Page Change History
MBFP PSD Permit Application Dated December 31, 2007

Page Numbers	Revision Date	Action	Description
	4/23/08	Superseded	Updated Table of Contents, Acronyms
(1-1) 1-2	5/12/08	Superseded	Revised VOC total following revision to equipment leak emission calculation. Also noted Methanol emissions greater than major HAP threshold, rather than total facility HAPs as trigger for NESHAP applicability.
1-7 (1-8)	5/12/08	Superseded	Revised HAP emissions following revision to equipment leak emission calculation.
1-1	4/23/08	Superseded	Revised Saddleback Hills Mine coal production rate from 3.2 MMtpy to 3.25 MMtpy
1-2	4/23/08	Superseded	Updated emissions in Table 1.1 for PM10
(1-1) 1-2	2/12/08	Superseded	Updated emissions in Table 1.1
1-7 (1-8)	2/12/08	Superseded	Updated emissions in Table 1.2
2-1 to 2-2; 2-5 (2-6)	4/23/08	Superseded	Added sentence in Section 2.1, 2nd paragraph, to explain conveyors C6-C10 will be ¾-covered, rather than fully enclosed. Resulting text carryover to page 2-5. (Note, Figures 2.1 and 2.2 are pages 2-3 and 2-4, with no changes.)
2-9 (2-10)	2/12/08	Superseded	Added sentence (bottom of page) about heating CO2 vent stream
(3-3) 3-4	7/21/08	Superseded	Updated Table 3.3 to match facility total emission rates listed in Table 1.1. This was inadvertently missed in earlier revisions.
(3-3) 3-4 to 3-6	5/12/08	Superseded	Revised VOC emissions in Tables 3.3 and 3.5 to reflect updated equipment leak values and total facility VOC emission rates and HAP emissions in Table 3.4 following revision to equipment leak calculations.
3-9 (3-10)	5/12/08	Superseded	Revised equipment leak definitions in Section 3.2.6.3 from 10,000 ppmv to 500 ppmv for valves and connectors and 2,000 ppmv for pumps following revised equipment leak emission calculations.
3-1 to 3.4; (3-5) 3-6	4/23/08	Superseded	Revised SBH Mine Section 3.1 to clarify that some conveyors will be ¾ covered, rather than fully enclosed; Revised Tables 3.1 through 3.5 by adding revised SBH Mine development and ongoing East Portal coal storage & conveying emission rates.

Page Numbers	Revision Date	Action	Description
3-3 to 3-10	2/12/08	Superseded	Revised emissions and emission-related descriptions to address operating hour and fuel simplifications requested by WDEQ *
4-3	7/31/08	Superseded	Correction to the total number of work hours per year for the black start generators. 250 hours were changed to 360 hours per generator per year.
4-30	7/31/08	Superseded	Correction to the total number of work hours per year for the black start generators. 250 hours were changed to 360 hours per generator per year.
4-1	7/21/08	Superseded	Updated Table 4.1 to match facility total emission rates listed in Table 1.1. This was inadvertently missed in earlier revisions.
4-31 (4-32)	5/29/03	Superseded	Correction to mercury emission rate, to reflect flow through two mercury guard beds instead of one.
4-27 (4-28)	5/12/08	Superseded	Revised equipment leak definitions in Section 4.7 from 10,000 ppmv to 500 ppmv for valves and connectors and 2,000 ppmv for pumps following revised equipment leak emission calculations. Also corrected the VOC and HAP emission rates from equipment leaks in this section.
4-29 (4-30)	4/23/08	Superseded	Clarification to first paragraph under Section 4.10, to sate that the expected operating hours for the gasifier preheaters will be 500 hours per year, per preheater. Previously, this sentence stated the maximum would be 500 hours per year, per preheater, because PTE emission rates are based on this value. However, 500 hours per year per preheater is only an estimate of annual operating hours for the gasifier preheaters.
4-7 (4-8)	1/18/08	Superseded	Revised $/ton NOx removed based on revised emissions. (Last two sentences of 1st paragraph)
5-8	7/31/2008	Superseded	Correction to the total number of work hours per year for the black start generators. 250 hours were changed to 360 hours per generator per year.
5-3 to 5-10	2/12/08	Superseded	Added discussions of: • --New 40 CFR Part 60, Subpart JJJJ regulations • --Wyoming Chapter 6, Section 5 permitting requirements Revised discussion of Subpart DDDDD NESHAP

