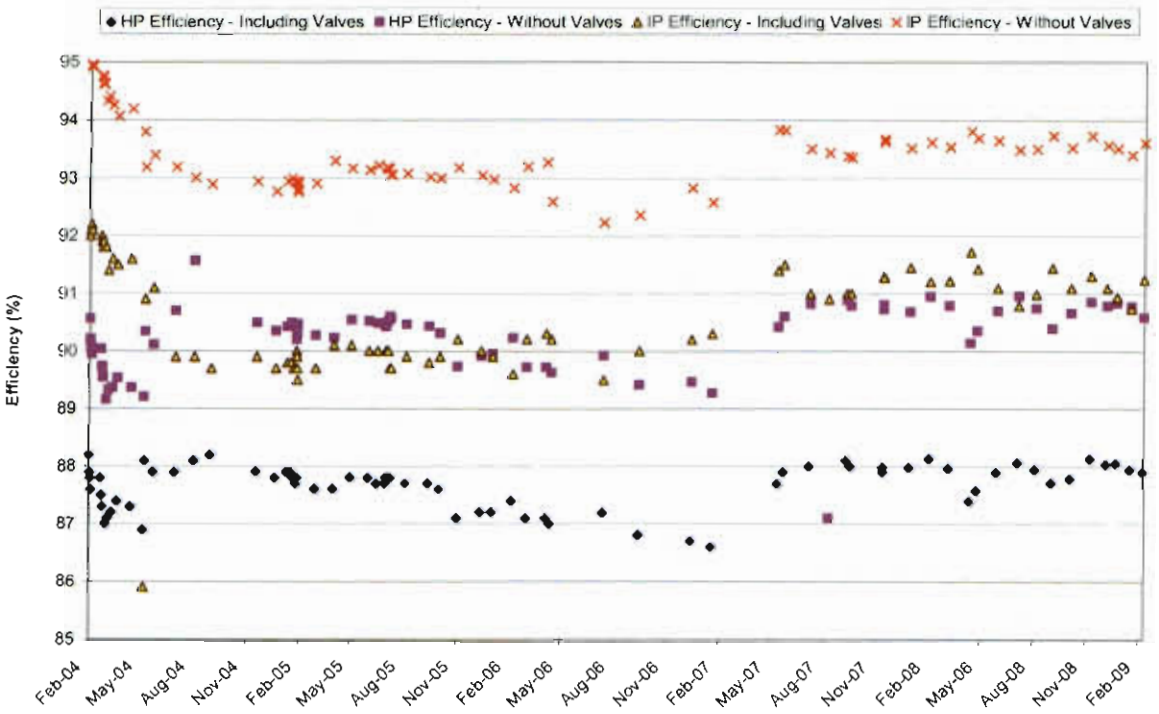
Plant	Rush Island			
Unit	2			
Period				
		Feb-08	Jan-09	Feb-09
Full Load Performance				
Hours of Data		500	452	328
		Averages	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	603.4	624.1	613.5
AUX POWER	MW	32.2	37.7	37.4
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	10246.1	10677.5	10742.5
Boiler Efficiency Actual	%	86.5	86.4	86.2
CONTROL VALVE POSITION LVDT	%	99.8	99.6	99.6
FEEDWATER TEMP TO ECON	degF	488.4	491.4	490.0
FEEDWATER TEMP TO HTR 1	degF	440.2	443.0	441.5
HP Turbine Efficiency Actual	%	89.4	88.5	87.9
IP Turbine Efficiency Corrected	%	91.3	92.0	92.5
Condenser Pressure HP	inHga	2.0	1.5	1.8
AIRHTR-A GAS OUTLET TEMP	degF	305.0	289.7	294.7
AIRHTR-B GAS OUTLET TEMP	degF	317.9	340.7	331.8
AMBIENT AIR TEMP	degF	33.0	30.2	35.9
CIRC WTR TEMP TO LP CONDB	degF	37.8	35.6	40.2
CIRC WTR TEMP TO LP CONDB	degF	37.8	35.6	40.1
Minimum River Temperature	degF	37.8	35.6	40.1
FWH 1 Temperature Rise	degF	48.2	48.4	48.5
Net Load	MW	571.2	586.4	576.1
Average Exit Gas Temperature	degF	311.4	315.2	313.2
Aux Power	%	5.3	6.0	6.1
Gross Unit Heat Rate	BTU/KW-HR	9699.8	10032.8	10087.2
Gross Turbine Heat Rate	BTU/KW-HR	8386.9	8663.4	8695.0
Measured Feedwater Flow	KPPH	4072	4458.2	4359.9
Calc Steam Evaporated	KPPH	4193	4540.4	4467.9
Steam Flow From First Stage	KPPH	3900	4093.6	4006.3
FW/Steam		1.04	1.09	1.09
Steam/Load		6.46	6.56	6.53
FW/Load		6.75	7.14	7.11
Rolling 12 Month Heat Rate Average			10513.5	10554.9

The only thing requiring further investigation or action on the plants part is to reconcile the apparently high feedwater flow relative to steam flow and load.

Rush Island Unit 2 - Corrected Load



Rush Island Unit 2 - HP and IP Efficiencies

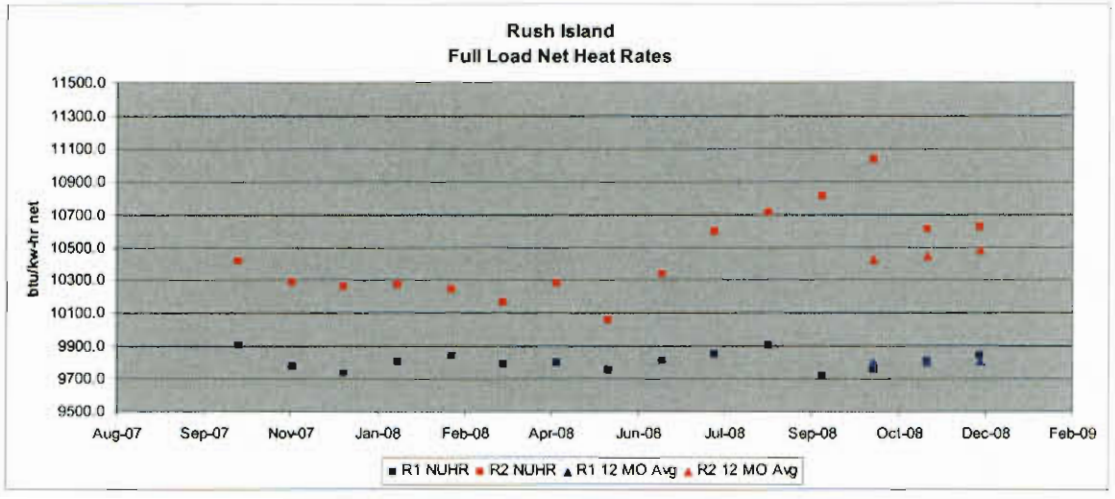


January 12, 2009

To: Mr. David Strubberg
From: Joe Sind
Cc: Andy Williamson, Paul Starks, Greg Vasel, Gary Blessing, Mike Clonts, Matt Wallace, Ken Stuckmeyer, Jeff Shelton, Jeff Colter, Tim Finnell, Don Clayton, Scott McCormack, Mike Kobel

Re: Rush Island December 2008 Performance Report

Last report was on November 12, 2008 and was for operation through October 2008. Performance Engineering has a goal to produce reports for each month in a timely manner by end of 2009.

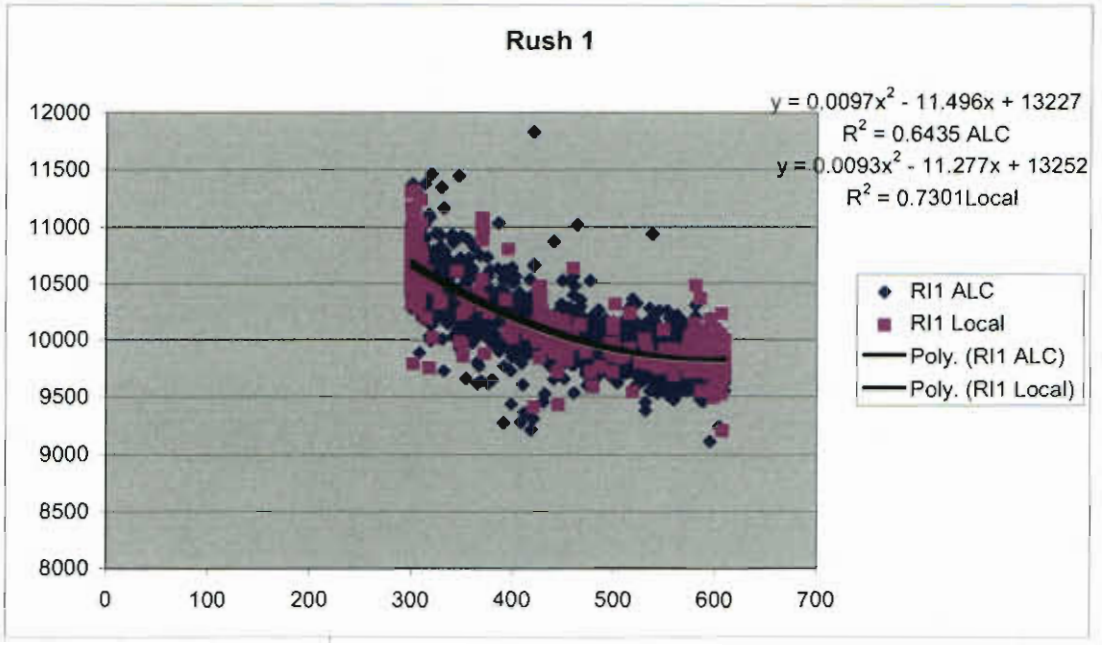


Executive Summary

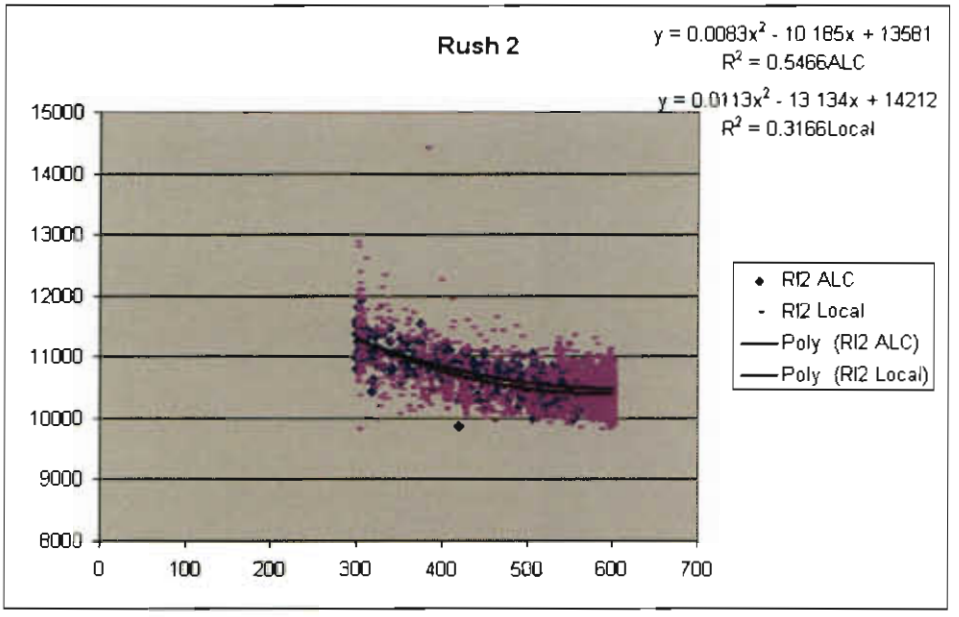
- Following Unit 2's return to service after a SBO in early November, with the top heater in service and it's leaking feedwater relief valve presumably repaired, the unit's heat rate improved but is still significantly higher than Unit 1. Detailed observations concerning this difference are in the section on Unit 2, however the plant will be requested to take action concerning cycle isolation checks and instrument calibration.

Action Items from last Performance Meeting

In the November meeting J. Sind got action items to estimate the relative cost from decreased performance for both ALC and 25MW of spinning reserve operation. Net heat rate data was sampled from all of 2008 and the following results were obtained comparing ALC to LOCAL operation. These results are not presented as final.



MW	Heat Rates ALC	Local	diff
300	10651.2	10705.9	-54.7
320	10541.56	10595.68	-54.12
340	10439.68	10492.9	-53.22
360	10345.56	10397.56	-52
380	10259.2	10309.66	-50.46
400	10180.6	10229.2	-48.6
420	10109.76	10156.18	-46.42
440	10046.68	10090.6	-43.92
460	9991.36	10032.46	-41.1
480	9943.8	9981.76	-37.96
500	9904	9938.5	-34.5
520	9871.96	9902.68	-30.72
540	9847.68	9874.3	-26.62
560	9831.16	9853.36	-22.2
580	9822.4	9839.86	-17.46
600	9821.4	9833.8	-12.4



MW	Heat Rates ALC	Local	diff
300	11272.5	11288.8	-16.3
320	11171.72	11166.24	5.48
340	11077.58	11052.72	24.86
360	10990.08	10948.24	41.84
380	10909.22	10852.8	56.42
400	10835	10766.4	68.6
420	10767.42	10689.04	78.38
440	10706.48	10620.72	85.76
460	10652.18	10561.44	90.74
480	10604.52	10511.2	93.32
500	10563.5	10470	93.5
520	10529.12	10437.84	91.28
540	10501.38	10414.72	86.66
560	10480.28	10400.64	79.64
580	10465.82	10395.6	70.22
600	10458	10399.6	58.4

Data used for the this comparison were filtered to eliminate low load LOCAL data below the range also seen by ALC. Also, all data was eliminated where the top feedwater heater was out of service or other obvious non normal conditions.

As can be seen there appears to be virtually no difference for Unit 1 and the difference for Unit 2, although slightly larger, is less than 1 percent.

As mentioned, these results are presented as preliminary. Plans to further refine the comparison include trying to find comparable periods of average loading in both modes in closer time proximity (this presentation is a regression through all data throughout the year). Comments are solicited to also help refine this comparison such as:

- Other operating considerations to be filtered out?
- Known periods of 2008 where data should be ignored for some other reason?
- Any reason to expect a difference between units?
- Has there been previous work at trying to determine this difference, either at Rush Island or known in literature?

Work has not begun in trying to determine the effect of spinning reserve operation.

Instrumentation and other Performance Monitoring Issues

Two Pi tags are noted as bad quality for this report:

Unit 1 – 1PMN15104 – FWH 2 Ext pressure
Unit 2 – 2BLR04474 – Secondary Air Temp

Neither of these tags effect the heat rate calculation but due influence other performance parameters.

As an attachment to this report please find an example Excel file that is proposed to be used to keep track of instrumentation issues and other action items, including the ability to retain a historical record. Please comment on the intent, format and also a common drive to Rush and Perf. Engr., where this might be stored. We don't have write access to I:Rush.

Unit 1 Observations

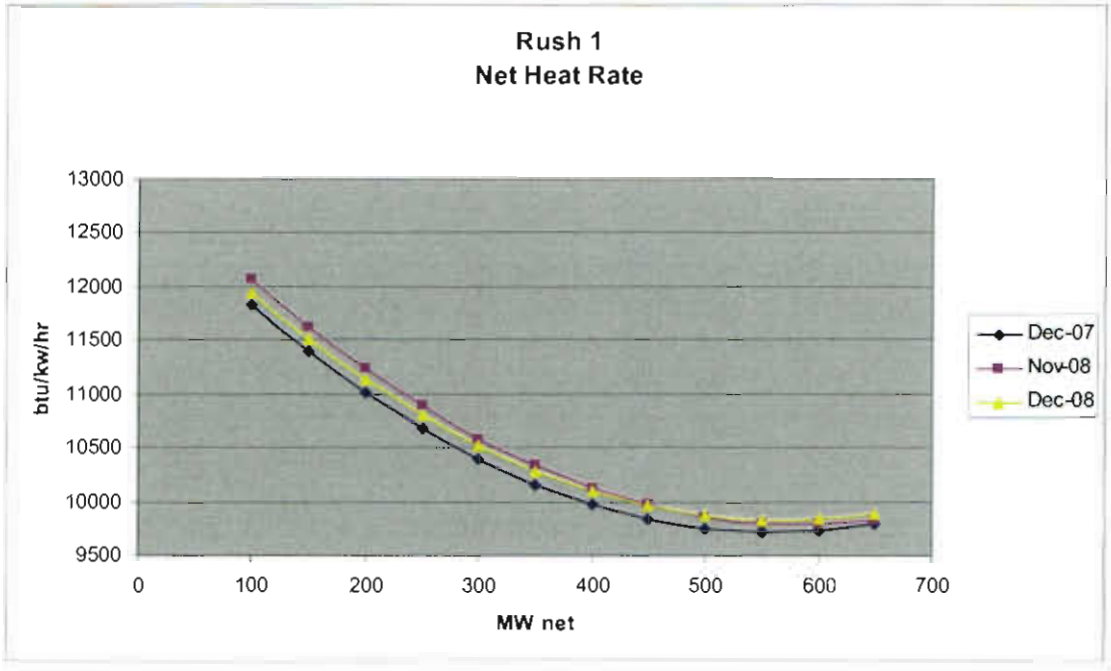
Summary of Performance Report for:

