



IN REPLY REFER TO:

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
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N3615 (2350)

September 28, 2012

Mr. Doug Aburano
Chief, Control Strategies Section
U.S. EPA, Region 5
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Aburano:

The National Park Service submits these comments in our consultation role for the Voyageurs and Isle Royale National Parks which are designated as Federal Class I Areas under the Clean Air Act. We support the proposed Federal Implementation Plan (FIP) to require best available retrofit technology (BART) for the taconite plants in Minnesota and Michigan (EPA Docket ID Nos. EPA-R05-OAR-2010-0954 and EPA-R05-OAR-2010-0037). Our specific technical comments which support the proposed FIP are included in attachments to this letter.

Voyageurs National Park (NP) is comprised of 218,000 acres along the Canadian border in the heart of the North American Continent. Visitors to Voyageurs NP—approximately 250,000 each year—come to see and touch rocks half as old as the world, experience the life of a voyageur, immerse themselves in the sights and sounds of a boreal forest, view the dark skies, or ply the interconnected water routes. And while Congress established the park to preserve, among other things, “outstanding scenery,” those visitors also experience a park with impaired visibility.

Isle Royale NP is located in northwestern Lake Superior, about 20 miles east of Grand Portage, Minnesota. It is a remote Island archipelago with one large Island about 45 miles long and 9 miles wide surrounded by over 450 smaller islands. Congress designated the Park as 99% Wilderness in 1976 under the Wilderness Act. Isle Royale NP is also a designated Class I area under the Clean Air Act, and a Biosphere Reserve designated by the United Nations Educational, Scientific, and Cultural Organization. Air quality is a long-standing concern at the Park. A primary activity for visitors is hiking the Greenstone Ridge and climbing to Lookout Louise. The ability to observe the Minnesota and Canadian landscapes in the distance is an important part of the wilderness experience.

Federal land managers are directed by the Clean Air Act to protect air quality related values, including visibility. Additionally, the same pollutants that cause visibility impairment also cause acid rain and artificial fertilization of the nearly pristine, nutrient poor lakes and streams of Voyageurs and Isle Royale NPs. Considerable effort and resources have been spent over the past ten years developing the technical information necessary to complete the Minnesota Regional Haze plan. Much of the technical work was done by states, Tribes and Federal land managers working together through multi-state regional planning organizations. Additionally, the National Park Service monitors visibility in Voyageurs and Isle Royale National Parks. The results of all of these efforts support the BART determinations to reduce impacts to these parks.

According to technical analyses by the State of Minnesota and others, the highest contributors to haze in Voyageurs National Park from all sources in the U.S. are the taconite industry and power plants in Minnesota. The National Park Service supports the emission controls for the taconite plants under the proposed FIP. The FIP demonstrates that these controls are technically and economically feasible for and available to the taconite industry.

We appreciate the opportunity to work closely with Minnesota and EPA to make progress toward achieving natural visibility conditions at our National Parks and Wilderness Areas. For further information regarding our comments, please contact Don Shepherd at (303) 969-2075.

Sincerely,



Susan Johnson
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enclosures

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**National Park Service Comments on Best Available Retrofit Technology
for Taconite Plants in Michigan and Minnesota
September 28, 2012**

BART Facilities and PM BART

We agree with EPA R5 and with Michigan and Minnesota (the States) on the BART-eligibility determinations with respect to the taconite facilities and the States' determination that BART for direct PM is satisfied by the taconite maximum achievable control technology (MACT) rule.

General Comments on NO_x BART

We commend United States Steel (USS) for its efforts toward reducing NO_x emissions from grate/kiln indurating furnaces, and for its installation of Continuous Emissions Monitors (CEMs) to evaluate its NO_x reduction efforts.

