Economic Impact Analysis for the Proposed Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels

U.S. Environmental Protection Agency
Office of Air and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711

EPA-452/R-22-001
April 2022

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ACKNOWLEDGEMENTS

In addition to U.S. EPA staff from the Office of Air and Radiation, personnel from RTI International contributed data and analysis to this document.

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1 INTRODUCTION

1.1 Industry Background

1.1.1 Electric Arc Furnace Production Processes and Air Emissions

An electric arc furnace (EAF) is a metallurgical furnace used to produce carbon and alloy steels in the steel industry. The input material to an EAF is typically 100 percent scrap steel. Cylindrical, refractory-lined EAFs are equipped with carbon electrodes that are raised or lowered through the furnace roof. With electrodes retracted, the furnace roof can be rotated to permit the charge of scrap steel by overhead crane. Electric current is passed between the electrodes and through the scrap, generating arcing and enough heat to melt the scrap steel charge. Alloying agents and fluxing materials usually are added through doors on the side of the furnace. After the melting and refining periods, slag (an impurity) and refined steel are poured from the furnace.

If an argon-oxygen decarburization vessel (AOD) is present, it follows the EAF in the production sequence and is used to oxidize carbon, silicon, and impurities, such as sulfur, and to reduce alloy additions compared to an EAF alone. Use of AODs reduces EAF heat times, improves quality control, and increases daily steel production. AODs are primarily used in stainless steel making.

The production of steel in an EAF is a batch process. Cycles, or heats, range from about 1.5 to 5 hours to produce carbon steel and from 5 to 10 hours to produce alloy steel. Scrap steel is charged to begin a cycle, and alloying agents and slag forming materials are added for refining. Stages of each cycle normally are charging, melting, refining (which usually includes oxygen blowing), and tapping. All of these operations generate PM emissions.

Air emission control techniques typically involve an air emission capture system and a gas cleaning system. Air emission capture systems used in the EAF industry include direct shell evacuation control (DEC) systems, side draft hoods, combination hoods, canopy hoods, scavenger ducts, and furnace enclosures. The DEC system consists of ductwork attached to a separate opening, or “fourth hole”, at the top (or roof) of the furnace, which draws emissions to a gas cleaner and which works only when the furnace is upright and the top (or roof) is in place. Side draft hoods collect furnace off gases from around the electrode holes and work doors after the gases leave the furnace. A combination hood incorporates elements from the side draft and

DEC systems. Canopy hoods and scavenger ducts are used to address charging and tapping emissions. Baghouses are typically used as gas cleaning systems, i.e., control devices. Particulate matter emissions from the furnace via side draft or DEC systems are called "primary" emissions, and emissions from charging and tapping are called "secondary" emissions.

1.1.2 Domestic Trends in Steel Production

Annual steel production in the U.S. has varied since 2000 but can be seen to have declined with average production over the 2000 to 2009 period at about 92 million metric tons per year, and about 84 million metric tons per year over the 2010 to 2019 period (Figure 1-1). During this period, production capacity also varied and averaged about 113 million tons over both the 2000 to 2009 and 2010 to 2019 periods (Figure 1-1).

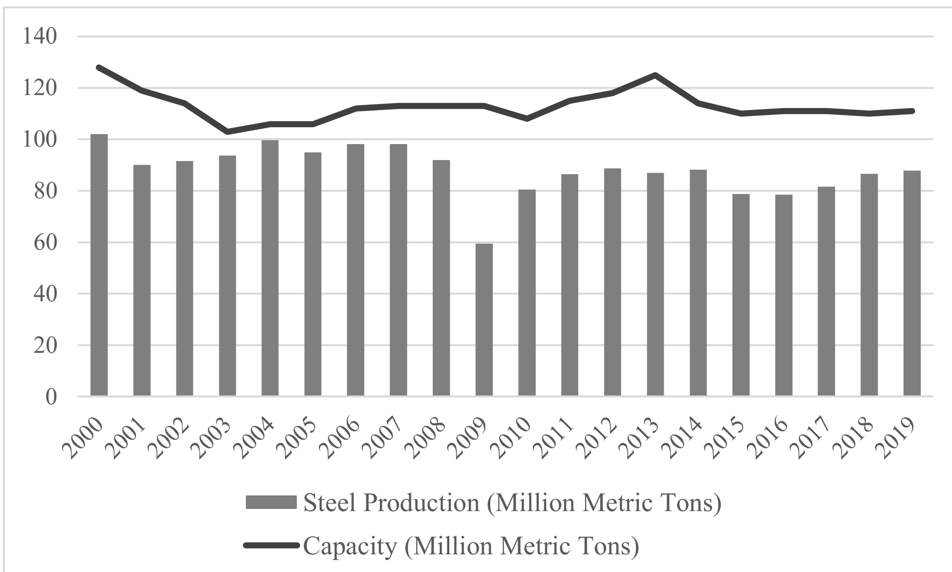

Figure 1-1 Total Domestic Steel Production and Capacity (Million Metric Tons), 2000 to 2019[1]

As shown in Figure 1-2, the share of domestic steel production from EAFs has risen from 2000 to 2019, as steel producers in the U.S. have continued to shift from Blast Furnace/Basic Oxygen Furnace (BF/BOF) to EAFs since the 1990s.

[1] USGS National Minerals Information Center. Iron and Steel Statistics and Information. https://www.usgs.gov/centers/national-minerals-information-center/iron-and-steel-statistics-and-information.

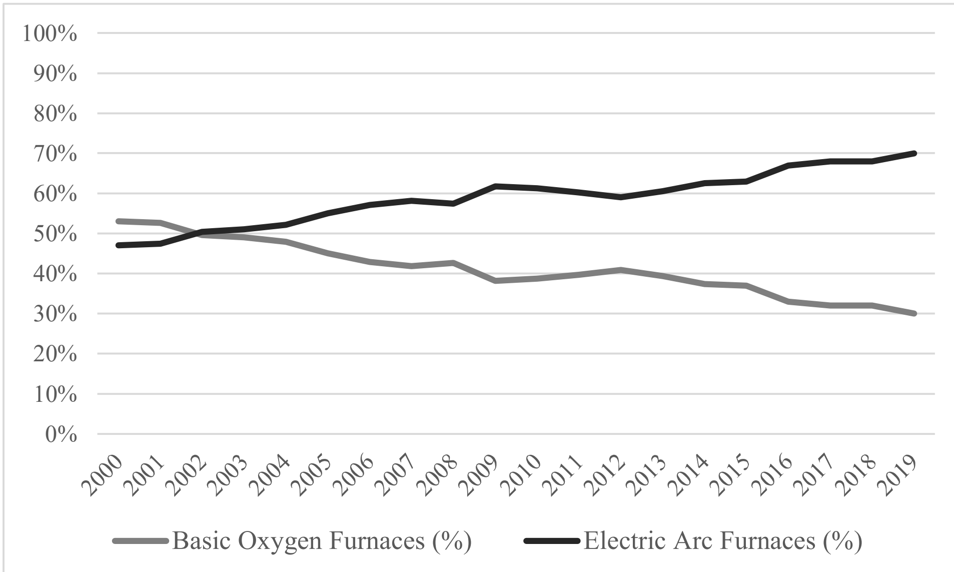

Figure 1-2 Domestic Steel Production Share by Furnace Type (Percent), 2000 to 2019[2]

The increase in the production share of EAFs is due to a combination of factors. EAF production relies primarily on scrap steel, of which the U.S. has a large supply. The U.S. has been the world leader in scrap exports and has annual scrap production equal to total domestic steel production.[1] Since scrap is distributed broadly across the U.S., siting EAF facilities is less restrictive compared to BF/BOF production whose feedstock is mainly raw iron ore/taconite that is found in Minnesota and Michigan. Additionally, EAF production has been historically confined to lower quality steel, such as rebar or sewer piping. This led to expectations that BF/BOF production would eventually level off. However, technical advances and investment have allowed EAF producers to begin producing advanced high strength steels.[3] Imports of high-quality scrap steel also have increased.

