BEFORE THE ENVIRONMENTAL QUALITY COUNCIL
STATE OF WYOMING

IN THE MATTER OF:	)	Docket No. 09-2801
MEDICINE BOW FUEL & POWER, LLC	)	
AIR PERMIT CT-5873	)	

Report of Katrina Winborn, P.E.

Qualifications

I have over 17 years of professional experience in the fields of process engineering and air quality compliance and permitting, including 10 years of industrial-sector work on-site at two large (more than 150,000 barrels per day of crude oil capacity) petroleum refineries and one large (more than 1,000 MW) coal-fired electrical generating station. I have had opportunity to work with state environmental agency staff, the EPA, corporate management staff, environmental professional peers, project and process engineers, plant management staff, and operations personnel regarding matters ranging from ongoing air quality compliance (day-to-day practical, "real" issues) and air quality permitting to regulatory and policy review, commentary, and development.

I have a Bachelor of Science degree in Chemical Engineering from the University of Arkansas, and a Master's degree in Environmental Policy and Management from the University of Denver. I am a licensed Professional Engineer (Environmental Engineering) in the states of Wyoming, Colorado, and Louisiana.

Currently, I work as an air quality consultant, assisting clients with obtaining air quality construction and operation permits, and providing assistance with a wide variety of air quality compliance issues. The majority of my clients are located, or have facilities operating in, the Rocky Mountain Region, although I continue to work with clients and facilities located across the United States. I primarily work with clients in the oil and gas sector (upstream E&P/wellhead facilities, midstream operations, and transmission

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facilities), petroleum and petrochemical production, other petrochemical production, power generation, cement manufacturing, and ethanol production. I have personally worked with over fifteen Prevention of Significant Deterioration permits and numerous other air quality construction permitting projects involving complex emission calculations, including netting analyses, as prescribed by the New Source Review regulation. Additionally, I have worked on numerous air quality operating permits, to obtain initial permits, renewal permits, and revised permits following permitted modifications to facilities which require subsequent operating permit modification.

I was directly and closely involved with the EPA's National Petroleum Refinery Enforcement Initiative during my years working on-site at a large oil refinery. I became involved in the work as the EPA began its Initiative, and so I gained insight about the Initiative's goals and the EPA's concerns and "marquee issues" while responding to EPA data requests and assisting with Consent Decree development for my company. My company, Motiva Enterprises, was the third major refiner to sign a Global Clean Air Act Consent Decree with the EPA, and I was fortunate to be involved in both developing the Consent Decree and implementing its requirements (including pollution control installation, performing audits, training operations staff, and implementing work practices) at the facility where I was working full-time. I have also been involved with Consent Decree implementation at a large coal-fired electric utility, working with similar issues and performing similar work.

Introduction

This report has been prepared in response to the Initial Expert Report of Ranajit Sahu, submitted by the Sierra Club on September 1, 2009. Dr. Sahu's report focuses on six issues, repeated below, pertaining to Permit No. CT-5873, issued by the Wyoming Department of Environmental Quality (WDEQ) to Medicine Bow Fuel and Power, LLC, (MBFP) authorizing construction of an underground coal mine (Saddleback Hills Mine) and industrial gasification and liquefaction plant (IGL Plant) to be located in Carbon County.

As noted on the page 1 of Permit No. CT-5873, the Saddleback Hills Mine is expected to produce approximately 3.2 million tons per year of coal as feed to the IGL Plant, which will gasify the coal to produce 18,500 barrels per day of gasoline, 42 tons per day of sulfur, and 198 million standard cubic feet per day of carbon dioxide (CO_2).

As noted in the MBFP "Prevention of Significant Deterioration Permit Application," dated December 31, 2007 (PSD Permit Application), the IGL Plant will also produce approximately 253 million British thermal units per hour (MMBtu/hr) of fuel gas and 400 to 500 MMBtu/hr of liquefied petroleum gas, which will provide much of the energy required to produce up to 400 megawatts (MW) of electricity for plant operation. Three combustion turbines will be used to generate electricity. MBFP states that it does not expect to export power to the electrical grid; therefore, all electrical power generated at the IGL Plant will be used for plant operation.

The six issues addressed by Dr. Sahu are listed on page 5 of his report, and are repeated here:

> *"(i) Medicine Bow and the Wyoming Department of Environmental Quality (DEQ) did not properly consider the emissions of various pollutants, including sulfur dioxide (SO2) from normal operations of the proposed flares, as part of their potential to emit calculations. In effect, DEQ excluded emissions that will be part of the normal operations from the facility by improperly defining what is normal;"*

"(ii) Medicine Bow and DEQ did not properly conduct the (BACT) analysis for SO2 during startup, shutdown, and malfunction time periods notwithstanding DEQ's claim that the Startup, Shutdown, and Maintenance (SSM) Plan constitutes BACT;"

"(iii) Medicine Bow and DEQ did not accurately estimate all of the fugitive VOC and HAP emissions that are likely to be emitted by the proposed plant; DEQ also did not properly support its contention that BACT for fugitive VOC emissions is the Leak Detection and Repair (LDAR) program proposed by Medicine Bow;"

"(iv) Medicine Bow and DEQ improperly classified the proposed facility as a minor source of emissions of hazardous air pollutants (HAPs), thus exempting it from applicable Maximum Achievable Control Technology (MACT) standards;"

"(v) Medicine Bow and DEQ failed to properly consider a regulated air pollutant, PM2.5 in their analysis;"

"(vi) Medicine Bow and DEQ improperly excluded emissions of fugitive particulates from the required dispersion modeling."

The remainder of this report will address Dr. Sahu's response to each issue in the order presented above, with additional or clarifying information to support my professional opinion as necessary. Note that issue (iii) above contains two issues that were addressed separately in Dr. Sahu's report and are likewise addressed separately in this report.

Issue (i): Emissions of Various Pollutants, Including SO_2, in Potential-to-Emit Calculations

Based on review of the available documents (notably, the MBFP PSD Permit Application, correspondence between MBFP and WDEQ, the WDEQ AP-5873 Application Analysis, and WDEQ CT-5873 Decision Document), the WDEQ appropriately determined the proposed facility to be a minor source of SO_2 emissions under the New Source Review (NSR) program.

PTE Calculation

A facility's Potential-to-Emit (PTE) emission rate is calculated (for each pollutant) on the basis of the equipment design capacities, taking into account physical or operational limitations, and including limitations from pollution control devices or air permit restrictions provided that the air permit limitations are federally enforceable. It is my experience that when calculating an emission source's PTE, emissions from normal operations are included. If a facility conducts startup and shutdown activities as part of its normal operations, then emissions from such normal startups and shutdowns are included in the PTE calculation. Normal startups and shutdowns can be distinctly different than those resulting from large-scale maintenance work at the facility.