We have been collaborating with the Minnesota Pollution Control Agency (MPCA) for several years as it has sought cost-effective ways to reduce NO_x emissions from indurating furnaces. We have been especially involved in studies triggered by USS' need to reduce NO_x emissions as part of a retroactive PSD permitting process at the Minntac facility, as well as the recent PSD permitting action for Minnesota/Essar Steel. We agree with EPA R5's proposal that BART for NO_x for indurating furnaces is Low-NO_x Burners (LNB) achieving a 70% reduction from both straight-grate and grate/kilns. That proposal for grate/kiln lines is supported by research sponsored by USS that found:

It is recommended to limit the NO_x on NG to 1.0#/MMB as opposed to an hourly limit. This will correspond to a 75% reduction over baseline and allow for variations in measurements...¹

The proposal for straight-grate kilns is supported by Essar's testing which demonstrated a 95% reduction in NO_x emissions for its new kiln.

The first LE burner configuration as designed and operated based on the engineering study did not perform quite as well as expected, generating NO_x emissions of around 1 lb/MMBtu, which represents a reduction of around 75% compared to a baseline of 4.0 lb/MMBtu. Optimization of configuration and operating parameters for that design ultimately resulted in NO_x emissions of around 0.5 lb/MMBtu. Although this level of reduction from baseline NO_x emissions is consistent with the engineering study results, evolution of both the furnace production requirements and the NO_x emissions permit process have resulted in a requirement for even lower burner NO_x emissions. Therefore, investigation and testing of alternative designs was performed to identify a burner design capable of even lower NO_x emissions.

The final result is the configuration described in this report, which has achieved an average emissions factor of 0.22 lb/MMBtu over three tests, each test lasting about three hours.²

Finally, it is clear that LNB is now accepted by the industry as illustrated by the following examples:

- December 2011 - permit issued by MPCA for USS Keetac expansion. The permit includes application of a LNB to a reconstructed furnace

¹ October 26, 2011 "Summary Report for USS On NO_x reduction for Kilns #6 and 7" by S. Londerville

² "Summary of Findings for Presentation to the Minnesota Pollution Control Agency Essar Steel / Minnesota Steel Results of Testing at ¼-Scale of LE Low NO_x Burner Prototype for Straight-Grate Pelletizing Furnaces," Fives North American Combustion, Inc., September 19, 2011

- April 2012 - LNB proposed by Magnetation for their taconite furnace

BART analyses should include consideration of all technically feasible control options. As noted above, we have been working with MPCA for over a decade in a joint effort to find cost-effective ways to reduce NO_x from these indurating lines. While it was true that “U.S. Steel documented the infeasibility of SCR controls” earlier in the Minntac retroactive PSD review process (due to the presence of high concentrations of SO₃), subsequent analyses have resulted in a determination by the MPCA that SCR was technically feasible but not economically feasible. This configuration assumed reheating of the waste gas. The cost per ton calculated was sensitive to the assumed cost of natural gas and was “at or above the upper range of economic feasibility,” and was rejected as best available control technology (BACT).³

More recently, MPCA has looked at low temperature oxidation (LoTOx):

- In a letter dated August 18, 2006 the MPCA assessed the applicability of LoTOx at 90% control efficiency to Minntac and concluded that LoTOx was technically and economically feasible and therefore BACT.
- In their PSD permit application, Minnesota Steel proposed LoTOx on the waste gas stack at 90% control efficiency for their taconite furnace.

It appears that LoTOx is technically and economically feasible for the entire industry. In addition, tail-end SCR with natural gas reheat has been found technically feasible and borderline economically infeasible based on a BACT analysis from several years ago (when natural gas prices were much higher). Another form of SCR, Regenerative Selective Catalytic Reduction (RSCR) looks promising, but, as a new technology, would require trials.

While we would normally prefer to see all of the technically-feasible control options (e.g., tail-end SCR with reheat, RSCR, LoTOx) evaluated, given the time constraints and the success of the LNB technology, it is likely that LNB technology will reduce NO_x so much that addition of the other technologies would become too expensive (on \$/ton and \$/deciview bases) for this phase of the Regional Haze program. We therefore agree that LNB at 1.2 lb/mmBtu represents BART for the taconite industry. By setting such a uniform limit, EPA R5 is establishing a “level playing field” that is achievable by all of the taconite plants and will provide substantial (almost 16,000 tons per year) NO_x reductions.