Page Numbers	Revision Date	Action	Description
General Note for Section 6, regarding equipment leak emission rates			Revisions were made in other sections of the application on 5/12/08 to reflect changes to equipment leak VOC and HAP emission rate calculations. However, these changes were not made in Section 6 because the HAP Modeling, discussed in Section 6.7, was not revised by the permittee. Rather, the WDEQ performed the revised HAP modeling and risk assessment using the revised equipment leak emission rates. Discussion of the revised modeling should be in the WDEQ technical analysis.
6-7 (6-8)	4/30/08	Superseded	Revised Table 6.4 to remove Source ID 'CoalStor,' and to provide clarifying footnotes based on conversations with JNall (4-30-08).
6-3	4/23/08	Superseded	Revised Table 6.1 for modeled PM_{10} emission rates
6-4	4/23/08	Superseded	Revised Table 6.2 for LP Flare model parameters and added table footnote.
6-5 to 6-6	4/23/08	Superseded	Carry-over text from page 6-3, due to edits on that page. Added footnote at bottom of Table 6.2. Deleted reference to year 2010 in Section 6.2.2.1, third paragraph.
6-7	4/23/08	Superseded	Revised Table 6.4 for coal mine area source modeling parameters and emission rates and added footnotes
6-8	4/23/08	Superseded	Added road haul volume sources to Table 6.5 and footnote.
6-9 (6-10)	4/23/08	Superseded	Replaced Figure 6.3 with updated version, showing road haul sources associated with the EMM and SBH Mine
6-19 to 6-22	4/23/08	Superseded	Updated Tables 6.10, 6.11, and Figures 6-7, 6-8 for revised 3-hr and 24-hr SO_2 modeling results
(6-23) 6-24 to 6-26	4/23/08	Superseded	Updated Tables 6.12, 6.13, and Figures 6-10, 6-11 for revised PM_{10} modeling results
6-1 to 6-48	2/12/08	Superseded	Revised chapter to reflect new AERMOD near field modeling results and incorporated relevant portions from Appendix J
6-19 to 6-30	3/3/08	Superseded	Revised near-field modeling criteria pollutant results based on revised modeling for years 2000 and 2003
6-33 to 6-36	3/3/08	Superseded	Revised near-field modeling HAP results based on revised modeling for years 2000 and 2003

Page Numbers	Revision Date	Action	Description
7-1 (7-2)	1/18/08	Superseded	Removed first and last sentence of first paragraph after Note. Text removed was: *MBFP is proposing to construct a 13,000 barrel per day (BPD) Industrial Gasification & Liquefaction Plant near Medicine Bow, Wyoming.* *The proposed project is scheduled to start construction in the spring of 2008 with the construction being complete by December 2010.*
Appendix B	5/29/08	Superseded	Edits to pages B-1, B-2, and B-3 through B-11 to correct mercury emission rates.
Appendix B	4/23/08	Superseded, Addition	Replace pages B-1 and B-2 to reflect updated coal storage & processing emission rates Replace page B-29 (SBH Mine, coal storage emission calculations) with renumbered page B-29(1) and additional pages for coal mining emission calculations (pages B-29(2) through B-29(16)). Page B-30 reprinted, due to pagination detail.
Appendix B	2/12/08	Superseded	Emission revisions requested by WDEQ * and page numbering changes
Appendix F	1/4/08	Superseded	Updated coal storage BACT analysis
Appendix H	1/18/08	Addition	Added Incremental NO_x Removal Cost as Appendix H
Appendix I	2/12/08	Superseded	Revised to discuss far field modeling only (since near field modeling has been re-run)
Appendix J	2/12/08	Superseded	Moved and revised near field modeling discussions to Chapter 6; far field modeling description remains
Appendix N	1/18/08	Added	Added tabbed divider
Appendix O	2/13/08	Deleted	Delete Appendix O pages (see revised Appendix H)