Emissions resulting from "cold" startups are a special case. Many large and complex plants conduct occasional broad-scale maintenance work (known as "outages," or "turnarounds") on extensive portions of their plants, sometimes on the entire facility. During outages and turnarounds, equipment is removed from service, shutdown, de-pressurized, and brought to ambient temperature in order for maintenance to safely proceed. During startup following an outage or turnaround, the equipment is brought up to operating temperatures and pressures (hence, the term "cold startup") and the facility begins to operate once more. The extensive amount of work involved with outages and turnarounds makes them unique, and typically, the associated startup activities are notably different than normal and routinely-occurring startup activities. The same is true for outage and turnaround-related cold startup emissions; they are notably different from normal, routine startup emissions due to procedures that differ from normal. Although facilities generally schedule outages and turnarounds within given frequencies (as an example, every 4 to 6 years), the actual times between outages and turnarounds can vary due to factors such as equipment inspection results, economics, maintenance concerns, et cetera, that can play into scheduling an outage. The combined effect is that cold startup emissions tend to be larger, yet episodic and less frequent, and more unpredictable than normal startup emissions. It is my experience (10 years working in operating facilities, and 7 years assisting operating facilities with air quality permitting) that these "cold start" emissions are not included in a facility's PTE emission rates.[1]

<u>Unintended Consequences of Including Cold Start Emissions in PTE</u>

A very practical, and environmentally beneficial, reason exists for an agency to omit cold startup emissions from a facility's PTE: if such emissions are included in the PTE, then those emissions have been permitted, and the facility is then allowed to emit up to that level established as the PTE. If cold start emissions occur on an episodic, infrequent basis (for example, once every 3, 4, or 5 years), yet when they occur they are significantly larger than emissions from the normal operating years, it follows that a PTE that includes cold start emissions would be significantly over-estimated for the normal operating years (when no outage or turnaround occurs). However, since the emissions would be permitted, the facility could legally emit up to the PTE level during normal operating years. In my opinion, this would be an unintended negative consequence to including cold start emissions in the PTE.

PTE levels based on normal operating emissions, including normal startups (as the WDEQ has done with MBFP Permit CT-5873), places a greater limitation than PTE levels that include cold startup emissions and would provide ongoing incentive during normal years to use operating procedures and maintenance practices to keep emissions at the lower, normal levels. During cold startup years, MBFP will be faced with a strong incentive to continually improve its cold startup procedures such that emissions are

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[1] This discussion applies to shutdown emissions related to shutdown activities for outages and turnarounds. Shutdown emissions are not discussed here, as they are not the focus of this discussion for the MBFP facility.

minimized; since emissions occurring from cold startups are not permitted and must be reported as excess emissions in violation of the permit, subject to potential penalty. Current EPA policy on this issue is that excess emissions from startup activities are determined to be violations, but each violation is assessed on a case-by-case basis, with States using their enforcement discretion to determine if penalties should be assessed. My experience and observation for these scenarios is that EPA and state agencies are now critically reviewing excess emissions related to startup, and they question startup procedures and work with permittees to reduce or prevent emissions generated during cold startups.[2] This review has already started for MBFP, with the WDEQ asking for the Startup/Shutdown Emission Minimization Plan to be created, and the resulting permit condition in Permit CT-5873 requiring any change to the plan to be approved by the WDEQ. This dialogue with the WDEQ and the incentive to control, reduce, and prevent cold startup emissions would not be as likely to happen in a situation where cold startups are permitted through inclusion in a facility's PTE. It is my opinion that the more stringent approach is to omit cold startup emissions from the PTE, such that cold startup emissions, if they occur, are not permitted.

<u>No Change to Selected Best Available Control Technology (BACT)</u>

If cold start emissions were to be included in the facility's PTE, and if the facility were designated as a major source of SO_2 emissions and required to conduct a (PSD) SO_2 BACT analysis on flaring emissions (including cold startup emissions), then the selected SO_2 BACT would be the same as that selected today for controlling normal startup emissions: a Startup/Shutdown Emission Minimization Plan.

In accordance with the Wyoming Air Quality Standards and Regulations (WAQSR), Chapter 6, Section 2, a BACT analysis was performed for all SO_2 emission sources at the facility (refer to the WDEQ AP-5873 Application Analysis), as well as for normal startup/shutdown emissions. The result of this analysis determined that use of the Startup/Shutdown Emission Minimization Plan represents BACT for flare emissions.

[2] The best scenario is to prevent startup emissions through careful evaluation of procedures, combined with careful operation/maintenance practices performed by well-trained operations staff. Fewer process vents generated during startup procedures results in less flow to flares, which results in fewer emissions.

(The plan will be discussed in more detail in the following section of this report.) This plan would be selected as BACT under a PSD-level review for SO_2 from flaring as well, due to the fact that in this case, no differences exist between possible SO_2 flaring emissions controls regardless if evaluated under a WAQSR-required BACT analysis, or if evaluated under a PSD-required BACT analysis. Very few emission control options exist to control flaring emissions. The flare itself is a pollution-control option for VOC emissions from process vents that would otherwise be vented to atmosphere.[3] No "end-of-pipe," or post-combustion emission control options exist for flares; the only available SO_2 control options rely on controlling the sulfur content in the vent streams directed to flare and in preventing or reducing the amount of flow directed to the flare.[4]

Additionally, no differences exist between potential controls from normal startup flaring emissions and cold startup flaring emissions. The quantity of emissions from normal and cold startups may vary, due to varying flow rates to the flare as well as varying compositions from the process vents during normal startups versus cold startups, but collectively, the type of emissions (process vent streams) generated during normal and cold startups are generally the same, and they would be controlled the same way.

Therefore, even if the cold startup flaring emissions were counted in the MBFP PTE, and even if the facility was determined to be a major source of SO_2 emissions subject to PSD review, the result of the PSD SO_2 BACT analysis for flaring would remain the same as the option selected under the WAQSR-required BACT analysis and required in Permit CT-5873 (the Startup/Shutdown Emission Minimization Plan).

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[3] The flares are also safety devices for safely disposing of unexpected hydrocarbon vents.

[4] For improved combustion from the flare, which is desirable for better control of CO, PM_{10}, VOC, and HAP flaring emissions, other potential control options exist, such as improved flare design and various steam or air-assist options, all intended to provide for more complete combustion to avoid generating CO and PM_{10}, and to avoid venting VOC and HAP. In the case of SO_2, the options are very limited: complete combustion is desired in order to avoid venting hydrogen sulfide (H_2S) present in vent streams, but more complete combustion of H_2S will generate more SO_2. Therefore, the obvious, and most effective, solutions for controlling SO_2 flaring emissions focus on controlling *what* and *how much* is directed to the flares.

Issue (ii): Startup/Shutdown Emission Minimization (SSEM) Plan

Note: The MBFP Startup/Shutdown Emission Minimization Plan is referred to as the "SSM Plan" in both the WDEQ's final Decision Document for Permit No. CT-5873 and Dr. Sahu's report, as well as in other documents submitted to the Environmental Quality Council. This abbreviation will not be used in this report; the acronym "SSEM" provides more meaning and will avoid confusion. The acronym "SSM" is generally understood among air quality professionals to mean "startup, shutdown, and malfunction." The acronym SSEM will be used to represent the term "startup/shutdown emission minimization" in this report as a means to avoid confusing the MBFP SSEM Plan with SSM Plans required in Clean Air Act regulations such as 40 CFR 63 (NESHAP/MACT regulations).

Work Practices and Operational Standards as BACT

WDEQ does not have to justify reasons for establishing non-numerical limitations and work practices as BACT, because regulatory language in the federal PSD regulation at 40 CFR 52.21 provides justification within the definition for BACT for establishing non-numerical standards and work practices:

> *If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results." (40 CFR 52.21(b)(12))*

Thus, a work practice or operational standard is an acceptable means to establish BACT, and although a measure of emission reduction provided by a chosen work practice or operational standard is desired, the measure is to be established "to the degree possible."

This regulatory language allows the permitting authority to used discretion in setting such measures of emission reduction.

