



201 South Main, Suite 2300  
Salt Lake City, Utah 84111

May 2, 2011

***VIA ELECTRONIC FILING  
AND OVERNIGHT DELIVERY***

Utah Public Service Commission  
Heber M. Wells Building, 4<sup>th</sup> Floor  
160 East 300 South  
Salt Lake City UT 84111

Attention: Julie P. Orchard  
Commission Secretary

Re: Docket No. 06-999-03  
Rocky Mountain Power's Fossil Fuel Energy Efficiency Standard Plan

On August 10, 2007, the Public Service Commission of Utah issued its Determination Concerning the PURPA Fossil Fuel Generation Efficiency Standard and adopted the PURPA Fossil Fuel Generation Efficiency Standard with a due date of March 31 each year. On November 25, 2010, the Commission modified the filing schedule to May 1 each year.

Enclosed for filing is the 2011 Rocky Mountain Power Fossil Fuel Energy Efficiency Plan Report for all coal fired plants. The report includes a heat rate improvement plan for the PacifiCorp system followed by individual plans for each coal fired plant. Heat rate improvement plans are still being developed for gas fueled plants and therefore are not included with this report. Also included is the summary of the 2010 FERC Form 1 data.

It is respectfully requested that all formal correspondence and staff requests regarding this filing be addressed to:

By e-mail (preferred): [datarequest@pacificorp.com](mailto:datarequest@pacificorp.com)

By regular mail: Data Request Response Center  
PacifiCorp  
825 NE Multnomah, Suite 2000  
Portland, Oregon, 97232

Utah Public Service Commission

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Informal questions should be directed to Dave Taylor at (801) 220-2923.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jeffrey K. Larsen".

Jeffrey K. Larsen

Vice President, Regulation

cc: Division of Public Utilities  
Office of Consumer Services

Table with columns for FERC Act no., Form 1, Fuel Kind (Coal, Gas, Oil, Nuclear), and various cost categories including Blundell Plant, Dave Johnston Plant, Gasby Plant, Hunter Unit No. 1-3, Huntington Plant, Jim Bridger Plant, Little Mountain, Naughton Plant, Wyodak Plant, and Thermal Plants Total. Includes sub-headers like Kind of Plant, Year of Constr., and Net Generation.

Table with columns for FERC Act no., Form 1, Fuel Kind (Coal, Gas, Oil, Nuclear), and various cost categories including Carbon Plant, Devel. Johnston Plant, Gasby Plant, Hunter Unit No. 1-3, Huntington Plant, Jim Bridger Plant, Little Mountain, Naughton Plant, Wyodak Plant, and Thermal Plants Total. Includes sub-headers like Kind of Plant, Year of Constr., and Net Generation.





Table with multiple columns: FERC Acct no., Form 1 Acct no., Blundell Plant, Dave Johnston, Gadsby Plant, Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Jim Bridger Plant, Little Mountain, Naughton Plant, Wyodak Plant, Thermal Plants, FERC Acct no., Total. Rows include plant details, gas turbine, steam boiler, and various fuel types with associated costs and generation metrics.















FERC Acct no.	Form 1 Line no.	Kind of Plant (Internal Comb. Gas Turb. Nuclear Hydro, etc.)	Bundled Plant	Carbon Plant	Dave Johnston Plant	Gadsby Peakers	Hunter Unit No. 1	Hunter Unit No. 2	Hunter Unit No. 3	Huntington Plant	Jim Bridger Plant	Little Mountain	Naughton Plant	West Valley Peakers	Wyodak Plant	Thermal Plants Total	FERC Acct no.	
			Steam - Geo Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	Steam Outdoor Boiler 1951 1955 1978 1984 1984 1984	FERC Acct no.	
	1	Net Generation, Excludes of Plant Use - kWh	194,676,000	1,135,603,000	5,824,643,000	66,986,000	2,652,543,000	2,010,941,000	3,575,260,000	6,388,654,000	9,620,371,000	91,965,000	5,245,831,000	395,480,000	2,153,135,000	40,013,428,000	500	
	2	Cost of Plant, Land and Land Rights	31,282,815	1,256,170	10,417,290	9,628,532	10,333,162	10,333,162	2,426,337	1,161,925	1,243,596	635	1,243,596	210,536	210,536	78,422,036	502	
	3	Structures and Improvements	6,218,337	11,578,138	48,237,859	13,811,541	4,111,894	60,603,383	88,931,453	198,338,688	98,465,311	133,679,404	209,660	57,155,058	48,460	48,377,029	622,230,751	503
	4	Equipment	33,892,461	73,322,778	352,306,689	55,921,836	75,114,900	221,544,932	379,245,288	738,598,344	359,245,288	4,988,107	269,661,534	81,813	250,111,165	2,925,179,954	504	
	5	Plant Retirement Costs	71,251,524	85,657,463	417,133,886	79,228,767	283,075,333	479,569,518	973,049,333	441,258,310	859,153,986	4,898,402	351,638,777	130,273	286,688,720	3,365,265,821	505	
	6	Allowances	27,489,100	133,906	455,171	561,880	26,812	26,812	713,934	395,233	443,133	306,115	497,233	6,860	1,031,42	1,031,42	506	
	7	Operation	630	11,442,174	133,906	1,676,796	2,650,791	38,943,321	1,676,796	128,116	128,116	6,430,344	237,513	3,001,485	13,659,494	405,711,002	507	
	8	Maintenance	6,661	682,262	210,184	3,473,238	3,112,262	3,782,891	10,368,382	8,464,770	538,259	7,449,228	-	-	-	27,717,746	508	
	9	Electricity	4,158,192	-	-	-	-	-	-	-	-	-	-	-	-	4,158,192	509	
	10	Steam Transferred (OT)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	509	
	11	Electricity	1,525,679	5,311,683	37,229	304,162	1,472,392	1,472,392	1,472,392	442,176	6,527,143	732,762	12,975	1,897,624	-	4,344,300	506	
	12	Misc. Steam (or Nuclear) Power Expenses	145	40,453	4,160,991	943	5,928	13,683	17,561	55,584	850,671	184	584,478	17,064,416	719,752	27,111,228	507	
	13	Allowances	-	-	-	-	-	-	-	-	-	-	-	-	-	-	509	
	14	Maintenance Supervision and Engineering	77,962	492,808	2,012,980	107,246	100,049	1,718,934	1,718,934	5,262,046	1,231,589	-	2,335,073	-	5,802	4,443,113	510	
	15	Maintenance of Boilers (or reactor) Plant	2,013	4,605	16,602	1,671	3,608	5,448	5,448	1,671	1,671	-	685,142	677	420,680	16,737,633	511	
	16	Maintenance of Boilers (or reactor) Plant	51,013	2,548,794	5,168,676	1,824,368	437,423	1,021,693	639,626	945,174	2,568,380	9,045,848	6,827,977	47,415	1,230,171	26,319,211	512	
	17	Maintenance of Misc. Steam (or Nuclear) Plant	22,424	26,588,293	1,203,100	254,339	151,677	122,652	102,754	139,028	364,234	1,717,677	368	786,138	9,709	6,699,263	513	
	18	Total Production Expenses	6,157,834	26,588,293	66,642,152	8,757,616	6,855,045	39,303,463	25,489,313	46,384,315	167,472,163	7,172,638	85,017,240	29,835,850	24,370,765	632,069,883	514	
	19	Expenses per Net kWh	0.0316	0.0232	0.0118	0.0135	0.0127	0.0130	0.0132	0.0148	0.0171	0.0162	0.0157	0.0757	0.0113	0.0158	500	
	20	Total Fuel - \$/MWh	31.60	23.23	11.78	13.52	12.68	12.97	13.19	14.60	17.05	16.21	15.53	75.69	11.32	15.80	502	
	21	Non-Fuel - \$/MWh	37.09	10.08	6.34	25.18	9.24	9.98	9.14	9.98	12.28	70.02	11.53	27.60	6.34	10.14	503	
	22	Total Fuel and Non-Fuel - \$/MWh	68.69	33.31	18.12	38.70	22.92	22.97	23.13	24.58	29.33	86.23	27.06	103.29	17.66	25.94	504	
	23	Fuel Kind (Oil, Gas, Coal, or Nuclear)	8.31	10.53	4.35	65.09	3.62	3.78	3.24	3.73	3.83	6.38	3.78	47.10	3.96	4.62	505	
	24	Total Coal without Fuel	1,998,742	14,926,119	31,668,931	7,080,620	6,924,468	14,285,903	34,111,540	28,530,504	46,884,697	733,264	24,519,675	19,019,841	10,711,271	226,378,981	506	
	25	Fuel Kind (Coal, Gas, Oil, or Nuclear)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	507	
	26	Quantity (units) of Fuel Burned	589,628	3,827,412	1,345,806	952,672	1,651,452	2,888,019	3,949,930	2,888,019	5,522,362	2,808,373	2,808,373	1,615,197	8,019	21,171,921	508	
	27	Avg Heat Content - Fuel Burned (Btu/lb. of Fuel)	11,841	8,316	11,404	11,289	11,262	11,179	11,322	11,179	9,352	9,352	9,352	9,352	9,352	9,352	509	
	28	Avg Heat Content - Fuel Burned (Btu/lb. of Fuel)	19,951	8,426	19,284	19,284	19,284	19,284	19,284	19,284	21,785	21,785	21,425	21,425	21,425	21,425	510	
	29	Average Cost of Fuel Burned per MWh Net Gen	0.849	0.855	0.855	0.855	0.849	0.849	0.849	0.849	0.849	0.849	0.849	0.849	0.849	0.849	511	
	30	Average Cost of Fuel Burned per MWh Net Gen	0.010	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.010	512	
	31	Fuel Kind (Coal, Gas, Oil, or Nuclear)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	513	
	32	Quantity (units) of Fuel Burned	955,228	2,980,164	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	514	
	33	Avg Heat Content - Fuel Burned (Btu/lb. of Fuel)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500	
	34	Average Cost of Fuel per Unit Burned	-	-	-	-	-	-	-	-	-	-	-	-	-	-	501	
	35	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	502	
	36	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	503	
	37	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	504	
	38	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	505	
	39	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	506	
	40	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	507	
	41	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	508	
	42	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	509	
	43	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	510	
	44	Average Cost of Fuel Burned per MWh Net Gen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	511	