* During a meeting on January 18, 2008, WDEQ requested emission changes to minimize recordkeeping and reporting requirements and simplify permit writing. For certain equipment, MBFP agreed to increase operating hours and base emission calculations on the highest-emitting fuel (natural gas) in order to streamline compliance. Consequently, potential emissions were increased. Notes reflecting actual equipment operations have been added to pertinent spreadsheets. WDEQ stated that BACT analyses would not be affected by these simplifying assumptions, and would instead be based on the actual operations of the equipment.

4.2 BACT SUMMARY

Table 4.2 summarizes BACT proposed for this project:

Table 4.2 - Summary of BACT Applied to the Plant

Source	Proposed BACT Method
Combustion Turbine/HRSG/Steam Turbine Combined Cycle Trains (3x3x1)	NO_x SCR with NO_x control to 6 ppmvd NO_x (corrected to 15% O_2) in the HRSG exhaust when firing fuel gas mixture or natural gas CO: Catalytic Oxidation control to 6 ppmvd CO (corrected to 15% O_2) in the HRSG exhaust when firing fuel gas mixture or natural gas VOC: Collateral control from Catalytic Oxidation control to 1.4 ppmvw CO (corrected to 15% O_2) in the HRSG exhaust when firing fuel gas mixture or natural gas PM/PM10: Good combustion practices SO_2: SRU system designed to reduce fuel sulfur concentrations to 0.1 ppmvd and combustion of low sulfur natural gas as supplementary fuel
Auxiliary Boiler and Process Heaters	NO_x: Low NO_x burners CO, VOC, PM/PM10: Good combustion practices SO_2: SRU system designed to reduce fuel sulfur concentrations to 0.1 ppmvd and combustion of low sulfur natural gas as supplementary fuel
Storage Tanks	Gasoline, Methanol, Heavy Gasoline, and Slop Storage tanks will have internal floating roofs; all other tanks will have fixed roofs
Coal Handling	Dust suppression (fogging) used in combination with fully enclosed conveyors and passive engineering design at transfer points
Equipment Fugitives	VOC: Leak Detection and Repair (LDAR) program
Sulfur Recovery Unit (flare and thermal oxidizer)	Re-route tail gas to upstream point in SELEXOL® Unit
Carbon Dioxide Vent	Startup, shutdown, upset conditions only (<50 hours/year), optimized process design
Gasifier Preheaters	Low sulfur fuel (natural gas), good combustion practices, restricted operation (initial startup and new refractory only, < 500 hours/year per gasifier)
Black-Start Generators	Low sulfur fuel (natural gas), good combustion practices, restricted operation (initial startup only, <360 hours/year)
Firewater Pump	Restricted operation (<500 hours/year), ultra-low-sulfur diesel fuel (15 ppm sulfur), good combustion practices

4.3 COMBUSTION TURBINE CONTROL TECHNOLOGY REVIEW

The following is the BACT analysis for the proposed combustion turbines. Each of the three proposed combustion turbines will be a GE 7EA model turbine with a nominal capacity of 66 MW at average ambient conditions. Each combustion turbine will have a heat recovery steam generator (HRSG), and all three will utilize one steam turbine generator, in a 3 x 3 x 1, combined cycle configuration. The primary fuel will be a fuel gas mixture comprised of imported natural gas plus process generated fuels including: LPG from the MTG process, and fuel gas from both the Davy and MTG synthesis processes. By volume, the combustible portion of this natural gas based fuel mixture will consist primarily of methane (61.4%), hydrogen (15.3%), and butane (5.1%). Each combustion turbine will also be capable of firing natural gas, for startup, fuel enrichment, and backup purposes. Finally, under certain market conditions, each combustion turbine may also be fired with a syngas-based fuel mixture. By volume, the combustible portion of this syngas-based fuel mixture will consist primarily of hydrogen (46.1%) and CO (44.5%) with a small amount of hydrocarbons.