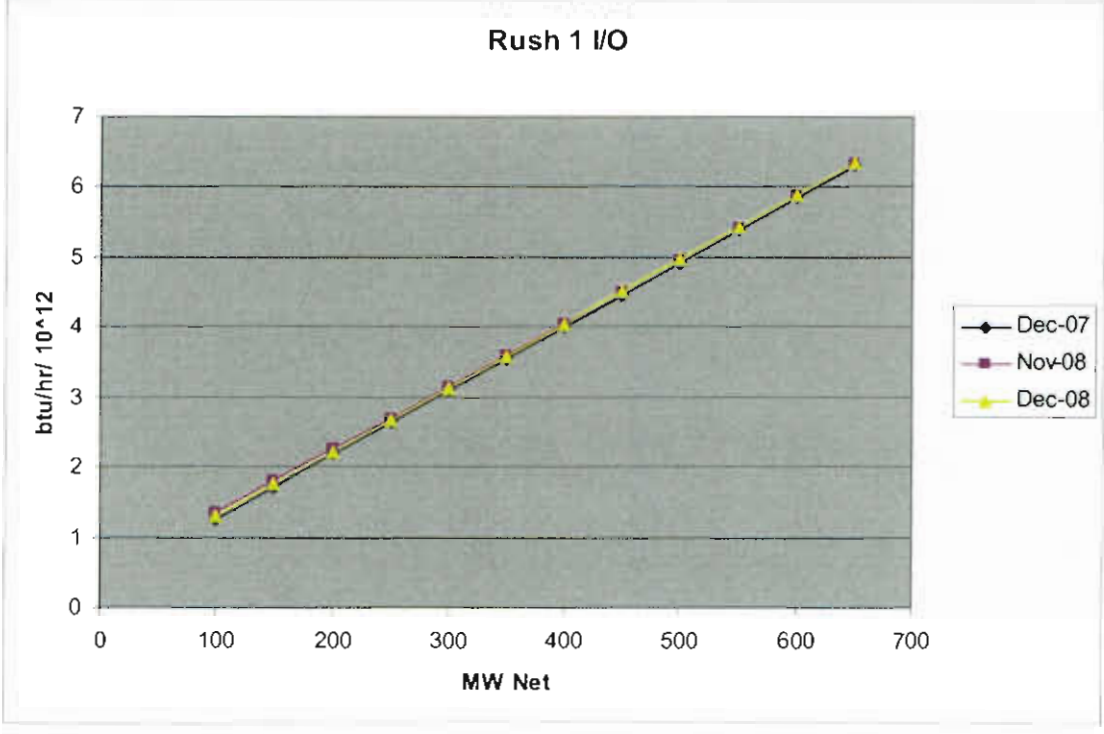
Plant	Rush Island			
Unit	1			
Period				
		Dec-07	Nov-08	Dec-08
Full Load Performance				
Hours of Data		413	464	302
		Averages	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	638.2	643.5	641.0
AUX POWER	MW	29.6	31.5	31.5
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	9739.0	9810.9	9844.8
Boiler Efficiency Actual	%	86.9	86.7	87.0
CONTROL VALVE POSITION LVDT	%	100.5	100.0	100.0
FEEDWATER TEMP TO ECON	degF	494.9	496.5	496.0
FEEDWATER TEMP TO HTR 1	degF	445.0	446.9	446.6
HP Turbine Efficiency Actual	%	85.1	84.9	84.9
IP Turbine Efficiency Corrected	%	93.5	92.7	92.7
Condenser Pressure	inHga	1.6	2.2	2.0
AIRHTR-A GAS OUTLET TEMP	degF	284.8	285.9	290.1
AIRHTR-B GAS OUTLET TEMP	degF	291.6	299.2	308.3
AMBIENT AIR TEMP	degF	36.0	46.4	33.3
CIRC WTR TEMP TO LP CONDB	degF	39.0	50.1	37.4
CIRC WTR TEMP TO LP CONDB	degF	37.4	48.5	36.4
Minimum River Temperature	degF	37.4	48.5	36.4
FWH 1 Temperature Rise	degF	49.9	49.6	49.4
Net Load	MW	608.5	611.9	609.4
Average Exit Gas Temperature	degF	288.2	292.5	299.2
Aux Power	%	4.6	4.9	4.9
Gross Unit Heat Rate	BTU/KW-HR	9286.8	9330.3	9360.3
Gross Turbine Heat Rate	BTU/KW-HR	8068.8	8088.1	8145.7
Measured Feedwater Flow	KPPH	4330.8	4352.1	4369.6
Calc Steam Evaporated	KPPH	4323.1	4347.4	4365.2
Steam Flow From First Stage	KPPH	4074.9	4155.9	4172.4
FW/Steam		1.1	1.0	1.0
Steam/Load		6.4	6.5	6.5
FW/Load		6.8	6.8	6.8

The only performance concern noted for this unit either from the previous heat rate trends and table, or the following d trends, is a decreasing trend in corrected load. There is no apparent reason for this change from trends of cylinder efficiencies or stage pressures. It is hard to discern from the graph, but the corrected load appears to repeat this pattern every year back to 2002. That is there is a general trend down from fall to January (the exception is the 2004-2005 outage). This may indicate an error in a correction factor or the measurement used for it (steam coil flow, backpressure?).

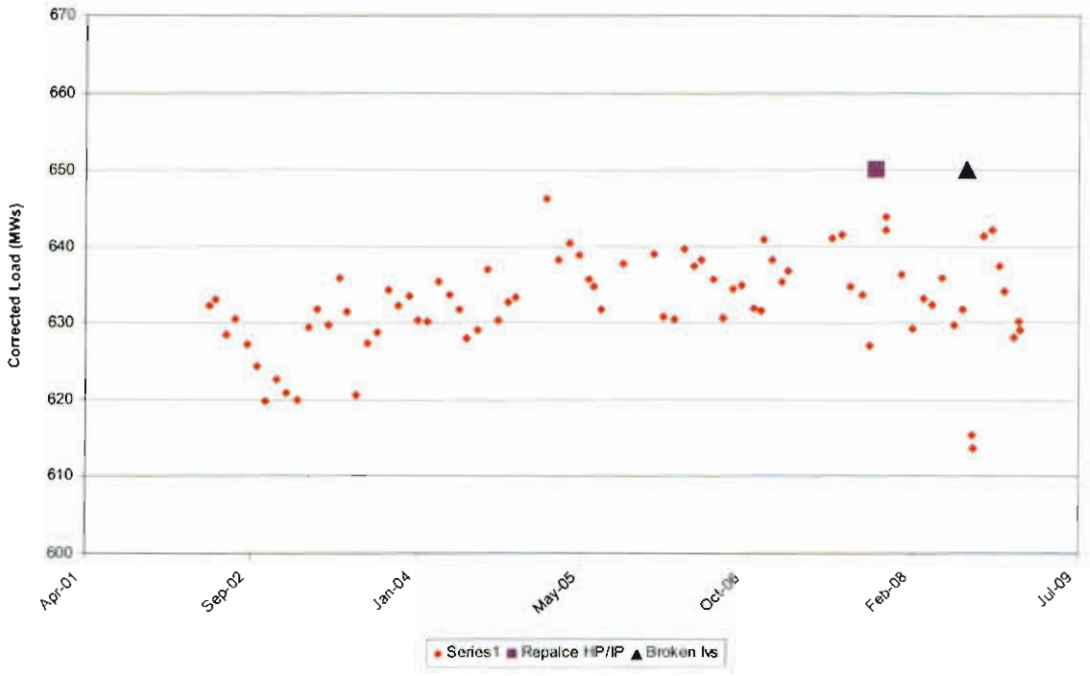
In the last report, it was pointed out that there were some unexplained step changes in turbine heat rate. Further investigation narrowed the cause down to several tags that made corresponding step changes. Efforts to determine the cause of these changes were indeterminate. Recently, efforts and changes were made to ensure that the EtaPRO system is using the same tags as have been used previously for periodic turbine

performance assessments. Hence additional step changes can be expected from December and January results. This is true for both units.

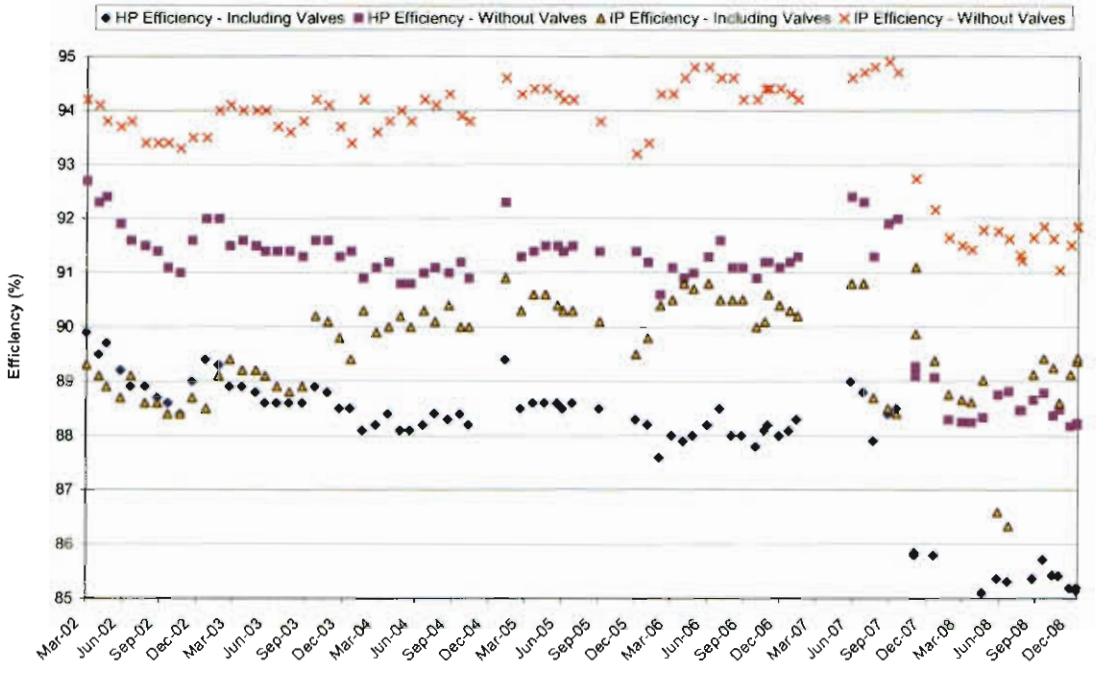




Rush Island Unit 1 - Corrected Load



Rush Island Unit 1 - HP and IP Efficiencies



Unit 2 Observations

Summary of Performance Report for:

Plant	Rush Island			
Unit	2			
Period				
		Dec-07	Nov-08	Dec-08
Full Load Performance				
Hours of Data		371	208	272
		Averages	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	612.8	630.5	627.7
AUX POWER	MW	35.6	36.9	37.3
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	10256.8	10608.8	10622.3
Boiler Efficiency Actual	%	86.0	86.0	86.3
CONTROL VALVE POSITION LVDT	%	99.8	99.6	99.6
FEEDWATER TEMP TO ECON	degF	489.8	492.3	491.8
FEEDWATER TEMP TO HTR 1	degF	441.7	443.5	443.3
HP Turbine Efficiency Actual	%	89.7	90.2	90.1
IP Turbine Efficiency Corrected	%	91.3	91.7	91.5
Condenser Pressure HP	inHga	2.2	1.7	1.5
AIRHTR-A GAS OUTLET TEMP	degF	301.1	308.8	298.6
AIRHTR-B GAS OUTLET TEMP	degF	309.8	321.6	334.7
AMBIENT AIR TEMP	degF	38.6	38.9	33.9
CIRC WTR TEMP TO LP CONDB	degF	39.9	46.2	37.5
CIRC WTR TEMP TO LP CONDB	degF	39.9	46.2	37.4
Minimum River Temperature	degF	39.9	46.2	37.4
FWH 1 Temperature Rise	degF	48.1	48.9	48.6
Net Load	MW	577.2	593.7	590.5
Average Exit Gas Temperature	degF	305.5	315.2	316.6
Aux Power	%	5.8	5.8	5.9
Gross Unit Heat Rate	BTU/KW-HR	9660.9	9988.6	9991.9
Gross Turbine Heat Rate	BTU/KW-HR	8309.7	8586.3	8621.1
Measured Feedwater Flow	KPPH	4171.8	4466.1	4471.8
Calc Steam Evaporated	KPPH	4244.8	4544.9	4551.5
Steam Flow From First Stage	KPPH	3970.2	4086.9	4099.7
FW/Steam		1.050792	1.09	1.09
Steam/Load		6.479021	6.48	6.53
FW/Load		6.8081	7.08	7.12

Note that compared to the same time last year the only major difference in operating parameters was backpressure which is considerably better for 2008 however the indicated heat rate is worse. This difference is driven by the apparent increase in feedwater flow.

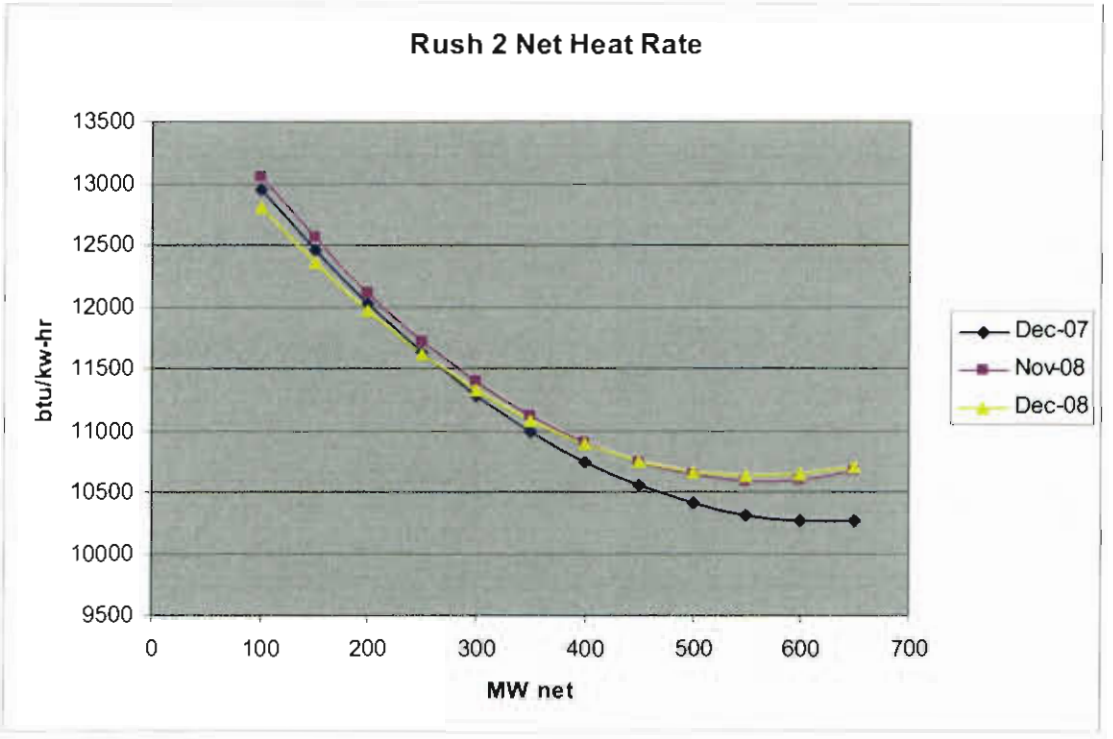
Note the large difference in feedwater to first stage determined steam flow ratio for Unit 2 compared to Unit 1. (It should be remembered that the steam flow indication for Unit 1 is probably erroneously low due to the increase in first stage nozzle area for that unit. This would make the ratio difference between the two units even larger). Also note that the steam to load ratio for both the units is very close (unit 1's would be slightly higher than shown for the foregoing explanation).

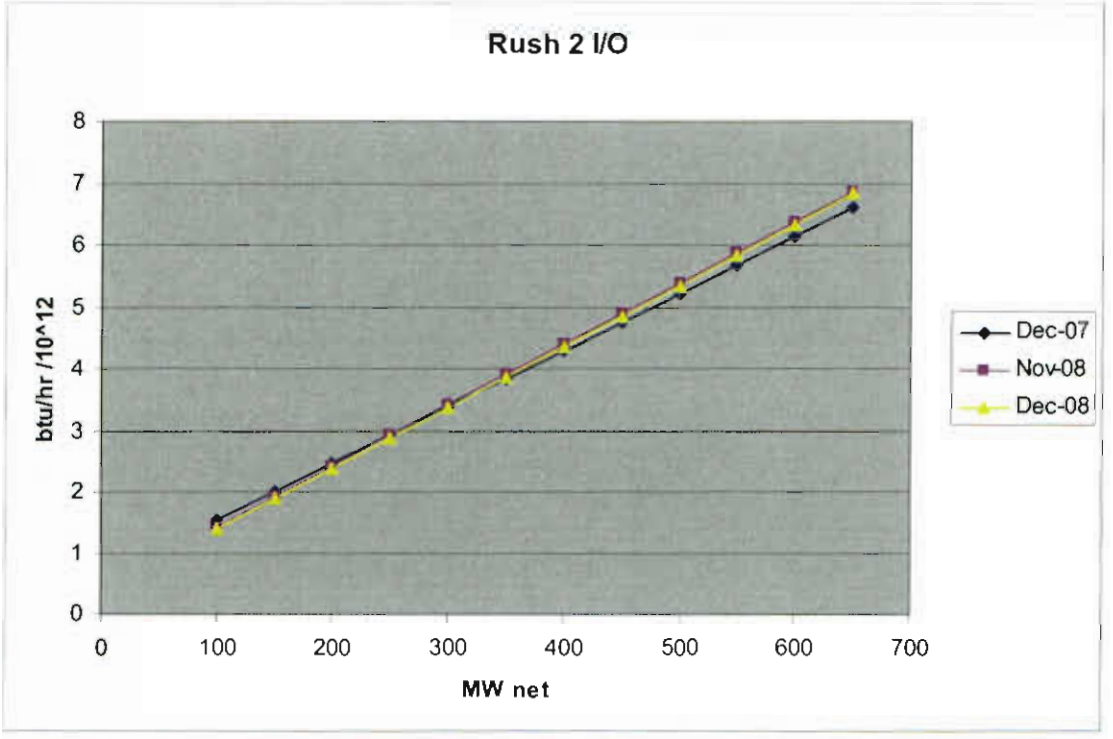
EtaPRO uses the feedwater flow for heat rate determination by calculating a steam flow from that value and adding in and subtracting appropriate other flows (sprays, blowdown, etc.) It is felt that this determined steam flow for unit 2 is erroneously high either due to an error in the feedwater flow measurement, some loss of flow from the cycle in the boiler boundary, or other isolation problem which makes the measured feedwater flow not indicative of the true flow to the economizer and hence turbine steam flow. It is recommended that a thorough field feedwater isolation check be made from the point of feedwater measurement (HPBFPp suction) to finishing superheater outlet. Also a calibration of the feedwater flow transmitters should be done.

Also as an attachment to the report is an email from Scott Anderson in Corporate Planning-Operations Analysis. The gist of this correspondence is that their comparison of the previous months' reported heat rates with that by fuel burn does not agree. Although the fuel burn heat rate is on a plant basis, it does show values very close to Unit 1. This gives further suspicion to the EtaPRO heat rate for Unit 2.

