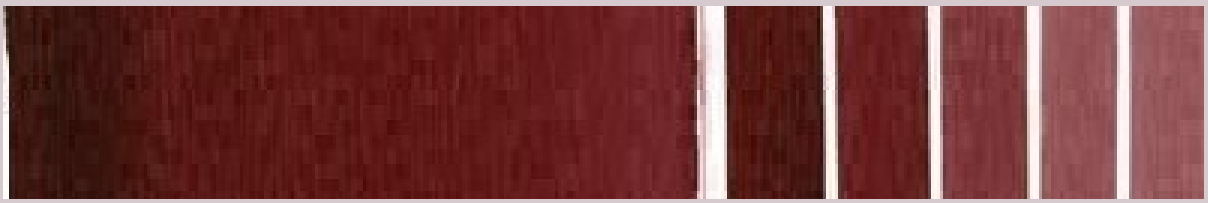
Economic Analysis of the Proposed Regulation of PV29 Under TSCA Section 6(a)



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Office of Pollution Prevention and Toxics U.S. Environmental Protection Agency

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Notice

This document was prepared to provide economic information for the rulemaking process, and to meet various administrative and legislative requirements. Due to the nature of the information available to EPA, the document contains various assumptions that may not reflect how all regulated entities would comply with the rule's requirements. Persons seeking information on regulatory requirements as they apply to specific facilities should consult 40 CFR part 751, the preamble for the regulatory action, and EPA guidance documents.

CONTENTS

List of Acronyms and Abbreviations

ACS	American Community Survey
APF	Assigned protection factor
APR	Air purifying respirator
ARA	Automotive Recyclers Association
BLS	Bureau of Labor Statistics
CARE	Carpet America Recovery Effort
CDR	Chemical Data Reporting
CIH	Certified industrial hygienist
COPD	Chronic obstructive pulmonary disease
COU	Condition of use
CPI	Consumer price index
CPMA	Color Pigment Manufacturing Association
EJ	Environmental justice
ELV	End-of-life vehicles
EPA	Environmental Protection Agency
FEF	Forced expiratory flow
FEV	Forced expiratory volume
FVC	Forced vital capacity
GDP	Gross domestic product
HEC	Human equivalent concentration
HEPA	High efficiency particulate air
HVAC	Heating, ventilation, and air conditioning
ICR	Information Collection Request
LOD	Limit of detection
LOQ	Limit of quantification
mg/m3	Milligrams per cubic meter
MOE	Margin of exposure
NAICS	North American Industry Classification System
NIOSH	National Institute for Occupational Safety and Health
NOAEC	no observed adverse effect concentration
OEM	original equipment manufacture
ONU	Occupational non-user
OR	Odds ratio

OSHA	Occupational Safety and Health Administration
PAPR	Powered air purifying respirator
PDV	Present discounted value
PEF	Peak expiratory flow
PESS	Potentially exposed or susceptible subpopulations
POD	Point of departure
PPE	Personal protective equipment
PV29	Color Index Pigment Violet 29
QWI	Quarterly Workforce Indicators
RFA	Regulatory Flexibility Act
SAR	Supplied air respirator
SBA	Small Business Administration
SBREFA	Small Business Regulatory Enforcement Fairness Act
SCBA	Self-contained breathing apparatus
SDS	Safety data sheet
SEG	Similar exposure group
SKU	Stock keeping unit
SUSB	Statistics of U.S. Businesses
TSCA	Toxic Substances Control Act
UMRA	Unfunded Mandates Reform Act
VC	Vital capacity
VPS	Voluntary Product Stewardship
WTP	Willingness to pay

Executive Summary

Introduction

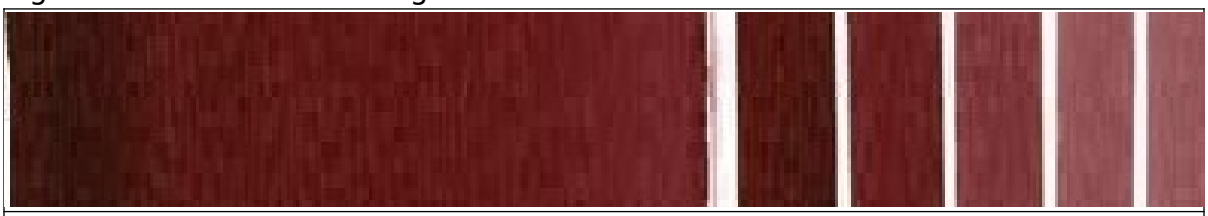
The Frank R. Lautenberg Chemical Safety for the 21st Century Act amended the Toxic Substances Control Act (TSCA), the nation's primary chemicals management law, in June 2016. Under the amended statute, the Environmental Protection Agency (EPA) is required, under TSCA Section 6(b), to conduct risk evaluations to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, under the conditions of use, without consideration of costs or other non-risk factors, including an unreasonable risk to potentially exposed or susceptible subpopulations identified as relevant to the Risk Evaluation. If unreasonable risk is found, EPA is required to perform Risk Management.

Pursuant to TSCA Section 6, EPA conducted a risk evaluation for C.I. Pigment Violet 29 (PV29) and identified several cases where conditions of use constitute unreasonable risks (EPA 2021e). This report estimates and evaluates the costs and benefits expected to result from a rule limiting the use of PV29 to mitigate the risks.

Background

PV29 is an organic compound that is used as a pigment.[1] It has a dark red purple color. As shown in Figure 1 -2, the color of PV29 has been described as dark red-violet, bordeaux, black, maroon, and purple (American Chemical Society 2019).

Figure 1-1: Shades of C.I. Pigment Violet 29



Source: The Paint Spot 2022

The name "C.I. Pigment Violet 29" is assigned, copyrighted and maintained by the Society of Dyers and Colourists and the American Association of Textile Colorists and Chemists. As documented in EPA's final risk evaluation (EPA 2021e), PV29 is considered a high-performance pigment, known for its high color strength, weather fastness and heat stability. PV29 is primarily processed as a site-limited intermediate for the creation or adjustment to other perylene pigments. The pigment is also used in paints, coatings, and plastics.

TSCA Section 3 defines a chemical's conditions of use (COU) as ''the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of." Based on research and public comments, EPA determined the COUs for PV29, as listed in Table ES-1. As detailed in EPA's risk evaluation (EPA 2021e), 10 out of 14 identified COUs were designated as presenting an

[1] **The Color Pigment Manufacturing Association (CPMA) defines color pigments as "colored or fluorescent particulate organic or inorganic solids which usually are insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate in which they are incorporated. They alter appearance by selective absorption and/or by scattering of light. Pigments are usually dispersed in vehicles or substrates for application, as for instance in the manufacture or inks, paints, plastics or other polymeric materials. Pigments retain a crystal or particulate structure throughout the coloration process" (CPMA 2024).**

unreasonable risk. Figure 1 -3 also presents a summary of the COUs and their corresponding risk determinations.

Table ES-1: Categories and Subcategories of Conditions of Use Included in the Risk Evaluation

Condition of Use			Unreasonable risk?
Stage	**Category**	**Sub-Category**	
Manufacture	Domestic manufacture	Domestic manufacture	**yes**
	Import	Import	**yes**
Processing	Incorporation into formulation, mixture or reaction products	Paints and coatings	**yes**
		Plastic and rubber products	**yes**
	Processing - Use as an Intermediate	Creation or adjustment to other perylene pigments	**yes**
	Recycling	Recycling	**yes**
Distribution in commerce	Distribution	Distribution	no
Industrial/ commercial use	Plastic and rubber products	Automobile plastics	no
		Industrial carpeting	no
	Paints and coatings	Automobile (e.g., OEM and refinishing)	**yes**
		Coatings and basecoats	**yes**
	Merchant ink for commercial printing	Merchant Ink	**yes**
	Consumer watercolor and acrylic paints	Professional quality watercolor and acrylic artist paint	no
Disposal	Emissions to Air	Air	**yes**
	Wastewater	Industrial Pretreatment	
		Industrial wastewater treatment	
		Publicly owned treatment works (POTW)	
		Underground injection	
	Solid wastes and liquid wastes	Municipal landfill	
		Hazardous landfill	
		Other land disposal	
		Municipal waste incinerator	
		Hazardous waste incinerator	
		Off-site waste transfer	
Source: EPA 2021e			

This economic analysis will focus only on the 10 COUs where an unreasonable risk was found. Additionally, as indicated in the 2021 Risk Evaluation (EPA 2021e), once PV29 is encapsulated into plastics, paints, and inks, it is not expected to be reactive or leachable. EPA expanded on this point in a 2024 memo, stating that encapsulated PV29 and thus would not be biologically available, implying it will not present the same human health hazards of dry powder PV29 (EPA 2024). This information was factored into the development of the regulatory options considered for the proposed PV29 rule. These options, described in the next section, address the risk from exposure to dry powder PV29, also called regulated PV29 through this analysis.

Regulatory Options Analyzed

Pursuant to TSCA section 6(b), EPA determined that PV29 presents an unreasonable risk of injury to health, without consideration of costs or other nonrisk factors, including an unreasonable risk to potentially exposed or susceptible subpopulations (PESS) identified as relevant to the Risk Evaluation for C.I. Pigment Violet 29, under the conditions of use (EPA 2021e; 2022).

Table ES-2 presents a summary of the proposed and alternative regulatory options. Both the proposed and alternative regulatory options apply to all conditions of use of PV29 in dry powder form, referred to in this economic analysis as "regulated PV29". As noted in the first column of Table ES-2, there are some conditions of use that EPA believes do not use regulated PV29 and therefore would only be subject to the requirements if they do, in fact, use regulated PV29 (PV29 in dry powder form).

Table ES-2: Regulatory Options by Condition of Use

<table>
<tr><th>Condition of Use</th><th>Option 1 (Proposed)</th><th>Option 2 (Alternative)</th></tr>
<tr><td>The following conditions of use are presumed to use Regulated PV29 and therefore would be subject to the requirements under the regulatory options:
Domestic manufacture;
Import;
Incorporation into formulation, mixture or reaction products in paints and coatings;
Incorporation into formulation, mixture or reaction products in plastic and rubber products; and
Intermediate in the creation or adjustment of color of other perylene pigments;</td><td rowspan="2">Where regulated PV29 is manufactured, processed, used, or disposed:
Respiratory PPE: Require APF 50 respirators when workers and ONUs are in rooms where regulated PV29 is actively in use (including anywhere with an open container)
Labeling and downstream notification: Labeling is required on regulated PV29 containers indicating regulated PV29 is in the product and therefore, the product is subject to additional requirements under TSCA section 6; downstream notification through Safety Data Sheets
Equipment and Area Cleaning
Recordkeeping</td><td>Where regulatedPV29 is manufactured, processed, used, or disposed:
Engineering controls: Use engineering controls, such as HEPA filters, to reduce the concentration of regulated PV29 in workplace air.
Respiratory PPE: Require APF 10 respirators when workers and ONUs are in rooms where regulated PV29 is actively in use (including anywhere with an open container)
Monitoring[1]: Use NIOSH 0600 method for respirable dust
Equipment and Area Cleaning
Recordkeeping</td></tr>
<tr><td>The following conditions of use are presumed <u>not</u> to use regulated PV29 (but are subject to the regulatory options if they do use regulated PV29):
Recycling;
Industrial and commercial use in automobile (original equipment manufacturer (OEM) and refinishing) paints and coatings;
Industrial and commercial use in coatings and basecoats paints and coatings;
Industrial and commercial use in merchant ink for commercial printing; and
Disposal.</td><td>Where regulated PV29 is manufactured or purchased by owners or operators:
Respiratory PPE: Require APF 50 respirators but only in such cases where regulated PV29 is present. PPE requirements would apply when workers and ONUs are in areas where dry powder PV29 is actively in use (including anywhere with an open container)
Equipment and Area Cleaning</td></tr>
<tr><td colspan="3">[1]Monitoring needs to occur at least once every 3 months during a time period when regulated PV29 is manufactured or is in use (meaning that workers have handled or are handling an open container). If the concentration of airborne dust is above the NIOSH 0600 LOD, monitoring needs to occur at least once every 3 months. If the concentration of airborne dust is below the NIOSH 0600 LOD, monitoring needs to occur at least once every 6 months. All workplace dust would be considered to be PV29 when powder PV29 is being manufactured or is in use (meaning that workers have handled or are handling an open container). If there are changes to production equipment or procedures, or major disruptions, companies would be required to conduct testing to establish a new baseline for monitoring purposes. Additionally, monitoring would need to restart and occur regularly based on the cadence outlined above.</td></tr>
</table>

Estimated Number of Affected Entities and Individuals

Table ES-3 presents a summary of baseline of the number of firms using regulated PV29 and the number of occupational and consumer users exposed to PV29for each use category. Occupational users include employees working directly with PV29 (workers) and employees that do not work directly with PV29, but work in the area where it is used (occupational non-users (ONUs)).

Table ES-3: Number of Affected Sites and Exposed Workers

Use category	Affected facilities [a]	Employees per facility [b]		Total Employees[c]
		Workers	ONUs	
Domestic manufacturing and intermediate processing	1	2 to 22	56	58 to 78
PV29 importing	1	14	5	19
Processing into automotive paints & coatings	14	14	5	266
Processing into plastics & rubber products	6	27	12	234
Total	**22**			**577 to 597**

ONU = occupational non-users
a. Based on information provided by Sun Chemical.
b. For domestic manufacturing, based on information provided by Sun Chemical (citation); for others, based on EPA (2021e).
c. Sum of direct and ONUs per facility times the number of affected facilities.

Estimated Incremental Costs

Table ES-4 presents the total 15-year annualized costs for a 2 percent discount rate. Note that PV29 manufacturing and intermediate processing, PV29 importing, Processing into automotive paints and coatings, and Processing into plastic and rubber products are the only use categories that have incremental costs beyond rule familiarization costs.

Table ES-4: Summary of Total Annualized[a] Incremental Costs (2023$; 2% Discount Rate)

Use category	Option 1 (Proposed)[b]		Option 2 (Alternative)[c]	
	Low	High	Low	High
PV29 manufacturing and intermediate processing	$113,324	$148,324	$41,799	$52,153
PV29 importing	$46,297	$46,297	$22,892	$22,892
Processing into automotive paints and coatings	$648,161	$648,161	$320,495	$320,495
Processing into plastic and rubber products	$483,186	$483,186	$194,939	$194,939
Recycling	$59,777	$59,777	$59,777	$59,777
Automotive painting (new vehicles)	$5,591	$5,591	$5,591	$5,591
Automotive refinishing	$228,133	$228,133	$228,133	$228,133
Disposal	$57,069	$57,069	$57,069	$57,069
Total	**$1,641,538**	**$1,676,538**	**$930,695**	**$941,049**

a. Annualized over 15 years using a 2% discount rate; rounded to the nearest dollar.
b. Proposed option includes costs for rule familiarization, personal protective equipment, labeling and downstream notification, and cleaning.
c. Alternative option includes costs for rule familiarization, personal protective equipment, cleaning, monitoring, and engineering controls.

Estimated Incremental Benefits

Chronic exposure to dry powder C.I. Pigment Violet 29 may increase lung burden which may result in kinetic lung overload, a pharmacokinetic phenomenon, which is not due to the overt toxicity of the chemical, but rather the possibility that C.I. Pigment Violet 29 dust overwhelms the lung clearance mechanisms over time. The inhalation toxicity data on the analogue carbon black demonstrated increased lung burden, alveolar hyperplasia, and inflammatory and morphological changes in the lower respiratory tract. These endpoints are not monetizable themselves, however there are occupational studies on carbon black that have found significant relationships between inhalable carbon black dust exposure and respiratory effects, including chronic bronchitis. Therefore, this analysis provides estimates to understand the magnitude of potential chronic bronchitis cases avoided from exposure reduction to PV29 as a result of the proposed rule.

Table ES-5 presents the total monetized 15-year annualized benefits for a 2 percent discount rate.

Table ES-5: Total Annualized Benefits (2% discount; 2023$)

Use category	Option 1 (Proposed)		Option 2 (Alternative)	
	Low	High	Low	High
PV29 manufacturing and intermediate processing	$10,215	$33,758	-	-
PV29 importing	$13,006	$29,422	$9,594	$21,465
Processing into automotive paints and coatings	$182,088	$411,908	$134,327	$300,500
Processing into plastic and rubber products	$65,569	$154,318	$23,605	$52,812
Total	**$270,878**	**$629,406**	**$167,526**	**$374,777**

a. Annualized over 15 years using a 2% discount rate; rounded to the nearest dollar.
b. Proposed option includes costs for rule familiarization, personal protective equipment, labeling and downstream notification, and cleaning.
c. Alternative option includes costs for rule familiarization, personal protective equipment, cleaning, monitoring, and engineering controls.

Effects of increased lung burden, alveolar hyperplasia, and inflammatory and morphological changes in the lower respiratory tract are not quantifiable or monetizeable due to data limitations on these effects, Therefore, to the extent that these result in health effects other than chronic bronchitis, this analysis underestimates the benefits of this proposed rule.

Estimated Incremental Net Benefits

Table ES-6 presents the total 15-year monetized annualized costs, benefits, and net benefits estimated using a 2 percent discount rate.

Table ES-6: Summary of Net Benefits by Scenario (2% discount; 2023$)

Option	Annualized costs		Annualized benefits		Annualized net benefits	
	Low	High	Low	High	Low	High
Option 1 (Proposed)	$1,641,538	$1,676,538	$270,878	$629,406	($1,370,660)	($1,047,132)
Option 2 (Alternative)	$930,695	$941,049	$167,526	$374,777	($763,169)	($566,272)

Environmental Justice Impacts

EPA's *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis*[2] provides recommendations that encourage analysts to conduct the highest quality analysis feasible, recognizing

[2] https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf

that data limitations, time and resource constraints, and analytic challenges will vary by media and circumstance (EPA 2016c). This analysis presents information about the facilities, workforce, and communities potentially affected by the regulatory options under current conditions before the final rule goes into effect. It draws on publicly available data provided by EPA and U.S. Census, including the Chemical Data Reporting (CDR), the American Community Survey (ACS), and the Quarterly Workforce Indicators (QWI).

As discussed in Chapter 1., EPA found unreasonable risk for numerous uses to workers and ONUs. EPA also concluded that general population exposures to PV29 are expected to be minimal due to the limited releases of C.I. Pigment Violet 29 to the environment as a result of engineering controls on manufacturing releases. Furthermore, the risk evaluation stated that physical and chemical properties and fate endpoints would also result in minimal exposure to air, water, sediment, and groundwater via biosolids and landfill leaching and that inhalation of PV29 is expected to be low due to limited fugitive and incineration air releases. Based on these findings, the risk evaluation did not analyze exposure to the general population or evaluate potential unreasonable risk to the general population. Therefore, this analysis focuses solely on characterizing the baseline conditions faced by workers[3] affected by the proposed regulation to identify the potential for disproportionate impacts on minority and low-income populations.

The benefits chapter (Chapter 4.5.1) does not discuss the sociodemographic characteristics of the affected workers. While EPA lacks information on the characteristics of the workers in the specific regulated facilities, this analysis provides sociodemographic information on workers in the affected industries and locations as a proxy for the likely characteristics of affected workers.

Data limitations prevent EPA from conducting a more comprehensive EJ analysis that would identify the incremental impacts of the regulatory options and assess the extent to which they mitigate or exacerbate any disproportionate impacts in communities with environmental justice concerns. Uncertainties include the information on the specific location of affected facilities using regulated PV29, sociodemographic characteristics of the specific individuals affected by the use categories, and the substitute technologies and practices that would be adopted at regulated entities in response to the proposed rule.

Chapter 3. describes how the number of facilities potentially affected by the proposed rule were estimated. EPA was only able to determine the specific location of a single facility known to be using regulated PV29. That facility, DCL Corporation, is located at Goose Creek, SC, is both the sole manufacturer of PV29 and the sole processor of PV29 as an intermediate to make other perylene pigments. This section characterizes the baseline demographics of workers at that facility. The Goose Creek facility falls under the NAICs code *325130 (Synthetic Dye and Pigment Manufacturing* sector). However, demographic data were not available at that level of detail so data are presented for NAICS 3251, Basic Chemical Manufacturing. This analysis assumes that the demographic composition of workers in the county in which the facility is located is representative of the demographics of workers at the facility. Data are taken from the Census' QWI data averages indicator values for four quarters of 2020 (U.S. Census Bureau, 2022). Table ES-7 shows the data for workers in Berkely County in which the facility is located.