Top-Down BACT Methodology

The top-down BACT methodology for flaring emissions was not required for SO_2, as the MBFP facility is determined to be a minor source of SO_2 emissions.[5] As discussed earlier in this report, because the facility is a minor source of SO_2 emissions, PSD review (which includes a PSD BACT analysis, utilizing the top-down methodology for identifying control options and selecting one as BACT) was not triggered for SO_2. However, a BACT analysis was conducted for the flares in accordance with the Wyoming Air Quality Standards and Regulations (WAQSR) requirement to utilize BACT for any pollutants emitted from a proposed facility seeking a WY air quality construction permit.

Flare Emission Measurement

WDEQ noted that work practices were requested for the MBFP flares because emission limits for flares cannot be verified, to which Dr. Sahu responded by mentioning a technology (long-path infrared techniques) which has capability to measure flare emissions, but is not yet in common use. While this measurement technology sounds potentially promising for future flare compliance demonstrations, it has little bearing on the emission control technology evaluation necessary for determining BACT for the flares. Given the unique design of a plant flare, no "end-of-pipe" or add-on pollution control exists. Rather, the only potentially feasible options available for consideration in a flare BACT analysis are based on pre-combustion optimization and pollution prevention actions that focus on minimizing the quantity and frequency of vent gases directed to the flares. The ability to measure flaring emissions would provide an additional tool for compliance demonstration, but alternative methods exist to estimate

[5] For both MBFP flares, the pollutant of concern is SO_2. Although the flares will emit NOx, CO, PM_{10}, and uncombusted VOC as a result of normal operations (including normal startup and shutdown activities), the amounts of each pollutant emitted from the flares represent very small contributions when compared to other emission sources at the facility For example, the primary contributors to MBFP NOx emissions are the combustion turbines (refer to WDEQ's "AP-5873 Application Analysis" document for detail emission data).

flare emissions and control efficiencies, and neither direct emission measurement nor alternative emission estimation methods should factor significantly into the BACT selection for flares.

Possible Control Options

Possible control options for startup/shutdown flaring emissions, such as specific and enforceable work practice standards, minimum gasifier loads during startup, limits on startup duration, and limits on the number of startups per year, are noted in Dr. Sahu's report. The first option listed, a specific and enforceable work practice standard, is the option that was selected as BACT (the SSEM Plan). Other suggested options, such as the limitations on duration and number of startups per year, are not desirable due to potential economic impositions that could result. Pollution control technologies that are not cost effective due to significant economic impositions do not meet the regulatory definition of BACT, which allows for consideration of economic factors when selecting a control technology or work practice. The option to minimize gasifier loads during startup is one of several work practice standards already detailed in the SSEM Plan. The SSEM Plan contains multiple work practice standards in one document, and therefore will have the effect of enacting multiple pollution control/prevention strategies.

SSEM Plan

I consider the SSEM Plan and the corresponding permit condition requiring it to be a strong positive feature of the air permit. It is a well-reviewed document; WDEQ stated in its response to the Petitioner's Discovery Request that the SSEM plan was reviewed using engineering judgment, and the WDEQ's AP-5873 Application Analysis provides assurance that the SSEM Plan was reviewed, through a detailed discussion of key plan elements that will provide the most emission reduction/pollution prevention. It is my direct experience that a well-written plan, implemented with management and operational staff support, and accompanied with continual operator training can result in dramatic emission reductions and pollution prevention. Implementation of this plan can be recorded (through plant operating data and operator "log sheets"), and records related to plan implementation will be reviewed by the WDEQ Inspector in order to maintain the practical enforceability of the plan. MBFP will be allowed to make changes to the plan, and this should be expected as staff gains operational familiarity with the equipment and lean how to more efficiently operate the facility. The fact that all plan changes must be approved by WDEQ provides an assurance that the plan will continue receive critical review, while allowing a mechanism for improvements.

Conclusion

In summary, it is my opinion that the WDEQ sufficiently performed the BACT analysis for emissions from flaring, and the resulting SSEM Plan will provide for significant emission reduction/pollution prevention with the strong possibility of providing for additional emission reductions over the life of the facility. The SSEM Plan requirement in Permit CT-5873 is an example of how the permit provides incentive for MBFP to continuously improve operations and reduce emissions over time.

Issue (iii), Part 1: Fugitive VOC Emission Calculation

Dr. Sahu's report presents a discussion and his opinions regarding four variables involved with calculating fugitive VOC emissions from the proposed MBFP facility, as follows:

1. Fugitive component counts;
2. Engineering design details;
3. VOC and HAP emission factors;
4. Leak Detection and Repair (LDAR) control efficiency.

Responses to these issues and additional comments made within the discussions are provided in this section of the report.

Component Counts and Engineering Design Details for Fugitive VOC/HAP Emissions

MBFP provided detailed calculation pages in Appendix B of its PSD Permit Application, with each calculation page presenting a different process stream type (e.g., acid gas stream, knockout drum drainage process stream, gasifier vent process stream, etc.), and details of the equipment leak calculations. Detailed VOC and HAP stream compositions are provided for each stream type, based on engineering (material balance) data developed at the time of the permit application submittal. Component counts are provided for each stream type, also based on engineering data developed at the time of the permit application submittal. Each calculation page notes the basis of the emission factors used, with ample information provided to easily find the document on the EPA's website (verified personally through a quick Internet search using information provided in the calculation footnotes) and the corresponding table of emission factors in the document (MBFP used the SOCMI average emission factors, provided in Table 2-1 of the EPA's Protocol for Equipment Leak Emission Estimates document).[6] Section 3.2.6.3 of the PSD permit application explains the reasoning behind the selected emission factor table and notes the underlying basis for the control efficiencies presented in the Appendix B calculations. With this detailed information, the equipment leak calculations are easily verifiable and can be duplicated by anyone reviewing the application who wishes to check the calculations.

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[6] EPA, "Protocol for Equipment Leak Emission Estimates," EPA-453/R-95-017, November 1995. Available at http://www.epa.gov/ttn/chief/efdocs/equiplks.pdf

The amount of available data and references provided to justify and explain the fugitive equipment leak emission calculations is both typical and adequate, when compared to other permittees seeking an air quality construction permit. MBFP notes that it has provided the best available component estimate in the application; this is a logical and understandable statement to anyone who has been involved with detailed process design for a project and simultaneously tasked with obtaining an air quality construction permit (which must be obtained prior to starting construction on the proposed project). Engineering designs and detailed final drawings are typically not available at the time when the air permit must be obtained. As a result, the equipment leak emission rate is typically a conservative estimate.

In my experience, detailed engineering drawings are not provided with the air quality construction permit application. Component counts and references or assumptions used, as applicable, may be listed in the application to supplement the emission calculations, but detailed piping and instrumentation diagrams (P&IDs) are not provided in applications.

Typically, permitting agencies do not specify permit conditions regarding the component counts or stream compositions, due to their understanding that emission rate calculations have been based on conservative assumptions. Rather, the permitting agencies typically note the allowable (permitted) VOC and HAP emission rates in the permit, and entrust the permittee with the responsibility to comply with the agreed-upon emission limits. This keeps the burden of compliance with the permittee, who will suffer from the effects of enforcement violation and/or the requirement for re-permitting, if the emission rates have been under-estimated. In this case, the WDEQ has taken a special interest in the equipment leak emission estimate, due to the HAP emission rates (discussed later in this report) and has written a specific condition requiring MBFP to conduct a final "as-built" component count following facility construction, but prior to facility initial commissioning.[7] If the final component count results in VOC or HAP PTE emission

[7] MBFP Air Quality Permit CT-5873, Condition 19.

rates that are larger than those presented in the MBFP PSD Permit Application and WDEQ CT-5873 Decision Document, MBFP will be required to obtain a revised permit application and possibly conduct a MACT analysis prior to startup. Therefore, the final component count requirement in Permit CT-5873 provides a strong incentive to MBFP to carefully evaluate piping components during ongoing engineering design activities, in order to stay at or below the estimated VOC and HAP PTE emission rates.

