Economic Impact Analysis for the Final National Emission Standards for Hazardous Air Pollutants: Chemical Manufacturing Area Sources

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Economic Impact Analysis for the Final National Emission Standards for Hazardous Air Pollutants: Chemical Manufacturing Area Sources

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1 INTRODUCTION

1.1 Background

The U.S. Environmental Protection Agency (EPA) is finalizing amendments to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Chemical Manufacturing Area Sources (40 CFR part 63, subpart VVVVVV). The Chemical Manufacturing Area Source (CMAS) categories are comprised of area sources in nine source categories in the chemical manufacturing sector: Agricultural Chemicals and Pesticides Manufacturing, Cyclic Crude and Intermediate Production, Industrial Inorganic Chemical Manufacturing, Industrial Organic Chemical Manufacturing, Inorganic Pigments Manufacturing, Miscellaneous Organic Chemical Manufacturing, Plastic Materials and Resins Manufacturing, Pharmaceutical Production, and Synthetic Rubber Manufacturing. The standards and associated requirements for the nine area source categories are combined in one subpart. Facilities currently subject to the CMAS NESHAP emit one or more of 15 urban air toxics.[1] This document presents the economic impact analysis (EIA) for this final rule.

Facilities in the CMAS categories manufacture a wide variety of specialty chemicals and products. The CMAS NESHAP was promulgated in 2009 and contained requirements for the 15 urban hazardous air pollutants (HAP) for process vents, storage tanks, wastewater systems, heat exchange systems, transfer operations, and equipment leaks. The EPA identified approximately 251 area source facilities that may be impacted by the final revisions to the CMAS NESHAP.

To meet the requirements of Clean Air Act (CAA) section 112(d)(6), the EPA must review, and revise standards promulgated under CAA section 112 no less often than every eight years. This review takes into account developments in practices, processes, and control technologies and determines which may be appropriate for the considered source category or source categories. This process is known as a "technology review."

This final rule, as part of the technology review, is adding new leak detection and repair (LDAR) requirements to the CMAS NESHAP for equipment leaks and for heat exchange

[1] The 15 urban HAP regulated by the CMAS NESHAP are: 1,3-butadiene, 1,3-dichloropropene, acetaldehyde, chloroform, ethylene dichloride, hexachlorobenzene, methylene chloride, quinoline, hydrazine, arsenic compounds, cadmium compounds, chromium compounds, lead compounds, manganese compounds, and nickel compounds.

systems in organic HAP service.[2] In addition, the EPA is adding new generally available control technology (GACT) standards pursuant to CAA section 112(d)(5) for pressure vessels and pressure release devices (PRDs) in organic HAP service. The EPA is also requiring performance testing once every five years to demonstrate compliance with emission limits. Finally, changes to recordkeeping and reporting requirements will require the use of electronic reporting of certain reports. More information on these requirements can be found in the preamble for this rule.

1.2 Economic Basis for this Rulemaking

Regulation can be used to address market failures, which otherwise lead to a suboptimal allocation of resources within a free market. Many environmental problems are classic examples of "negative externalities," which arise when private entities do not internalize the full opportunity cost of their production, and some of this opportunity cost is borne by members of society who are neither consumers nor producers of the goods produced (*i.e.*, they are "external"). For example, the smoke from a factory may adversely affect the health of nearby residents, local soil quality, and visibility. Public goods such as air quality are valued by individuals but suffer from a lack of property rights, so the value of good air quality tends to be unpriced in markets that generate air pollution. In such cases, markets fail to allocate resources efficiently and regulatory intervention is needed to address the problem.

While recognizing that the socially optimal level of pollution is often not zero, the emissions from CMAS facilities impose costs on society (*i.e.*, adverse human health and environmental impacts) that may not be reflected in the equilibrium market prices for the chemicals they produce. If emissions from CMAS facilities increase risks to human health and the environment, some social costs will be borne not by affected firms and their customers but rather imposed on communities near the facilities and other individuals exposed to their emissions.

[2] Organic HAP service is defined in the context of equipment that handles or processes substances containing organic hazardous air pollutants. In Subpart VVVVVV, an "organic HAP service" generally refers to any equipment that contains or contacts a fluid (liquid or gas) that is at least 5 percent by weight of total organic HAPs.

1.3 Summary of Impacts

The EPA estimates that the amendments will reduce HAP emissions from affected CMAS by approximately 160 tons per year (tpy). The potential health and environmental impacts the HAP reductions are not quantified or monetized in this EIA, but a description of the health effects associated with exposure to some of the HAP emissions is provided. The HAP emissions reductions from this rulemaking may include, but are not limited to acrolein and nickel.

As part of fulfilling the analytical requirements of EO 12866, we present estimates of the PV and EAV of the costs over the period 2027 to 2041 using three and seven percent discount rates.[3] The 15-year period for the analysis fully captures the 15-year lifetime for the pressure relief device equipment. Capital costs are projected to be incurred in their entirety in 2027. For the purposes of this analysis, we assume all capital costs are incurred in 2027, rather than being spread out over the compliance period. While the affected firms may instead spread out these capital costs over the compliance timeframe, our approach assumes all capital costs across the affected industry are incurred in one year.