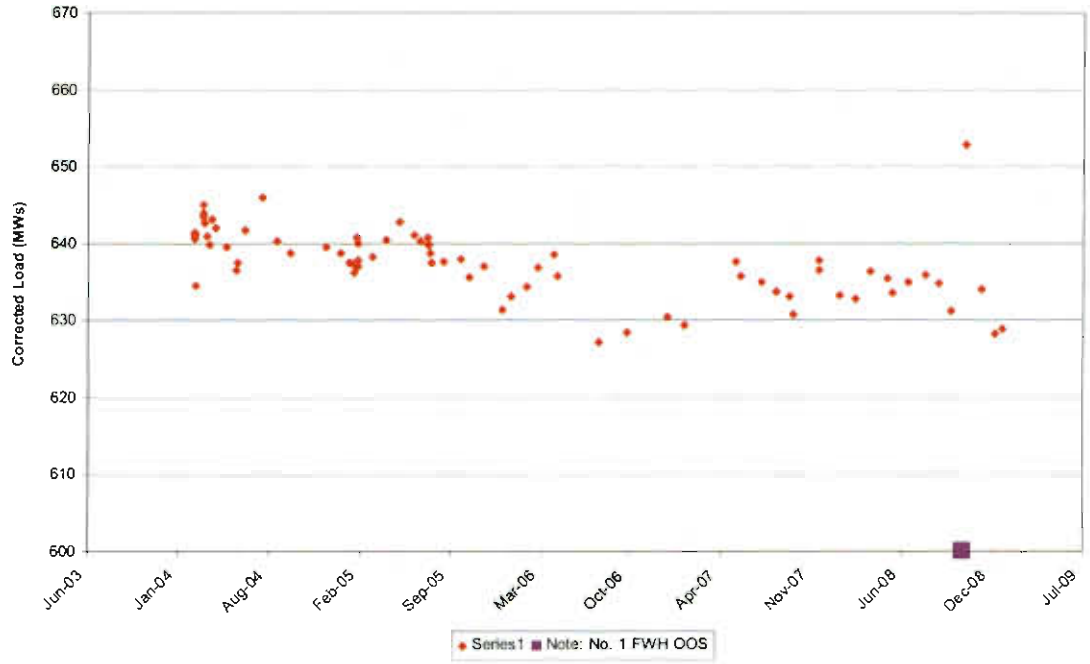
A low corrected load for this unit is noted also and although only looking back to 2004, the same sort of cycle is apparent, that is low corrected loads is more common in January. These corrected load and efficiency plots are determined from grabbing an hours worth of VWO data about once a month at random. Future improvement plans for EtaPRO include on-line corrected load calculations. Once this is complete a thorough cause/effect study can be done concerning load correction factors.

For future reference are there air heater gas bypass systems on both ducts and both units? Also is there a ProcessBook display that may indicate their status?

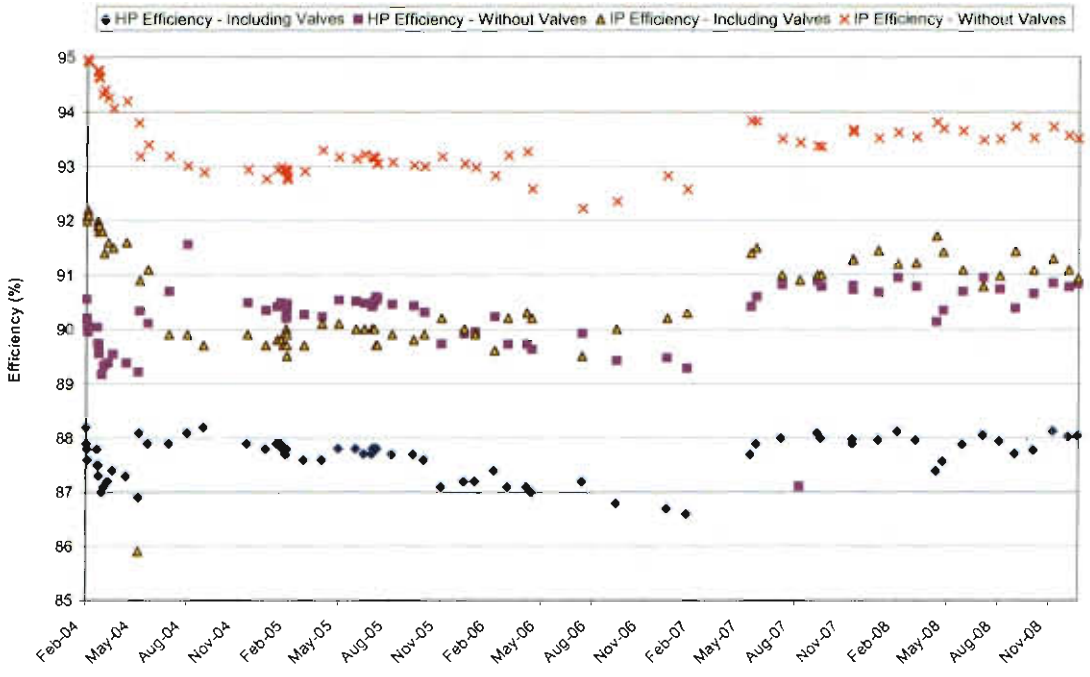

Rush 2 Net Heat Rate
btu/kw-hr
13500
13000
12500
12000
11500
11000
10500
10000
9500
0
100
200
300
400
500
600
700
MW net
Dec-07
Nov-08
Dec-08


Rush 2 I/O
btu/hr /10^12
8
7
6
5
4
3
2
1
0
0
100
200
300
400
500
600
700
MW net
Dec-07
Nov-08
Dec-08

Rush Island Unit 2 - Corrected Load



Rush Island Unit 2 - HP and IP Efficiencies



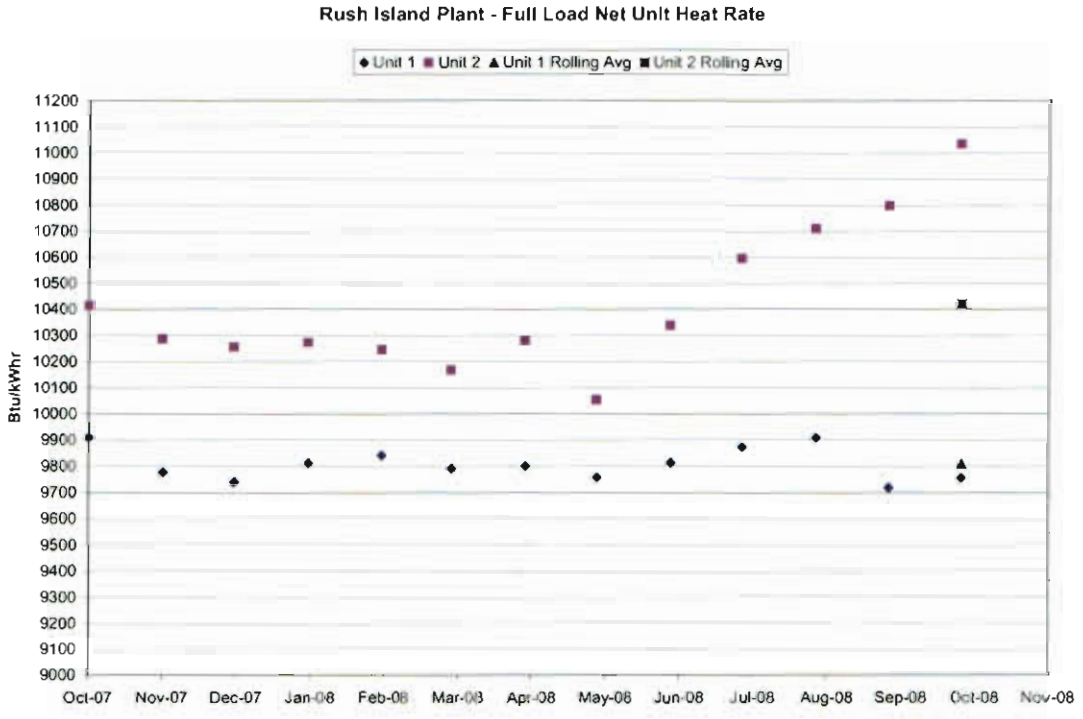
November 12, 2008

To: Mr. David Strubberg
From: Joe Sind
Cc: Andy Williamson, Paul Starks, Greg Vasel, Gary Blessing, Mike Clonts, Matt Wallace, Ken Stuckmeyer, Jeff Shelton, Jeff Colter, Tim Finnell

Re: Rush Island October Performance Report

The last report data was Sept. 2 and covered data through August 2008. No comments were received concerning the report format so this report is basically the same. However please advise on anything you think would be an improvement: presentation, content (additional or that you feel is of little use). Attempts will be made to improve the report until all recipients are satisfied.

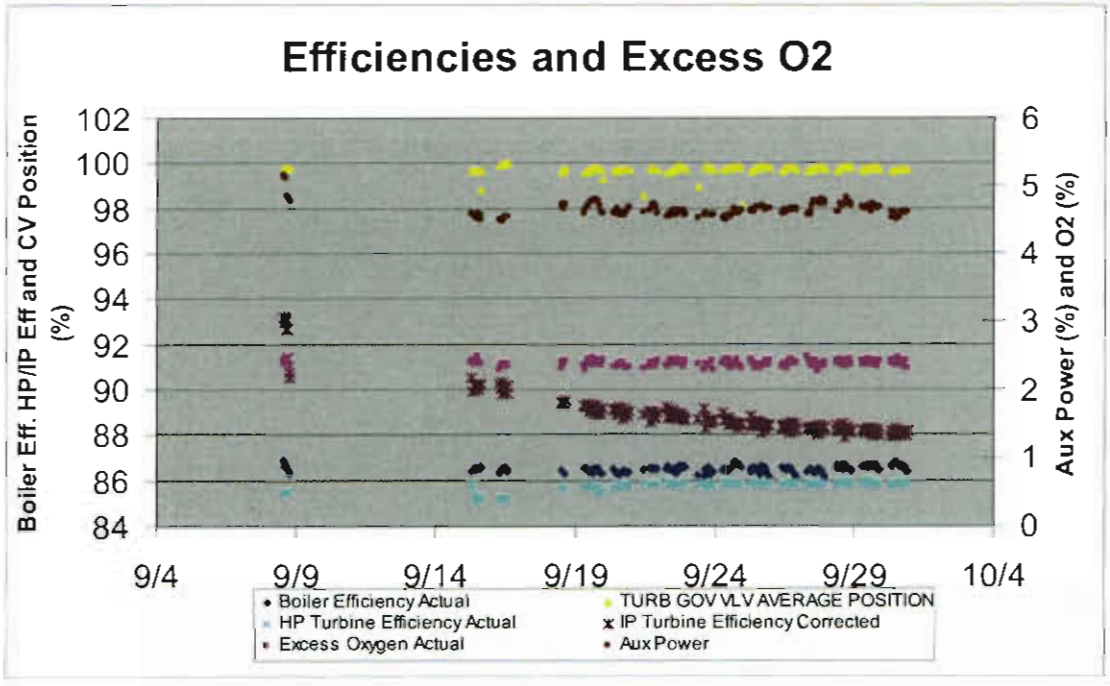
Actual data and graphs for the month's performance report are on page 4. Observation concerning the data, the units' operation and performance in general are as follows.



Unit 1 heat rate was improved with the repair of two the unit's intercept valves in early September. Furthermore intercept valve strainers were removed on all four IVs at that time. Jeff Shelton estimated the improvement by removing the strainers was about 1 MW to corrected load.

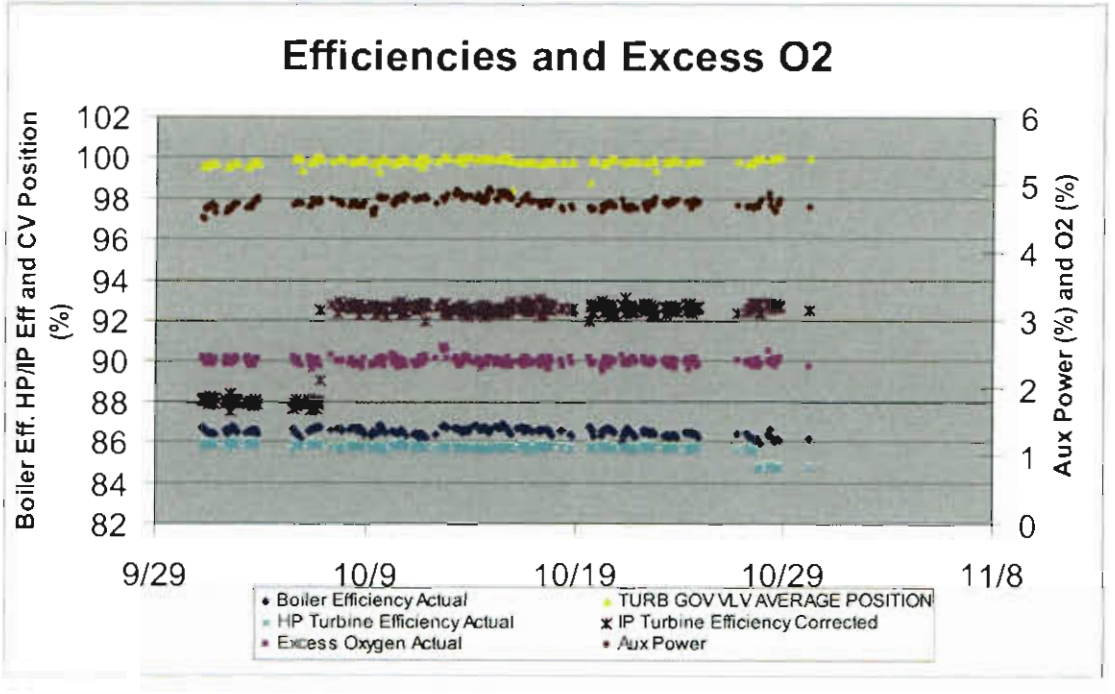
The tabular data for unit 1 that follows has some suspicious results for IP turbine efficiency. The data used for this calculation needs to be reviewed in more detail to determine the cause of step changes and unexplained trends.

UNIT 1 VWO



Note the few observations of apparent improvement in IP efficiency post RHIV repair and downward trend the remainder of the month.

UNIT 1 VWO



Note step change increase in efficiency on Oct. 6 (and decrease in HP efficiency on 10/27). J. Sind has action to review and correct these reported efficiencies provided a suitable replacement tag can be found for any identified bad data.

Unit 2 heat rate continues to get worse with the latest month being a full month with the top heater OOS. This heater is OOS due to a water side relief valve being failed on the heater and proper isolation cannot be achieved to repair. In the last report attention was drawn to Unit 2's high relative feedwater flow rate which could at least partly be attributed to this relief valve. If heat rates don't return to pre July level when the valve is repaired and the top heater is restored, a more thorough investigation into cycle isolation is recommended.

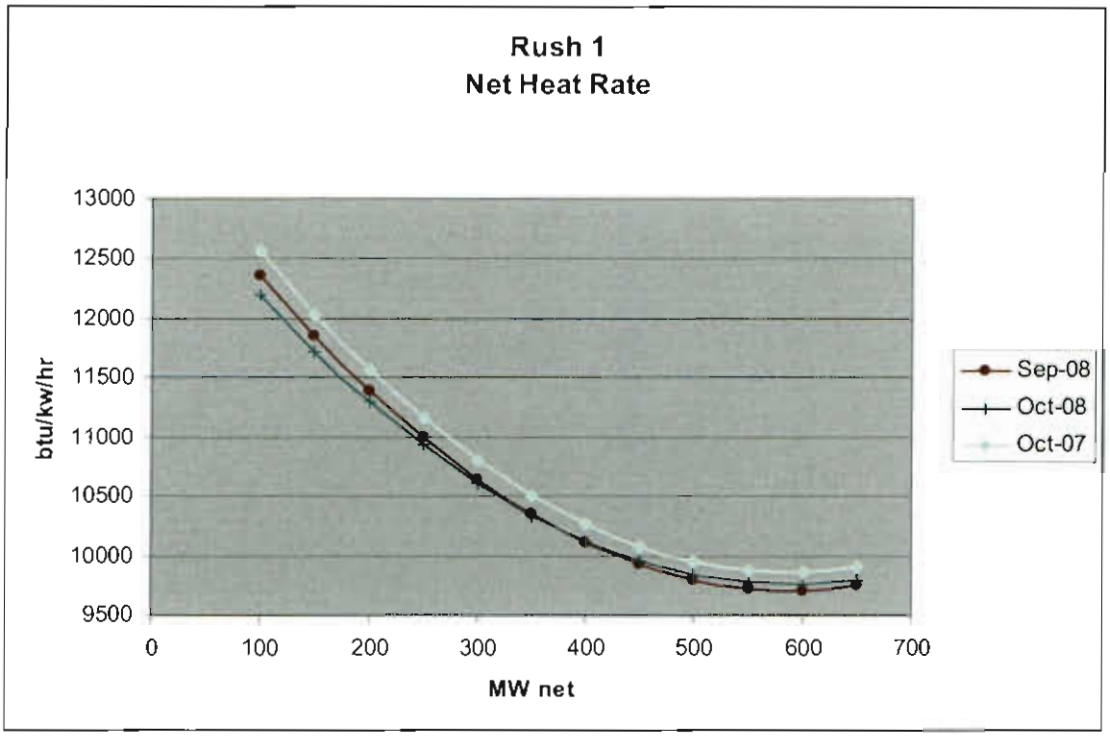
Jeff Shelton has done a great job at emulating the previous work of Gary Blessing to determine corrected unit load, HP/IP efficiencies, corrected stage pressures, etc. He has also calculated these performance indicators for some months to bridge the gap between when GSB quit performing these duties and present. Plots of corrected load and turbine efficiencies for both units are included in the back of this report. The intent is to include this information in future reports. Additional graphs of corrected stage pressure will be included if necessary to explain any changes in performance.