Fugitive Equipment Leak VOC and HAP Emission Factors

The emission factors used to calculate fugitive equipment leak emissions are taken from the EPA's 1995 Protocol for Equipment Leak Emission Estimates (1995 Protocol Document). This document continues to be the primary source of emission data for air quality permittees seeking to establish permit limits for fugitive equipment leak emissions. Several websites, documents, and guidance support this statement:

- A review of EPA's "AP-42" emission factor website verifies that the 1995 Protocol Document is the only option or guidance currently presented by EPA for equipment leak calculations.[8]
- The only document on EPA's Emission Inventory Improvement Program (EIIP) website addressing equipment leak emissions was issued in November 1996, and notes in its Chapter 4 (Preferred Method for Estimating Emissions) that "[t]he EPA correlation equation approach is the preferred method when actual screening values are available....[f]or new sources, when no actual screening values are available, average emission factors can be used temporarily to determine fugitive emissions from equipment leaks until specific and/or better data are available." Following this, example calculations and data tables all reference back to data and average emission factors provided in the 1995 Protocol Document.[9]
- The NSR Guidance for Equipment Leak Fugitives website, provided by the Texas Commission on Environmental Quality (TCEQ), offers a document titled "Facility/Compound Specific Fugitive Emission Factors," addressing specific compounds, petroleum marketing terminals, oil and gas operations, and petroleum

[8] http://www.epa.gov/ttn/chief/ap42/ch05/index.html

[9] STAPPA-ALAPCO-EPA, Emission Inventory Improvement Program, "Preferred and Alternative Methods for Estimating Fugitive Emissions from Equipment Leaks, Final Report, November 1996.

refineries. Emission factors presented for petroleum refineries are footnoted to have been taken from the 1995 Protocol Document.

- The Mid-Atlantic Regional Air Management Association (MARAMA) commissioned a report published in October 2003 to evaluate petroleum industry VOC emissions and calculation methods. With regard to process equipment leaks, the study reiterated the 1996 EIIP preferred methodologies, citing the 1995 Protocol Document.[10]

Relevance of EPA Audits to Equipment Leak PTE Calculation

Comments made on page 10 of Dr. Sahu's report regarding the EPA's LDAR Audit program are immaterial to the equipment leak PTE calculation. The EPA LDAR audits referred to in the report are the audits undertaken by the EPA at the start of EPA's National Petroleum Refinery Initiative.[11] Based on my direct experience with the National Petroleum Refinery Initiative, as an air quality environmental engineer working within the petroleum industry at that time, it is my opinion that EPA's LDAR audits and the resulting Clean Air Act Consent Decrees for petroleum refiners were not focused on calculating PTE emission estimates. To my knowledge, documentation of the audits undertaken does not provide any reference back to the 1995 Protocol Document's average emission factors used to develop the MBFP equipment leak PTE emission rates, nor does it offer alternatives or corrections to the 1995 Protocol Document. Rather, the audits were focused on day-to-day LDAR program compliance, most notably, the means of field-testing and determining whether a component was above leak threshold standards and how the repairs were undertaken.[12] [13] The audit results directly relate to how actual, not potential, equipment leak emissions may be calculated and reported to state/local environmental agencies and the EPA.

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[10] Mid-Atlantic Regional Air Management Association, "Evaluating Petroleum Industry VOC Emissions in Delaware, New Jersey, and Southeastern Pennsylvania, Final Report," October 2003.

[11] http://www.epa.gov/compliance/data/planning/priorities/petrol.html

[12] EPA, "Enforcement Alert, Volume 2 Number 9 (EPA 300-N-99-014), October 1999.

[13] EPA Office of Enforcement and Compliance Assurance, "Leak Detection and Repair: A Best Practices Guide," (EPA-305-D-07-001), October 2007.

LDAR Control Efficiency

Dr. Sahu notes on page 10 of his report that

> *"...it is impossible to ascertain if the control efficiencies assumed by Medicine Bow, as a result of application of the LDAR program, are meaningful or real. Clearly DEQ could not have verified any of these assumptions. DEQ's review in this regard amounts to little more than rubber-stamping what it was provided by Medicine Bow."*

In response to these comments, refer to page B-32 of Appendix B of the MBFP PSD Permit application, titled "Equipment Leaks: Pump LDAR Control Effectiveness Calculation." The paragraph at the top of this page states:

> *"Leak detection and repair (LDAR) control effectiveness factors for valves and connectors are based on "HON reg neg" factors from Protocol for Equipment Leak Emission Estimates (Table G-1) [EPA-453/R-95-017]. These factors assume leak definitions of 500 ppmv for valves and connectors, which equate to the leak definitions expected to be used at MBFP. However, the HON reg neg leak definition for pumps in light liquid service is 1,000 ppmv, which is more stringent than the 2,000 ppmv leak definition planned for the LDAR program to be implemented at MBFP. Consequently, the LDAR control effectiveness factor for a 2,000 ppmv pump leak definition is calculated below. All table numbers refer to the Protocol for Equipment Leak Emission Estimates (Protocol)."*

Following this statement, the control effectiveness calculation for pumps is presented, with variables listed and equations provided. This page from the MBFP PSD Permit Application directly refutes Dr. Sahu's statements: the basis for the control efficiencies are clearly documented, an adjustment for the pump control efficiency is documented, and the adjustment calculation is provided. The basis for the control efficiencies and the adjustment calculation is noted to be the 1995 Protocol Document, which is publicly accessible and readily available to the WDEQ. It is my opinion that adequate detail was provided such that the control efficiencies assumed by MBFP can be verified.

Issue (iii), Part 2: Fugitive VOC Emission BACT Determination

Much of the discussion in Dr. Sahu's report for this issue focuses on the BACT methodology and the VOC BACT determination for fugitive emissions from equipment leaks. Thus, as a preface to this response, the recommended top-down BACT methodology should be reviewed.

The top-down BACT methodology is described in numerous places in the literature, but notably, a summary is provided at the beginning of Section 4 (Best Available Control Technology) of the MBFP PSD Permit Application. A summary of the five steps comprising the methodology is provided below, quoted exactly as presented on page 4-2 of the permit application:

> *Step 1:* *Identify all available control technologies with practical potential for application to the specific emission unit for the regulated pollutant under evaluation;*
>
> *Step 2:* *Eliminate all technically infeasible control technologies;*
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> *Step 3:* *Rank remaining control technologies by control effectiveness and tabulate a control hierarchy;*
>
> *Step 4:* *Evaluate most effective controls and document results; and*
>
> *Step 5:* *Select BACT, which will be the most effective practical option not rejected based on economic, environmental, and/or energy impacts.*

The VOC BACT analysis for equipment leak "fugitive" emissions followed the top-down BACT methodology, and the final determination was not based on a simple equivalency comparison to an existing NSPS or NESHAP program.

Top-Down Methodology

Step 1 of the Top-Down Methodology for determining BACT is to *identify* all potentially available control options, and then to move into Step 2 to *review* all potentially available control options. MBFP's air permitting consultant conducted a search of the literature, including current journals and technical publications, as well as phone interviews with air quality experts, and a review of recent BACT determinations on the EPA's RACT/BACT/LAER (RBL) Clearinghouse in order to create a list of potentially available control options for VOC from equipment leaks. Following this search, it was determined that the only potentially available control option was implementation of an LDAR program at the facility: "[t]he only available control technology for comprehensively addressing equipment leak fugitive emissions is a structured Leak Detection and Repair (LDAR) program…"[14] As a result, the top-down analysis naturally stopped at this point, and the one identified control option became the selected BACT.