General Comments on SO₂ BART

EPA proposes to determine that BART for SO₂ for straight-grate kilns is existing controls because these furnaces do not burn coal. While it is true that straight-grate kilns do not burn coal, they can burn fuel oil which, depending upon the sulfur content, can have a high potential for emitting SO₂. Although the BART Guidelines do not mandate fuel switching, they do encourage evaluation of lower sulfur content fuels. For example, limiting fuel sulfur was an option

³ letter dated October 22, 2003

considered by EPA for oil-fired EGUs in the BART rule. We suggest that MPCA consider use of lower sulfur fuels in future “Reasonable Progress” analyses.

We concur with EPA R5’s statement that:

...we do not agree that the Minnesota Pollution Control Agency (MPCA) and Minntac have adequately documented the infeasibility of all of the SO₂ controls described above...

This is especially pertinent with respect to the technical feasibility of Spray Dryer Absorption (SDA) which, according to Barr Engineering (the taconite industry’s consultant), would not be technically feasible because:

the high moisture content of the exhaust would lead to saturation of the baghouse filter cake and plugging of the filters and the dust collection system

On the contrary, SDA requires moisture because a slurry of lime and water is injected into the spray dryer where the slurry reacts with SO₂ to form a dry sulfate powder which is then collected in the baghouse. As long as the moisture content of the gas stream is not excessive or the temperature too low (e.g., the approach to saturation too small), SDA becomes a preferred and highly effective SO₂ control option. It is expected that retrofitting of SDA would eliminate the need for the existing Venturi rod scrubbers used to control particulate emissions on most taconite furnace, thus reducing water consumption, gas stream moisture content, and particulate emissions (due to the higher removal efficiency of the baghouse).

In its 2011 permit application for Essar Steel, Barr Engineering determined that both SDA and Gas Suspension Absorption (GSA) were technically feasible for the straight-grate indurating furnace. This is how Barr Engineering described the GSA technology proposed by Essar as BACT:

A Gas Suspension Absorber (GSA) scrubber is a more efficient version of SDA that uses a single injection spray nozzle to spray sorbent concurrently into a vessel where it contacts the flue gas. . The sorbent chemically reacts with SO₂ and removes it. GSA technology uses scrubbing sorbent more efficiently than a SDA because it allows sorbent recirculation. Consequently, GSA control efficiency is similar but better than a SDA. A fabric filter is used to collect spent sorbent. A minor amount of solid waste byproduct is generated by this control device.

Essar proposed use of a GSA system because it has several operational and environmental advantages over a wet scrubber. According to Essar:

- The GSA dry scrubber is an advanced technology which allows dry controls to match the SO₂ control efficiency of absorbers (wet scrubbers).
- The dry control strategy allows Essar the flexibility to evaluate the use of activated carbon for mercury control without the issue of capturing the carbon in a wet scrubber where some portion of the mercury is transferred to the wastewater treatment system. Mercury “re-emissions” have been shown to occur from wet scrubbers due to reduction of the captured oxidized mercury. This causes additional elemental mercury to be emitted from the wet scrubber, resulting in a lower overall control efficiency. Mercury, as well as sulfates and other particulates, captured in a wet scrubber must be removed from the wastewater prior to discharge.
- Dry SO₂ control systems use approximately half the amount of make-up water used in wet scrubbers; consequently, water appropriation and wastewater treatment are minimized.

- Dry SO₂ control systems do not generate wastewater. So, no increase in wastewater generation or sulfate loading in the Essar wastewater system will occur. The water used to make the lime slurry for injection into the GSA unit is minimal and evaporates when it comes in contact with the exhaust stream.
- Sorbent from the GSA dry scrubber can be captured within the recirculation cyclone and the baghouse which allows it to be recycled back to the GSA reactor. Recycling sorbent reduces sorbent usage.
- Particulates collected can be managed as a solid waste with less environmental impact than management as wastewater.

We are providing more extensive excerpts from the Essar permit application in Appendix A. That information also contains an extensive discussion of the justification for the 5 ppm SO₂ limit at Essar, which is the same limit proposed by EPA R5.

Based upon our evaluation of the Essar Steel permit application, we believe that EPA R5 has correctly determined that SDA (and GSA) are technically feasible and can meet a 5 ppm SO₂ limit. (Tilden Mining also determined that SDA is technically feasible.)

