Carbon Plant Heat Rate Improvement Plan

Car_2010_HRIP

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1. Revision History

Version	Status	Author	Reason for Issue	Date
1			2010 Plan Issue	March 31, 2010

2. Revision Control

This document is maintained by the PacifiCorp Energy Asset Management group.

3. Glossary of Terms

3.1. Actual Net Heat Rate (Btu/kWh)

Total actual heat input in Btu's divided by actual net generation.

3.2. As-built Net Heat Rate (Btu/kWh)

Total guaranteed heat input, from the design heat balances in Btu's divided by the guaranteed net generation, corrected for changes in equipment from design. This is the baseline number for the plant personnel when they make their annual reconciliation.

3.3. British thermal unit (Btu)

British thermal unit is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

3.4. Gross Heat Rate (Btu/kWh)

Total actual heat input in Btu's divided by actual gross generation.

3.5. Net Generation (kWh)

Gross generation minus auxiliary or station usage

3.6. Planned Net Heat Rate (Btu/kWh)

Total budgeted heat input in Btu's divided by the budgeted net generation. This number is the annual goal for the plant personnel to achieve.

4. Overall Plan and Objectives

4.1. Unit 1- Goals for 10-year plan

Figure 1, in the appendix, shows the ten-year heat rate plan for Carbon unit 1. The dips in the Planned Net Heat Rate in the years 2009, 2014 and 2018 are due to the work that is scheduled to take place during the planned outages in 2009, 2013 and 2017 (see section 7).

4.2. Unit 2 - Goals for 10-year Plan

Figure 2, in the appendix, shows the ten-year heat rate plan for Carbon unit 2. The dip in the Planned Net Heat Rate in the year 2008 is due to the work that occurred during the planned outages in 2008. There are only small fluctuations in the unit heat rate in other years that will be the result of smaller overhaul projects (see section 7).

5. Performance against last year's plan

5.1. Unit 1

Planned Net Heat Rate			11,799
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	106	90	(16)
Turbine Losses	705	(27)	(732)
Other Losses	(366)	(47)	319
Actual Net Heat Rate			11,370

Negative numbers in the table above are improvements to heat rate.

5.2. Unit 2

Planned Net Heat Rate			11,169
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	27	152	125
Turbine Losses	1,162	1,153	(9)
Other Losses	38	(130)	(168)
Actual Net Heat Rate			11,116

Negative numbers in the table above are improvements to heat rate.

6. Major Losses for Current Planned Net Heat Rate

This section of the heat rate plan identifies the reconciliation of the items that have the most impact between the As-built Net Heat Rate and the Planned Net Heat Rate.

6.1. Unit 1

As-Built Net Heat Rate	11,354
Boiler Losses	34
Turbine Losses	813
Other Losses	60
Planned Net Heat Rate	12,261

6.2. Unit 2

As-Built Net Heat Rate	9,941
Boiler Losses	42

Turbine Losses	1,138
Other Losses	49
Planned Net Heat Rate	11,170

7. Major Unit Specific Initiatives

This section identifies the major planned capital and operational activities to improve or regain lost heat rate for the current 10-year plan.

7.1. Unit 1

Table 1 shows the capital projects included in the 10-year plan that contribute to the recovery of lost heat rate. Numbers inside parentheses are negative impact on heat rate and represent improvement to the overall unit efficiency.