One alternative, leakless valve and pump design, is mentioned in Dr. Sahu's report. Utilizing leakless valves and pumps would present several challenging questions in a BACT analysis, to the extent that it would likely be discounted as a potential control option. For example, in order to consider 'leakless valves and pumps' as a potential BACT option, it seems that a majority of the piping connections would need to be leakless. However, due to the large number and variety of components necessary for the MBFP facility (more than 4,000), it seems highly unlikely that a leakless valve make/model would be available for all valve and pump types located at the facility. Numerous other problems present themselves when considering this as a possible BACT control option: the cost and time required to obtain an adequate cost estimate to use in BACT analysis; the questions as to what percentage of the facility will require leakless technology; questions about monitoring frequency, etc. The EPA considered leakless valve technology in the preamble to the recently promulgated 40 CFR 60, Subpart VVa regulation (Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006) for applicable equipment and provides the following comments:

> *"We also considered an equipment standard requiring installation of "leakless" equipment. "Leakless" equipment, such as diaphragm valves, is less likely to leak than standard equipment, but leaks may still develop. Therefore, monitoring or other type of observation is appropriate to ensure that leaks are caught if they develop. In addition, these types of equipment may not be suitable for all possible*

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[14] MBFP, PSD Permit Application, December 31, 2007, page 4-27.

process operating temperatures, pressures, and fluid types. We could not identify any new ''leakless'' technologies that could be applied in all applications. Therefore, requiring ''leakless'' equipment is not technically feasible and this option was not considered to be BDT for SOCMI or petroleum refining sources. We note that 40 CFR part 60, subpart VV does include provisions for equipment designed for no detectable emissions, so owners or operators that do replace existing equipment with ''leakless'' equipment have options for compliance." 72 Federal Register 64864.

Therefore, installing leakless equipment is not a potential BACT control option.

<u>WDEQ Review of Proposed BACT and Final BACT Determination</u>

The MBFP PSD Permit Application submitted on December 31, 2007 proposed an LDAR program as VOC BACT that defined a "leaking" component at the 10,000 parts per million (ppm) level. (In other words, the MBFP LDAR program would function to fix piping components only after they had been field-testing and found to be leaking 10,000 ppm of hydrocarbon.) However, during the permit application and VOC BACT analysis review, the WDEQ notified MBFP that this leak definition was too high and did not seem to represent VOC BACT for equipment leaks. MBFP was asked to review lower leak definitions as VOC BACT within the proposed LDAR program. As a result of this review, MBFP lowered the LDAR program leak definitions to 500 ppm for valves and 2,000 ppm for pumps. WDEQ determined this to be BACT, and a letter was sent to the WDEQ in June 2008, noting the revised leak definitions.[15] The emission calculations remained at this level until after the draft permit was issued in 2008. In August 2008, the WDEQ contacted MBFP, requesting MBFP to review lower leak standards as BACT as the result of a public comment that had been made concerning lower leak detection levels. MBFP responded to this request on September 30, 2008, asserting that the currently agreed-upon leak definitions (500 ppm for valves/connectors and 2,000 ppm for pumps) represented BACT standards, and that lower leak definitions would not provide

[15] Letter from K.Winborn (URS) to C.Schlichtemeier, "Updated Pages to Air Quality Permit Application (AP-5873), June 4, 2008.

additional emission reduction. This statement was based on the preamble to the recently promulgated 40 CFR 60, Subpart VVa regulation (Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006) and related documents from the docket. MBFP's response reads as follows (with references noted in the both of the response):

> *"The EPA considered the more stringent California-leak standards (lower than 500 ppm for valves) when promulgating the November 2007 New Source Performance Standards (BACT) for chemical plants and refineries (40 CFR 60, Subparts VVa and GGGa.), but noted that "data gathered from facilities making a first attempt at repair on valves with leaks above 100 or 200 ppm suggests that these attempts do not always reduce emissions." (Summary of Public Comments and Responses, Docket ill NO. EPA-HQ-OAR-2006-0699-0094) EPA assessed a cost effectiveness of $5,700/ton for the SOCMI and $16,000/ton for refineries if leak definitions were lowered to less than 500 ppm for valves, and thus concluded that a leak standard below 500 ppm for valves was not cost effective (72FR64864, November 16,2007). EPA also dismissed lower leak standards for pumps (less than 2,000 ppm) by stating they had no evidence that lowering pump leak standards would achieve significant emission reductions at a reasonable cost and noting uncertainties regarding pump repair effectiveness at low leak concentrations (72FR64864)."*[16]

The WDEQ agreed with the points raised by MBFP in this response letter, and agree to maintain the leak definitions at 500 ppm for valves/connectors and 2,000 ppm for valves. Thus, the final VOC BACT determination for equipment leaks was made on the technical merits of the discussion, which included an evaluation of cost effectiveness and the results of field studies which indicated no additional control effectiveness would be gained from more stringent controls. In other words, the WDEQ reviewed and

[16] Letter from Jude Rolfes to Chad Schlichtemeier, "Response to Public CommentlWDEQ Information Request," September 30, 2008

questioned the MBFP proposed leak definitions twice before making a final, informed decision as to what level of control represented BACT.

Issue (iv): Minor Source of HAP Emissions

An explanation of the changes made to the MBFP HAP emission calculations is warranted, not only because adjustments have been made to lower the emissions, but because the process and reasons for lowering the emissions highlight the fact that WDEQ undertook a review of the emission calculations and performed a BACT analysis for equipment leak emissions. The changes to HAP emission rates prove that WDEQ sought to establish a BACT level of VOC (and HAP) emissions for equipment leaks, based on analysis of the best available controls. The explanation of emission calculation history, combined with the information presented earlier for VOC emission calculations, will prove that appropriate and adequate review was given to the equipment leak calculations and that the proposed MBFP facility will be a minor source of HAP emissions.

HAP Emission Calculation History and VOC BACT Review

The MBFP PSD Permit Application submitted on December 31, 2007, contained PTE calculations in its Appendix B that listed total facility HAP emissions to be greater than 25 tons per year (tpy), and greater than 10 tpy for some individual HAPs. These values, above the HAP major source thresholds, were based in part on emission calculations that represented an LDAR program that defined a "leaking" component at the 10,000 parts per million (ppm) level. In other words, the emission calculations assumed that the MBFP LDAR program would function to fix piping components only after they had been field-testing and found to be leaking 10,000 ppm of hydrocarbon. This calculation reflected the LDAR program originally proposed to be BACT for VOC control. However, during the permit application and BACT analysis review, the WDEQ notified WDEQ that this leak definition was too high and did not seem to represent VOC BACT for equipment leaks. MBFP was asked to review lower leak definitions as BACT, within the context of the LDAR program that had been selected as BACT. As a result of this review, MBFP lowered the LDAR program leak definitions to 500 ppm for valves and 2,000 ppm for pumps. WDEQ determined this to be BACT, and the emission calculations were modified and submitted to WDEQ by letter in June 2008, noting improved control efficiency for the MBFP LDAR program.[17] The modified emission calculations resulted in a revised total facility HAP emission rate of 24.7 tpy, and a methanol emission rate of 10.3 tpy (no other individual HAPs above the 10 tpy threshold). The emission calculations remained at this level until after the draft permit was issued.