The data suggests that worker populations for Berkely County have a higher percentage of Black workers than the national average for workers in the Basic Chemical Manufacturing sector. Additionally, Berkely County, which is rural, has a higher percentage of Black workers than the national average (including both urban and rural averages) for all workers.

[3] **Throughout this section, the term workers also includes ONUs.**

Table ES-7: Characteristics of General Worker Populations at National Level and Sector Worker Populations in Areas nearby PV29 Manufacturing Facility

Region	National/County Employees in Industry	Percent Local Employees in Industry	Percent Asian	Percent Black	Percent Pacific Islander	Percent Hispanic	Percent Native American	Percent 2 of More Races	Percent White
National	326,569,308		5.60%	12.60%	0.20%	18.20%	0.80%	5.20%	70.40%
Urban	266,435,744		6.60%	14.20%	0.20%	21.70%	0.60%	5.70%	66.50%
Rural	60,133,564		1.20%	5.80%	0.10%	2.40%	1.70%	2.80%	87.60%
Basic Chemical Manufacturing[1]									
National			4.20%	10.90%	0.10%	9.90%	0.60%	1.20%	82.90%
Berkely County, SC	433	0.80%	1.39%	24.02%	0.00%	3.23%	0.46%	0.92%	72.98%

[1]NAICS code for this facility is 325130 (Synthetic Dye and Pigment Manufacturing), however, data were not available at the 6-digit NAICS so data at the 4-digit NAICS 3251 (Basic Chemical Manufacturing) are presented.

The findings of this baseline characterization suggest that workers in the PV29 manufacturing facility are more likely people of color than those working in the same industry nationwide. Additionally, these workers are also more likely people of color than workers in all sectors nationwide. In the baseline, the analysis suggests that workers at the manufacturing facility may be disproportionately black. To the extent that this reflects the actual distribution of workers at the facility, the proposed regulation, which is designed to protect workers, would improve human health conditions for this population.

Estimated Small Business Impacts

Table ES-8 presents a summary of the small business impacts overall and for each of the use categories where small business impacts were estimated.

Table ES-8: Costs and Cost-Revenue Ratios for Affected Small Firms

Use Category	Affected small firms	Revenue floor	Annualized costs per facility (high)	Number of Firms by Cost-Revenue Impact Threshold		
				<1 Percent	1-3 Percent	>3 Percent
Processing into plastic and rubber products	5	$3,421,642	$80,531	4	1	-
Recycling	8,412	$91,354	$7	8,412	-	-
Automotive painting (new vehicles)	763	$87,734	$7	763	-	-
Automotive refinishing	31,117	$74,589	$7	31,117	-	-
Disposal	8,094	$91,354	$7	8,094	-	-
Total	**48,391**	**-**	**$15**	**48,390**	**1**	**-**

1. Introduction

The Frank R. Lautenberg Chemical Safety for the 21st Century Act amended the Toxic Substances Control Act (TSCA), the nation's primary chemicals management law, in June 2016. Under the amended statute, the Environmental Protection Agency (EPA) is required, under TSCA Section 6(b), to conduct risk evaluations to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, under the conditions of use, without consideration of costs or other non-risk factors, including an unreasonable risk to potentially exposed or susceptible subpopulations identified as relevant to the Risk Evaluation. If unreasonable risk is found, EPA is required to perform Risk Management.

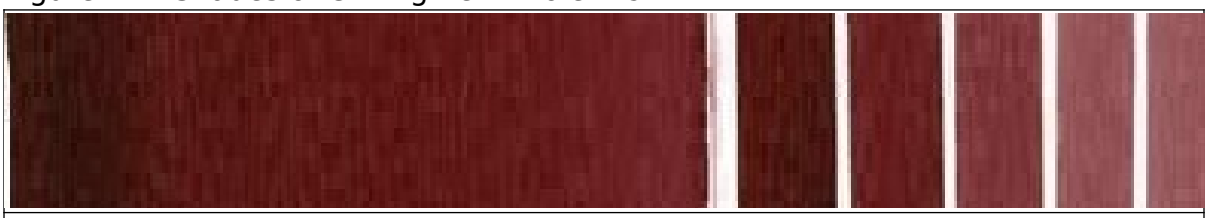
Pursuant to TSCA Section 6, EPA conducted a risk evaluation for Colour Index (C.I.) Pigment Violet 29 (PV29) and identified several cases where conditions of use constitute unreasonable risks (EPA 2021e). This report estimates and evaluates the costs and benefits expected to result from a rule limiting the use of PV29 to mitigate the risks.

This chapter provides an overview of PV29, its chemical properties, and its uses (Section 1.1), summarizes the conditions of use that constitute an unreasonable risk pursuant to the risk evaluation (Section 1.2), summarizes the proposed and alternative regulatory option considered in this economic analysis (Section 1.3), and summarizes the organization of this economic analysis document (Section 1.4).

1.1 Overview of PV29

PV29 is an organic compound that is used as a pigment.[4] It has a dark red purple color. As shown in Figure 1 -2, the color of PV29 has been described as dark red-violet, bordeaux, black, maroon, and purple (American Chemical Society 2019).

Figure 1-2: Shades of C.I. Pigment Violet 29



Source: The Paint Spot 2022

The name "C.I. Pigment Violet 29" is assigned, copyrighted and maintained by the Society of Dyers and Colourists and the American Association of Textile Colorists and Chemists. As documented in EPA's final risk evaluation (EPA 2021e), PV29 is considered a high-performance pigment, known for its high color strength, weather fastness and heat stability. PV29 is primarily processed as a site-limited intermediate for the creation or adjustment to other perylene pigments. The pigment is also used in paints, coatings, and plastics.

[4] **The Color Pigment Manufacturing Association (CPMA) defines color pigments as "colored or fluorescent particulate organic or inorganic solids which usually are insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate in which they are incorporated. They alter appearance by selective absorption and/or by scattering of light. Pigments are usually dispersed in vehicles or substrates for application, as for instance in the manufacture or inks, paints, plastics or other polymeric materials. Pigments retain a crystal or particulate structure throughout the coloration process" (CPMA 2024).**

C.I. Pigment Violet 29 is a name used in sales of products containing anthra[2,1,9-def:6,5,10-d'e'f']diisoquinoline-1,3,8,10(2H,9H)-tetrone, CASRN 81-33-4. As a member of the perylene[5] class of pigments, it has been recognized for its high color strength, weatherfastness, and heat stability. The reasons for these high-performance characteristics have been attributed to the organizational structure of the molecule, which is a well-organized planer polycyclic aromatic ring system (EPA 2021e). As shown in Table 1 -1, PV29 has a high melting point (>500 °C) and low solubility in water and in organic solvents. Due to its low solubility, determining various physical and chemical properties using conventional methods is difficult, if not impossible, to perform.

Table 1-1: Physical and Chemical Properties of C.I. Pigment Violet 29

Property	Value	Data Quality Rating
Molecular Formula	$C_{24}H_{10}N_2O_4$	N/A
Molecular Weight	390.35 g/mol	N/A
Physical Form	Solid	N/A
Purity [a]	98% before purification; ≥ 99.6% after purification	N/A
Melting Point	No melting point found <500˚C	High
Density	1.584 g/cm^3 at 20˚C	High
Vapor Pressure	<0.000001 hPa at 20˚C	High
Solubility in n-octanol	Not observed LOD: 0.0014 mg/L LOQ: 0.003 mg/L	High
Water Solubility	Not observed LOD: 0.0014 mg/L LOQ: 0.003 mg/L	High
Log KOW2	Not determined	N/A
Henry's Law Constant [b]	1.84E-021 atm-m^3/mol (estimated)	High

Source: EPA 2021e
a. Impurities for the 98% pure substance were determined to be moisture (1.4%), ash (0.3%), naphthalimide (0.2%), and naphthalic acid/anhydride (0.02%).
b. Due to low solubility of C.I. Pigment Violet 29 in water and octanol, LogKow was determined not to be a relevant property for C.I. Pigment Violet 29. Similarly, Henry's Law Constant should be interpreted with caution due to the low solubility of the compound, the predicted value may be questionable.

1.2 Unreasonable Risk Determination

TSCA Section 3 defines a chemical's conditions of use (COU) as ''the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of." Based on research and public comments, EPA determined the COUs for PV29, as listed in Table 1 -2. As detailed in EPA's (2021e; 2022) risk evaluation, 10 out of 14 identified COUs were designated as presenting an unreasonable risk. Figure 1 -3 also presents a summary of the COUs and their corresponding risk determinations.

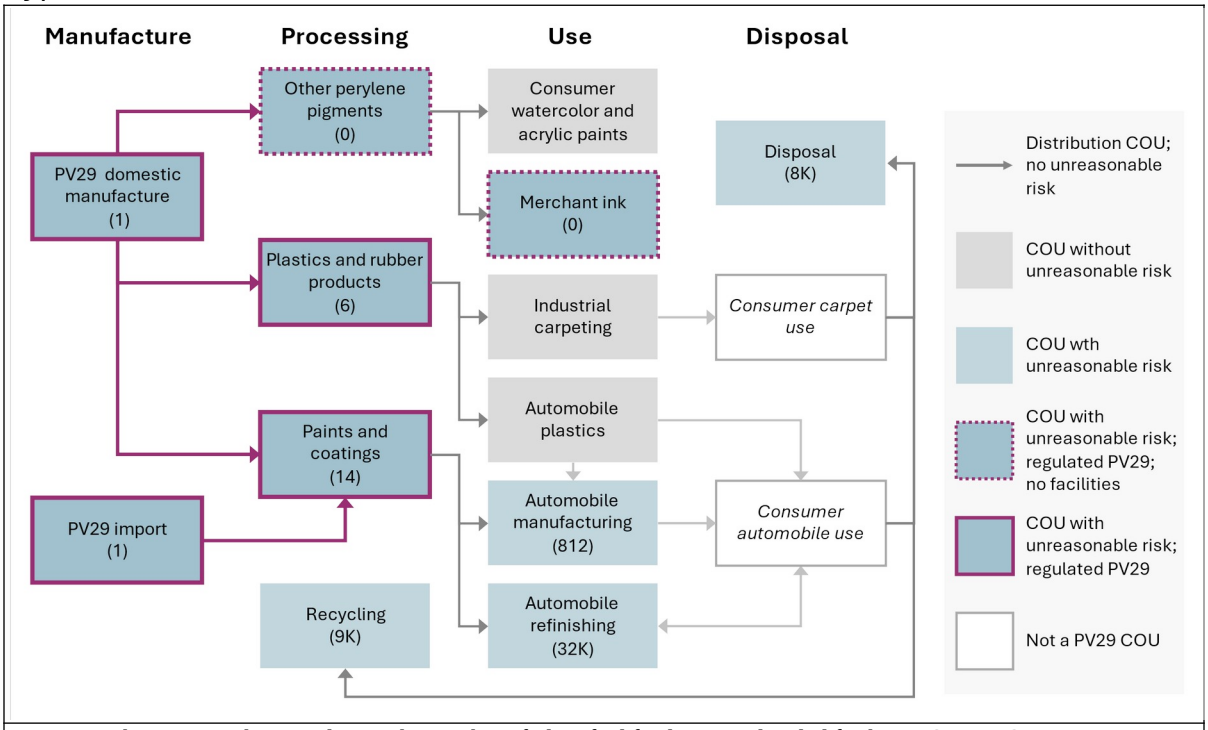
[5]Perylene pigments" refers to a class of high-performance pigments made up of N,N'-disubstituted perylene-3,4,9,10-tetracarboxylic acid imides or perylene 3,4,5,10-tetracarboxylic acid dianhydride (Greene 2002).

Table 1-2: Categories and Subcategories of Conditions of Use Included in the Risk Evaluation

Condition of Use			Unreasonable risk?
Stage	**Category**	**Sub-Category**	
Manufacture	Domestic manufacture	Domestic manufacture	**yes**
	Import	Import	**yes**
Processing	Incorporation into formulation, mixture or reaction products	Paints and coatings	**yes**
		Plastic and rubber products	**yes**
	Processing - Use as an Intermediate	Creation or adjustment to other perylene pigments	**yes**
	Recycling	Recycling	**yes**
Distribution in commerce	Distribution	Distribution	no
Industrial/ commercial use	Plastic and rubber products	Automobile plastics	no
		Industrial carpeting	no
	Paints and coatings	Automobile (e.g., OEM and refinishing)	**yes**
		Coatings and basecoats	**yes**
	Merchant ink for commercial printing	Merchant Ink	**yes**
	Consumer watercolor and acrylic paints	Professional quality watercolor and acrylic artist paint	no
Disposal	Emissions to Air	Air	**yes**
	Wastewater	Industrial Pretreatment	
		Industrial wastewater treatment	
		Publicly owned treatment works (POTW)	
		Underground injection	
	Solid wastes and liquid wastes	Municipal landfill	
		Hazardous landfill	
		Other land disposal	
		Municipal waste incinerator	
		Hazardous waste incinerator	
		Off-site waste transfer	
Source: EPA 2021e			

This economic analysis will focus only on the 10 COUs where an unreasonable risk was found. Additionally, as indicated in the 2021 Risk Evaluation (EPA 2021e), once PV29 is encapsulated into plastics, paints, and inks, it is not expected to be reactive or leachable. EPA expanded on this point in a 2024 memo, stating that encapsulated PV29 and thus would not be biologically available, implying it will not present the same human health hazards of dry powder PV29 [ECRAD memo]. This information was factored into the development of the regulatory options considered for the proposed PV29 rule. These options, described in Section 1.3 address the risk from exposure to dry powder PV29, also called regulated PV29 throughout this analysis.

Figure 1-3: Summary of PV29 Conditions of Use, Risk Determinations, and PV29 Type



Note: Number in parentheses indicates the number of identified facilities, as detailed further in Section 3.
COU = condition of use

1.3 Proposed and Alternative Regulatory Options

Pursuant to TSCA section 6(b), EPA determined that PV29 presents an unreasonable risk of injury to health, without consideration of costs or other nonrisk factors, under multiple conditions of use (EPA 2021e; EPA 2022). Section 1.3.1 describes EPA's proposed regulation for mitigating unreasonable risks posed by regulated PV29 to address the unreasonable risk, and Section 1.3.2 describes the primary alternative regulation.

1.3.1 Proposed Option

The proposed regulatory requirement will:

(i) Require use of assigned protection factor (APF) 50 respirators and equipment and area cleaning to address the risk from inhalation exposure to dry powder PV29, also referred to as regulated PV29, for the following conditions of use:

- Domestic manufacture;
- Import;
- Incorporation into formulation, mixture or reaction products in paints and coatings;
- Incorporation into formulation, mixture or reaction products in plastic and rubber products; and
- Intermediate in the creation or adjustment of color of other perylene pigments;

(ii) Require use of APF 50 respirators and equipment and area cleaning to address the risk from inhalation exposure to dry powder PV29, also referred to as regulated PV29, if it is manufactured or purchased by entities, for the following conditions of use:

- Recycling;
- Industrial and commercial use in automobile (original equipment manufacturer (OEM) and refinishing) paints and coatings;
- Industrial and commercial use in coatings and basecoats paints and coatings;
- Industrial and commercial use in merchant ink for commercial printing; and
- Disposal.

(iii) Require manufacturers (including importers), processors, and distributors in commerce to provide downstream notification of the requirements,

(iv) Require recordkeeping.

1.3.2 Alternative Regulatory Options

The primary alternative will: For the following conditions of use:

- Domestic manufacture;
- Import;
- Processing: Incorporation into formulation, mixture, or reaction products in paints and coatings;
- Processing: Incorporation into formulation, mixture, or reaction products in plastic and rubber products.;
- Processing: intermediate in the creation or adjustment of color of other perylene pigments

(i) Require engineering controls, such as high efficiency purification air (HEPA) filters, to reduce the concentration of regulated PV29, in workplace air;

(ii) Require APF 10 respirators when workers and ONUs are in rooms where regulated PV29 is actively in use (including anywhere with an open container);

(iii) Require equipment and area cleaning (related to the use of regulated PV29);

(iv) Require monitoring. Monitoring needs to occur at least once every 3 months during a time period when regulated PV29 is manufactured or is in use (meaning that workers have handled or are handling an open container);

- Exceptions: If the concentration of airborne dust is above the National Institute for Occupational Safety and Health (NIOSH) 0600 limit of detection (LOD), monitoring needs to occur at least once every 3 months. If the concentration of airborne dust is below the NIOSH 0600 LOD, monitoring needs to occur at least once every 6 months. All workplace dust would be considered to be PV29 when regulated PV29 is being manufactured or is in use (meaning that workers have handled or are handling an open container).

- The monitoring method would be the NIOSH 0600 method for respirable dust. Companies would be required to monitor all airborne particulate

- If there are changes to production equipment or procedures, or major disruptions, companies would be required to conduct testing to establish a new baseline for monitoring purposes. Additionally, monitoring would need to restart and occur regularly based on the cadence outlined above.

(v) Require recordkeeping,

For the following conditions of use:

- Processing: recycling;
- Industrial and commercial use in automobile paints and coatings (original equipment manufacturing and refinishing);
- Industrial and commercial use in coatings and basecoats for paints and coatings;
- Industrial and commercial use in merchant ink for commercial printing;
- Disposal.

(vi) Require APF 50 respirators but only in such cases where regulated PV29 is present. PPE requirements would apply when workers and ONUs are in areas where dry powder PV29 is actively in use (including anywhere with an open container);

(viii) Require equipment and area cleaning (related to use of regulated PV29);

(ix) Require recordkeeping.

Table 1 -3 summarizes the proposed and alternative option requirements by condition of use considered.

Table 1-3: Regulatory Options by Condition of Use

Condition of Use	Option 1 (Proposed)	Option 2 (Alternative)
The following conditions of use are presumed to use Regulated PV29 and therefore would be subject to the requirements under the regulatory options: • Domestic manufacture; • Import; • Incorporation into formulation, mixture or reaction products in paints and coatings; • Incorporation into formulation, mixture or reaction products in plastic and rubber products; and • Intermediate in the creation or adjustment of color of other perylene pigments; •	Where regulated PV29 is manufactured, processed, used, or disposed: • Respiratory PPE: Require APF 50 respirators when workers and ONUs are in rooms where regulated PV29 is actively in use (including anywhere with an open container) • Labeling and downstream notification: Labeling is required on regulated PV29 containers indicating regulated PV29 is in the product and therefore, the product is subject to additional requirements under TSCA section 6; downstream notification through Safety Data Sheets • Equipment and Area Cleaning • Recordkeeping	Where regulatedPV29 is manufactured, processed, used, or disposed: • Engineering controls: Use engineering controls, such as HEPA filters, to reduce the concentration of regulated PV29 in workplace air. • Respiratory PPE: Require APF 10 respirators when workers and ONUs are in rooms where regulated PV29 is actively in use (including anywhere with an open container) • Monitoring[1]: Use NIOSH 0600 method for respirable dust • Equipment and Area Cleaning • Recordkeeping
The following conditions of use are presumed not to use regulated PV29 (but are subject to the regulatory options if they do use regulated PV29): • Recycling; • Industrial and commercial use in automobile (original equipment manufacturer (OEM) and refinishing) paints and coatings; • Industrial and commercial use in coatings and basecoats paints and coatings; • Industrial and commercial use in merchant ink for commercial printing; and Disposal.		Where regulated PV29 is manufactured or purchased by owners or operators: • Respiratory PPE: Require APF 50 respirators but only in such cases where regulated PV29 is present. PPE requirements would apply when workers and ONUs are in areas where dry powder PV29 is actively in use (including anywhere with an open container) Equipment and Area Cleaning
[1]Monitoring needs to occur at least once every 3 months during a time period when regulated PV29 is manufactured or is in use (meaning that workers have handled or are handling an open container). If the concentration of airborne dust is above the NIOSH 0600 LOD, monitoring needs to occur at least once every 3 months. If the concentration of airborne dust is below the NIOSH 0600 LOD, monitoring needs to occur at least once every 6 months. All workplace dust would be considered to be PV29 when powder PV29 is being manufactured or is in use (meaning that workers have handled or are handling an open container). If there are changes to production equipment or procedures, or major disruptions, companies would be required to conduct testing to establish a new baseline for monitoring purposes. Additionally, monitoring would need to restart and occur regularly based on the cadence outlined above.		