United Taconite SO₂ BART

United Taconite operates two grate/kilns equipped to burn coal. We agree with EPA R5 that dry FGD scrubbers are feasible for United Taconite's two indurating furnaces and would reduce SO₂ emissions by over 2,600 tons per year at \$2,000 – \$3,000/ton. Information included in the Essar Steel permit application supports EPA R5's proposed limit of 5 ppmv or a 95% reduction requirement, on a 30-day rolling average, to be achieved within two years after the effective date of this rule for Line 2 and 4 years after the effective date of this rule for Line 1.

Tilden Mining Company SO₂ BART

The BART-subject emission units include indurating furnace/grate-kiln. Tilden evaluated a wet-wall electrostatic precipitator (WWESP) and wet scrubber after its existing ESP, SDA, and dry sorbent injection (DSI) as the remaining retrofit technologies it deemed to be available and technically feasible. Tilden estimated the control efficiency of WWESPs and a wet scrubber to be about 80%, DSI to be 55% and SDA to be 90%. We agree with EPA R5's determination that the cost-effectiveness of a 90% FGD scrubber is reasonable at \$4,500-\$5,500/ton. We support EPA R5's proposed limit of 5 ppmv or a 95% emission reduction, on a 30-day rolling average, to be achieved within two years after the effective date of this rule. This would reduce SO₂ emissions by over 1,000 tons per year.

Visibility Improvement

We agree with EPA R5's conclusions that:

- Control of emissions from taconite plants in Minnesota and Michigan can be expected to yield significant benefits in reducing visibility impairment in the Class I areas in the two states; and
- Technically feasible controls that are available at a reasonable cost for taconite plants can be expected to provide a visibility benefit that makes those controls warranted.

Testing and Monitoring, Recordkeeping, and Reporting Requirements

We are especially pleased that EPA has proposed testing and Continuous Emissions Monitoring (CEM) requirements for the taconite plants subject to this rule. Our discussions with USS, which has led the way in installation and operation of CEMs on indurating furnaces, have led to the mutual agreement that CEM data is essential for the proper tuning and operation of combustion controls to reduce NO_x emissions.

The Regional Haze SIP discussed the need for continuous emission monitoring systems on the taconite industry for nitrogen oxides for a number of reasons including:

- To set the BART limits;
- To “allow facilities to more efficiently manage their combustion processes, resulting in less fuel usage and fewer emissions” and
- To track reasonable progress under the Northeast Minnesota Plan.

The MPCA expects that the use of CEMs could result in emission reductions of 5% - 30%, depending on the facility.

CEM data is also essential for assessing the effectiveness of the SO₂ controls, and should provide an indication of changes in fuel use/sulfur content for use in future regional haze planning efforts.

Appendix A Excerpts from

***Best Available Control Technology Analysis
Prepared for
Essar Steel Minnesota LLC
April 2011
Version 1***

6.2 Steps 2 – 5 for Pellet Plant Indurating Furnace Sulfur Dioxides (SO₂) Emissions

Potential control technologies that were identified for pellet plant SO₂ emissions are the following:

- Absorber (Wet Scrubber)
- Gas Suspension Absorber (GSA)
- Spray dryer absorption (SDA)
- Wet ESP
- Dry sorbent injection (DSI)
- Clean Fuels
- Good Design and Operating Practices

6.2.1 Step 2 – Technical Feasibility of SO₂ Control Options on the Pellet Plant Indurating Furnace

All of the technologies identified in Step 1 are technically feasible in this application for both the hood exhaust and the waste gas exhaust

Spray Dryer Absorption (SDA)

A dry or semi-dry sorbent is sprayed countercurrently via many injection nozzles into a vessel where it contacts the flue gas. The sorbent chemically reacts with SO₂ and removes it. A fabric filter is used to collect the spent reagent. A minor amount of solid waste byproduct is generated by this control device.

