Economic Impact Analysis (EIA) for the Manganese Ferroalloys RTR

Final Report

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Economic Impact Analysis (EIA) for the Manganese Ferroalloys RTR

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CONTENTS

Section **Page**

SECTION 1
EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) has prepared final amendments to the national emissions standards for hazardous air pollutants (NESHAP) for Ferroalloys Production to address the results of the residual risk and technology review that EPA is required to conduct by the Clean Air Act. This final rule is to be signed under a court-order on May 28, 2015. These amendments include revisions to existing particulate matter standards for electric arc furnaces, metal oxygen refining process, and crushing and screening operations. The amendments add hydrochloric acid, polycyclic aromatic hydrocarbons, and formaldehyde emission limits to electric arc furnaces. The amendments also expand and revise the requirements to control process fugitive emissions from furnace operations and casting. Other requirements related to testing, monitoring, notification, recordkeeping, and reporting requirements are included.

This is not an economically significant rule as defined by Executive Order 12866 and 13563 since the annual effects, either benefits or costs, are not estimated to potentially exceed $100 million. Therefore, EPA is not required to develop a regulatory impact analysis (RIA) as part of the regulatory process. EPA has prepared an economic impact analysis (EIA) for this final rule, however, and includes documentation for the methods and results.

1.1 Analysis Summary

The key results of the EIA are as follows:

> **Engineering Cost Analysis:** EPA estimates the final NESHAP's total annualized costs will be $7.7 million ($2012). This estimate includes all of the compliance costs for expected controls on all affected hazardous air pollutants (HAP), with both control and administrative (monitoring, testing) costs and costs of additional ductwork and fans included. These costs primarily reflect the costs to install and operate controls to reduce process fugitive emissions of HAP metals (e.g., manganese, nickel, cadmium) that are necessary to reduce risks, and reflect the MACT floor level of control for HAP emissions from the furnace stacks. EPA estimates the total capital cost of the final rule to be about $40.3 million.
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> **Economic Impact Analysis: T**he economic impacts for the firms affected by the final rule include annual compliance costs of approximately 1.9 percent of sales, and a potential 10.4 percent reduction in output. Thus, consumers will experience moderate increases in the price of affected domestic ferroalloy output, using annual compliance costs as a percent of sales as a proxy for price increases, and there will be some reduction in domestic ferroalloy demand assuming all other factors constant.

Social Cost Analysis: The estimated social cost of this final rule will be $7.7 million, which is also the total annualized cost of compliance ($2012).

Small Entity Analyses: Neither of the two affected firms are small businesses according to the Small Business Administration's (SBA's) small business size standard for this industry. The small business size standard for the ferroalloy manufacturing industry is 1,000 employees for an ultimate parent company. Thus, there are no small business or entity impacts associated with this rule.

1.2 Organization of this Report

The remainder of this report supports and details the methodology and the results of the EIA:

- Section 2 describes the final rule.
- Section 3 presents the profile of the affected industry.
- Section 4 describes the baseline emissions, emission reductions, and costs for options considered in the final rule.
- Section 5 describes the economic impacts and analyses to comply with Statutory and Executive Order requirements.
- Section 6 contains the references for the EIA.

SECTION 2
INTRODUCTION

2.1 Background for Rule

This action supplements our amendments to the national emission standards for hazardous air pollutants for the ferroalloys production source category published in the Federal Register on November 23, 2011 (76 FR 72508). In that action, the EPA proposed amendments under section 112(d)(6) and (f)(2) of the Clean Air Act. Specifically, this action presents a new technology review and a new residual risk analysis for the ferroalloys production source category and finalizes revisions to the standards based on those reviews. This action also finalizes new compliance requirements to meet the revised standards.

2.1.1 What is this source category and how did the MACT regulate its HAP emissions?

The NESHAP (or MACT rule) for Ferroalloys Production: Ferromanganese and Silicomanganese was promulgated on May 20, 1999 (64 FR 27450) and codified at 40 CFR part 63, subpart XXX.[1] The 1999 NESHAP (40 CFR 63.1650(a)) applies to all new and existing ferroalloys production facilities that manufacture ferromanganese or silicomanganese and are major sources or are co-located at major sources of HAP emissions. The rule's product-specific applicability reflected the only known major source at the time of promulgation. Since then, one other producer of silicomanganese has started production.

Today, there are two ferroalloys production facilities that are subject to the MACT rule. The ferroalloys products that are the focus of the NESHAP are ferromanganese (FeMn) and silicomanganese (SiMn), which are produced by two facilities in the United States. One facility (Eramet) is located in Ohio and produces both FeMn and SiMn. The other plant (Felman) is located in West Virginia and produces only SiMn.

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[1] The emission limits were revised on March 22, 2001 (66 FR 16024) in response to a petition for reconsideration submitted to EPA following promulgation of the final rule, and a petition for review filed in the U.S. Court of Appeals for the District of Columbia Circuit.

No new ferroalloys production facilities have been built in over 20 years, and we anticipate no new ferroalloys production facilities in the foreseeable future, although one facility is currently exploring expanding operations.

Ferroalloys are alloys of iron in which one or more chemical elements (such as chromium, manganese, and silicon) are added into molten metal. Ferroalloys are consumed primarily in iron and steel making and are used to produce steel and cast iron products with enhanced or special properties.

Ferroalloys within the scope of this source category are produced using submerged electric arc furnaces, which are furnaces in which the electrodes are submerged into the charge. The submerged arc process is a reduction smelting operation. The reactants consist of metallic ores (ferrous oxides, silicon oxides, manganese oxides, etc.) and a carbon-source reducing agent, usually in the form of coke, charcoal, high- and low-volatility coal, or wood chips. Raw materials are crushed and sized and then conveyed to a mix house for weighing and blending. Conveyors, buckets, skip hoists, or cars transport the processed material to hoppers above the furnace. The mix is gravity-fed through a feed chute either continuously or intermittently, as needed. At high temperatures in the reaction zone, the carbon source reacts with metal oxides to form carbon monoxide and to reduce the ores to base metal.[2] The molten material (product and slag) is tapped from the furnace, sometimes subject to post-furnace refining, and poured into casting beds on the furnace room floor. Once the material hardens, it is transported to product crushing and sizing systems and packaged for transport to the customer.

HAP generating processes include electrometallurgical (furnace) operations (primary and tapping), other furnace room operations (ladle treatment and casting), building fugitives, raw material handling and product handling. HAP are emitted from ferroalloys production as process emissions, process fugitive emissions, and outdoor fugitive dust emissions.

Process emissions are the exhaust gases from the control devices, primarily the furnace control device, metal oxygen refining control device and crushing operations control device. The HAP in process emissions are primarily composed of metals (mostly manganese, arsenic, nickel, lead and chromium) and also may include organic

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[2] U.S. Environmental Protection Agency. AP-42, 12.4. Ferroalloy Production. October 1986.

compounds that result from incomplete combustion of coal or coke that is charged to the furnaces as a reducing agent. There is also evidence of mercury emissions. There are process metal HAP emissions from the product crushing control devices. Process fugitive emissions occur at various points during the smelting process (such as during charging and tapping of furnaces and casting) and are assumed to be similar in composition to the process emissions. Outdoor fugitive dust emissions result from the entrainment of HAP in ambient air due to material handling, vehicle traffic, wind erosion from storage piles, and other various activities. Outdoor fugitive dust emissions are composed of metal HAP only.

The MACT rule applies to process emissions and process fugitive emissions from the submerged arc furnaces, the metal oxygen refining process, and the product crushing equipment and outdoor fugitive dust emissions sources such as roadways, yard areas, and outdoor material storage and transfer operations. For process sources, the NESHAP specifies numerical emissions limits for particulate matter (as a surrogate for metal HAP) from the electric (submerged) arc furnaces (including primary and tapping emissions), depending on furnace type, size, and product being made. Particulate matter emission limits (again as a surrogate for metal HAP) are also in place for the metal oxygen refining process and product crushing and screening equipment. Table 2-1 contains a summary of the applicable limits.

Table 2-1. Emission Limits in Subpart XXX

New or Reconstructed or Existing Source	Affected Source	Applicable PM Emission Standards	Subpart XXX Reference
New or reconstructed	Submerged arc furnace	0.23 kilograms per hour per megawatt (kb/hr/MW) (0.51 pounds per hour per megawatt (lb/hr/MW) or 35 milligrams per dry standard cubic meter (mg/dscm) (0.015 grains per dry standard cubic foot (gr/dscf)	40 CFR 63.1652(a)(1) and (a)(2)
Existing	Open submerged arc furnace producing ferromanganese and operating at a furnace power input of 22 MW or less	9.8 kg/hr (21.7 lb/hr)	40 CFR 63.1652(b)(1)
Existing	Open submerged arc furnace producing ferromanganese and operating at a furnace power input greater than 22 MW	13.5 kg/hr (29.8 lb/hr)	40 CFR 63.1652(b)(2)

New or Reconstructed or Existing Source	Affected Source	Applicable PM Emission Standards	Subpart XXX Reference
Existing	Open submerged arc furnace producing silicomanganese and operating at a furnace power input greater than 25 MW	16.3 kg/hr (35.9 lb/hr)	40 CFR 63.1652(b)(3)
Existing	Open submerged arc furnace producing silicomanganese and operating at a furnace power input of 25 MW or less	12.3 kg/hr (27.2 lb/hr)	40 CFR 63.1652(b)(4)
Existing	Semi-sealed submerged arc furnace (primary, tapping, and vent stacks) producing ferromanganese	11.2 kg/hr (24.7 lb/hr)	40 CFR 63.1652(c)
New, reconstructed, or existing	Metal oxygen refining process	69 mg/dscm (0.03 gr/dscf)	40 CFR 63.1652(d)
New or reconstructed	Individual equipment associated with the product crushing and screening operation	50 mg/dscm (0.022 gr/dscf)	40 CFR 63.1652(e)(1)
Existing	Individual equipment associated with the product crushing and screening operation	69 mg/dscm (0.03 gr/dscf)	40 CFR 63.1652(e)(2)

The 1999 NESHAP established a building opacity limit of 20 percent that is measured during the required furnace control device performance test. The rule provides an excursion limit of 60 percent opacity for one 6-munute period during the performance test. The opacity observation is focused only on emissions exiting the shop due solely to operations of any affected submerged arc furnace. In addition, blowing taps, poling and oxygen lancing of the tap hole; burndowns associated with electrode measurements; and maintenance activities associated with submerged arc furnaces and casting operations are exempt from the opacity standards specified in §63.1653.

For outdoor fugitive dust sources, as defined in §63.1651, the 1999 NESHAP requires that plants prepare and operate according to an outdoor fugitive dust control plan that describes in detail the measures that will be put in place to control outdoor fugitive dust emissions from the individual outdoor fugitive dust sources at the facility. The owner or operator must submit a copy of the outdoor fugitive dust control plan to the designated permitting authority on or before the applicable compliance date.

2.1.1.1 History of RTR Development Up to the Present

Pursuant to section 112(f)(2) of the Clean Air Act, we evaluated the residual risk associated with the Ferroalloys Production NESHAP in 2011. We also conducted a technology review, as required by section 112(d)(6) of the Clean Air Act. We also reviewed the 1999 MACT rule to determine if other amendments were appropriate. Based on the results of that previous residual risk and technology review, and the MACT rule review, we proposed amendments to subpart XXX on November 23, 2011 (76 FR 72508) (referred to herein out as the 2011 proposal). The proposed amendments in the 2011 proposal which we have revisited in today's rulemaking included the following:

- proposed revisions to particulate matter standards for electric arc furnaces and local ventilation control devices;
- emission limits for hydrochloric acid (HCl), mercury, and polycyclic aromatic hydrocarbons (PAHs);
- proposed requirements to control process fugitive emissions based on full-building enclosure with negative pressure, or fenceline monitoring as an alternative; and
- a provision for emissions averaging.

In today's Notice of Final Rulemaking we present revised analyses, and based on those analyses we are revising amendments for the items listed above to allow the public an opportunity to review and comment on these revised analyses and revised amendments.

The comment period for the November 2011 proposal opened on November 23, 2011 and ended on January 31, 2012. We have addressed the comments we received during the public comment period for the 2011 proposal in this final action. Responses to comments are found in the final preamble and in the response to comments (RTC) document.

2.1.2 What data collection activities were conducted to support this action?

Commenters on the 2011 proposal expressed concern that the data set used in the risk assessment did not adequately reflect current operations at the plants. In response to these comments, we worked with the facilities to address these concerns, and we have obtained a much more robust data set than the one available to us at proposal. Specifically, the plants provided data collected during their ongoing compliance tests in fall 2012. Then, in response to an Information Collection Request (ICR) from the EPA in December 2012, they conducted more tests in the spring of 2013. This combined testing effort provided the following data:

Additional stack test data for arsenic, cadmium, chromium, lead, manganese, mercury, nickel, HCl, formaldehyde, PAH, polychlorinated biphenyls (PCB), and dioxins/furans;

- Test data collected using updated, state-of-the-art test methods and procedures;
- Hazardous air pollutant (HAP) test data for all operational furnaces;
- Test data obtained during different seasonal conditions (i.e., spring and fall);
- Test data for both products (ferromanganese and silicomanganese) for both furnaces at Eramet (Felman only produces silicomanganese).

We believe that the current data set is significantly better than the data set we relied on in the 2011 proposal. With the new data, we do not have to extrapolate HAP emissions from a ratio of particulate matter to HAP emissions from just one or two tested furnaces. We are also using test data collected using test methods that we believe, in some cases, are more appropriate and provide better QA/QC of the test results. For mercury, test data was collected for the supplemental proposal using EPA Method 30B, which requires paired samples collected for each test run, in addition to a spiked sample during the 3-run test. Test data for PAH were collected using CARB 429, which uses higher resolution and greater sensitivity analytical procedures to determine concentration of the PAH compounds. We also received PCB and dioxin/furan test data that was collected using CARB 428, which also uses higher resolution and greater sensitivity analytical procedures to determine the concentration of the organic compounds.