In September 2008, the emission calculations were revised to reflect changing out traditional sample lines with close-loop sample lines. This change was made subsequent to receiving an updated process engineering design package from the design engineers in August 2008. The WDEQ was notified of the change as part of a response to public comment that had suggested the need for a case-by-case MACT analysis for heaters and boilers at the facility. With this change in September 2008, total facility HAP emissions were reduced to 23.6 tpy, with no individual HAPs above the 10 tpy threshold (methanol emissions were reduced to 9.1 tpy).

Additional Emission Calculation Notes

Emission calculation pages in Appendix B of the MBFP PSD Permit Application provide calculation detail for HAPs, as well as VOC. The primary contributor to facility HAP emissions are the equipment leaks, which includes the majority of the facility's methanol emissions. The HAP equipment leak calculations rely on the same assumptions as the VOC emissions. As stated earlier in this report, the amount of supporting information provided with the equipment leak calculations is sufficient to verify the calculated emission rates and ascertain the facility is a minor source of HAP emissions. Engineering designs and detailed final drawings are typically not available at the time when the air permit must be obtained. As a result, the equipment leak emission rates, including HAP emissions, are typically a conservative estimate. The burden of compliance will rest with MBFP to comply with the specific condition in the permit regarding the final component count and to ensure the number of estimate piping components does not exceed what was assumed in the permit application.

[17] Letter from K.Winborn (URS) to C.Schlichtemeier, "Updated Pages to Air Quality Permit Application (AP-5873), June 4, 2008.

HAP emissions from normal startup flaring activities are extremely low and negligible when compared to other HAP emission sources at the facility. The vent streams that will be directed to flares during normal startups are located "upstream" of the equipment that will be processing methanol; therefore, the vent streams directed to flare during normal startups will not contain methanol. A review of emission calculations and correspondence between MBFP and WDEQ provide information to verify this information.

Additional Note: Flares as Control Devices

Dr. Sahu provides an "Additional Note" in the discussion on this issue to comment about flares. I disagree with his point regarding the use of flares as control devices and their ability to combust VOC. Flares are control devices, as well as safety devices, and when well designed and operated, they combust hydrocarbon gases safely and efficiently.[18][19] Field tests have established that a properly designed and operated flare burner will have a combustion efficiency of more than 98%.[20] Flares are presented as a viable HAP control in the National Emission Standards for Hazardous Air Pollutants (NESHAPs) at 40 CFR 63.

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[18] Davis, Wayne, ed., Air Pollution Engineering Manual, 2nd Edition, John Wiley & Sons, Inc., 2000.

[19] EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 13: Miscellaneous Sources, Section 5 (Industrial Flares), September 1991.

[20] Baukal, Charles Jr., ed., The John Zink Combustion Handbook, CRC Press, New York, 2001, with reference to M.R. Keller and R.K. Noble, "RACT for VOC – A Burning Issue," Pollution Engineering, July 1983.

Issue (v): Consideration of $PM_{2.5}$ Emissions

As noted in the WDEQ CT-5873 Decision Document, $PM_{2.5}$ was analyzed for the MBFP facility using the EPA policy of considering PM_{10} as a surrogate for $PM_{2.5}$ (documented in the 1997 Seitz memo, herein referred to as the "Surrogate Policy"), in accordance with EPA's 2007 and 2008 approvals regarding States' use of the policy until State Implementation Plans (SIPs) are revised, as well as EPA's approval of the current WY SIP.[21][22][23] Given the timing of this permit as it relates to the ongoing $PM_{2.5}$ regulatory development, as well as the specific emission sources/equipment at the proposed facility and the control technologies that exist to control particulate matter from these sources, it is my opinion that the WDEQ has appropriately considered $PM_{2.5}$ emissions in Permit CT-5873.

$PM_{2.5}$ Regulatory Development

The WDEQ has provided discussions to explain the development of $PM_{2.5}$ regulation since the $PM_{2.5}$ NAAQS was established (reference page 5 of the WDEQ CT-5873 Decision Document, and also the DEQ's Memorandum in Support of Motion To Dismiss $PM_{2.5}$ and CO_2 Claims).[24][25] Both discussions provide the history on this issue necessary to understand why the Surrogate Policy has been used. (Please reference these discussions, as they are not repeated here, but are relied upon in this section of the report.)

The Surrogate Policy was issued for interim use "in view of the significant technical difficulties that now exist with respect to $PM_{2.5}$ monitoring, emissions estimation, and modeling." The Surrogate Policy also notes that "[w]hen the technical difficulties are resolved, EPA will amend the PSD regulations under 40 CFR 51.166 and 52.21 to establish a $PM_{2.5}$ significant emissions rate, and EPA will also promulgate other

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[21] Memorandum from John S. Seitz, "Interim Implementation of New Source Review Requirements for PM2.5," October 23, 1997.

[22] 72 Federal Register 54112, 54114 (September 21, 2007)

[23] 73 Federal Register 26019

[24] Wyoming Department of Environmental Quality, Decision Document, Permit Application AP-5873.

[25] Wyoming Department of Environmental Quality, "Memorandum in Support of DEQ's Motion to Dismiss $PM_{2.5}$ and CO_2," *In re Medicine Bow Fuel & Power LLC Air Permit CT-5873* – EQC Docket No. 09-2801

appropriate regulatory measures pertinent to $PM_{2.5}$ and its precursors."[26] On May 18, 2008, the EPA issued its final NSR Implementation Rule for $PM_{2.5}$, stating in the preamble discussion that *"[a]ccordingly, we are requiring States with SIP-approved PSD programs to submit revised PSD programs and revised NA NSR programs for $PM_{2.5}$ (see section V.I.) within 3 years from the date of this action. During this SIP development period, the $PM_{2.5}$ NAAQS must still be protected under the PSD program in such States. We are finalizing our proposed option 1 that if a SIP-approved State is unable to implement a PSD program for the $PM_{2.5}$ NAAQS based on these final rules, the State may continue to implement a PM_{10} program as a surrogate to meet the PSD program requirements for $PM_{2.5}$ pursuant to the 1997 guidance mentioned previously."*[27] Also, with this final rulemaking, a "grandfathering" provision was finalized at 40 CFR 52.21(i)(1)(xi) as follows:

> *"(xi) The source or modification was subject to 40 CFR 52.21, with respect to $PM_{2.5}$, as in effect before July 15, 2008, and the owner or operator submitted an application for a permit under this section before that date consistent with EPA recommendations to use PM_{10} as a surrogate for $PM_{2.5}$,and the Administrator subsequently determines that the application as submitted was complete with respect to the $PM_{2.5}$ requirements then in effect, as interpreted in the EPA memorandum entitled ''Interim Implementation of New Source Review Requirements for $PM_{2.5}$'' (October 23, 1997). Instead, the requirements of paragraphs (j) through (r) of this section, as interpreted in the aforementioned memorandum, that were in effect before July 15, 2008 shall apply to such source or modification."*

On July 15, 2008, after the draft MBFP PSD permit was issued, the EPA was petitioned to reconsider and administratively stay this portion of the final rule. This petition was

[26] Memorandum from John S. Seitz, "Interim Implementation of New Source Review Requirements for PM2.5," October 23, 1997.

[27] 73 Federal Register 28321 (May 18, 2008), "Implementation of the New Source Review (NSR) Program for Particulate Matter Less than 2.5 Micrometers ($PM_{2.5}$)"

denied on January 16, 2009. The petition was sent to EPA again in February, 2009; the EPA agreed on April 24, 2009 to reconsider certain aspects of the rule and to administratively stay the grandfathering provision for three months.[28] [29] The dates are very important to note here, as the reconsidering and administrative stay occurred after the final MBFP PSD Permit was issued on March 4, 2009.