Gas Suspension Absorber(GSA)

A Gas Suspension Absorber (GSA) scrubber is a more efficient version of SDA that uses a single injection spray nozzle to spray sorbent concurrently into a vessel where it contacts the flue gas. . The sorbent chemically reacts with SO₂ and removes it. GSA technology uses scrubbing sorbent more efficiently than a SDA because it allows sorbent recirculation. Consequently, GSA control efficiency is similar but better than a SDA. A fabric filter is used to collect spent sorbent. A minor amount of solid waste byproduct is generated by this control device.

Table 6-4 Ranking of Remaining SO₂ Control Technologies and Control Effectiveness for the Indurating Furnace Waste Gas Stream

Gas Suspension Absorber (GSA) 5 ppm

Spray Dryer Absorption (SDA) 5 ppm

6.2.4 Step 4 – Evaluation of Most Effective SO₂ Control Technologies on Taconite Pellet Plant Indurating Furnace – Waste Gas

GSA and SDA are dry control systems. Spent sorbent is disposed of as a solid waste. Therefore the proposed project would not have an adverse impact on wastewater systems at the plant using these control technologies. Dry SO₂ control systems use approximately half the amount of water used in wet scrubbers, so selection of GSA or SDA control technology will minimize water consumption associated with the proposed project. GSA technology has the highest efficiency of dry controls for sorbent use. The density of the fluidized bed absorber system is greater than spray towers, which improves mixing and therefore SO₂ control efficiency.

As previously discussed, Essar is proposing use of baghouses for particulate control. Use of a baghouse for particulate control also has an advantage for SO₂ control in this situation. When dry scrubbing systems are used for SO₂ control, the dust cake collected on baghouse filters contains some unreacted SO₂ control reagent. This reagent can react with residual SO₂ in the exhaust gas as it passes through the filter cake and provide additional SO₂ control.

Additionally, dry SO₂ control systems allow flexibility to use activated carbon for mercury control. Sorbent injection, specifically activated carbon injection, has been demonstrated as an effective control technology when used in conjunction with a dry particulate control system.

Dry controls offer a couple of advantages with respect to mercury control:

1. Mercury “re-emissions” have been shown to occur from wet scrubbers due to reduction of the captured oxidized mercury. This causes additional elemental mercury to be emitted from the wet scrubber, resulting in a lower overall control efficiency.
2. Mercury, as well as sulfates and other particulates, captured in a wet scrubber must be removed from the wastewater prior to discharge.

Absorption is a wet control system. Waste generated by absorption can be disposed of as a liquid waste or a mixture of liquid and solid waste. Additional processing equipment is needed to convert the sulfates generated by absorption to a solid waste (gypsum). This reduces the sulfate loading in the absorption system wastewater, but residual water must be disposed of as a liquid waste. Additional discussion of wastewater impacts is included in item 2 below. Absorption produces a visible plume due to the water condensation in absorber exhaust plume.

Note that activated carbon for mercury control has also been proposed for control of mercury in conjunction with wet particulate control systems. Currently Essar is aware of two power plants, Montana-Dakota Utilities Co.’s Lewis & Clark Station in Montana, and Xcel Energy’s Sherco Power Plant.

6.2.6 Step 5 – Indurating Furnace Waste Gas SO₂ BACT Selection

The proposed emission control system for the waste gas exhaust SO₂ BACT is a GSA dry scrubber with a baghouse for sorbent capture and particulate control. There are three top ranked SO₂ control technologies capable of achieving controlled SO₂ emissions of 5 ppmv on the waste gas stream. A GSA dry scrubber is one of the three top ranked SO₂ control options. It was selected over the other top ranked SO₂ control options (wet scrubber and SDA) for the reasons discussed below.

The proposed BACT limits for the waste gas stream are 5 ppmv SO₂ wet corrected to 15% oxygen on a 3-hour rolling average basis and 29.9 lb SO₂/hr on a 3-hour rolling average basis.

The vendor performance guarantee of 5 ppm SO₂ for the waste gas stream includes a correction to an oxygen concentration of 15% when the exhaust oxygen content is less than 15% O₂. GSA scrubber performance is limited to 5 ppm by chemical equilibrium constraints when the oxygen content of a stream exceeds 15% oxygen. Above 15% oxygen, the vendor guarantee is 5 ppm SO₂ wet, and no oxygen correction is applied.