Commenters also expressed concern that the estimated cost and operational impacts of the proposed process fugitive standards based on use of a total building enclosure requirement were significantly underestimated. In their comments both companies submitted substantial additional information and estimates regarding the elements, costs and impacts involved with constructing and operating a full building enclosure for their facilities. Furthermore, in their comments, and in subsequent meetings and other communications, the companies also provided design and cost information for an alternative approach to substantially reduce fugitive emissions based on enhanced local capture and control of these emissions at each plant. In the summer of 2012 and fall of 2013, both plants submitted updated enhanced capture plans and cost estimates to implement those plans. We also consulted with outside ventilation experts and control equipment vendors to re-evaluate the costs of process fugitive capture as well as other control device costs such as activated carbon injection. We also gathered a substantial amount of opacity data from both facilities, and collected additional information regarding the processes, control technologies, and modeling input parameters (such as stack release heights and fugitive emissions release characteristics). We reviewed and evaluated all the data and information provided by the facilities, the ventilation experts and venders, and revised our analyses accordingly.

2.1.3 Technology Review

Our technology review focused on the identification and evaluation of developments in practices, processes and control technologies that have occurred since the 1999 MACT standards were promulgated. Where we identified such developments, in order to inform our decision of whether it is "necessary" to revise the emissions standards, we analyzed the technical feasibility of applying these developments, and the estimated costs, energy implications, non-air environmental impacts, as well as considering the emission reductions. We also considered the appropriateness of applying controls to new sources versus retrofitting existing sources.

Based on our analyses of the available data and information, we identified potential developments in practices, processes and control technologies. For this exercise, we considered any of the following to be a "development":

- Any add-on control technology or other equipment that was not identified and considered during development of the original MACT standards.

- Any improvements in add-on control technology or other equipment (that were identified and considered during development of the original MACT standards) that could result in additional emissions reduction.
- Any work practice or operational procedure that was not identified or considered during development of the original MACT standards.
- Any process change or pollution prevention alternative that could be broadly applied to the industry and that was not identified or considered during development of the original MACT standards.
- Any significant changes in the cost (including cost effectiveness) of applying controls (including controls the EPA considered during the development of the original MACT standards).

We reviewed a variety of data sources in our investigation of potential practices, processes or controls to consider. Among the sources we reviewed were the NESHAP for various industries that were promulgated since the MACT standards being reviewed in this action. We reviewed the regulatory requirements and/or technical analyses associated with these regulatory actions to identify any practices, processes and control technologies considered in these efforts that could be applied to emission sources in the Ferroalloys production source category, as well as the costs, non-air impacts and energy implications associated with the use of these technologies. Additionally, we requested information from facilities regarding developments in practices, processes or control technology. Finally, we reviewed information from other sources, such as state and/or local permitting agency databases and industry-supported databases.

For the 2011 proposal, our technology review focused on the identification and evaluation of developments in practices, processes, and control technologies that have occurred since the 1999 NESHAP was promulgated. In cases where the technology review identified such developments, we conducted an analysis of the technical feasibility of applying these developments, along with the estimated impacts (costs, emissions reductions, risk reductions, etc.) of applying these developments. We then made decisions on whether it is necessary to propose amendments to the 1999 NESHAP to require any of the identified developments. Based on our analyses of the data and information collected by the 2010 ICR and our general understanding of the industry and other available information on potential controls for this industry, we identified several potential developments in practices, processes, and control technologies.

Based on our technology review for the 2011 proposed rule, we determined that there had been advances in emissions control measures since the Ferroalloys Production NESHAP was originally promulgated in 1999. Based on that review, we proposed lower PM emissions limits for the process vents because we determined that the existing add-on control devices (baghouses and wet venture scrubbers) were achieving better control than that reflected by the older emissions limits in the 1999 MACT rule. Furthermore, based on that previous technology review, to reduce fugitive process emissions, in 2011 we decided to propose a requirement for sources to enclose the furnace building, collect the fugitive emissions such that the furnace building is maintained under negative pressure, and duct those emissions to a control device. We proposed that approach in 2011, because at that time, we believed it represented a technically-feasible advance in emissions control since the Ferroalloys Production NESHAP was originally promulgated in 1999. Additional details regarding the previously-conducted technology review can be found in the docket for this action: Memorandum: Technology Review for Ferroalloys Production Source Category (10/27/2011) (See Docket No. EPA-HQ-OAR-2010-0895-0044), and are discussed in the preamble to the November 2011 proposal. However, we received significant adverse public comments regarding the proposed requirement for full-enclosure with negative pressure. After reviewing and considering the comments and other information regarding the costs and feasibility of full-enclosure, we determined that full-enclosure with negative pressure may not be feasible for these facilities and would be much more costly than what we had estimated for the 2011 proposal. Therefore we decided to evaluate other potential approaches to reduce fugitive process emissions, such an option based on enhanced local capture and control of the fugitive emissions, which is described in more detail below.

We also gathered additional emissions data for the process vents. Therefore, we have up-dated and revised our technology review for the process vent emissions and fugitive emissions control options. For further information on the technology review, and the risk review, please refer to the preamble for the supplemental proposal.

2.2 Options for Current Rule

The first option (Option 1) evaluated for fugitive metal HAP emissions in this document is based on enhanced local capture and control, including primary and secondary hooding. The second option (Option 2) is full building enclosure.   The three options evaluated for mercury emissions in this document are:

Option 1 – Propose mercury limits based on the calculated UPL (i.e., MACT Floor) for each of the product types (silicomanganese (SiMn), ferromanganese (FeMn)).

Option 2 – Propose a beyond the floor mercury limit for FeMn production and the UPL (i.e., MACT Floor) mercury limit for SiMn production.

Option 3 – Propose a beyond the floor mercury limit for FeMn production and for SiMn production.

The options that are selected in this final rulemaking are Option 1 for the fugitive metal HAP emissions and Option 1 for the mercury emissions.

It should be noted that new language on how the UPL method is addressed and explained can be found in the preamble for this final rule.

As part of the regulatory process of preparing these standards, EPA has prepared an economic impact analysis (EIA). This analysis includes consideration impacts to small entities as part of compliance with the Small Business Regulatory Enforcement Fairness Act (SBREFA) and analyses to comply with other Executive Orders.

SECTION 3
INDUSTRY PROFILE

3.1 Background

EPA has developed this industry profile to provide the reader with an understanding of the technical and economic aspects of the industry that would be directly affected by this final rule.

Ferroalloys are alloys of iron in which one or more chemical elements (such as chromium, manganese, and silicon) are added into molten metal. Ferroalloys are consumed primarily in iron and steel making and are used to produce steel and cast iron products with enhanced or special properties. Ferroalloy manufacturing is found in NAICS 331110 (Iron and Steel Mills and Ferroalloy Manufacturing).

Ferroalloys within the scope of this source category are produced using submerged electric arc furnaces, which are furnaces in which the electrodes are submerged into the charge. The submerged arc process is a reduction smelting operation. The reactants consist of metallic ores (ferrous oxides, silicon oxides, manganese oxides, etc.) and a carbon-source reducing agent, usually in the form of coke, charcoal, high- and low-volatility coal, or wood chips. Raw materials are crushed and sized and then conveyed to a mix house for weighing and blending. Conveyors, buckets, skip hoists, or cars transport the processed material to hoppers above the furnace. The mix is gravity-fed through a feed chute either continuously or intermittently, as needed. At high temperatures in the reaction zone, the carbon source reacts with metal oxides to form carbon monoxide and to reduce the ores to base metal. The molten material (product and slag) is tapped from the furnace, sometimes subject to post-furnace refining, and poured into casting beds on the furnace room floor. Once the material hardens, it is transported to product crushing and sizing systems and packaged for transport to the customer.

Silicomanganese, a metallic silvery ferroalloy, is composed principally of manganese, silicon, and iron. It is produced in a number of grades and sizes. Most, but not all, silicomanganese is manufactured and sold to ASTM International specification A 483, which covers three grades, designated “A,” “B,” and “C” and differentiated by their silicon and carbon contents. Most silicomanganese produced and sold in the United States conforms to the specification for grade B. Silicomanganese is sold in small pieces of fairly uniform sizes. A typical piece of silicomanganese is 3 inches by ¼ inch.[1]

Silicomanganese is consumed in bulk form primarily by the steel industry as a source of both silicon and manganese, although some silicomanganese is used as an alloying agent in the production of iron castings. Manganese, intentionally present in nearly all steels, is used as a steel desulfurizer and deoxidizer. By removing sulfur from steel, manganese prevents the steel from becoming brittle during the hot rolling process. In addition, manganese increases the strength and hardness of steel. Silicon is used as a deoxidizer, aiding in making steels of uniform chemistry and mechanical properties. As such, it is not retained in the steel, but forms silicon oxide, which separates from the steel as a component of the slag. As an alloying agent, silicon increases the hardness and strength of hot-rolled steel mill products, and enhances the toughness, corrosion resistance, and magnetic and electrical properties of certain steel mill products.

Use depends upon the steelmaking practices of a given producer. Silicomanganese may be introduced directly into the steelmaking furnace or added as a chemistry addition/deoxidizer to molten steel at a separate ladle metallurgy station. As a furnace addition, it is typically used in lump sizes and melted along with other steelmaking raw materials; as a ladle addition, silicomanganese is used in smaller sizes. Silicomanganese is mostly consumed by electric furnace steelmakers in the production of long products, including bars and structural shapes. This use in long products may be due to less restrictive specifications for silicon for these products than for flat-rolled carbon steel mill products, such as sheet and strip.

Silicomanganese is believed to account for only a small share of the total cost of end-use steel mill products. A low-carbon grade of silicomanganese containing around 60 percent of manganese with around 30 percent of silicon and less than 0.10 percent carbon is also available and is used primarily in the production of stainless steel, not in the applications of the more common standard grade silicomanganese. Low-carbon silicomanganese is not a subject product in these reviews. Low-carbon silicomanganese is produced by upgrading standard grade material by the addition of silicon wastes from the ferrosilicon industry. It is produced primarily in Norway by a firm related to the Eramet Group, one of the firms affected by this final rule.

[1] U.S. International Trade Commission. Silicomanganese from India, Kazakhstan and Venezuela. Investigation Nos. 731-TA-929-931 (Second Review). Publication No. 4424. September 2013. Available on the Internet at http://www.usitc.gov/publications/701_731/4424.pdf.

3.2 Manufacturing Process

Silicomanganese is produced by smelting together in a submerged arc furnace sources of silicon, manganese, iron, and a carbonaceous reducing agent, usually coke. The reducing agent and the other items are combined in a "charge" (which may include wood chips, dolomite, and a fluxing agent) and electrically heated. Impurities from the ore or other manganese sources are released and form slag, which rises to the top of the furnace and floats on top of the molten silicomanganese. Following smelting, molten metal and slag are removed or "tapped" from the furnace. The molten silicomanganese is poured into large molds (called "chills"), where it cools and hardens. Once the alloy has hardened, the chills are emptied and the alloy is crushed into small pieces and screened to fairly uniform sizes.

Eramet Marietta, Inc. is located in Marietta, OH and is wholly-owned by Eramet Holding Manganese of France. Prior to July 1999, the Marietta, OH, facility was operated by Elkem Metals Co. In July 1999, Eramet SA of France purchased the production facility in Marietta, OH, which included all of Elkem Metals Co.'s silicomanganese assets, from Elkem S/A, and created the U.S. company Eramet Marietta, Inc. From 2002 to 2005, Highlander Alloys, LLC ("Highlander"), attempted to produce silicomanganese at a silicon and silicon alloy facility in New Haven, WV, but was beset by a number of problems ranging from financial woes, service cutoffs, strikes by unpaid workers, and production difficulties resulting in only sporadic production of silicomanganese. Domestic producer Eramet produces silicomanganese at a plant in Marietta, OH, that it purchased in July 1999 from Elkem. Eramet also produces other manganese ferroalloys as well as other alloying agents at that plant. Silicomanganese is manufactured in the same or similar facilities as those used to produce high carbon ferromanganese, although switching from one grade or type of manganese ferroalloy to another involves costs in terms of lost production, reduced productivity, or possible contamination of the higher grade product.

Organizational Structure

Currently, the Eramet Marietta site is one of 11 subsidiaries of Eramet Group's Manganese division, with other facilities in this division including mining and metallurgical business segments operating in twenty countries across five continents (Eramet Marietta, 2015).

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Inputs and Outputs

According to the website of Eramet Marietta (2012), the Marietta facility acquired manganese ore via barge from sister company Eramet Comilog, which operates a mine in Gabon, Africa. This ore is refined into either ferromanganese or silicomanganese. The finished product is shipped to the company's customers, which "are primarily steel companies – most of which are located within a 500-mile radius of the facility" (Eramet Marietta, 2012).

Revenue and Employment

Revenue data for Eramet Marietta is available in Hoover's, but it is proprietary.[2] Yahoo Finance (2008) estimates the company's 2008 employment at 365, while Dun and Bradstreet (2011a) list 2009 employment as 240. Eramet Marietta has recently stated that there are 188 full-time equivalent direct employees at its facility as of December 31, 2014 (Eramet Marietta, 2015).

Felman Production, LLC

Felman Production, LLC has been operating on the West Virginia side of the Ohio River since 2006 in a facility built in 1952 (Felman Trading, 2012). Felman Production, Inc. became a limited liability corporation (LLC) in 2012. This plant has 256 employees when operating at full production. The union representing the Felman employees is the United Steelworkers Union and at full production the plant operates 24 hours per day and 7 days per week.

[2] Based on download of data from Hoover's, http://www.hoovers.com, on March 14, 2014.

Organizational Structure

Felman Production, LLC is a foreign-owned and privately-held company. The company is a wholly owned subsidiary of Georgian American Alloys Corp. Also, according to the U.S. Geological Survey (2010), Georgian American Alloys Corp. is owned by Ukraine's Privat Group. A document from the U.S. District Court for the Southern District of West Virginia sheds more light on the ownership of the company. In a 2011 memorandum regarding an insurance claim made by Felman Production, the court reported that "Felman is 100% owned by Haftseek Investments Limited, which is 100% owned by Divot Enterprises, Ltd., the stock of which is 100% owned by Igor Kolomoiskiy" who is described as "one of three shareholders of Privat Bank" (U.S. District Court for the Southern District of West Virginia [USDC SDWV], 2011). The memorandum also specifies that the Privat entity "is intimately related to Felman and its operations" (USDC SDWV, 2011).

Felman Production, LLC also has close ties with Felman Trading, Inc., which is "an exclusive distributor of ferroalloys produced by its relative company Felman Production, Inc." This entity is the trading arm for Felman Production and is responsible for selling and delivering ferroalloy products produced by the company.