1.4 Organization of this Document

Chapter 2. presents a discussion of the problems with PV29 uses that are addressed through the rule. Chapter. Chapter 3. presents a profile of the affected industry sectors, the baseline conditions that are relevant for estimating the costs and benefits of the rule, and the estimated numbers entities affected by the proposed rule. Chapters 4., 4.5.1, and 6. presents the estimated costs, benefits and net benefits, respectively. Chapter 7. presents various impact analyses. The references are listed in Chapter 8..

2. Problem Definition/Market Failure

This report estimates and evaluates the costs and benefits expected to result from the proposed rule for PV29 by the EPA under the authority granted by Section 6 of TSCA. The proposed rule, "Regulation of C.I. Pigment Violet 29 under TSCA Section 6(a)" addresses the unreasonable risk from PV29 under the COUs.

2.1 PV29 Problem

2.1.1 Sources of Exposure

Exposure to PV29 occurs through the chemical substance's COU. TSCA Section 3(4) defines a chemical substance's conditions of use as ''*the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of.*" EPA's Risk Evaluation for PV29 evaluated whether exposure resulting from PV29 conditions of use presents an unreasonable risk to health and/or the environment (EPA 2021e).

2.1.2 Health Effects of PV29 Exposure

For assessment of risks associated with inhalation exposures to workers for PV29, EPA used an analogue, carbon black, to estimate toxicity. EPA used an analog because no data were available for PV29 for inhalation exposure. Chronic exposure to PV29 is expected to increase lung burden which may result in kinetic lung overload, a pharmacokinetic phenomenon, which is not due to the overt toxicity of the chemical, but rather the possibility that PV29 dust overwhelms the lung clearance mechanisms over time. The inhalation toxicity data on the analogue, carbon black, demonstrated increased lung burden, alveolar hyperplasia, inflammatory and morphological changes in the lower respiratory tract. Hazards to environmental receptors are expected to be low.

2.1.3 Regulatory Approaches for Primary and Alternative Options

Under TSCA section 6(a), if the EPA pursuant to TSCA section 6(b)(4)(A) determines that a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other non-risk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified as relevant to the Agency's risk evaluation, under the conditions of use, EPA must by rule apply one or more requirements to the extent necessary so that the chemical substance no longer presents such risk.

The TSCA section 6(a) requirements can include one or more, or a combination of, the following actions:

- Prohibit or otherwise restrict, or limit the manufacturing, processing, or distribution in commerce of the substance or mixture (TSCA section 6(a)(1)).
- Prohibit or otherwise restrict, or limit the manufacturing, processing, or distribution in commerce of the substance or mixture for particular uses or above a specific concentration for a particular use (TSCA section 6(a)(2)).
- Require clear and adequate minimum warning and instructions with respect to its use, distribution in commerce, or disposal of the substance or mixture (TSCA section 6(a)(3)).
- Require record keeping, monitoring or testing by manufacturers and processors (TSCA 6(a)(4)).
- Prohibit or regulate any manner or method of commercial use of the substance or mixture (TSCA section 6(a)(5)).

- Prohibit or otherwise regulate any manner or method of disposal of the substance or mixture (TSCA section 6(a)(6)).

- Direct manufacturers or processors to give notice of the determination of risk to distributors and users and replace or repurchase the substance or mixture (TSCA section 6(a)(7)).

EPA considered all of the regulatory mechanisms described above, but EPA believes only a few would be effective in addressing the identified unreasonable risk. The regulatory mechanisms that are being utilized as part of this rulemaking include recordkeeping, notification, labeling, and prescriptive respiratory protection and cleaning requirements.

2.2 Regulatory Background

EPA is not aware of any existing state or federal, or international regulations restricting or regulating the use of PV29.

2.3 Justification for Risk Management Action for PV29

This section provides legal and economic justification of the final rule to regulate PV29 in the United States at the federal level of government. Section 2.3.1 indicates the statutory authority for EPA to take risk management action, Section 2.3.2 identifies market failure in the industries where PV29 is used, Section 2.3.3 discusses regulatory remedies to address market failure from negative externalities, and Section 2.3.4 provides justification for regulation at the federal level specifically.

2.3.1 Statutory Authority

The Frank R. Lautenberg Chemical Safety for the 21st Century Act amended the Toxic Substances Control Act (TSCA), the nation's primary chemicals management law, in June 2016.[6] Under the amended statute, EPA is required, under TSCA section 6(b), to conduct risk evaluations to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, including an unreasonable risk to potentially exposed or susceptible subpopulations identified as relevant to the Risk Evaluation under the conditions of use, without consideration of costs or other non-risk factors. If unreasonable risk is found, the agency must apply one or more of the risk management options listed in TSCA 6(a) to the extent necessary to reduce or eliminate these risks.

2.3.2 Market Failure

The private market is a mechanism that can allocate resources efficiently. However, the market's allocation of resources will not always be desirable from the standpoint of society. The market will fail to achieve a socially efficient outcome when differences exist between private market values and social values.

Welfare economics states that a socially efficient outcome is achieved if no alternative allocation of society's resources can make at least one person better off without making another one worse off. This is referred to as a Pareto optimal outcome. If the private market fails to achieve this efficient outcome, too little or too much is produced, resulting in a loss in economic welfare. This is referred to as a market failure.

However, Pareto optimality is a strict condition and can allow for very unequal allocations. It does not address redistributive actions, in which one group is made worse off and another group is made better off. A less strict criteria for measuring economic improvement is Kaldor-Hicks efficiency. Under this criterion, economic efficiency is improved if those who benefit from an action gain more

[6] **See https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act.**

than those who lose from that action.[7] This is the fundamental efficiency criterion of benefit-cost analysis: society is considered to be better off (in terms of economic efficiency) if the benefits of an action outweigh the cost of undertaking it.

Government regulation of a private market is justified when the market fails to deliver a socially efficient outcome. If a regulation can produce benefits that exceeds its cost, then economic efficiency has been improved. The economic literature has identified the following common causes of market failure and economic inefficiency:

- Existence of externalities (negative and positive);
- Under-provision of common property resources and public goods;
- Market power (e.g., monopolies); and
- Inadequate or asymmetric information.

This section discusses how negative externalities are present in the market for the chemical regulated under this rule.[8] By understanding how the market is affected by this market failure, more effective regulations can be designed.

Externalities

A negative externality occurs when one party's action imposes an uncompensated negative effect on another party. For example, the manufacturer, processor, or consumer of a good may impose costs on another party if the good causes an adverse health impact that is not known or factored into the market transaction. Since these external costs are not internalized by the manufacturer, processor, or user, they are not considered in the production (or processing or use) and pricing decisions. As a result, the societal cost of these goods is under-valued and the level of output produced (or processed or used) is higher than the social optimal output level. In other words, a negative externality occurs when a firm makes decisions based on private costs instead of social costs, leading to an excess of product in the market.

EPA believes that the cause of market failure in the market for PV29 subject to this rule stems from negative externalities. A negative externality occurs when one party's action imposes an uncompensated negative effect on an affected party. For example, the manufacturer, processor, or consumer of a good may impose uncompensated healthcare costs or damages that are not reflected in the cost of that good. Even when both parties have full information about the magnitude of the health damages—which is not always the case in the context of hazardous chemical exposures—the private market is likely to reach an efficient outcome only when bargaining is possible and transaction costs are low (Coase 1960). While many of the adverse health effects from exposure to PV29 are known (EPA 2021e), some effects are difficult to quantify in humans and to predict at the individual level. Bargaining is not possible because neither party has the information or skill to predict the risk accurately. Even if the EPA provided this information, transaction costs are high because of the effort required for workers and employers to determine the correct risk-adjusted wage for each site. Therefore, the adverse health effects of PV29 exposure are imposed on workers who may not be fully

[7] The Kaldor-Hicks criterion is also referred to as the potential Pareto criterion or the potential compensation principle because it implies that economic efficiency is improved if those who benefit from an action could fully compensate those who lose from that action, and still be better off. In other words, it is theoretically possible to achieve a Pareto improvement – in which some are made better off, and no one is made worse off – if those who benefit from a regulation were to fully compensate those who pay the cost. The word "potential" is used because the compensation does not have to actually occur, it just has to be theoretically possible to do so for this to be a social improvement.

[8] This discussion focuses on negative externalities because this is the market failure addressed by this regulation. Please refer to *EPA Guidelines for Preparing Economic Analyses* (EPA 2014) for a discussion on additional sources of market failure identified in the literature.

compensated for the additional burden from increased health risks and are thus not internalized by those manufacturing, processing, distributing, or using the chemical.

Because these external costs are not internalized by the manufacturer, processor, or user, they are therefore not considered in the production (or processing, use) and pricing decision of the manufacturer, processor or user. As a result, costs are under-valued and the level of output produced (or processed, used) is higher than the socially optimal output level. Therefore, a negative externality occurs when a firm has made decisions based on private costs instead of social costs, leading to an excess of product in the market.

While it is theoretically possible for manufactures, processers, distributers, and users to internalize the external costs of PV29 (for example, through a pollution tax or tradable permit program), EPA believes that this is not the right approach for addressing the negative externality in this market. This approach would be administratively burdensome and impose high transaction costs in a market with a multitude of varied conditions of use. Instead, EPA's approach is to decrease the health risks from PV29 exposure through worker protections and, thereby, reduce the negative externality of health impacts caused by exposure to the chemical.

Society will experience health benefits from regulatory measures that mitigate or eliminate the adverse health risks associated with the manufacture, processing and use of PV29. However, society will experience *net benefits* from these regulatory measures only up to the point where the benefits of reducing these negative externalities are less than the costs of achieving them. If the costs of these regulatory measures on manufacturers and users of PV29 are greater than the external costs imposed by their use without additional worker protections, the regulation is too strict and the new state is also suboptimal. Social welfare would be decreased by any regulatory measure that goes beyond the point where the externalities were internalized. The economically efficient level of control is where the additional (marginal) cost of further control equals society's willingness to pay for the next increment of control. Adverse effects may still occur at this level, but additional regulatory costs to further reduce or eliminate these effects would not be potentially Pareto optimal (that is, it would not meet the criteria for Kaldor-Hicks efficiency). Conversely, if post-rule, the cost to society from release and exposure to PV29 remains greater than costs to regulated firms, the rule would also not produce a potentially Pareto optimal outcome.

2.3.3 Regulatory Remedies to Reduce Negative Externalities

As discussed in Section 2.3.2, the regulatory options detail various requirements that will reduce the negative human health costs associated with the negative externality. EPA contends that these measures are sufficient to reduce negative externalities associated with PV29.

2.3.4 Justification for Regulation at Federal Level

The chemical and products associated with this rulemaking are distributed in commerce across state lines, and thus they fall under the federal jurisdiction of regulation under TSCA. It is more efficient for companies manufacturing, processing, and distributing these products to comply with a single federal standard rather than a patchwork of different state regulations.

3. Profile and Affected Industries and Baseline Analysis

Section 3.1 provides information on the industries potentially affected by the rule and estimates for the numbers of affected entities. Section 3.2 provides information on the baseline worker exposures to PV29.

3.1 Potentially Affected Industries and Entities

This section provides information on the cross-section of society potentially affected by the rule. It provides background on the various PV29 COUs broken out into the conditions of use with unreasonable risk, as depicted in Table 1 -2, broken out by lifecycle stage: Manufacture (Section 3.1.1); Processing (Section 3.1.2); Industrial/Commercial use (Section 3.1.3); and Disposal (Section 3.1.4). Each section is broken out into the relevant categories and subcategories that further define COUs and suggests estimates of the production volume of PV29, the number of entities potentially affected by the proposed rule, and available information about existing practices around employee personal protective equipment (PPE). Section 3.1.5 provides a summary of the industries and facility counts by COU.

3.1.1 Manufacture

The manufacture stage includes domestic manufacturing of PV29 as well as import of PV29 from foreign markets.

Domestic manufacture

PV29 is manufactured domestically solely at one Sun Chemical facility in Goose Creek, S.C. (CPMA 2017). Sun Chemical is a large provider of inks, pressroom products, and color materials. It is part of the DIC Group headquartered in Japan; Table 3 -4 summarizes available information about DIC from Dun & Bradstreet.

Table 3-4: Company Associated with Manufacturing of C.I. Pigment Violet 29

Company	Parent Company	Parent Primary NAICS Code	Parent Revenue (USD)	Parent Number of Employees
Sun Chemical	DIC Group	325910: Printing ink manufacturing	$7.4 billion	22,255
Source: Dun & Bradstreet (2024) data				

The procedure for manufacturing has been well-established and has not changed in the last 80 years (EPA 2021e). The domestic manufacturer of PV29 produces it as a solid (powder) that is used within its own plant to produce other pigments or is sold to other manufacturers and processers in bags.

According to information provided by Sun Chemical Corporation (EPA 2020b), there are between 2 and 22 workers directly handling PV29 at the manufacturing facility, and 56 occupational non-users (ONUs) who might be exposed to the pigment during manufacturing. It also specified that there are two primary packing configurations for PV29 employed at the facility: a 20 kg bag and a 300 kg bulk bag (EPA 2020b).

Facility-wide, the minimum PPE requirements include long-sleeve shirt, long-pants, steeled-toed safety shoes, safety glasses, and hard hat (EPA 2020b). In the buildings where PV29 pigments are handled, additional minimum requirements include safety glasses, nitrile gloves, Tyvek coveralls, and 3M N95 8511 paper dust mask. Because PPE information comes directly from the company impacted, EPA assumes a 100% baseline compliance rate with Sun Chemical Corporation's facility PPE requirements.

Annual production volume is approximately 600,000 lbs, as shown in Table 3 -5. According to information provided to EPA, 90 percent or 540,000 lbs of PV29 are used internally by the manufacturer, as discussed in Section 3.1.2. Of the remaining 60,000 lbs, approximately one third (20,000 lbs) goes to foreign customers (EPA 2020b) and is not assessed further in this economic analysis. The remaining 40,000 lbs is sold to other domestic companies, including automotive paint manufacturers and plastics and rubber manufacturers, as described further in Section 3.1.2.

Table 3-5: National Production Volume Data for C.I. Pigment Violet 29 (Total Aggregate Production Volume (lbs))

2012	2013	2014	2015
517,980	474,890	535,139	603,420
Source: Non-confidential production data from CDR (EPA 2012-2015).			

Importing

EPA identified one importer of PV29, BASF. BASF's 2020 Chemical Data Reporting (CDR) reporting indicates that it does import PV29, however, their reporting also suggests that it is imported in a "liquid, other solid" form (EPA 2012-2015). Because CDR categories for form include multiple dry powder categories, this implies that BASF imports are not in dry powder form. However, information provided by BASF indicates that regulated PV29 is imported at volumes below the CDR reporting threshold of 25,000 lbs. Therefore, EPA assumes that regulated PV29 is expected to be imported at unknown minor volumes under 25,000 lbs. According to information received from BASF, PV29 is imported as an "industrial pigment product is 80% to 90% C.I. Pigment Violet 29. The concentration of the imported tint paste is <25% C.I. Pigment Violet 29. The concentration of paint/coating is <3% C.I. Pigment Violet 29. The primary function of this pigment is to tint the color of a paint and would generally be formulated at levels <1% but can be as high as 3%" (EPA 2021a).

BASF states that coatings containing PV29 are used only on automotive customer paint lines (EPA 2021a). According to BASF's website, the U.S. site where BASF Coatings manufactures its Automotive OEM product group is in Greenville, Ohio (BASF 2023). This facility is included under the automotive paints and coatings (processing into) use, described further under Section 3.1.2. EPA assumes that this facility has the same number of exposed employees and baseline PPE use as others under the processing into automotive paints and coatings condition of use.

3.1.2 Processing

Processing of PV29 involves the use of PV29 pigment as a component of the manufacturing of another product such as paints or plastics. The processing stage also encompasses recycling, in which products containing PV29 are dismantled or transformed for alternative uses.

Use as an intermediate

In their 2016 CDR submission, Sun Chemical Corporation reported that 90 percent of their annual PV29 production volume goes to synthetic dye and pigment manufacturing at the same facility where the PV29 is manufactured (EPA 2016a), primarily as an intermediate for the adjustment or the creation of other perylene pigments. According to the process information received, "the production of C.I. Pigment Violet 29 is the starting point for the synthesis of all other perylene pigments at the facility. Other perylenes produced at the facility may contain an estimated 0-5% residual C.I. Pigment Violet 29 in the finished pigment" (EPA 2021e).

Using this information, EPA estimates that 540,000 lbs (90 percent of the 600,000 lb annual production volume) of PV29 is used as an intermediate for the adjustment or the creation of other perylene pigments internally at the manufacturing facility. Because they are using dry powder form PV29, workers and

ONUs are assumed to be exposed to regulated PV29. EPA assumes that the same 2 to 22 workers and 56 ONUs might be exposed to regulated PV29 during the manufacture of other perylene pigments as during the manufacture of PV29 itself.

Incorporation into formulation, mixture, or reaction products

In addition to using regulated PV29 in-house to create perylene pigments, the domestic manufacturer also sells approximately 40,000 lbs of regulated PV29 to other domestic companies which process it into paints, coatings, plastics, or rubber products. These manufacturers receive PV29 in the regulated dry powder form.

Paints and coatings

In their 2016 CDR submission, Sun Chemical reported that 5% of their annual production volume goes to the paint and coating manufacturing industrial sector for incorporation into a formulation, mixture, or reaction product (EPA 2016a) while in their 2020 CDR submission (EPA 2020a) Sun Chemical reported that 100% of annual production goes to processing as a reactant for synthetic dye and pigment manufacture. Additional information provided to EPA elaborated that approximately 69% of Sun Chemical Company's domestic market for PV29 is the paints and coatings industry (EPA 2021c). Therefore, EPA estimates that 27,600 lbs (69 percent of the 40,000 lbs distributed in the domestic market) are used in the paints and coatings industry.

Automotive paints

A major use of PV29 is for the coloration of automotive paint. Perylene pigments' high color strength, weatherfastness, and heat stability are key characteristics that make these pigments suitable for this use (Greene 2002). PV29 is used in paint both for original automotive equipment manufacture (in which the paint is baked onto the metal by the car manufacturer) and for refinish (where the paint is sprayed on by auto body shops) (CPMA 2017). CPMA notes that PV29 "is one of the few pigments in its color range that can withstand the high heat involved in OEM application. It is highly light-fast, and so will not fade after years of direct sun exposure."

Sun Chemical Corporation provided information to EPA indicating its direct customers that process PV29 for paint and coating manufacturing receive the chemical at 80% concentration in powder in bags that are manually opened and dumped into a mixer where it is milled and formulated into a tint paste. The paste is added to a wide variety of liquid base coats for the automobile industry (EPA 2020b). Pigments are typically supplied to the paint and coating formulator as dry powders, press cakes, or slurries. These materials may be classified in a variety of ways including white, inert extenders, color, and functional pigments (citation). This analysis assumes that all PV29 supplied to paint and coating formulators is in the regulated PV29, or dry powder, form.

CPMA representatives stated that Sun Chemical provides PV29 to 14 automotive coating customers. Therefore, EPA assumes that there are 14 sites associated with this COU[9] (EPA 2021b). However, the specific set of automotive coating manufacturing facilities that use regulated PV29 is unknown. EPA identified 38 active automotive paint manufacturing facilities in the United States owned by 8 parent companies, which are summarized in Table 3 -6. EPA expects that the 14 facilities using regulated PV29 are likely owned by a subset of these companies.

[9] This estimate differs from that in the Risk Evaluation, which estimated four sites that process PV29 for paint manufacturing using a market volume calculation. This analysis uses the number of sites later provided directly by CPMA/Sun Chemical.