Table 1 contains a summary of the costs and EtO emission impacts estimated for this final rule. This action is estimated to result in capital investment costs of approximately $18.4 million and annual operating and maintenance costs of 6.2 million (in 2024 dollars).[4] The present value (PV) of the estimated compliance costs from 2026 to 2045 for the final rule is $72 million in 2024 dollars, discounted at a 3 percent rate. The equivalent annualized value (EAV)[5] of the estimated costs is $6.1 million, using a 3 percent discount rate. Using a 7 percent discount rate, the PV and EAV of the costs are estimated to be $56 million and $6.2 million, respectively. The health benefits associated with these emissions reductions were not monetized for this final rule due to methodological limitations. We anticipate that this final rulemaking may affect requirements for a total of 251 CMAS facilities (owned by 176 ultimate parent companies). Of

[3] The EAV takes the "lumpy" stream of costs *(i.e.*, different costs in different years) and converts them into a single value that, if paid each year from 2027 to 2041, would equal the original stream of values in present value terms. In other words, the sum of uniform EAVs across years in the analytical timeframe in present value terms yields the total present value (*i.e.*, the total discounted stream of costs across years).

[4] The total annualized cost savings are the sum of the annualized capital cost savings and other annual cost savings. The capital cost savings were annualized over the lifetime of the equipment at a 7.5 percent interest rate.

[5] The EAV represents a flow of constant annual values that, had they occurred in each year from 2026 to 2045, would yield a sum equivalent to the present value.

the 176 affected ultimate parent entities, 55 is a small entity. As detailed later in this EIA, the Agency has determined that this action will not have a significant economic impact on a substantial number of small entities (SISNOSE) under the Regulatory Flexibility Act.

Table 1-2. Estimated Costs and Emissions Reductions (millions 2024$)

	3 Percent Discounting	7 Percent Discounting
PV	**$72**	**$56**
EAV	**$6.1**	**$6.2**
HAP Emissions Reduction (tpy)	160	

Note: Values have been rounded to two significant figures. Values include product recovery in calculations.

This EIA is organized as follows. Section 2 provides an overview of the CMAS regulatory background. Regulatory cost analysis is provided in Section 3. Section 4 presents the emissions impacts and benefits analysis. Section 5 presents the economic impact analysis.

2 REGULATORY BACKGROUND

2.1 Regulatory History

This section provides the regulatory history for the CMAS categories and the baseline regulatory requirements for CMAS subject to the NESHAP. CMAS facilities are chemical manufacturing facilities that produce a wide variety of specialty chemicals and products.

Collectively, CAA sections 112(c)(3), (d)(5), and (k)(3) are the basis of the Area Source Program under the Urban Air Toxics Strategy, which provides the framework for regulation of area sources under CAA section 112. CAA section 112(k)(3)(B) requires the EPA to identify at least 30 HAP that pose the greatest potential health threat in urban areas with a primary goal of achieving a 75 percent reduction in cancer incidence attributable to HAP emitted from stationary sources. The HAP identified by the EPA (see the Integrated Urban Air Toxics Strategy (64 FR 38706, 38715, July 19, 1999)) are commonly referred to as the "30 urban HAP." CAA section 112(c)(3), in turn, requires the EPA to list sufficient categories or subcategories of area sources to ensure that area sources representing 90 percent of the emissions of the 30 urban HAP are subject to regulation.

In October 2009, the EPA promulgated the final NESHAP for area sources in the chemical manufacturing industry. The CMAS NESHAP affected area sources in nine source categories, including: Agricultural Chemicals and Pesticides Manufacturing, Cyclic Crude and Intermediate Production, Industrial Inorganic Chemical Manufacturing, Industrial Organic Chemical Manufacturing, Inorganic Pigments Manufacturing, Miscellaneous Organic Chemical Manufacturing, Plastic Materials and Resins Manufacturing, Pharmaceutical Production, and Synthetic Rubber Manufacturing. The rule established GACT standards pursuant to CAA section 112(d)(5). Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to and appropriate for area sources in the categories. The EPA considers technical capabilities of affected sources, costs, and economic impacts in establishing and amending GACT standards.

The 2009 rule established GACT emission standards in the form of management practices for each chemical manufacturing process unit as well as emission limits for certain subcategories of process vents and storage tanks. The rule also established management practices and other emission reduction requirements for subcategories of wastewater systems, heat exchange systems, transfer operations, and equipment leaks.