Inputs and Outputs

While it is unclear where the mined ore comes from, sale and delivery of finished products is entirely done by Felman Trading, Inc. The goods are sold to "metallurgical consumers in North, Central, and South Americas" (Felman Trading, 2012). Felman sells their product through its sister company, Felman Trading, Inc. (which is based in Miami, FL) to various steelmakers such as AK Steel, Nucor, Gerdau Ameristeel, and Timken to name a few. In addition to the plant near New Haven, West Virginia, Felman Trading also handles the output of U.S.-based CC Metals and Alloys and five plants in the Black Sea region, including three plants in Ukraine, one plant in Romania, and one plant in Georgia.

Revenue, Employment and Other Economic Data

According to Manta, Inc. in 2012, Felman Production, Inc. parent company had $27.7 million in sales. Other measures of revenue were either largely inaccurate or undisclosed.

In an EPA inspection report dated March 19, 2012, the company describes its profit margins as "extremely tight and dependent on, among other factors, the price of manganese ore and the market price for silicomanganese, which varies considerably (e.g., between October 2011 and March 2012, the market price for silicomanganese fluctuated between $900 and $1200 per ton)."[3] The same inspection report also indicated that at this time, Felman is considering shutting down the facility in the next 2-3 years if the capital and operating costs associated with new and proposed air emissions control requirements make silicomanganese production in West Virginia uneconomical. However, if the facility is able to obtain the required air permits, the plant manager did say that there was the possibility of Felman installing an additional 1-2 furnace(s) in the plant (which may be accompanied by a shutdown of 1-2 of the existing furnaces). This would be a 30 million dollar (per furnace) investment in the facility. The plant's Title V permit was revised on March 12, 2012 in order for the Company to install and operate a pelletizer, extruder and crusher for material handling purposes.[4]

More recently, Felman's chief financial officer, Barry Nuss, testified before the West Virginia Public Services Commission that Felman Production, LLC incurred losses in 2011 and 2012, and that "it is not logical to assume that the shareholder of Felman Production will continue to operate a high cost, unprofitable operation if it has an alternative to do otherwise." [5]

Within the United States, the electrometallurgical ferroalloy manufacturing industry is composed of two facilities located about 80 miles apart in the Ohio River Valley. Eramet Marietta, the larger of the two, is located in the town of Marietta, within Washington County, Ohio; the other manufacturer, Felman Production LLC, is located near New Haven, within Mason County, West Virginia.

Today, there are two ferroalloys production facilities that are subject to the supplemental proposal. No new ferroalloys production facilities have been built in over 20 years, and we anticipate no new ferroalloys production facilities in the foreseeable future, although one facility is currently exploring expanding operations.

In general, little difference appears to exist between the production processes in the domestic industry and those used abroad to produce silicomanganese. This fact reflects the maturity of the industry, and may be attributed to the diffusion of process technology,

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[3] Memorandum from U.S. EPA, Region III. Report for Inspection of Felman Production, Inc. plant in Letart, West Virginia. March 19, 2012. Redacted version.

[4] Memorandum from U.S. EPA, Region III. Report for Inspection of Felman Production, Inc. plant in Letart, West Virginia. March 19, 2012. Redacted version.

[5] Public Service Commission of West Virginia. Redacted Rebutal testimony of Barry Nuss on behalf of Felman Production, LLC. Case No. 13-1325-E-PC. November 26, 2013, p. 6.

techniques, and equipment on a world-wide basis; the similarity of steelmaking techniques; and the commonality of steel recipes.

Most silicomanganese is sold directly to the end user, steel producers, for use as a deoxidizer in the production of steel. It is mostly used in production of long products (rods, bars, and sections) in electric arc furnace mini-mills, which have increased their share of raw steel production in the United States. Silicomanganese is also used, although to a lesser extent, in steel plate production. Demand for silicomanganese follows the trends of the steel industries as well as overall economic conditions. Purchasers of silicomanganese reported that their main customers are foundries and steel mills.

Based on available information, U.S. silicomanganese producers have the ability to respond to changes in demand with moderate changes in the quantity of shipments of U.S. produced silicomanganese to the U.S. market. The main contributing factors to the moderate degree of responsiveness of supply are the availability of unused capacity, some ability to use inventories to increase shipments, and the ability to produce alternate products.

Based on available information, overall U.S. demand for silicomanganese is likely to experience small changes in response to changes in price. Silicomanganese accounts for a very small share of the total cost of its end uses. Apparent U.S. consumption of silicomanganese, by quantity, decreased during 2007-09 and increased during 2010-12.

Purchasers in the U.S. reported that silicomanganese accounted for 1 percent of the total cost of steel produced in integrated mills and less than 3 percent of costs for steel produced with electric arc furnaces.

Most firms reported that U.S. demand for silicomanganese since 2007 decreased or fluctuated considerably.   Most firms attributed the decreases or fluctuations in demand to the overall condition of the economy and the decline in steel production. Several firms specifically cited the recession in 2009 as causing a decrease in demand for silicomanganese due to the decrease in construction activity and associated decline in demand for steel.

Firms’ responses to a US ITC survey regarding future demand for silicomanganese were mixed. One-half of responding importers expect U.S. demand for silicomanganese to fluctuate, while others anticipate that demand will increase or not change. Purchasers who expect demand for silicomanganese to change reported that it will fluctuate, and most foreign producers anticipate U.S demand for silicomanganese to increase. Most firms attributed these changes to economic recovery and changing demand for steel.

Both responding U.S. producers reported that the silicomanganese market subject to business cycles or conditions of competition distinctive to silicomanganese, and most responding importers (8 of 12) reported that silicomanganese is subject to business cycles or conditions of competition distinctive to silicomanganese. Firms reported that demand for silicomanganese tracks certain industry demand, such as construction, which heavily impacts the demand for steel.

3.3 Substitute Products and Related Issues

Both domestic producers, 9 of 12 importers, 6 of 13 purchasers, and 2 of 5 foreign producers reported to the U.S. ITC that high-carbon ferromanganese and ferrosilicon could be substituted for silicomanganese in steel production. Almost all responding firms reported that the substitutes for silicomanganese have not changed since 2007, and that they do not anticipate changes in the future.

Six of nine importers and four of seven purchasers reported that the price of identified substitutes affected the price of silicomanganese and reported that firms will switch to substitute products if the price for silicomanganese is too high.

It should be noted that the two domestic producers also import substantial amounts of the ferroalloys that they also produce. This interesting facet of domestic ferroalloy operations should be noted in examination of the industry.[6]

3.3.1 Substitutability Issues

The degree of substitution between domestic and imported silicomanganese depends upon such factors as relative prices, quality (e.g., levels of silicon and manganese, levels of other chemicals, consistency, and lump size), and conditions of sale (e.g., discounts, lead times, payment terms, etc.). Based on available data, US International Trade Commission (ITC) staff indicate in a report that there is a moderate-to-high degree of substitutability between domestically produced silicomanganese and silicomanganese produced outside of the U.S.

[6] U.S. International Trade Commission. Silicomanganese from Brazil, China, and Ukraine. Investigation No. 731-TA-671-673 (Third Review). September 5, 2012. Washington, D.C. p. 159.

3.4 Elasticity Estimates

3.4.1 U.S. Supply Elasticity

The domestic supply elasticity for silicomanganese measures the sensitivity of the quantity supplied by U.S. producers to changes in the U.S. market price of silicomanganese. The elasticity of domestic supply depends on several factors including the level of excess capacity, the ease with which producers can alter capacity, producers' ability to shift to production of other products, the existence of inventories, and the availability of alternate markets for U.S. produced silicomanganese. Earlier analysis of these factors indicates that the U.S. industry has a moderate ability to increase or decrease shipments to the U.S. market given a price change. The US ITC estimates that the supply elasticity is between 5 to 7.

3.4.2 U.S. Demand Elasticity

The U.S. demand elasticity for silicomanganese measures the sensitivity of the overall quantity demanded to a change in the U.S. market price of silicomanganese. This estimate depends on factors discussed earlier such as the existence, availability, and commercial viability of substitute products, as well as the component share of the silicomanganese in the production of any downstream products. Based on the available information, the US ITC estimates the demand elasticity for silicomanganese is likely to be in the range of -0.4 to -0.7.

3.4.3 Substitution Elasticity

The elasticity of substitution depends upon the extent of product differentiation between the domestic and imported products. Product differentiation, in turn, depends upon such factors as quality (e.g., chemistry, appearance) and conditions of sale (e.g., availability, sales terms, discounts). Based on available information, the US ITC estimates the elasticity of substitution between U.S.-produced silicomanganese and subject imported silicomanganese is likely to be in the range of 3 to 6.[7]

[7] The substitution elasticity measures the responsiveness of the relative U.S. consumption levels of the subject imports and the domestic like products to changes in their relative prices. This reflects how easily purchasers switch from the U.S. product to the subject products (or vice versa) when prices change.

3.5 Raw Material and Electricity Costs

Silicomanganese prices are related to the costs of raw materials and tend to follow similar trends. Raw materials used in the production of silicomanganese include manganese ore, silica, coke, and electricity. U.S. producers reported that raw materials costs as a share of cost of goods sold increased from 2007 to 2012. Raw materials as a share of cost of goods sold were slightly higher in January-March 2013 than in January-March 2012. The primary raw materials used to produce silicomanganese are manganese ore and/or high-carbon ferromanganese slag. Felman reported that it imports manganese ore from Australia, South Africa, and Gabon, and Eramet reported sourcing manganese ore from Gabon and South Africa. Prices for manganese ore increased from January 2007 to July 2008, then declined through 2008 and mid-2009, and then fluctuated through March 2013.

At a hearing before the ITC, representatives from Georgian American Alloys and Eramet stated that electricity costs are also a significant cost in producing silicomanganese. A representative from Georgian American Alloys added that electricity accounts for approximately 25 percent of their total cost of production and is their second most costly input in producing silicomanganese. Eramet Marietta has recently stated that "the delivered cost of electricity has a significant impact on the Marietta [Ohio] Facility's cost of production and its ability to compete domestically, internationally and within its own corporate structure," and that the "local delivered price of electricity is the main source of competitive advantage or disadvantage for any ferromanganese alloy producer," given the other major production costs are set in international markets (Eramet Marietta, 2015).

3.6 Current operations at U.S. Ferroalloy Producers

On June 28, 2013, Felman announced that it had ceased operations at its New Haven, West Virginia facility for three months. In the next "two months," Felman intended to reevaluate market conditions to determine whether operations will resume earlier or if the plant will remain closed for additional time. At a hearing for the US ITC, a representative from Felman explained that both the current silicomanganese market conditions and planned maintenance at the facility were factors in deciding to shutdown for three months. In its posthearing brief, Felman further explained that it is committed to producing silicomanganese in the United States as evidenced by its significant investment in maintenance for its facility and its retention of all employees during the shutdown.[8]

In the summer of 2013, Felman officials asked the West Virginia Public Services Commission (PSC) for a special power rate on the electricity it uses for production in order to reduce its cost of production and remain competitive with other ferroalloy producers worldwide. The PSC decided to grant Felman's request in early April, 2014. On June 30, 2014, Felman Production signed a contract with their power provider, Appalachian Power Co. (a subsidiary of American Electric Power, AEP) that includes a special power rate. In a press release issued that day, Felman officials indicated the facility will be restarted for production by the end of July, 2014. On July 1, 2014, Felman officials, through their parent company (Georgian-American Alloys, Inc.) indicated two of the three furnaces onsite will be restarted by the end of July.[9] Those furnaces were restarted and operated into early 2015.

The Eramet facility in Marietta, OH will continue to produce silicomanganese and ferromanganese in 2014, according to a spokesperson for the facility interviewed on January 17, 2014. [10] While production at this facility continued in 2014, the Agency is aware that Eramet Marietta, Inc. requested on January 22, 2015 that the Public Utilities Commission (PUC) of Ohio grant a reduction in their electric power rate from their power provider. Part of the reason for this request is to better afford the compliance costs associated with this final rule, which are estimated by Eramet Marietta to be $25,000,000 in capital investment.[11] If this request is granted, then the likelihood that the facility will continue to operate and experience lower economic impacts after implementation of the final rule than estimated in this report appears higher given that electricity is a relatively large portion of the production costs at the facility. A decision on this request is expected in late spring.

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[8] U.S. International Trade Commission. Silicomanganese from India, Kazakhstan and Venezuela. Investigation Nos. 731-TA-929-931 (Second Review). Publication No. 4424. September 2013. Available on the Internet at http://www.usitc.gov/publications/701_731/4424.pdf. P. III-2.

[9] Press release from Georgian-American Alloys, Inc., July 1, 2014. Available on the Internet at http://www.gaalloys.com/index.php/news/press-releases/34-news/press-releases/225-felman-production-to-restart-one-furnace-effective-immediately.

[10] "Eramet continues making silicomanganese/ferromanganese in Ohio." Published by Platts News. Downloaded from the Internet on January 22, 2014 at http://www.platts.com/latest-news/metals/louisville-kentucky/eramet-continues-making-silicomanganes/ferromanganese.

[11] Application by Eramet Marietta, Inc. to Amend Reasonable Arrangement. Case No. 09-516-EL-AEC. Submitted to the Public Utilities Commission of Ohio. January 22, 2015, p.3. This application is available at http://dis.puc.state.oh.us/TiffToPDf/A1001001A15A22B60221I33078.pdf . Redacted version. Requested power rate discount is confidential.

Below is additional economic and financial background information on the Eramet Marietta plant.

Eramet Marietta

In February 2010, the plant completed the first two phases of a plant security and rerouting project aimed at making the plant and its facilities more secure and changing traffic routes to improve production efficiencies and employee safety.

"This project was the first real infrastructure overhaul the plant saw in several decades and it was desperately needed to improve our efficiencies and to further secure our plant in the wake of our indefinite idling of our North Side facilities due to the economic downturn," said Willoughby.

In May 2010, Eramet Marietta performed the "first tap" on its rebuilt Furnace 12, the capstone of a $12 million renovation project aimed at improving and adding flexibility to the furnace's production capabilities while improving its environmental performance and safety. The project received the 2011 Initiative Award from the plant's corporate parent, The Eramet Group, a prestigious recognition presented to the top projects completed in the organization, which employs over 17,000 people worldwide, Willoughby said.

In early 2011, Eramet Marietta connected a $10 million baghouse emissions abatement system to Furnace 1, completing the project started in 2008.