In summary, it is my opinion, based on the referenced WDEQ discussions, that the WDEQ has acted, and continues to act, to incorporate $PM_{2.5}$ into its SIP (and into its air permitting regulations in the WAQSR). This process is not yet complete, but once it is completed, those permittees seeking WY air quality construction permits will be required to evaluate $PM_{2.5}$ emissions, best available control technologies for $PM_{2.5}$, and potential impacts from $PM_{2.5}$ emissions without use of the Surrogate Policy. It is also my opinion that the WDEQ acted in accordance with EPA policy and regulation in effect at the time to use the Surrogate Policy for the proposed MBFP facility. At the time MBFP submitted its PSD permit application to the WDEQ (December 2007), and at the time that WDEQ issued the draft PSD permit for public comment (June 2008), the EPA was in the process of addressing $PM_{2.5}$ technical difficulties referenced in the Surrogate Policy. By the time that WDEQ issued the final PSD permit in March 2009, the technical issues referenced in the Surrogate Policy (including $PM_{2.5}$ emission measurement/monitoring, estimation, and modeling) had been addressed, and EPA had promulgated the NSR Implementation Rule for $PM_{2.5}$, allowing the use of the Surrogate Policy during states' SIP development periods, but requiring states to revise their SIPs within a three-year timeframe. It is only after the WDEQ issued the final MBFP PSD permit that EPA has agreed to stay the grandfathering provision promulgated in the final rule.

<u>PM_{10} as a Reasonable Surrogate for $PM_{2.5}$</u>

[28] US EPA, Fact Sheet, "Implementation of the New Source Review Program for Particulate Matter Less than 2.5 Micrometers ($PM_{2.5}$) – Proposed Extension of Existing Administrative Stay and Proposal to Repeal the Stayed Provision."
[29] The US EPA has recently proposed to extend the administrative stay, as noted in the Fact Sheet cited in the prior footnote.

A recent EPA Administrative Order, regarding the Louisville Gas and Electric Company, Trimble County, Title V/PSD Air Quality Permit was issued last month (August 2009), granting a petition to object to the permit, in part due to the use of the Surrogate Policy.[30] The Administrative Order provides suggested methods to evaluate the reasonableness of applying the Surrogate Policy to specific cases, including an assessment of the relationship between PM_{10} and $PM_{2.5}$ emissions from the emission unit, and a demonstration that the degree of $PM_{2.5}$ control by the control technology selected in the PM_{10} BACT analysis would be at least as effective as the technology that would have been selected if a BACT analysis specific to $PM_{2.5}$ emissions had been conducted. Such a "reasonableness evaluation" for the proposed MBFP facility will support the use of the Surrogate Policy.

Relationship between PM_{10} and $PM_{2.5}$ Emissions

The primary contributors to PM emissions at the proposed MBFP facility are the combustion turbines and fugitive emissions associated with coal storage and material handling. (Refer to the WDEQ CT-5873 Decision Document, as well as the MBFP PSD Permit Application, for the particulate emission inventory.)

Particulate emissions from the combustion turbines will result from the combustion of (gaseous) syngas and natural gas. The EPA's Compilation of Air Pollutant Emission Factors (AP-42) provides a discussion of emissions from stationary gas turbines and provides suggested emission factors in its Volume I, Chapter 3, Section 1.[31] With regard to particulate emissions, EPA states that "PM emissions are negligible with natural gas firing and marginally significant with distillate oil firing because of the low ash

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[30] Petition No. IV -2008-3, In the Matter of Louisville Gas and Electric Company, Trimble County, Kentucky, Title V/PSD Air Quality Permit #V-02-043, Revisions 2 and 3, August 12, 2009

[31] The Initial Expert Witness Report provides a footnote on page 21, following a statement that the EPA's AP-42 document contains approaches to size classify PM emissions. The footnote and specific tables and figures provided in the footnote (Section 1.1, Table 1.1-6, and Figure 1.1-1) apply only to coal combustion sources. The title of Section 1.1 is "Bituminous and Subbituminous Coal Combustion," and applies to coal-fired boilers. This section is not applicable to the MBFP facility, as coal-fired boilers will not be used. The coal used at the MBFP facility will be gasified to create a syngas product, which will remain in a closed-piping system (i.e., not vented to atmosphere) and will be processed downstream of the gasifier to produce gasoline and provide electrical power to the facility.

content."[32] No mention of $PM_{2.5}$ emissions, or of "fine particulate", is made in this document, and the emission tables presented in this section do not differentiate between PM_{10} and $PM_{2.5}$[33]. In Chapter 1 of AP-42, the section addressing emissions from natural gas combustion in heaters and boilers (Section 4) contains a similar statement: "[b]ecause natural gas is a gaseous fuel, filterable PM emissions are typically low."[34] This section continues on to state that "[p]articulate matter from natural gas combustion has been estimated to be less than 1 micrometer in size and has filterable and condensable fractions." Table 1.4-2 of this section, presenting emission factors for criteria pollutants including particulate matter, states in a footnote that "[a]ll PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions."[35] Since both of these AP-42 sections address gas combustion emissions, it is reasonable to assume that PM emissions from stationary gas combustion turbines will likewise be comprised of PM_1 or smaller, and that similarly, calculated PM emissions from turbines can be used to estimate used to estimate PM_{10} and $PM_{2.5}$. Thus, use of the Surrogate Policy for $PM_{2.5}$ emissions from the gas turbines is reasonable.

Fugitive particulate emissions from coal storage and material handling will result from a variety of activities, including wind erosion from the outdoor coal stockpile, coal transport via bulldozer, addition to coal stockpile, and temporary road dust emissions from truck transport of coal to the Seminoe II processing area. (It should be noted that road dust emissions from truck transport are expected to occur only during the first three years of operations, with truck transport of coal stopping once the IGL Plant begins

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[32] EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 3: Stationary Internal Combustion Sources, Section 3.1 (Stationary Gas Turbines), April 2000. Available via http://www.epa.gov/ttn/chief/ap-42/ch03/final/c03s01.pdf

[33] EPA AP-42, Volume 1, Table 3.1-2a provides emission factors for PM(condensable), PM(filterable), and PM(total), which is the sum of the condensable and filterable emission factors. In this case, PM_{10} emissions are estimated using the PM(total) emission factor.

[34] EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 1: External Combustion Sources, Section 1.4 (Natural Gas Combustion), July 1998. Available via http://www.epa.gov/ttn/chief/ap-42/ch01/final/c01s04.pdf

[35] Ibid, page 1.4-6.

operation.[36]) The EPA's Compilation of Air Pollutant Emission Factors (AP-42) provides a discussion of emissions from these types of fugitive particulate sources provides suggested emission factors in its Volume I, Chapter 13, Section 2. These emission factors were revised in 2006, in response to studies determining $PM_{2.5}/PM_{10}$ ratios in fugitive dust emissions. Fugitive emissions of PM_{10} from storage piles and material handling are estimated to be almost seven times greater than $PM_{2.5}$ emissions, and fugitive emissions from road hauling are estimated to be almost seven times to ten greater than $PM_{2.5}$ emissions depending on whether or not the road is paved.[37] [38] Thus, unlike particulate emissions from gaseous combustion, $PM_{2.5}$ emissions from road dust are not equivalent to PM_{10} emissions; rather, $PM_{2.5}$ emissions from road dust are much less than PM_{10} emissions. Therefore, use of the Surrogate Policy for fugitive particulate emissions is reasonable only inasmuch that overestimating $PM_{2.5}$ emissions is acceptable or desirable.