[2] USGS National Minerals Information Center. Iron and Steel Statistics and Information. https://www.usgs.gov/centers/national-minerals-information-center/iron-and-steel-statistics-and-information

[3] S&P Global Platts, US Steel Sector Thrives as Mills Move up Quality Ladder, Nicholas Tolomeo, Insight Blog, May 9, 2019. https://www.spglobal.com/platts/en/market-insights/blogs/metals/050919-us-steel-sector-thrives-as-mills-move-up-quality-ladder

1.2 Legal and Economic Basis for this Rulemaking

1.2.1 Statutory Requirements

Section 111 of the Clean Air Act (CAA) requires the EPA Administrator to list categories of stationary sources that in the Administrator's judgment cause or contribute significantly to air pollution that reasonably may be anticipated to endanger public health or welfare. The EPA must then issue performance standards for new (and modified or reconstructed) sources in each source category. These standards are referred to as new source performance standards (NSPS). The EPA has the authority to define the scope of the source categories, determine the pollutants for which standards should be developed, set the emission level of the standards, and distinguish among classes, type, and sizes within categories in establishing the standards. The section requires the Administrator to review and revise, if appropriate, the NSPS every eight years.

Section 111 also provides that performance standards are to "reflect the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated." We refer to this level of control as the best system of emission reduction (BSER).

1.2.2 Market Failure

Many regulations are promulgated to correct market failures, which uncorrected lead to a suboptimal allocation of resources. Air quality and pollution control regulations address "negative externalities" whereby the market does not internalize the full opportunity cost of production borne by society as public goods such as air quality are unpriced.

While recognizing that the optimal social level of pollution may not be zero, PM emissions impose costs on society, such as negative health and welfare impacts, that are not reflected in the market price of the goods produced through the polluting process. For this regulatory action the good produced is steel manufactured via EAFs and AODs. If producers pollute the atmosphere when producing steel, the social costs will not be borne by the polluting firm but rather by society as a whole. Thus, the producer is imposing a negative externality, or a social cost of emissions, on society. The equilibrium market price of EAF and AOD-produced steel may fail to incorporate the full opportunity cost to society of these products. Consequently, absent a regulation on emissions, producers will not internalize the social cost of emissions and social costs will be higher as a result. This regulation will work towards addressing this market failure by causing affected producers to further internalize the negative externality associated with PM emissions.

1.3 This Proposal

1.3.1 Regulatory Background

This action proposes to amend existing new source performance standards (NSPS) under the CAA section 111(b) for EAFs and AODs in the steel industry. The EPA is also proposing new standards of performance for EAFs and AODs in the steel industry. This document presents the regulatory impact analyses (RIA) for both the proposed amendments and new standards. More detail on each of the proposed actions follows a brief background on the regulatory history for this source category.

In 1975, the first NSPS for EAF were promulgated as subpart AA for EAF that commenced construction after October 21, 1974. (40 FR 43852). The 1975 NSPS set particulate matter (PM) standards for emissions from EAF control devices and set opacity limits for EAF melt shop emissions, control device exhaust, and dust handling procedures

In 1984, the EAF NSPS were revised (49 FR 43843) and a new subpart was promulgated as subpart AAa to add AOD as affected units for EAF and AOD that commenced construction after August 17, 1983. Additionally, the 1984 amendments raised the melt shop opacity for AA from 0 percent to 6 percent, same as the new subpart AAa. Both subparts AA and AAa (and Appendix A to 40 CFR part 60) were revised in the 1984 amendments to include EPA Method 5D for the determination of PM emissions from positive-pressure fabric filters, which are common control devices for EAF and AOD.

Subparts AA and AAa subsequently underwent a series of revisions, including:

- On February 14, 1989 (54 FR 6672), subparts AA and AAa (and Appendix A) were revised to consolidate EPA test methods and referencing.

- On May 17, 1989 (54 FR 21344), minor corrections were made to the February 1989 revisions.

- On March 2, 1999 (64 FR 10109), subparts AA and AAa were revised to add an option to monitor furnace static pressure instead of melt shop opacity and to monitor baghouse fan amperage instead of baghouse flowrate.

- On October 17, 2000 (65 FR 61758), amendments were made to subparts AA and AAa to promulgate Performance Specification (PS) 15 for certifying continuous emission monitoring systems (CEMS), to reformat various methods per recommendations by the Environmental Monitoring Management Council, and to make miscellaneous technical and editorial corrections.

- On February 22, 2005 (70 FR 8530), 40 CFR part 60, subparts AA and AAa were amended to add bag leak detection systems (BLDS) as an alternative monitoring method to the continuous opacity monitoring systems currently cited in the rules.

1.3.2 Proposed Requirements

For this proposed action, the EPA reviewed the requirements of 40 CFR part 60, subpart AA and AAa and found that there were improvements in the performance of EAFs, AODs, and their control devices since 1984. As explained in the preamble of the proposal, the EPA has developed proposed performance standards for PM emissions and melt shop opacity that reflect BSER, considering the cost of achieving such emission reductions, and any nonair quality health and environmental impacts and energy requirements. The EPA is also making minor changes to the existing rules, subparts AA and AAa, to clarify and refine some of the current provisions by adding, removing, or revising ambiguous or outdated definitions, compliance procedures, and measurement, monitoring, and reporting requirements; add alternative monitoring procedures; and require electronic reporting. These changes also will be included in the new subpart.

The specific proposed requirements whose costs and emissions impacts are examined in this EIA include:

- A proposed a new subpart AAb under which EAF facilities that begin construction, reconstruction, or major modifications after publication of the proposal in the federal register would need to comply with a PM standard in the format of facility-wide PM emitted per amount of steel produced and a melt shop opacity limit of zero.

- In the proposed new subpart, the PM testing frequency for control devices is set at once every five years. This testing frequency is expected to be performed already for most EAF facilities due to permit requirements.
- Last, the standards will apply at all times under the proposed new subpart.

1.4 Baseline and Regulatory Options

The impacts of regulatory actions are evaluated relative to a baseline that represents the world without the regulatory action. In this EIA, we present results for the proposed AAb. Throughout this document, we focus the analysis on the proposed requirements that result in quantifiable compliance cost or emissions changes compared to the baseline. The proposed regulatory options quantified in this EIA include the increased testing requirements proposed for subpart AAb and the zero percent opacity requirements for melt shop emissions in the proposed AAb. The proposed facility-wide PM limit is not projected to have any cost or emissions impacts as it is expected that units would be able to comply without additional actions. Table 1-1 depicts the proposed requirements evaluated in this EIA.