Form 1 Line no.	FERC Account	Bundled Plant		Carbon Plant		Current Creek		Dave Johnston		Gasdy Plant		Gadsby Plant		Hunter Unit No. 1		Hunter Unit No. 2		Hunter Unit No. 3		Hunter Plant		Huntington		Jim Bridger		Little Mountain		Naughton Plant		West Valley		Wyoakid Plant		Thermal Plants Total	FERC Acct No.		
		Steam-Gas	Gas	Steam	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas					
1	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000





FERC Form 1

Table with columns: FERC Act no., Line no., Type of Plant, Fuel, Net Peak Demand, etc.

Table with columns: Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No., Hunter Unit No.

Table with columns: West Valley, Woodlake Plant, Thermal Plants Total, etc.

Table with multiple columns: Line no., FERC Act no., Form 1, Type of Plant (e.g., Steam, Gas, Oil, Wind, Solar), Fuel Use, Net Generation, Net Output, and various cost metrics like Fixed O&M, Variable O&M, and Fuel Cost. Includes sub-sections for various plant types like Blundell, Carbon Plant, and others.







**Carbon Plant Heat Rate Improvement Plan**  
**Car\_2011\_HRIP**

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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			2011 Plan Issue	April 30, 2011

**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	12,261		
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	34	49	15
Turbine Losses	813	(207)	(1020)
Other Losses	60	(70)	(130)
Actual Net Heat Rate	11,127		

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

5.2. Unit 2

Planned Net Heat Rate	11,170		
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	42	79	37
Turbine Losses	1,138	903	(235)
Other Losses	49	(8)	(57)
Actual Net Heat Rate	10,914		

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	9
Turbine Losses	733
Other Losses	-62
Planned Net Heat Rate	12,034



6.2. Unit 2

As-Built Net Heat Rate	9,941
Boiler Losses	92
Turbine Losses	1,211
Other Losses	140
<hr/>	<hr/>
Planned Net Heat Rate	11,384

**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 April 30.

**9. Appendix**

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

	<b>Carbon 1</b>														
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
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 2011, Btu/Kwh	11,650	12,757	12,189	11,799	12,261	12,041	12,582	12,782	12,542	10,800	11,800	12,895	13,489	13,203	13,809
Actual Net Heat Rate, Btu/Kwh	11,449	12,030	11,754	11,370	11,416										
Capacity Factor 2011, %	88.5%	89.0%	86.0%	75.1%	90.4%	70.8%	67.3%	63.1%	69.9%	68.7%	66.0%	56.8%	58.2%	56.8%	57.6%

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

	<b>Carbon 2</b>														
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
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 2011, Btu/Kwh	11,420	11,065	10,776	11,169	11,170	11,269	11,422	11,852	11,827	10,603	11,094	11,574	11,564	11,539	12,047
Actual Net Heat Rate, Btu/Kwh	11,204	11,269	11,482	11,116											
Capacity Factor 2011, %	86.3%	84.9%	74.3%	84.4%	89.0%	82.6%	69.9%	80.6%	80.5%	75.6%	68.0%	73.2%	69.2%	67.7%	66.1%

Carbon Plant Heat Rate Improvement Plan

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

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
CY2009 Air Heater Partial Basket Replacement (hot end)	Btu/kWh	-28	-25	-22	-19	-16	-13	-10	-7	-4	-4
Retube Condenser CY2009	Btu/kWh	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
Total adjustments related to Capital Projects	Btu/kWh	-78	-75	-72	-69	-66	-63	-60	-57	-54	-54
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-35	-34	-32	-31	-30	-28	-27	-26	-24	-24
Replacement Plan for Air Heater Seals	KW	62	83	21	42	62	83	83	83	83	83
Mercury Capture (2017 -0.1 MW)	KW							100	100	100	100
Total Auxiliary Load Changes	KW	27	49	-12	10	33	55	156	157	159	159
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
	MW										
Total Capacity Changes	MW	0	0	0	0	0	0	0	0	0	0

Carbon Plant Heat Rate Improvement Plan

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

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
CY2008 overhaul Air Heater Basket Replacement (hot and cold)	Btu/kWh	-18	-15	-12	-9	-6	-30	-30	-30	-30	-30
Total adjustments related to Capital Projects	Btu/kWh	-18	-15	-12	-9	-6	-30	-30	-30	-30	-30
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-11	-9	-8	-6	-4	-19	-19	-19	-19	-19
Replacement Plan for Air Heater Seals	KW	41	-21	0	21	41	-21	-21	-21	-21	-21
Mercury Capture (2018 -0.1 MW)	KW								100	100	100
Total Auxiliary Load Changes	KW	30	-30	-8	15	37	-40	-40	60	60	60
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
	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:	4/15/11

Manager, Engineering – Carbon Plant			
Signature:		Date:	

Managing Director, Carbon Plant		Shawn Smith	
Signature:	{ on file }	Date:	4/15/11



**Dave Johnston Plant Heat Rate Improvement Plan**  
**DJ\_2011\_HRIP**



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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			2010 Plan Issue	April 30, 2011

**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 Dave Johnston unit 1. The dips in the Planned Net Heat Rate in the years 2013 and 2018 are due to the work that is scheduled to take place during the planned outages in 2013 and 2018 (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 Dave Johnston unit 2. The dips in the Planned Net Heat Rate in the years 2012 and 2017 are due to the work that is scheduled to take place during the planned outages in 2012 and 2017 (see section 7).

4.3. Unit 3 - Goals for 10-year Plan

Figure 3, in the appendix, shows the ten-year heat rate plan for Dave Johnston unit 3. The dips in the Planned Net Heat Rate in the years 2010, 2014, and 2018 are due to the work that is scheduled to take place during the planned outages in 2010, 2014 and 2018 (see section 7).

4.4. Unit 4 - Goals for 10-year Plan

Figure 4, in the appendix, shows the ten-year heat rate plan for Dave Johnston unit 4. The dips in the Planned Net Heat Rate in the years 2012 and 2016 are due to the work that is scheduled to take place during the planned outages in 2012 and 2016 (see section 7).

**5. Performance against last year's plan**

5.1. Unit 1

Planned Net Heat Rate				11,106
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	(9)	6		15
Turbine Losses	619	929		310
Other Losses	106	220		114
Actual Net Heat Rate				11,545

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

5.2. Unit 2

Planned Net Heat Rate				11,038
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	14	46		32
Turbine Losses	598	659		61
Other Losses	37	236		199
Actual Net Heat Rate				11,330

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

5.3. Unit 3

Planned Net Heat Rate			11,473
<hr/>			
Reconciliation to Planned Net Heat Rate	Planned	Actual	
<hr/>			
Boiler Losses	31	(45)	(76)
Turbine Losses	580	177	(403)
Other Losses	355	633	278
<hr/>			
Actual Net Heat Rate			11,272
<hr/>			

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

5.4. Unit 4

Planned Net Heat Rate			10,459
<hr/>			
Reconciliation to Planned Net Heat Rate	Planned	Actual	
<hr/>			
Boiler Losses	(64)	13	77
Turbine Losses	416	714	298
Other Losses	(135)	117	252
<hr/>			
Actual Net Heat Rate			11,085
<hr/>			

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		10,390
Boiler Losses		-7
Turbine Losses		604
Other Losses		70
<hr/>		
Planned Net Heat Rate		11,057
<hr/>		

6.2. Unit 2

As-Built Net Heat Rate	10,389
Boiler Losses	16
Turbine Losses	633
Other Losses	46
Planned Net Heat Rate	11,083

6.3. Unit 3

As-Built Net Heat Rate	10,507
Boiler Losses	30
Turbine Losses	398
Other Losses	426
Planned Net Heat Rate	11,362

6.4. Unit 4

As-Built Net Heat Rate	10,242
Boiler Losses	-65
Turbine Losses	599
Other Losses	-203
Planned Net Heat Rate	10,574

**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.

7.3. Unit 3

Table 3 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.