"These investments made in our plant by our parent company indicate their belief that Eramet Marietta is an important operation in their portfolio," Willoughby said. "Each project is a testament to the hard work and dedication of our employees, and our commitment to continue to remain competitive in our field and a good corporate citizen here in the Mid-Ohio Valley."[12]

Willoughby said 2012 is ushering in more progress at the Eramet Marietta plant. Last year, the company received final approvals from its parent company for an estimated $10.2

[12] It should be noted that Eramet Marietta indicated that its plant was not subsidized by its parent company, Eramet Group, in a comment on the proposed rule ("NERA, Final Report, Prepared on behalf of Eramet Marietta, Incorporated. "Technical Comments on the Regulatory Impact Analysis Supporting EPA's Proposed Rule for Hazardous Air Pollutants from Ferroalloys Production (76 FR 72508)." January 31, 2012. pp. 6-7). The relevant quote is "In the case of EMI, EMI has advised us that EMI's parent does not subsidize EMI, and therefore, any investment would need to be self-financed on the basis of EMI's ability to operate profitably in the future while absorbing the higher compliance costs imposed by the Proposed Rule."

million overhaul of its outdated mixhouse/raw material handling department. The mixhouse project should be completed sometime in 2013.

Additionally, early in 2012 Eramet learned that it received financing for a water service project that will provide water from the Ohio River to Eramet Marietta as well as several other companies along Ohio Highway 7. The company, which uses river water as part of a closed loop process that cools its furnaces, took the lead on the project when AMP-Ohio, which used to provide the service water to several facilities in the area, announced its closure.

3.7 National Defense Stockpile for Raw Materials

The U.S. Department of Defense (DOD) has maintained a stockpile of raw materials, known as the National Defense Stockpile (NDS), deemed essential for purposes of national security since World War II. The NDS is a stockpile inventory of strategic materials built and held to sustain the defense and essential civilian industrial base of the United States in the event of a national emergency. It is held in reserve; inventories can only be released subject to certain congressional and Presidential authorities. Ferromanganese has long been considered an essential raw material since it is an important input to steel production, and steel is a key component for ordinance, tanks, and other military equipment. Eramet Marietta and other parties have expressed concerns in comments that one impact of this final rule could be the reduction in the domestic supply of ferromanganese for military purposes, and increased reliance on ferromanganese from countries that may not be friendly to US military interests. Information from the US Geological Survey's Mineral Summaries 2014 suggests, however, than there is considerable ferromanganese available for purchase from the NDS. Of the 91,000 tons of ferromanganese available for disposal from the NDS in Fiscal Year 2013, only 2,000 tons were sold or disposed of. There were 347,000 tons available for disposal, thus indicating that there appears to be sufficient quantities of ferromanganese from the NDS for use by the US DOD, and for purchase by Eramet Marietta.[13] The Strategic and Critical Report 2013 on Stockpile Requirements prepared by DOD concluded that no shortfalls in ferromanganese were anticipated to meet military and civilian demand for every scenario analyzed in the report.[14] In addition, no

[13] U.S. Geological Survey. 2014 Mineral Commodity Summaries. p. 101. Available at http://minerals.usgs.gov/minerals/pubs/mcs/2014/mcs2014.pdf.

[14] U.S. Department of Defense, Defense Logistics Agency. Strategic and Critical Materials 2013 Report of Stockpile Requirements. January 2013. Available at http://www.strategicmaterials.dla.mil/Report%20Library/2013%20NDS%20Requirements%20Report.pdf.

one from the DOD has participated in the Interagency Review of the supplemental proposal and, before that, the Interagency Review of the 2011 ferroalloys proposal.

SECTION 4
BASELINE EMISSIONS, EMISSION REDUCTIONS, AND COSTS

4.1 Introduction

This section presents the baseline emissions for the pollutants emitted by affected units, the resulting emissions after imposition of the final rule and the costs from reducing emissions as a result of the final rule. We present the baseline emissions and emission reductions for HAP including mercury and for other emissions affected such as $PM_{2.5}$. Emission reductions were calculated from the baseline emissions based on the final emissions limits.

4.2 Summary Of Cost Estimates And Emissions Reductions For The Regulatory Options Considered

Regulatory options were considered for control of emissions of particulate matter (PM) metal HAP (e.g., Mn, Ni, Cd), Mercury (Hg), organic HAP, and Polycyclic Aromatic Hydrocarbons (PAH) from furnace stacks, and metal HAP from product sizing stacks and fugitive sources.

Emissions of each pollutant vary considerably among facilities, and multiple control options are available for different groups of pollutants. Because of this, and the limited number of facilities in the source category (two), specific regulatory options were assessed for each facility based on both technology review and modeled risk. Because of differences in modeled risk and existing controls, some options were not considered for all process lines at all facilities. Emissions reductions were estimated for each facility based on emissions data received in an information collection request (ICR) sent to the industry and based on interactions with officials from each facility.

A brief description of the options selected for the final revisions to the NESHAP and the associated costs and emissions reductions for each facility in the source category are summarized in Table 4-1. A more detailed description of all the regulatory options considered and their associated cost and emissions reductions estimates are presented in the cost memoranda for this final rule.

The emissions reductions associated with the control options are calculated as the difference between baseline emissions and the estimated emissions for each control scenario. Details of the methodology employed to calculate these emissions are included in a separate memorandum. All costs are estimated in 2012 dollars. The impacts for Option 1, the option to apply enhanced fugitive emissions capture, is shown by plant and in total, and the same is true for Option 2, the option to apply full building enclosure. Option 1 is in the final rule, and Option 2 is not. The HAP emission reductions estimated for this final rule are 77 tons of metal HAP. PM emissions in this chapter refer to total PM.

Of the 229 tons of total PM reduced, 48 tons are $PM_{2.5}$ since approximately 21 percent of the total PM is in the fine PM fraction.

Table 4-1: Summary of the Estimated Costs and Emissions Reductions of Fugitive HAP Regulatory Options Considered for the Final Rule

		Costs		Emission Reductions			Cost Effectiveness			Incremental Cost Effectiveness		
Compliance Option	Facility	Total Capital Cost ($)	Total Annual Cost[1] ($/yr)	PM Reduction (Tons)	$PM_{2.5}$ Reduction[2] (Tons)	HAP Reduction (Tons)[3]	Cost Effectiveness ($/Ton PM)	Cost Effectiveness ($/Ton $PM_{2.5}$)	Cost Effectiveness ($/lb HAP)	Incremental Cost Effectiveness ($/Ton PM)	Incremental Cost Effectiveness ($/Ton $PM_{2.5}$)	Incremental Cost Effectiveness ($/lb HAP)
Option 1: Enhanced Fugitive Capture	Eramet	$25,147,000	$5,343,095	147	31	61	$36,660	$174,573	$43			
	Felman	$14,627,782	$1,853,325	83	17	16	$22,251	$105,955	$58			
	Total	$39,774,782	$7,196,420	230	48	77	$31,420	$149,619	$46			
Option 2: Building Ventilation	Eramet[4]	$33,154,302	$13,670,228	157	33	65	$87,072	$414,626	$105	$832,713	$3,965,301	$1,171
	Felman[5]	$28,228,603	$5,042,545	97	20	19	$52,214	$248,637	$134	$240,123	$1,143,441	$561
	Total	$61,382,905	$18,712,773	254	53	84	$73,796	$351,408	$112	$494,654	$2,355,496	$900

[1] Annual cost calculated using 7% interest and a 20-year equipment life.

[2] PM2.5 estimated to be approximately 21% of total PM, based on analysis performed by EPA's National Environmental Investigation Center of TSP data collected in the Marietta area by Ohio EPA and ATSDR during 2007-8.

[3] HAP reduction estimates assume Eramet Furnaces #1 and #12 both producing silicomanganese 50% of the time, FeMn 50% of the time.

[4] Eramet Building Ventilation costs provided by Eramet Marietta Inc, in their comments on the proposed rule: "Engineering Review of Proposed Ferroalloy NESHAP Requirements for Eramet Marietta Inc.", EPA-HQ-OAR-2010-0895-0106. Emissions and costs reflect the assumption that building ventilation will not be required for Eramet building #18.

[5] Felman building ventilation cost estimate provided by Felman Production Inc, in their comments on the proposed rule: "Building Ventilation Costs January 30, 2012", EPA-HQ-OAR-2010-0895-0073

*Final Option.

4.3 Regulatory Options Considered For the Final Rule

This section provides a detailed description of all regulatory options that were considered for the Ferroalloys NESHAP and their associated costs and emissions reductions.

4.3.1 Furnace Stack Emissions – Metal HAP

This section provides a detailed description of regulatory options under the final rule for fugitive HAP emissions for the Ferroalloys NESHAP and their associated costs and emissions reductions.

4.3.2 Furnace Stack Emissions Control Options

These impacts for the regulatory options were calculated for existing units only, as no new facilities are expected to become operational within the next 5 years. The methodology used to estimate the costs are provided in the costs memorandum[17] for the 2014 supplemental proposal. The emissions estimates (baseline and enhanced capture) for this source category are discussed in the modeling emissions memorandum.[18]

For the 2014 supplemental proposal, the EPA considered two options for reducing fugitive emissions from the ferroalloys process; Option 1 includes enhanced local capture and roofline ventilation for both facilities. Option 2 reflects full building enclosure with negative pressure for both facilities. The cost estimates for Option 1 contained in Table 1 of this memorandum represent controls likely to be installed as a result of facility-specific ventilation analyses, the controls likely to be needed to address risk, and existing capture and control systems at the facilities. These estimates were based on cost estimates supplied by the facilities after discussions with EPA regarding the standards being considered, and incorporating their best estimates of the improvements to fugitive emission capture and control they would implement to achieve "enhanced" capture". The cost estimates for Option 2 are based on revised analyses that were conducted after considering comments, information and data submitted by the facilities in response to EPA's November 2011 proposal.[19,20]

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[17] Memorandum from Jeff Harris and Bradley Nelson, EC/R to Phil Mulrine, U.S. Environmental Protection Agency, OAQPS/SPPD/MICG, Cost Impacts of Control Options Considered for the Ferroalloys Production NESHAP to Address Fugitive HAP Emissions, August 13, 2014.

[18] Memorandum from Bradley Nelson, EC/R Inc. to Phil Mulrine, EPA OAQPS/SPPD/MMG, Revised Development of the Risk and Technology Review (RTR) Emissions Dataset for the Ferroalloys Production Source Category for the 2015 Final Rule, April 21, 2015.

[19] Eramet: "Engineering Review of Proposed Ferroalloy NESHAP Requirements for Eramet Marietta Inc.", EPA-HQ-OAR-2010-0895-0106.

[20] Felman: "Building Ventilation Costs January 30, 2012", EPA-HQ-OAR-2010-0895-0073.

4.3.2.1 Option 1: Enhanced Local Capture

As previously mentioned, design of a local ventilation system begins with a detailed analysis of specific localized parameters (e.g., building volume, process locations, and airflow) leading to development of a site-specific local ventilation plan and installation of custom hoods and ventilation equipment. Such a system might rely on a variety of specific ventilation systems. Installed systems may include the following:

- Curtains or doors surrounding furnace tops to contain fugitive emissions,
- Improvements to hoods collecting tapping emissions,
- Upgraded fans to improve the airflow of fabric filters controlling fugitive emissions,
- Addition of "Secondary Capture", or additional hoods to capture emissions from tapping platforms or crucibles,
- Addition of fugitive capture for casting operations,
- Addition of additional fabric filters where necessary, and
- Addition of rooftop ventilation, in which fugitive emissions escaping local control are collected in the roof canopy over process areas through addition of partitions, then directed through roof vents and ducts to control systems.

For the purposes of this analysis, it has been assumed that enhanced fugitive capture and control systems and roofline ventilation will be installed for all operational furnaces at both facilities, and for MOR operations at Eramet Marietta. The specific elements of the capture and control systems selected for each facility are based directly on information supplied by the facilities incorporating their best estimates of the improvements to fugitive emission capture and control they would implement to achieve the standards to be included in the supplemental proposal.

4.3.2.2 Option 2: Full Building Enclosure

Details of Option 2 (building ventilation) remain the same as in EPA's November 2011 proposal. This control option involves installation of full building ventilation at negative pressure for furnace buildings instead of installing fugitive controls on individual tapping and casting operations. This option would require installation of ductwork from the roof vents of furnace buildings, structural repairs to buildings, and a new fabric filter for each building. For emissions modeling and cost estimation purposes we assumed that building ventilation would be required for buildings containing furnaces, (*i.e.*, Eramet buildings #1 and #12, and the melt shop building at Felman).

4.4 Methodology For Estimating Control Costs

The following sections present the methodologies used to estimate the costs associated with the regulatory options considered in the revised NESHAP for the Ferroalloys Production source category.

4.4.1 Option 1 – Enhanced Fugitive Capture

Fugitive emissions of metal HAP at Ferroalloys Production facilities result from several areas of the process. Process fugitive emissions primarily result from furnace leaks and incomplete capture of emissions during tapping and casting of product. Furnace upsets can result in release of emissions that would normally be contained by negative pressure occurring inside furnace hood. Process fugitive emissions can also result from incomplete capture of emissions by tapping hoods, or from casting operations, some of which are uncontrolled.

Both facilities employ negative-pressure hoods to collect emissions from tapping operations and direct them to a control device. Some casting operations at both facilities capture emissions and direct them to a fabric filter, while some casting operations are currently uncontrolled.

As previously mentioned, design of a local ventilation system begins with a detailed analysis of specific localized parameters (e.g., building volume, process locations, and airflow) leading to development of a site-specific local ventilation plan and installation of custom hoods and ventilation equipment. Both facilities which will be subject to the NESHAP have performed preliminary analyses to assess the measures that they are likely to need to take to comply with

EPA's potential requirements, and have submitted cost estimates to EPA based on their analyses. Attachments 1 and 2 of the fugitive emissions cost memo contain copies of the cost estimates provided by the facilities.

Costs were estimated for enhanced process fugitive control including roofline ventilation, as described in the fugitive emissions cost memo. Details of the methodology employed to estimate these costs follow.

4.4.1.1 General Considerations

A variety of potential enhancements to local ventilation and control of fugitive emissions may be used by the facilities depending on their individual situation. Specific enhancements for each facility were selected for cost estimation based on estimates directly provided by the facilities based on their own engineering analyses and discussions with EPA. Analyses and cost estimates provided by the facilities were given precedence where they were available. In addition, the following general considerations apply to all estimated costs for process fugitives:

- Annualized costs assume a 20-year life expectancy for the installed control devices and other equipment and, to be consistent with OMB Guidance in Circular A-4, a 7-percent cost of capital as an estimate of the annualized capital cost.