Table 1-1 Regulatory Options Examined in this RIA

Requirement	Proposed
Increased Emissions Testing	X
Zero Opacity for Melt Shop Emissions	X
Tighten Facility-wide Total PM Control Device Emissions Limit	X

1.5 Methodology

The impacts analysis summarized in this EIA reflects a nationwide engineering analysis of compliance cost and emissions reductions. Using data on current facilities and historical EAF construction data, we generate projections of counts of regulated facilities in the future. The regulated facility projections are combined with information on control options, including capital and annual operations and maintenance costs and control efficiencies. Impacts are calculated by multiplying activity data by model plant cost and emissions estimates.

For the analysis, we calculate the cost and emissions impacts of the proposed requirements from 2023 to 2032. The initial analysis year is 2023 because we assume that year will be the first full year the proposed requirements would be in effect, as the proposed requirements will take effect immediately and impact sources constructed after publication of the proposed rule. The final analysis year is 2032, which allows us to present ten years of potential regulatory impacts.

1.6 Organization of this EIA

The remainder of this report details the methodology and the results of the RIA. Section 2 describes emissions, emissions control options, and engineering costs. Section 3 discussion of potential economic, small entity, and employment impacts.

2 EMISSIONS AND ENGINEERING COSTS ANALYSIS

2.1 Introduction

In this section, we present estimates of the projected engineering compliance costs and emissions reductions associated with the proposed rule for the 2023 to 2032 period. These estimates are generated by combining the model plant-level cost and emissions reductions used in the BSER analysis with activity data projections based on historical trends.

2.2 Description of Regulatory Options

The proposed AAb standards would apply to all new, modified, or reconstructed EAF and AOD, and their associated dust-handling systems in the steel industry, which commence construction after Federal Register publication. The proposed standards would first limit total PM emissions from all pollution control devices, i.e., baghouses, installed on EAF and AOD, in terms of total mass of PM emitted at the facility per total mass of steel produced as a facility-wide average of all control devices, to 79 milligrams PM per kilogram steel (mg/kg) [0.16 pounds (lb.) PM per ton steel produced (lb./ton)]). Second, visible emissions from EAF and AOD that exit from the melt shop would be limited to an opacity of 0 percent during all phases of operation. Visible emissions from control devices on EAF and AOD would remain at less than 3 percent opacity, as in the current subparts AA and AAa, and opacity of the dust handling system would remain at less than 10 percent, also in the current subparts AA and AAa. Third, the proposed PM testing frequency is set at once every five years, which will coincide with permit cycles for most facilities. This testing frequency is expected to be performed already for most EAF facilities due to permit requirements.

Table 2-1 depicts the requirements evaluated in this EIA across regulatory options.

Table 2-1 Regulatory Options Examined in this EIA

Requirement	Proposed
Increased Emissions Testing	X
Zero Opacity for Melt Shop Emissions	X
Tighten Facility-wide Total PM Control Device Emissions Limit	X

2.3 Model Plant-level Compliance Cost and Emissions Reduction Estimates

To project compliance costs and emissions reductions under the proposal, we combined the affected facility projections with information on baseline emissions, testing and control costs, including capital and annual operations and maintenance costs, and control efficiencies associated with the controls. This section focuses on developing estimates of compliance costs and emissions reduction for model plants.

Information on control options is derived from the analysis underpinning the BSER determinations. Detailed discussion of the control options and model plant costs and emissions reductions can be found in the docketed memorandum (Docket ID No. EPA-HQ-OAR-2002-0049) documenting the cost and emissions analyses to determine BSER for PM emissions and opacity (referred to in this EIA as the "Cost Memo").

2.3.1 Model Plant-level Compliance Cost Estimates

Costs for Emissions Testing: In this proposal, the PM testing frequency is increased to once every five years, which will coincide with permit cycles for most facilities. This testing frequency is expected to be performed already for most EAF facilities due to permit requirements. The cost of testing using EPA Method 5 is estimated at $18,500 per baghouse tested, as is shown in

Table 2-2. We also estimate that the 9 new units projected in the analysis have an average of 1.64 baghouses per facility. While EPA Method 5 testing is already required upon startup, the new testing requirements would not incur costs until five years after startup.

Costs for Installing and Operating a Partition Roof Canopy: Canopy hoods are a common method of controlling fugitive EAF emissions. To estimate the costs for EAF facilities to reduce their PM emissions and melt shop opacity from 6 percent to 0 percent opacity, the costs for addition of a partition roof canopy (above the crane rails) were estimated using the procedure and information from the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Ferroalloys, where EAF also are used and shop fugitives also are a concern.[4] Detailed cost information was not available to the EPA to support cost estimates for the canopy at steel-making EAF facilities; whereas, the ferroalloy cost estimates included detailed cost input parameters from the ferroalloy industry where EAFs are also used. Therefore, without source-category specific information, the ferroalloy cost parameters were used in the cost calculations for this proposed rule.

To adapt the ferroalloy cost-estimating procedure to steelmaking EAF facilities, equipment costs and other parameters were scaled by the ratio of the ferroalloys EAF baghouse flowrate to the average steel EAF flowrate. The capital and annual cost estimates resulting from adapting the ferroalloy costs to steelmaking EAFs are presented in Table 2-2. Approximately 8 percent of the cost is due to electricity needed to power the fans that draw air into the canopy hood and into the control device. Details of the cost estimating procedure for these facilities are included in the docketed Cost Memo.

Based on information from 2010 through 2017 obtained by the EPA for 31 EAF facilities, the EPA found the average opacity to be 0.14 percent, with about half of the units achieving 0 percent opacity in the tests. Because opacity in the baseline is already low, the EPA expects any new, modified, or reconstructed facility would be able to meet the proposed opacity and PM limits without any additional control devices beyond those already required by the NSR program or applicable state requirements or by minor process changes to improve capture of exhaust flows or other process parameters, if needed. Because it is uncertain whether the

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[4] *Cost Impacts of Control Options Considered for the Ferroalloys Production NESHAP to Address Fugitive HAP Emissions*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. August 2014. (Docket ID Item No. EPA-HQ-OAR-2010-0895-0177).

facilities outperforming the baseline NSPS requirement do so because of state or local requirements or facility-specific factors that affect environmental performance, assumptions about the baseline represents an important source of uncertainty for projections of potential compliance costs and emissions impacts.

While the actual cost impacts of the proposed 0 percent opacity limit would likely be substantially lower, the EPA developed an upper bound estimate of potential compliance costs based upon the assumption that affected units would install a partial roof canopy above the crane rails to ensure 0 percent melt shop opacity compared to a hypothetical baseline model facility meeting 6 percent opacity. The costs should be viewed as upper bound estimates on the potential compliance costs as the EPA expects any new, modified, or reconstructed facility would be able to meet the proposed opacity and PM limits without any additional control devices beyond those already required by the NSR program or applicable state requirements or by minor process changes to improve capture of exhaust flows or other process parameters, if needed.