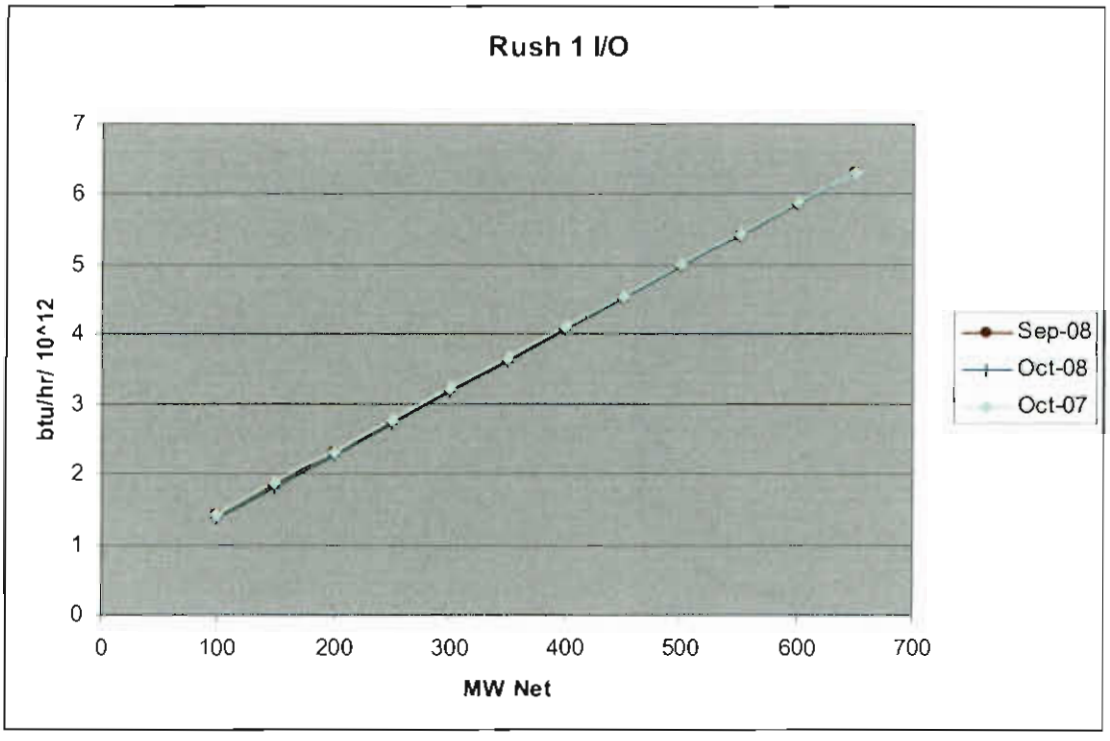
Summary of Performance Report for:

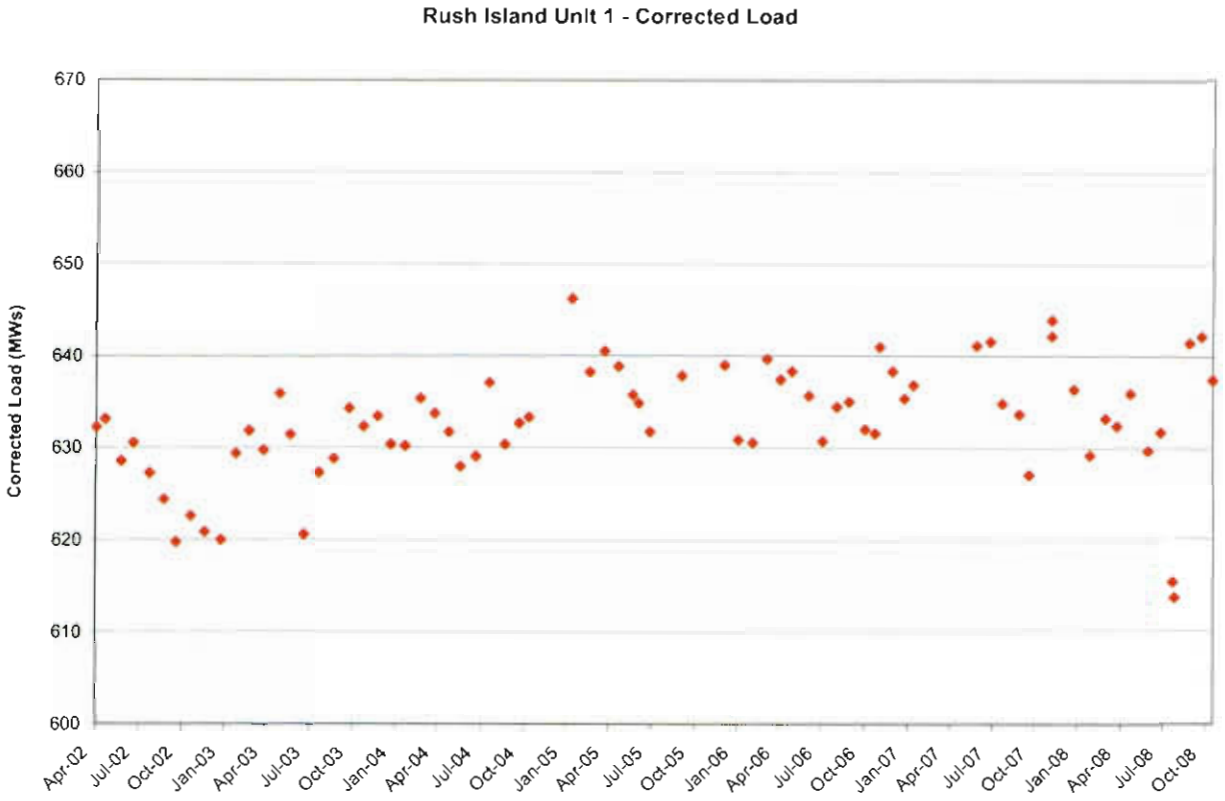
Plant Rush Island
Unit 1
Period

		Oct-07	Sep-08	Oct-08
Full Load Performance				
Hours of Data		74	201	341
		Averages	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	634.7	643.3	647.1
AUX POWER	MW	30.9	29.9	30.6
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	9909.5	9720.9	9755.8
Boiler Efficiency Actual	%	86.4	86.5	86.5
CONTROL VALVE POSITION LVDT	%	99.8	99.7	99.8
FEEDWATER TEMP TO ECON	degF	499.5	496.3	497.1
FEEDWATER TEMP TO HTR 1	degF	446.3	446.4	447.2
HP Turbine Efficiency Actual	%	86.7	85.8	85.7
IP Turbine Efficiency Corrected	%	90.3	88.8	91.7
Condenser Pressure	inHga	2.8	2.9	2.8
AIRHTR-A GAS OUTLET TEMP	degF	288.0	296.6	287.6
AIRHTR-B GAS OUTLET TEMP	degF	293.0	308.0	299.4
AMBIENT AIR TEMP	degF	63.9	70.3	61.6
CIRC WTR TEMP TO LP CONDB	degF	71.0	71.5	66.3
CIRC WTR TEMP TO LP CONDB	degF	69.4	69.9	64.7
Minimum River Temperature	degF	69.4	69.9	64.7
FWH 1 Temperature Rise	degF	53.2	49.9	49.9
Net Load	MW	603.8	613.5	616.5
Average Exit Gas Temperature	degF	290.5	302.3	293.5
Aux Power	%	4.9	4.6	4.7
Gross Unit Heat Rate	BTU/KW-HR	9427.0	9269.4	9294.8
Gross Turbine Heat Rate	BTU/KW-HR	8148.8	8017.7	8043.5
Measured Feedwater Flow	KPPH	4371.1	4310.6	4347.9
Calc Steam Evaporated	KPPH	4363.6	4302.4	4342.5
Steam Flow From First Stage	KPPH	4158.7	4116.3	4150.3
FW/Steam		1.1	1.0	1.0
Steam/Load		6.6	6.4	6.4
FW/Load		6.9	6.7	6.7

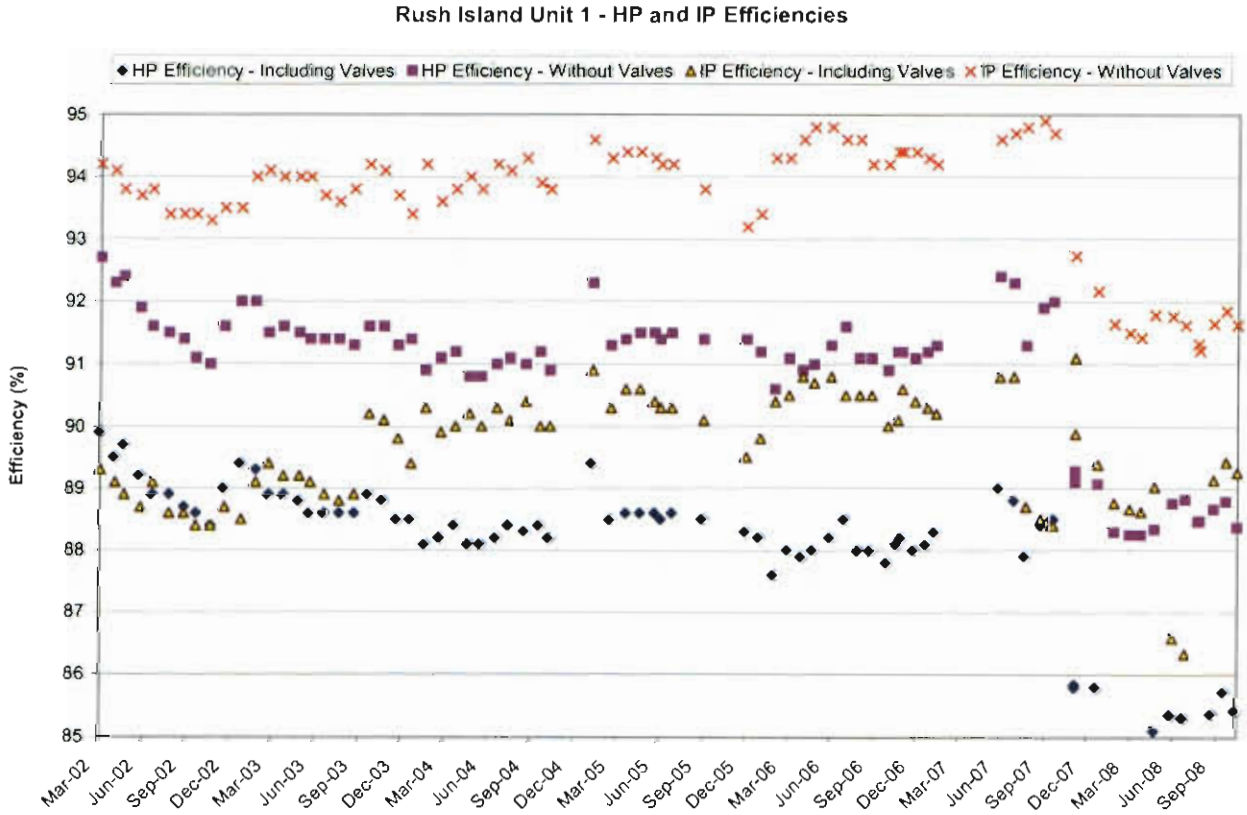
Suspect Data for IP turb Efficiency


Rush 1
Net Heat Rate
13000
12500
12000
11500
11000
10500
10000
9500
btu/kw/hr
0
100
200
300
400
500
600
700
MW net
Sep-08
Oct-08
Oct-07


Rush 1 I/O
7
6
5
4
3
2
1
0
btu/hr/ 10^12
0
100
200
300
400
500
600
700
MW Net
Sep-08
Oct-08
Oct-07



The two low load values in August were due to two broken intercept valves on the Unit.

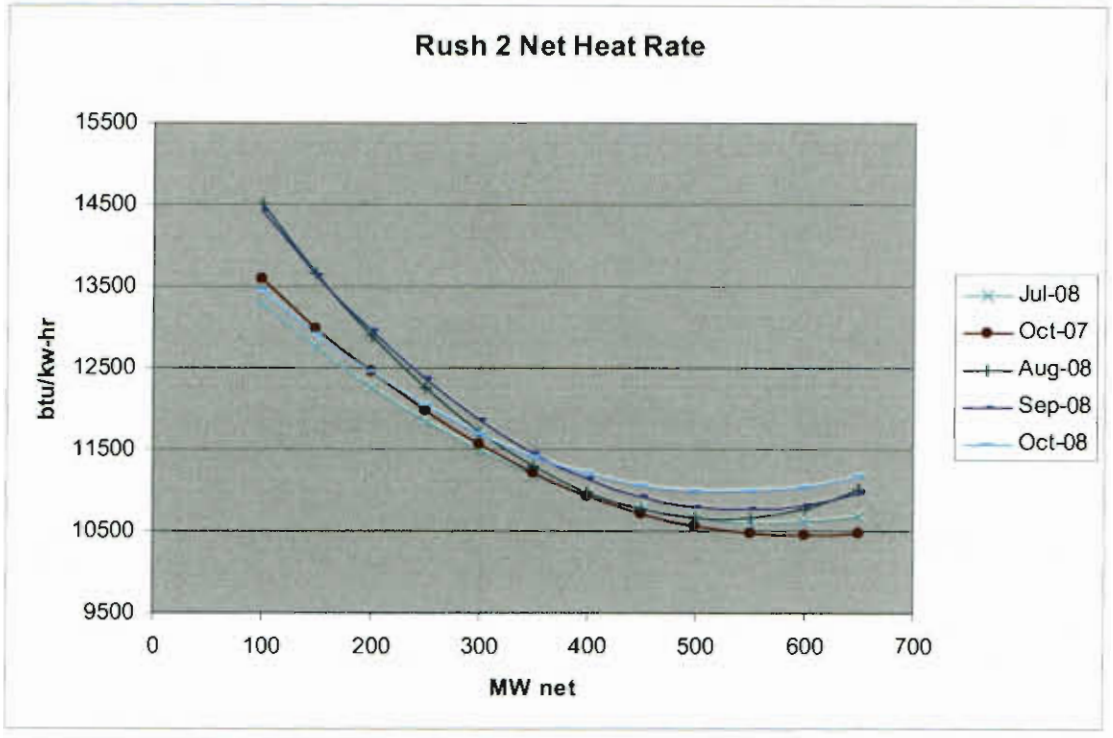


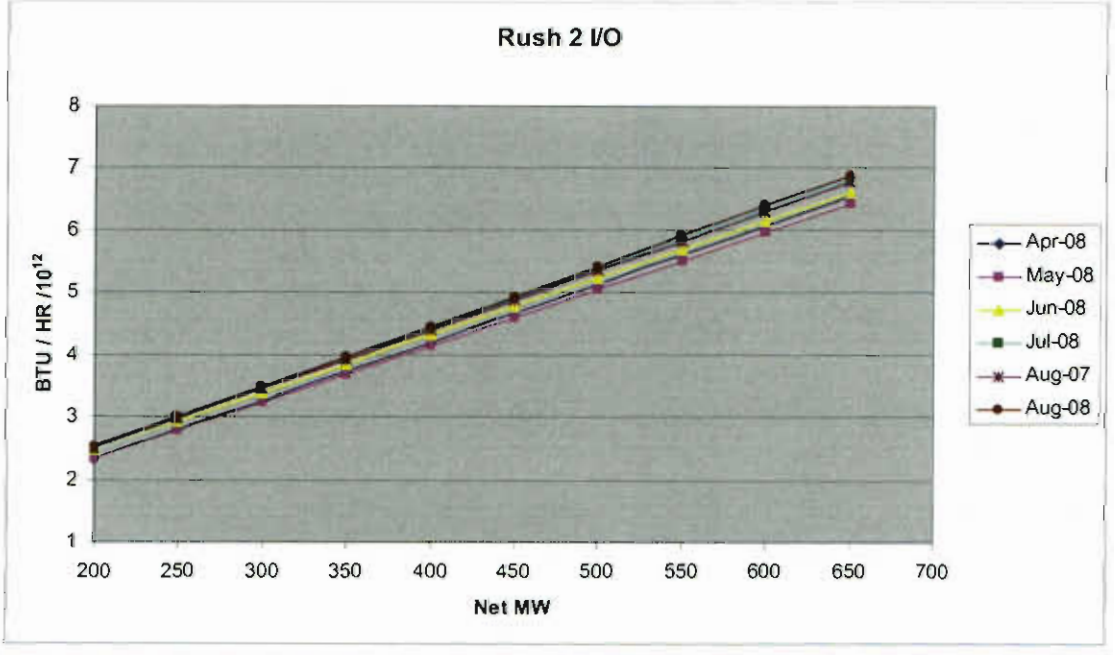
Significant efficiency changes following rotor replacement in Fall '07. The change in IP external efficiency following the second valve failure is also apparent in Aug. '08

Summary of Performance Report for:

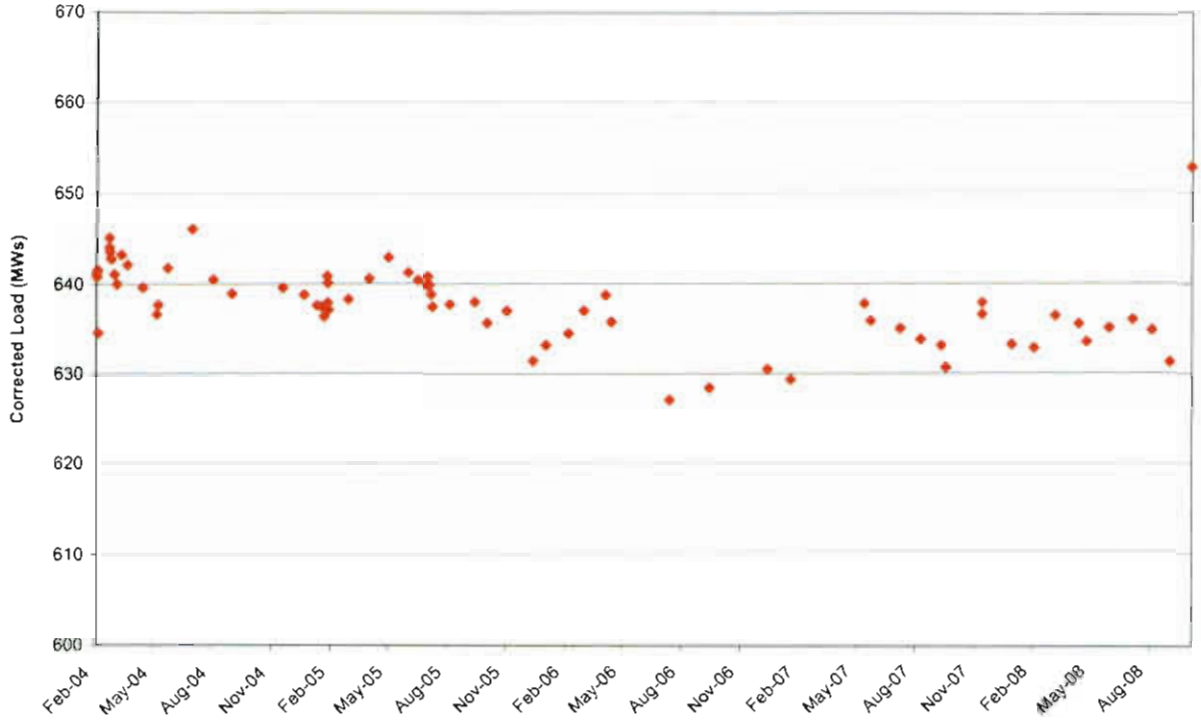
Plant	Rush Island			
Unit	2			
Period				
		Oct-07	Sep-08	Oct-08
Full Load Performance				
Hours of Data		183	67	62
		Averages	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	621.6	611.6	613.2
AUX POWER	MW	36.3	35.1	34.9
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	10421.0	10813.3	11037.0
Boiler Efficiency Actual	%	85.5	85.7	85.9
CONTROL VALVE POSITION LVDT	%	99.7	99.5	99.5
FEEDWATER TEMP TO ECON	degF	491.9	490.8	443.7
FEEDWATER TEMP TO HTR 1	degF	443.4	441.8	#DIV/0!
HP Turbine Efficiency Actual	%	89.7	89.8	89.8
IP Turbine Efficiency Corrected	%	92.2	91.5	91.3
Condenser Pressure HP	inHga	2.6	2.7	2.2
AIRHTR-A GAS OUTLET TEMP	degF	299.6	314.6	299.1
AIRHTR-B GAS OUTLET TEMP	degF	308.7	327.8	307.3
AMBIENT AIR TEMP	degF	61.7	73.6	57.9
CIRC WTR TEMP TO LP CONDB	degF	62.0	74.4	63.1
CIRC WTR TEMP TO LP CONDB	degF	61.9	74.4	63.1
Minimum River Temperature	degF	61.9	74.4	63.1
FWH 1 Temperature Rise	degF	48.6	48.9	#DIV/0!
Net Load	MW	585.3	576.5	578.4
Average Exit Gas Temperature	degF	304.1	321.2	303.2
Aux Power	%	5.8	5.7	5.7
Gross Unit Heat Rate	BTU/KW-HR	9812.6	10192.5	10409.2
Gross Turbine Heat Rate	BTU/KW-HR	8384.9	8735.9	8944.0
Measured Feedwater Flow	KPPH	4254.7	4382.5	4160.1
Calc Steam Evaporated	KPPH	4344.8	4460.1	4362.1
Steam Flow From First Stage	KPPH	4019.4	3996.5	3852.7
FW/Steam		1.06	1.10	1.08
Steam/Load		6.47	6.53	6.28
FW/Load		6.84	7.17	6.78