4.3.1 Nitrogen Oxides BACT Analysis for the Combustion Turbines

NO_x is formed during combustion primarily by the reaction of combustion air nitrogen and oxygen within the high temperature combustion zone (thermal NO_x), or by the oxidation of nitrogen in the fuel (fuel NO_x). Because the tail gas contains negligible amounts of fuel-bound nitrogen, essentially all combustion turbine NO_x emissions originate as thermal NO_x.

The rate of thermal NO_x formation in the combustion turbines is primarily a function of the fuel residence time, availability of oxygen, and peak flame temperature. Several NO_x control technologies are available to reduce the impacts of these variables during the combustion process, including diluent injection and dry low NO_x burner technology. Post-combustion control technologies have also been used in some processes to remove NO_x from the exhaust gas stream.

Identify Control Technologies

The following NO_x control technologies were evaluated for the proposed combustion turbines:

Combustion Process Controls

- Diluent Injection
- Dry Low NO_x Burners
- Low NO_x Burners
- Flue Gas Recirculation

Post-Combustion Controls

- EMx™
- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)

operations. Another factor is that this carbon dioxide stream is a product. Design elements that maximize the reliability of the carbon dioxide stream and minimize startup, shutdown, and malfunction periods will reduce the frequency and duration of venting events. The venting is only anticipated for a few days during initial startup (approximately 250 hrs/yr for the first year). Since the plant will be started up at reduced load, the venting will be at a reduced rate (approximately 25% of the normal process stream flow rate). Venting is anticipated for only a few hours for subsequent warm starts, not to exceed 50 hrs/yr. Again, the venting would be at a reduced load (approximately 50% of the normal process stream flow rate).

Catalytic oxidation is not technically feasible based on the low temperature of the vent stream, approximately 100°F. Based on the temperature and large flow rate, an extremely large amount of energy would be necessary to oxidize the CO with a thermal oxidizer, and may not be possible due to the size of the stream, low temperature, and high concentration of CO_2 in the stream. RBLC ID WY-0042 contained a process identified as "Vent, CO_2 Product" where incineration was not feasible due to CO_2 concentration in the gas. RBLC ID WY-0056 contained a process identified as "CO_2 Product Vent, Train III" that also vented uncontrolled.

The total annual proposed CO emissions to be permitted from the CO_2 stack are 275 tpy for the initial year of operation. Subsequent years will be limited to 74 tpy of CO. The proposed VOC emissions are 0.02 tpy for the first year and 0.01 tpy for subsequent years. Based on the limited operating time and resultant emissions, further controls are not warranted. Thus, an optimized process design is considered BACT for this process vent.

4.10 GASIFIER PREHEATING CONTROL TECHNOLOGY REVIEW (STARTUP OPERATIONS ONLY)

During the initial startup operations, or if new refractory is in place in a gasifier, a designated 21 MMBtu/hr natural gas burner is used to preheat the refractory lining prior to commencing tail gas production. Potential emissions from the natural gas combustion in the gasifiers is exhausted from a preheat vent located on each gasifier. The primary potential emissions from the gasifier preheat vents are NO_x and CO. Each gasifier preheat vent has a potential to emit less than 1 ton per year of NO_x and CO as discussed in the emission inventory. Emissions of VOC and particulate will also be relatively small based on the short operating time, approximately one week for each gasifier, for initial startup (and refractory replacement) only. Subsequent startup operations will be warm starts and will not include this step. The expected operating hours for the gasifier preheaters are 500 hours per year per heater, for a total of 2,500 hours per year. Good combustion controls that optimize burner efficiency will minimize potential NO_x, CO, VOC and particulate emissions. Because a low-sulfur-fuel (natural gas) is being used for preheating, the potential emissions of SO_2 will also be small.