In terms of management practices, the 2009 rule required quarterly inspections for equipment leaks, required owners and operators to keep lids on process vessels and to keep them closed whenever they were in organic HAP or metal HAP service, required the use of certain emissions control techniques when transferring liquid to tank trucks and railcars, and required the development and operation of an inspection plan to identify leaks from small heat exchange systems. In addition to these management practices, the 2009 rule included standards for certain process vents, storage tanks, heat exchange systems, and wastewater systems. Specifically, the rule required:

- Emission reductions of total organic HAP greater than or equal to 95 weight percent (85 percent during periods of startup and shutdown), to a concentration of 20 parts per million by volume (ppmv), or by routing emissions via closed vent system to a flare for certain continuous process vents;

- Emission reductions of total organic HAP greater than or equal to 85 weight percent, to a concentration of 20 ppmv, or by routing emissions via closed vent system to a flare for certain existing batch process vents (90 percent for new sources);
- Emission reductions of total organic HAP greater than or equal to 95 weight percent for certain vents emitting metal toxic air pollutants;
- Emission reductions of certain halogenated vent streams by greater than or equal to 95 weight percent, to less than or equal to 0.45 kilograms per hour, or to a concentration of less than or equal to 20 ppmv;
- Improved controls for storage tanks varying in stringency depending on capacity and maximum true vapor pressure of the stored fluid;
- Quarterly monitoring via water sampling for heat exchange systems with flow rates greater than or equal to 8,000 gallons per minute;
- Separation of the organic and water phases or hard piping of the wastewater stream to either onsite treatment or a transfer point for offsite treatment for certain wastewater streams.

CMAS facilities were also required to submit one-time notifications of applicability and compliance status, semiannual compliance reports under certain circumstances, and keep records to demonstrate compliance with the final rule.

In December of 2012, the EPA finalized a reconsideration of the CMAS NESHAP to address minor technical corrections; to remove startup, shutdown, and malfunction exemptions; and to add affirmative defense provisions.

2.2 Final Requirements

The amendments being promuglated in this rule are the result of the statutory authorities of CAA sections 112(d)(5) and (6). For area sources, in lieu of maximum available control technology (MACT) standards, the EPA may establish GACT standards and consider additional factors such as cost. Technology reviews assess developments in practices, processes, or control technologies and revise the standards as necessary, considering factors like cost and cost-effectiveness. The EPA is required to conduct a technology review every eight years after a

NESHAP is promulgated. Refer to the preamble of this action, available in the docket for this rulemaking, for additional details.

This final rule updates several standards in the CMAS NESHAP and includes new standards for certain sources. These standards include:

- Pressure vessels, which will be subject to monitoring requirements.
- Pressure relief devices, require PRDs to be equipped with preventive measures and monitoring equipment and specify that PRDs may not release to the atmosphere more than twice over a rolling three-year period.
- Equipment leaks, establish an annual instrument monitoring program for valves, pumps, connectors, and other equipment using EPA Method 21.
- Heat exchange systems with flow rates greater than or equal to 8,000 gallons per minute, quarterly monitoring via the Modified El Paso Method.

The EPA is also requiring performance testing of non-flare control devices once every five years to demonstrate compliance with the emissions limits and amending the recordkeeping and reporting requirements to require the use of electronic reporting of certain reports. The EPA is finalizing that affected sources must be in compliance with the requirements within three years of this rule being finalized.

The preamble contains a more thorough discussion of the analyses conducted to determine the amendments in this rule, including the range of technologies, practices, and other requirements considered and the EPA's reasoning for ultimately choosing the standards.

3 REGULATORY COST ANALYSIS

3.1 Introduction

This section describes the EPA's estimates of the regulatory costs associated with this final rule's requirements for affected CMAS operations. This EIA focuses on the requirements that result in quantifiable compliance cost or emissions changes compared to a regulatory baseline that represents the status quo without this rule. The EPA assumed each facility achieved emissions control sufficient to meet the baseline standards and estimated the emissions reductions and cost of fully complying with the requirements relative to this baseline. The regulatory costs were estimated by multiplying facility and source counts by regulatory cost estimates for the various requirements in the rule.

The technical memoranda in the docket describe the methodology, data, and assumptions used to estimate the capital and annual costs and the emission reductions associated with the requirements for the CMAS NESHAP (40 CFR part 63, subpart VVVVVV). These costs represent the incremental costs for the final rule relative to the baseline requirements describe in the previous section. For greater detail on the methods for estimating the cost and emissions impacts associated with each emissions process group, see the documents *Section 112(d)(6) Technology Review for Heat Exchange Systems Associated with Chemical Manufacturing Process Units at Area Sources Subject to the CMAS NESHAP*, *Clean Air Act Section 112(d)(5) GACT Standard Analysis for Pressure Relief Devices Associated with Processes Subject to the CMAS NESHAP and Section 112(d)(6) Technology Review for Process Vents and Storage Tanks Associated with Chemical Manufacturing Process Units at Area Sources Subject to the CMAS NESHAP*, *Clean Air Act Section 112(d)(5) GACT Standard Analysis for Pressure Vessels Associated with Processes Subject to the CMAS NESHAP*, *Clean Air Act Section 112(d)(6) Technology Review for Wastewater Systems Associated with Chemical Manufacturing Process Units at Area Sources Subject to the CMAS NESHAP*, and *Updated Impact Calculations for the CMAS Categories – Final Rule*, and the preamble, in the docket.