7.4. Unit 4

Table 4 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 Dave Johnston plant management team by March 31.

**9. Appendix**

**Figure 1**  
**Dave Johnston Unit 1**  
**10-year Plan Heat Rate Goals**

	<b>Dave Johnston 1</b>															
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
As-Built Net Heat Rate, Btu/Kwh	10,390	10,389	10,390	10,389	10,390	10,390	10,390	10,390	10,390	10,390	10,390	10,390	10,399	10,399	10,399	
Planned Net Heat Rate 2011, Btu/Kwh	11,090	11,201	11,061	10,971	11,106	11,059	11,103	10,948	10,784	10,840	10,910	10,942	11,151	11,069	11,106	
Actual Net Heat Rate, Btu/Kwh	11,020	11,156	11,610	11,454	11,574											
Capacity Factor 2011, %	90.6%	87.7%	79.0%	89.2%	90.2%	83.5%	83.7%	76.3%	84.7%	85.1%	85.5%	86.1%	80.5%	90.8%	90.3%	

**Figure 2**  
**Dave Johnston Unit 2**  
**10-year Plan Heat Rate Goals**

	<b>Dave Johnston 2</b>															
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
As-Built Net Heat Rate, Btu/Kwh	10,390	10,371	10,390	10,384	10,389	10,389	10,389	10,389	10,389	10,389	10,389	10,398	10,398	10,398	10,398	
Planned Net Heat Rate 2011, Btu/Kwh	11,090	10,804	10,959	10,987	11,038	11,085	11,001	10,513	10,553	10,702	10,764	10,749	10,893	10,923	10,952	
Actual Net Heat Rate, Btu/Kwh	11,169	10,987	11,421	11,528	11,355											
Capacity Factor 2011, %	88.9%	78.9%	82.7%	92.6%	91.3%	83.5%	75.6%	84.6%	84.7%	85.1%	85.5%	76.1%	92.3%	91.2%	90.1%	



**Figure 3**  
**Dave Johnston Unit 3**  
**10-year Plan Heat Rate Goals**

		<b>Dave Johnston 3</b>														
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
As-Built Net Heat Rate, Btu/Kwh	10,490	10,488	10,490	10,490	10,506	10,694	10,694	10,694	10,505	10,504	10,504	10,504	10,504	10,504	10,504	
Planned Net Heat Rate 2011, Btu/Kwh	11,200	11,171	11,335	11,476	11,473	11,364	11,321	11,072	11,136	11,142	11,206	11,179	11,420	11,165	11,429	
Actual Net Heat Rate, Btu/Kwh	11,487	11,447	11,058	11,472	11,237											
Capacity Factor 2011, %	89.8%	88.4%	92.2%	88.1%	75.0%	83.5%	83.7%	84.6%	74.3%	81.3%	81.7%	82.3%	82.1%	90.1%	89.7%	

**Figure 4**  
**Dave Johnston Unit 4**  
**10-year Plan Heat Rate Goals**

**Dave Johnston 4**

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	10,252	10,252	10,252	10,245	10,242	10,242	10,249	10,253	10,254	10,254	10,254	10,254	10,254	10,254	10,254
Planned Net Heat Rate 2011, Btu/Kwh	11,080	11,062	10,758	10,563	10,459	10,576	10,612	10,145	10,282	10,431	10,383	10,371	10,572	10,510	10,757
Actual Net Heat Rate, Btu/Kwh	11,263	11,233	11,418	11,318	11,088										
Capacity Factor 2011, %	82.3%	83.9%	81.2%	57.1%	89.0%	83.5%	74.5%	85.7%	85.8%	86.3%	78.2%	87.2%	89.7%	89.8%	79.4%

**Table 1**  
**Dave Johnston Unit 1**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
	Btu/kWh										
Total adjustments related to Capital Projects	Btu/kWh	0	0	0	0	0	0	0	0	0	0
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Hg Capture (100 kw in 2018)	KW								100	100	100
Total Auxiliary Load Changes	KW	0	0	0	0	0	0	0	100	100	100
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
	MW										
Total Capacity Changes	MW	0	0	0	0	0	0	0	0	0	0

**Table 2**  
**Dave Johnston Unit 2**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Pulverizer/PA Fan Controls Replace - (2008)	Btu/kWh	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20
Total adjustments related to Capital Projects	Btu/kWh	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-13	-13	-13	-13	-13	-13	-13	-13	-13	-13
Hg Capture (100 kw in 2017)	KW							100	100	100	100
Total Auxiliary Load Changes	KW	-13	-13	-13	-13	-13	-13	87	87	87	87
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
	MW										
Total Capacity Changes	MW	0	0	0	0	0	0	0	0	0	0

**Table 3**  
**Dave Johnston Unit 3**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
3C Mill PA Flow indication 2010	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Clean Air Initiative - DFGD (85%) LNB	Btu/kWh	204.6	204.6	204.6	204.6	204.6	204.6	204.6	204.6	204.6	204.6
Total adjustments related to Capital Projects	Btu/kWh	194.6	194.6	194.6	194.6	194.6	194.6	194.6	194.6	194.6	194.6
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	367	367	367	367	367	367	367	367	367	367
Total Auxiliary Load Changes	KW	367	367	367	367	367	367	367	367	367	367
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Clean Air Initiative - DFGD (85%) LNB	MW	-4.21	-4.21	-4.21	-4.21	-4.21	-4.21	-4.21	-4.21	-4.21	-4.21
Unit Rerated after Environmental Projects (2014 +10MWn)	MW				10	10	10	10	10	10	10
Total Capacity Changes	MW	-4.21	-4.21	-4.21	5.79	5.79	5.79	5.79	5.79	5.79	5.79

**Table 4**  
**Dave Johnston Unit 4**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Digital Control System	Btu/kWh	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
FW Heater Level Controls Replace	Btu/kWh	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15
AH Basket Replacement	Btu/kWh	-25	-20	-20	-10	-10					
AH Sootblowers	Btu/kWh	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15
Clean Air Initiative - DFGD (90%), BH, LNB	Btu/kWh		92.1	138.1	138.1	138.1	138.1	138.1	138.1	138.1	138.1
Total adjustments related to Capital Projects	Btu/kWh	-125	-28	18.1	28.1	28.1	38.1	38.1	38.1	38.1	38.1
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-321	-72	46	72	72	98	98	98	98	98
Total Auxiliary Load Changes	KW	-321	-72	46	72	72	98	98	98	98	98
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Clean Air Initiative - DFGD (90%), BH, LNB	MW		-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4
Total Capacity Changes	MW	0	-4	-4	-4	-4	-4	-4	-4	-4	-4

**10. Required Signatures**

Performance Engineer – Dave Johnston Plant		Teresa Jorris	
Signature:	{ signature on file }	Date:	30Apr11

Engineering Manager – Dave Johnston Plant			
Signature:		Date:	

Managing Director, Acting – Dave Johnston Plant			
Signature:	{ signature on file }	Date:	30Apr11



## **Huntington Plant Heat Rate Improvement Plan**

**Htg\_2011\_HRIP**



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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			2011 Plan Issue	April 30, 2011

**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 Huntington unit 1. The dips in the Planned Net Heat Rate in the years 2011 and 2015 are due to the work that is scheduled to take place during the planned outages in 2010 and 2014 (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 Huntington unit 2. The dips in the Planned Net Heat Rate in the years 2012 and 2016 are due to the work that is scheduled to take place during the planned outages in 2011 and 2015 (see section 7).