Table 3-6: Companies Manufacturing Automotive Paints in the United States

Company (*and subsidiaries*)	Description[1]	U.S. Manufacturing Facilities[2]	
PPG Industries, Inc. (*Hemmelrath*)	U.S. manufacturer of broad range of coatings, paints, and other materials; automotive paint manufacturing encompassed by industrial coating operating segment which accounts for approximately 40% of company revenues.	11	*AR, GA, IN, MI, NC, OH [4], PA, WI*
BASF	German company that bundles products and services for specific sectors and customers; coating segment accounts for approximately 6% of revenues.	5	*AL, NC, OH, SC, TN*
Axalta Coating Systems (*Spies Hecker, Standox, Shinto Coatings*)	U.S. manufacturer of high-performance coating systems supplying OEMs of light and commercial vehicles as well as performance coatings to a variety of customers (including for refinishing).	4	*MN, NC, OH, VA*
Nippon Paint Holdings Co. (*Nippon Paint Automotive Americas*)	Japanese paint and coating manufacturer; automotive coating segment accounts for approximately 25% of revenues.	2	*IL, OH*
Kansai Paint Co. (*U.S. Paint*)	Japanese paint manufacturer and leading supplier of automotive paint to Toyota, Suzuki, Nissan, Honda, Peugeot, and Renault worldwide; automotive coatings operating segment accounts for approximately 30% of revenues.	1	*MO*
Akzo Nobel Coatings (*Sikkens*)	Dutch coatings manufacturer; performance coatings account for approximately 63% of operating incomes for 2023.	7	*TX [3], IL, TN [2], IN*
Beckers Group	German paint manufacturer and a leading supplier of industrial paints with approximately 1,700 employees in 20 countries.	2	*IL, CA*
Sherwin Williams (*Matrix System Automotive Finishes; Valspar Automotive*)	U.S. manufacturer of automotive finishes, high-quality paint, and coating systems; performance Coatings held about 10% of sales in 2022.	6	*PA [2], NY, VA, NC, FL*

1. based on information from Chakravarty (2018) and company websites.
2. based on site location information available on company websites and cross-referenced with Google's information regarding the verified status of the specific location (open, permanently closed, merged, etc.)

In the Risk Evaluation (EPA 2021e), EPA estimated that there were 14 workers with potential direct exposure and 5 ONUs per site in this industry. Therefore, among the 14 sites, there are a total of 196 directly exposed workers and 70 ONUs.

According to data provided by Sun Chemical (EPA 2020b), in the coatings industry, PPE worn during batch additions are typically protective clothing, respirator, and chemical resistant gloves. The summary does not specify what kind of respirators are used. As the Risk Evaluation notes, for downstream processors, SDS-recommended PPE includes safety glasses with side-shields, dust mask and goggles under certain circumstances, chemical resistant impervious gloves, and particulate respirators. EPA assumes that the companies use NIOSH-approved N95 particulate respirator.

As noted above, PPE including safety glasses with side-shields, dust mask and goggles is recommended in the SDS. However, these recommendations may not be followed 100 percent of the time. Sun Chemical reported that they do follow these recommendations and therefore the analysis assumes 100 percent adherence to the SDS recommendations in the baseline for their facility (See Section 3.1.1). For other affected facilities, the analysis uses NAICS-specific compliance rates with respiratory protection requirements according to OSHA inspection data as the estimated baseline rate of following the SDS recommendations for PPE use. From October 2020 to September 2021, the Occupational Safety and Health Administration (OSHA) performed 8 inspections at facilities in the NAICS Code 325510 (Paint

and Coating Manufacturing). At two (25%) of those inspections, violations involving respiratory protection (1910.134) were found (OSHA 2022).

Other Paints and Coatings

PV29 has been identified as previously used in pencil lacquer, by Egyptian Coatings. However, this use ended in 2014 when the company transitioned to a mix of other pigments due to the cost of PV29 (EPA 2021d).

PV29 has also previously been used as a coating on office furniture, filing cabinets, and industrial equipment such as automotive in ground lifts. However, the pigment is not currently being used in these products due to customer preference (Marcus Paint 2021). As such, EPA did not identify any facilities under the proposed rule in this category.

Plastic and rubber products

CPMA indicates that that approximately 31% of Sun Chemical Company's domestic supply of PV29 (12,400 out of 40,000 lbs) is sold to six plastics masterbatchers[10] in the U.S. (EPA 2021b). EPA does not have information to identify these six companies, but EPA assumes they are classified under NAICS Code 325991, Custom Compounding of Purchased Resins, or 325211, Plastics Material and Resin Manufacturing.

Sun Chemical estimates that 80 percent (9,920 lb) of the volume designated for plastic and rubber goes to make fibers for industrial carpeting, and 20 percent (2,480 lb) goes to make automotive plastic such as for interior auto parts (EPA 2020b). EPA does not have information on the breakout of the 6 facilities between these two uses but assumes that the use of PV29 is similar for both. Additionally, EPA assumes that the entire volume of PV29 used to make plastics is regulated PV29.

According to Sun Chemical (EPA 2020b), PV29 bags are typically manually opened by the processor and added to a vessel for weighing. This blend is then extruded via a continuous and closed process that incapsulates it into pellets.

In the Risk Evaluation (EPA 2021e), EPA estimated that there were 27 workers with potential direct exposure and 12 ONUs per site. Therefore, among the six sites, there are a total of 162 directly exposed workers and 420 ONUs.

According to data provided by Sun Chemical to EPA (EPA 2020b), dust collection and PPE are required in the area where a potential for exposure to dust exists. Typical PPE includes Tyvek coverings, goggles, and dust masks. OSHA (2022) defines "dust mask" interchangeably with filtering facepiece, so EPA assumes that the companies use NIOSH-approved N95 particulate respirator.

From OSHA inspections during October 2020 to September 2021 (OSHA 2022), for NAICS code 325211 (Plastics Material and Resin Manufacturing) there were no violations involving respiratory protection. For NAICS 325991 (Custom Compounding of Purchased Resins) there were respiratory protection violations at 1 inspection. Overall, among these two NAICS, there were violations at 1 out of 20 inspections (5%), so EPA assumes a 95% baseline compliance rate for this use.

Recycling

EPA's Risk Evaluation (EPA 2021e) did not find PV29-specific information for recycling. However, this chemical has been identified in articles that are commonly recycled such as plastics and painted metals which indicates that recycling may occur for waste plastics. Specifically, this analysis assumes that PV29

[10] This estimate differs from that in the Risk Evaluation which assumes one plastic manufacturer. This analysis uses the number of sites later provided directly by CPMA/Sun Chemical.

can be found in painted and plastic automobile parts and industrial carpets, however not in the regulated PV29 form. Therefore, EPA does not estimate that recyclers purchase or use regulated PV29.

Automobile Recycling

More than 95 percent of end-of-life vehicles (ELVs) in the United States are recycled (Mashek 2016). Approximately 86 percent of a vehicle's material content is recycled, reused, or used for energy recovery (ARA 2021).

The Automotive Recyclers Association (ARA) reports that automotive recycling businesses employ over 140,000 people at more than 9,000 locations, representing over $32 billion in annual sales (ARA 2021). Based on a sample of ARA members as listed on their website,[11] these companies typically fall into NAICS 423140 (Motor vehicle parts (used) merchant wholesalers), 423930 (Recyclable material merchant wholesalers), and 5 62920 (Materials recovery facilities). According to data from the U.S. Census Bureau's 2021 Statistics on U.S. Businesses (SUSB) (U.S. Census Bureau 2023), there are 8,672 U.S. firms encompassed by these NAICs codes.

Industrial carpet recycling

According to the Carpet America Recovery Effort (CARE), an organization dedicated to the advancement of market-based programs to increase landfill diversion and recycling of post-consumer carpet, the total gross U.S. collections of used carpet in 2019 were 335 million pounds, up from 281 million pounds in 2018. Ninety-eight percent of the post-consumer carpet collected was processed in the United States (CARE 2019).

A review the "Collector Finder Map" on CARE's website,[12] the CARE California Carpet Stewardship Program 2020 Annual Report, the Dun & Bradstreet database, and additional web-based searches (Google) yielded 70 companies associated with carpet recycling. These companies are examples only and may not be comprehensive. Note that it is not known whether or how much of any of the post-consumer carpet material handled by these companies contains PV29. Additionally, CARE's Voluntary Product Stewardship (VPS) program was terminated in April 2020. This program had provided financial incentives to sorters and recyclers to divert post-consumer carpet from landfills (Yarbrough 2020). It is not known how the lack of this subsidy will affect these companies; it is likely that some of them may have ceased or will cease operating. These uncertainties may drive the estimates either up or down.

3.1.3 Industrial/Commercial Use

Products containing PV29 are used in various industrial and commercial settings. Whereas the processing stage entails the use of raw PV29 to manufacture products (such as automotive paints), this stage involves the use of the resultant products (such as automobile painting). EPA's risk determination identified automobile painting and refinishing and commercial printing as COUs with unreasonable risk in this stage.

As described above, industrial carpets, plastic vehicle components, and other pigmented products may contain PV29. However, EPA's risk evaluation did not identify any unreasonable risk associated with these COUs. As such, they are not evaluated further in this analysis.

None of the COUs at this stage involve the use of regulated PV29; in all cases, the PV29 has already been incorporated into either a liquid (e.g. a paint) or a solid (e.g. a pellet).

[11] https://web.a-r-a.org/search

[12] https://carpetrecovery.org/recovery-effort/collector-finder-map/, searched in April 22

Automobile painting and refinishing

According to information submitted to EPA by CPMA, PV29 is used in paint both for original automotive equipment manufacture (in which the paint is baked onto the metal by the car manufacturer) and for refinish (where the paint may be sprayed on by auto body shops) (CPMA 2017).

New Vehicles (OEM)

For original equipment manufacturing (OEM), EPA assumes that workers in NAICS codes 336111 (automobile manufacturing), 336112 (light truck and utility manufacturing), and 336211 (motor vehicle body manufacturing) may be exposed to PV29. The U.S. Census Bureau (2023) estimates that there are 832 U.S. firms in these three NAICSs codes.

Refinishing

The automotive refinishing industry is comprised of 31,728 facilities nationwide (U.S. Census Bureau 2023) in NAICS code 811121 (automotive body, paint, and interior repair and maintenance). Automotive refinishing shops apply coatings to motor vehicles after the original manufacturing process. Refinishing operations occur in new car dealer repair/paint shops, fleet operator repair/paint shops, production auto-body paint shops and custom-made car fabrication facilities (EPA 2021b). Paint color used by the automotive refinishing ships is selected to match the existing paint. Therefore, it is not possible to determine which companies will use paints containing PV29; all automotive paint shops may have PV29-containing paint available for when it is needed, but the likelihood that it is actually used on any given day is probably very low, given the large number of paint color options available. Furthermore, it is highly unlikely that paint shop technicians would be aware of the identity of pigments used in each paint color.

Merchant Ink for Commercial Printing

Based on discussion with representatives of CPMA (EPA 2021b), EPA understands that there is no current use of PV29 in merchant ink for commercial printing. Therefore, there are no companies affected by the proposed rulemaking for this COU.

3.1.4 Disposal

Each of the conditions of use of PV29 may generate waste streams that are collected and transported to third-party sites for disposal or treatment. Wastes containing PV29 that are sent to a third-party site for treatment or disposal may include wastewater, solid wastes, and other wastes. It is not possible to determine which disposal companies may handle PV29-containing waste; nor does EPA anticipate that disposal companies would know whether waste items they handle would contain PV29. The Agency expects that all disposal companies would need to comply with the proposed rule due to this absence of information. Therefore, EPA assumes that all companies within the relevant NAICS codes (listed in Table 3 -7) may be affected by the proposed rulemaking.

Note that facilities in this use category are not expected to receive or use regulated PV29.

Table 3-7: Number of Companies Potentially Associated with Disposal of C.I. Pigment Violet 29

NAICS	NAICS Description	Firms
221320	Sewage Treatment Facilities	333
562111	Solid Waste Collection	6,813
562212	Solid Waste Landfill	690
562213	Solid Waste Combustors and Incinerators	40
562219	Other Nonhazardous Waste Treatment and Disposal	470
Total		**8,346**

Source: BLS 2021a

3.1.5 Summary of Relevant Industries

Table 3 -8 summarizes the industries identified as relevant for each COU as well as the number of firms. It also identifies which COUs may use regulated PV29; for these industries and for the import and commercial printing industries, the firm counts represent the number of facilities that use PV29 based on information provided to EPA. For the other industries, none of which are expected to handle regulated PV29, EPA does not have information on the number of facilities; as such, the firm counts represent the total number of firms nationwide, which is an upper bound on the number that may be subject to the regulation.

Based on this assessment, the COUs with unreasonable risk encompass 49,670 facilities, including 22 facilities that are expected to handle regulated PV29.

Table 3-8: Summary of Relevant Industries and Firm Counts for COUs with Unreasonable Risk

Condition of Use		Regulated PV29?	Industries	Firms
Manufacture	PV29 manufacture	**Yes**	**Manufacturing** [a]	**1**
	PV29 import	**Yes**	**Import** [b]	**1**
Processing	Incorporation into paints and coatings	**Yes**	**Automotive paint manufacturing** [c]	**14**
	Incorporation into plastic and rubber products	**Yes**	**Industrial carpet manufacturing** [c]	**6**
			Automotive parts manufacturing [c]	
	Creation or adjustment to other perylenes pigments	**Yes**	**Pigment manufacturing** [d]	**1**[d]
	Recycling	No	Motor vehicle parts (used) merchant wholesalers (423140) [e]	1,410
			Recyclable material merchant wholesalers (423930) [e]	6,261
			Materials recovery facilities (562920) [e]	1,001
			Carpet recycling [f]	70
Industrial/ commercial use	Paints and coatings	No	Automobile Manufacturing (336111) [e]	162
			Light Truck and Utility Vehicle Manufacturing (336112) [e]	59
			Motor Vehicle Body Manufacturing (336211) [e]	611
			Automotive Body, Paint and Interior Repair and Maintenance (811121) [e]	31,728
	Merchant ink	No	Commercial printing [g]	0
Disposal		No	Sewage Treatment Facilities (221320) [e]	333
			Solid Waste Collection (562111) [e]	6,813
			Solid Waste Landfill (562212) [e]	690
			Solid Waste Combustors and Incinerators (562212) [e]	40
			Other Nonhazardous Waste Treatment and Disposal (562219) [e]	470

a. PV29 is manufactured domestically by a single firm; see Section 3.1.1.
b. PV29 is imported by a single firm which processes it into automotive paint; see Section 3.1.1.
c. Number of firms based on information provided by domestic manufacturer (EPA 2021d).
d. The firm that manufactures PV29 uses it to manufacture pigments; there are no additional facilities in this industry.
e. Number of firms based on data from Census Bureau (2023)
f. Number of firms based on industry data; see Section 3.1.2.
g. Available information indicates there is no use of PV29 in merchant ink for commercial printing; see Section 3.1.3.

3.2 *Worker Exposure to Regulated PV29*

Because the costs and benefits of the rule depend in part on the number of employees in regulated facilities, it is also necessary to estimate the number of workers who may be exposed to regulated PV29 either directly or as part of peripheral duties (ONUs). For each use category, EPA estimated the number of exposed workers based on methods detailed in the Risk Evaluation (EPA 2021e) and summarized in Sections 3.1.1 and 3.1.2. Table 3 -9 summarizes the estimates.

Table 3-9: Number of Affected Sites and Exposed Workers

Use category	Affected facilities [a]	Exposed employees per facility [b]		Total exposed employees [c]
		Workers	ONUs	
Domestic manufacturing and intermediate processing	1	2 to 22	56	58 to 78
PV29 importing	1	14	5	19
Processing into automotive paints & coatings	14	14	5	266
Processing into plastics & rubber products	6	27	12	234
Total	**22**			**577 to 597**

ONU = occupational non-users
a. Based on information provided by Sun Chemical.
b. For domestic manufacturing, based on information provided by Sun Chemical (citation); for others, based on EPA (2021e).
c. Sum of direct and ONUs per facility times the number of affected facilities.

The Risk Evaluation also summarizes available data on the concentrations of PV29 to which the employees may be exposed, based on monitoring conducted by Sun Chemical (The EI Group 2020). Specifically, the company monitored 11 operators[13] using the NIOSH 0600 tests. The operators performed various functions that either directly handled dry powder PV29 or were in the same area where it was being handled (ONUs). The monitoring program grouped the operator functions into 5 "similar exposure groups" (SEGs) and into day and night shifts. As shown in Table 3 -10, the overall average concentration for all workers was 0.37 mg/m^3 and was similar for direct workers and ONUs. Each SEG had average concentrations between 0.32 mg/m^3 and 0.44 mg/m^3.

Table 3-10: Summary of Regulated PV29 Concentrations in Manufacturing Facility

	Observations	Samples	Average minutes per sample	Average concentration (mg/m^3)
Overall	13	28	47	0.37
By employee type				
Worker	9	22	49	0.37
ONU	4	6	38	0.36
By SEG				
1. Spray dryer pack-out	4	10	29	0.44
2. Bag transfer to IPCs for salt grinding	1	1	35	0.35
3. Tray dryer unloading	4	7	37	0.34
4. Grind and blend charging	1	3	33	0.37
5. Grind and blend pack-out	3	7	90	0.32

IPCs = integrated process containers; ONU = occupational non-users; SEG = similar exposure group
Source: based on data from EPA (2021e) and The EI Group (2020).

[13] **Two operators were monitored twice in different roles, for a total of 13 observations. See the Risk Evaluation for additional details.**

4. Cost Analysis

This section presents EPA's estimated incremental costs for implementation of the proposed regulation. It first provides an overview of assumptions and methods that are generally applicable, including the analysis time period and assumed estimated labor rates (Section 4.1). Section 4.2 details the estimated costs for all covered industries to become familiar with the rule requirements, and Section 4.3 describes the estimated costs for the regulatory requirements applicable to facilities handling regulated PV29. Section 4.4 summarizes the total estimated annualized and total costs to industry, and Section 4.5 describes unquantified potential costs and key uncertainties in the cost analysis.

4.1 Method and assumptions

The total costs of the proposed rule include labor costs for covered facilities to become familiar with the rule requirements (Section 4.2) and to implement actions needed to comply (Section 4.3). For both categories of costs, Table 4 -11 shows the labor rates for relevant occupations in the three industries encompassing the COUs based on the U.S. Bureau of Labor Statistics' (BLS) Employer Costs for Employee Compensation dataset (Bureau of Labor Statistics 2024b).

Table 4-11: Fully Loaded Hourly Labor Rates for Relevant Occupations (2023$)

Industry	Use Categories	Occupation	Total Compensation[a]	Overhead[b]	Loaded hourly rate[c]
Manufacturing	PV29 manufacturing and intermediate processing PV29 importing Processing into automotive paints and coatings Processing into plastics and rubber products Automotive painting (new vehicles)	Management, business, and financial	$77.56	$15.51	$93.07
		Installation, maintenance, and repair	$49.17	$9.83	$59.00
		Production	$35.15	$7.03	$42.18
		Certified Industrial Hygienist	$61.76	$12.35	$74.12
Trade, transportation, and utilities	Recycling Disposal	Management, business, and financial	$78.92	$15.78	$94.70
		Production, transportation, and material moving	$36.60	$7.32	$43.92
Service providing	Automotive refinishing	Management, business, and financial	$82.98	$16.60	$99.58
		Production	$29.88	$5.98	$35.86

a. Source: Bureau of Labor Statistics 2024b
b. Total compensation times assumed overhead rate of 20%.
c. Sum of total compensation and overhead

The recommendation in EPA's (2016b) Guidelines for Preparing Economic Analyses that "the time horizon should be long enough that the net benefits for all future years (beyond the time horizon) are expected to be negligible when discounted to the present." EPA selected a relatively short time horizon of 15 years because annual recurring monetized costs and annual recurring monetized benefits are estimated to be the same each year. In addition, the annual recurring costs exceed the annual recurring benefits, and therefore net benefits will remain negative irrespective of the analysis time horizon selected. However, it should be noted that the relative effect of the initial costs on net benefits would decrease with a longer time horizon, and therefore the magnitude of the negative net benefits would decrease as the analytical time horizon is increased.

4.2 Rule Familiarization Costs

EPA assumes that each facility within each of the affected COUs would incur initial rule familiarization burden of one managerial labor hour, with a loaded hourly wage rate depending on the relevant industry (Table 4-11). Rule familiarization costs are estimated for entities using regulated PV29 and entities that are using PV29 that is not regulated (i.e., PV29 that is not in powdered form). Entities using PV29 that is not regulated are assumed to review the rule in order to determine that it does not apply to them. Table 4-12 summarizes the resultant one-time costs, which are the same under the proposed and alternative options.

Table 4-12: Total One-time Rule Familiarization Costs by Use

Use category	Facilities	Labor Rate[a]	Total one-time costs[b]
PV29 manufacturing and intermediate processing	1	$93.07	$93
PV29 importing	1	$93.07	$93
Processing into automotive paints and coatings	14	$93.07	$1,303
Processing into plastic and rubber products	6	$93.07	$558
Recycling	8,742	$94.70	$827,867
Automotive painting (new vehicles)	832	$93.07	$77,434
Automotive refinishing	31,728	$99.58	$3,159,474
Disposal	8,346	$94.70	$790,366
Total	**49,670**		**$4,857,188**

a. See Table 4-11; based on managerial occupation in relevant industry
b. Number of facilities times one hour per facility times labor rate; rounded to the nearest dollar

4.3 Compliance Costs

Under both the proposed and alternative regulatory options, facilities handling regulated PV29 would be subject to various requirements pertaining to PPE, labeling and downstream notification, cleaning, and recordkeeping. Because many of the COUs encounter PV29 only after it has been incorporated into other liquid or solid products where it is encapsulated and no longer a dry powder form, only a subset of facilities would be subject to these requirements. Specifically, EPA estimates that the COUs that involve handling dry powder PV29 are:

1. Domestic PV29 manufacture;
2. PV29 importing;
3. Intermediate processing for other perylene pigments;
4. Processing into automotive paints and coatings; and
5. Processing into plastic and rubber products.