Cost for Facility-Wide PM Limit: The control costs for a small, medium, and large model plant exhibiting a range of baghouse performance levels were estimated based on baghouse air-to-cloth (A/C) ratio, which is expressed in units of volume of air flow per unit bag area (*i.e.*, cloth), or meters [feet] per unit of time. The A/C ratio is generally accepted as the most important design parameter between baghouses of different performance levels, where a low A/C ratio is considered to be the best level of control (less air and more baghouse filter cloth) and a high A/C ratio is a low or poor level control (high air volume and low baghouse filter area).[5] Because no A/C ratio data were available in the EAF PM test reports, values for A/C ratios from CAA section 114 responses submitted by the integrated iron and steel industry (II&S) industry for the RTR for 40 CFR part 63, subpart FFFFF (85 FR 42074)[6] were used in the EAF BSER PM cost analysis. The baghouses used for emissions from furnaces in the II&S industry are expected to be similar in operation as the baghouses used at EAF/AOD for the purposes of the analysis.

[5] EPA Air Pollution Control Cost Manual, Sixth Edition, EPA/42/B-02-001. U. S. Environmental Protection Agency, Research Triangle Park, NC. January 2002. Section 6, Particulate Matter Controls, Chapter 1, Baghouses and Filters. Available at: *https://www3.epa.gov/ttn/catc/dir1/c_allchs.pdf*.

[6] Summary of Questionnaire (Enclosure 1) Responses to EPA Information Collection Requests from Integrated Iron & Steel Facilities. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. (Docket ID Item No. EPA-HQ-OAR-2002-0083-0614).

Costs of control were estimated based on model baghouses with flows and production levels for baghouses at small, medium, and large facilities, as described above. Differences in capital costs for the model plants mainly reflect the cost of bags needed for each A/C ratio. The operating and maintenance (O&M) costs reflect periodic replacement of bags, along with other typical baghouse O&M costs. Annual costs include the annualized capital costs combined with the annual operating and maintenance costs. The capital and annual cost estimates relevant for analyzing the more stringent regulatory option are presented in Table 2-2. Note there are no costs for the proposed requirement tightening the facility-wide stack emissions standard as it not expected that facilities would need to perform additional actions over the baseline to comply with the standard. Details of the cost estimating procedure for are included in the docketed Cost Memo.

Table 2-2 Compliance Cost Estimates by Model Plant Size across Proposed Requirements (2020 dollars)

Model Plant Type	Capital	Annual O&M
Compliance Testing for All EAFs		
All plants	0	19,000
Melt Shop Fugitive Emissions from New, Modified, and Reconstructed EAFs (Upper Bound Estimates)		
Small	480,000	27,000
Medium	6,800,000	340,000
Large	34,000,000	1,700,000
Facility-wide stack PM Emissions from New, Modified, and Reconstructed EAFs		
Small	0	0
Medium	0	0
Large	0	0
Facility-wide stack PM Emissions from New, Modified, and Reconstructed EAFs (Upper Bound Estimates)		
Small	480,000	46,000
Medium	6,800,000	360,000
Large	34,000,000	1,700,000

Note: Numbers rounded to two significant digits.

2.3.2 Model Plant-level Emissions Reduction Estimates

Emissions Reductions from Emissions Testing: While we do not expect emissions impacts associated with the proposed emissions testing requirements in subpart AAb, the requirement is expected to clarify the rule and enhance compliance and enforcement. Hence, Table 2-3 does not present non-zero PM and $PM_{2.5}$ reductions from the proposed increase in emission testing.

Emissions Reductions from Operating a Partition Roof Canopy: As described in the docketed Cost Memo, to estimate emissions associated with a 0 percent opacity requirement, we compared an estimate of the PM emissions reductions with the lower opacity as compared to the performance of existing facilities in opacity test data. As discussed in the Cost Memo, opacity data for over 30 EAF facilities in test reports from the 2005 through 2011 period revealed that all facilities operated at the limit for opacity from control device exhaust and for dust handling. However, lower levels of opacity than the NSPS-required 6 percent were achieved for melt shops at many of the EAF facilities. Out of 31 EAF facilities with melt shop opacity data, 15 facilities achieved melt shop opacity of 0 percent, typically in more than one test report. It is uncertain why facilities are achieving 0 percent opacity in the source test data submitted to the EPA when not required by the rule.

As the EAF data for 30 facilities in test reports showed that the average actual melt shop opacity was 0.14 percent, we felt it appropriate to assume in this EIA that the projected new EAFs would outperform the current NSPS requirements in the baseline and achieve an average melt shop opacity of 0.14 percent. Given these assumptions, Table 2-3 presents the PM and $PM_{2.5}$ reductions anticipated under the proposed 0 percent melt shop opacity standard for small, medium, and large model plant facilities. Note $PM_{2.5}$ reductions are a subset of total PM emissions.

Emissions Reductions from Facility-Wide PM Limit: As discussed in Section 2.4.2, the control costs for a small, medium, and large model plant exhibiting a range of baghouse performance levels were estimated based on baghouse air-to-cloth (A/C) ratio. The A/C ratio is generally accepted as the most important design parameter between baghouses of different performance levels, where a low A/C ratio be the best level of control (less air and more baghouse filter cloth) and a high A/C ratio is a low or poor level control (high air volume and low baghouse filter area). As presented in the Cost Memo, a range of emissions reduction estimates were developed for small, medium, and large model plants operating at incrementally decreasing levels of A/C ratio (which reduces the emissions rates). Given the EPA is proposing tightening the facility-wide total PM control device limit to a level already achieved by facilities, we do not expect incremental emissions impacts from that requirement. Hence, Table 2-3 does not present non-zero PM and $PM_{2.5}$ reductions from the proposed facility-wide limit.

Table 2-3 PM and $PM_{2.5}$ Emissions Reduction Estimates by Model Plant Size and Proposed Requirement (short tons per year)

Model Plant Size	Model Plant-Level Emissions Reductions by Proposed Requirements		
	Increased Emissions Testing (PM / $PM_{2.5}$)	Tighten Facility-wide Total PM Control Device Emissions Limit (PM / $PM_{2.5}$)	Zero Opacity for Melt Shop Emissions (PM / $PM_{2.5}$)
Small	0.0 / 0.0	0.0 / 0.0	5.7 / 1.2
Medium	0.0 / 0.0	0.0 / 0.0	16 / 3.4
Large	0.0 / 0.0	0.0 / 0.0	37 / 7.8

Note: Numbers rounded to two significant digits.

2.4 Projected Compliance Costs and Emissions Reductions

In this section, we present estimates of the projected engineering compliance costs and emissions reductions associated with the proposed rule for the 2023 to 2032 period. These estimates are generated by combining the model plant-level cost and emissions reductions used in the BSER analysis with the projections of affected facilities. The methods and assumptions used to construct the affected facility projections are also documented in this section.

2.4.1 Projection of Potentially Affected Sources

The initial analysis year is 2023 because we assume 2023 will be the first full year the proposed requirements would be in effect. The final analysis year is 2032, which allows us to provide ten years of impact projections after the proposed requirements are assumed to take effect. While it would be desirable to analyze impacts beyond 2032, we have limited information to model longer-term changes in technologies, production practices, and equipment use in the iron and steel industry, making the choice of a longer time horizon infeasible.