No 1 heater OOS


Rush 2 Net Heat Rate
15500
14500
13500
12500
11500
10500
9500
btu/kw-hr
0
100
200
300
400
500
600
700
MW net
Jul-08
Oct-07
Aug-08
Sep-08
Oct-08

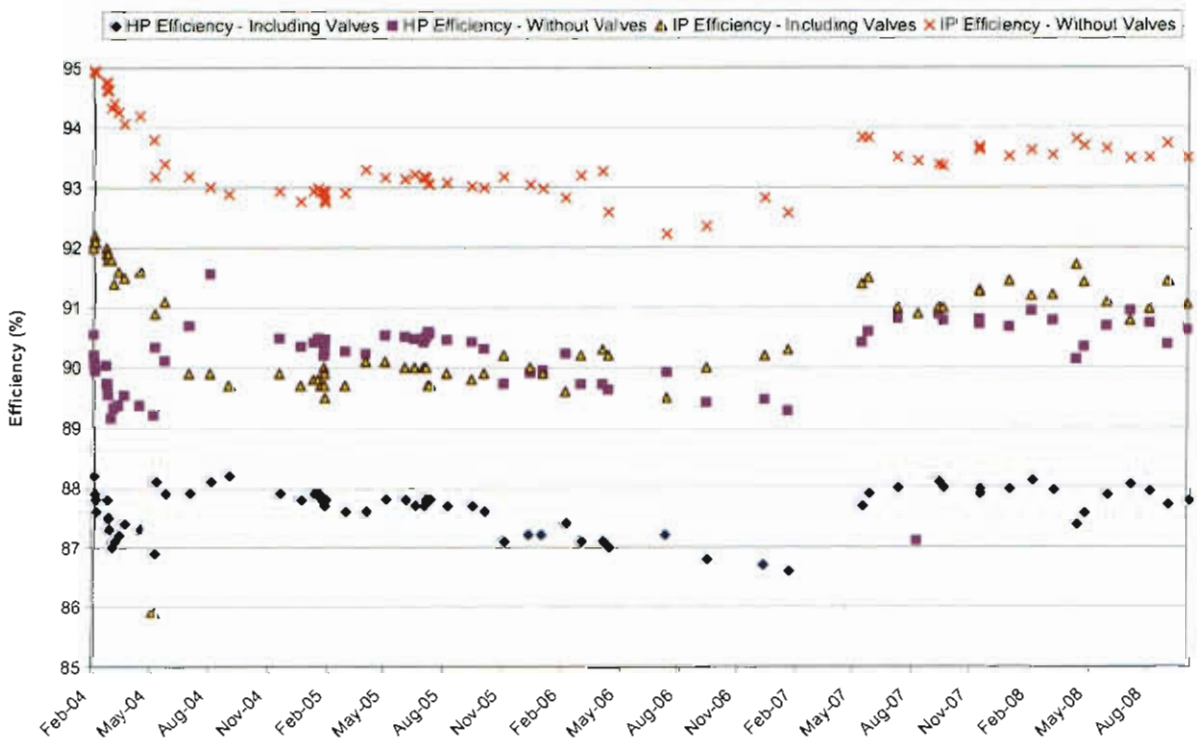

Rush 2 I/O
8
7
6
5
4
3
2
1
BTU / HR /10^12
200
250
300
350
400
450
500
550
600
650
700
Net MW
Apr-08
May-08
Jun-08
Jul-08
Aug-07
Aug-08

Rush Island Unit 2 - Corrected Load



The last load point is high due to the top heater being out of service.

Rush Island Unit 2 - HP and IP Efficiencies



September 2, 2008

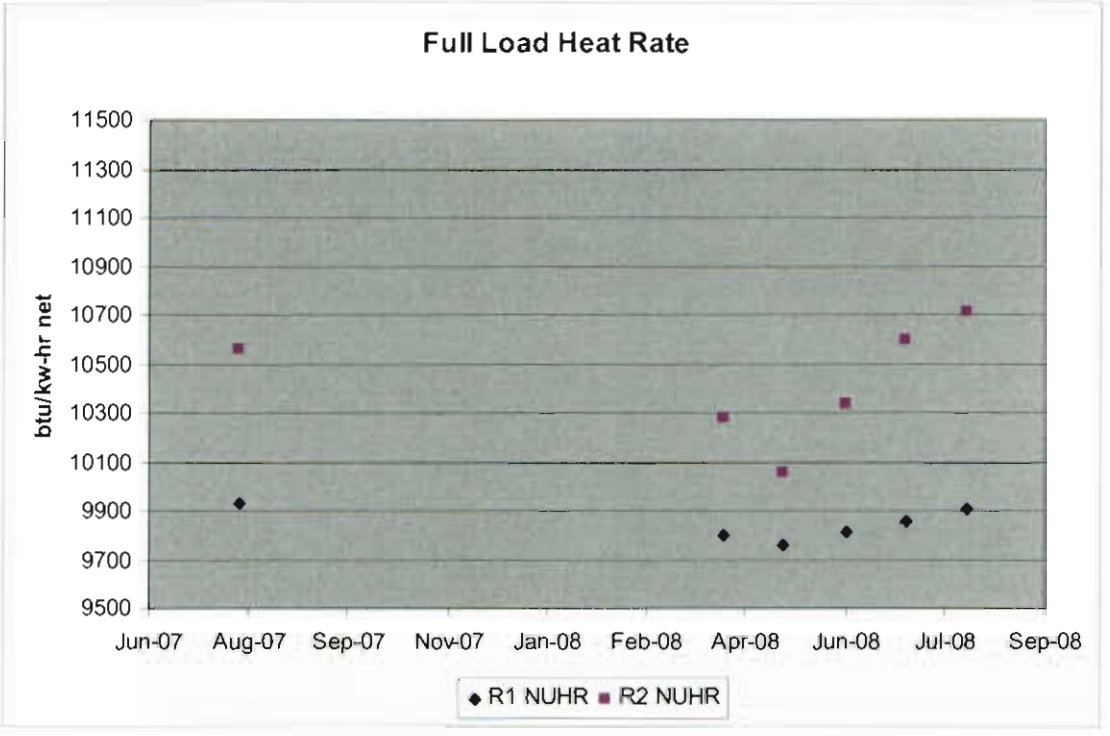
To: Mr. David Strubberg
From: Joe Sind
Cc: Andy Williamson, Paul Starks, Greg Vasel, Gary Blessing, Mike Clonts, Matt Wallace, Ken Stuckmeyer, Jeff Shelton, Jeff Colter, Tim Finnell

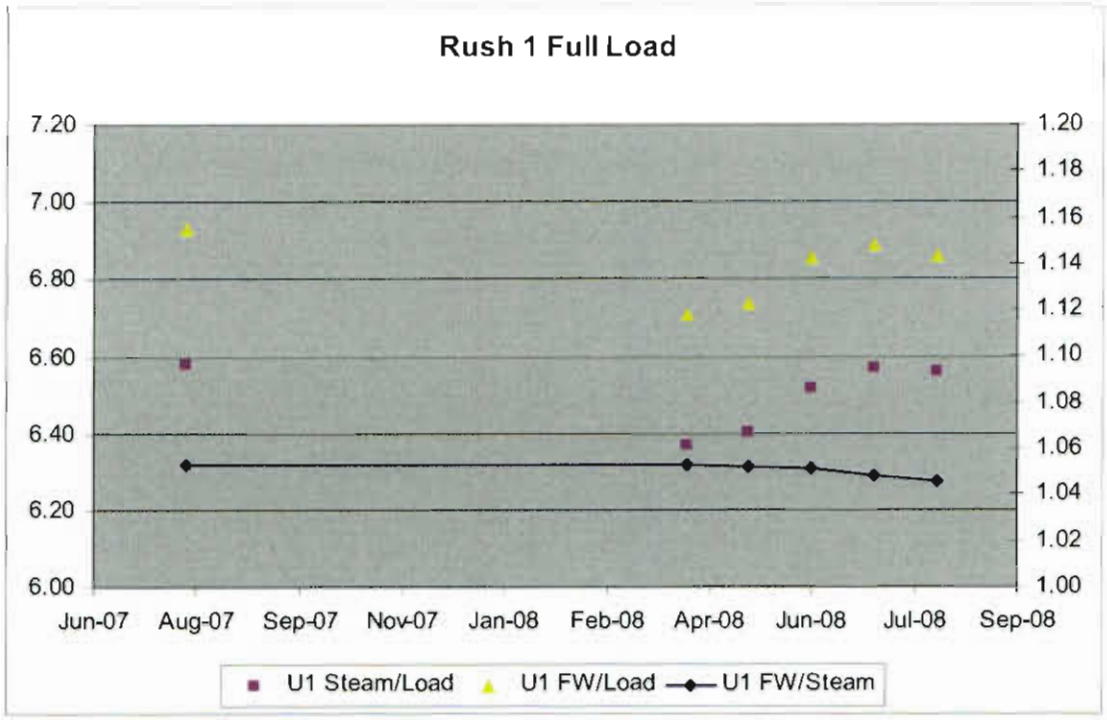
Re: Rush Island August Performance Report

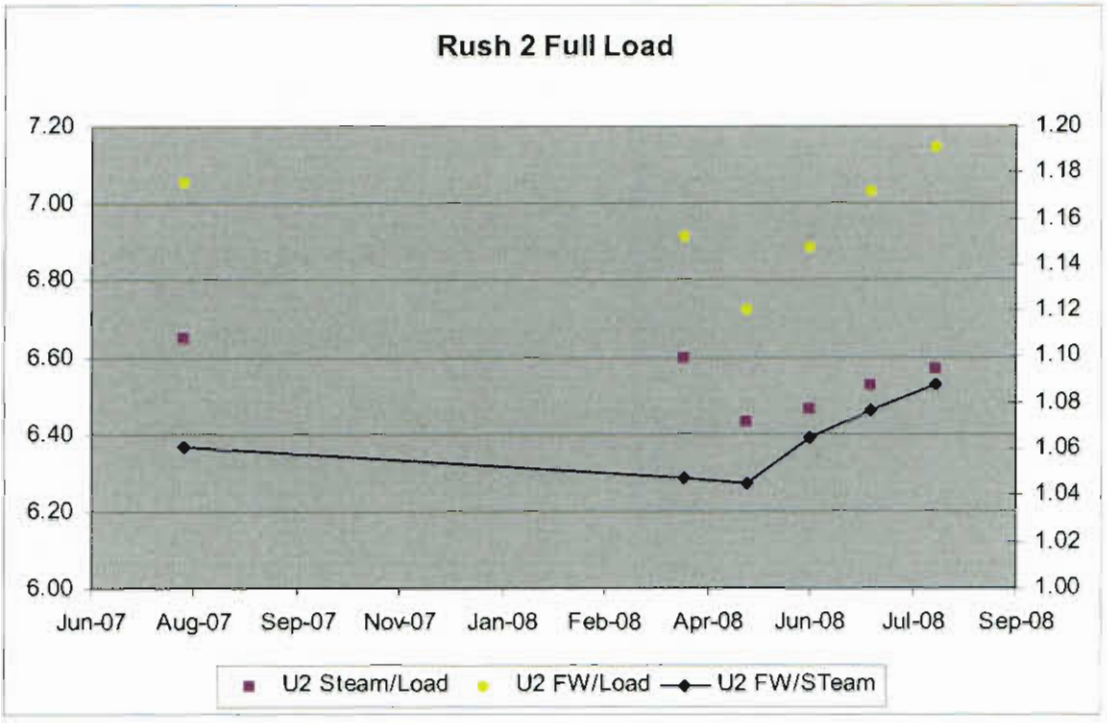
This is the first regular report following the initial demonstration in July's performance meeting. Some of the suggestions Gary Blessing made have been incorporated, but the report should not be considered in it's final form for regular publication. Please advise on anything you think would be an improvement: presentation, content (additional or that you feel is of little use). Attempts will be made to improve the report until all recipients are satisfied.

Actual data and graphs for the month's performance report are on page 4. Observation concerning the data, the units' operation and performance in general are as follows.

- The first observation is that Unit 2 heat rate is appreciably worse than Unit 1s, on the order of 5 % or more, and getting worse. The following three trends show both units data. The second and third are indicators of feedwater/steam flow/load relations.







Please note that heat rates are those calculated by EtaPRO at VWO (>98%) and use the feedwater flow to determine the turbine cycle heat input. Both units exhibit an expected increase in heat rate from May due to rising river temps and backpressures. They also

both show the same change in steam flow/mw, however the feedwater/mw is much higher for unit 2 reflecting the change in indicated heat rate. The disparity in feedwater/steam for unit 2 indicates either an instrumentation error or a loss of isolation.

As of the date of this report we are aware of a problem with a feedwater relief valve problem on the discharge of the No. 1 heater on Unit 2. This would definitely contribute to this disparity, however the difference in feedwater/load is on the order of almost 3%. Depending on the relative location of the feedwater measurement, other possible reasons for the high feedwater to load and steam ratio could be BFPp recirc., unmeasured boiler blowdown, boiler drains, drains before the turbine first stage (main steam line), etc. It is recommended that unless a dramatic improvement is seen following the relief valve repair a thorough investigation of unit 2 feedwater isolation be undertaken.

Following are examples of the normal tables and graphs that will be included in each report. Some relevant comments are:

- Unit 1 IP efficiency change from May to June to July reflects the first intercept valve failure. The second IV failure in August would not show up as there was not any VWO data after that.
- The abnormal shape of the heat rate curve for unit 1 in August is due to operation with the top heaters OOS. Note these are plots of the trendlines of actual data. For unit 1 in August the actual data appeared as 2 distinct groups with the higher grouping with the FWHs OOS. The trendline terminating at a lower heat rate is not a true indication, just a result of the bad fit. Efforts could be made to glean all "bad operation" data from these plots but it is felt that this would diminish their purpose. Note the FWH OOS data does not get reflected in full load VWO data.
- Please note the low number of VWO hours for Unit 2 in May.

Please let me know if you have any questions regarding the data and once again I would appreciate any comments on how to make the report more valuable.

Summary of Performance Report for:

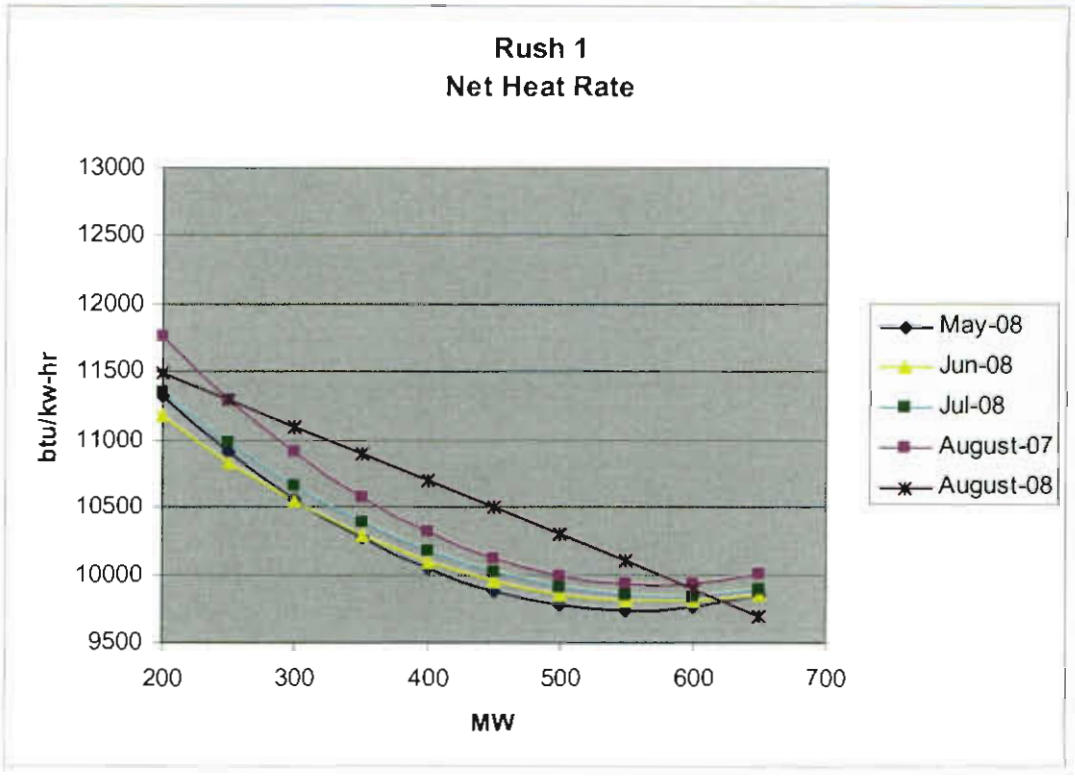
Plant	Rush Island
Unit	1
Period	

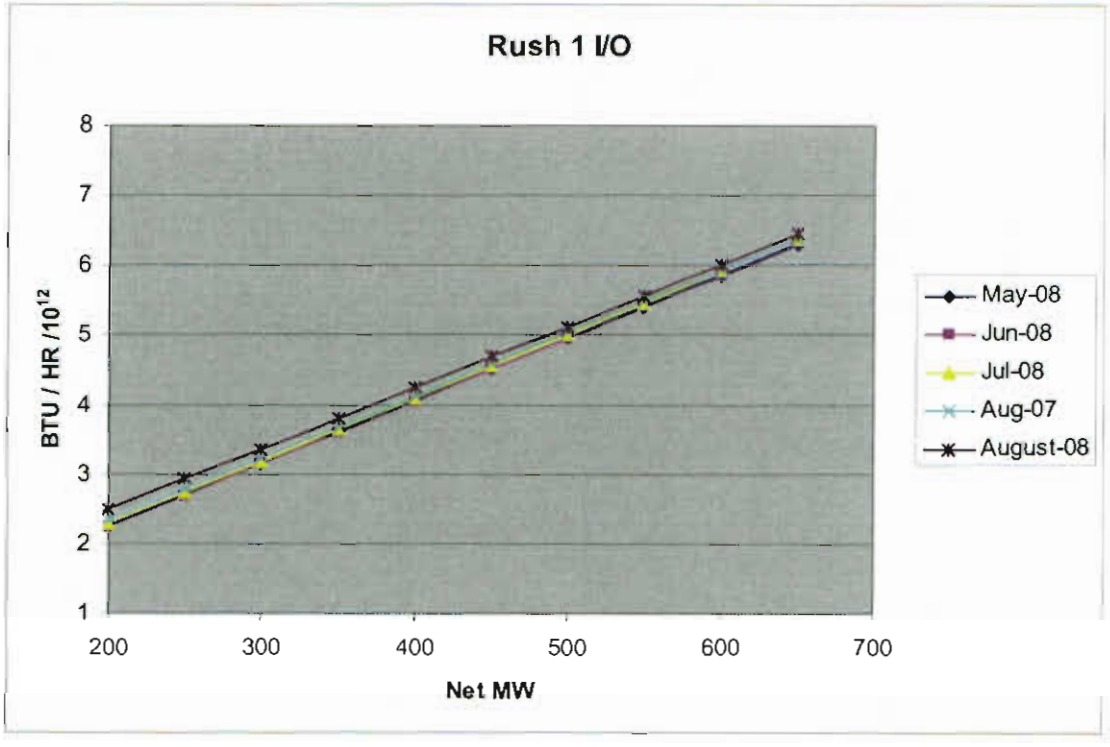
		August-07	April-08	May-08	June-08	July-08	August-08
Full Load Performance							
Hours of Data		434	122	231	329	335	152
		Averages	**Averages**	**Averages**	**Averages**	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	629 6	634.4	634.8	632.9	626.7	622.7
AUX POWER	MW	29.1	30.3	29.6	30.7	30.5	30.4
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	9926	9801	9758	9614	9854	9909
Boiler Efficiency Actual	%	86 6	86.4	86.4	86.5	86.6	86.6
CONTROL VALVE POSITION LVDT	%	100 2	100.0	100.1	99.9	99 9	99.9
FEEDWATER TEMP TO ECON	degF	500	496	496	497	499	499
FEEDWATER TEMP TO HTR 1	degF	446	446	447	447	447	447
HP Turbine Efficiency Actual	%	86.3	84 8	84.9	85.4	85.3	85.1
IP Turbine Efficiency Corrected	%	90.4	92.4	92 7	91 5	89.5	89 6
Condenser Pressure	inHga	3 7	1.9	2.1	2.8	3.1	3.3
AIRHTR-A GAS OUTLET TEMP	degF	294	279	287	300	300	297
AIRHTR-B GAS OUTLET TEMP	degF	295	290	295	305	305	305
AMBIENT AIR TEMP	degF	86.9	54.0	65.7	80.0	82.1	75.2
CIRC WTR TEMP TO LP CONDB	degF	85.5	51.1	61 7	75.3	79.9	82.2
CIRC WTR TEMP TO LP CONDB	degF	83.8	49.6	60.1	73.7	78.3	80 6
Minimum River Temperature	degF	83.8	49.8	60.1	73.7	78.3	80.6
FWH 1 Temperature Rise	degF	53.7	49.9	49.3	50.0	51 9	51.9
Net Load	MW	600.5	604.1	605.2	602.2	596 2	592 3
Average Exit Gas Temperature	degF	294.4	284.3	290.9	302.5	302 8	301 4
Aux Power	%	4.8	4.8	4.7	4.9	4.9	4.9
Gross Unit Heat Rate	BTU/KW-HR	9467	9334	9303	9338	9375	9424
Gross Turbine Heat Rate	BTU/KW-HR	8197	8066	8038	8076	8115	8157
Measured Feedwater Flow	KPPH	4362	4255	4277	4339	4315	4271
Calc Steam Evaporated	KPPH	4354	4248	4271	4334	4310	4266
Steam Flow From First Stage	KPPH	4142	4041	4065	4126	4117	4084

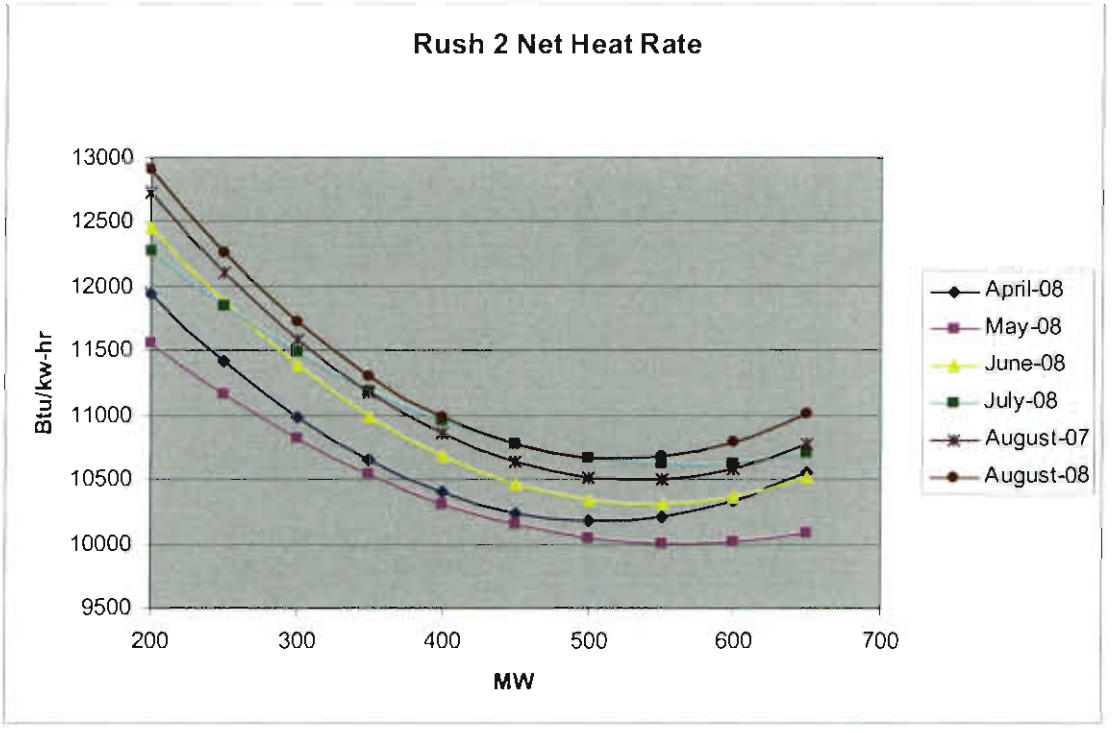
Summary of Performance Report for:

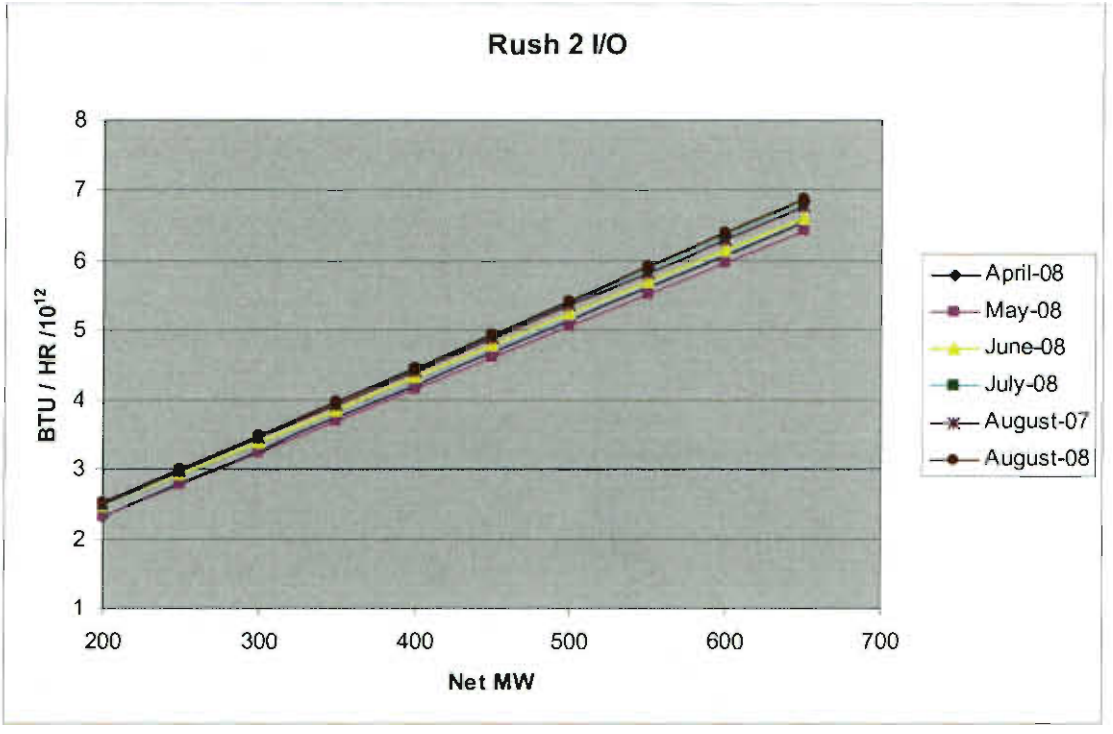
Plant	Rush Island
Unit	2
Period	

		August-07	April-08	May-08	June-08	July-08	August-08
Full Load Performance							
Hours of Data		354	137	36	224	233	351
		Averages	**Averages**	**Averages**	**Averages**	**Averages**	**Averages**
GENERATOR MEGAWATTS	MW	607.4	587 2	611.9	616.0	599.1	610 9
AUX POWER	MW	35.5	32 0	34.6	35.9	35.4	37 3
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	10561	10282	10056	10339	10597	10713
Boiler Efficiency Actual	%	85 6	85.7	85 7	85.6	85 7	85 7
CONTROL VALVE POSITION LVDT	%	99.7	99 8	100.1	100.2	100 1	100.1
FEEDWATER TEMP TO ECON	degF	491	487	489	490	488	491
FEEDWATER TEMP TO HTR 1	degF	443	439	442	442	440	442
HP Turbine Efficiency Actual	%	90.1	90.0	89.5	89 9	90 0	90.0
IP Turbine Efficiency Corrected	%	92.5	91.4	91.5	91.4	91.4	91.2
Condenser Pressure HP	inHga	3.9	2.4	1 7	2.4	2 8	2 9
AIRHTR-A GAS OUTLET TEMP	degF	316	287	296	317	315	319
AIRHTR-B GAS OUTLET TEMP	degF	325	302	307	329	327	331
AMBIENT AIR TEMP	degF	87.1	53.7	61.1	80.8	82.5	79 0
CIRC WTR TEMP TO LP CONDB	degF	85.2	51.3	61 3	75.1	79 8	80 7
CIRC WTR TEMP TO LP CONDB	degF	85.1	51.3	61.3	75.1	79 7	80.6
Minimum River Temperature	degF	85.1	51 3	61 3	75.1	79.7	80.6
FWH 1 Temperature Rise	degF	48.6	47 8	47 8	48.2	48.2	48.5
Net Load	MW	571 9	555.2	577.3	580.2	563.8	573.6
Average Exit Gas Temperature	degF	320.5	294.2	301.6	323.0	320.9	324.7
Aux Power	%	5 8	5.4	5.7	5.8	5.9	6.1
Gross Unit Heat Rate	BTU/KW-HR	9943	9722	9487	9737	9972	10059
Gross Turbine Heat Rate	BTU/KW-HR	8506	8330	8129	8333	8544	8617
Measured Feedwater Flow	KPPH	4284	4290	4113	4239	4211	4365
Calc Steam Evaporated	KPPH	4331	4454	4152	4294	4278	4416
Steam Flow From First Stage	KPPH	4039	4096	3936	3982	3911	4013


Rush 1
Net Heat Rate
13000
12500
12000
11500
11000
10500
10000
9500
btu/kw-hr
200
300
400
500
600
700
MW
May-08
Jun-08
Jul-08
August-07
August-08


Rush 1 I/O
8
7
6
5
4
3
2
1
BTU / HR /10^12
200
300
400
500
600
700
Net MW
May-08
Jun-08
Jul-08
Aug-07
August-08


Rush 2 Net Heat Rate
13000
12500
12000
11500
11000
10500
10000
9500
Btu/kw-hr
200
300
400
500
600
700
MW
April-08
May-08
June-08
July-08
August-07
August-08


Rush 2 I/O
8
7
6
5
4
3
2
1
BTU / HR /10^12
200
300
400
500
600
700
Net MW
April-08
May-08
June-08
July-08
August-07
August-08

Sioux

Heat Rate Performance Reports

Attachment D

July 16, 2009

To: Karl Blank
From: Scott Hixson
Cc: Bob Meiners, Keith Stuckmeyer, Harry Benhardt, John Romano, Pat Weir, Greg Gilbertsen, David Azar, Mark Selvog, Steve Garner, Scott McCormack, Lisa Meyer, Ken Stuckmeyer, Don Clayton, Joe Sind, Jim Barnett, Glenn Tiffin, Matt Wallace, Jeff Shelton

Subject: Sioux June 2009 Performance Report

Executive Summary

The most notable items regarding Sioux unit performance were:

- Total plant heat rate increased 124 Btu/kwh from May to June. This increase in heat rate can be primarily attributed to increased condenser pressure due to higher river temperatures and lower apparent cleanliness.
- Feed water recirculation valves FIC 2-1418-V1 FIC 2-1418-V2 were re-inspected and verified to not be leaking.

Instrumentation issues have been moved to the end of the report.

A monthly summary of each Unit's heat rate for operation above 450 MW is shown in Fig. 1. Sioux plant heat rate for May increased 124 Btu/kwh from May. Unit 1 and Unit 2 month average heat rates increased 89Btu/kwh and 158Btu/kwh respectively in June.

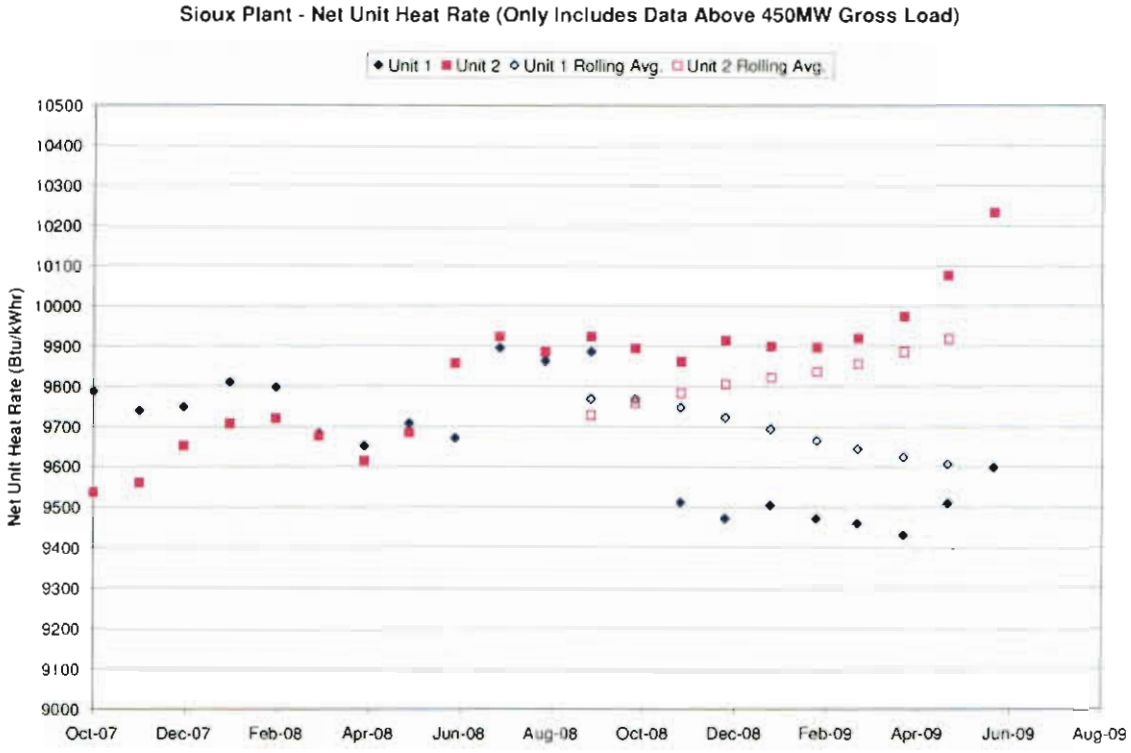


Fig. 1 Individual Unit Heat Rates

Plant total heat rate has remained increased 124 Btu/kwh from May to June.

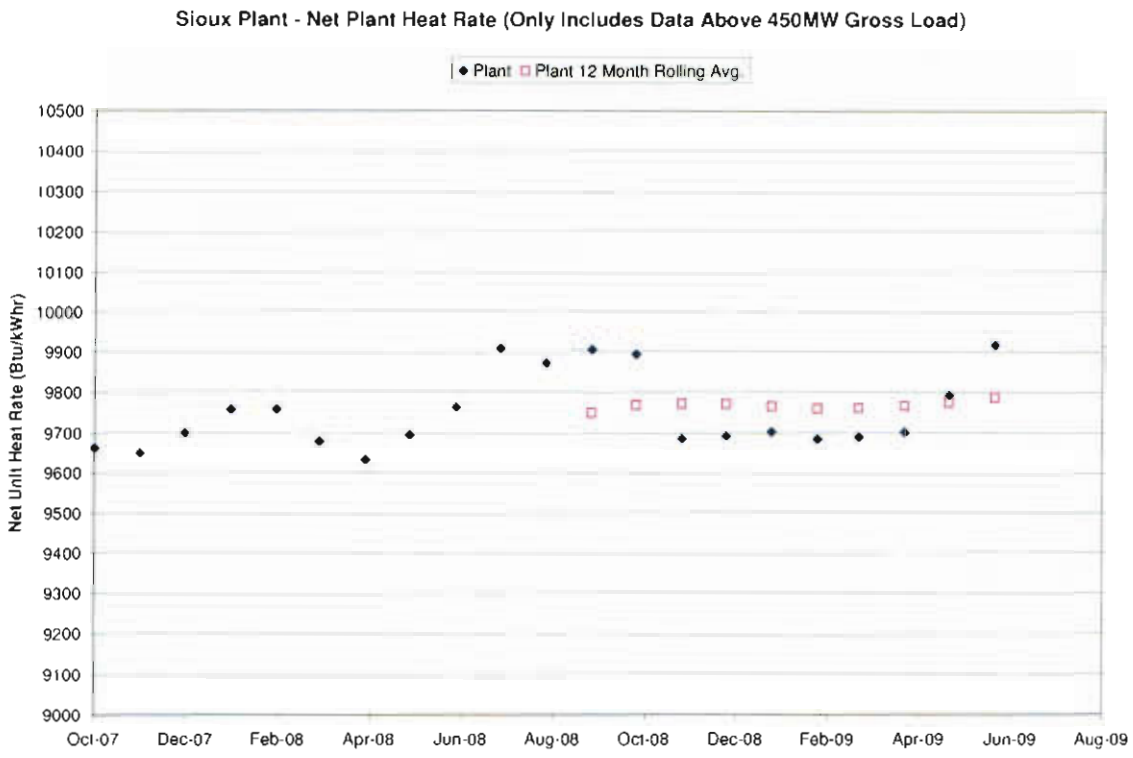


Fig 2. Plant Heat Rate

Heat Rate KPI

A trend only heat rate KPI has been created for 2009 with the intent of having a pay heat rate KPI in 2010. Table 1 shows the actual performance of the plant through June.