**5. Performance against last year's plan**

5.1. Unit 1

Planned Net Heat Rate			10,110
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	111	165	54
Turbine Losses	218	219	1
Other Losses	(10)	172	182
Actual Net Heat Rate			10,347

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

5.2. Unit 2

Planned Net Heat Rate			10,101
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	124	58	(66)
Turbine Losses	241	624	383
Other Losses	35	189	154
Actual Net Heat Rate			10,572

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	9,791
Boiler Losses	117
Turbine Losses	187
Other Losses	-520
<b>Planned Net Heat Rate</b>	<b>9,576</b>

6.2. Unit 2

As-Built Net Heat Rate	9,702
Boiler Losses	109
Turbine Losses	249
Other Losses	37
<b>Planned Net Heat Rate</b>	<b>10,096</b>

**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 Huntington plant management team by April 30.

**9. Appendix**

Huntington Plant Heat Rate Improvement Plan

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**Figure 1  
Huntington Unit 1  
10-year Plan Heat Rate Goals**

		<b>Huntington 1</b>														
Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh		9,793	9,787	9,794	9,794	9,791	9,793	9,793	9,793	9,793	9,791	9,791	9,791	9,791	9,791	9,791
Planned Net Heat Rate 2011, Btu/Kwh		10,320	10,026	10,177	10,143	10,110	9,569	9,655	9,786	9,824	9,554	9,561	9,626	9,725	9,601	9,615
Actual Net Heat Rate, Btu/Kwh		9,573	9,935	9,993	10,020	10,347										
Capacity Factor 2011, %		89.3%	89.3%	89.3%	85.4%	72.1%	76.5%	89.4%	88.6%	87.5%	77.2%	92.8%	91.5%	90.0%	79.1%	91.7%

**Figure 2  
Huntington Unit 2  
10-year Plan Heat Rate Goals**

		<b>Huntington 2</b>														
Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh		9,701	9,742	9,701	9,702	9,702	9,701	9,702	9,702	9,702	9,701	9,692	9,692	9,692	9,692	9,692
Planned Net Heat Rate 2011, Btu/Kwh		10,140	10,753	10,078	10,075	10,101	10,060	10,080	10,260	10,313	10,042	9,663	9,728	9,765	9,781	9,816
Actual Net Heat Rate, Btu/Kwh		9,774	10,214	9,940	10,034	10,573										
Capacity Factor 2011, %		67.1%	93.7%	94.6%	87.4%	88.0%	91.9%	89.9%	88.8%	77.9%	92.7%	91.5%	90.5%	81.3%	91.6%	92.9%

Huntington Plant Heat Rate Improvement Plan

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**Table 1**  
**Huntington Unit 1**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
3 Feedwater Heater Replacement (2010)	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Cooling Tower Fill (2010)	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Air Heater Basket Replacements (2010)	Btu/kWh	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80
Scrubber Wet Stack Conversion (Aux steam reheat)(2010)	Btu/kWh	-75	-75	-75	-75	-75	-75	-75	-75	-75	-75
Steam Air Heaters (est)(2011)	Btu/kWh	120	120	120	120	120	120	120	120	120	120
Dense Pack Turbine	Btu/kWh	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350
Low NOX Burners (LOI effect)	Btu/kWh	50	50	50	50	50	50	50	50	50	50
Total adjustments related to Capital Projects	Btu/kWh	-355	-355	-355	-355	-355	-355	-355	-355	-355	-355
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-14	-14	-14	-14	-126	-126	-126	-126	-126	-126
Total Auxiliary Load Changes	KW	-14	-14	-14	-14	-126	-126	-126	-126	-126	-126
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Clean Air Initiative Additions (1.48MW 2010)	MW	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48
Turbine upgrade Dense Pack (18nMW 2010)	MW	18	18	18	18	18	18	18	18	18	18
Total Capacity Changes	MW	17	17	17	17	17	17	17	17	17	17

Huntington Plant Heat Rate Improvement Plan

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**Table 2**  
**Huntington Unit 2**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Cooling Tower Fill	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Air Heater Basket Replacements (2011)	Btu/kWh		-80	-80	-80	-80	-80	-80	-80	-80	-80
Steam Air Heaters (2011)	Btu/kWh		120	120	120	120	120	120	120	120	120
2 LP FWHeaters (2015)	Btu/kWh					-5	-5	-5	-5	-5	-5
Dense Pack Turbine	Btu/kWh					-62	-373	-373	-373	-373	-373
Total adjustments related to Capital Projects	Btu/kWh	-10	30	30	30	-37	-348	-348	-348	-348	-348
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-25	62	62	62	62	-37	-37	-37	-37	-37
Complete Unit 1 & 2 BA Drag Chain Conveyor (eliminate ash water pumps)(2011)	KW					-73	-440	-440	-440	-440	-440
Total Auxiliary Load Changes	KW	-25	62	62	62	-11	-477	-477	-477	-477	-477
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Turbine upgrade Dense Pack (18nMW 2019)	MW					18	18	18	18	18	18
Total Capacity Changes	MW	0	0	0	0	18	18	18	18	18	18



**10. Required Signatures**

Performance Engineer – Huntington Plant		Ron Hall	
Signature:	(on file)	Date:	15Apr11

Manager, Engineering – Huntington Plant		Glenn Pinterich	
Signature:	(on file)	Date:	15Apr11

Managing Director – Huntington Plant		DJ Cunningham	
Signature:	(on file)	Date:	15Apr11



**Hunter Plant Heat Rate Improvement Plan**  
**Htr\_2011\_HRIP**

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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			2011 Plan Issue	April 30, 2011

**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 Hunter unit 1. The dips in the Planned Net Heat Rate in the years 2011 and 2015 are due to the work that is scheduled to take place during the planned outages in 2010 and 2014 (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 Hunter unit 2. The dips in the Planned Net Heat Rate in the years 2012 and 2016 are due to the work that is scheduled to take place during the planned outages in 2011 and 2015 (see section 7).

4.3. Unit 3 - Goals for 10-year Plan

Figure 3, in the appendix, shows the ten-year heat rate plan for Hunter unit 3. The dips in the Planned Net Heat Rate in the years 2013 and 2017 are due to the work that is scheduled to take place during the planned outages in 2012 and 2016 (see section 7).

**5. Performance against last year's plan**

5.1. Unit 1

Planned Net Heat Rate				10,125
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	162	7	(155)	
Turbine Losses	288	263	(25)	
Other Losses	(170)	511	681	
Actual Net Heat Rate				10,625

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

5.2. Unit 2

Planned Net Heat Rate				10,681
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	267	145	(122)	
Turbine Losses	519	906	387	
Other Losses	56	437	381	
Actual Net Heat Rate				11,327

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

5.3. Unit 3

Planned Net Heat Rate				10,238
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	211	150	(61)	
Turbine Losses	402	234	(168)	
Other Losses	50	166	116	
Actual Net Heat Rate				10,126

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	9,843
Boiler Losses	190
Turbine Losses	289
Other Losses	(84)
<u>Planned Net Heat Rate</u>	<u>10,238</u>

6.2. Unit 2

As-Built Net Heat Rate	9,839
Boiler Losses	165
Turbine Losses	323
Other Losses	96
<u>Planned Net Heat Rate</u>	<u>10,423</u>

6.3. Unit 3

As-Built Net Heat Rate	9,576
Boiler Losses	235
Turbine Losses	508
Other Losses	118
<u>Planned Net Heat Rate</u>	<u>10,437</u>

**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.

7.3. Unit 3

Table 3 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 Hunter plant management team by April 30.

**9. Appendix**



**Figure 1  
Hunter Unit 1  
10-year Plan Heat Rate Goals**

**Hunter 1**

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	9,846	9,846	9,846	9,846	9,845	9,844	9,844	9,844	9,845	9,846	9,846	9,846	9,846	9,846	9,846
Planned Net Heat Rate 2011, Btu/Kwh	10,720	10,675	10,758	10,762	10,125	10,238	10,398	10,506	10,502	10,363	10,419	10,443	10,227	10,230	10,302
Actual Net Heat Rate, Btu/Kwh	10,697	10,656	11,042	10,993	10,625										
Capacity Factor 2011, %	91.1%	85.9%	88.1%	84.5%	75.5%	89.6%	85.4%	84.2%	71.0%	90.6%	90.5%	89.7%	81.7%	90.2%	90.0%

**Figure 2**

**Hunter Unit 2  
10-year Plan Heat Rate Goals**

**Hunter 2**

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	9,839	9,839	9,839	9,839	9,839	9,839	9,840	9,840	9,840	9,840	9,840	9,840	9,840	9,842	9,842
Planned Net Heat Rate 2011, Btu/Kwh	10,570	10,463	10,558	10,607	10,681	10,423	10,233	10,345	10,435	10,164	10,224	10,255	10,308	10,134	10,170
Actual Net Heat Rate, Btu/Kwh	10,636	10,198	10,817	11,117	11,327										
Capacity Factor 2011, %	80.4%	90.6%	89.7%	84.1%	88.9%	73.0%	87.9%	86.8%	86.0%	84.2%	90.9%	89.4%	88.9%	82.1%	90.9%