To construct the activity data projections used in this analysis, we perform three steps. First, we assume that the 88 existing NSPS-affected facilities continue to operate over the entire time horizon of the analysis. Second, for new facilities affected by the proposed requirements, using information from the BSER analysis underpinning the rule, we identify capacity ranges to categorize projected facilities into small, medium, and large facilities. In the third step, we rely on historical information on EAF construction and capacity from the Association for Iron & Steel Technology (AIST) publication "2021 AIST Electric Arc Furnace Roundup" [7] to develop a profile of new EAF construction over the 2011 to 2020 period by model plant size. Table 2-4

[7] http://digital.library.aist.org/categories/roundups.html

shows the capacity ranges in tons per year (tpy) denominating whether a facility is a small, medium, or large facility.

Table 2-4 Capacity Ranges Used to Categorize EAFs into Model Plant Size Categories

Model Plant Type	Model Plant Size Ranges
Small	Less than 524,000 tpy capacity
Medium	Between 524,000 tpy and 1,270,000 tpy capacity
Large	Greater than 1,270,000 tpy capacity

Table 2-5 lists the year of construction, company name, location, capacity, and assumed model plant size for new EAFs constructed from 2011 to 2020. We also list new EAF facilities that have been announced and may be in a construction stage but, as of this writing, have not initiated production.

Table 2-5 EAFs Constructed from 2011 to 2020 and Announced Future EAFs, Capacity, and Assumed Model Plant Category[a]

Year Built	Company	City	State	Stated Capacity (Tons/Year)	Assumed Model Plant Size
2011	Outokumpu	Calvert	AL	1,102,310	Medium
2011	Finkl Steel[b]	Chicago	IL	631,624	Medium
2013	Republic Steel[c]	Lorain	OH	999,795	Medium
2017	Commercial Metals Company	Durant	OK	396,832	Small
2017	Big River Steel[d]	Osceola	AR	1,598,350	Large
2020	Nucor	Sedalia	MO	496,040	Small
2020	Nucor	Frostproof	FL	496,040	Small
2020	Nucor	Birmingham	AL	551,155	Medium
2020	Big River Steel[d]	Osceola	AR	1,598,350	Large
Future	Steel Dynamics, Inc.	Sinton	TX	2,500,000	Large
Future	Nucor Corporation	Brandenburg	KY	1,200,000	Medium
Future	ArcelorMittal/Nippon Steel	Calvert	AL	1,653,000	Large
Future	Commercial Metals Company	Mesa	AZ	500,000	Small

[a] Source for existing facilities: year built, company, city, state, and stated capacity from AIST publication “2021 AIST Electric Arc Furnace Roundup.” Model plant type assumed using stated capacity and capacity ranges shown in Table 2-4. Source for future facilities: Firm announcements and news articles
[b] Finkl Steel is a subsidiary of Swiss Steel Group.
[c] Republic Steel is a subsidiary of Grupo Simec.
[d] Big River Steel was acquired by United States Steel Corporation.

As is shown in Table 2-5, there were three small, four medium, and three large facilities built over the 2011 to 2020 period. For the purposes of this analysis, in the absence of a means to project new facilities, we assume the same number of facilities are constructed and affected by the proposed rule during the 2023 to 2032 period as were built over the 2011 to 2020 period.

Since we do not know with certainty when the four announced facilities will initiate construction or production, we exclude them from this analysis.

We do not assume that the number and size of new facilities follows the exact trajectory of the 2011 to 2020 period; rather, we assume that fractions of the assumed total facilities are built annually adding up to the assumed total over the ten-year period. The fractional projections are shown in Table 2-6. Note that, as the new facilities are built on an ongoing basis, the projected number of affected facilities increases over time.

Table 2-6 Projected Counts of Potentially Affected EAF Facilities

	Assumed New Facilities in a Given Year			Cumulative New Facilities in a Given Year			
Year	**Small**	**Medium**	**Large**	**Small**	**Medium**	**Large**	**Total**
2023	0.3	0.4	0.2	0.3	0.4	0.2	0.9
2024	0.3	0.4	0.2	0.6	0.8	0.4	1.8
2025	0.3	0.4	0.2	0.9	1.2	0.6	2.7
2026	0.3	0.4	0.2	1.2	1.6	0.8	3.6
2027	0.3	0.4	0.2	1.5	2.0	1.0	4.5
2028	0.3	0.4	0.2	1.8	2.4	1.2	5.4
2029	0.3	0.4	0.2	2.1	2.8	1.4	6.3
2030	0.3	0.4	0.2	2.4	3.2	1.6	7.2
2031	0.3	0.4	0.2	2.7	3.6	1.8	8.1
2032	0.3	0.4	0.2	3.0	4.0	2.0	9.0

2.4.2 Projected Compliance Cost Estimates

The compliance costs are estimated by multiplying the model plant-level costs associated with each applicable requirement and model plant type by the projected number of EAFs of that model plant type. Table 2-7 and Table 2-8 summarize the projected compliance costs under the proposed standards across the proposed requirements in this EIA. Table 2-7 presents the projected compliance costs from 2023 to 2032 broken down into capital and annual operations and maintenance (O&M) expenditures. Table 2-8 presents the present value (PV) and equivalent annual value (EAV) of the projected compliance costs over the 2023 to 2032 period, discounted to 2021 using 3 and 7 percent discount rates.

Table 2-7 Upper Bound Estimate of the Projected Capital and Annual O&M Compliance Costs, 2023-2032 (millions of 2020 dollars)

	Proposed Requirements		
Year	Capital	Annual O&M	Total
2023	9.65	0.48	10.13
2024	9.65	0.96	10.60
2025	9.65	1.44	11.08
2026	9.65	1.91	11.56
2027	9.65	2.39	12.04
2028	9.65	2.89	12.54
2029	9.65	3.37	13.01
2030	9.65	3.84	13.49
2031	9.65	4.32	13.97
2032	9.65	4.80	14.45

Table 2-8 Upper Bound Estimate of the Projected Present Value and Equivalent Annual Value of Compliance Costs, 2023-2032 (2020 dollars)

	3 Percent Discount Rate	**7 Percent Discount Rate**
Present Value	100	79
Equivalent Annual Value	12	11

Note: The projected PV and EAV are discounted to 2021. Numbers rounded to two significant digits. Totals may not sum due to independent rounding.

2.4.3 Projected Emissions Reduction Estimates

Implementing the proposed new subpart, 40 CFR part 60, subpart AAb, is expected to reduce PM emissions, including $PM_{2.5}$. These emissions reductions would be expected to produce health benefits in the affected locations. The Integrated Science Assessment for Particulate Matter (ISA)[8] synthesizes the toxicological, clinical, and epidemiological evidence to determine whether each pollutant is causally related to an array of adverse human health outcomes associated with either acute (i.e., hours or days-long) or chronic (i.e., years-long) exposure. For each outcome, the ISA reports this relationship to be causal, likely to be causal, suggestive of a causal relationship, inadequate to infer a causal relationship, or not likely to be a causal relationship.

[8] U.S. Environmental Protection Agency (U.S. EPA). 2019. Integrated Science Assessment (ISA) for Particulate Matter (Final Report, 2019). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-19/188, 2019.