The use of a low-sulfur-fuel, restricted operating conditions, and good combustion practices are proposed as BACT for each of the five (5) gasifier preheat burners. Table 4.4 shows the proposed BACT emission rates for each gasifier preheater.

Table 4.4 – Gasifier Preheater BACT Analysis Summary

Pollutant	Proposed BACT	Proposed BACT Emission Limits (emission limits are per gasifier preheater)
NO_x	Low Sulfur Fuel Good Combustion Practices Restricted Operation (startup only)	NO_x Limit: 0.26 tpy
SO_2		SO_2 Limit: <0.01 tpy
CO		CO Limit: 0.43 tpy
VOC		VOC Limit: 0.03 tpy
PM		Particulate Limit: 0.04 tpy (PM_{10} - filterable)

4.11 BLACK-START GENERATOR CONTROL TECHNOLOGY REVIEW (STARTUP OPERATIONS ONLY)

The proposed Plant will include three (3) 1.6 MW natural gas fired generators for use during startup. The generators will be used for commissioning and initial startup. Key utility systems such as instrument air, water supply and purification, firewater, and nitrogen will be made operational prior to initiating the startup sequence for the process. It is especially important that the flare system be ready for service before any flammable gas is present. Once critical utilities are in service, one of the three gas turbines is started on natural gas. This will produce enough power to displace the Black-Start generators. The primary potential emissions from the Black-Start generators are NO_x and CO. Emissions of VOC and particulate will also be relatively small based on the short operating time and infrequent use (only initial startup and commissioning and upset conditions). The maximum hours per year proposed for the Black-Start generators are 360. Subsequent startup operations will be warm starts and are not anticipated to require firing of the Black-Start generators. Good combustion controls that optimize combustion efficiency will minimize potential NO_x, CO, VOC and particulate emissions. Because natural gas is being used, the potential emissions of SO_2 will also be small. Additionally, these natural gas fired generators will also be subject to and will comply with the NSPS for Stationary Compression Ignition Combustion Engines (Subpart IIII), as applicable.

The use of a natural gas, restricted operating conditions, and good combustion practices are proposed as BACT for the three Black-Start generators. Table 4.5 shows the proposed BACT emission rates for each Black-Start generator.

Table 4.5 – Black-Start Generator BACT Analysis Summary

Pollutant	Proposed BACT	Proposed BACT Emission Limits (emission limits are per generator)
NO_x	Natural Gas Fired Good Combustion Practices Restricted Operation (initial startup only)	NO_x Limit: 0.80 tpy
SO_2		SO_2 Limit: <0.01 tpy
CO		CO Limit: 1.93 tpy
VOC		VOC Limit: 0.72 tpy
PM		Particulate Limit: 0.0002 tpy (PM_{10} - filterable)

Table 5.2 – Subpart Kb Tanks List

Tank Name	Tank	Number of Tanks	Operating Temperature (°F)	Vapor Pressure At Operational Temperature (psia)	Liquid Capacity (Gallons)	Roof Type
Methanol Tanks	*TBD*	2	45	0.96	6,341,984	IFR
Gasoline Product Tanks	*TBD*	8	45	4.14	6,341,984	IFR
Heavy Gasoline Tank[1]	*TBD*	1	45	2.25	4,763,841	IFR

1. "Heavy" gasoline is estimated to have RVP of 3-5 psia.

Subpart Y Coal Preparation Plant NSPS

Under 40 CFR Part 60, Subpart Y, coal transfer, crushing, and drying activities are subject to particulate matter emission limits. Specifically, emissions from coal conveying equipment may no exceed 20 percent opacity. Use of fully covered conveyors and fogging of transfer points at the Plant should maintain compliance with Subpart Y particulate emission limits and opacity standards.

Subpart VV Equipment Leaks in the SOCMI Industry NSPS

The Plant does not meet the definition of a facility that is part of the Synthetic Organic Chemical Manufacturing Industry (SOCMI). Consequently, the Plant is not subject to this regulation.