**Figure 3**

**Hunter Unit 3  
10-year Plan Heat Rate Goals**

**Hunter 3**

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	9,576	9,572	9,576	9,576	9,576	9,575	9,574	9,574	9,574	9,574	9,574	9,574	9,574	9,574	9,574
Planned Net Heat Rate 2011, Btu/Kwh	10,300	10,141	10,098	10,178	10,238	10,437	10,101	10,156	10,190	10,232	10,088	10,142	10,171	10,221	10,093
Actual Net Heat Rate, Btu/Kwh	10,318	10,123	10,275	10,335	10,126										
Capacity Factor 2011, %	85.2%	81.3%	88.4%	81.2%	89.6%	82.6%	73.5%	84.1%	82.0%	87.1%	82.4%	87.9%	86.2%	86.0%	79.8%

**Table 1**  
**Hunter Unit 1**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Plant controls replacement/Optimization systems in place	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Feedwater Heater Replacement--HP FWH's	Btu/kWh	-16	-16	-16	-16	-16	-16	-16	-16	-16	-16
Air Preheater basket and seal replacement	Btu/kWh	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
HP/IP Turbine Upgrade	Btu/kWh	-374	-374	-374	-374	-374	-374	-374	-374	-374	-374
Clean air initiative: Baghouse installation, wet stack	Btu/kWh				21	32	32	32	32	32	32
Total adjustments related to Capital Projects	Btu/kWh	-408	-408	-408	-387	-376	-376	-376	-376	-376	-376
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-100	-100	-100	-37	-6	-6	-6	-6	-6	-6
Total Auxiliary Load Changes	KW	-100	-100	-100	-37	-6	-6	-6	-6	-6	-6
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Clean air initiative: wet stack & baghouse	MW	0	0	0	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
HP/IP/LP Turbine Upgrade	MW	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Total Capacity Changes	MW	17	17	17	16	16	16	16	16	16	16

**Table 2  
Hunter Unit 2  
10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Plant controls replacement/Optimization system in place	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Air Preheater Basket Replacement	Btu/kWh	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
Turbine Upgrade DensePack	Btu/kWh	-249	-374	-374	-374	-374	-374	-374	-374	-374	-374
Clean air initiative - Baghouse installation, wet stack	Btu/kWh	23	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8
Clean air initiative - SCR	Btu/kWh									36	36
Total adjustments related to Capital Projects	Btu/kWh	-234	-358	-358	358	-358	-358	-358	-358	-322	-322
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	12	43	43	43	43	43	43	43	143	143
Total Auxiliary Load Changes	KW	12	43	43	43	43	43	43	43	143	143
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Clean air initiative: Baghouse, wet stack	MW	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48	-1.48
Turbine Upgrade DensePack	MW	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Clean air initiative - SCR	MW									-2.4	-2.4
Total Capacity Changes	MW	15.52	15.52	15.52	15.52	15.52	15.52	15.52	15.52	13.16	13.16

**Table 3  
Hunter Unit 3  
10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Cooling tower replacement	Btu/kWh						-20	-20	-20	-20	-20
Feedwater Htr replacement - HP	Btu/kWh	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Turbine Upgrade DensePack	Btu/kWh		-284	-378	-378	-378	-378	-378	-378	-378	-378
CAI work (SCR)	Btu/kWh						0	0	0	0	0
Total adjustments related to Capital Projects	Btu/kWh	-10	-294	-388	-388	-388	-408	-408	-408	-408	-408
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-29	-86	-86	-86	-86	-86	-86	-86	-86	-86
Total Auxiliary Load Changes	KW	-29	-86	-86	-86	-86	-86	-86	-86	-86	-86
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Turbine Upgrade DensePack	MW		19	19	19	19	19	19	19	19	19
CAI work (SCR)	MW		0	0	0	0	0	0	0	0	0
Total Capacity Changes	MW	0	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9

**10. Required Signatures**

Performance Engineer – Hunter Plant		Kent Gilbert	
Signature:	( on file )	Date:	30Mar10

Manager, Engineering – Hunter Plant		Larry Bruno	
Signature:	( on file )	Date:	30Mar10

Managing Director – Hunter Plant		Laren Huntsman	
Signature:	( on file )	Date:	31Mar10



**Jim Bridger Plant Heat Rate Improvement Plan**  
**JB\_2011\_HRIP**



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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			Original Submittal	April 30, 2011

**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 Jim Bridger unit 1. The dip in the Planned Net Heat Rate in the year 2011 is due to the work that is scheduled to take place during the planned outage in 2010 (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 Jim Bridger unit 2. The dip in the Planned Net Heat Rate in the year 2014 is due to the work that is scheduled to take place during the planned outage in 2013 (see section 7).

4.3. Unit 3 - Goals for 10-year Plan

Figure 3, in the appendix, shows the ten-year heat rate plan for Jim Bridger unit 3. The dip in the Planned Net Heat Rate in the year 2012 is due to the work that is scheduled to take place during the planned outage in 2011 (see section 7).

4.4. Unit 4 - Goals for 10-year Plan

Figure 4, in the appendix, shows the ten-year heat rate plan for Jim Bridger unit 4. The dip in the Planned Net Heat Rate in the years 2013 is due to the work that is scheduled to take place during the planned outage in 2012 (see section 7).

**5. Performance against last year’s plan**

The 2010 accounting heat rates shown are markedly less than plan. The units benefited by coal pile aerial survey adjustments that resulted in more tons on the pile than were being carried as “book” values. As a result, the unit burn quantities were credited. Additionally, Unit One greatly benefited from a replacement of the HP/IP turbine sections which reduced the unit heat rate. Plans for successive turbine replacements are on hold until subsynchronous resonance issues between LP turbines and the transmission system are resolved.

5.1. Unit 1

Planned Net Heat Rate			10,360
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	148	127	(21)
Turbine Losses	757	239	(518)
Other Losses	(67)	67	134
Actual Net Heat Rate			9,954

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

5.2. Unit 2

Planned Net Heat Rate			10,448
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	139	165	26
Turbine Losses	673	515	-158
Other Losses	94	59	-35
Actual Net Heat Rate			10,281

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

5.3. Unit 3

Planned Net Heat Rate			10,351
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	196	213	17
Turbine Losses	579	516	(63)
Other Losses	55	97	42
Actual Net Heat Rate			10,347

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

5.4. Unit 4

Planned Net Heat Rate			10,366
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	152	189	37
Turbine Losses	640	502	(138)
Other Losses	48	57	9
Actual Net Heat Rate			10,273

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	9,520
Boiler Losses	169
Turbine Losses	613
Other Losses	65
Planned Net Heat Rate	10,367

6.2. Unit 2

As-Built Net Heat Rate	9,538
Boiler Losses	147
Turbine Losses	815
Other Losses	-14
Planned Net Heat Rate	10,487

6.3. Unit 3

As-Built Net Heat Rate	9,529
Boiler Losses	194
Turbine Losses	817
Other Losses	-71
Planned Net Heat Rate	10,469

6.4. Unit 4

As-Built Net Heat Rate	9,526
Boiler Losses	161
Turbine Losses	741
Other Losses	-1
Planned Net Heat Rate	10,427

**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. Numbers inside parentheses are negative impact on heat rate and represent improvement to the overall unit efficiency.

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.

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. The turbine project originally planned for 2017 has been changed to a partial project (HP/IP) in 2013.

7.3. Unit 3

Table 3 shows the capital projects included in the 10-year plan that contribute to the recovery of lost heat rate. The turbine upgrade planned for 2019 has been deferred indefinitely pending resolution of resonance issues.

7.4. Unit 4

Table 4 shows the capital projects included in the 10-year plan that contribute to the recovery of lost heat rate. The turbine upgrade planned for 2016 has been deferred indefinitely pending resolution of resonance issues.

**8. Annual Review and Update**

This plan will be reviewed and updated annually by the Jim Bridger plant management team by April 30.