The ISA for $PM_{2.5}$ found acute exposure to $PM_{2.5}$ to be causally related to cardiovascular effects and mortality (i.e., premature death), and respiratory effects as likely-to-be-causally related. The ISA identified cardiovascular effects and total mortality as being causally related to long-term exposure to $PM_{2.5}$ and respiratory effects as likely-to-be-causal; and the evidence was suggestive of a causal relationship for reproductive and developmental effects as well as cancer, mutagenicity, and genotoxicity. Table 2-9 summarizes the health endpoints related to $PM_{2.5}$. None of these endpoints were quantified or monetized for this rule. This table does not include benefits to ecosystems related to the reduction of nitrogen and sulfur deposition such as the effects of acidification and nutrient enrichment both aquatic and terrestrial.

Table 2-9 Health Effects of the Projected $PM_{2.5}$ Emissions Reductions

Category	Effect	Effect Quantified	Effect Monetized	More Information
Premature mortality from exposure to $PM_{2.5}$	Adult premature mortality from long-term exposure (age 65-99 or age 30-99)	—	—	PM ISA
	Infant mortality (age <1)	—	—	PM ISA
Nonfatal morbidity from exposure to $PM_{2.5}$	Heart attacks (age > 18)	—	—	PM ISA
	Hospital admissions—cardiovascular (ages 65-99)	—	—	PM ISA
	Emergency department visits— cardiovascular (age 0-99)	—	—	PM ISA
	Hospital admissions—respiratory (ages 0-18 and 65-99)	—	—	PM ISA
	Emergency room visits—respiratory (all ages)	—	—	PM ISA
	Cardiac arrest (ages 0-99; excludes initial hospital and/or emergency department visits)	—	—	PM ISA
	Stroke (ages 65-99)	—	—	PM ISA
	Asthma onset (ages 0-17)	—	—	PM ISA
	Asthma symptoms/exacerbation (6-17)	—	—	PM ISA
	Lung cancer (ages 30-99)	—	—	PM ISA
	Allergic rhinitis (hay fever) symptoms (ages 3-17)	—	—	PM ISA
	Lost work days (age 18-65)	—	—	PM ISA
	Minor restricted-activity days (age 18-65)	—	—	PM ISA
	Hospital admissions—Alzheimer's disease (ages 65-99)	—	—	PM ISA
	Hospital admissions—Parkinson's disease (ages 65-99)	—	—	PM ISA
	Other cardiovascular effects (e.g., other ages)	—	—	PM ISA[2]
	Other respiratory effects (e.g., pulmonary function, non-asthma ER visits, non-bronchitis chronic diseases, other ages and populations)	—	—	PM ISA[2]
	Other nervous system effects (e.g., autism, cognitive decline, dementia)	—	—	PM ISA[2]
	Metabolic effects (e.g., diabetes)	—	—	PM ISA[2]
	Reproductive and developmental effects (e.g., low birth weight, pre-term births, etc.)	—	—	PM ISA[2]
	Cancer, mutagenicity, and genotoxicity effects	—	—	PM ISA[2]

Table 2-10 summarizes the PM and $PM_{2.5}$ emissions reductions projected under the proposed standards, where $PM_{2.5}$ emissions are a subset of total PM. The PM and $PM_{2.5}$ reductions may also be in part composed on for non-mercury metal HAP. The emissions reductions are estimated by multiplying the source-level emissions reductions associated with each applicable control and model plant type by the projected number of EAFs of that model plant type.

Table 2-10 Projected PM and $PM_{2.5}$ Emissions Reductions, 2023-2032 (short tons)

	PM	**$PM_{2.5}$**
2023	16	3.3
2024	31	6.6
2025	47	10
2026	63	13
2027	79	16
2028	94	20
2029	110	23
2030	130	26
2031	140	30
2032	160	33
Total	**860**	**180**

Note: Numbers rounded to two significant digits. Totals may not sum due to independent rounding.

The benefits per ton of the emissions reductions above at 3 percent and 7 percent discount rates for years 2025 and 2030 are presented in Table 2-11 below. Information regarding the process by which these BPTs were calculated is available in the technical support document "Estimating the Benefit per Ton of Reducing Directly-Emitted $PM_{2.5}$, $PM_{2.5}$ Precursors and Ozone Precursors from 21 Sectors."[9]

[9] U.S. Environmental Protection Agency, 2022. *Estimating the Benefit per Ton of Reducing Directly-Emitted $PM_{2.5}$, $PM_{2.5}$ Precursors and Ozone Precursors from 21 Sectors*. Available at: https://www.epa.gov/system/files/documents/2021-10/source-apportionment-tsd-oct-2021_0.pdf

Table 2-11 Estimated $PM_{2.5}$-related Health Benefits Per Ton by Discount Rate and Estimate (2020 dollars)[a]

Year	3 Percent		7 Percent	
	Low Estimate	High Estimate	Low Estimate	High Estimate
2025	$407,000	$413,000	$366,000	$371,000
2030	$431,000	$449,000	$388,000	$404,000

[a] The range reported here reflects the use of risk estimates from two alternative long-term exposure PM-mortality studies.

2.5 Uncertainties and Limitations

Throughout this, we encountered several sources of uncertainty, both quantitatively and qualitatively, regarding the compliance costs and emissions reductions estimated for the proposed rule. We summarize the key elements of our discussions of uncertainty below.

Source-level compliance costs and emissions impacts: As discussed in Section 2.3, the first step in the compliance cost analysis is the development of representative costs and emissions impacts using a model plant approach. The model plants are designed based upon the best information available to the Agency at the time of the rulemaking. By emphasizing facility averages, geographic variability, and heterogeneity across producers in the industry is masked, and regulatory impacts at the facility-level may vary from the model plant averages.

Projection methods and assumptions: As discussed in Section 2.4.1, the second component in estimating national impacts is the projection of affected facilities. Uncertainties in the projections informing this EIA results include: 1) choice of projection method; 2) data sources; 3) limited information about rate of modification or retirement of facilities; 4) behavioral responses to regulation; and 5) unforeseen changes in industry and economic shocks.

Years of analysis: The years of analysis are 2023, to represent the full first-year facilities are affected by this action, through 2032, to represent impacts of the rule over a longer period, as discussed in Section 2.4.1. While it would be desirable to analyze impacts beyond 2032 in this RIA, the EPA has chosen not to do this largely because of the limited information and uncertainty associated with the projection of new facilities and the rate of modification or retirement of facilities. Extending the analysis beyond 2032 would introduce substantial and increasing uncertainties in the projected impacts of the proposal.

Environmental performance in the baseline: As discussed in Section 2.3.2, while the baseline NSPS requirements requires a maximum 6 percent opacity for melt shop emissions, testing results demonstrate that many existing facilities perform at lower levels of opacity. It is uncertain whether the facilities outperforming the baseline NSPS requirement do so as a result of state or local requirements or facility-specific factors that affect environmental performance. The assumption that new EAFs would achieve an average level of 0.14 percent opacity absent the proposed AAb requirements strongly influence the emissions projections under the rule and represents an important source of uncertainty.

3 ECONOMIC IMPACT ANALYSIS AND DISTRIBUTIONAL ASSESSMENTS

3.1 Introduction

The proposed NSPS is projected to result in environmental control expenditures by the EAF sector to comply with the rule. The national level compliance cost analysis in Section 2 does not speak directly to potential economic and distributional impacts of the proposed rule, which may be important consequences of the action. This section is directed toward complementing the compliance cost analysis and includes an analysis of potential firm-level impacts of regulatory costs, an analysis of small entities that are potentially affected, and a discussion of potential employment impacts.