3.2 Affected Facilities

The EPA estimated costs for 251 CMAS facilities expected to conduct additional performance compliance actions due to the requirements in the final rule. We assumed that all of

these facilities would continue to operate and be affected by the rule throughout the 15-year analytical timeframe from 2027 to 2041. The EPA did not estimate compliance costs for any new sources that may become affected by this rule in the future. Although the action contains requirements for new sources, the EPA is not aware of any new sources being constructed now or planned in the future and, consequently, did not estimate any costs for new sources.

It should be noted that the EPA's rule, "Reclassification of Major Sources as Area Sources Under Section 112 of the Clean Air Act" (MM2A), that was finalized in September 2020, may offer some chemical manufacturing sources that are currently major HAP sources the opportunity to reclassify as area sources under certain conditions. The EPA was not able to estimate how many major sources may reclassify that would then become affected by the CMAS NESHAP. While MM2A may result in a greater number of CMAS subject to the NESHAP in the future, reclassification to area source status is generally expected to reduce costs for those sources relative to the costs that would be associated with the relevant major source standards, all other considerations being equal. Any major source considering reclassification will need to consider both the MM2A requirements and the requirements of the CMAS NESHAP.

3.3 Regulatory Compliance Cost Estimates

3.3.1 Private Compliance Cost Estimates

The total capital, operation and maintenance, and annualized private compliance costs estimated for the different requirements are presented in Table 3-1. The "total annual costs" are the sum of the annualized capital costs and other annual costs (*e.g.*, operating and maintenance costs, recordkeeping and reporting costs). Annualization of capital costs involves establishing an annual "payment" sufficient to finance the investment over the expected lifetime of the equipment or loan period. This payment is often referred to as the "capital recovery cost." To obtain annualized capital costs, a capital recovery factor is applied to the total capital cost estimate. The capital recovery factor is based on the lifetime of the capital equipment as well as the interest rate. To annualize the capital costs, the EPA assumed a 7.5 percent interest rate, a 15-year lifetime for the pressure relief device equipment, a 5-year lifetime for the equipment leaks

capital, a 5-year lifetime for the pressure vessel capital. The other requirements were not assumed to require capital expenditures.[6]

In this EIA, the EPA also estimated the revenues that could be earned from selling the product that is estimated to be recovered by complying with the requirements. The product recovery revenues are treated as an offset to the compliance costs, though the revenues may also be considered as a benefit of the action. Regardless of whether the revenue from product recovery is considered a compliance cost offset or a benefit, the net benefits are equivalent. The cost estimates for this rule are provided both including and excluding the value of product recovery.[7] When included, product recovery is embedded in the annual cost estimate. When the value of product recovery is included, the total annual cost estimate for the rule is about four percent lower.

Table 3-1. Compliance Cost Estimates by Requirement and Cost Component (2024$)

	Capital costs	Annual O&M Costs	Total Annual Costs (without Product Recovery)	Total Annual Costs (with Product Recovery)
Equipment Leaks	2,700,000	1,700,000	2,340,000	961,000
Pressure Relief Devices	15,700,000	4,400,000	4,710,000	4,710,000
Heat Exchange Systems	-	58,800	58,800	17,900
Pressure Vessels	3,700	2,300	3,300	3,300
Total	**18,400,000**	**6,200,000**	**7,110,000**	**5,690,000**

Total annual costs include annualized capital costs, annual operating and maintenance costs, and one-time costs. All estimates are rounded to three significant figures.

The updated requirements for pressure relief devices are associated with the highest estimated capital cost for any single requirement in Table 3-1 at about $16 million, which accounts for 85 percent of the total capital costs estimated for the final rule.

3.3.2 Social Cost Estimates

The compliance cost estimates are to approximate the social cost of this regulation. The private cost of purchasing and operating pollution control equipment and performing other compliance-

[6] The interest rate was obtained from https://fred.stlouisfed.org/series/PRIME on August 10, 2024.

[7] Product recovery revenues were estimated per ton of VOC recovered at an estimate of $900 per ton based on the estimates for SOCMI facilities (see https://www.epa.gov/stationary-sources-air-pollution/synthetic-organic-chemical-manufacturing-industry-organic-national).

related activities is assumed to reflect the social opportunity cost of these technologies. Furthermore, the regulation is not anticipated to meaningfully affect behavior and prices in the markets supplied by the affected chemical manufacturers

As part of fulfilling the analytical requirements of EO 12866, we present estimates of the PV and EAV of the costs over the period 2027 to 2041 using three and seven percent discount rates.[8] The 15-year period for the analysis fully captures the 15-year lifetime for the pressure relief device equipment. Capital costs are projected to be incurred in their entirety in 2027. For the purposes of this analysis, we assume all capital costs are incurred in 2027, rather than being spread out over the compliance period. While the affected firms may instead spread out these capital costs over the compliance timeframe, our approach assumes all capital costs across the affected industry are incurred in one year.

