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November 11, 2008

Chad Schlichtemeier
Wyoming Department of Environmental Quality
Air Quality Division / NSR Program Manager
Herschler Building
122 West 25th Street
Cheyenne, WY 82002

**Subject: Medicine Bow Fuel & Power LLC
Proposed Integrated Gasification and Liquefaction Plant
(PSD Air Quality Permit Application AP-5873)
Clarification of normal SO₂ emissions**

Dear Mr. Schlichtemeier:

Attachment 1 is intended to provide further clarification regarding normal Medicine Bow Fuel & Power (MBFP) SO₂ emissions as follow-up to the MBFP October 14, 2008 letter. The October 14 letter was in response to a letter from Mr. Andrew Keyfauver, dated September 5, 2008, that included a request for additional information regarding normal startup emissions.

We hope this information is useful and encourage you to contact us if you have any questions regarding this clarification information.

Sincerely,

Jude Rolfes
Senior Vice President

CC: Andrew Keyfauver (QDEQ)
Robert Moss (DKRW)
Susan Basset (URS)

Enclosure: Attachment 1

Making Material Change

Copy Sent To: CH
Date: 1-5-09

DEQ 001482

Attachment 1

**Medicine Bow Fuel & Power LLC
Proposed Integrated Gasification and Liquefaction Plant
(PSD Air Quality Permit Application AP-5873)
Clarification October 14, 2008 response WDEQ September 5, 2008 Information Request**

In correspondence to WDEQ dated October 14, 2008, Medicine Bow Fuel & Power LLC (MBFP) addressed public comments regarding MBFP SO₂ emissions. The response discussed malfunction emissions in the first year and subsequent normal years. This is a clarification of the October 14, 2008 correspondence further detailing expected emissions due to normal maintenance operations.

Normal Operations

The gasification block of the plant includes coal processing, gasification, syngas scrubbing, and slag handling. During normal operations the plant is expected to operate continuously with no planned annual plant shutdown events. The plant can operate continuously due to the multi-gasifier configuration of the plant. This scenario is what is presented in the permit application, with the majority of the normal SO₂ emissions from the power block stack and no normal emissions from the high pressure flare.

Due to the complexity of the system and in order to minimize unplanned shutdowns (malfunctions), periodic maintenance is required on critical components. The maintenance schedule and procedures will be part of the plant's preventative maintenance program. This will be a set of operating procedures initially based on vendor and licensor information and on lessons learned from other similar gasifiers. The procedures are to be revised as required to incorporate lessons learned at MBFP during its operating lifetime; industry best practices; and plant design changes based on lessons learned at MBFP or at other operating facilities. If a component has a built-in spare (for our example the MBFP spare gasifier), maintenance can be conducted without impacting operations or emissions. Some components, such as the gasifier burner, require a switchover event several times each year, where the standby gasifier is started up and the gasifier to be maintained is shutdown. This is a planned event coordinated to minimize upsets to downstream systems and minimize flaring of syngas. Because in normal operation MBFP will have four operating gasifiers, these planned switchovers of a single gasifier reduce facility output for a short duration and does not result in the need for cold starts. Flaring syngas is not desirable because it results in lost revenue for the plant and increases emissions.

Based on the experience of existing similar gasifiers the planned maintenance activity that will govern the gasifier switchover schedule is the replacement of the burner.¹ This item is placed under extreme conditions; temperature fluctuations, high heat, abrasive slurry flow, and exposure to high purity oxygen.

¹ Steve Hrivnak, Fine Tuning to Improve Reliability and Availability of Coal Based Gasification, 2001, page 6.

It is expected that this maintenance may be required every 60 days, although burner life is improving and approaching 90 days in newer models.^{2,3} Planned maintenance is expected to be coordinated such that four gasifiers are operating at all times. When maintenance is required on one of the four operating gasifiers the standby gasifier will be started up and the gasifier train to be maintained will be shutdown. Minimal flaring is expected during these planned switchovers based on published data and discussions with operators of existing similar facilities.^{4,5} After the gasifier is shutdown its burner will be changed out and scheduled maintenance that would be due prior to the next planned shutdown for that gasifier train is performed. After completion of the maintenance the gasifier is heated using the preheater in preparation for the next switchover event. Based on this maintenance plan, the plant is expected to have minimal high pressure flare emissions during normal operations, including maintenance activities.