- Costs provided by the facility were assumed to be in current dollars. All other costs for this estimate were adjusted to 2012 dollars using Chemical Engineering Plant Cost Indices (CEPCI[1]) where necessary.

- Downtime associated with installation was not directly included in in cost estimates.[2]

- Costs were not included for items noted by the facilities as currently being in place.

4.4.1.2 Facility-Specific Considerations

The following facility-specific considerations also apply:

- Felman Production provided two general cost estimate scenarios:

[1] CEPCI values employed: 584.6 for 2012, 521.9 for 2009, and 359.2 for 1993. For more information, see http://www.chengonline.com.

[2] Eramet Marietta provided costs for downtime associated with installation, while Felman did not. These costs were significant, but because these costs were declared to be confidential by Eramet, they were considered by EPA, but not directly included in these analyses.

- The first assumes a scenario in which one of their three furnaces is not in operation and its fabric filter are used to provide roofline ventilation for the other two furnaces, and

- The second assumes all three furnaces are operational with the addition of a new fabric filter for roofline ventilation.

Estimated costs for Felman represent the second scenario. This scenario was selected to be in line with modeled emissions, which are based on the assumption that all three furnaces are operational.

- Because Felman Production did not provide detailed estimated costs for the additional fabric filter included in the second scenario, total installed capital cost and annual costs for the fabric filter were estimated using EPA's Integrated Planning Model (IPM) for Particulate Control Cost Development[3], with additional costs for ductwork estimated using EPA's Air Pollution Control Cost Manual.[4] The estimated cost for this fabric filter is significantly higher than Felman Production's brief estimate of the difference between the two cost scenarios, but the higher estimate has been retained to be conservative. Details of these cost estimates are included in Attachment 3 of the fugitive emissions cost memorandum.

- Eramet's cost estimate assumed capital costs of about $7.3 million for addition of "Scrubber upgrades OR dust collector" for Furnace #12. Adding proportional amounts of the associated installation and engineering costs results in total capital costs of approximately $12.5 million for upgrades to the control device for Furnace #12. Furnace #12 currently is equipped with 2 venturi scrubbers used to control fugitive emissions from the furnace and tapping. The scrubbers are designed to handle approximately 127,000 acfm each and the average flow rate from the current capture configuration is 171,000 acfm, or roughly 67% of the estimated capacity of the scrubbers. Assuming that the enhanced capture system which Eramet has proposed for Furnace 12 (increased tapping capture and roof line ventilation) would increase the required airflow over current levels by 50 to 100% (*i.e.*, to a total of 256,000 to 342,000 acfm), the low end of the estimated range would put them very near the maximum capacity of the current controls in place. Accordingly, it seems reasonable to assume that additional control capacity will be required, whether in the form of upgrades to the scrubber(s) or their replacement with a fabric filter.

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[3] Sargent & Lundy, IPM Model - Revisions to Cost and Performance for APC Technologies, Particulate Control Cost Development Methodology Final, March 2011.

[4] http://epa.gov/ttn/catc/products.html#cccinfo

4.4.2 Option 2 – Building Ventilation

As described in Sections 2 and 3, EPA proposed the full building enclosure option in the November 2011 proposal. However, EPA received significant comments saying that EPA had substantially underestimated the cost. Both Eramet and Felman provided extensive comments regarding implementation of building ventilation, including cost estimates based on their own engineering analyses. Analyses and cost estimates provided by the facilities have been given precedence in developing new cost estimates. In addition, the following facility-specific considerations apply to estimated costs for building ventilation:

- Felman's cost estimate applied overhead and contingency adjustments to ductwork costs twice (once in the ductwork cost calculations by Chu & Gassman, and again in the costs prepared by Lan Associates). Our cost estimate corrects this. For consistency with the overhead adjustments used in preparation of the two sections of Felman's overall cost estimate, we have calculated the Total Capital Investment (TCI) for the fabric filter as 2.17*Purchased Equipment Cost (PEC), and for ductwork as TCI=1.41*PEC. Details of the revised cost estimate for Felman are included in Attachment 4 of the cost memo.

- Eramet's cost estimate included costs for installation of building ventilation for building #18. For consistency with the option contained in the 2011 proposal, and with modeled emissions, our cost estimate only assumes building ventilation is installed for buildings #1 and #12. Only the "Building 1" and "Building 12" costs from Eramet's cost estimate are included.

4.5 Mercury Control Options

4.5.1 Background

The raw materials used to produce ferroalloys contain trace amounts of mercury, which is emitted during the smelting process. These mercury emissions are derived primarily from the manganese ore, although there may be trace amounts in the coke or coal used in the smelting process. The mercury emissions can exist in three forms: elemental, oxidized, and as a particulate. While some of the mercury in particulate and oxidized forms is captured by the particulate control devices, the more volatile elemental mercury is largely emitted to the atmosphere. Control technologies used to reduce mercury emissions from combustion sources have been used with success on other sources. The most highly advanced technology, activated carbon injection (ACI) has been used on facilities that burn municipal solid waste for the past decade. This technology uses particles of activated carbon to capture the mercury in the exhaust gas stream. This is achieved by injecting the activated carbon into the exit gas flow, downstream from the combustion source. The mercury attaches to the activated carbon particles, and it is removed in a particulate control device. This control technology is expected to achieve up to 90% removal of mercury from the exhaust stream, and it was selected as the control technology that would be used to reduce mercury emissions from the furnace smelting process at ferroalloy production facilities under two of the three options described below.

4.5.2 Methodology for Estimating Costs of Mercury Reductions at Ferroalloy Facilities

The impacts of reducing mercury emissions from the furnace smelting process at ferroalloys production facilities are based on the costs and emission reductions achieved through the retrofit of ACI. This section summarizes the methodology and estimates the capital cost, annual cost, and expected mercury emission reduction of retrofitting ACI on the furnaces at Eramet and Felman.

Capital and Annual Costs

The capital and annual costs of retrofitting ACI on ferroalloy furnaces were estimated using ACI cost algorithms[5] developed for the Mercury and Air Toxics Standards (MATS). The total capital investment (TCI) equation uses exhaust gas flow rate and carbon injection rate as variables to scale the cost of retrofitting ACI to the exhaust duct. The equation used for estimating TCI for the retrofit of ACI in 2012 dollars is presented below:

$$TCI_{ACI} = 1{,}350{,}000 * 1.2 * (Q * ACI\ Injection\ \frac{[illegible]}{[illegible]}\ Rate)^{[illegible]} *$$

where;

Q = Volumetric flow rate of the exhaust gas in actual standard cubic feet per minute (acfm),
ACI Injection Rate = Estimated carbon injection rate (lb/MMacf), assumed 2.0 for furnaces equipped with a fabric filter and 5.0 for furnaces equipped with a venturi scrubber,
1,350,000 = Cost constant for installing an ACI system,
1.2 = Retrofit factor,

[5] Sargent & Lundy, IPM Model – Revisions to Cost and Performance for APC Technologies, Mercury Control Cost Development, Final, March 2011.

584.6 = Chemical Engineering Price Cost Index for 2012,
521.9 = Chemical Engineering Plant Cost Index for 2009.

The TCI for the ACI algorithm include the costs for all of the equipment, installation, buildings, foundations, electrical, and retrofit factor to address difficulty of installation. This cost equation was used to estimate TCI for retrofitting ACI on each of the ferroalloy furnaces. It was assumed that the retrofit would take place upstream from the existing control device for Furnaces 2, 5, and 7 at Felman and Furnace 12 at Eramet. For Furnace 1 at Eramet, it was assumed that a polishing baghouse would be installed and the ACI would be installed after the existing baghouse and prior to the newly installed polishing baghouse. The equation used to estimate the TCI for adding a polishing baghouse with an air-to-cloth ratio of 6.0 in 2012 dollars is presented below:

[illegible]

where;

Q = Volumetric flow rate of the exhaust gas in actual standard cubic feet per minute (acfm),
1,350,000 = Cost constant for installing an ACI system,
1.2 = Retrofit factor
584.6 = Chemical Engineering Price Cost Index for 2012,
521.9 = Chemical Engineering Plant Cost Index for 2009.

To estimate the total project cost (TPC), expenses for engineering and construction management (10% of TCI), labor adjustments (5% of TCI), and contractor profit and fees (5% of TCI) were included.

Annual costs for operation of the ACI were broken into direct annual costs and indirect annual costs. Direct annual costs included operating labor, administrative and supervisory labor, maintenance and materials, amount of activated carbon injected, and the cost for disposal of the captured carbon. Indirect annual costs consisted of overhead, property taxes, insurance, administration, and capital recovery. Table 4-2 lists the assumptions used to calculate each of these direct and indirect costs.

The capital recovery factor was calculated assuming a 20-year equipment life and a 7 percent interest rate. Additional cost data used for this estimate was obtained from a mercury control cost document developed for coal-fired utility boilers[6]. This document provided the ACI injection rate (2 lb/MMacf for fabric filter applications), non-hazardous waste disposal costs ($30/Ton), and cost for the ACI ($0.75/lb). A summary of the ACI costs and more details on how these costs are estimated are provided in Appendix A of the mercury cost memorandum.[7]

Table 4-2. Activated Carbon Injection Model Annual Costs

Parameter		Equation/Assumptions
Direct Annual Cost ($/yr)		
1	Additional Operating Labor[1]	= $0
2	Supervisory Labor	= 0.03 * (Operating Labor + 40% of Maintenance Costs)
3	Maintenance	= 0.005 * TCI for ACI/Retrofit Factor
4	Activated Carbon	= (ACI Injection rate, lb/MMacf)*(Exhaust Flow Rate, acf/min) *(MMacf/10^6 acf)*(60 min/hr)*(8760 hr/yr)*($0.75/lb)
5	Dust Disposal	= (ACI Injection rate, lb/MMacf)*(Exhaust Flow Rate, acf/min) *(MMacf/10^6 acf)*0.99*(60 min/hr)*(8760 hr/yr)*(Ton/2000 lb) *($40/Ton)
Indirect Annual Cost ($/yr)		
1	Overhead	= 0.6 * (Labor + Maintenance)
2	Property taxes, insurance, and administration	= 0.04 * TCI
3	Capital Recovery	= CRF * TCI

[1] It was assumed that no additional operating labor is needed to operate the ACI.

[6] Sargent & Lundy, IPM Model - Revisions to Cost and Performance for APC Technologies, Mercury Control Cost Development Methodology Final, March 2011.

[7] Memo from Bradley Nelson, EC/R Inc. to Phil Mulrine, US EPA. Revised Mercury Control Options for the Ferroalloys Production Industry. April, 2015.

Baseline Mercury Emissions

Emissions data have been re-calculated incorporating newly provided test data[8,9,10] received prior to and after the publication of the 2014 supplemental proposal. This additional test data was received from one of the facilities, and provides additional HAP data for some pollutants at previously tested emission sources, including Hg data from each of the operational furnaces at a single facility, one furnace producing Ferromanganese (FeMn) and the other producing Silicomanganese (SiMn), and additional PM data from from one furnace at one of the facilities.

To estimate the reductions in mercury emissions that would be achieved under Option 2, first we calculated the estimated baseline annual mercury emissions during the production of FeMn. These baseline emissions for FeMn production for Option 2 were calculated using test data from Furnaces 1 and 12 at Eramet during FeMn production. Baseline emissions for Option 2 were not calculated for Felman, because they produce only SiMn in each of their three furnaces. For each of the furnaces at Eramet, the average mercury emissions rate in pounds per hour (lb/hr) from the test data during FeMn production was multiplied by 4,380 hours per year (i.e., 50% annual production of FeMn).

Cost and Emissions Impacts

A summary of the impacts for each of the Mercury Control Options are presented in Table 4-3. The impacts for Control Option 1, the option that is included in the final rule, were calculated to be zero. These impacts are based on the assumption that the facilities would be able to meet the mercury limits with their current furnace controls.

The impacts for Control Option 2 are based on the installation of ACI on Furnace 1 and 12 at Eramet with operation only during the production of FeMn, and a polishing baghouse on Furnace 1. The emissions and annual cost for this option are based on the assumption that both

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8 "Emission Measurement Summary Report Furnace No. 12 Scrubber PAHs and Mercury Eramet Marietta Inc. Marietta, OH", January 2013, Available in the docket, EPA-HQ-OAR-2010-0895.

9 "Polycyclic Aromatic Hydrocarbons and Mercury Emission Summary Report EAF No. 12 Scrubber EAF No. 1 Baghouse Eramet Marietta Inc. Marietta, OH", November 2014, Available in the docket, EPA-HQ-OAR-2010-0895.

10 "Emission Measurement Summary Report Filterable Particulate Matter Furnaces 1 and 12 Eramet Marietta, Inc. Marietta, Ohio", April 2014, Available in the docket, EPA-HQ-OAR-2010-0895.

furnaces produce FeMn 50 percent annually (or 4,380 hours per year).[11] The mercury reduction is assumed to be 90 percent for the installation of ACI and the polishing baghouse on Furnace 1 at Eramet, and 50 percent for installation of ACI and the existing scrubber on Furnace 12 at Eramet.

The impacts for Control Option 3 were calculated assuming that all of the furnaces at Eramet and Felman would install and operate ACI during FeMn and SiMn production. Again, the assumption is that ACI would be installed downstream from the Furnace 1 baghouse and a second polishing baghouse would be added. The emissions and annual cost for this option are based on the assumption that both furnaces at Eramet produce 50 percent annually (or 4,380 hours per year) of FeMn and 50 percent annually of SiMn. The furnaces at Felman are assumed to produce SiMn only. The mercury reduction is assumed to be 90 percent for the installation of ACI and the polishing baghouse on Furnace 1, and 50 percent for installation of ACI and the existing scrubber on Furnace 12 at Eramet. The mercury reduction for ACI installed with the existing baghouses at Felman is assumed to be 90 percent.