**9. Appendix**

**Figure 1**  
**Jim Bridger Unit 1**  
**10-year Plan Heat Rate Goals**

		<b>Jim Bridger 1</b>														
Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh		9,533	9,520	9,533	9,520	9,521	9,520	9,520	9,520	9,520	9,520	9,520	9,520	9,520	9,520	9,520
Planned Net Heat Rate (2011), Btu/Kwh		10,440	10,408	10,404	10,410	10,734	10,203	10,272	10,281	10,290	10,276	10,273	10,279	10,097	10,088	10,098
Actual Net Heat Rate, Btu/Kwh		10,354	10,336	10,413	10,119	9,980										
Capacity Factor 2011, %		73.5%	88.3%	83.0%	86.9%	65.7%	89.0%	89.3%	87.5%	76.5%	88.2%	88.5%	87.7%	78.4%	88.4%	88.4%

**Figure 2**  
**Jim Bridger Unit 2**  
**10-year Plan Heat Rate Goals**

		<b>Jim Bridger 2</b>														
Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh		9,535	9,525	9,535	9,533	9,542	9,538	9,538	9,538	9,538	9,538	9,538	9,538	9,538	9,538	9,538
Planned Net Heat Rate (2011), Btu/Kwh		10,460	10,473	10,528	10,417	10,497	10,378	10,446	10,370	10,370	10,370	10,393	10,393	10,393	10,393	10,393
Actual Net Heat Rate, Btu/Kwh		10,342	10,425	10,352	10,164	10,322										
Capacity Factor 2011, %		86.0%	86.1%	85.5%	71.4%	87.4%	87.0%	86.1%	78.1%	89.7%	88.6%	88.0%	77.9%	89.5%	89.4%	88.2%

**Figure 3**  
**Jim Bridger Unit 3**  
**10-year Plan Heat Rate Goals**

		<b>Jim Bridger 3</b>													
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	9,521	9,521	9,521	9,521	9,521	9,529	9,535	9,535	9,535	9,535	9,535	9,535	9,535	9,534	9,534
Planned Net Heat Rate (2011), Btu/Kwh	10,590	10,513	10,479	10,350	10,361	10,372	10,390	10,386	10,377	10,489	10,427	10,311	10,299	10,299	10,299
Actual Net Heat Rate, Btu/Kwh	10,491	10,496	10,300	10,174	10,387										
Capacity Factor 2011, %	83.4%	73.1%	89.2%	90.4%	84.7%	75.0%	90.2%	89.7%	88.5%	66.3%	89.8%	85.2%	88.4%	77.8%	90.2%

**Figure 4**  
**Jim Bridger Unit 4**  
**10-year Plan Heat Rate Goals**

		<b>Jim Bridger 4</b>													
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	9,516	9,515	9,516	9,526	9,526	9,526	9,526	9,526	9,526	9,526	9,526	9,526	9,526	9,526	9,526
Planned Net Heat Rate (2011), Btu/Kwh	10,468	10,539	10,473	10,365	10,346	10,275	10,377	10,375	10,346	10,336	10,147	10,095	10,002	9,992	10,058
Actual Net Heat Rate, Btu/Kwh	10,530	10,571	10,319	10,098											
Capacity Factor 2011, %	81.3%	84.6%	71.1%	90.2%	85.1%	88.1%	77.3%	89.0%	88.4%	89.9%	67.9%	89.7%	84.9%	90.2%	79.8%



**Table 1**  
**Jim Bridger Unit 1**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Controls Upgrade	Btu/kWh	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
Turbine Upgrade Dense Pack	Btu/kWh	-100	-100	-100	-100	-100	-100	-100	-224	-313	-313
Scrubber Upgrade	Btu/kWh	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Total adjustments related to Capital Projects	Btu/kWh	-119	-119	-119	-119	-119	-119	-119	-243	-332	-332
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-204	-204	-204	-204	-204	-204	-204	-204	-204	-204
Drag Chain conveyor	KW	-553	-553	-553	-553	-553	-553	-553	-553	-553	-553
Total Auxiliary Load Changes	KW	-757	-757	-757	-757	-757	-757	-757	-757	-757	-757
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Turbine Upgrade Dense Pack	MW	5.6	5.6	5.6	5.6	5.6	5.6	5.6	18	18.0	18.0
Scrubber Upgrade	MW	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1
Total Capacity Changes	MW	2.5	2.5	2.5	2.5	2.5	2.5	2.5	14.9	14.9	14.9

**Table 2**  
**Jim Bridger Unit 2**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Controls Upgrade	Btu/kWh	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5
Turbine Upgrade Dense Pack	Btu/kWh			-58	-100	-100	-100	-100	-100	-100	-100
Scrubber Upgrade	Btu/kWh	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9
Total adjustments related to Capital Projects	Btu/kWh	64.4	64.4	6.4	-35.6	-35.6	-35.6	-35.6	-35.6	-35.6	-35.6
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-53	-53	-53	-53	-53	-53	-53	-53	-53	-53
Drag Chain Conveyor	KW	-530	-530	-530	-530	-530	-530	-530	-530	-530	-530
Clean Air Initiative - WFGD (90%) LNB	KW	795	795	795	795	795	795	795	795	795	795
Total Auxiliary Load Changes	KW	211	211	211	211	211	211	211	211	211	211
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Turbine Upgrade Dense Pack	MW			4	4	4	4	4	4	4	4
Scrubber Upgrade	MW	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Total Capacity Changes	MW	-3.0	-3.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

**Table 3**  
**Jim Bridger Unit 3**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Turbine Upgrade Dense Pack	Btu/kWh					0	0.0	0.0	0.0	0	0
Scrubber upgrade	Btu/kWh	32	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1
SCR addition	Btu/kWh					34	57.5	57.5	57.5	57.5	57.5
Total adjustments related to Capital Projects	Btu/kWh	32	54	54	54	88	112	112	112	112	112
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Clean Air Initiative - WFGD (90%) LNB	KW	464	795	795	795	795	795	795	795	795	795
Total Auxiliary Load Changes	KW	464	795	795	795	795	795	795	795	795	795
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Turbine Upgrade Dense Pack	MW									0	0
Scrubber upgrade	MW	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
SCR addition	MW					-3.2	-3.2	-3.2	-3.2	-3.2	-3.2
Total Capacity Changes	MW	-3.0	-3.0	-3.0	-3.0	-6.2	-6.2	-6.2	-6.2	-6.2	-6.2

**Table 4**  
**Jim Bridger Unit 4**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
41 Feedwater heater replacement	Btu/kWh	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70
Turbine Upgrade Dense Pack	Btu/kWh										
SCR	Btu/kWh						30	60	60	60	60
Total adjustments related to Capital Projects	Btu/kWh	-70	-70	-70	-70	-70	-40	-10	-10	-10	-10
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-223	-223	-223	-223	-223	-223	-223	-223	-223	-223
Clean Air Initiative - WFGD (90%) LNB	KW	795	795	795	795	795	795	795	795	795	795
Total Auxiliary Load Changes	KW	572	572	572	572	572	572	572	572	572	572
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Turbine Upgrade Dense Pack	MW										
SCR	MW						-3.3	-3.3	-3.3	-3.3	-3.3
Total Capacity Changes	MW	0	0	0	0	0.00	-3.3	-3.3	-3.3	-3.3	-3.3

**10. Required Signatures**

Performance Engineer – Jim Bridger Plant		Bernie Caulfield	
Signature:	(on file)	Date:	28 April 2011

Engineering Manager – Jim Bridger Plant		Jim Sedey	
Signature:	(on file)	Date:	28 April 2011

Managing Director – Jim Bridger Plant		Bob Arambel	
Signature:	(on file)	Date:	28 April 2011



**Naughton Plant Heat Rate Improvement Plan**  
Ntn\_2011\_HRIP

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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			2011 Plan Issue	April 30, 2011

**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 Naughton Unit 1. The dips in the Planned Net Heat Rate in the years 2012 and 2016 are due to the work that is scheduled to take place during the planned outages in 2012 and 2016 (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 Naughton Unit 2. The dips in the Planned Net Heat Rate in the years 2011 and 2015 are due to the work that is scheduled to take place during the planned outages in 2011 and 2015 (see section 7).



4.3. Unit 3- Goals for 10-year plan

Figure 3, in the appendix, shows the ten-year heat rate plan for Naughton Unit 3. The dips in the Planned Net Heat Rate in the years 2009 and 2014 are due to the work that is scheduled to take place during the planned outages in 2010 and 2014 (see section 7).

**5. Performance against last year's plan**

5.1. Unit 1

Planned Net Heat Rate				10,298
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	9	84		75
Turbine Losses	340	172		(168)
Other Losses	(8)	77		85
Actual Net Heat Rate				10,290

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

5.2. Unit 2

Planned Net Heat Rate				10,383
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	27	148		121
Turbine Losses	345	171		(174)
Other Losses	67	(55)		(122)
Actual Net Heat Rate				10,208

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

5.3. Unit 3

Planned Net Heat Rate				10,234
Reconciliation to Planned Net Heat Rate	Planned	Actual		
Boiler Losses	57	(20)		(77)
Turbine Losses	295	811		516
Other Losses	25	60		35
Actual Net Heat Rate				10,708

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		9,957
	Boiler Losses		9
	Turbine Losses		499
	Other Losses		(110)
	<u>Planned Net Heat Rate</u>		<u>10,355</u>

6.2.	Unit 2		
	As-Built Net Heat Rate		9,963
	Boiler Losses		26
	Turbine Losses		552
	Other Losses		-53
	<u>Planned Net Heat Rate</u>		<u>10,488</u>

6.3.	Unit 3		
	As-Built Net Heat Rate		9,857
	Boiler Losses		57
	Turbine Losses		333
	Other Losses		97
	<u>Planned Net Heat Rate</u>		<u>10,344</u>

**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.

7.3. Unit 3

Table 3 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 Naughton plant management team by April 30.