Since a single facility performs both the domestic manufacture and intermediate processing COUs, the rest of this analysis refers to a single “domestic manufacturing and intermediate processing” use category to encompass them. Table 4-13 shows the number of affected facilities and workers for the four resultant use categories that are expected to handle regulated PV29. As described in Section 3., both domestic manufacturing and intermediate processing for perylene pigments occur at a single facility in the United States, and the manufacturer sells powder PV29 to an additional 20 customers that process it into paints/coatings or plastic/rubber products (EPA 2020b). There is also one facility that imports PV29

and processes it into automotive paints and coatings. As such, EPA expects that these requirements would apply to 22 total facilities.

Table 4-13: Number of Affected Sites and Exposed Workers

Use category	Affected facilities [a]	Workers per facility [b]		Total workers [c]
		Direct	ONUs	
PV29 manufacturing and intermediate processing	1	2 to 22	56	58 to 78
PV29 importing	1	14	5	19
Processing into automotive paints & coatings	14	14	5	266
Processing into plastics & rubber products	6	27	12	234
Total	**22**			**577 to 597**

ONU = occupational non-users
Source: see Table 3 -9

Table 4 -14 summarizes the types of costs that may be incurred under the proposed and alternative options, providing cross-references to the applicable section of the cost analysis.

Table 4-14: Summary of Control Measures Required for Regulated PV29 under Regulatory Options

Control Category	Proposed Option		Alternative Option	
	Requirement	Section	Requirement	Section
Personal protective equipment (PPE)	APF 50 respirators in rooms where dry powder PV29 is in use	4.3.1	APF 10 respirators in rooms where dry powder PV29 is in use	4.3.1
Labeling and downstream notification	Required	4.3.2	None	NA
Equipment and area cleaning	Required	4.3.2	Required	4.3.2
Monitoring	None	NA	At least once every 3 months during period when powder PV29 is manufactured or used	4.3.4
Engineering controls	None	NA	Use of engineering controls so that air concentration is below the limit of detection	4.3.5

4.3.1 Personal Protective Equipment (PPE)

This section presents the estimated costs associated with the respirator provision of the rule, which would be applicable to the 22 facilities that handle regulated PV29 under the proposed and alternative regulatory options. Table 4 -13 shows the number of facilities and exposed workers broken out by use category.

Respirators are grouped into different classes defined by the air supply system, operating mode, and the type of facepiece. The major air supply systems (as defined in 29 CFR 1910.134(b)) are:

- Air Purifying Respirator (APR). A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
- Atmosphere-Supplying Respirator. A respirator that supplies breathing air from a source independent of the ambient atmosphere. Includes SAR and SCBA units.
- Powered Air-Purifying Respirator (PAPR). A type of air purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering. The inlet covering is

the portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source.

- Self-Contained Breathing Apparatus (SCBA). An atmosphere-supplying respirator, where the source of breathing air is designed to be carried by the user.
- Supplied-Air Respirator (SAR). An atmosphere-supplying respirator, where the source of breathing air is not designed to be carried by the user.

The types of operating modes (as defined in 29 CFR 1910.134(b)) are:

- Continuous Flow Mode. Provides a continuous flow of breathable air to the respirator facepiece.
- Demand Mode. Admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.
- Positive Pressure Mode. The pressure inside the respirator inlet covering exceeds the ambient air pressure outside the respirator.
- Pressure Demand Mode. Admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

The major facepiece types (as defined in 29 CFR 1910.134(b), unless otherwise noted) are:

- Full Facepiece. Covers from the hairline to below the chin, and typically provides eye protection as well (NIOSH 2012).
- Half Mask. Covers the nose, mouth, and under the chin (NIOSH 2012).
- Helmet/Hood. A helmet is a rigid covering that also provides head protection against impact and penetration. A hood is designed to completely cover the head and neck and may also cover portions of the shoulders and torso.
- Loose-Fitting Facepiece. A respiratory inlet covering that is designed to form a partial seal with the face.
- Quarter Mask. Covers the mouth and nose, and the lower sealing surface rests between the chin and mouth (NIOSH 2012).

-Each respirator has a numeric Assigned Protection Factor (APF) which indicates the level of protection offered from airborne particulates. Table 4 -15 reproduces Table 1 of the Respiratory Protection Standard (29 CFR 1910.134(d)(3)(i)(A)) and presents each type of respirator with its expected APF.

Table 4-15: Assigned Protection Factors (APF) for Respirators in OSHA Standard 29 CFR 1910.134

Type of Respirator	Quarter Mask	Half Mask	Full Facepiece	Helmet/ Hood	Loose-Fitting Facepiece
Air-Purifying Respirator (APR)	5	10	50	-	-
Powered Air-Purifying Respirator (PAPR)	-	50	1,000	25/1,000 [a]	25
Supplied-Air Respirator (SAR) or Airline Respirator					
Demand mode	-	10	50		
Continuous flow mode	-	50	1,000	25/1,000 [a]	25
Pressure-demand or other positive-pressure mode	-	50	1,000	-	-
Self-Contained Breathing Apparatus (SCBA)					
Demand Mode	-	10	50	50	-
Pressure-demand or other positive-pressure mode (e.g. open/closed circuit)	-	-	10,000	10,000	-

a. The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000.

Not all respirators presented in Table 4-15 would be suitable under the rule. To identify respirators for this cost analysis, EPA excluded demand-mode SARs and SCBAs because demand mode creates negative pressure in the mask during inhalation, which is prohibited under the proposed rule. Additionally, SAR respirators operated in pressure-demand and other positive-pressure modes require a high-pressure air supply provided by a compressed air cylinder or the combination of a fixed air filtration panel and an air compressor. Both of these air supply systems are expected to be more costly than the pump needed to supply a SAR respirator operated in continuous flow mode. As such, EPA also excluded pressure-demand SAR respirators from the cost analysis.

The specific PPE requirements under the proposed and alternative options differ. Under the proposed option, it is expected that a respirator controlling PV29 exposure at an APF 50 level will sufficiently manage exposure risk from PV29. Workers and ONUs in rooms where dry powder PV29 is actively in use (including anywhere with an open container) must be required to use PPE with an APF of at least 50 to minimize exposure.

Abt Global's (2024) report documents EPA's unit costs for respirators, which includes equipment purchase costs and replacement costs as well as costs associated with medical evaluations, fit testing, annual training, and annual cleaning and maintenance. Annual costs are based on the useful life (i.e., the number of years until a respirator or respirator component needs to be replaced), as well as the number of years until a medical evaluation, fit testing, or training is required.

Table 4-16 and Table 4-17 summarize the resultant one-time and annual recurring unit costs for the selected respirators, respectively. In addition to the per-worker costs, there are additional costs associated with the development of a respirator program written plan at affected facilities, which has an estimated one-time cost of $593 and annual recurring costs of $148 (Abt Global 2024). EPA assumes that each affected facility would incur this cost. Additionally, the rule requires recordkeeping associated with the PPE program. EPA assumes that these requirements would entail 2 hours of managerial time per year. Based on the managerial labor rates in the manufacturing sector (Table 4-11), this equates to $186 annually.

Table 4-16: Estimated Initial Respirator Costs (2023$)

Respirator System	Per Facility Program Costs	Per Worker Costs		
		Equipment	Medical Evaluation	Total
APR, Half Mask (APF 10)	$593	$2,047	$107	$2,154
PAPR, Loose-Fitting Facepiece (APF 25)	$593	$1,933	$107	$2,040
SAR, Loose-Fitting Facepiece (APF 25)	$593	$1,388	$107	$1,495
APR, Full Facepiece (APF 50)	$593	$2,270	$107	$2,377
PAPR, Half Mask (APF 50)	$593	$1,897	$107	$2,004
SAR, Continuous Flow Half (APF 50) Mask	$593	$1,352	$107	$1,459
PAPR, Full Facepiece (APF 1,000)	$593	$2,076	$107	$2,183
PAPR, Helmet/Hood (APF 1,000)	$593	$1,974	$107	$2,081
SAR, Continuous Flow Full Facepiece (APF 1,000)	$593	$1,531	$107	$1,638
SAR, Continuous Flow Helmet/Hood (APF 1,000)	$593	$1,520	$107	$1,627
SCBA, Positive-pressure Mode, Full Facepiece (APF 10,000)	$593	$8,531	$107	$8,638
SCBA, Positive-pressure Mode, Helmet/Hood (APF 10,000)	$593	$8,769	$107	$8,876
Source: Based on costs for manufacturing sector from Abt Global's (2024) report (Table 4 and Table 16); rounded to the nearest dollar				

Table 4-17: Estimated Annual Recurring Respirator Costs (2023$)

Respirator System	Per Facility Program and Recordkeeping Costs	Per Worker Costs					
		Equipment	Medical Evaluation	Fit Test	Training	Cleaning	Total
APR, Half Mask (APF 10)	$334	$2,036	$21	$66	$131	$439	$2,693
PAPR, Loose-Fitting Facepiece (APF 25)	$334	$1,073	$21	$0	$262	$439	$1,795
SAR, Loose-Fitting Facepiece (APF 25)	$334	$322	$21	$0	$262	$439	$1,044
APR, Full Facepiece (APF 50)	$334	$2,148	$21	$66	$131	$439	$2,805
PAPR, Half Mask (APF 50)	$334	$1,061	$21	$158	$262	$439	$1,941
SAR, Continuous Flow Half (APF 50) Mask	$334	$310	$21	$158	$262	$439	$1,190
PAPR, Full Facepiece (APF 1,000)	$334	$1,121	$21	$158	$262	$439	$2,001
PAPR, Helmet/Hood (APF 1,000)	$334	$1,087	$21	$158	$262	$439	$1,967
SAR, Continuous Flow Full Facepiece (APF 1,000)	$334	$370	$21	$158	$262	$439	$1,250
SAR, Continuous Flow Helmet/Hood (APF 1,000)	$334	$357	$21	$158	$262	$439	$1,237
SCBA, Positive-pressure Mode, Full Facepiece (APF 10,000)	$334	$1,218	$21	$158	$524	$439	$2,360
SCBA, Positive-pressure Mode, Helmet/Hood (APF 10,000)	$334	$1,297	$21	$158	$524	$439	$2,439
Source: Per facility costs include the per facility respirator program written plan costs of $148 from Abt Global's (2024) report (Table 4) and a recordkeeping cost of $186 associated with 2 hours of manufacturing managerial labor (see wage rates in Table 4 -11). Per worker costs are based on costs for manufacturing sector from Abt Global's (2024) report (Table 17) rounded to the nearest dollar.							

As such, for each use category, the PPE costs are calculated as follows:

$$PPE\ costs = (number\ of\ facilities \times [program\ written\ plan\ costs + reccordkeeping\ costs]) + (number\ of\ exposed\ work$$

Additionally, as described in Section 3., the facilities affected by the PPE requirement already have some baseline PPE usage among exposed workers. Specifically, based on information provided by Sun Chemical, EPA assumes that 100% of workers in the domestic manufacturing facility currently use an N95 mask with an APF of 10. Based on data from past OSHA inspections, EPA assumes that 75% of workers in automotive paint manufacturing (including the facility that imports PV29) and 95% of workers in plastic and rubber manufacturing currently use an N95 mask. Since the PPE requirements under the proposed rule would replace these existing PPE practices, the incremental costs of the proposed rule are estimated as the increased costs of the mandated respirators relative to the costs of existing practices.

Table 4-18: Unit Costs for N95 Mask (3M™ Particulate Respirator 851; 2023**$)**

Distributor	Unit Cost	Source
Industrial Safety Products	$2.11	Industrial Safety Products 2024
GT Midwest	$3.74	GT Midwest 2024
Stauffer Gloves & Safety	$2.24	Stauffer Gloves & Safety 2024
American Products	$2.17	AmPro Online 2024
Strobels Supply	$2.32	Strobels Supply 2024
Hillas Packaging	$2.41	Hillas Packaging 2024
Average	**$2.50**	

EPA estimates that N95 masking entails a one-time cost of $107 and annual recurring costs of $283, as shown in Table 4 -19.

Table 4-19: Estimated Initial and Recurring Costs for N95 Masking (per worker; 2023$)

	Equipment [a]	Medical evaluation [b]	Fit test [b]	Training [b]	Total cost
Initial costs	$0	$107	$0	$0	$107
Annual recurring costs	$65	$21	$66	$131	$283

a. based on 26 masks per year at a cost of $2.50 per mask (Table 4 -18).
b. based on costs equivalent to an APR half-mask (Abt Global 2024)

Table 4 -20 shows the calculation of the one-time and annual recurring PPE costs under the baseline using these assumptions. Although some of the facilities may have existing respirator program written plans governing the use of PPE, EPA assumes that the respirator program written plans would need to be revised or replaced under the rule and as such are not included in the baseline cost estimates.[14] For the baseline PPE costs besides the respirator program written plan, the economic analysis estimates the baseline costs by adjusting the costs of a respiratory PPE program by the baseline compliance percentage. However, this may result in an underestimate of the baseline costs (and a corresponding overestimate of

[14] **In other words, EPA conservatively assumes that all program costs would be incremental under the rule. This may result in an overestimate of costs if established programs lessen the burdens associated with the development of programs under the proposed rule.**

the incremental costs) if the true baseline costs incurred are closer to the full costs of a respiratory PPE program.

Table 4-20: Calculation of Baseline PPE Costs (2023$)

Use category	Baseline PPE Compliance[a]	Exposed workers [b]		One-time costs [c]		Annual costs [d]	
		Low	High	Low	High	Low	High
PV29 manufacturing and intermediate processing	100%	58	78	$6,206	$8,346	$16,414	$22,074
PV29 importing	75%	19	19	$1,525	$1,525	$4,033	$4,033
Processing into automotive paints and coatings	75%	266	266	$21,347	$21,347	$56,459	$56,459
Processing into plastic and rubber products	95%	234	234	$23,786	$23,786	$62,911	$62,911
Total		**577**	**597**	**$52,864**	**$55,004**	**$139,817**	**$145,477**

PPE= personal protective equipment
a. See Section 3.
b. See Table 3-10 for the estimated numbers of directly exposed workers and occupational non-users (ONUs)
c. Number of exposed workers times $107 (Table 4-19) times PPE compliance; rounded to the nearest dollar
d. Number of exposed workers times $277 (Table 4-19) times PPE compliance; rounded to the nearest dollar

Proposed Option

To estimate the costs of the PPE provisions of the proposed option, EPA used the average one-time and recurring unit costs for all respirators with an APF of 50 or higher (Table 4-15). Based on the costs shown in Table 4-16 and Table 4-17 for these respirators, EPA applied the average unit cost per exposed worker of $3,431 initially and $1,910 annually. Table 4-21 and Table 4-22 show these calculations for the one-time (initial) and annual recurring PPE costs respectively, broken out by use category. The incremental PPE costs of the rule are the total PPE costs under the rule (Table 4-21 and Table 4-22) minus the PPE costs under the baseline (Table 4-20). Table 4-23 shows the resultant incremental PPE costs under the proposed option.

It is worth noting that a number of factors are taken into account when selecting a respirator, including cost, comfort, compatibility with the facility layout, and mobility requirements of the job. Thus, it is likely that respirator selection is not based solely on required APF or cost alone and that facilities may provide respirators with APFs above what is required.

Table 4-21: Calculation of One-time PPE Costs under the Proposed Option (2023$)

Use category	Program costs [a]	Respirator costs [b]		Total costs [c]	
		Low	High	Low	High
PV29 manufacturing and intermediate processing	$593	$198,998	$267,618	$199,591	$268,211
PV29 importing	$593	$65,189	$65,189	$65,782	$65,782
Processing into automotive paints and coatings	$8,302	$912,646	$912,646	$920,948	$920,948
Processing into plastic and rubber products	$3,558	$802,854	$802,854	$806,412	$806,412
Total	**$13,046**	**$1,979,687**	**$2,048,307**	**$1,992,733**	**$2,061,353**

PPE = personal protective equipment
a. Number of facilities (Table 4 -13) times $593, the one-time costs to develop a PPE program (Abt Global 2024)
b. Number of exposed workers (Table 4 -13) times $3,431, the average one-time cost for respirators with APF50 and higher (Table 4 -16)
c. Sum of program costs and respirator costs

Table 4-22: Proposed Option Annual Recurring PPE Costs (2023$)

Use category	Program costs [a]	Recordkeeping costs [b]	Respirator costs [c]		Total costs [d]	
			Low	High	Low	High
PV29 manufacturing and intermediate processing	$148	$186	$110,780	$148,980	$111,114	$149,314
PV29 importing	$148	$186	$36,290	$36,290	$36,624	$36,624
Processing into automotive paints and coatings	$2,072	$2,604	$508,060	$508,060	$512,736	$512,736
Processing into plastic and rubber products	$888	$1,116	$446,940	$446,940	$448,944	$448,944
Total	**$3,256**	**$4,092**	**$1,102,070**	**$1,140,270**	**$1,109,418**	**$1,147,618**

PPE = personal protective equipment
a. Number of facilities (Table 4 -13) times $148, the annual PPE program cost (Abt Global 2024)
b. Number of facilities times $186, the estimated annual recordkeeping cost
c. Number of exposed workers (Table 4 -13) times $1,918, the average annual cost for respirators with APF50 and higher (Table 4 -17)
d. Sum of program costs, recordkeeping costs, and respirator costs

Table 4-23: Proposed Option Incremental One-time and Annual Recurring PPE Costs (2023$)

Use category	One-time [a]		Annual Recurring [b]	
	Low	High	Low	High
PV29 manufacturing and intermediate processing	$193,385	$259,865	$94,700	$127,240
PV29 importing	$64,257	$64,257	$32,591	$32,591
Processing into automotive paints and coatings	$899,601	$899,601	$456,277	$456,277
Processing into plastic and rubber products	$782,626	$782,626	$386,033	$386,033
Total	**$1,939,869**	**$2,006,349**	**$969,601**	**$1,002,141**

PPE = personal protective equipment
a. Proposed rule one-time costs (Table 4 -21) minus baseline one-time costs (Table 4 -20)
b. Proposed rule annual recurring costs (Table 4 -22) minus baseline annual recurring costs (Table 4 -20)

Alternative Option

The alternative option requires that all workers wear PPE with an APF of 10 or higher when regulated PV29 is in use. As described in Section3., facilities that handle regulated PV29 already use N95 masks which are APF10, with compliance rates of 75 percent to 100 percent depending on the use category (see Table 4 -20). Under the alternative option, EPA assumes that facilities would incur costs associated with providing N95 masks to all exposed workers, as well as program and recordkeeping costs equivalent to the proposed option. Table 4 -24 and Table 4 -25 show the resultant total one-time and annual recurring costs.

The incremental PPE costs are the total PPE costs minus the PPE costs under the baseline (Table 4 -20). Table 4 -26 shows the resultant incremental PPE costs under the alternative option.