Subpart IIII Stationary Compression Ignition Internal Combustion Engine NSPS

The diesel Firewater Pump will be subject to the compression ignition (diesel) engine NSPS. Compliance with this regulation is relatively simple for engine owners who purchase an engine that is certified by the engine manufacturer to meet new engine standards. MBFP will likely purchase a 2008 or later model year engine and will comply with this rule.

Subpart JJJJ Stationary Spark Ignition Internal Combustion Engine NSPS

The three Black-Start Generators will be subject to the spark ignition engine NSPS. In addition to purchasing engines that are certified by the engine manufacturer to meet the required new engine standards, MBFP will comply with performance testing, maintenance, and recordkeeping requirements and operate the engines in accordance with good air pollution control practices to minimize emissions. MBFP will conduct initial performance tests and, due to the limited usage of these units, will repeat performance tests every three years.

Subpart KKKK Stationary Combustion Turbines NSPS

The combustion turbines will be subject to NSPS codified in 40 CFR Part 60, Subpart KKKK. Affected units will include the three combustion turbines because they each have a heat input at peak load of more than 10 MMBtu/hr and will commence construction after February 18, 2005 [§60.4305(a)].

The combustion turbines will burn a mixture of fuel gas, LPG, and natural gas. Since more than 50 percent of the mixture will be natural gas, the turbines will be deemed to be firing natural gas [§60.4325]. Therefore, the NO_x emission limit will be based on a new turbine with a heat input of between 50 and 850 MMBtu/hr firing natural gas fuel. The applicable NO_x limit is 25 ppm (corrected to 15 percent oxygen) or 1.2 lb/MWh [40 CFR Part 60, Subpart KKKK, Table 1]. The turbines can meet the SO_2 compliance requirements by burning fuels with potential emissions of less than 0.060 lb SO_2/MMBtu [§60.4330(a)(2)]. Extensive monitoring, recordkeeping, and reporting are required by the rule. Because the combustion turbines will be subject to this recent NSPS, they will not be subject to CAM requirements.

5.2.2 National Emissions Standards for Hazardous Air Pollutants (NESHAP)

The Plant will be a major source of HAPs. Consequently, it may be subject to a variety of NESHAP regulations. The following discussion identifies NESHAPs that are potentially applicable to the facility.

Subpart ZZZZ Reciprocating Internal Combustion Engine NESHAP

Subpart ZZZZ within 40 CFR Part 63, will apply to all reciprocating internal combustion engines (RICE) at the Plant that have a site rating of more than 500 brake horsepower. The three Black-Start Generators, each nominally rated at 2,889 horsepower, will be subject to rule. However, many of the compliance requirements within Subpart ZZZZ may not apply to these units, depending on their use. They may qualify as "emergency use RICE" or as "limited use RICE," especially if they are used less than the amount of time assumed for emission estimation purposes in this permit application (360 hr/yr, each).

Subpart DDDDD Industrial-Commercial-Institutional Steam Generating Unit NESHAP

The Industrial-Commercial-Institutional Steam Generating NESHAP (40 CFR Part 63, Subpart DDDDD) is currently being implemented by the WDEQ via provisions in WAQS&R, Chapter 3, §3(b). Although federal implementation of this NESHAP has been vacated by a federal court decision, the WDEQ continues to enforce this NESHAP.

Regulatory requirements depend on the classification of each boiler and process heater at the Plant. Proposed equipment at the Plant will likely be classified as follows.

- New small gaseous fuel equipment: HGT Reactor Charge Heater
- New large gaseous fuel equipment: Auxiliary Boiler, Catalyst Regenerator, and Reactivation Heater

Based on these classifications, the HGT Reactor Charge Heater will be subject only to initial notification requirements. In contrast, the large gaseous fuel equipment will be subject to a CO emission limit of 400 ppmv (dry basis, corrected to 3 percent oxygen). Because each of the large gaseous fuel emission units at the Plant has a maximum heat input rate of less than 100 MMBtu/hr, installation of a continuous emission monitoring system (CEMS) will not be required. MBFP will comply with all applicable Subpart DDDDD notification, performance testing, recordkeeping, and reporting requirements.