7.2. Unit 2

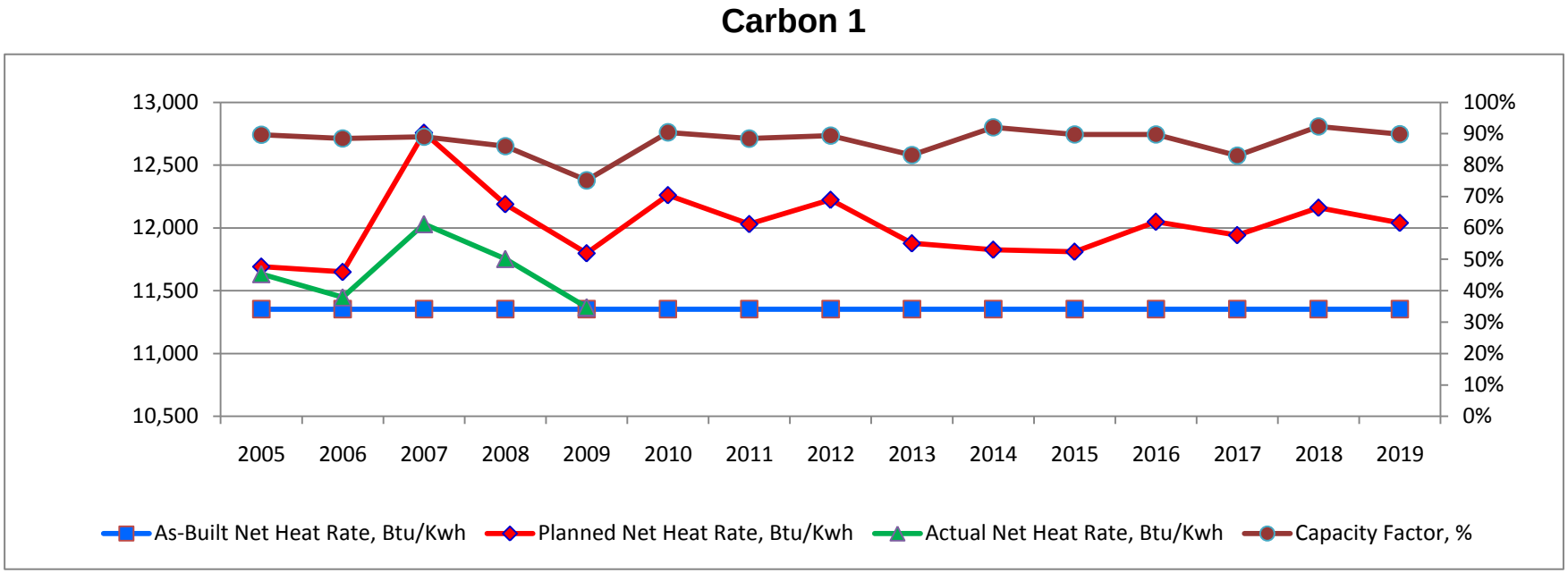
Table 2 shows the capital projects included in the 10-year plan that contribute to the recovery of lost heat rate. Numbers inside parentheses are negative impact on heat rate and represent improvement to the overall unit efficiency.

8. Annual Review and Update

This plan will be reviewed and updated annually by the Carbon plant management team by March 31.