Table 3-2 shows the results of these calculations. The values in the columns for capital costs, annual costs, and product recovery are the undiscounted costs.

[8] The EAV takes the "lumpy" stream of costs *(i.e.*, different costs in different years) and converts them into a single value that, if paid each year from 2027 to 2041, would equal the original stream of values in present value terms. In other words, the sum of uniform EAVs across years in the analytical timeframe in present value terms yields the total present value (*i.e.*, the total discounted stream of costs across years).

Table 3-2. Present Value of Costs and Undiscounted Costs of the Rule (millions of 2024$)

Year	Capital costs	Annual operating & maintenance costs	Value of product recovery	Discounted stream of costs (3%)	Discounted stream of costs (7%)
2027	$18.4	$6.2	($1.4)	$22	$20
2028		$6.2	($1.4)	$4.3	$3.9
2029		$6.2	($1.4)	$4.2	$3.6
2030		$6.2	($1.4)	$4.1	$3.4
2031		$6.2	($1.4)	$4.0	$3.2
2032		$6.2	($1.4)	$3.9	$2.9
2033		$6.2	($1.4)	$3.7	$2.8
2034		$6.2	($1.4)	$3.6	$2.6
2035		$6.2	($1.4)	$3.5	$2.4
2036		$6.2	($1.4)	$3.4	$2.3
2037		$6.2	($1.4)	$3.3	$2.1
2038		$6.2	($1.4)	$3.2	$2.0
2039		$6.2	($1.4)	$3.1	$1.8
2040		$6.2	($1.4)	$3.0	$1.7
2041		$6.2	($1.4)	$3.0	$1.6
Present value				**$72**	**$56**
Equivalent annualized value				**$6.1**	**$6.2**

3.4 Uncertainties

The cost estimates are subject to several sources of uncertainty. This analysis includes many data sources as inputs, including source counts, equipment and labor costs, and assumptions regarding the current state of the industry and how individual facilities carry out their operations, the future state of the industry, and the future state of the world (*e.g.*, regulations, technology, economic activity, and human behavior). There is also uncertainty about the specific components of the regulatory compliance cost estimates, such as the costs of the equipment and labor required to comply with the rule and how the costs might change over time. Facilities may comply with the requirements through alternative methods that were not accounted for in the EPA's estimates. Each of the inputs and assumptions used are uncertain to some degree and generate uncertainty in the overall cost estimates. When the uncertainties from each stage of the analysis are compounded, even small uncertainties can have large effects on the total cost estimates.

This analysis assumes full compliance with the rule across affected sources. This analysis also assumes that compliance will start in 2027 and that all capital costs will be incurred that year, and this may not be the case. Companies have two years to comply with the requirements once the final rule is published (assuming finalization in 2025) but facilities may begin incurring compliance related costs in the years leading up to the compliance date. The cost impacts were estimated out to 2041, and more uncertainty is introduced when impacts are estimated further into the future.

The total number of facilities subject to the action could change. The EPA estimated costs for existing facilities, but other new facilities may be constructed and become subject to the requirements. Facilities may modify or upgrade in ways that affect the counts of the various emissions sources impacted by this rule. Additionally, new control technology may become available in the future at lower cost, and the EPA is unable to predict exactly how industry will comply with the rule in the future. Some firms, such as small businesses, may not be able to obtain financing at the assumed interest rate (*i.e.*, the U.S. bank prime rate).

There may be an opportunity cost associated with the installation of environmental controls for purposes of mitigating emissions that is not reflected in the compliance cost estimates. If investment in environmental compliance displaces other productive investment, the difference between the rate of return on the displaced investment and the mandatory compliance-related investment is a measure of the opportunity cost of the regulation. The opportunity cost is the value lost to society of any goods and services that will not be produced and consumed because some resources are reallocated towards pollution mitigation activities that yield lower returns to society. To the extent that any opportunity costs are not included in the control costs, the compliance costs for this action may be underestimated.

4 EMISSIONS IMPACTS AND BENEFITS ANALYSIS

4.1 Introduction

The EPA estimates that the amendments will reduce HAP emissions from affected CMAS by approximately 160 tpy. The potential health and environmental impacts the HAP reductions are not quantified or monetized in this EIA, but a description of the health effects associated with exposure to some of the HAP emissions is provided. The HAP emissions reductions from this rulemaking may include, but are not limited to acrolein and nickel.

4.2 Health Effects from Exposure to HAP Reduced by this Rule

This section contains qualitative discussion of the human health risks associated with exposure to acrolein and nickel. Due to methodology and data limitations, we did not attempt to quantify or monetize the potential health impacts of reductions in HAP in this analysis. Instead, we are providing a qualitative discussion of the health effects associated with HAP emitted from sources subject to control under the final action.