A breakdown of the individual furnace emission reductions and the capital and annual costs for Options 2 and 3, the beyond the MACT floor options analyzes, are provided in Tables 4-4 and 4-5. The spreadsheet calculation sheet with the control cost algorithms are provided in Appendix A of the mercury control cost memorandum for Options 2 and 3.[12]

Table 4-3. Summary of the Updated Estimated Emissions Reductions and Cost Impacts for the Mercury Control Options Considered for Existing Furnaces

Mercury Control Option	***Hg Emission Reductions (lb/yr)***	***Total Capital Cost ($2012)***	***Total Annual Cost ($/year)***	***Cost Effectiveness ($/lb)***
Option 1 – MACT Floor for FeMn and SiMn Production	0	$0	$0	-----
	263	$30,195,970	$3,361,901	$12,769

[11] Cost effectiveness varies significantly with the percentage of FeMn production. As shown in Table 2-2, the Option 1 cost effectiveness for Eramet EAF 1 at 50% FeMn production is approximately $13,600/lb Hg. For the same furnace producing 100% FeMn, the cost effectiveness would be approximately $7,100/lb Hg.

[12] Memo from Bradley Nelson, EC/R Inc. to Phil Mulrine, US EPA. Revised Mercury Control Options for the Ferroalloys Production Industry. April, 2015.

Option 2 – Beyond-the-floor for FeMn Production and MACT Floor for SiMn Production				
Option 3 – Beyond-the-floor for FeMn and SiMn Production	328.6	$41,681,907	$6,872,764	$20,911

Table 4-4. Summary of Updated Mercury Cost Effectiveness for Control Option 2 (Beyond-the-floor Mercury Control for Furnaces Producing FeMn Only)

Cost Parameter	Eramet EAF 1 Cost ($2012)	Eramet EAF 12 Cost ($2012)	Total Eramet Cost ($2012)[1]
	Existing FF w/ ACI & New Polishing FF	ACI w/ Existing Venturi Scrubber	
Polishing Baghouse Capital Cost[2]	$14,659,265	$0	$14,659,265
Activated Carbon Injection Capital Cost[2]	$3,184,766	$3,625,211	$6,809,977
Other Installation Capital Cost[3]	$7,974,497	$752,231	$8,726,729
Total Capital Cost	$25,818,528	$4,377,442	$30,195,970
Direct Annual Cost ($/yr)[4]	$217,476	$318,449	$535,925
Indirect Annual Cost ($/yr)[5]	$2,334,447	$491,529	$2,825,976
Total Annual Cost ($/yr)	$2,551,924	$809,977	$3,361,901
Mercury Emission Rate (lb/yr)	208.6	151.1	359.7
Mercury Emission Reduction w/ ACI (lb/yr)[6]	187.7	75.6	263.3
Mercury Cost Effectiveness ($/lb)	$13,595	$10,718	$12,769

[1] Mercury Control Option 1 includes: Eramet EAF 1 - adding ACI and polishing FF to existing EAF #1 w/ FF, Eramet EAF 12 - adding ACI to existing EAF #12 w/ VS.

[2] ACI and BH costs developed using capital and annual cost algorithms from the IPM Model - Revisions to Cost and Performance for APC Technologies, Mercury Control Cost Development Methodology, March 2011.

[3] Other installation capital costs include: engineering and construction management, construction labor adjustment, and contractor profit & fees.

[4] Direct annual costs include: operating labor, administrative and supervisory labor, maintenance labor and materials, activated carbon, and non-hazardous dust disposal for Eramet.

[5] Indirect annual costs include: overhead, property tax, insurance, administration, and capital recovery (20 years @ 7% interest).

[6] Assumes 90% mercury reduction for FF and 50% mercury reduction with a VS.

Table 4-5. Summary of Updated Mercury Cost Effectiveness for Control Option 3 (Beyond-the-floor Mercury Control for Furnaces Producing FeMn and SiMn)

Cost Parameter	Felman Furnace 2 Cost ($2012)	Felman Furnace 5 Cost ($2012)	Felman Furnace 7 Cost ($2012)	Total Felman Cost ($2012)[1]	Eramet EAF 1 Cost ($2012)	Eramet EAF 12 Cost ($2012)	Total Eramet Cost ($2012)[1]
	ACI w/ Existing Fabric Filter	ACI w/ Existing Fabric Filter	ACI w/ Existing Fabric Filter		Existing FF w/ ACI & New Polishing FF	ACI w/ Existing Venturi Scrubber	
Polishing Baghouse Capital Cost[2]	$0	$0	$0	$0	$14,659,265	$0	$14,659,265
Activated Carbon Injection Capital Cost[2]	$3,320,988	$3,069,015	$3,122,161	$9,512,164	$3,184,766	$3,625,211	$6,809,977
Other Installation Capital Cost[3]	$689,105	$636,821	$647,848	$1,973,774	$7,974,497	$752,231	$8,726,729
Total Capital Cost	$4,010,093	$3,705,836	$3,770,009	$11,485,937	$25,818,528	$4,377,442	$30,195,970
Direct Annual Cost ($/yr)[4]	$653,379	$513,562	$737,893	$1,904,834	$314,092	$534,324	$848,417
Indirect Annual Cost ($/yr)[5]	$451,132	$417,674	$424,731	$1,293,537	$2,334,447	$491,529	$2,825,976
Total Annual Cost ($/yr)	$1,104,511	$931,236	$1,162,624	$3,198,371	$2,648,540	$1,025,853	$3,674,393
Mercury Emission Rate (lb/yr)[6]	21.5	4.39	8.93	34.8	238.3	165.8	404.1
Mercury Emission Reduction w/ ACI (lb/yr)[7]	19.3	3.95	8.03	31.3	214.4	82.9	297.3
Mercury Cost Effectiveness ($/lb)	$57,143	$235,763	$144,717	$102,143	$12,351	$12,373	$12,357

[1] Mercury Control Option 1 includes: Eramet EAF 1 - adding ACI and polishing FF to existing EAF #1 w/ FF, Eramet EAF 12 - adding ACI to existing EAF #12 w/ VS.
[2] ACI and BH costs developed using capital and annual cost algorithms from the IPM Model - Revisions to Cost and Performance for APC Technologies, Mercury Control Cost Development Methodology, March 2011.
[3] Other installation capital costs include: engineering and construction management, construction labor adjustment, and contractor profit & fees.
[4] Direct annual costs include: operating labor, administrative and supervisory labor, maintenance labor and materials, activated carbon, and non-hazardous dust disposal.
[5] Indirect annual costs include: overhead, property tax, insurance, administration, and capital recovery (20 years @ 7% interest).
[6] Eramet mercury enhanced capture emissions based on 50/50 production of FeMn and SiMn. Felman mercury enhanced capture emissions based on 100% production of SiMn.
[7] Assumes 90% mercury reduction for FF and 50% mercury reduction with a VS.

4.6 Costs of Digital Opacity Compliance System (DOCS)

A compliance monitoring option that will be required in the final rule is the use of a Digital Opacity Compliance System (DOCS). The DOCS translates images from an imaging digital camera into visual plume opacity measurements using computer software, and is proposed as an alternate reporting method to EPA Method 9 (see Preliminary Method 008). Currently the American Society for Testing and Materials (ASTM) has approved a method for the use of the DOCS (see ASTM D7520-09). The form of the standard under this option includes an opacity limit of 8 percent with the use of a digital camera opacity system (DOCS) to comply with the enhanced fugitive capture and control systems. The costs for the DOCS were updated based on new cost information from the vendor. The one-time or capital cost for setting up the DOCS was estimated to be $4,900 per source, and includes the cost of 2 cameras to be set up to read from the single roof vent to cover sun angle during different times of the day, mounts, cables, computer and accessories, and training.[13] Eramet Marietta is assumed to need 3 DOCS and Felman is assumed to need 1 DOCS.

The annual cost of operating the system per source was estimated to be $32,300 for weekly monitoring and $16,300 for monthly monitoring. The annual DOCS costs assume weekly monitoring for 26 weeks and monthly monitoring thereafter. The annual cost includes the costs for the software license, analyzing 90 minutes of opacity per monitoring event , and quarterly reporting of results. Thus, the capital cost of DOCS for Felman Production's facility will be $4,900, and the annual costs will be $24,300. For the Eramet Marietta facility, the capital costs will be $14,700 and the annual costs will be $72,900. All costs are in 2012 dollars.

As explained in the final rule FR notice, EPA is also considering the possibility of including a provision in the rule whereby if a facility achieves DOCS readings over an extended period of time that are well below the opacity limit then that facility may be able to reduce the frequency of such readings and therefore the annual operating costs would also decrease accordingly.

4.7 Costs of Bag Leak Detectors (BLS)

The baghouse systems used to control emissions from the furnaces are required to be outfitted with a bag leak detection system (BLS) to ensure proper operation of a baghouse. The capital cost for BLS was estimated to be $269,148 per affected facility with an annual cost of $219,078. Thus, the capital cost for BLS for Eramet Marietta and Felman is $269,148, and the annual cost of BLS for each facility is $219,078. All costs are in 2012 dollars.

[13] Memo from Brad Nelson, EC/R Inc. to Phil Mulrine, US EPA/OAQPS. Final Cost Impacts of Control Options Considered for the Ferroalloys Production NESHAP to Address Fugitive HAP Emissions. May 21, 2015.

4.8 Summary of Total Cost of Final Rule by Facility

Table 4-5 summarizes estimated costs for each facility in the Ferroalloys source category, assuming implementation of the final requirements, including the use of DCOS and installation of BLS, for reduction of process fugitive HAP emissions. As shown in Table 4-5, the total capital costs of the rule are $40.3 million and the total annualized costs are $7.7 million (2012 dollars).

Table 4-5: Summary Cost Estimates of Implementation of the Final Rule by Facility*

Facility	*Control System*	*Capital Cost ($)*	*Annual Cost ($)*
Eramet	Enhanced Capture System	$25,147,000	$5,343,095
	DOCS	$14,700	$72,900
	BLS	$269,148	$219,078
	Total Facility Cost	$25,430,848	$5,635,073
Felman	Enhanced Capture System	$14,627,782	$1,853,325
	DOCS	$4,900	$24,300
	BLS	$269,148	$219,078
	Total Facility Cost	$14,901,830	$2,096,703
Total Industry Cost		$40,332,678	$7,731,776

* Costs are in 2012 dollars. As stated previously, the cost of mercury control and control of PAH in the final rule is zero.

SECTION 5
ECONOMIC IMPACT ANALYSIS AND STATUTORY AND EXECUTIVE ORDER ANALYSES

5.1 Background

In this chapter, we present the results of the economic impact analysis and analyses prepared in adherence to statutory and Executive Order requirements.

5.2 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this rule on small entities, small entity is defined as: (1) a small business as defined by the Small Business Administration's (SBA) regulations at 13 CFR 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field. For this source category, which has the NAICS code 331110 (i.e., Iron and Steel Mills and Ferroalloy manufacturing), the SBA small business size standard is 1,000 employees according to the SBA small business size standard definitions.[1]

After considering the economic impacts of today's rule on small entities, I certify that this final action will not have a significant economic impact on a substantial number of small

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[1] The SBA small business size standards can be found at http://www.sba.gov/sites/default/files/Size_Standards_Table.pdf. These standards are up to date as of July 14, 2014.

entities (or SISNOSE). Neither of the companies affected by this rule is considered to be a small entity per the definition provided in this section. Hence, there is no SISNOSE for this final rule.

5.3 Economic Impacts

This section of the economic impact analysis focuses on the impacts of the final rule to the two affected ferroalloys producers in the US and to their consumers. We examine the impacts of enhanced local capture (called Option 1) for reducing fugitive HAP emissions, and the option for mercury reductions (called Option 1) on the affected facilities. In doing so, we assume that each affected facility is entirely self-supporting; that is, the parent company for each facility does not contribute any capital or other supporting funds to the operation of the facility. This statement is consistent with statements made by Eramet Marietta Inc. in its comments on the previous ferroalloys proposed NESHAP (January 29, 2012). Felman Production LLC, which was known as Felman Production, Inc. prior to becoming an LLC in early 2012, made similar statements in its comments on the earlier proposed rule (January 31, 2012). It should be noted, however, that Eramet Group, a French conglomerate that is the parent company for Eramet Marietta, Inc., has made substantial funds (>$100 million) available for several projects over the last few years implemented at the Eramet Marietta facility, including installation of a new baghouse, according to comments from its CEO in a local newspaper (March 8, 2012, Parkersburg, WV News and Record, available on the Internet). Estimating the impacts on affected facilities in such a way is a conservative estimate of impacts of the rule since any support from the parent company should reduce impacts on an individual plant owned by the company; thus, this level of estimate may overstate the calculated impacts of the final rule on each facility provided in this report.

For this analysis of economic impacts, we apply microeconomic theory in a relatively straightforward fashion. Markets are composed of people and organizations as consumers and producers acting as economic agents to maximize utility or profits, respectively. One way economists illustrate behavioral responses to pollution control costs is by using market supply and demand diagrams. The market supply curve describes how much of a good or service firms are willing and able to sell to people at a particular price; we often draw this curve as upward sloping because some production resources are fixed. As a result, the cost of producing an additional unit typically rises as more units are made. The market demand curve describes how much of a good or service consumers are willing and able to buy at some price. Holding other factors constant, the quantity demanded is assumed to fall when prices rise. In a perfectly competitive market, equilibrium price (P_0) and quantity (Q_0) are determined by the intersection of the supply and demand curves (see Figure 5-1below). This approach is based on similar economic impact approaches presented in the final CI and SI RICE NESHAP and the residential wood heaters NSPS RIAs.[2]

Changes in Market Prices and Quantities

To qualitatively assess how the regulation may influence the equilibrium price and quantity in the affected markets, we assumed the market supply function shifts up by the additional cost of producing the good or service; the unit cost increase is typically calculated by dividing the annual compliance cost estimate by the baseline quantity (Q_0) (see Figure 5-1). As shown, this model makes two predictions: the price of the affected goods and services are likely to rise and the consumption/production levels are likely to fall.