Table 1. Heat Rate KPI

Plant	2009 Actual	Threshold	Target	Stretch
Sioux	9749	9705	9624	9591

Action Items

- Performance Engineering to further investigate Unit 2 condenser performance and cir water flow.
- Performance Engineering to provide heat rate reports weekly (or possibly daily) for the plant.
- Performance Engineering will develop unit heat rate estimates based on coal HHV and coal feed rate.
- Performance Engineering will develop and execute a plan to collect and analyze turbine performance data.

Unit 1

The following observations were made regarding Unit 1 operation and performance:

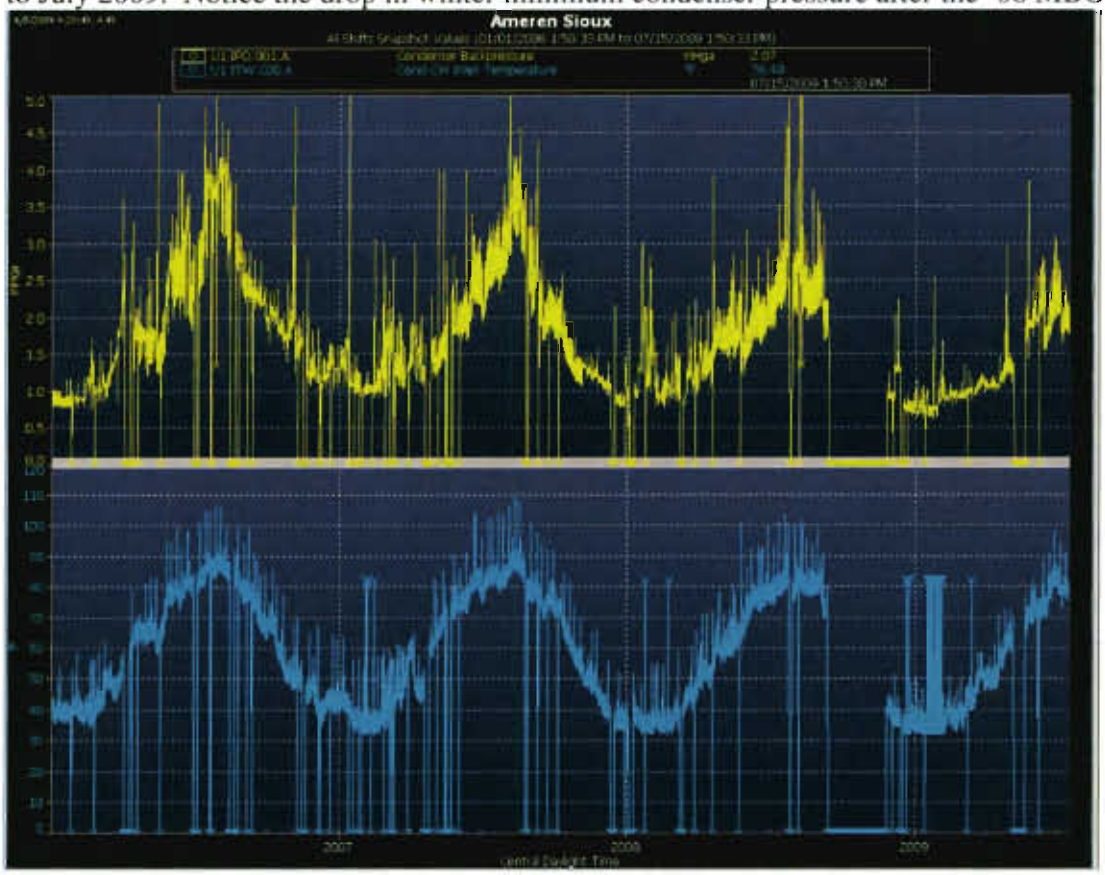
- The heat rate for Unit 1 is down 72 Btu/kwhr from June 2008
  - The increase in IP turbine efficiency is a tribute to instrument error.
  - Boiler efficiency increased 0.7%, causing a 67 Btu/kwhr decrease in heat rate
  - Condenser pressure increased 0.2", causing an increase of 38 Btu/kwhr
  - Average Gas outlet temperature increased 16°F

Summary of Performance Report for:

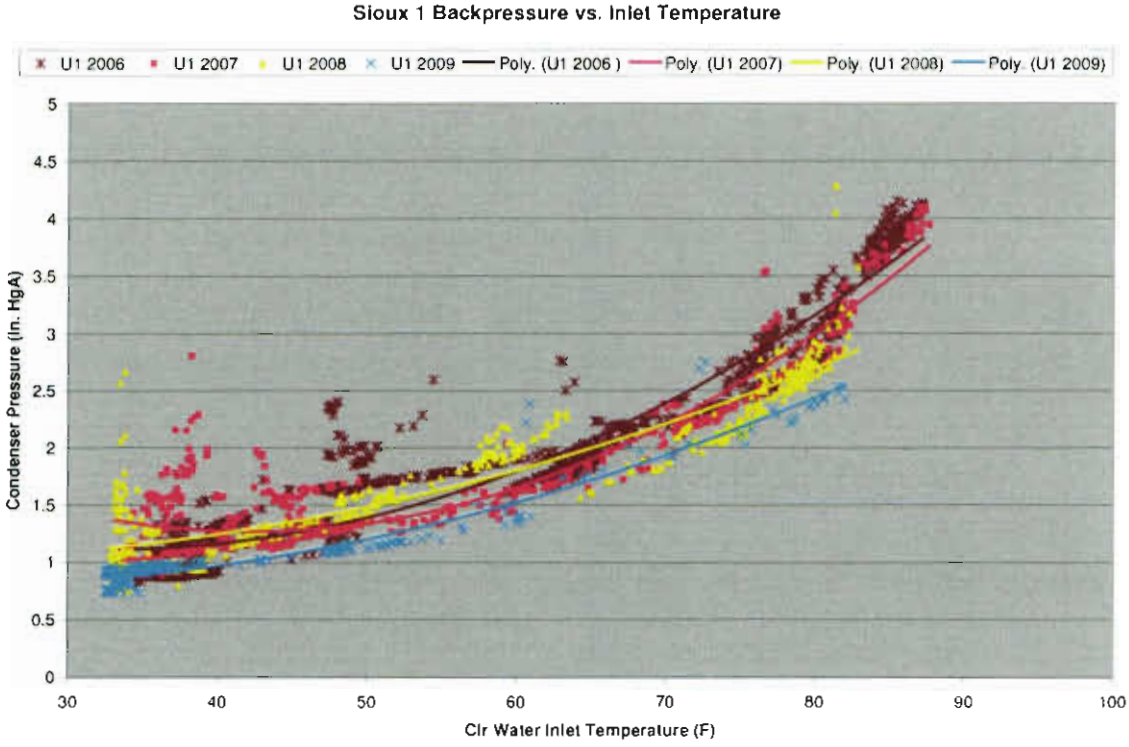
Plant Sioux
Unit 1
Period 6/1/09 to 6/30/09

Full Load Performance		Jun-09	May-09	Jun-08
Hours of Data (Gross load>450 MW)		103	65	339
		Averages	Averages	Averages
GENERATOR MEGAWATTS	MW	459.0	458.1	470.6
AUX POWER	MW	27.0	26.1	27.4
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	9601.1	9512.0	9673.1
Boiler Efficiency Actual	%	87.4	87.1	86.7
CONTROL VALVE POSITION LVDT	%	27.7	26.9	31.5
FEEDWATER TEMP TO ECON	degF	469.8	468.1	471.5
FEEDWATER TEMP TO HTR 1	degF	402.6	400.8	404.7
HP Turbine Efficiency Actual	%	82.1	81.9	82.8
IP Turbine Efficiency Corrected	%	96.0	96.2	93.1
Condenser Pressure	inHga	2.3	1.8	2.1
AIRHTR-A GAS OUTLET TEMP	degF	319.1	312.6	300.9
AIRHTR-B GAS OUTLET TEMP	degF	321.7	312.8	308.0
AMBIENT AIR TEMP	degF	90.7	78.0	82.4
River Temperature	degF	78.3	65.8	73.8
FWH 1 Temperature Rise	degF	67.2	67.4	66.8
Net Load	MW	431.9	432.0	443.2
Average Exit Gas Temperature	degF	320.4	312.7	304.5
Aux Power	%	5.9	5.7	5.8
Gross Unit Heat Rate	BTU/KW-HR	9035.5	8970.3	9109.9
Gross Turbine Heat Rate	BTU/KW-HR	7892.8	7814.0	7901.3
Feedwater Flow	KPPH	2934.0	2894.0	

The plot below shows condenser pressure and cir water inlet temperatures from January 2006 to July 2009. Notice the drop in winter minimum condenser pressure after the '08 MBO.



The next plot shows the relationship between circulating water temperatures and condenser pressure when gross load is 450-480MW. The better performance for 2009 can be attributed larger circulation water pumps and condenser cleanliness.



Unit 2

The following observations were made regarding Unit 2 operation and performance:

- The heat rate for Unit 2 is up 377.9 Btu/kWhr from the prior year.
    - Condenser pressure is a major contributor to this, approximately a 194.5 Btu/kWhr increase in heat rate due to the increased backpressure.
    - A portion of this increase can be attributed to higher Aux load, approximately 46 Btu/kWhr.

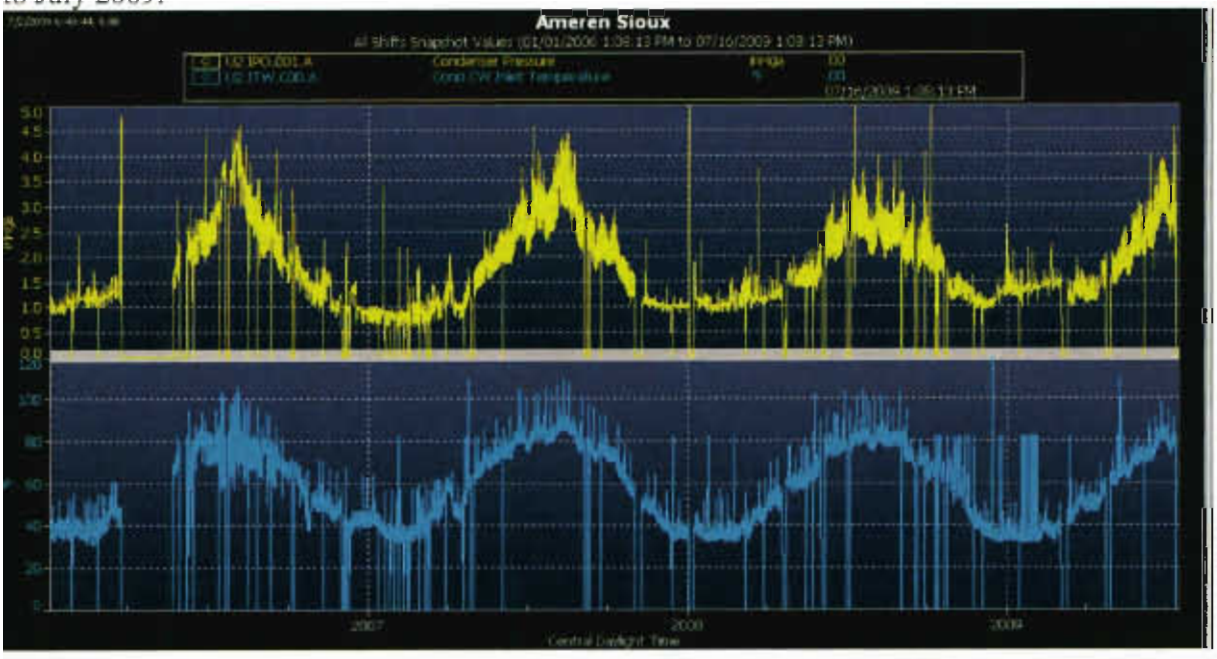
After the Quarterly Performance Meeting, Performance Engineering re-inspected the feed water recirculation valves FIC 2-1418-V1, FIC 2-1418-V2 using a temperature gun. Temperature measurements indicate that the valves are not leaking.

Summary of Performance Report for:

Plant Sioux
Unit 2
Period 6/1/09 to 6/30/09

Full Load Performance		Jun-09	May-09	Jun-08
Hours of Data (Gross load>450 MW)		52	175	317
		Averages	Averages	Averages
GENERATOR MEGAWATTS	MW	454.2	459.5	471.7
AUX POWER	MW	27.2	26.7	25.3
Net Unit Heat Rate Actual (GPHI)	BTU/KW-HR	10235.3	10077.3	9857.4
Boiler Efficiency Actual	%	87.1	87.0	87.0
CONTROL VALVE POSITION LVDT	%	27.3	27.0	28.5
FEEDWATER TEMP TO ECON	degF	471.9	470.8	473.6
FEEDWATER TEMP TO HTR 1	degF	406.3	405.1	407.1
HP Turbine Efficiency Actual	%	82.8	82.3	83.9
IP Turbine Efficiency Corrected	%	92.1	92.3	92.5
Condenser Pressure	inHga	3.4	2.3	2.6
AIRHTR-A GAS OUTLET TEMP	degF	304.7	314.7	323.4
AIRHTR-B GAS OUTLET TEMP	degF	332.0	344.7	332.1
AMBIENT AIR TEMP	degF	90.5	74.4	82.1
River Temperature	degF	84.8	72.7	74.5
FWH 1 Temperature Rise	degF	65.7	65.7	66.5
Net Load	MW	427.0	432.8	446.4
Average Exit Gas Temperature	degF	318.3	329.7	327.7
Aux Power	%	6.0	5.8	5.4
Gross Unit Heat Rate	BTU/KW-HR	9622.3	9492.5	9328.4
Gross Turbine Heat Rate	BTU/KW-HR	8381.5	8258.4	8111.7

The plot below shows condenser pressure and cir water inlet temperatures from January 2006 to July 2009.



The next plot shows the relationship between circulating water temperatures and condenser pressure when gross load is 450-480MW. Condenser performance is the worst since 2006.

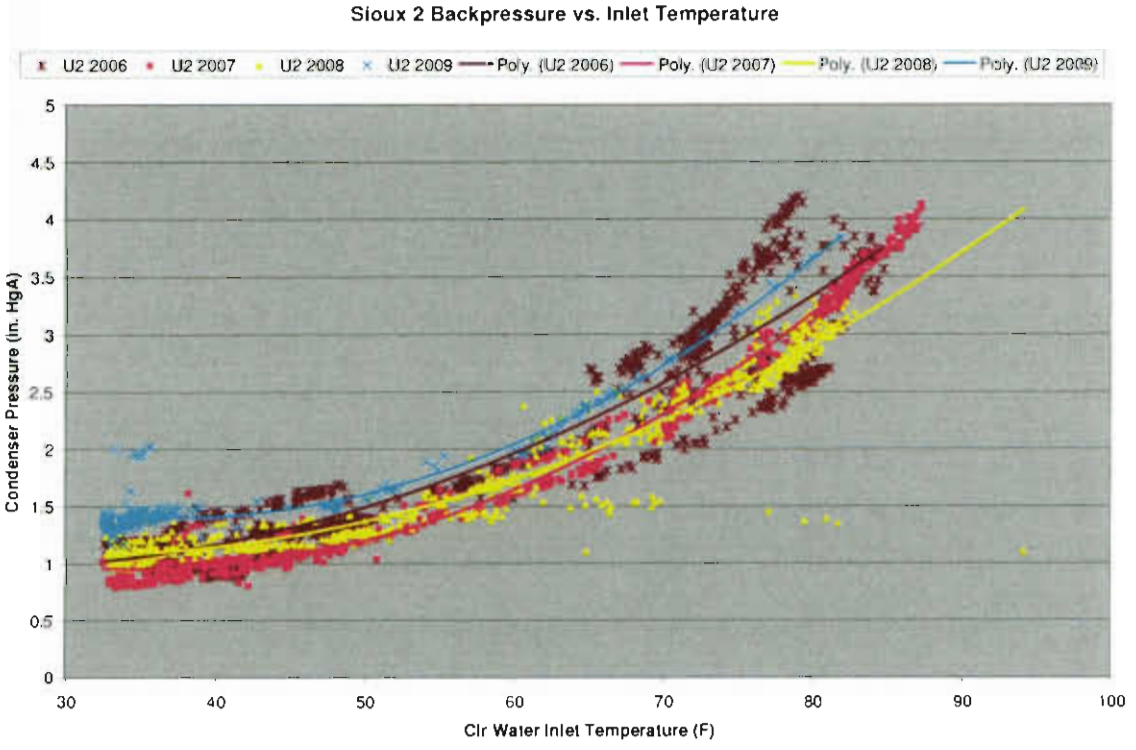
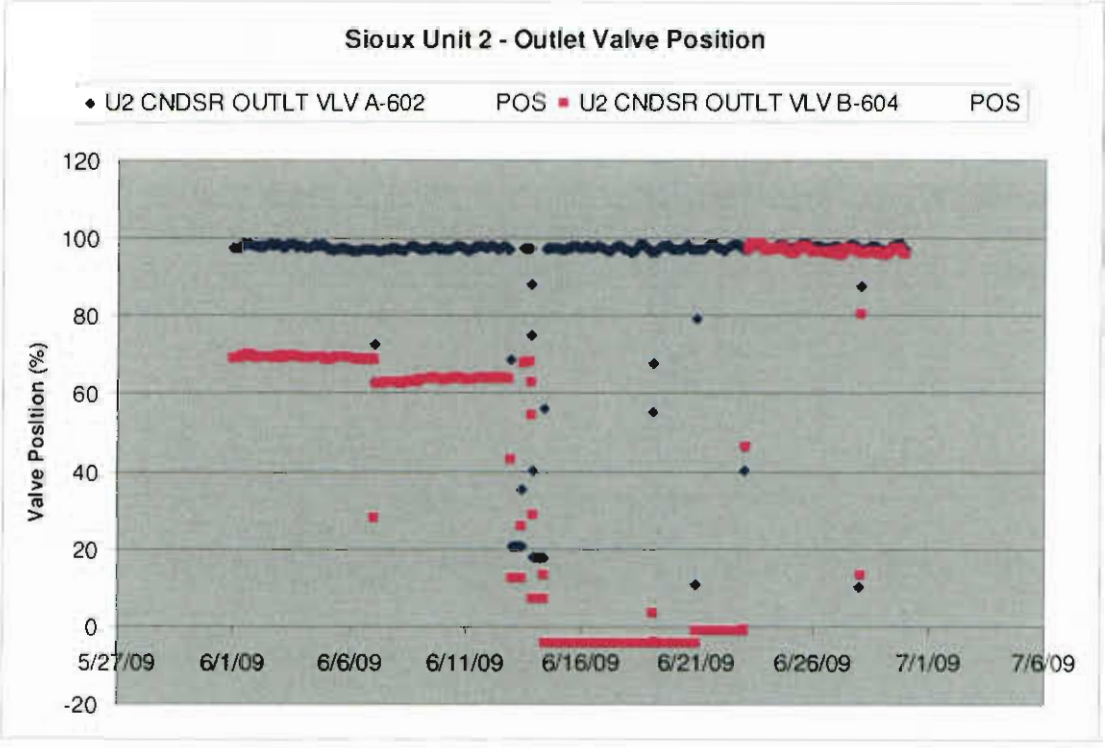