3.2 Economic Impact Analysis

Although facility-specific economic impacts (production changes or closures, for example) cannot be estimated by this analysis, the EPA conducted a screening analysis of compliance costs compared to the revenue of firms owning EAF facilities. The EPA often performs a partial equilibrium analysis to estimate impacts on producers and consumers of the products or services provided by the regulated firms. This type of economic analysis estimates impacts on a single affected industry or several affected industries, and all impacts of this rule on industries outside of those affected are assumed to be zero or inconsequential.[10]

If the compliance costs, which are key inputs to an economic impact analysis, are small relative to the receipts of the affected industries, then the impact analysis may consist of a calculation of annual (or annualized) costs as a percent of sales for affected parent companies. This type of analysis is often applied when a partial equilibrium or more complex economic impact analysis approach is deemed unnecessary given the expected size of the impacts. The annualized cost per sales for a company represents the maximum price increase in the affected product or service needed for the company to completely recover the annualized costs imposed by the regulation. We conducted a cost-to-sales analysis to estimate the economic impacts of this proposal, given that the EAV of the compliance costs are about $12 million in 2020 dollars, which is small relative to the revenues for the affected industry.

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[10] U.S. EPA. Guidelines for Preparing Economic Analyses. May 2016. p. 9-17. Available at https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-09.pdf.

The EPA prefers a “sales test” as the impact methodology in economic impact analyses as opposed to a “profits test”, in which annualized compliance costs are calculated as a share of profits.[11] This is consistent with guidance published by the U.S. Small Business Administration (SBA) Office of Advocacy, which suggests that cost as a percentage of total revenues is a metric for evaluating cost impacts on small entities relative to large entities.[12] This is because revenues or sales data are commonly available for entities impacted by the EPA regulations and profits data are often private or tend to misrepresent true profits earned by firms after undertaking accounting and tax considerations.

While a “sales test” can provide some insight as to the economic impact of an action such as this one, it assumes that the impacts of a rule are solely incident on a directly affected firm (therefore, no impact to consumers of affected product), or solely incident on consumers of output directly affected by this action (therefore, no impact to companies that are producers of affected product). Thus, an analysis such as this one is best viewed as providing insight on the polar examples of economic impacts: maximum impact to either directly affected companies or their consumers. A “sales test” analysis does not consider shifts in supply and demand curves to reflect intermediate economic outcomes.

For context, Table 3-1 presents a list of firms that own existing EAFs, the number of EAFs owned by each firm and the total employment and revenues for each firm. The list was compiled using the EPA’s list of EAFs and from research using D&B Hoovers, a private business information provider, and firm websites.

[11] More information on sales and profit tests as used in analyses done by U.S. EPA can be found in the Final Guidance for EPA Rulewriters: Regulatory Flexibility Act as Amended by the Small Business Regulatory Enforcement Fairness Act, November 2006, pp. 32-33.

[12] U.S. SBA, Office of Advocacy. 2010. A Guide for Government Agencies, How to Comply with the Regulatory Flexibility Act, Implementing the President’s Small Business Agenda and Executive Order 13272.

Table 3-1 Firms that Own Potentially Affected Existing EAFs, Number of EAFs Owned and Firm-Level Employment and Revenues

Firm Name	Firm-Owned EAFs	Total Firm Employment	Firm Revenues ($ millions)
Acciaierie Valbruna S.p.a.	1	1,600	670
Acerinox S.A.	1	6,600	940
Allegheny Technologies Inc.	1	8,100	3,000
Berkshire Hathaway Inc.	1	360,000	250,000
Bluescope Steel Limited	1	6,100	9,600
Carpenter Technology Corp.	2	4,600	1,500
Charter Manufacturing Company, Inc.	2	2,000	570
Cleveland-Cliffs Inc.	4	12,000	5,400
Commercial Metals Company	9	11,000	6,700
Ellwood Group, Inc.	2	1,900	660
Evraz PLC	1	67,000	9,800
G. O. Carlson, Inc.[a]	1	220	49
Gerdau S.A.	10	25,000	520
Grupo Simec, S.A.B. De C.V.	2	4,200	1,700
Haynes International, Inc.[a]	1	1,200	340
Höganäs Holding AB	1	2,400	940
JSW Steel Limited	1	13,000	9,400
KCI Holdings, Inc.	1	35,000	190
Kyoei Steel Ltd.	1	4,000	2,100
Leggett & Platt, Inc.	1	20,000	4,300
Melrose Industries PLC	1	55,000	11,000
Nippon Steel Corporation	1	110,000	46,000
NLMK, PAO	1	27,000	6,100
Nucor Corporation	21	27,000	20,000
Outokumpu	1	10,000	6,400
Schnitzer Steel Industries, Inc.	1	3,000	2,800
SSAB U.S. Holding, Inc.	2	14,000	1,600
Steel Dynamics, Inc.	6	9,600	9,600
Sumitomo Corporation	1	75,000	44,000
Swiss Steel Holding AG	1	9,000	3,300
Tenaris Global Services (USA) Corporation	1	4,600	1,200
Timkensteel Corporation	2	3,000	1,200
United States Steel Corp	2	24,000	9,700
Universal Stainless & Alloy Products, Inc.[a]	1	800	180
Vallourec Deutschland Gmbh	1	3,400	960
Whemco Inc.	1	1,800	180
Grand Total	**88**	**960,000**	**470,000**

Source: Information on existing EAFs from AIST publication "2021 AIST Electric Arc Furnace Roundup." Information on firm-level employment and revenues from D&B Hoovers and firm websites.
[a] Firm identified as small business.

We find that the great majority of the estimated 36 firms affected are large, sometimes foreign-owned multinational companies with substantial revenues. Many firms are engaged in a broad range of economic activities, not just steel production from EAFs. The EPA has not estimated any cost impacts associated with the proposed minor changes to the existing rules AA and AAa to clarify and refine some of the current provisions. As a results, under this proposal, the cost-to-sales ratios based on the proposed changes to AA and AAa are zero for firms owning existing facilities.

With respect to the proposed melt shop requirements for new, modified, and reconstructed EAFs, the EPA does not know what firms will construct new facilities in the future and, as a result, cannot perform a cost-to-sales analysis with the same confidence as we do with firms owning existing facilities. However, we can perform an illustrative assessment using the firm's owning EAFs which begin operating during the 2011 to 2020 and firms that own future EAFs that have been announced as presented in Table 3-2.