As noted in the Louisville G&E Administrative Order, "...a simple ratio of AP-42 emissions factors or of the results of a single compliance stack test would not appear to be sufficient. Instead, reasonable consideration would be given to whether and how the $PM_{2.5}$ to PM_{10} ratio may vary with source operating conditions, including variations in the fuel rate and in control equipment condition and operation. This consideration may be based on engineering analysis of the facility including the proposed control technology."[39] Therefore, in order to determine whether using the Surrogate Policy for fugitive emissions is reasonable, the focus should turn from emission quantification to emission control.

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[36] Medicine Bow Fuel & Power, LLC, PSD Permit Application, Appendix B (Emission Calculations), pg B-29(1), footnote date April 23, 2008

[37] EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 13: Miscellaneous Sources, Section 2.4 (Aggregate Handling and Storage Piles), November 2006. Available via http://www.epa/gov/ttn/chief/ap-42/ch13/final/c13s0204.pdf

[38] EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 13: Miscellaneous Sources, Sections 2.1 (Paved Roads) and Section 2.2 (Unpaved Roads), November 2006. Available via http://www.epa/gov/tt/chief/ap-42/ch13/final/c13s0201.pdf and http://www.epa/gov/ttn/chief/ap-42/ch13/final/c13s0202.pdf

[39] Petition No. IV -2008-3, In the Matter of Louisville Gas and Electric Company, Trimble County, Kentucky, Title V/PSD Air Quality Permit #V-02-043, Revisions 2 and 3, August 12, 2009, page 45.

$PM_{2.5}$ Control Technologies

Emission control technologies for $PM_{2.5}$ can differ and should be evaluated on a case-by-case basis, depending on the source of $PM_{2.5}$ emissions, and both the amounts and proportions of direct $PM_{2.5}$ emissions and $PM_{2.5}$ precursors emitted by the source in question. However, in some cases, the emission controls to be employed for PM_{10} and $PM_{2.5}$ can be, or must be, the same technology. That is the case for the proposed MBFP facility, and this fact supports the use of the Surrogate Policy for $PM_{2.5}$.

The selected control technology for particulate matter (PM_{10}) from the combustion turbines is a combination of good combustion practices and use of fuels with low potential for particulate emissions. This decision was made after consideration of using baghouses and electrostatic precipitation (ESP) as part of the top-down BACT analysis for PM_{10}. Both baghouses and ESP were determined to be technically infeasible, as it was found that neither technology could provide a lower particulate emission rate than the baseline emission rate. As noted in the previous section, all particulate emissions from gaseous combustion in the stationary turbines are considered to be less than 1 micrometer in diameter. This may explain why no additional control could be gained from baghouse and ESP technology. In this case, no difference exists between the emission control selected for PM_{10} versus $PM_{2.5}$, and no additional control for $PM_{2.5}$ can be achieved over what is currently proposed. Thus, use of the Surrogate Policy for $PM_{2.5}$ for the combustion turbines remains justified.

With regard to fugitive particulate emissions, the previous section established that based on AP-42 emission factors, emissions of $PM_{2.5}$ are less than PM_{10} by average factors, depending on the fugitive emission source. It should also be noted that the proportion of $PM_{2.5}$ to PM_{10} in fugitive dust may vary, depending on the emission source and meteorological conditions (rain, wind, etc.). However, the same set of emission control techniques are applied for fugitive particulate emissions regardless of the size of the particulate matter, and irrespective of varying proportions due to meteorological conditions. EPA's AP-42 document describes techniques such as watering and the use of chemical wetting agents as primary means of controlling dust emissions. No differentiation between PM_{10} and $PM_{2.5}$ exists for these types of controls. Therefore, regardless of the amount of PM_{10} and $PM_{2.5}$ in the MBFP fugitive emission inventory, the selected control technologies for the MBFP facility will remain the same. Thus, use of the Surrogate Policy for $PM_{2.5}$ is justified.

Additional Note re: $PM_{2.5}$ Control Technologies

Note: Dr. Sahu's report contains a discussion on page 22 of differences in fabric filters, specifically the choice of fabric required for control of PM_{10} and $PM_{2.5}$ emissions. While this is an interesting and accurate observation, it is not applicable to this permit, as fabric filters were not proposed to be installed on any emission source at the facility. The last sentence of this paragraph reads as follows: "*Simply noting that "...the selected control technology for particulate matter emissions from the boilers "fabric filtration) is also effective for PM2.5...." as DEQ has done, does not mean that what has been specified for PM10 BACT (were it even to be correct) is BACT for $PM_{2.5}$.*" This statement is confusing for a few reasons, and appears to not be applicable to this permit or facility. First, the statement seems to provide a quotation from a WDEQ document, regarding fabric filter controls. No reference is provided for this quotation, and I cannot find it in either the WDEQ Application Analysis document or the final permit's Decision Document. Second, the DEQ quotation indicates that fabric filters are a selected control technology. As noted earlier in this paragraph, fabric filters were not selected as a control technology for any emission source at the MBFP facility. Finally, the DEQ quotation mentions the use of boilers. No boilers are proposed for the MBFP facility. Rather than using coal-fired boilers, as a traditional coal-fired power plant might use, the MBFP facility will utilize coal gasifiers. Given this, it is not clear to me how the discussion on page 22 of the report is relevant to this specific case.

Example Cases

Dr. Sahu's report notes a case in Montana (Highwood Generating Station) where a separate $PM_{2.5}$ BACT analysis was conducted. He also notes a case in Kansas (Sunflower Electric Power Holcomb Station) where a recommendation has been made to conduct a separate $PM_{2.5}$ BACT analysis. In both these cases, the proposed emission source is a coal-fired boiler, with the BACT analysis addressing the emissions from traditional coal combustion in a boiler. Neither case is directly applicable to this MBFP facility, as the facility will not utilized a coal-fired boiler.

However, it should be noted that in other recent cases, use of the Surrogate Policy has been upheld. The EPA, in 2007, denied a petition requesting that a Title V permit be objected on the basis of using the Surrogate Policy for the Hugh L. Spurlock Generating Station in Maysville, Kentucky. As with the Highwood and Holcomb Station cases, the Spurlock Generating Station is a coal-fired power plant, and so technical details of any BACT analysis for emissions from coal combustion are not applicable to the MBFP facility. However, this case is relevant because EPA found that under the circumstances presented for the Spurlock Generating Station, use of the Surrogate Policy was appropriate.[40] This case is mentioned in the August 2009 Louisville G&E Administrative Order, as well, as an example of a situation when the Surrogate Policy can be used.

[40] Order Responding to Petitioner's Request That the Administrator Object to Issuance of State Permit, In the Matter of East Kentucky Power Cooperative, Inc. Hugh L. Spurlock Generating Station, Maysville, Kentucky, Petition IV-2006-4, Permit No. V-06-007, August 30, 2007

Issue (vi): Fugitive Particulate Emissions In Dispersion Modeling

Contrary to the statement made on page 25 of Dr. Sahu's report, fugitive particulate matter emissions were included in the particulate matter dispersion modeling analyses performed by MBFP and the WDEQ. Refer to Sections 6 and 7 of the MBFP PSD Permit Application, specifically Sections 6.6.2 and 7.4, for discussion of particulate matter model input emission rates (including fugitive emission sources) and modeled output concentrations. Refer also to pages 37 and 69 of the WDEQ Application Analysis document for discussion of PM_{10} modeling (including fugitive particulate emissions).[41]

Date: September 15, 2009

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[41] Wyoming Department of Environmental Quality, AP-5873 Application Analysis, June 19, 2008.