Table 4-24: Alternative Option Total One-time PPE Costs (2023$)

Use category	Program costs[a]	Respirator costs[b]		Total costs[c]	
		Low	High	Low	High
PV29 manufacturing and intermediate processing	$593	$6,206	$8,346	$6,799	$8,939
PV29 importing	$593	$2,033	$2,033	$2,626	$2,626
Processing into automotive paints and coatings	$8,302	$28,462	$28,462	$36,764	$36,764
Processing into plastic and rubber products	$3,558	$25,038	$25,038	$28,596	$28,596
Total	**$13,046**	**$61,739**	**$63,879**	**$74,785**	**$76,925**

PPE = personal protective equipment
a. Number of facilities (Table 4 -13) times $593, the one-time costs to develop a PPE program (Abt Global 2024)
b. Number of exposed workers (Table 4 -13) times $107, the average one-time cost for N95 masks (Table 4 -19)
c. Sum of program costs and respirator costs

Table 4-25: Alternative Option Total Annual Recurring PPE Costs (2023$)

Use category	Program costs[a]	Recordkeeping costs[b]	Respirator costs[c]		Total costs[d]	
			Low	High	Low	High
PV29 manufacturing and intermediate processing	$148	$186	$16,414	$22,074	$16,748	$22,408
PV29 importing	$148	$186	$5,377	$5,377	$5,711	$5,711
Processing into automotive paints and coatings	$2,072	$2,604	$75,278	$75,278	$79,954	$79,954
Processing into plastic and rubber products	$888	$1,116	$66,222	$66,222	$68,226	$68,226
Total	**$3,256**	**$4,092**	**$163,291**	**$168,951**	**$170,639**	**$176,299**

PPE = personal protective equipment
a. Number of facilities (Table 4 -13) times $148, the annual PPE program cost (Abt Global 2024)
b. Number of facilities times $186, the estimated annual recordkeeping cost
c. Number of exposed workers (Table 4 -13) times $283, the average annual cost for N95 masks (Table 4 -19)
d. Sum of program costs, recordkeeping costs, respirator costs

Table 4-26: Alternative Option Incremental One-time and Annual Recurring PPE Costs (2023$)

Use Category	One-time [a]		Annual Recurring [b]	
	Low	High	Low	High
PV29 manufacturing and intermediate processing	$593	$593	$334	$334
PV29 importing	$1,101	$1,101	$1,678	$1,678
Processing into automotive paints and coatings	$15,417	$15,417	$23,495	$23,495
Processing into plastic and rubber products	$4,810	$4,810	$5,315	$5,315
Total	**$21,921**	**$21,921**	**$30,822**	**$30,822**

PPE= personal protective equipment
a. Alternative option one-time costs (Table 4 -24) minus baseline one-time costs (Table 4 -20)
b. Alternative option annual recurring costs (Table 4 -25) minus baseline annual recurring costs (Table 4 -20)

4.3.2 Equipment and area cleaning

The proposed and alternative options both require that facilities conduct equipment and area cleaning anytime regulated PV29 is used. EPA assumes that each affected facility would incur a one-time cost of 4 managerial hours to develop a cleaning plan and program, and a weekly cleaning burden of four maintenance labor hours, including 15 minutes for recordkeeping. Table 4 -27 and Table 4 -28 show the resultant one-time and annual cleaning costs under both the proposed rule and the alternative option. This analysis assumes that the total cost of cleaning will be attributable to the proposed rule. However, it is likely that many facilities are likely performing some type of cleaning in the baseline. For example, The EI Group (2020) reported that employees performing pack-out activities "also conducted housekeeping activities including extra bag and box disposal and cleaning floors with water hose." To the extent to which cleaning is already being performed in the baseline, EPA's assumption of no baseline cleaning may result in an overestimate of cleaning costs.

Table 4-27: Total One-Time Incremental Cleaning Costs by Use (2023$)

Use category	Facilities	Total hours[a]	Hourly labor rate[b]	Total costs[c]
PV29 manufacturing and intermediate processing	1	4	$93.07	$372
PV29 importing	1	4	$93.07	$372
Processing into automotive paints and coatings	14	56	$93.07	$5,212
Processing into plastic and rubber products	6	24	$93.07	$2,234
Total	**22**	**88**		**$8,190**

a. Number of facilities times 4 hours
b. Fully loaded hourly wage rate for managerial positions in the manufacturing industry (Table 4 -11)
c. Total hours times hourly labor rate, rounded to the nearest dollar.

Table 4-28: Total Annual Incremental Cleaning Costs by Use (2023$)

Use category	Facilities	Total hours[a]	Hourly labor rate[b]	Total costs[c]
PV29 manufacturing and intermediate processing	1	208	$59.00	$12,272
PV29 importing	1	208	$59.00	$12,272
Processing into automotive paints and coatings	14	2,912	$59.00	$171,808
Processing into plastic and rubber products	6	1,248	$59.00	$73,632
Total	**22**	**4,576**		**$269,984**

a. Number of facilities times 208 hours (4 hours per week)
b. Fully loaded hourly wage rate for maintenance positions in the manufacturing industry (Table 4 -11)
c. Total hours times hourly labor rate, rounded to the nearest dollar

4.3.3 Labeling and downstream notification

Under the proposed rule, firms involved in the import and domestic manufacture (including import) of regulated PV29 would be required to notify persons to whom PV29 is shipped in writing prior to shipment. The notification must occur through a modification to both the labels on their products and the Safety Data Sheet (SDS) provided with the product to indicate that the product contains PV29. This section provides estimates of the costs of this requirement.

The following factors must be considered in determining the cost impact of a label change.

Labeling requirement and packaging size. The cost of graphic design changes generally depends on how easily the modifications can be integrated into the existing design. This in turn depends on both the label text required by the rule and the size of the product packaging. For example, adding new warning label text or graphics to a product with smaller packaging may require more extensive graphic design changes due to lack of space for the additional text. On the other hand, less extensive redesigns are likely needed for minor text modifications (e.g., wording changes to a pre-existing voluntary warning label) or larger product packaging that allows for easy integration of additional graphics. Similarly, costs may be lower for products that do not require packaging and can have a label directly affixed to the container (e.g. products not sold for consumer use).

The proposed rule applies to manufacture and import of PV29, which likely involves bulk packaging; and processing of PV29 into paint and plastic masterbatch. EPA does not anticipate that packaging size for any of these products would be small enough to require extensive redesigns due to lack of space.

Complexity of label. Labeling costs tend to increase as the number of colors used in the label design increases. Thus, a manufacturer may incur minor costs if only one color is affected, but more significant costs if multiple color changes are required.

The proposed rule requires a simple indication that the product contains PV29. EPA does not expect this to involve a complex redesign.

Number of SKUs. Total industry costs may be dependent on the number of Stock Keeping Units (SKUs) requiring a label change rather than the number of products. SKUs are distinct items that are distinguished not only by different products, but also by differences in color, size, and packaging for the same product. Thus, the number of SKUs can be larger than the number of products. Products sold in different packaging sizes or types will likely incur separate labeling costs for each SKU. However, manufacturers that comply with a labeling requirement by externally applying a label to each product (vs. modifying the packaging design) may only incur one labeling cost even if multiple products and SKUs are affected.

For EPA's Economic Analysis of Regulation of Methylene Chloride, Paint and Coating Remover under TSCA Section 6(a) (EPA 2019), Abt Associates Inc. surveyed five blenders of aerosol spray degreasers

that contain trichloroethylene on what types of costs they would incur for amending labels to add additional precautions and directions to their products. Aerosol spray degreasing products are used in consumer, commercial, and industrial sectors. Respondents reported potential costs associated with disposal of pre-existing labels and packaging, graphic design, reviewing proofs, creating electronic files used to engrave the printing plates, and changing the printing plates. None of the respondents reported any incremental recurring costs for labeling. One blender estimated minimal labor costs of approximately $100 to $200 per label (SKU) for graphic design changes, and $600 for the plate change,[15] for total one-time costs ranging from approximately $700 to $800 per SKU (2014 $).

EPA assumes that a similar effort would be required to modify labels on the products as regulated under the proposed rule. EPA updated these costs to 2023$ using the U.S. average Consumer Price Index (Bureau of Labor Statistics 2024a). Table 4-29 shows these estimated unit costs. EPA expects that all labelling costs will be one-time initial costs (i.e., incurred in the first year of rule compliance).

Table 4-29: One-time Unit Costs for Labeling per SKU

	Labor cost (2014$)	Materials cost (2014 $)	Total labeling cost (2014 $)	Total labeling cost (2023 $)[1]
Low estimate	$100	$600	$700	**$900**
High estimate	$200	$600	$800	**$1,030**

SKU = stock keeping units
Source: EPA 2019
1. Updated to 2023 $ using the Consumer Price Index for all items, U.S. city average (not seasonally adjusted) and rounded to the nearest $10.

As described in Section 3.1.1, one manufacturing facility provides powder PV29 in large bulk bags to foreign markets, automobile paint manufacturers, and plastic and rubber product manufacturers. While the product may be packaged in two configurations, EPA assumes that labeling requirements would be the same for any size bag, with one SKU.

Additionally, each facility will need to conduct downstream notification, which entails updating the SDS for the product. EPA assumes that this task will take 2 managerial hours per facility, at a one-time cost of $186 (see the labor rates in Table 4-11).

Once the powder is used in the receiving facilities, it is incorporated into paints or pellets and is no longer in the regulated form. As such, EPA assumes that these facilities would not incur any labeling or downstream notification costs.

Table 4-30 shows the total one-time labeling and downstream notification costs associated with the proposed rule. There are no labeling or downstream notification requirements or costs associated with the alternative option.

[15] New printing plates or cylinders will need to be engraved with the redesigned label. EPA assumes only one plate is needed because the label change will only need one color.

Table 4-30: Proposed Rule Total One-Time Labeling and Downstream Notification Costs by Use (2023$)

Use category	SKUs	Labeling [a]		Notification [b]	Total	
		Low	High		Low	High
PV29 manufacturing and intermediate processing	1	$900	$1,030	$186	$1,086	$1,216
PV29 importing	0	$0	$0	$0	$0	$0
Processing into automotive paints and coatings	0	$0	$0	$0	$0	$0
Processing into plastic and rubber products	0	$0	$0	$0	$0	$0
Total	**1**	**$900**	**$1,030**	**$186**	**$1,086**	**$1,216**

SKU = stock keeping units
a. Based on per-SKU labeling costs of $900 to $1,030 (Table 4 -29).
b. Based on 2 managerial hours in the manufacturing sector.

4.3.4 Monitoring

Under the alternative option, facilities that handle regulated PV29 would be required to conduct monitoring using the NIOSH 0600 method for respirable dust. For facilities that have a baseline concentration above the NIOSH 0600 limit of detection (LOD), the monitoring is required at least once every three months. For facilities with a baseline concentration below the LOD, monitoring is required at least once every 6 months All facilities will also be required to conduct new baseline monitoring whenever they have changes to production equipment or procedures or any major disruptions. Available monitoring data (see Section 3.2) indicate that existing concentrations at the PV29 manufacturing facility are currently below the NIOSH 0600 LOD of 0.5 mg/m^3. As such, EPA assumes that all 21 facilities that manufacture or handle regulated PV29 will be required to conduct monitoring every six months, or twice per year, based on estimated baseline concentrations.

To estimate the costs associated with each monitoring event, EPA used available information about equipment, media, and laboratory analysis costs together with assumptions around sampling labor from the economic analysis of the 2023 proposed regulation of carbon tetrachloride. In support of that regulation, the industrial hygiene firm Environmental Health & Engineering (Environmental Health & Engineering 2023) estimated that one exposure monitoring event at a complex worksite of 20 employees would entail 6 hours of labor by an outside certified industrial hygienist (CIH) at a cost of $190 per hour and 36 hours of labor by outside technical specialists at a cost of $90 per hour.

In addition to these labor costs, each monitoring event entails material and analytical costs. The NIOSH 0600 test protocol includes the following materials list:

- Sampler
    - Filter: 5.0-µm pore size, polyvinyl chloride filter or equivalent hydrophobic membrane filter supported by a cassette filter holder (preferably conductive).
    - Cyclone: 10-mm nylon, Higgins-Dewell, aluminum cyclone, or equivalent.
- Personal sampling pump, 1.7 L/min ± 5% for nylon cyclone, 2.2 L/min ± 5% for HD cyclone, or 2.5 L/min ± 5% for the Al cyclone with flexible connecting tubing.
- Balance, analytical, with sensitivity of 0.001 mg.
- Weights, NIST Class S-1.1, or ASTM Class 1.

- Static neutralizer, e.g., Po-210; replace nine months after the production date.
- Forceps (preferably nylon).
- Environmental chamber or room for balance, e.g., 20 °C ± 1 °C and 50% ± 5% RH."[16]

EPA assumes that the contracted CIH firm would provide laboratory equipment including the cyclone, sampling pump, balance, weights, forceps, and environmental chamber. For the single-use sampling media (filter and filter cassette), EPA used available cost data as summarized in Table 4 -31, calculating a per-sample unit cost of $4. Additionally, EPA assumed that facilities may incur the costs associated with the static neutralizer given that it must be replaced after nine months. Available cost data suggests a cost of $256 for this sampling equipment (Sterlitech 2024), which EPA assumes will be incurred on a per-event basis.

Table 4-31: Unit Costs for Sampling Media

Component	Cost	Quantity	Unit cost[a]	Source
Filter	$99.00	100	$1	Environmental Express 2024
Filter cassette	$29.95	10	$3	SKC 2024
Total			**$4**	
a. cost divided by quantity; rounded to the nearest dollar				

In addition to the costs associated with on-site sampling, media, and equipment, EPA assumes that the facilities would incur additional costs for laboratory analysis. Table 4 -32 summarizes the range of per-sample costs charged by laboratories with available price lists, which average to $24.

Table 4-32: Unit Costs for Laboratory Analysis

Laboratory Name	Cost per Sample	Source
Bureau Veritas	$23	(Bureau Veritas 2024)
SGS Galson	$27	(SGS Galson 2024)
RJ Lee Group	$20	(RJ Lee Group 2018)
Wisconsin Occupational Health Laboratory	$28	(Wisconsin Occupational Health Laboratory 2024)
EMSL	$21	(EMSL 2024)
Hawaii Analytical	$23	(Hawaii Analytical Laboratory 2024)
Average [a]	**$24**	
a. rounded to the nearest dollar		

-The NIOSH 0600 testing protocol specifies that there should be 2 to 4 replicate samples per batch of field samples. As such, EPA assumes that there would be 25 samples taken per 20 employees. Table 4 -33 summarizes the resultant total costs associated with a single monitoring event at a complex worksite with 20 employees. The total costs per worker is $279 based on this approach.

[16] **https://www.cdc.gov/niosh/docs/2003-154/pdfs/0600.pdf**

Table 4-33: Summary of Costs Associated with Monitoring Event at a Complex Worksite (20 Workers)

Cost category	Unit	Rate	Quantity	Total cost
Certified industrial hygienist [a]	Labor hours	$190	6	$1,140
Technical specialist [a]	Labor hours	$97	36	$3,492
Sampling equipment [b]	Monitoring event	$256	1	$256
Sampling media [c]	Sample	$4	25	$100
Laboratory analysis [d]	Sample	$24	25	$600
Total				**$5,588**
Total per worker [e]				**$279**

a. Source: Environmental Health & Engineering 2023
b. Based on the cost of a Polonium 210 Static Eliminator (Sterlitech 2024)
c. Based on Table 4 -31; assumes five replicate samples per 20 samples
d. Based on Table 4 -32; assumes five replicate samples per 20 samples
e. Total cost divided by 20 employees, rounded to the nearest dollar

Under the alternative option, EPA assumes that facilities would monitor all directly exposed workers and ONUs during each monitoring event, which would occur twice per year per facility. Table 4 -34 summarizes the resultant total annual monitoring costs.

Table 4-34: Alternative Option Annual Incremental Monitoring Costs (2023$)

Use category	Monitoring events [a]	Facility workers		Event cost [b]		Total annual cost [c]	
		Low	High	Low	High	Low	High
PV29 manufacturing and intermediate processing	2	58	78	$16,182	$21,762	$32,364	$43,524
PV29 importing	2	19	19	$5,301	$5,301	$10,602	$10,602
Processing into automotive paints and coatings	28	19	19	$5,301	$5,301	$148,428	$148,428
Processing into plastic and rubber products	12	39	39	$10,881	$10,881	$130,572	$130,572
Total	**44**					**$321,966**	**$333,126**

a. Number of facilities (Table 4 -13) times two monitoring events per year
b. Number of facility workers times $279 per worker (Table 4 -33)
c. Event cost times number of monitoring events

4.3.5 Engineering Controls

The proposed rule does not include any requirements for engineering controls. Under the alternative option, facilities would be required to use engineering controls to reduce concentrations the concentration of regulated PV29 in workplace air. This analysis assumes that facilities would reduce the concentration of respirable dust (measured by NIOSH 06000) to below the NIOSH 0600 limit of detection, which is 0.5 mg/m^3.

There are a variety of engineering approaches that facilities may leverage to control concentrations of airborne PV29, which may be broken out into four general categories:

1. Facility-wide systems, which filter and clean air throughout the entire facility (e.g. use of HEPA filters as part of facility heating, ventilation, and air conditioning (HVAC) systems);

2. Local systems, which clean the air in close proximity to the source of the dust (e.g. portable HEPA air filters);

3. Containment, which confines the dust to a fixed space (e.g. glove boxes or bags); and

4. Prevention, which stops the occurrence of airborne dust (e.g. dust extraction).

The costs of different controls vary widely depending on the facility configuration, existing filtration system specifics, frequency of use, and other factors.

Available concentration data from the PV29 manufacturing facility indicates that the average concentration of PV29 during active use is 0.37 mg/m^3, which is below the LOD for NIOSH 0600. As such, EPA expects that facilities would not incur any incremental engineering control costs due to the alternative option requirements.

4.4 Total Industry Costs

able 4 -35, Table 4 -36, Table 4 -37, and Table 4 -38 present the one-time and annually recurring total costs for the regulatory options. able 4 -39 presents the total annualized costs for the regulatory options. Total costs are annualized over 15 years using a two percent discount rate.

The present discounted value for the annualized value of the stream of costs for the 15-year analytical timeframe is estimated using a two percent discount rate. Costs are discounted back to the beginning of the 15-year period, as follows:

$$Present\ Discounted\ Value = \sum_{t=0}^{15} \frac{(Undiscounted\ Value)_t}{(1+2\%)^t} \qquad \text{Equation 4-1}$$

The present discounted value (PDV) costs are annualized as follows:

$$(Annualized\ COsts) = (PDV\ ¿¿\ 15\ year\ cost\ stream) * 2\% * ¿¿¿ \qquad \text{Equation 4-2}$$

Given these equations, the total annualized value can be calculated by multiplying one-time costs by 7.221 percent and recurring annual costs by 92.779 percent and then summing across all the annualized costs.