**9. Appendix**

**Figure 1**  
**Naughton Unit 1**  
**10-year Plan Heat Rate Goals**

	<b>Naughton 1</b>														
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	9,960	9,959	9,960	9,959	9,957	9,957	9,963	9,960	9,960	9,960	9,959	9,959	9,959	9,959	9,959
Planned Net Heat Rate 2011, Btu/Kwh	10,720	10,332	10,219	10,346	10,298	10,289	10,115	10,156	10,248	10,238	10,121	10,121	10,199	10,238	10,121
Actual Net Heat Rate, Btu/Kwh	10,740	10,206	10,417	10,263	10,290										
Capacity Factor 2011, %	78.4%	79.7%	88.6%	88.4%	87.9%	87.8%	76.1%	90.7%	89.9%	89.5%	81.5%	91.3%	90.5%	89.7%	81.8%

**Figure 2  
Naughton Unit 2  
10-year Plan Heat Rate Goals**

		<b>Naughton 2</b>														
Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh		9,958	9,958	9,955	9,950	9,944	9,963	9,962	9,962	9,962	9,962	9,962	9,962	9,962	9,962	9,962
Planned Net Heat Rate 2011, Btu/Kwh		10,480	10,350	10,364	10,445	10,383	10,406	10,445	10,505	10,558	10,346	10,319	10,393	10,452	10,324	10,229
Actual Net Heat Rate, Btu/Kwh		10,672	10,810	10,848	10,128	10,208										
Capacity Factor 2011, %		73.5%	89.3%	84.7%	82.8%	88.2%	72.2%	90.3%	90.0%	88.9%	79.5%	91.2%	90.4%	89.6%	80.2%	91.1%

**Figure 3  
Naughton Unit 3  
10-year Plan Heat Rate Goals**

		<b>Naughton 3</b>														
Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh		9,863	9,863	9,863	9,857	9,857	9,857	9,857	9,856	9,857	9,858	9,858	9,858	9,858	9,858	9,858
Planned Net Heat Rate 2011, Btu/Kwh		10,350	10,366	10,393	10,111	10,234	10,267	10,319	10,377	10,376	10,328	10,375	10,422	10,334	10,334	10,385
Actual Net Heat Rate, Btu/Kwh		10,198	10,506	10,683	10,859	10,708										
Capacity Factor 2011, %		85.7%	84.7%	79.6%	68.0%	89.7%	85.7%	87.4%	86.3%	66.5%	89.8%	86.1%	87.3%	80.5%	90.3%	86.3%

**Table 1  
Naughton Unit 1  
10-year Plan Heat Rate Improvement Projects**

Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)	2011 2012 2013 2014 2015 2016 2017 2018 2019 2020									
	Btu/kWh	0	0	0	0	0	-25	-25	-25	-25
Install Intelligent soot blowing (2016)	Btu/kWh	0	0	0	0	0	-25	-25	-25	-25
CO&O2 Grid (2012)	Btu/kWh	0	-13	-13	-13	-13	-13	-13	-13	-13
Condenser Replacement (2016)	Btu/kWh	0	0	0	0	0	-30	-30	-30	-30
SO3 Injection System (2010)	Btu/kWh	-25	-25	-25	-25	-25	-25	-25	-25	-25
Scrubber Addition (-2.58Mw Aux Load) (2012)	Btu/kWh	0	163.2	163.2	163.2	163.2	163.2	163.2	163.2	163.2
Total adjustments related to Capital Projects	Btu/kWh	-25	138.2	138.2	138.2	138.2	70.2	70.2	70.2	70.2

Budgeted / Planned Auxiliary Load Changes	2011 2012 2013 2014 2015 2016 2017 2018 2019 2020									
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	-26	146	146	146	146	74	74	74	74
Air Compressor Upgrade (2009)	KW	-27	-27	-27	-27	-27	-27	-27	-27	-27
Total Auxiliary Load Changes	KW	-53	119	119	119	119	48	48	-27	-27

Budgeted / Planned Net Dependable Rating Changes, (Net Basis)	2011 2012 2013 2014 2015 2016 2017 2018 2019 2020									
Scrubber Addition (-2.58Mw Aux Load) (2012)	MW		-2.58	-2.58	-2.58	-2.58	-2.58	-2.58	-2.58	-2.58
Total Capacity Changes	MW	0	-2.58	-2.58	-2.58	-2.58	-2.58	-2.58	-2.58	-2.58

**Table 2  
Naughton Unit 2  
10-year Plan Heat Rate Improvement Projects**

Budgeted / Planned Heat Rate Changes, Net basis. (Improvements are negative)	2011 2012 2013 2014 2015 2016 2017 2018 2019 2020										
	Btu/kWh	0	-25	-25	-25	-25	-25	-25	-25	-25	-25
Install intelligent soot blowing (2012)	Btu/kWh										
CO&O2 grid (2011)	Btu/kWh	-5	-13	-13	-13	-13	-13	-13	-13	-13	-13
SO3 Injection System (2010)	Btu/kWh	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
Scrubber Addition (2011 -4.71MW)	Btu/kWh	228	228	228	228	228	228	228	228	228	228
Total adjustments related to Capital Projects	Btu/kWh	178	178	178	178	173	165	165	165	165	165
<b>Budgeted / Planned Auxiliary Load Changes</b>	<b>Auxiliary Load</b>										
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	266	266	266	266	259	247	247	247	247	247
Cooling Tower VFD optimization (2012)	KW	-134	-134	-134	-134	-134	-134	-134	-134	-134	-134
Air Compressor Upgrade (2009)	KW	-27	-27	-27	-27	-27	-27	-27	-27	-27	-27
Total Auxiliary Load Changes	KW	105	105	105	105	98	86	86	86	86	86
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
Scrubber Addition (2011 -4.71MW)	MW	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71
Total Capacity Changes	MW	-4.7	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71	-4.71



**Table 3  
Naughton Unit 3  
10-year Plan Heat Rate Improvement Projects**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>										
CO&O2 grid (2014)	Btu/kWh	0	0	-12	-25	-25	-25	-25	-25	-25
Install intelligent soot blowing (2014)	Btu/kWh	0	0	-12	-25	-25	-25	-25	-25	-25
Increased CAI load (-4.55MW 2014)	Btu/kWh	0	0	80	137.8	137.8	137.8	137.8	137.8	137.8
Total adjustments related to Capital Projects	Btu/kWh	0	0	56	88	88	88	88	88	88
<b>Budgeted / Planned Auxiliary Load Changes</b>										
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	0	0	110	172	172	172	172	172	172
Condensate Pump Upgrade (2011)	KW	-100	-160	-160	-160	-160	-160	-160	-160	-160
Air Compressor Upgrade (2009)	KW	-27	-27	-27	-27	-27	-27	-27	-27	-27
Total Auxiliary Load Changes	KW	-127	-187	-76	-15	-15	-15	-15	-15	-15
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>										
Increased CAI load (-4.55MW 2014)	MW			-4.6	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6
Total Capacity Changes	MW	0.0	0.0	0.0	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6

**10. Required Signatures**

Performance Engineer – Naughton Plant		Ryan Witbeck	
Signature:		Date:	22 April 2011
Manager, Engineering – Naughton Plant		Rodger Holt	
Signature:		Date:	22 April 2011
Managing Director – Naughton Plant		Bruce Vinnola	
Signature:		Date:	22 April 2011



**Pacificorp Energy Heat Rate Improvement Plan**  
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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			Original Submittal	April 26, 2011

**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**

The overall heat rate strategy is to 1) minimize heat rate losses in our operating plants, 2) add new resources that are more heat rate efficient.

4.1. Turbine Upgrades

Improve Pacificorp Energy overall system heat rate by replacement of major turbine components. Technology improvements in turbine steam path design should result in 1-3% more generated megawatts for the same amount of steam energy supplied. No changes to the boiler capacity, fuel consumed, or stack emissions are expected. These replacements are economical on the larger units, generally those over 350 MW. Turbine

replacements will be done on the regular turbine / boiler outage cycle by unit.

4.2. Availability Improvements

Improvement in unit availability and reduction of forced outages will contribute to less low load operation (higher heat rate) and offline fuel use of offline electrical power use. This will affect overall heat rate less than 0.5 %.

4.3. New Resources

Increased demand will be met with natural gas fueled units. Coal fueled units are already near their capacity, so any increase in demand will be provided by increasing capacity factors at the gas fueled units. Fossil-fueled system heat rate does not include the contribution of gas plant operation.

**5. Performance against last year's plan**

Comparison of the planned heat rate and the actual heat rate is shown in Figure 1 in the Appendix.