The size of these changes depends on two factors: the size of the unit cost increase (supply shift) and differences in how each side of the market (supply and demand) responds to changes in price. Economists measure responses using the concept of price elasticity, which represents the percentage change in quantity divided by the percentage change in price. This dependence has been expressed in the following formula:[3]

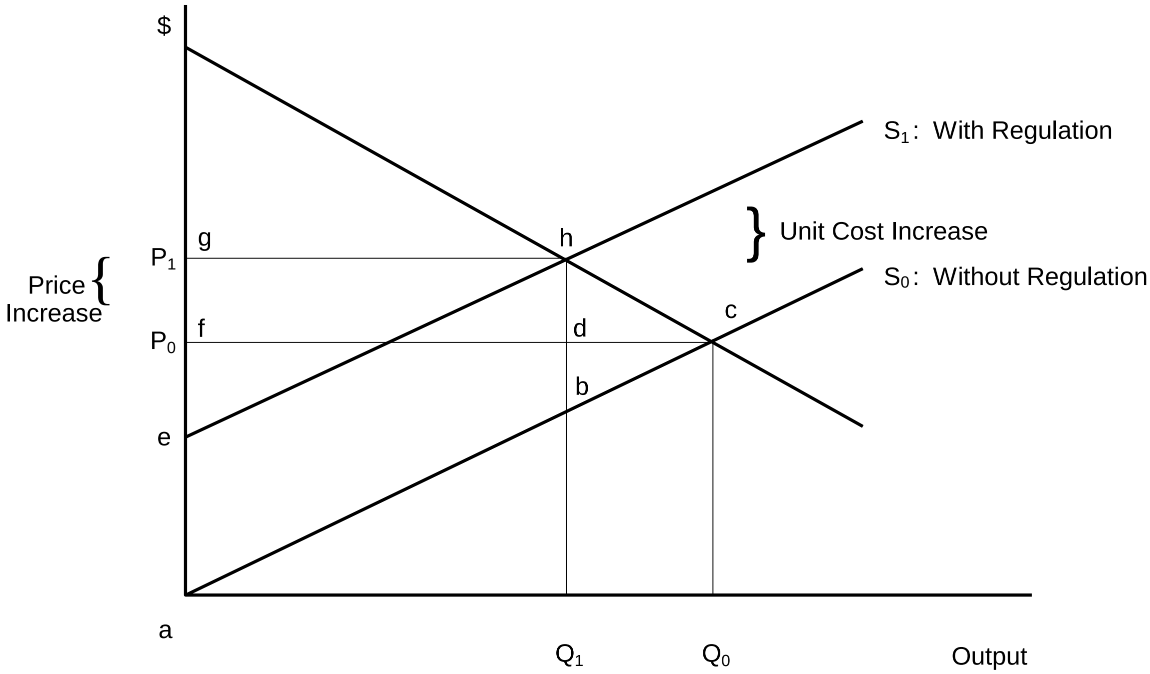
$$\textit{Share of per-unit cost} = \frac{\textit{Price Elasticity of Supply}}{(\textit{Price Elasticity of Supply} - \textit{Price Elasticity of Demand})}$$

As a general rule, a higher share of the per-unit cost increases will be passed on to consumers in markets where:

- goods and services are necessities and people do not have good substitutes that they can switch to easily (demand is inelastic) and
- suppliers have excess capacity and can easily adjust production levels at minimal costs, or the time period of analysis is long enough that suppliers can change their fixed resources; supply is more elastic over longer periods.

[2] These RIAs are available on the Internet at http://www.epa.gov/ttn/ecas/ria.html.
[3] For examples of similar mathematical models in the public finance literature, see Nicholson (1998), pages 444–

447, or Fullerton and Metcalf (2002).



consumer surplus = –[fghd + dhc]

producer surplus = [fghd − aehb] − bdc

total surplus = consumer surplus + producer surplus = −[aehb + dhc + bdc]

Figure 5-1. Market Demand and Supply Model: With and Without Regulation

Short-run demand elasticities for energy goods (electricity and natural gas), agricultural products, and construction are often inelastic. Specific estimates of short-run demand elasticities for these products can be obtained from existing literature. For the short-run demand of energy products, the National Energy Modeling System (NEMS) buildings module uses values between 0.1 and 0.3; a 1% increase in price leads to a 0.1 to 0.3% decrease in energy demand. For the short-run demand of agriculture and construction, EPA has estimated elasticities to be 0.2 for agriculture and approximately 1 for construction. As a result, a 1% increase in the prices of agriculture products would lead to a 0.2% decrease in demand for those products, while a 1% increase in construction prices would lead to approximately a 1% decrease in demand for construction. Given these demand elasticity scenarios, approximately a 1% increase in unit costs would result in a price increase of 0.1 to 1%. As a result, 10 to 100% of the unit cost increase could be passed on to consumers in the form of higher goods/services prices. This price increase would correspond to a 0.1 to 0.8% decline in consumption in these markets.

For the ferroalloys RTR, we have elasticity data that will allow us to estimate potential economic impacts for affected ferroalloy consumers and producers using the framework described above. Data from a 2013 U.S. International Trade Commission report indicate that the price elasticity of demand for silicomanganese ranges from -0.4 to -0.7, and the price elasticity of supply ranges from 5 to 7.[4] Using the midpoint of these elasticity ranges and the equation shown in the Appendix, the share of per-unit output cost is equal to 6/(6-(-0.55)) = 6/6.55 = 0.92. Thus, based on this calculation and the explanation of its implications as discussed previously, a 1% increase in per-unit cost yields a 0.92% reduction in demand for silicomanganese output.

To calculate the change in per-unit cost of silicomanganese associated with the requirements of the final rule, we use the cost to sales estimate of impact to affected firms and knowledge of the firm's net income (or profits) to help estimate a proxy for the change in per-unit output cost. According to the cost memos for this RTR, the annualized cost of all the potential requirements for the Eramet Marietta firm (the subsidiary of the Eramet Group that owns the affected facility in Ohio) is $5.64 million, which primarily includes the estimated costs to reduce process fugitive manganese emissions.

Using the average of sales figures over the last two years, we construct an average annual sales estimate of $303.8 million for use in this calculation.[5] The annualized cost to sales estimate is therefore 5.64/303.8 = 0.0186 or 1.86%. The cost to sales estimate reflects how much product price will have to rise for a producer to have as much revenue as before for a given level of output. This would be difficult for Eramet Marietta to accomplish, even partially, in that Eramet is a price taker in the market for silicomanganese, which is a commodity traded on a worldwide market. Also, we know from information provided verbally by consultants working on behalf of Eramet Marietta that this facility experienced negative net income for the last two fiscal years. [6] We also recognize that an estimate of cost to sales exceeding the profit or net income margin (i.e., profit or net income/unit of sales) for a facility is a circumstance that, if this continues, could lead to the risk of a potential facility closure in the long term. This type of conclusion is drawn from standard microeconomic theory and has been part of economic analyses for EPA rulemakings, such as those for the final Lime Manufacturing NESHAP and for the proposed Revisions to the Underground Storage Tank rulemaking.

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[4] U.S. International Trade Commission. Silicomanganese from India, Kazakhstan and Venezuela. Investigation Nos. 731-TA-929-931 (Second Review). Publication No. 4424. September 2013. Available on the Internet at http://www.usitc.gov/publications/701_731/4424.pdf.

[5] Based on revenue data for Eramet Marietta taken from Hoovers, Inc. Data retrieved on March 14, 2014.

[6] Verbal communication with staff from Policy Navigation Group, contractors for Eramet Marietta, Inc. March 12, 2014.

Economic Impact Results

With net income as a measure of profit, and profit = revenues – production costs, we can reasonably presume that the production costs at Eramet Marietta could be equal to or greater than the revenue estimate above over the last two years. Thus, the per-unit output cost in production resulting from the control requirements of the final rule at Eramet Marietta can be reasonably estimated as equal to the annualized cost to sales estimate, which for this case is 1.86% shown above. Given this per-unit output cost estimate, then the decline in output resulting from imposition of the RTR is calculated to be 1.86*0.92 = 1.71%. However, this estimated decline in production is before any consideration of the effect of imports, which is discussed below. Also, the decline in output will change to the extent the per-unit output cost is higher or lower than that estimated in this analysis.

Regarding the effect of the global market and imports in our analysis, the elasticity of substitution between U.S. produced silicomanganese and imported silicomanganese ranges from 3 to 6.[7] Thus, a 1% increase in price for U.S. produced silicomanganese could yield a 3 to 6% increase in demand for imported silicomanganese and thus yield a corresponding decline in demand for U.S. produced silicomanganese. This high elasticity of substitution indicates the relative ease that consumers have to switch from U.S. produced silicomanganese to imported silicomanganese compounds. The ease that consumers have to switch from U.S. produced silicomanganese (from Eramet Marietta) will increase the decline in output estimated above. Using a midpoint estimate of 4.5 for the elasticity of substitution between U.S. produced and imported silicomanganese, an increase in price of 1.86% in silicomanganese produced in the U.S. would yield a 1.86*4.5 = 8.4% increase in demand for imported silicomanganese. (Note: Eramet Marietta also imports silicomanganese, so that may mitigate the substitution effect between U.S. produced and imported silicomanganese to some extent). Nevertheless, assuming the effects are entirely additive, which may yield an overestimates of economic impact, the decline in output from Eramet Marietta resulting from the costs incurred from the RTR may be as high as 1.71+ 8.4 = 10.1% or around a 10% decline in output. Thus, the effect of an increase in silicomanganese price in the U.S. is not only a direct decline in silicomanganese output but also a switch by consumers to imported (non-U.S.) silicomanganese, ceteris paribus.

[7] Reference 1 in this report.

If we required the beyond the MACT floor limits for mercury control for FeMn production furnaces, the estimated annualized costs for Eramet Marietta increase from $5.6 million to $9.3 million. The overall cost impacts of this Option 2 for mercury (in addition to the proposed controls for process fugitive emissions described above) can be calculated by the ratio of these costs (i.e., 9.3/5.6 =1.65). Thus, the projected increase in price becomes 1.65* 1.86 = 3.07% from the direct effect of the costs. Likewise, the direct decrease in production would be calculated to be 3.07% (before consideration of the effects of the global market and imports). Regarding imports, using a midpoint estimate of 4.5 for the elasticity of substitution between U.S. produced and imported silicomanganese (as described above) and assuming the elasticity of substitution between U.S. produced and imported ferromanganese would be the same as for silicomanganese, we calculate that an increase in price of 3.07% in ferromanganese produced in the U.S. would yield a 3.07*4.5 = 13.8% increase in demand for imported ferromanganese. Therefore, assuming additive of impacts, which may yield an overestimate of economic impacts, the decrease in production of FeMn could be as high as about 17% (3.07 + 13.8 = 16.9%) at Eramet when accounting for substitution from U.S. produced to imported FeMn. We lack demand and supply elasticities information specifically for ferromanganese, but we believe it is reasonable to assume that the elasticity of FeMn would be similar to SiMn given that this ferroalloy is also a commodity with most of the same market characteristics and therefore we believe the economic impacts for FeMn production would be similar in magnitude to those calculated for SiMn production sources.

Assuming market conditions remain approximately the same, we believe Eramet Marietta would not be able to sustain the costs of beyond-the-MACT floor mercury controls (in addition to the fugitive control costs). This would likely result in substantial economic impacts to the facility in the short-term and the potential for risk of closure in the longer-term.

Given the substantial economic impacts estimated in this analysis associated with the emissions control when including the beyond the MACT floor option for mercury control in addition to the costs for the control of process fugitive HAP metals emissions, as well as other factors such as which HAP metals are being reduced and by how much, and the magnitude of the total capital costs and annual costs, the Agency is finalizing emissions limits for mercury based on the MACT floor level of mercury control as part of this rule.

Caveats to the Economic Impact Analysis

Some important caveats to list for this analysis:

- We assume no earnings or net income is available to Eramet Marietta from previous fiscal years to offset any losses experienced during the timeframe of this analysis (2013 and 2014);
- We assume that no capital is supplied to Eramet Marietta by their parent company, the Eramet Group, to support the subsidiary in complying with this RTR;
- We assume the demand and supply responsiveness of ferromanganese output from Eramet Marietta is consistent with that for silicomanganese output.
- We assume that the impacts on price and output from changes in ferroalloy price and effects from substitution of foreign-produced ferroalloys for domestically-producted ferroalloys are additive.

Based on the costs to the industry shown in Section 4 for the controls for process fugitive emissions (i.e., Option 1 shown in table 4-1), the supply and demand elasticities in Section 3 of this report and the economic impact results presented earlier in Section 5, a price increase for silicomanganese of up to 1.9 percent could potentially occur domestically, and an output decrease of as much as 10.1 percent could potentially also occur. Given that both of these producers of ferroalloys are also importers of the same alloys, the existence of ferromanganese in relatively abundant quantity in the National Defense Stockpile, and Felman having its own stockpile of silicomanganese, the importation of these alloys and the silicomanganese stockpile could potentially mitigate these economic impacts to some extent.

One other note is that growth in the US steel industry should lead to growth in demand for ferromanganese. Ferromanganese is a major input to steel production. U.S. steel production is projected to increase by 4% from 2014 to 2015, with growth continuing up to 2018, according to a study on the U.S. Industrial Outlook for 27 industries done by the Manufacturers Alliance for Productivity and Innovation (MAPI) Foundation in Dec. 2014 (found at https://www.mapi.net/research/publications/us-industrial-outlook-widespread-growth-ahead). With increases in steel production in the US, increases in US production should follow and thus lead to increases in domestic demand for ferromanganese. Any potential increase in ferromanganese demand is not accounted for in the calculations above. The same is true for silicomanganese demand.

5.4 Energy Impacts

Executive Order 13211 (66 FR 28355, May 22, 2001) provides that agencies will prepare and submit to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, a Statement of Energy Effects for certain actions identified as "significant energy actions." Section 4(b) of Executive Order 13211 defines "significant energy actions" as any action by an agency (normally published in the *Federal Register*) that promulgates or is expected to lead to the promulgation of a final rule or regulation, including notices of inquiry, advance notices of proposed rulemaking, and notices of proposed rulemaking: (1) (i) that is a significant regulatory action under Executive Order 12866 or any successor order, and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action.

This final rule is not a significant energy action as designated by the Administrator of the Office of Information and Regulatory Affairs because it is not likely to have a significant adverse impact on the supply, distribution, or use of energy. This action will not create any new requirements and therefore no additional costs for sources in the energy supply, distribution, or use sectors.

5.5 Unfunded Mandates Reform Act

5.5.1 Future and Disproportionate Costs

The UMRA requires that we estimate, where accurate estimation is reasonably feasible, future compliance costs imposed by the rule and any disproportionate budgetary effects. Our estimates of the future compliance costs of the rule are discussed previously in this EIA. We do not believe that there will be any disproportionate budgetary effects of the supplemental proposal on any particular areas of the country, state or local governments, types of communities (e.g., urban, rural), or particular industry segments.