Table 4-35: Proposed Option Total Incremental One-Time Costs (2023$)

Use category	Familiar-ization	PPE		Labeling & Notification		Cleaning	Total	
		Low	High	Low	High		Low	High
PV29 manufacturing and intermediate processing	$93	$193,385	$259,865	$1,086	$1,216	$372	$194,936	$261,546
PV29 importing	$93	$64,257	$64,257	$0	$0	$372	$64,722	$64,722
Processing into automotive paints and coatings	$1,303	$899,601	$899,601	$0	$0	$5,212	$906,116	$906,116
Processing into plastic and rubber products	$558	$782,626	$782,626	$0	$0	$2,234	$785,418	$785,418
Recycling	$827,867	$0	$0	$0	$0	$0	$827,867	$827,867
Automotive painting (new vehicles)	$77,434	$0	$0	$0	$0	$0	$77,434	$77,434
Automotive refinishing	$3,159,474	$0	$0	$0	$0	$0	$3,159,474	$3,159,474
Disposal	$790,366	$0	$0	$0	$0	$0	$790,366	$790,366
Total	**$4,857,188**	**$1,939,869**	**$2,006,349**	**$1,086**	**$1,216**	**$8,190**	**$6,806,333**	**$6,872,943**

Table 4-36: Proposed Option Total Incremental Annual Recurring Costs (2023$)

Use category	PPE		Cleaning	Total	
	Low	High		Low	High
PV29 manufacturing and intermediate processing	$94,700	$127,240	$12,272	$106,972	$139,512
PV29 importing	$32,591	$32,591	$12,272	$44,863	$44,863
Processing into automotive paints and coatings	$456,277	$456,277	$171,808	$628,085	$628,085
Processing into plastic and rubber products	$386,033	$386,033	$73,632	$459,665	$459,665
Recycling	$0	$0	$0	$0	$0
Automotive painting (new vehicles)	$0	$0	$0	$0	$0
Automotive refinishing	$0	$0	$0	$0	$0
Disposal	$0	$0	$0	$0	$0
Total	**$969,601**	**$1,002,141**	**$269,984**	**$1,239,585**	**$1,272,125**

Table 4-37: Alternative Option Total Incremental One-Time Costs (2023$)

Use category	Familiarization	PPE		Cleaning	Engineering controls	Total	
		Low	High			Low	High
PV29 manufacturing and intermediate processing	$93	$593	$593	$372	$0	$1,058	$1,058
PV29 importing	$93	$1,101	$1,101	$372	$0	$1,566	$1,566
Processing into automotive paints and coatings	$1,303	$15,417	$15,417	$5,212	$0	$21,932	$21,932
Processing into plastic and rubber products	$558	$4,810	$4,810	$2,234	$0	$7,602	$7,602
Recycling	$827,867	$0	$0	$0	$0	$827,867	$827,867
Automotive painting (new vehicles)	$77,434	$0	$0	$0	$0	$77,434	$77,434
Automotive refinishing	$3,159,474	$0	$0	$0	$0	$3,159,474	$3,159,474
Disposal	$790,366	$0	$0	$0	$0	$790,366	$790,366
Total	**$4,857,188**	**$21,921**	**$21,921**	**$8,190**	**$0**	**$4,887,299**	**$4,887,299**

Table 4-38: Alternative Option Total Incremental Annual Recurring Costs (2023$)

Use category	PPE		Cleaning	Monitoring		Engineering Controls	Total	
	Low	High		Low	High		Low	High
PV29 manufacturing and intermediate processing	$334	$334	$12,272	$32,364	$43,524	$0	$44,970	$56,130
PV29 importing	$1,678	$1,678	$12,272	$10,602	$10,602	$0	$24,552	$24,552
Processing into automotive paints and coatings	$23,495	$23,495	$171,808	$148,428	$148,428	$0	$343,731	$343,731
Processing into plastic and rubber products	$5,315	$5,315	$73,632	$130,572	$130,572	$0	$209,519	$209,519
Recycling	$0	$0	$0	$0	$0	$0	$0	$0
Automotive painting (new vehicles)	$0	$0	$0	$0	$0	$0	$0	$0
Automotive refinishing	$0	$0	$0	$0	$0	$0	$0	$0
Disposal	$0	$0	$0	$0	$0	$0	$0	$0
Total	**$30,822**	**$30,822**	**$269,984**	**$321,966**	**$333,126**	**$0**	**$622,772**	**$633,932**

Table 4-39: Summary of Total Annualized Incremental Costs (2023$; 2% Discount Rate)

Use category	Proposed Option [b]		Alternative Option [c]	
	Low	High	Low	High
PV29 manufacturing and intermediate processing	$113,324	$148,324	$41,799	$52,153
PV29 importing	$46,297	$46,297	$22,892	$22,892
Processing into automotive paints and coatings	$648,161	$648,161	$320,495	$320,495
Processing into plastic and rubber products	$483,186	$483,186	$194,939	$194,939
Recycling	$59,777	$59,777	$59,777	$59,777
Automotive painting (new vehicles)	$5,591	$5,591	$5,591	$5,591
Automotive refinishing	$228,133	$228,133	$228,133	$228,133
Disposal	$57,069	$57,069	$57,069	$57,069
Total	**$1,641,538**	**$1,676,538**	**$930,695**	**$941,049**

a. Annualized over 15 years using a 2% discount rate; rounded to the nearest dollar.
b. Proposed option includes costs for rule familiarization, personal protective equipment, labeling and downstream notification, and cleaning.
c. Alternative option includes costs for rule familiarization, personal protective equipment, cleaning, monitoring, and engineering controls.

4.5 Unquantified Costs and Uncertainties

This economic analysis does not include quantified cost estimates for all costs under the options. Although certain costs cannot be quantified, this does not mean that they are less important than the quantified costs. This section discusses these unquantified costs qualitatively as well as other uncertainties in the cost estimates.

4.5.1 Estimated Numbers of Facilities Handling Regulated PV29

It is possible that the estimated number of regulated PV29 importers is underestimated because one or more importers are importing small enough volumes of regulated PV29 to be exempt from reporting the import of the chemical to CDR. It follows that there could also be downstream users of regulated PV29 that EPA is not including in the economic analysis.

4.5.2 Productivity Losses from PPE Use

In addition, there are likely to be unquantified costs associated with implementing a respirator program. Respirators have been found to interfere with many physiological and psychological aspects of task performance (Johnson 2016) and therefore likely reduce worker productivity or necessitate offering higher wages to workers who wear respirators. The extent of productivity reductions or higher wages to workers who must wear respirators is unknown, and therefore unquantified in this analysis. However, these costs may be significant.

4.5.3 Costs of PPE Requirements (Alternative Option)

Under the alternative option, EPA assumed that attaining 100 percent compliance with existing practices around PPE in affected facilities (i.e. the use of N95 masks) would be sufficient to comply with the PPE requirements (APF 10). It is possible that some workers may not be able to wear N95 masks and may require alternatives such as an air-purifying respirator at a higher unit cost. However, the extent to which this may occur is unknown. Additionally, since some level of PPE is already provided at the relevant facilities, workers may already have some baseline variation in the types of PPE used and as such the additional costs would not be attributable to the proposed rule.

4.5.4 Costs of Engineering Controls (Alternative Option)

Based on available monitoring data, EPA assumes that facilities handling PV29 have existing air concentrations below 0.5 mg/m^3 which is the LOD for the NIOSH 0600 test. Under the alternative option, facilities with concentrations above this level would need to use engineering controls to reduce the concentrations and conduct monitoring every three months rather than every six months. The costs associated with potential engineering controls are uncertain and depend on the specific facility configuration, the nature and frequency of worker exposures, available technological controls, and other factors. If some facilities have higher baseline concentrations than is reflected in the available exposure monitoring data, then they may need to employ facility-wide filtration systems, area-specific filtration controls, dust capture or removal equipment, or dust prevention or containment mechanisms.

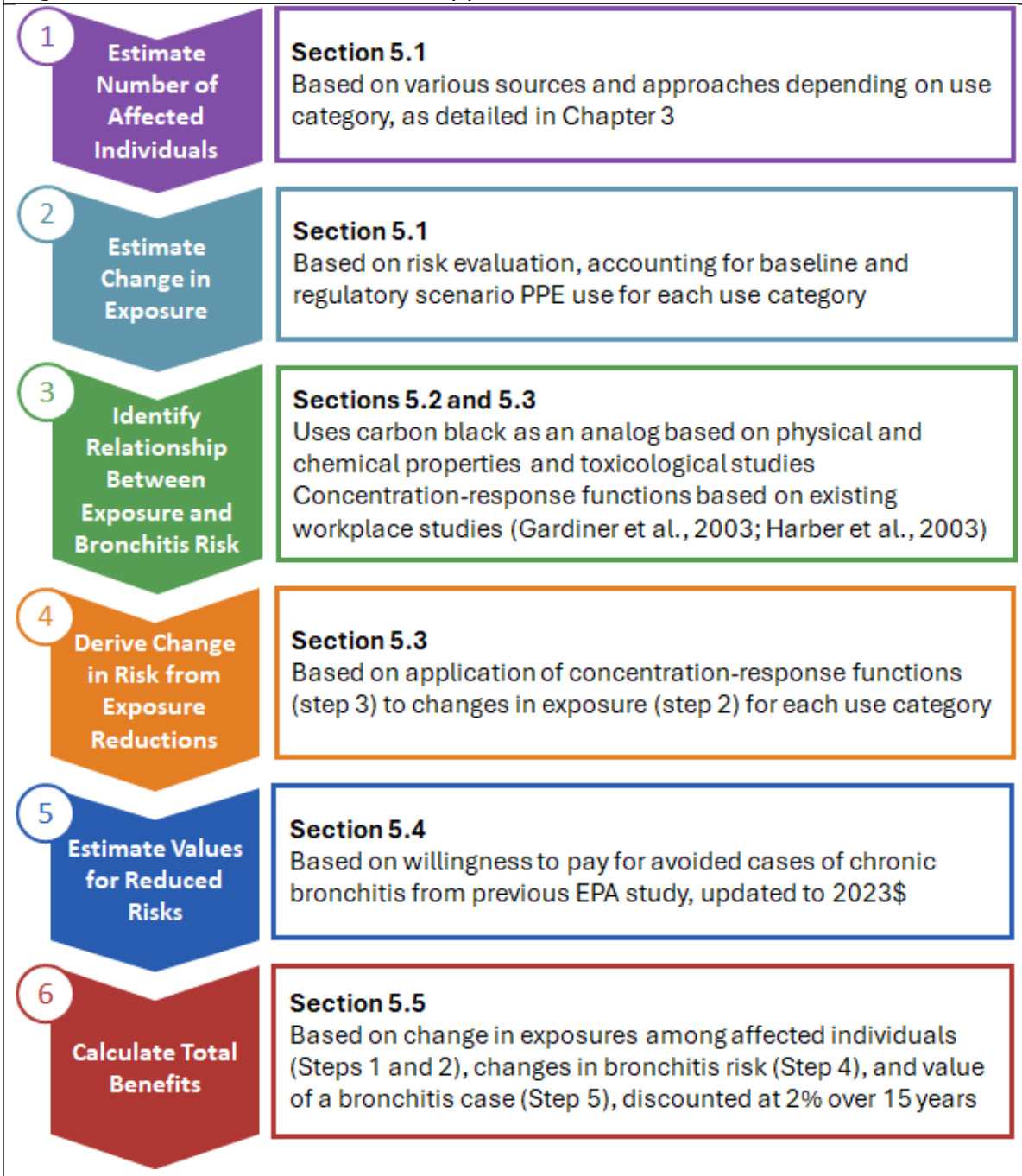
5. Benefits Analysis

This Chapter presents the monetized benefits estimates under the options. Chronic exposure to dry powder C.I. Pigment Violet 29 may increase lung burden which may result in kinetic lung overload, a pharmacokinetic phenomenon, which is not due to the overt toxicity of the chemical, but rather the possibility that C.I. Pigment Violet 29 dust overwhelms the lung clearance mechanisms over time. The inhalation toxicity data on the analogue carbon black demonstrated increased lung burden, alveolar hyperplasia, and inflammatory and morphological changes in the lower respiratory tract. These endpoints are not monetizable themselves, however there are occupational studies on carbon black that have found significant relationships between inhalable carbon black dust exposure and respiratory effects, including chronic bronchitis. Therefore, this analysis provides estimates to understand the magnitude of potential chronic bronchitis cases avoided from exposure reduction to PV29 as a result of the proposed rule. Effects of increased lung burden, alveolar hyperplasia, and inflammatory and morphological changes in the lower respiratory tract are not quantifiable or monetizeable due to data limitations on these effects. Therefore, to the extent that these result in health effects other than chronic bronchitis, this analysis underestimates the benefits of this proposed rule.

As described above in 4.1 and below in section 5.5, the timeline for the analysis is 15 years, and therefore benefits are annualized over 15 years of reduced exposure risks. Since the benefits in each year of reduced exposure risks are estimated to be the same, annualized benefits are not sensitive to the analysis timeframe.

The estimated benefits associated with reduced risk for chronic bronchitis are described in sections 5.1 through 5.5, following the approach outlined in Figure 5 -4. In addition, Figure 5 -5 in section 5.5 provides an example illustrating each step of the benefits calculations.

Figure 5-4: Overview of Benefits Approach



5.1 Number of Exposed Workers and Exposure Levels According to PPE Use

Table 5 -40 shows the number of exposed workers who may be exposed to regulated PV29 in the relevant use categories. EPA expects that these workers may experience decreased exposure to inhalable PV29 due to the requirements of the proposed rule.

Table 5-40: Number of Exposed Workers by Use Category

Use Category	Total workers			Baseline PPE use	
	Direct		ONUs	None	APF10
	Low	High			
PV29 manufacturing and intermediate processing	2	22	56	0%	100%
PV29 importing	14	14	5	25%	75%
Processing into automotive paints and coatings	196	196	70	25%	75%
Processing into plastic and rubber products	162	162	72	5%	95%
Total	**374**	**394**	**203**		
Note The gold shaded cells are referenced below in Figure 5 -5.					

Table 5 -41 summarizes the expected PV29 exposures for these workers based on three PPE scenarios. The incremental changes in exposure from the last three rows of Table 5 -41 are used in the benefits calculations. Benefits are calculated assuming 100 percent compliance with the proposed rule.

Table 5-41: Exposures based on PPE use (mg/m^3)

Scenario	Central tendency		High-end	
	Direct	ONUs	Direct	ONUs
No PPE	0.370	0.360	1.200	0.590
APF10	0.037	0.036	0.120	0.059
APF50	0.0074	0.0072	0.024	0.012
Incremental change from no PPE to APF 10	0.3330	0.3240	1.0800	0.5310
Incremental change from no PPE to APF 50	0.3626	0.3528	1.1760	0.5782
Incremental change from APF 10 to APF 50	0.0296	0.0288	0.0960	0.0472
Note The gold shaded cells are referenced below in Figure 5 -5.				

5.2 *Available Studies to Support Benefits Analysis*

In EPA's Risk Evaluation, no acceptable inhalation studies were identified for PV29, therefore, human health hazards were assessed using carbon black as an analogue. Carbon black and PV29 are both respirable pigments and have similar physical and chemical properties. EPA reviewed the available toxicological data and identified a key subchronic inhalation toxicity study of carbon black in rodents, which was used in the Risk Evaluation to assess the inhalation toxicity of PV29 for chronic exposures and non-cancer endpoints (Elder, Gelein et al. 2005).

For EPA's Risk Evaluation, the Elder, Gelein et al. (2005) study supplied a *no observed adverse effect concentration* (NOAEC) that was used as a point of departure (POD) for deriving the human equivalent concentration (HEC) for carbon black. This HEC was compared to occupational PV29 exposures to calculate margins of exposure (MOEs) in a variety of occupational use scenarios. Furthermore, Elder et al. measured physiological respiratory changes including increased lung burden, alveolar hyperplasia, inflammatory and morphological changes in the lower respiratory tract, which are generally not conducive to a benefits analysis.

As such, for this benefits analysis, EPA identified additional epidemiologic studies on carbon black exposures, and relevant physiological and histopathological changes in the respiratory system that may support the choice of endpoint for benefits analysis. Based on EPA's determination that the chemical is not likely carcinogenic (see the Risk Evaluation), studies on carbon black and cancer were excluded from the review. This yielded three occupational epidemiologic studies that are potentially relevant for benefits analysis.

5.2.1 Harber et al. (2003)

Harber, Muranko et al. (2003) reported the effects of carbon black exposure in 1,755 male workers from 22 North American plants. Exposures measured were recent (mg/m^3) and cumulative ($mg\text{-}year/m^3$) respirable, inhalable, and total carbon black dust. Health endpoints included measures of lung function from spirometry (forced expiratory volume in 1 second (FEV_1), forced vital capacity (FVC), forced expiratory flow ($FEF_{25\text{-}75\%}$)) and a medical questionnaire for respiratory symptoms (chronic bronchitis, chronic sputum, dyspnea). A "triangulation approach" was used to estimate cumulative exposures. The approach combined air level measurements from industry-wide air sampling surveys, a questionnaire assessing changes in production and exposure control technologies, and a scoring instrument used to rate relative exposures over time. These three methods were combined and linked to a job exposure matrix spanning four decades (1960 to 2000). Job histories were then linked to the job exposure matrix to estimate cumulative exposures for each worker. Recent exposure used only the most recent air sampling survey results collected in 2000 combined with job title and plant information.

Lung function analyses used multiple linear regression with continuous exposure variables. Analysis of symptoms obtained from questionnaires (e.g., chronic bronchitis) used categorical exposure (split into pentiles). Harber et al. observed significant exposure-response relationships between cumulative exposures to high carbon black levels, small reductions in FEV_1, and small increases in chronic bronchitis. For analysis of respiratory symptoms, workers were grouped in pentiles according to exposure; statistically significant relationships were only observed in non-smokers in the two highest pentiles compared to the lowest pentile. No significant associations were observed between recent exposure and respiratory effects, and no threshold effect was reported.

5.2.2 Gardiner et al. (2001)

Gardiner, van Tongeren et al. (2001) measured respiratory health effects from inhalable carbon black dust in 3,518 male workers in a multi-phase study with manufacturing facilities across Europe. This study reports the results from two phases of exposure data collection: Phase 2 from 1991-2 and Phase 3 from

1994-5. Results from Phase 1 of data collection, from 1987-9, were found to be less reliable and are not reported (Gardiner, Trethowan et al. 1992). The authors measured current exposure (mg/m^3) in addition to cumulative ($mg\text{-}month/m^3$) exposure, and health endpoints included lung function from spirometry (FEV_1, FVC, $FEF_{25\text{-}75\%}$, FEV_1/FVC) and self-reported respiratory symptoms (cough, sputum production, cough with sputum production, chronic bronchitis). Current exposures were estimated for each worker according to the mean exposure for the factory and for their job category (e.g., process operator, laboratory assistant). Cumulative exposures were calculated for each worker by combining job histories with mean exposures for the factory and job category.

Gardiner, van Tongeren et al. (2001) used multiple linear regression with continuous exposure variables for lung function endpoints. Analysis of symptoms obtained from questionnaires (e.g., chronic bronchitis) used logistic regression and continuous exposure variables. Significant exposure-response relationships were observed between carbon black exposure and all respiratory symptoms in at least one phase (Phase 2 or Phase 3) for both current and cumulative dust exposures. Consistently significant relationships were also observed across both phases for current and cumulative carbon black exposures and FEV_1, $FEF_{25\text{-}75\%}$, FEV_1/FVC, but not FVC. No threshold effect was reported.

5.2.3 Neghab et al. (2011)

Neghab, Mohraz et al. (2011) carried out a cross-sectional study in rubber factory in Iran on 72 male carbon black workers and a reference group of 69 unexposed office workers. The authors note workers did not wear respiratory protection in areas of the warehouse with heavy carbon black contamination, there were no local exhaust ventilation systems, and housekeeping programs were poor. Health endpoints measured were lung function from spirometry (vital capacity (VC), peak expiratory flow (PEF), FEV_1, FVC, FEV_1/FVC) and self-reported respiratory symptoms gathered from a medical questionnaire (cough, phlegm, productive cough, wheezing, dyspnea).

Lung function and respiratory symptoms analyses used either multiple linear or logistic regression with binary exposure variables (exposed/unexposed). Neghab, Mohraz et al. (2011) observed significant association between current exposure to carbon black and VC, FVC, FEV_1, FEV_1/FVC, and all respiratory symptoms. Mean atmospheric concentrations of carbon black were higher than the recommended occupational exposure limit ($3.5\ mg/m^3$). The mean level of inhalable carbon black dust was $6.2 \pm 1.7\ mg/m^3$ and respirable carbon black dust was $2.3 \pm 0.29\ mg/m^3$.

5.2.4 Study applicability

Based on the evidence from literature on physiological changes in the respiratory system, chronic bronchitis and chronic obstructive pulmonary diseases (COPD) have underlying inflammatory conditions (Jeffery 2001; Saetta, Turato et al. 2000) similar to those found in the carbon black toxicity studies utilized in the Risk Evaluation, including inflammatory and morphological changes in the lower respiratory tract (Elder, Gelein et al. 2005; Nikula, Snipes et al. 1995). It is highly likely that the physiological changes seen as a result of exposure to carbon black in toxicity studies also cause changes in lung function in humans and are therefore associated with chronic bronchitis, and other COPD-type symptoms.

Mean inhalable carbon black concentrations from the three studies are presented in Table 5 -42. Current inhalable dust exposures in the Gardiner et al. and Harber et al. studies fall within a similar range as the C.I. Pigment Violet 29 air concentrations given in the Risk Evaluation ($0.37\ mg/m^3$ for the central estimate and $1.2\ mg/m^3$ for the high end; see Table 5 -41). However, the mean in Harber et al. is slightly higher than the high-end value in the Risk Evaluation, and the ranges in both Gardiner et al. and Harber et al. are wider than concentrations noted in the Risk Evaluation.

Table 5-42: Mean inhalable carbon black exposure level in reviewed occupational studies

Study		Current inhalable dust (mg/m³)	Cumulative inhalable dust (mg-year/m³)
Gardiner et al. (2001)	Phase 2	0.77 (0.07 – 7.41)	22 (0.05 – 286.1)*
	Phase 3	0.57 (0.11 – 3.26)	20.5 (0.08 – 292.2)*
Harber et al. (2003)		1.4 (0.1 – 9.2)	48.4 (0.2 – 415.8)
Neghab et al. (2011)		6.2 (4.5 – 7.9)	NA
* Value converted from mg-month/m^3 to mg-year/m^3.			

Neghab, Mohraz et al. (2011) compared exposed workers to unexposed office workers using a binary exposure variable and only provides enough information for responses at a single dose rather than a dose-response function with a continuous exposure variable. As such, this study is excluded from the remainder of the benefits analysis.

However, Harber et al. and Gardiner et al. both provide enough information to estimate continuous dose-response functions for carbon black dusts and respiratory effects based on cumulative long-term exposures (mg-month/m^3 or mg-year/m^3).