**6. Major Losses for Current Planned Net Heat Rate**

This section of the heat rate plan identifies the system influences that will affect the Planned Net Heat Rate.

6.1. Increase in Demand Energy

Increases in demand electrical energy will probably be made up with gas-fueled generation.

6.2. Displacement of Fossil-Fueled Generation with Non-Fossil Generation

Increases in available generation from non-fossil sources (Wind, Hydro, Geothermal, and Solar) will displace fossil-fueled generation. The displaced generation will tend to be gas-fueled generation due to fuel costs and the rapid response of gas-fueled generation to variable displacement. This will result in higher (worse) system fossil-fueled heat rate. The opposite of this effect is also possible, that less non-fossil generation available will result in lower (better) fossil-fueled system heat rate.

6.3. Environmental Plan Projects

Environmental projects will increase the unit's auxiliary load, which will result in an increase (worse) in heat rate. There are several environmental projects scheduled over the next 10 years.

**7. Major Initiatives**

This section identifies the major planned capital and operational activities to improve or regain lost heat rate for the current 10-year plan. See Table 1.

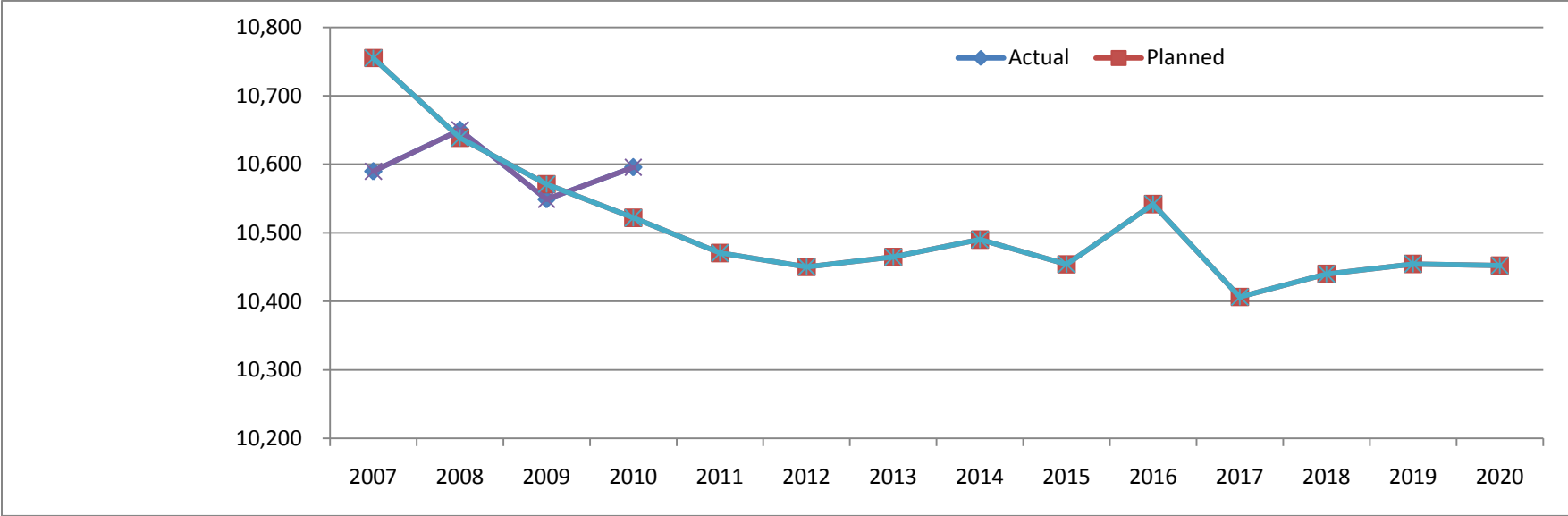
**8. Annual Review and Update**

This plan will be reviewed and updated annually by the Pacificorp Energy management team by April 30.

**9. Appendix**

**Figure 1**  
**PacifiCorp Energy**  
**10-year Plan Heat Rate Goals**

**Fossil-Fueled System**



Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Planned Net Heat Rate, Btu/Kwh	10,755	10,639	10,571	10,522	10,471	10,450	10,465	10,490	10,454	10,542	10,406	10,440	10,455	10,452
Actual Net Heat Rate, Btu/Kwh	10,590	10,650	10,549	10,596										



**Table 1**  
**Pacificorp Energy**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
System HR benefit of Turbine Upgrades	Btu/kWh	-57	-81	-87	-87	-91	-110	-115	-115	-115	-115
System HR effect of Environmental Projects	Btu/kWh	28	39	41	46	50	53	55	55	57	57
System HR effect of Other Heat Rate Improvement Projects	Btu/kWh	-25	-24	-24	-24	-27	-29	-30	-29	-29	-29
Total Adjustments from Heat Rate Improvement Projects	Btu/kWh	-55	-65	-70	-66	-67	-86	-90	-89	-87	-87

**10. Required Signatures**

Corporate Heat Rate Engineer		Alan Jackson	
Signature:	(on file)	Date:	28 April 2011

Manager, Engineering/Environmental		Greg Hunter	
Signature:	(on file)	Date:	28 April, 2011

Managing Director, Generation Support		Rod Roberts	
Signature:	(on file)	Date:	28 April, 2011



**Wyodak Plant Heat Rate Improvement Plan**  
Wyd\_2011\_HRIP

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**1. Revision History**

Version	Status	Author	Reason for Issue	Date
1			2011 Plan Issue	April 30, 2011

**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 Wyodak unit 1. The decrease in Heat Rate for 2016 reflects the capital overhaul improvement projects. In 2011 the installation of a bag house will increase aux load for the plant causing a heat rate increase of 88 Btu/Kwh. In 2016 the major projects are air heater basket changeout and repairs and a turbine overhaul).

**5. Performance against last year’s plan**

5.1. Unit 1

Planned Net Heat Rate	11,743		
Reconciliation to Planned Net Heat Rate	Planned	Actual	
Boiler Losses	120	(89)	(209)
Turbine Losses	301	395	94
Other Losses	(4)	124	128
Actual Net Heat Rate	11,756		

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	11,331
Boiler Losses	120
Turbine Losses	476
Other Losses	203
Planned Net Heat Rate	12,129

**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.

**8. Annual Review and Update**

This plan will be reviewed and updated annually by the Wyodak plant management team by April 30.

**9. Appendix**

**Figure 1**  
**Wyodak Unit 1**  
**10-year Plan Heat Rate Goals**

	<b>Wyodak</b>														
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
As-Built Net Heat Rate, Btu/Kwh	11,329	11,278	11,329	11,324	11,326	11,337	11,342	11,342	11,342	11,342	11,340	11,340	11,340	11,341	11,341
Planned Net Heat Rate 2011, Btu/Kwh	12,110	11,921	12,009	11,704	11,743	12,129	11,916	11,941	11,952	11,967	11,592	11,598	11,635	11,717	11,709
Actual Net Heat Rate, Btu/Kwh	11,644	11,535	11,511	11,780	11,756										
Capacity Factor 2011, %	80.2%	96.0%	95.6%	93.7%	96.2%	79.4%	91.3%	91.2%	91.2%	91.2%	82.4%	91.2%	94.1%	93.9%	93.8%

**Table 1**  
**Wyodak Unit 1**  
**10-year Plan Heat Rate Improvement Projects**

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Budgeted / Planned Heat Rate Changes, Net basis (Improvements are negative)</b>											
Low NOx burners installation	Btu/kWh	50	75	75	75	75	75	75	75	75	75
Air Heater Basket Replacement (hot and cold end)	Btu/kWh						-15	-25	-15	-10	-10
Major Pulverizer Overhauls	Btu/kWh	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30
CAI Upgrades DFGD, LNB, Baghouse	Btu/kWh	58.8	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2	88.2
Total adjustments related to Capital Projects	Btu/kWh	79	133	133	133	133	118	108	118	123	123
<b>Budgeted / Planned Auxiliary Load Changes</b>											
Reduced auxiliary load benefit of Budgeted / Planned Heat Rate Changes	KW	64	145	145	145	145	96	64	96	113	113
Total Auxiliary Load Changes	KW	64	145	145	145	145	96	64	96	113	113
<b>Budgeted / Planned Net Dependable Rating Changes, (Net Basis)</b>											
CAI Upgrades DFGD, LNB, Baghouse	MW	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
Total Capacity Changes	MW	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6



**10. Required Signatures**

Performance Engineer – Wyodak Plant			
Signature:	(on file)	Date:	08Apr11

Manager, Engineering – Wyodak Plant		Cory Bryngelson	
Signature:	(on file)	Date:	08Apr11

Managing Director, Wyodak Plant		Gary Harris	
Signature:	(on file)	Date:	08Apr11