Essar is proposing use of a dry control strategy using a GSA system because it has several operational and environmental advantages over a wet scrubber:

- The GSA dry scrubber is an advanced technology which allows dry controls to match the SO₂ control efficiency of absorbers (wet scrubbers).
- The dry control strategy allows Essar the flexibility to evaluate the use of activated carbon for mercury control without the issue of capturing the carbon in a wet scrubber where some portion of the mercury is transferred to the wastewater treatment system.
- Dry SO₂ control systems use approximately half the amount of make-up water used in wet scrubbers; consequently, water appropriation and wastewater treatment are minimized.
- Dry SO₂ control systems do not generate wastewater. So, no increase in wastewater generation or sulfate loading in the Essar wastewater system will occur. The water used to make the lime slurry for injection into the GSA unit is minimal and evaporates when it comes in contact with the exhaust stream. Use of a wet scrubber would increase water demand and wastewater generation rates and increase sulfate loading which would require additional treatment given Essar's water reuse/recycle water management strategy.
- Sorbent from the GSA dry scrubber can be captured within the recirculation cyclone and the baghouse which allows it to be recycled back to the GSA reactor. Recycling sorbent reduces sorbent usage.
- Particulates collected can be managed as a solid waste with less environmental impact than management as wastewater.

Essar's proposed BACT performance limits reflect site-specific consideration of low concentrations at the influent to the control device, and the SO₂ removal capacity of the GSA system. Specifying a BACT performance standard based on control efficiency is not appropriate in this application. Indurating furnaces have high exhaust oxygen concentrations, which are needed for pellet oxidation. This excess oxygen dilutes the exhaust gas from the indurating furnace by increasing the flow rate above the exhaust flow rates typical of combustion processes (i.e., typically 3% O₂). Lower numerical emission control efficiencies will be observed (e.g., 90% vs. design 95%) compared to a power plant application even though a high level of SO₂ control is being achieved. Control efficiency in this application is not an appropriate indicator of SO₂ emission control performance. In this application, the proposed GSA SO₂ design control efficiency of 95% may be lower than one would typically see listed in the literature for a wet scrubber (absorber) in a coal fired power plant application, but the GSA performance based on the controlled emission rate is better than a wet scrubber on a coal fired power plant application. For example, a coal-fired power plant may have uncontrolled exhaust SO₂ concentrations of 600 to 3,000 ppmv, compared to the uncontrolled exhaust concentration of approximately 32 ppmv

SO₂ from the waste gas exhaust. The final exhaust concentration in the waste gas stream will then be much lower than what is typically measured from a well controlled coal-fired power plant exhaust (25 ppm to 50 ppm SO₂). Therefore, Essar continues to propose that its SO₂ BACT emission limits be based on exhaust concentrations rather than control efficiency.

The original MSI BACT determination was 3.3 ppm SO₂. Induration furnace design work done after the issuance of the permit has found that this limit is not achievable with a lime based wet absorber on a short term basis. Since development of the MSI BACT information has been obtained from another recent permit application that shows a significant amount of variability in the sulfur content of the ore which in turn translates to variability in the uncontrolled SO₂ concentrations. On a short term (3-hour) basis the GSA lime feed system cannot respond quickly enough to maintain such a low outlet concentration. It is anticipated that a wet scrubber like the one proposed in the MSI BACT would have a similar or worse response rate to changes in SO₂ loading. Therefore, Essar is proposing a limit of 5 ppm on a 3-hour basis. In addition, Essar is proposing use of a dry scrubbing system for the reasons noted above. The proposed BACT limit represents the highest level of performance that can be achieved with GSA dry scrubbing technology in this application. Therefore, a BACT limit of 5 ppmv SO₂ on a wet basis is appropriate for the Essar project.

To ensure that GSA dry scrubbers subject to BACT operate in a manner consistent with the proposed BACT emission limits, Essar will track GSA performance using a continuous emission monitoring system (CEMS) and parameter monitoring. The CEMS will be used to demonstrate compliance with the proposed BACT limits. Information from the CEMS and parametric monitoring will allow Essar to operate the GSA dry scrubber in a manner consistent with the proposed BACT limits.