In the air permit application, the emissions that could result from maintenance were included in the malfunction section, since malfunctions often drive switchovers and shutdowns that can be used as opportunities to conduct planned maintenance, including burner change out. This assumption was made based on published data showing the gasifier run time between shutdowns and switchovers being less than the gasifier life (i.e. the time until a gasifier must be shut down for major maintenance).⁶ To separate planned maintenance from malfunctions the calculated emissions for normal planned maintenance, assuming no maintenance is performed during a malfunction shutdown, have been added to the Normal Operations section. It is noted that with this additional normal emissions results in a total of less than 40 tons per year SO₂. See Table 1 below.

The assumption for flaring duration during a gasifier startup is taken primarily from the Polk IGCC DOE final technical report⁷, which provides the best details on the startup raw syngas flaring event. Although this unit is a radiant cooled GE gasifier, it is expected that the purposes of flaring, purging the nitrogen from the system and building system pressure, are the same as for the GE quench gasifier to be used at MBFP and a similar timeline can be assumed. This will be confirmed during detailed engineering and incorporated into the Startup and Shutdown Minimization Plan. A conservative 60 day switchover cycle is assumed. Flaring is estimated to last 15 minutes at 50% of a single gasifier design flow rate. With a 60 day cycle a gasifier switchover will be conducted approximately every 12 days. During switchover events the downstream sulfur removal and recovery equipment can continue to run because flow to them is much greater than their turndown capability, so no acid gas flaring is expected during these events. So, estimated normal maintenance SO₂ emissions are:

² Hrivnak, page 6.

³ EPRI, Operating Experience, Risk, and Market Assessment of Clean Coal Technologies, : 2006, page 80.

⁴ Hrivnak, page 8.

⁵ DOE, Tampa Electric Polk Power Station Integrated Gasification Combined Cycle Project, Final Technical Report, 2002, page 74.

⁶ Hrivnak, page 4.

⁷ DOE, Tampa Electric Polk Power Station Integrated Gasification Combined Cycle Project, Final Technical Report, 2002, page 74.

Table 1: Maintenance Emissions

Source to HP Flare	Duration (hrs)	SO2 Flare Emissions (lb/hr)	Startups per year	tpy
Gasifier 1	0.25	939	7	0.82
Gasifier 2	0.25	939	6	0.70
Gasifier 3	0.25	939	6	0.70
Gasifier 4	0.25	939	6	0.70
Gasifier 5	0.25	939	6	0.70
Total				3.64

SO2 emissions due to flaring can be calculated using measured syngas flow to the flare and its H2S content. Flow monitoring equipment monitors flow and sulfur content can be determined either by direct sampling of the syngas or sampling of the coal. Details will be determined during detailed engineering and incorporated into the operating procedures.

Gasifier flaring can also result from upstream and downstream component problems, such as with the air separation unit, the coal preparation section, syngas cool-down components, syngas shift components, or the acid gas removal system. In order to prevent shutdowns for maintenance, MBFP critical equipment will be equipped with operational spares to allow planned maintenance without shutting down the gasifiers.

Per the licensor process design packages, every three to four years the plant is expected to perform a full plant shutdown for major maintenance requirements. At the end of this shutdown a cold startup will be performed with higher emissions than normal years. It is expected that cold start emissions after the initial year will be less than the first year due to operator training and improvements to the plant and its operating procedures.

Conclusions

Medicine Bow does have the potential for emissions as a result of normal maintenance. The above calculations update the air permit to reflect these potential emissions, but based on current estimates, MBFP continues to be below the 40 tons per year emissions limit for SO₂ (total for normal and normal maintenance emissions being 32.65 tons per year SO₂ from Table 1.1 of the air permit application plus 3.66 tpy SO₂ from normal maintenance that was under malfunctions in the application as mentioned above, now equals 36.3 total tons per year SO₂).

Facility emissions	32.65
Preheater emissions	0.0154
Planned maintenance emissions	3.64

36.3 tpy

During detailed design MBFP will develop a Startup and Shutdown Minimization Plan and verify the estimate for emissions during planned switchover events.