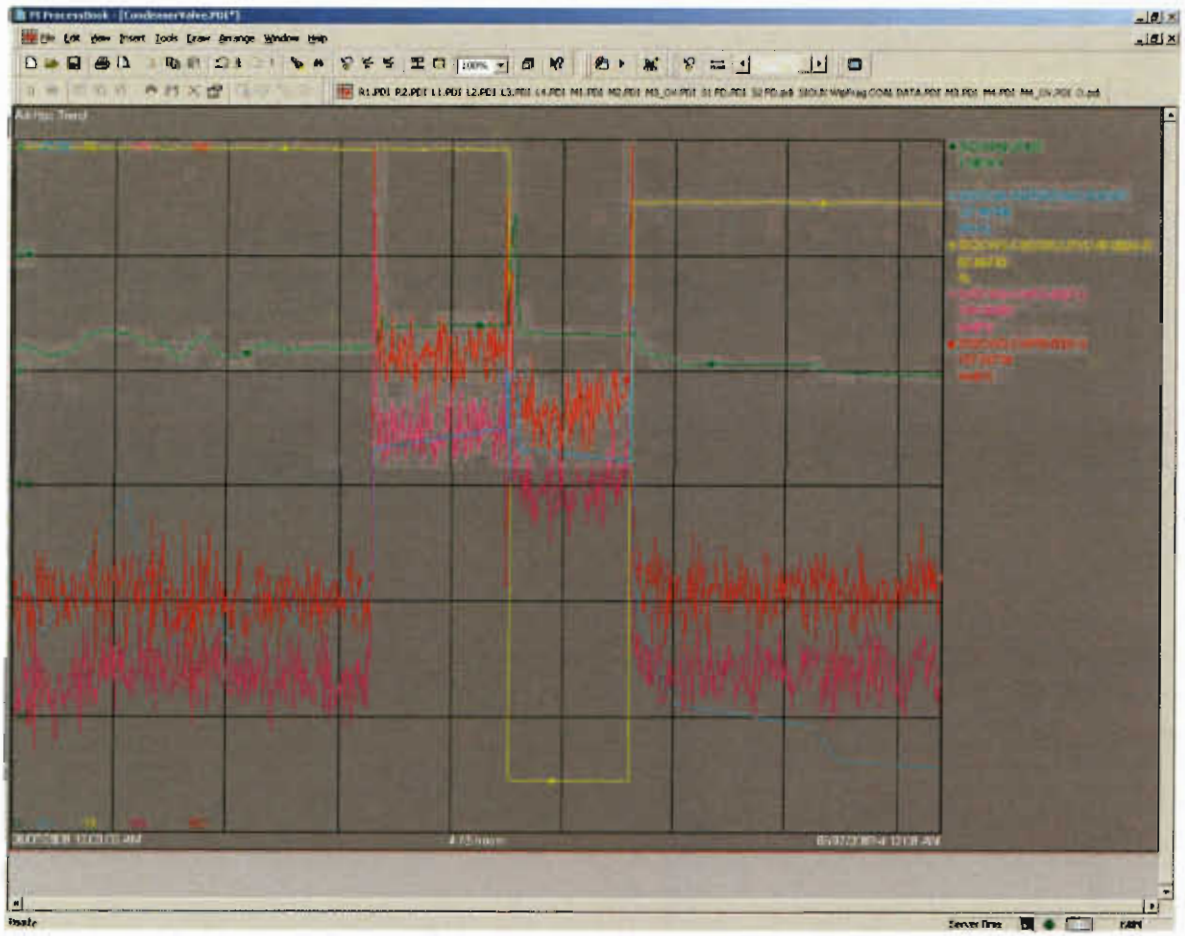
Table 4 shows the known instrument deficiencies for both units.

Table 4. Instrumentation Issues

Tag	Unit	Issue	Resolution	Carryover or New
SX2CWS-CNDSROUTVLVB-B604-ZI (U2 CNDSR OUTLT VLV B-604 POS)	2	Signal Quality	To Be JR'd	New
SX1CWS-RIVERTEMP-001-TI	1	Signal Quality	To Be JR'd	New
SX2CWS-RIVERTEMP-001-TI	2	Signal Quality	To Be JR'd	New

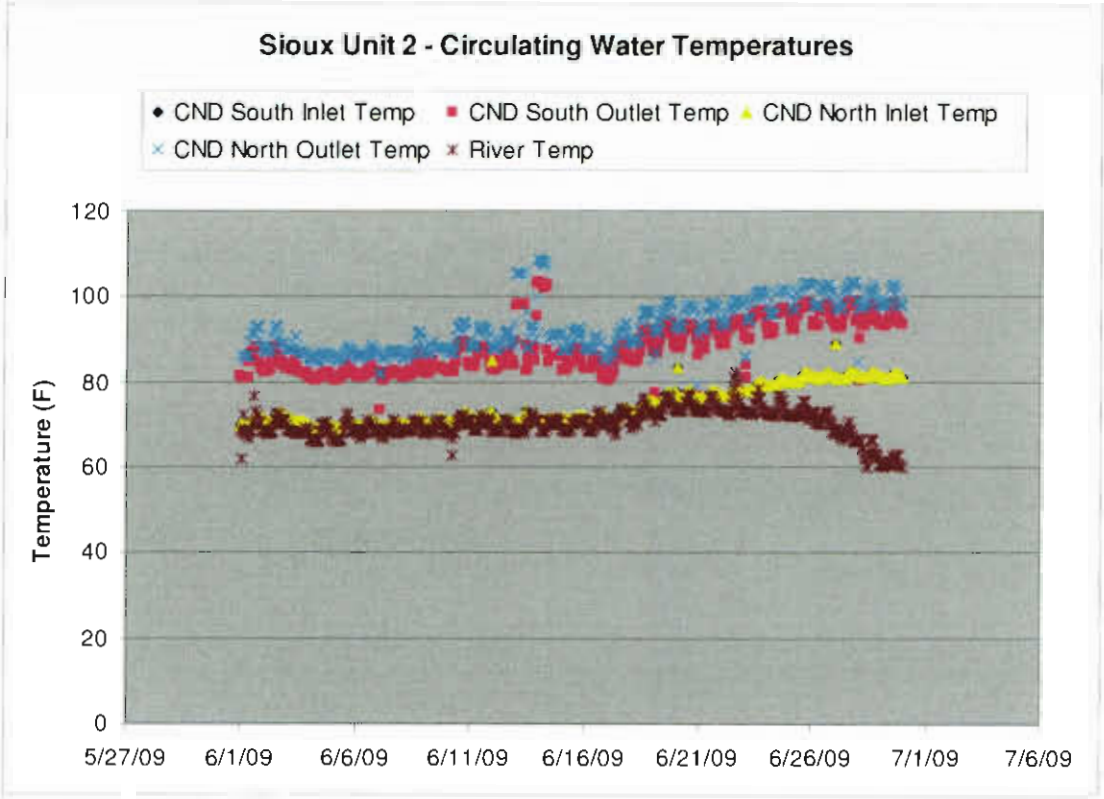


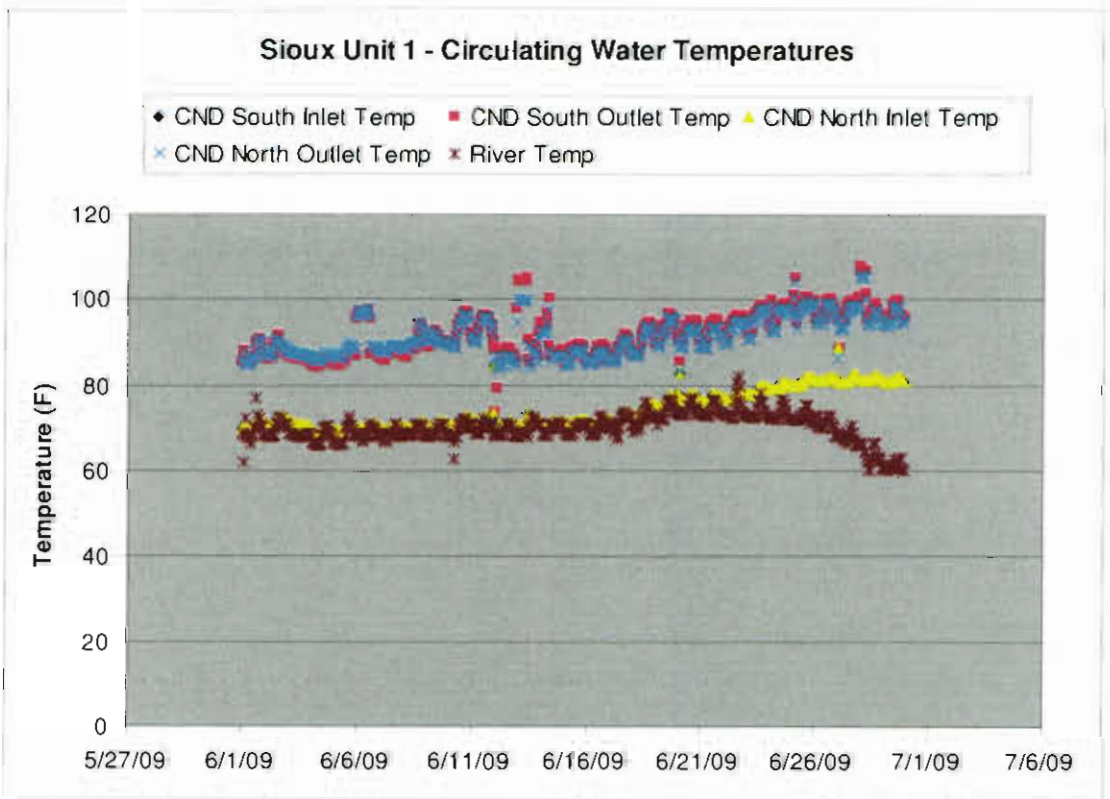
SX2CWS-CNDSROUTVLVB-B604-ZI is indicated step changes after condenser backwashes on 5/31/09 and 6/7/09. No changes in Cir pump amps were seen at these times after the backwashes.



The sensor then showed the -4 after the Cir Water pumps zebra muscle treatment on 6/14/09. The sensor did not return until the condenser back wash on 6/23/09.

The plots below shows condenser cir water inlet and outlet temperatures for the June. Note the inlet temps hold, while the inlet water temperature drifts down.


Sioux Unit 2 - Circulating Water Temperatures
CND South Inlet Temp
CND South Outlet Temp
CND North Inlet Temp
CND North Outlet Temp
River Temp
Temperature (F)
120
100
80
60
40
20
0
5/27/09
6/1/09
6/6/09
6/11/09
6/16/09
6/21/09
6/26/09
7/1/09
7/6/09


Sioux Unit 1 - Circulating Water Temperatures
CND South Inlet Temp
CND South Outlet Temp
CND North Inlet Temp
CND North Outlet Temp
River Temp
Temperature (F)
120
100
80
60
40
20
0
5/27/09
6/1/09
6/6/09
6/11/09
6/16/09
6/21/09
6/26/09
7/1/09
7/6/09

June 24, 2009

To: Karl Blank
From: Scott Hixson
Cc: Bob Meiners, Keith Stuckmeyer, Harry Benhardt, John Romano, Pat Weir, Greg Gilbertsen, David Azar, Mark Selvog, Steve Garner, Scott McCormack, Lisa Meyer, Ken Stuckmeyer, Don Clayton, Joe Sind, Jim Barnett, Glenn Tiffin, Matt Wallace, Jeff Shelton

Subject: Sioux May 2009 Performance Report

Executive Summary

The most notable items regarding Sioux unit performance were:

- Total plant heat rate increased 92 Btu/kwh from April to May. This increase in heat rate can be primarily attributed to increased condenser pressure due to higher river temperatures.
- Performance Engineering inspected feed water recirculation valves FIC 2-1418-V1, FIC 2-1418-V2. No significant leakage was found.
- Total plant aux load was added to Unit 1 and Unit 2 EtaPro Target CP view screens.

Table 1 shows the known instrument deficiencies for both units.

Table 1. Instrumentation Issues

Tag	Unit	Issue	Resolution	Carryover or New
SX1BFW-FWHTR7A-0001-PI (7A Extraction Pressure)	Unit 1	Bad since the outage	JR to be submitted by G.J.G.	Carryover
SX1BFW-FWHTR7A-0001-TI (7A Extraction Temperature)	Unit 1	Long term issue		Carryover
SX1BFW-FWHTR6A-0001-TI (6A Extraction Temperature)	Unit 1	Long term issue		Carryover
SX1BFW-FWHTR4B-0001-PI (4B Extraction Pressure)	Unit 1	Bad since mid-December		Carryover
SX2BFW-FWHTR7B-0001-PI (7B Extraction Pressure)	Unit 2	7B Extraction pressure - Not reading since Aug. 9, 2008		Carryover
SX2BFW-FWHTR7ADRN-0001-TI (7A Drain Temperature)	Unit 2	7A Drain temp - Not reading		Carryover

A monthly summary of each Unit's heat rate for operation above 450 MW is shown in Fig. 1. Sioux plant heat rate for May increased 92 Btu/kwh from April. Unit 1 and Unit 2 month average heat rates increased 80Btu/kwh and 105Btu/kwh respectively in May.

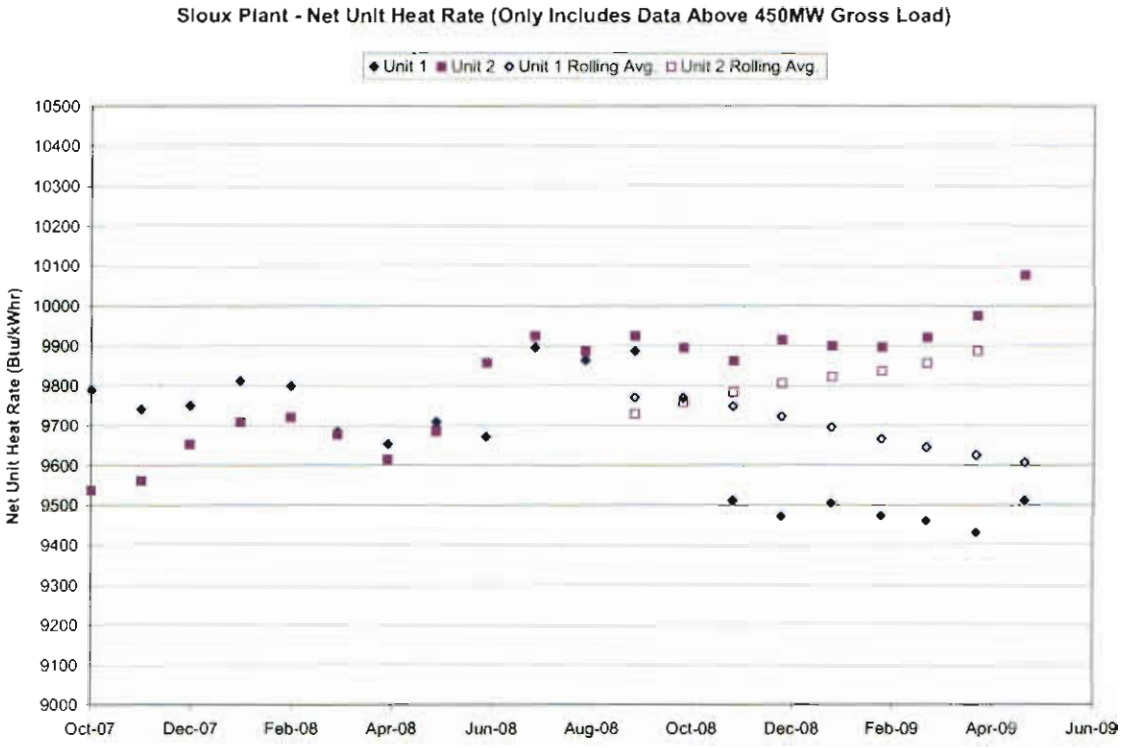


Fig. 1 Individual Unit Heat Rates

Plant total heat rate has remained relatively constant since November 2008.

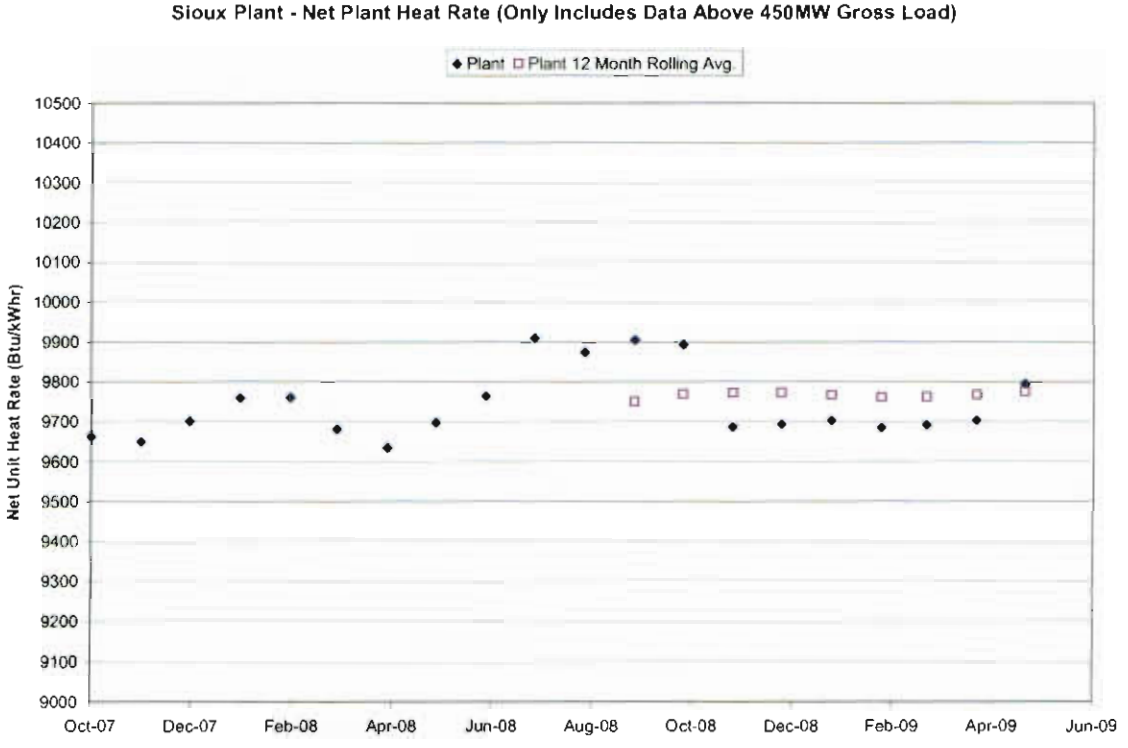


Fig 2. Plant Heat Rate