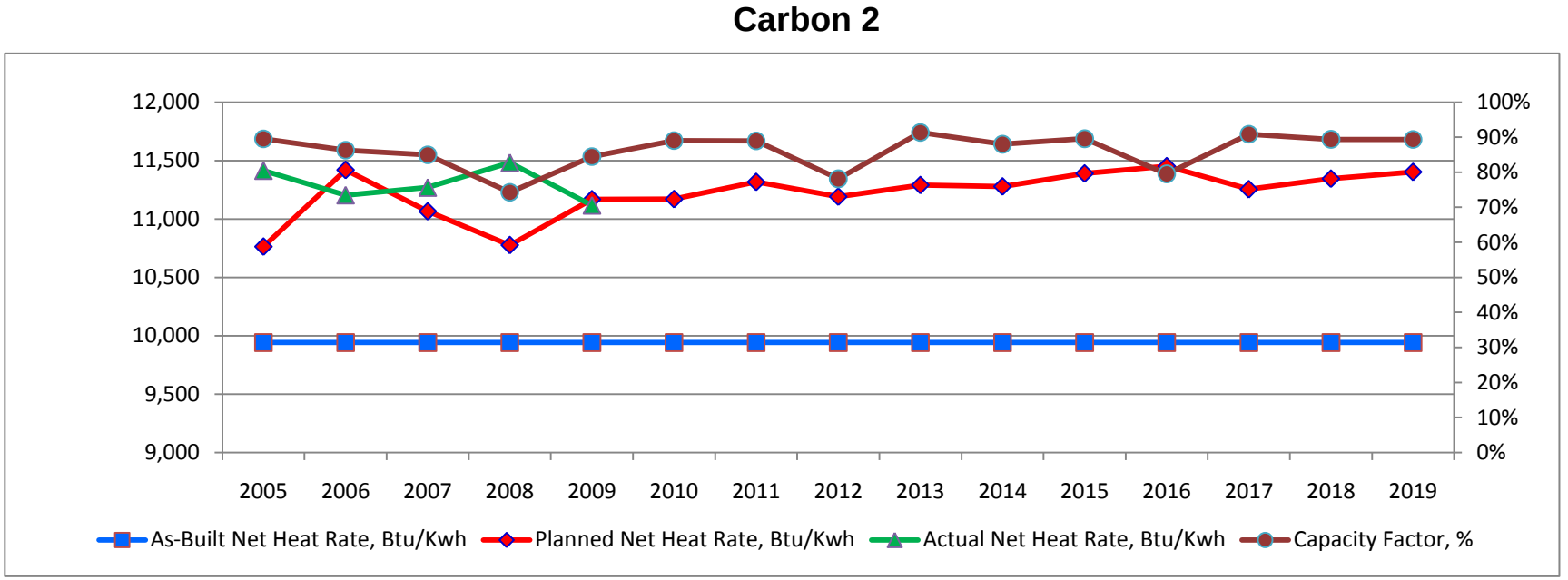
9. Appendix

Figure 1
Carbon Unit 1
10-year Plan Heat Rate Goals



Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
As-Built Net Heat Rate, Btu/Kwh	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354	11,354
Planned Net Heat Rate, Btu/Kwh	11,692	11,650	12,757	12,189	11,799	12,261	12,031	12,224	11,878	11,827	11,811	12,049	11,943	12,161	12,041
Actual Net Heat Rate, Btu/Kwh	11,633	11,449	12,030	11,754	11,370										
Capacity Factor, %	89.7%	88.5%	89.0%	86.0%	75.1%	90.4%	88.4%	89.4%	83.2%	92.0%	89.8%	89.8%	83.0%	92.3%	89.9%

Figure 2
Carbon Unit 2
10-year Plan Heat Rate Goals



Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
As-Built Net Heat Rate, Btu/Kwh	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941	9,941
Planned Net Heat Rate, Btu/Kwh	10,763	11,420	11,065	10,776	11,169	11,170	11,317	11,191	11,290	11,279	11,390	11,452	11,254	11,345	11,403
Actual Net Heat Rate, Btu/Kwh	11,414	11,204	11,269	11,482	11,116										
Capacity Factor, %	89.5%	86.3%	84.9%	74.3%	84.4%	89.0%	88.9%	78.1%	91.4%	88.0%	89.6%	79.5%	90.8%	89.4%	89.3%

Table 1
Carbon Unit 1
10-year Plan Heat Rate Improvement Projects

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)											
CY2009 Air Heater Partial Basket Replacement (hot end)	Btu/kWh	-31	-28	-25	-22	-19	-16	-13	-10	-7	-4
Retube Condenser CY2009	Btu/kWh	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
Total adjustments related to Capital Projects	Btu/kWh	-81	-78	-75	-72	-69	-66	-63	-60	-57	-54
Budgeted / Planned Auxiliary Load Changes											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-36	-35	-34	-32	-31	-30	-28	-27	-26	-24
Replacement Plan for Air Heater Seals	KW	42	62	83	21	42	62	83	83	83	83
Mercury Capture (2017 -0.1 MW)	KW								100	100	100
Total Auxiliary Load Changes	KW	5	27	49	-12	10	33	55	156	157	159
Budgeted / Planned Net Dependable Rating Changes, (Net Basis)											
	MW										
Total Capacity Changes	MW	0	0	0	0	0	0	0	0	0	0

Table 2
Carbon Unit 2
10-year Plan Heat Rate Improvement Projects

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)											
CY2008 overhaul Air Heater Basket Replacement (hot and cold)	Btu/kWh	-21	-18	-15	-12	-9	-6	-30	-30	-30	-30
Total adjustments related to Capital Projects	Btu/kWh	-21	-18	-15	-12	-9	-6	-30	-30	-30	-30
Budgeted / Planned Auxiliary Load Changes											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-13	-11	-9	-8	-6	-4	-19	-19	-19	-19
Replacement Plan for Air Heater Seals	KW	21	41	-21	0	21	41	-21	-21	-21	-21
Mercury Capture (2018 -0.1 MW)	KW									100	100
Total Auxiliary Load Changes	KW	7	30	-30	-8	15	37	-40	-40	60	60
Budgeted / Planned Net Dependable Rating Changes, (Net Basis)											
	MW										
Total Capacity Changes	MW	0	0	0	0	0	0	0	0	0	0

10. Required Signatures

Performance Engineer – Carbon Plant		April Haynes	
Signature:	{on file]	Date:	3/25/10

Manager, Engineering – Carbon Plant			
Signature:		Date:	

Managing Director, Carbon Plant		Kyle Davis	
Signature:	{on file}	Date:	3/25/10