Table 3-2 Firm-level Employment and Revenues for EAFs Constructed from 2011 to 2020 and Announced Future EAFs, Capacity, and Assumed Model Plant Category

Year Built	Company	City	State	Assumed Model Plant Size	Total Firm Employment	Firm Revenues ($ millions)
2011	Outokumpu	Calvert	AL	Medium	10,000	6,400
2011	Finkl Steel[a]	Chicago	IL	Medium	9,000	3,300
2013	Republic Steel[b]	Lorain	OH	Medium	4,200	1,700
2017	Commercial Metals Company	Durant	OK	Small	11,000	6,700
2017	Big River Steel[c]	Osceola	AR	Large	24,000	9,700
2020	Nucor	Sedalia	MO	Small	27,000	20,000
2020	Nucor	Frostproof	FL	Small	27,000	20,000
2020	Nucor	Birmingham	AL	Medium	27,000	20,000
2020	Big River Steel[c]	Osceola	AR	Large	24,000	9,700
Future	Steel Dynamics, Inc.	Sinton	TX	Large	9,600	9,600
Future	Nucor Corporation	Brandenburg	KY	Medium	27,000	20,000
Future	ArcelorMittal/Nippon Steel[d]	Calvert	AL	Large	110,000	46,000
Future	Commercial Metals Company	Mesa	AZ	Small	11,000	6,700

As can be seen in Table 3-2, the firms owning new and announced facilities are all relatively large enterprises with annual revenues in the billions. According to the Cost Memo the annualized costs, inclusive of annualized capital and O&M, for including a partial roof canopy above the crane rails to ensure 0 percent melt shop opacity are estimated to be $60,000, $800,000, and $4 million per year per facility for small, medium, and large facilities, respectively. To inform an illustrative analysis of potential impacts of regulatory costs to new facilities in the future, we assume that the same firms which established or announced new facilities in the period covered by Table 3-2 incur the annualized regulatory costs associated with this proposal for each model plant size. Under this illustrative analysis, 13 EAFs are established and incur total annualized costs of about $20 million per year (Table 3-3).

Table 3-3 Hypothetical Cost-to-Sales Ratios under the Proposal

	Model Plant Type					
Company	Small	Medium	Large	Hypothetical Annualized Regulatory Costs ($ millions)	Firm Revenues ($ millions)	Hypothetical Cost-to-Sales Ratio (%)
Outokumpu	0	1	0	0.8	6,400	< 0.1%
Finkl Steel	0	1	0	0.8	3,300	< 0.1%
Republic Steel	0	1	0	0.8	1,700	< 0.1%
Commercial Metals Company	2	0	0	0.1	6,700	< 0.1%
Big River Steel	0	0	2	8.0	9,700	< 0.1%
Nucor	2	2	0	1.7	20,000	< 0.1%
Steel Dynamics, Inc.	0	0	1	4.0	9,600	< 0.1%
ArcelorMittal/Nippon Steel	0	0	1	4.0	46,000	< 0.1%

As can be seen in Table 3-3, the cost-to-sales ratios derived in this illustrative analysis are all below 0.1 percent. These results indicate, under the assumptions applied to construct this hypothetical scenario, the potential economic impacts of this proposal are likely to be small. This conclusion is reinforced by the likelihood that the actual compliance costs are likely to lower than the upper bound estimates presented here, as is discussed in Section 2.4 in the EIA as well as the preamble and Cost Memo.

3.3 Small Business Impact Analysis

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, a 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 (Iron and Steel Mills and Ferroalloy Manufacturing), the SBA small business size standard is 1,500 employees according to the SBA small business size standard definitions.[13]

Using the current SBA small business size definitions, three of the potentially affected firms that currently own and operate EAFs are small businesses (Table 3-4).

Table 3-4 Small Businesses that Own Potentially Affected EAFs, Number of EAFs Owned and Firm-Level Employment and Revenues (Source: D&B Hoovers and Firm Websites)

Firm Name	Firm-Owned EAFs	Total Firm Employment	Firm Revenues ($ millions)
G. O. Carlson, Inc.	1	220	49
Haynes International, Inc.	1	1,200	340
Universal Stainless & Alloy Products, Inc.	1	800	180

As mentioned in the previous section, the EPA has not estimated any regulatory cost impacts associated with the proposed minor changes to the existing rules AA and AAa to clarify and refine some of the current provisions. As a result, under this proposal, the cost-to-sales ratios based on the proposed changes to AA and AAa are zero for firms owning existing facilities, including the three small business listed in Table 3-4.

With respect to the proposed melt shop requirements for new, modified, and reconstructed EAFs, the EPA does not know what firms will construct new facilities in the future and, as a result, cannot perform a cost-to-sales analysis with the same confidence as we do with firms owning existing facilities. However, based on an assessment of the new units built during the 2011 to 2020 period and the units that have been announced, which are all owned by firms that are not considered to be small businesses, the EPA does not believe it is likely that any future facilities will be built by a small business. Based on the likelihood that the small businesses that are potentially affected by this proposed rule will not incur incremental compliance costs as a result of the proposed requirements, we can certify that there is no significant economic impact on a

[13] https://www.sba.gov/document/support--table-size-standards

substantial number of small entities (SISNOSE) for this rule. This conclusion is reinforced by the likelihood that the actual compliance costs are likely to lower than the upper bound estimates presented here, as is discussed in Section 2.4 in the EIA as well as the preamble and Cost Memo, so if a future small entity were to build a new EAF or modify or reconstruct a facility, the compliance costs faced be the entity would likely be substantially lower than the upper bound estimates presented in Section 2.4.

3.4 Employment Impact Analysis

This section presents a qualitative overview of the various ways that environmental regulation can affect employment. Employment impacts of environmental regulations are generally composed of a mix of potential declines and gains in different areas of the economy over time. Regulatory employment impacts can vary across occupations, regions, and industries; by labor and product demand and supply elasticities; and in response to other labor market conditions. Isolating such impacts is a challenge, as they are difficult to disentangle from employment impacts caused by a wide variety of ongoing, concurrent economic changes. The EPA continues to explore the relevant theoretical and empirical literature and to seek public comments in order to ensure that the way the EPA characterizes the employment effects of its regulations is reasonable and informative.

Environmental regulation "typically affects the distribution of employment among industries rather than the general employment level."[14] Even if impacts are small after long-run market adjustments to full employment, many regulatory actions have transitional effects in the short run.[15] These movements of workers in and out of jobs in response to environmental regulation are potentially important and of interest to policymakers. Transitional job losses have consequences for workers that operate in declining industries or occupations, have limited capacity to migrate, or reside in communities or regions with high unemployment rates.

[14] Arrow, K. J., Cropper, M. L., Eads, G. C., Hahn, R. J., Lave, L. B., Noll, R. G., Portney, P. R., Russell, M., Schmalensee, R., Smith, V. K., & Stavins, R. N. (1996). Benefit-Cost Analysis in Environmental, Health, and Safety Regulation: A Statement of Principles. American Enterprise Institute, the Annapolis Center, and Resources for the Future; AEI Press. https://www.aei.org/research-products/book/benefit-cost-analysis-in-environmental-health-and-safety-regulation/

[15] OMB. (2015). 2015 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act. U.S. Office of Management and Budget, Office of Information and Regulatory Affairs. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/inforeg/inforeg/2015_cb/2015-cost-benefit-report.pdf

As indicated by the potential impacts on EAF-owning firms discussed in Section 3.2, the proposed requirements are unlikely to cause large shifts in steel production and prices. As a result, demand for labor employed in steel production activities and associated industries is unlikely to see large changes but might experience adjustments as there may be increases in compliance-related labor requirements such as labor associated with the manufacture, installation, and operation of pollution control as well as changes in employment due to quantity effects in directly regulated sectors and sectors that consume EAF-produced steel. For this proposal, however, we do not have the data and analysis available to quantify these potential labor impacts.

United States Environmental Protection Agency	Office of Air Quality Planning and Standards Health and Environmental Impacts Division Research Triangle Park, NC	Publication No. EPA-452/R-22-001 April 2022