Acrolein

Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. It is toxic to humans following inhalation, oral or dermal exposures. Acute (short-term) inhalation exposure may result in upper respiratory tract irritation and congestion. The major effects from chronic (long-term) inhalation exposure to acrolein consist of general respiratory congestion and eye, nose, and throat irritation.[9]

Nickel

Nickel exists naturally in the environment. Nickel dermatitis, consisting of itching of the fingers, hands, and forearms, is the most common effect in humans from chronic (long-term) skin contact with nickel. Respiratory effects have also been reported in humans from inhalation exposure to nickel. Human and animal studies have reported an increased risk of lung and nasal cancers from exposure to nickel refinery dusts and nickel subsulfide. Animal studies of soluble

[9] U.S. EPA. (2009). Acrolein. Health Effects Notebook for Hazardous Air Pollutants. Found at https://www.epa.gov/sites/default/files/2016-08/documents/acrolein.pdf.

nickel compounds (*i.e.*, nickel carbonyl) have reported lung tumors. The EPA has classified nickel refinery dust and nickel subsulfide as Group A, human carcinogens, and nickel carbonyl as a Group B2, probable human carcinogen.[10]

[10] U.S. EPA. (2000). Nickel Compounds. Health Effects Notebook for Hazardous Air Pollutants. Found at https://www.epa.gov/sites/default/files/2016-09/documents/nickle-compounds.pdf.

5 ECONOMIC IMPACT ANALYSIS

5.1 Introduction

This final rule is a significant regulatory action. The presentation of the compliance cost estimates in section 3 does not speak directly to potential economic and distributional impacts of the rule, which may be important consequences to consider. This section contains a discussion of the small entity analysis conducted for this rule and a qualitative discussion of potential market and employment impacts.

5.2 Small Entity Screening Analysis

Regulatory costs can disproportionately impact small entities for several reasons, even when larger firms incur higher absolute costs. In addition to potentially holding more market power, larger companies may be better positioned financially than small businesses to invest in proven compliance mechanisms, obtain financing for upgrades, raise prices to recoup regulatory costs, or conduct research and development needed to innovate and identify more efficient compliance methods. Small firms have fewer units of production to spread compliance costs over. In some situations, larger firms may also have the advantage of being closer to meeting a more stringent new standard under baseline conditions. This analysis assumes that small and large entities both obtain financing for capital expenses at the same interest rates (7.5 percent). It is possible that small businesses have less opportunities to obtain financing or receive higher interest rates than larger businesses.

This section describes the methods used to perform the small entity screening analysis, as well as the results of the screening analysis for this final rule. A small entity screening analysis is used to determine whether a regulatory action may have a significant impact on a substantial number of small entities (SISNOSE). Guidelines for what constitutes ‘significant’ for economic impacts and ‘substantial’ for the number of small entities are outlined in guidance prepared for the Regulatory Flexibility Act (RFA) as amended by SBREFA.

The small entity impact analysis determined that this final rule will not have significant cost impacts on a substantial number of small entities, thus EPA made a ‘no SISNOSE’ determination for this rule.

5.2.1 Description and Estimate of Affected Small Entities

The RFA describes small entities as "small businesses," "small governments," and "small organizations" (5 USC 601). The amendments being finalized by the EPA in this action are expected to affect a variety of businesses, including small businesses, but would not affect any small governments or small organizations. The "business" is defined as the parent owner rather than the facility. The EPA evaluates affected entities at the highest level of business ownership, or the 'ultimate parent company' level. The analysis uses the annual revenues of the ultimate parent company to determine the resources it has available to comply with the rule.

To conduct a small entity screening, the EPA first identifies the ultimate parent companies that own affected facilities, and obtains those companies' most recent annual revenues, number of employees, and North American Industrial Classification System (NAICS) code using the Dun & Bradstreet Hoover's online database.[11] The annual revenues for each entity should correspond to the year 2022 in most cases. U.S. Small Business Administration (SBA) size standards are defined for each NAICS code based on either annual revenues or number of employees. To determine whether an entity is small, the EPA identifies the size standard corresponding to the NAICS code of the ultimate parent company and compares the company's annual revenues (or number of employees) to the size standards. To assess potential impacts on small entities, the EPA calculates cost-to-sales ratios, which compare facility-level total annual compliance cost estimates aggregated to the ultimate parent company level (in case one company owns multiple affected facilities) to the annual sales revenues of the ultimate parent company. This metric for evaluating impacts is known as the "sales test" and is consistent with guidance published by SBA's Office of Advocacy.[12]

The sales test is an impact methodology the EPA employs in analyzing entity impacts as opposed to a "profits test," in which annualized compliance costs are calculated as a share of profits. The sales test is frequently used because revenues or sales data are commonly available for entities impacted by EPA regulations, and profits data normally made available are often not the true profit earned by firms because of accounting and tax considerations.