5.5.2 Effects on the National Economy

The UMRA requires that we estimate the effect of the rule on the national economy. To the extent feasible, we must estimate the effect on productivity, economic growth, full employment, creation of productive jobs, and international competitiveness of U.S. goods and services if we determine that accurate estimates are reasonably feasible and that such effect is relevant and material. The nationwide economic impact of the rule is presented earlier in this EIA. This analysis provides estimates of the effect of the rule on most of the categories mentioned above, and these estimates are presented earlier in this EIA. The nature of this rule is such that it is not practical for us to use existing approaches, such as the Morgenstern et al. approach,[8] or others to estimate the impact on employment to the regulated entities and others from this final rule. In addition, we have determined that the final rule contains no regulatory requirements that might significantly or uniquely affect small governments. Therefore, today's rule is not subject to the requirements of section 203 of the UMRA.

5.6 Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 19885, April 23, 1997), applies to any rule that (1) is determined to be "economically significant," as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, EPA must evaluate the environmental health or safety effects of the planned rule on children and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This rule is not subject to Executive Order 13045 (62 FR 19885, April 23, 1997) because the Agency does not believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children. The report, Analysis of Socio-Economic Factors for Populations Living Near Ferroalloys Facilities, shows that on a nationwide basis, there are approximately 26,000 people exposed to a cancer risk at or above 1-in-1 million and approximately 28,000 people exposed to a chronic noncancer TOSHI greater than 1 due to emissions from the source category. The percentages for the other demographic groups, including children 18 years and younger, are similar to or lower than their respective nationwide percentages. Further, implementation of the provisions included in this action is expected to

[8] Morgenstern, R. D., W. A. Pizer, and J. S. Shih. 2002. "Jobs versus the Environment: An Industry-Level Perspective." *Journal of Environmental Economics and Management* 43(3):412-436.

significantly reduce the number of at-risk people due to HAP emissions from these sources (from between 26,000 to 28,000 people to about 1,000), providing significant benefit to all the demographic groups in the at-risk population.

This rule is expected to reduce environmental impacts for everyone, including children. This action sets emissions limits at the levels based on MACT, as required by the Clean Air Act. Based on our analysis, we believe that this rule does not have a disproportionate impact on children.

5.7 Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

For the final rule, the EPA has determined that the current health risks posed to anyone by emissions from this source category are unacceptable. There are about 26,000 to 28,000 people nationwide that are currently subject to health risks which are non-negligible (i.e., cancer risks greater than 1 in a million or chronic noncancer TOSHI greater than 1) due to emissions from this source category. The demographic distribution of this "at-risk" population is similar or below the national distribution of demographics for all groups except for the "ages 65 and up" age group, which is 4 percent greater than its corresponding national percentage. The rule will reduce the number of people in this at-risk group from 26,000 - 28,000 people to about 1,000 people, thereby providing disproportionate benefits to a greater percentage of minorities. Therefore, the EPA has determined that the rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations.

5.8 Employment Impact Analysis

EPA has analyzed the impacts of this rulemaking on employment, which are presented in this section. While a standalone analysis of employment impacts is not included in a standard cost-benefit analysis, such an analysis is of particular concern given the current interest in the effect of environmental regulation on employment. . Executive Order 13563, states, "Our regulatory system must protect public health, welfare, safety, and our environment while promoting economic growth, innovation, competitiveness, and job creation" (emphasis added). A discussion of labor requirements associated with the installation, operation, and maintenance of control requirements, as well as reporting and recordkeeping requirements is included in the cost memoranda for this final rule. However, due to data and methodology limitations, we have not quantified the rule's effects on labor, or the effects induced by changes in workers' incomes. What follows is an overview of the various ways that environmental regulation can affect employment. EPA continues to explore the relevant theoretical and empirical literature and to seek public comments in order to ensure that the way EPA characterizes the employment effects of its regulations is valid and informative.

This regulation is expected to affect employment in the United States through the regulated sector – ferroalloy manufacturing. It is now an industry with only two facilities in the U.S., but it provides an important source of employment to their locales – Washington County, PA and Mason County, WV, respectively, as mentioned earlier in this report.

From an economic perspective labor is an input into producing goods and services; if a regulation requires that more labor be used to produce a given amount of output, that additional labor is reflected in an increase in the cost of production. Moreover, when the economy is at full employment, we would not expect an environmental regulation to have an impact on overall employment because labor is being shifted from one sector to another. On the other hand, in periods of high unemployment, employment effects (both positive and negative) are possible. For example, an increase in labor demand due to regulation may result in a short-term net increase in overall employment as workers are hired by the regulated sector to help meet new requirements (e.g., to install new equipment) or by the environmental protection sector to produce new abatement capital resulting in hiring previously unemployed workers . When significant numbers of workers are unemployed, the opportunity costs associated with displacing jobs in other sectors are likely to be smaller. And, in general, if a regulation imposes high costs and does not increase the demand for labor, it may lead to a decrease in employment. The responsiveness of industry labor demand depends on how these forces all interact. Economic theory indicates that the responsiveness of industry labor demand depends on a number of factors: price elasticity of demand for the product, substitutability of other factors of production, elasticity of supply of other factors of production, and labor's share of total production costs. Berman and Bui (2001) put this theory in the context of environmental regulation, and suggest that, for example, if all firms in the industry are faced with the same compliance costs of regulation and product demand is inelastic, then industry output may not change much at all.

Regulations set in motion new orders for pollution control equipment and services. New categories of employment have been created in the process of implementing environmental regulations. When a regulation is promulgated, one typical response of industry is to order pollution control equipment and services in order to comply with the regulation when it becomes effective. On the other hand, the closure of plants that choose not to comply – and any changes in production levels at plants choosing to comply and remain in operation - occur after the compliance date, or earlier in anticipation of the compliance obligation. Environmental regulation may increase revenue and employment in the environmental technology industry. While these increases represent gains for that industry, they translate into costs to the regulated industries required to install the equipment.

Environmental regulations support employment in many basic industries. Regulated firms either hire workers to design and build pollution controls directly or purchase pollution control devices from a third party for installation. Once the equipment is installed, regulated firms hire workers to operate and maintain the pollution control equipment—much like they hire workers to produce more output In addition to the increase in employment in the environmental protection industry (via increased orders for pollution control equipment), environmental regulations also support employment in industries that provide intermediate goods to the environmental protection industry. The equipment manufacturers, in turn, order steel, tanks, vessels, blowers, pumps, and chemicals to manufacture and install the equipment. Currently in most cases there is no scientifically defensible way to generate sufficiently reliable estimates of the employment impacts in these intermediate goods sectors.

5.8.1 Employment Impacts Within the Regulated Sector

It is sometimes claimed that new or more stringent environmental regulations raise production costs thereby reducing production which in turn must lead to lower employment. However, the peer-reviewed literature indicates that determining the direction of net employment effects in a regulated industry is challenging due to competing effects. Environmental regulations are assumed to raise production costs and thereby the cost of output, so we expect the "output" effect of environmental regulation to be negative (higher prices lead to lower sales). On the other hand, complying with the new or more stringent regulation requires additional inputs, including labor, and may alter the relative proportions of labor and capital used by regulated firms in their production processes. Two sets of researchers discussed here, Berman and Bui (2001) and

Morgenstern, Pizer, and Shih (2002),[9] demonstrate using standard neoclassical microeconomics that environmental regulations have an ambiguous effect on employment in the regulated sector.[59] These theoretical results imply that the effect of environmental regulation on employment in the regulated sector is an empirical question and both sets of authors tested their models empirically using different methodologies. Both Berman and Bui and Morgenstern et al. examine the effect of environmental regulations on employment and both find that overall they had no significant net impact on employment in the sectors they examined.

Berman and Bui (2001) examine how an increase in local air quality regulation that reduces NOx emissions affects manufacturing employment in the South Coast Air Quality Management District (SCAQMD), which incorporates Los Angeles and its suburbs. During the time frame of their study, 1979 to 1992, the SCAQMD enacted some of the country's most stringent air quality regulations, which were more stringent than federal and state regulations. Using SCAQMD's local air quality regulations, Berman and Bui identify the effect of environmental regulations on net employment in the regulated industries.[10,11] The authors find that "while regulations do impose large costs, they have a limited effect on employment" (Berman and Bui, 2001, p. 269). Their conclusion is that local air quality regulation "probably increased labor demand slightly" but that "the employment effects of both compliance and increased stringency are *fairly precisely estimated zeros* [emphasis added], even when exit and dissuaded entry effects are included" (Berman and Bui, 2001, p. 269).[12]

Morgenstern et al. (2002) estimated the effects of pollution abatement expenditures on net employment in four highly regulated sectors (pulp and paper, plastics, steel, and petroleum refining). They conclude that increased abatement expenditures generally have *not* caused a significant change in net employment in those sectors. While the specific sectors Morgenstern et al. examined are different than the sectors considered here, the methodology that Morgenstern et al. developed is still an informative way to qualitatively assess the effects of this rulemaking on employment in the regulated sector.

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[9] Berman, E. and L. T. M. Bui (2001). "Environmental Regulation and Labor Demand: Evidence from the South Coast Air Basin." Journal of Public Economics 79(2): 265-295.
Morgenstern, R. D., W. A. Pizer, and J. S. Shih. 2002. Jobs versus the Environment: An Industry-Level Perspective.‖ Journal of Environmental Economics and Management 43(3):412-436.

[10] Note, like Morgenstern, Pizer, and Shih (2002), this study does not estimate the number of jobs created in the environmental protection sector.

[11] Berman and Bui include over 40 4-digit SIC industries in their sample.

[12] Including the employment effect of exiting plants and plants dissuaded from opening will increase the estimated impact of regulation on employment.

While there is an extensive empirical, peer-reviewed literature analyzing the effect of environmental regulations on various economic outcomes including productivity, investment, competitiveness as well as environmental performance, there are only a few papers that examine the impact of environmental regulation on employment, but this area of the literature has been growing. As stated previously in this RIA section, empirical results from Berman and Bui (2001) and Morgenstern et al (2002) suggest that new or more stringent environmental regulations do not have a substantial impact on net employment (either negative or positive) in the regulated sector. Nevertheless, other empirical research suggests that more highly regulated counties may generate fewer jobs than less regulated ones (Greenstone 2002, Walker 2011). However, the methodology used in these two studies cannot estimate whether aggregate employment is lower or higher due to more stringent environmental regulation, it can only imply that relative employment growth in some sectors differs between more and less regulated areas. List et al. (2003) find some evidence that this type of geographic relocation, from more regulated areas to less regulated areas may be occurring. Overall, the peer-reviewed literature does not contain evidence that environmental regulation has a large impact on net employment (either negative or positive) in the long run across the whole economy.

While the theoretical framework laid out by Berman and Bui (2001) and Morgenstern et al. (2002) still holds for the industries affected under this final rule, important differences in the markets and regulatory settings analyzed in their study and the setting presented here lead us to conclude that it is inappropriate to utilize their quantitative estimates to estimate the employment impacts from this regulation. In particular, the industries used in these two studies as well as the timeframe (late 1970's to early 1990's) are quite different than those in this rule. For these reasons we conclude there are too many uncertainties as to the transferability of the quantitative estimates in these two studies to apply their estimates to quantify the employment impacts within the regulated sectors for this regulation.

References for Employment Impacts

Greenstone, M. (2002). "The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufactures." *Journal of Political Economy* 110(6): 1175-1219.

List, J. A., D. L. Millimet, P. G. Fredriksson, and W. W. McHone (2003). "Effects of Environmental Regulations on Manufacturing Plant Births: Evidence from a Propensity Score Matching Estimator." *The Review of Economics and Statistics 85*(4): 944-952.

Walker, Reed. (2011). "Environmental Regulation and Labor Reallocation." American Economic Review: Papers and Proceedings, 101(2

SECTION 6

REFERENCES FOR EIA

Dun & Bradstreet (D&B). 2010. *D&B Marketplace*. A company information database searchable by NAICS code. Accessed on July 15, 2010.

Eramet Marietta, Inc. Eramet Marietta, Inc. to Amend Reasonable Arrangement. Case No. 09-516-EL-AEC. Submitted to the Public Utilities Commission of Ohio. January 22, 2015, p.3. This application is available at http://dis.puc.state.oh.us/TiffToPDf/A1001001A15A22B60221I33078.pdf. Redacted version. Requested power rate discount is confidential.

Landsburg, S.H. 2005. *Price Theory and Applications. 6th Ed*. Thomson South Western. Mason, OH.

Mankiw, N.G. 1998. *Principles of Economics.* Orlando, Fl: Dryden Press.

U.S. Census Bureau. 2007. *Survey of Plant Capacity: 2006.* “Table 1a. Full Capacity Utilization Rates by Industry Fourth Quarter 2002–2006.” U.S. Census Bureau: Washington DC. Report No. MQ-C1(06). Available at: http://www.census.gov/manufacturing/capacity/historical_data/index.html .

U.S. Census Bureau. 2008a. Firm Size Data from the Statistics of U.S. Businesses: U.S. Detail Employment Sizes: 2002. <http://www2.census.gov/csd/susb/2002/ 02us_detailed%20sizes_6digitnaics.txt.

U.S. Census Bureau. 2008b. Firm Size Data from the Statistics of U.S. Businesses, U.S. All Industries Tabulated by Receipt Size: 2002. http://www2.census.gov/csd/susb/2002/ usalli_r02.xls .U.S. Census Bureau. 2009. *American Community Survey: 2006–2008*. Available at: http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=&_lang=en&_ts = .

U.S. Census Bureau. 2010e. Census Regions and Divisions of the United States. Available at: http://www.census.gov/geo/www/us_regdiv.pdf. Accessed September 12, 2010.

U.S. Census Bureau. 2010f. North American Industrial Classification System [NAICS] Code Definitions Web site. Available at: http://www.census.gov/eos/www/naics/ .

U.S. Environmental Protection Agency (EPA). 2006a. *Final Guidance EPA Rulewriters: Regulatory Flexibility Act as Amended by the Small Business and Regulatory Enforcement Fairness Act*. < http://www.epa.gov/sbrefa/documents/rfaguidance11-00-06.pdf>

U.S. Small Business Administration (SBA), Office of Advocacy. May 2003. A Guide for Government Agencies, How to Comply with the Regulatory Flexibility Act, Implementing the President's Small Business Agenda and Executive Order 13272.

U.S. Small Business Administration (SBA). 2014. Table of Small Business Size Standards Matched to North American Industry Classification System Codes. Effective July 14, 2014. http://www.sba.gov/services/contractingopportunities/size standardstopics/size/index.html.

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