[11] Dun & Bradstreet, Inc. (2024). D&B Hoovers. Retrieved from https://app.dnbhoovers.com/.

[12] U.S. SBA, Office of Advocacy. (2017). A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act. Retrieved from https://advocacy.sba.gov/2017/08/31/a-guide-for-government-agencies-how-to-comply-with-the-regulatory-flexibility-act/.

Table 5-1 shows some of the most common NAICS codes for the ultimate parent companies that own facilities affected by this rule. The table shows a wide variety of industries, although the most common code of the companies affected (20 out of 176, or 11 percent) is NAICS 551112: 'Offices of Other Holding Companies.' The second most common is NAICS 325412: 'Pharmaceutical Preparation Manufacturing,' with 14 affected companies.

Table 5-1. Affected NAICS Codes

2022 NAICS	NAICS Description	Parent Companies Affected
551112	Offices of Other Holding Companies	20
325412	Pharmaceutical Preparation Manufacturing	14
325199	All Other Basic Organic Chemical Manufacturing	12
325180	Other Basic Inorganic Chemical Manufacturing	10
325211	Plastics Material and Resin Manufacturing	9
424690	Other Chemical and Allied Products Merchant Wholesalers	9
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	6
325320	Pesticide and Other Agricultural Chemical Manufacturing	6
334516	Analytical Laboratory Instrument Manufacturing	4
325510	Paint and Coating Manufacturing	4
325120	Industrial Gas Manufacturing	3
325612	Polish and Other Sanitation Good Manufacturing	3
523150	Investment Banking and Securities Intermediation	1

See Table 5-2 for the number of entities and facilities by entity size. The EPA identified 251 CMAS facilities currently operating in the U.S. that will be impacted by this rule and incur costs, 61 of which are owned by small entities. This rule is expected to impact a total of 176 businesses, 55 of which are small entities based on the business size standards defined by the SBA.[13] Thus, approximately 31 percent of businesses affected by this rule are small entities and they own about 24 percent of the affected CMAS facilities.

[13] U.S. Small Business Administration. (2024). Table of Small Business Size Standards. Found at https://www.sba.gov/document/support-table-size-standards.

Table 5-2. Number of Percent of Entities and Facilities by Entity Size

Entity Size	Number of Affected Entities	Percent of Affected Entities	Number of Affected Facilities	Percent of Affected Facilities
Small	55	31%	61	24%
Large	121	69%	190	76%
All	**176**		**251**	

5.2.2 Compliance Cost Impact Estimates

The EPA calculated cost-to-sales ratios by first estimating the total annual compliance cost for each affected entity by summing annualized capital costs with other annual costs such as operating and maintenance costs. The EPA summed the annual compliance costs across facilities owned by an affected entity (when an entity owns more than one affected facility) and divided the company level total annual cost estimate by the company's annual sales to obtain the cost-to-sales ratio. Small entities incurring total annual costs less than one percent of annual sales are generally not expected to experience significant economic impacts due to the rule. Small entities with costs greater than three percent of their annual revenues may potentially experience significant economic impacts. The EPA also examines how many entities have cost-to-sales ratios of one percent or greater. The EPA believes the one and three percent ratio thresholds are appropriate for analyzing impacts of this rule.

Table 5-3 shows by business size the average annual sales, employees, capital cost, total annual cost (with and without product recovery), cost-to-sales ratio, and the max cost-to-sales ratio. The table also shows the number and percent of businesses above the one and three percent cost-to-sales ratio thresholds by business size. The average total annual cost (not including the value of product recovery) per entity of the requirements is about $31,000 for small entities and about $45,000 for large entities. When including the value of product recovery, the average total annual cost for small entities is about $25,000 and for large entities it is $35,000. Average annual sales for the 55 small entities is $240 million while the 121 affected large businesses have average annual sales of about $18 billion. On average, small entities are estimated to experience a 0.18 percent cost-to-sales ratio not including the value of product recovery to comply with the rule, compared to an average of 0.00 percent for large entities and about 0.06 percent for all entities. The highest cost-sales-ratio estimated is 1.37 percent and is experienced by a small entity

Table 5-3. Average Costs per Entity and Cost-to-Sales Ratios by Entity Size

	All Businesses	Large Businesses	Small Businesses
Average Annual Revenues (millions)	$12,900	$18,700	$240
Average Employees	32,800	47,700	260
Average Capital Cost	$104,600	$115,100	$81,300
Average Total Annual Cost	$40,400	$44,500	$31,400
Average Total Annual Cost w/ Product Recovery	$32,300	$35,600	$25,100
Average Cost-to-Sales Ratio	0.06%	0.00%	0.18%
Average Cost-to-Sales Ratio w/ Product Recovery	0.05%	0.00%	0.14%
Maximum Cost to Sales Ratio	1.37%	0.03%	1.37%
Number and Percent of Businesses with Cost-to-Sales ratio greater than or equal to 1%	3 (2%)	0 (0%)	3 (5%)
Number and Percent of Businesses with Cost-to-Sales ratio greater than or equal to 3%	0 (0%)	0 (0%)	0 (0%)
Number of Businesses	176	121	55
Number of Facilities	251	190	61

Table 5-4 shows the total capital costs, total annual costs, product recovery value, and annual operating and maintenance costs by business size. Out of a total capital cost estimate for the rule of about $18 million, small entities are expected to incur about $4.5 million, or about 25 percent of the total capital costs. Additionally, out of a total annual cost estimate for the rule of about $7.1 million, small entities are expected to incur about $1.7 million, or about 25 percent of the total annual costs. Large entities incur most of the total costs estimated for the rule and they incur higher total annual costs per entity on average than small entities.

Table 5-4. Total Costs of the Requirements by Entity Size (millions of 2024$)

	All Businesses	Large Businesses	Small Businesses
Capital Costs	$18	$14	$4.5
Total Annual Costs	$7.1	$5.4	$1.7
Value of Product Recovery	$1.4	$1.1	$0.3
Total Annual Costs w/ Product Recovery	$5.7	$4.3	$1.4
Operating and Maintenance Costs	$6.2	$4.7	$1.5
Number of Businesses	$18	$14	$4.5
Number of Facilities	$7.1	$5.4	$1.7

Table 5-5 shows the number of small and large entities with cost-to-sales ratios above one percent and three percent. These cost-to-sales ratios were estimated using the total annual

costs without the cost savings from product recovery to be conservative. There are three small entities, which account for about five percent of the 55 affected small entities, with estimated cost-to-sales ratios greater than or equal to one percent. There are no small entities with an estimated cost-to-sales ratio greater than or equal to three percent. No large entities have a cost-to-sales ratio estimated to exceed one percent.

Table 5-5. Small Entity Screening Summary

	Capital Cost (Million 2022$)	Total Annual Cost (w/o recovery credits)	Entities with 1% or greater Cost-to-Sales	Entities with 3% or greater Cost-to-Sales
All Entities	$18.4	$7.1	3	0
Small Entities	$4.5	$1.7	3	0
Large Entities	$14	$5.4	0	0

Total annual costs do not include the value of product recovery.

The results of this small entity screening analysis do not indicate that a substantial share of the small entities affected by this rule would incur potentially high costs relative to their revenues. EPA guidance on RFA implementation suggests that when less than 20 percent of small entities are estimated to experience annual compliance costs greater than or equal to one percent of their annual revenues, it may be appropriate to determine that the rule would not have a significant impact on small entities.[14] The EPA believes the example thresholds provided in the guidance are appropriate for the small entity analysis of this rule. Since a low percentage of small entities that own CMAS facilities have estimated cost-to-sales ratios that exceed the example thresholds in the guidance, the EPA does not expect this rule to have significant economic impacts on a substantial number of small entities, therefore the EPA has certified a no SISNOSE determination for the final rule.

5.2.3 Uncertainties

The cost-to-sales ratios estimated in this analysis may be overstated or understated depending on the accuracy of the information in the underlying data on parent company ownership and parent company revenues in addition to the accuracy of the facility-level cost estimates. The uncertainties associated with the cost estimates are discussed in section 3.

[14] US EPA. (2006). Final Guidance for EPA Rulewriters: Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act. Found at: https://www.epa.gov/sites/default/files/2015-06/documents/guidance-regflexact.pdf.

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 regulation are solely incident on a directly affected firm (therefore, no impact to consumers of the affected product), or solely incident on consumers of output directly affected by this action (therefore, no impact to companies that are producers of the affected product). Thus, an analysis such as this one is best viewed as providing insight on a polar example of economic impacts: maximum impact to directly affected companies. A "sales test" analysis does not consider shifts in supply and demand curves to reflect intermediate economic outcomes.

5.3 Economic and Employment Impacts

The EPA does not expect this rule to substantially affect market prices, or the supply of the products manufactured by affected CMAS facilities, regardless of whether costs are passed on to consumers or absorbed by affected firms. The costs of this rule are estimated to be low relative to the earnings of the companies that ultimately own impacted CMAS facilities. The average cost-to-sales ratio for the affected ultimate parent owners of CMAS facilities is less than 0.1 percent. Even if CMAS firms have market power and/or demand is inelastic and affected firms are able to raise prices for their chemical products in response to increased regulatory costs, it is reasonable to infer that the impact on consumers from this rule is likely to be minor given the low cost-to-sales ratios. Given the relatively low costs of the rule and the limited impacts on affected firms, the EPA also does not expect this rule to impact employment.[15] Any other economic impacts, such as changes in firm concentration within the affected industry or movement of CMAS facilities outside of the U.S., are also expected to be minor.

[15] The employment analysis in this EIA is part of EPA's ongoing effort to "conduct continuing evaluations of potential loss or shifts of employment which may result from the administration or enforcement of [the Act]" pursuant to CAA section 321(a).