5.3 Dose-Response Functions for Chronic Bronchitis from Regulated PV29 Exposure

Health endpoints associated with unreasonable risk in the Risk Evaluation included increased lung burden, alveolar hyperplasia, and inflammatory and morphological changes in the lower respiratory tract. These endpoints are also not monetizable themselves; however, respiratory symptoms measured in the occupational studies have already been assessed as part of other EPA efforts including *The Benefits and Costs of the Clean Air Act from 1990 to 2020* (EPA 2011). Medical surveillance questionnaires were administered to participants in all studies discussed above and were designed to collect respiratory symptom information related to COPD. Chronic bronchitis, a type of COPD, is measured in both Harber et al., and Gardiner et al.[17] and costs associated with preventing morbidity from chronic bronchitis are available in EPA (2011).

5.3.1 Gardiner et al. (2001)

Following Gardiner et al. (2001), EPA estimated the avoided cases of chronic bronchitis using Equation 5 -3 (Also see Appendix C of EPA's (2023) BenMap User Manual):

Equation 5-3: $$\Delta y = y_0\left(1-\frac{1}{\exp\left(\beta \times \Delta PV29\right)}\right) \times population$$

Where:

Δy = change in cases of chronic bronchitis per year

y_0 = baseline rate of chronic bronchitis (3.6% (American Lung Association 2024))

β = Beta estimate from Gardiner et al. (2001) (ln(1.8) or 0.5878)

$\Delta PV29$ = Reduction in PV29 exposure under the regulatory option (mg-year/m^3)

[17] **One limitation to note is that these studies measure effects in male workers; female workers were either absent or were excluded from the analyses due to small numbers; as such, there is uncertainty regarding the applicability of the resultant dose-response functions to female workers.**

$population$ = number of workers or ONUs in the population of interest

5.3.2 Harber et al. (2003)

Following Harber et al. (2003), EPA derived a dose-response function based on chronic bronchitis symptoms reported in pentiles for inhalable dust for males who never smoked.

Equation 5-4: $\Delta y = \beta \times \Delta PV29 \times population$

Where:

Δy = change in cases of chronic bronchitis per year

β = Beta estimate from Harber et al. (2003) (β = 0.0085964)

$\Delta PV29$ = Proposed reduction in PV29 exposure (mg-year/m^3)

$population$ = number of workers or ONUs in the population of interest

To derive β from the categorical data provided by Harber et al. (2003), EPA first calculated odds ratios (ORs) using pentile 1 as the nonexposed group, resulting in four ORs for the 2nd, 3rd, 4th, and 5th pentiles (Gordis 2009; Rosner 2011), as shown in Equation 5 -5.

Equation 5-5: $$Odds\,ratio(¿) = \frac{odds\,of\,developing\,disease \in exposed}{odds\,of\,developing\,disease \in the\,unexposed} = \frac{\left(\frac{p_{\exp}}{1-p_{\exp}}\right)}{\left(\frac{p_{unexp}}{1-p_{unexp}}\right)}$$

Where:

$p_{\exp}$ = percentage of workers reporting chronic bronchitis symptoms in exposure pentiles 2 to 5

p_{unexp} = percentage of workers reporting chronic bronchitis symptoms in exposure pentile 1 (the reference group)

Based on a total sample of 609, EPA assumed that the number of workers in each of the five exposure groups is 122 and calculated the 95% confidence intervals for the ORs using Equation 5 -6.

Equation 5-6: $$95\%CI = e^{\ln(¿) \pm 1.96\sqrt{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}}}$$

Where:

a = percentage of workers reporting chronic bronchitis symptoms in exposure pentiles 2 to 5 multiplied by the sample size of the exposure group

b = percentage of workers not reporting chronic bronchitis symptoms exposure pentiles 2 to 5 multiplied by the sample size of the exposure group

c = percentage of workers reporting chronic bronchitis symptoms in exposure pentile 1 (the reference group) multiplied by the sample size of the exposure group

d = percentage of workers not reporting chronic bronchitis symptoms in exposure pentile 1 (the reference group) multiplied by the sample size of the exposure group

Table 5 -43 shows the resulting ORs and 95% confidence intervals.

Table 5-43: Odds ratios and 95% Confidence Intervals Derived from Harber et al. (2003)

Exposure category (pentile compared to 1st pentile)	2nd	3rd	4th	5th
OR (95% CI)	1.21 (0.40, 3.66)	0.79 (0.23, 2.68)	2.11 (0.77, 5.78)	1.88 (0.68, 5.23)

Finally, EPA used Equation 5 -7 and Equation 5 -8 to calculate beta of 0.0086 for Harber et al. (2003).

Equation 5-7: $$\beta = \frac{\sum_{j=2}^{n} w_j x_j ¿_j - \sum_{j=2}^{n} w_j x_j}{\sum_{j=2}^{n} w_j x_j^{\,2}}$$

Where:

j = the exposure category

w_j = weight for the jth exposure category (Equation 5 -8)

x_j = average carbon black exposure for the jth exposure category (mg-year/m^3)

$¿_j$ = odds ratio for the jth exposure category

Equation 5-8: $$Weight(w) = ¿_j^2 \times \left[\frac{\ln(¿_{j(upper)}) - \ln(¿_{j(lower)})}{2 \times 1.96}\right]^2$$

Where:

$¿$ = odds ratio

$¿_{j(upper)}$ = 95% upper bound on the OR estimate for the jth exposure category

$¿_{j(lower)}$ =95% lower bound on the OR estimate for the jth exposure category

5.3.3 Summary of Avoided Cases

Table 5 -44 summarizes the expected reduction in the number of chronic bronchitis cases each year due to the requirements of the proposed rule (i.e. use of APF 50 or higher PPE for all workers and ONUs), based on the exposures described in section 5.1 and the dose-response functions described in Sections 5.3.1 and 5.3.2. Table 5 -45 shows the number of avoided cases per year under the alternative option, which reflect exposure reductions that are equivalent to what can be achieved by the use of APF 10 respirators.

Table 5-44: Number of Avoided Cases Per Year under the Proposed Option

Use Category	Direct		ONUs	Total	
	Low	High		Low	High
Based on Gardiner					
PV29 manufacturing and intermediate processing	0.0012	0.0137	0.0338	0.0351	0.0475
PV29 importing	0.0307	0.0307	0.0107	0.0414	0.0414
Processing into automotive paints and coatings	0.4299	0.4299	0.1497	0.5796	0.5796
Processing into plastic and rubber products	0.1515	0.1515	0.0656	0.2171	0.2171
Total	**0.6134**	**0.6258**	**0.2599**	**0.8732**	**0.8856**
Based on Harber					
PV29 manufacturing and intermediate processing	0.0005	0.0056	0.0139	0.0144	0.0195
PV29 importing	0.0136	0.0136	0.0047	0.0183	0.0183
Processing into automotive paints and coatings	0.1901	0.1901	0.0661	0.2562	0.2562
Processing into plastic and rubber products	0.0644	0.0644	0.0279	0.0923	0.0923
Total	**0.2686**	**0.2737**	**0.1125**	**0.3811**	**0.3862**
Note The gold shaded cells are referenced below in Figure 5 -5.					

Table 5-45: Number of Avoided Cases Per Year under the Alternative Option

Use Category	Direct		ONUs	Total	
	Low	High		Low	High
Based on Gardiner					
PV29 manufacturing and intermediate processing	-	-	-	-	-
PV29 importing	0.0224	0.0224	0.0078	0.0302	0.0302
Processing into automotive paints and coatings	0.3136	0.3136	0.1092	0.4228	0.4228
Processing into plastic and rubber products	0.0518	0.0518	0.0225	0.0743	0.0743
Total	**0.3878**	**0.3878**	**0.1395**	**0.5273**	**0.5273**
Based on Harber					
PV29 manufacturing and intermediate processing	-	-	-	-	-
PV29 importing	0.0100	0.0100	0.0035	0.0135	0.0135
Processing into automotive paints and coatings	0.1403	0.1403	0.0487	0.1890	0.1890
Processing into plastic and rubber products	0.0232	0.0232	0.0100	0.0332	0.0332
Total	**0.1735**	**0.1735**	**0.0622**	**0.2357**	**0.2357**

5.4 *Value of Avoided Cases of Chronic Bronchitis*

EPA (1999) provides a value of $260,000 (1990 $) for each case of chronic bronchitis. To apply this value to the avoided cases attributable to the proposed regulation, EPA updated the value, adjusting for inflation using the Consumer Price Index (CPI) (Bureau of Labor Statistics 2024a) and then adjusted for income growth using real GDP per capita (retrieved from the Federal Reserve Bank of St. Louis) and an income elasticity of 0.45,[18] which yielded a value of $766,000 per case of chronic bronchitis.

5.5 *Summary of Estimated Benefits*

Table 5 -46 and Table 5 -47 show the total annual and annualized benefits of avoided cases of chronic bronchitis under the proposed rule and the alternative option, respectively. The low end represents the

[18] **Specifically, the CPI increased by 133 percent between 1990 and 2023, while the GDP per capita increased by 68 percent. EPA calculated the updated value of a case as $260,000 x 1.33 x 0.68^0.45, rounded to the nearest thousand dollars.**

lower number of exposed workers together with the avoided cases derived from Harber et al. while the high end represents the higher number of exposed workers and avoided cases derived from Gardiner et al.

Since the benefits in each year of reduced exposure risks are estimated to be the same, annualized benefits are not sensitive to the analysis timeframe, which is 15 years. The present discounted value for the annualized value of the 15-year stream of benefits is estimated using a two percent discount rate. Benefits are discounted back to the beginning of the 15-year period, as follows:

$$Present\ Discounted\ Value = \sum_{t=0}^{15} \frac{(Undiscounted\ Value)_t}{(1+2\%)^t}$$ Equation 5-9

The present discounted value (PDV) benefits are annualized as follows:

$$(Annualized\ Benefits) = (PDV\ ¿¿\ 15\ year\ benefit\ stream) * 2\% * ¿¿¿$$ Equation 5-10

Given these equations, an annualized value can be calculated from the recurring annual benefit estimate by multiplying it by 92.779 percent.

Table 5-46: Option 1 (Proposed) Total Annualized Benefits (2% discount; 2023$)

Use Category	Exposure Type	Avoided cases [a]		Annual benefits [b]		Total annualized benefits	
		Low	High	Low	High	Low	High
PV29 manufacturing and intermediate processing	Worker	0.0005	0.0137	$390	$10,464	$362	$9,708
	ONU	0.0139	0.0338	$10,620	$25,922	$9,853	$24,050
	Subtotal	**0.0144**	**0.0475**	**$11,010**	**$36,385**	**$10,215**	**$33,758**
PV29 importing	Worker	0.0136	0.0307	$10,403	$23,520	$9,652	$21,822
	ONU	0.0047	0.0107	$3,615	$8,191	$3,354	$7,600
	Subtotal	**0.0183**	**0.0414**	**$14,018**	**$31,712**	**$13,006**	**$29,422**
Processing into automotive paints and coatings	Worker	0.1901	0.4299	$145,648	$329,285	$135,131	$305,509
	ONU	0.0661	0.1497	$50,611	$114,680	$46,957	$106,399
	Subtotal	**0.2562**	**0.5796**	**$196,259**	**$443,965**	**$182,088**	**$411,908**
Processing into plastic and rubber products	Worker	0.0644	0.1515	$49,337	$116,075	$45,775	$107,693
	ONU	0.0279	0.0656	$21,335	$50,253	$19,794	$46,625
	Subtotal	**0.0923**	**0.2171**	**$70,672**	**$166,328**	**$65,569**	**$154,318**
Total		**0.3811**	**0.8856**	**$291,959**	**$678,391**	**$270,878**	**$629,407**

a. Low estimate based on Harber; high estimate based on Gardner.
b. Number of avoided cases time $766,000, the value of a case of chronic bronchitis.
Note The gold shaded cells are referenced below in Figure 5 -5.

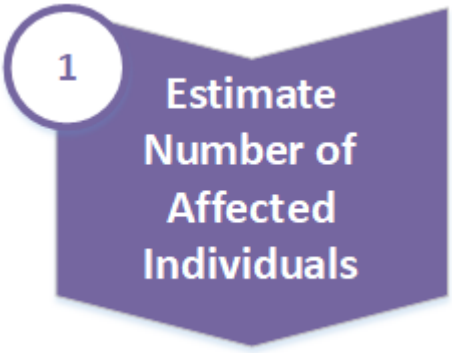
Table 5-47: Option 2 (Alternative) Total Annualized Benefits (2% discount; 2023$)

Use Category	Exposure Type	Avoided cases [a]		Annual benefits [b]		Total annualized benefits	
		Low	High	Low	High	Low	High
PV29 manufacturing and intermediate processing	Worker	-	-	-	-	-	-
	ONU	-	-	-	-	-	-
	Subtotal	-	-	-	-	-	-
PV29 importing	Worker	0.0100	0.0224	$7,675	$17,157	$7,120	$15,919
	ONU	0.0035	0.0078	$2,667	$5,977	$2,474	$5,546
	Subtotal	**0.0135**	**0.0302**	**$10,341**	**$23,135**	**$9,595**	**$21,464**
Processing into automotive paints and coatings	Worker	0.1403	0.3136	$107,445	$240,205	$99,687	$222,860
	ONU	0.0487	0.1092	$37,336	$83,683	$34,640	$77,640
	Subtotal	**0.1890**	**0.4228**	**$144,781**	**$323,887**	**$134,327**	**$300,501**
Processing into plastic and rubber products	Worker	0.0232	0.0518	$17,761	$39,707	$16,479	$36,840
	ONU	0.0100	0.0225	$7,681	$17,215	$7,126	$15,972
	Subtotal	**0.0332**	**0.0743**	**$25,442**	**$56,922**	**$23,605**	**$52,812**
Total		**0.2357**	**0.5273**	**$180,564**	**$403,944**	**$167,526**	**$374,777**

a. Low estimate based on Harber; high estimate based on Gardner.
b. Number of avoided cases time $766,000, the value of a case of chronic bronchitis.

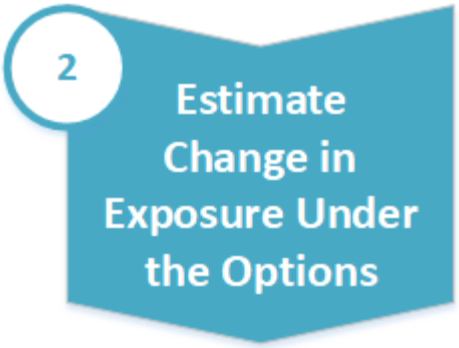
Figure 5 -5 walks through an example of the benefits calculation for the 2% annualized benefits under Option 1 for direct workers in the *processing for automotive paints and coatings* use category. The numbers referenced in the example can be identified in the tables above in the cells with gold shading.

Figure 5-5: Example Calculations for the Option 1 2% 15-Year Annualized Values of $135,131 and $305,509 for direct workers in the *processing for automotive paints and coatings* use category



Section 5.1 (see Table 5 -40)

- The *processing into automotive paints and coatings* use category is estimated to include 196 workers with direct contact with PV29.



Section 5.1 (see Table 5 -40 and Table 5 -41)

- 25% of workers are estimated to have a baseline exposure of 0.37 mg/m^3 (representing no PPE use); 75% of workers are estimated to have a baseline exposure of 0.037 mg/m^3 (representing APF 10 PPE use); Under the proposed option, workers are estimated to have an exposure of 0.0074 mg/m^3 (representing APF 50 PPE use).
- The reduction in PV29 exposure is estimated to be 0.3626 mg/m^3 (=0.37 – 0.0074) for the 25% of workers not using PPE in the baseline and 0.0296 mg/m^3 (=0.037 – 0.0074) for the 75% of workers using APF 10 respirators in the baseline.

Section 5.2 and 5.3

- Equation 5-1 relates chronic bronchitis risk to exposure based on Gardiner et al. (2001), β = 0.5878 and baseline incidence = 3.6%.
- Equation 5-2 relates chronic bronchitis risk to exposure based on Harber et al. 2003, β = 0.0086.

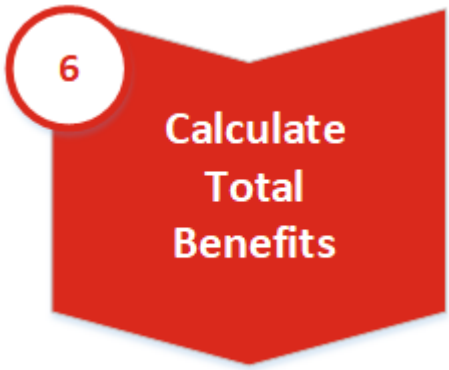
Figure 5-5: Example Calculations for the Option 1 2% 15-Year Annualized Values of $135,131 and $305,509 for direct workers in the *processing for automotive paints and coatings* use category

Section 5.3 (see Table 5 -44)

- The Gardiner estimate of 0.4299 cases avoided is calculated using Equation 5-1, the parameters specified in section 5.3.1, the changes in exposure of 0.3626 and .0296 mg/m^3 from step 2 (weighted by 25% and 75%, respectively), and the 196 workers from step 1.
- The Harbor estimate of 0.1901 cases avoided is calculated using Equation 5-2, the parameters specified in section 5.3.2, the changes in exposure of 0.3626 and .0296 mg/m^3 from step 2 (weighted by 25% and 75%, respectively), and the 196 workers from step 1.

Section 5.4

- Based on a WTP estimate, the value for a statistical case of chronic bronchitis is estimated to be $766,000 in 2023$.



Section 5.5 (see Table 5 -46)

- The Gardiner (high) annual benefit estimate of $329,285 is estimated as the product of the 0.4299 (0.429876) cases avoided from step 4 and the $766,000 value per case avoided from step 5.
- The Harbor (low) annual benefit estimate of $145,648 is estimated as the product of the 0.1901 (0.1901404) cases avoided from step 4 and the $766,000 value per case avoided from step 5.
- The 2% annualized benefits of $135,131 and $305,509 are calculated by multiplying the annual benefits from the previous two bullets by 92.7794 percent.

6. Comparison of Costs and Benefits and Monetized Net Benefits

This chapter presents estimates for the monetized net benefits and the estimated cost-effectiveness of the proposed regulatory options. Monetized net benefits are estimated by subtracting the total annualized cost of the options (see Chapter 4.) from the total annualized monetized benefits (see Chapter 4.5.1). Total monetized costs reflect costs of compliance with the options. Total monetized benefits reflect the benefits of reduced risks for chronic bronchitis.

Table 6 -48 presents the net benefits estimated using the 2 percent discount rate.

Table 6-48: Summary of Net Benefits by Option (2% discount; 2023$)

Regulatory Option	Annualized costs		Annualized benefits		Annualized net benefits	
	Low	High	Low	High	Low	High
Option 1 (Proposed)	$1,641,538	$1,676,538	$270,878	$629,406	($1,370,660)	($1,047,132)
Option 2 (Alternative)	$930,695	$941,049	$167,526	$374,777	($763,169)	($566,272)

In addition to analyzing the net benefits, EPA is required to consider the cost effectiveness of the options. Cost effectiveness is a method of comparing certain actions in terms of the expense per item of interest or goal. A goal of this regulatory action is to reduce exposure to regulated PV29. This analysis estimates that such exposure results in chronic bronchitis cases. Table 6 -49 summarizes the estimated cost-effectiveness of the regulatory options, which are estimated as the cost per avoided case of chronic bronchitis.

Table 6-49: Summary of Cost Effectiveness by Option (annualized costs using 2% discount rate; 2023$)

Regulatory Option	Annualized costs		Avoided cases of Chronic Bronchitis		Cost per avoided case	
	Low	High	Low	High	Low	High
Option 1 (Proposed)	$1,641,538	$1,676,538	0.381	0.886	$4,306,834	$1,893,051
Option 2 (Alternative)	$930,695	$941,049	0.236	0.527	$3,948,247	$1,784,512

The proposed rule costs an estimated $1.9-$4.3 million per potential bronchitis case avoided while the alternative option costs an estimated $1.8-$3.9 million per potential bronchitis case avoided using annualized costs for the 2 percent discount rate. Thus, Option 1 has a higher, but similar, cost per case of chronic bronchitis avoided compared to Option 2, making both options similar in terms of cost-effectiveness.

able 6 -50 presents the undiscounted stream of annual costs, benefits, and net benefits over the 15-year analytical timeframe. Note that year “0” costs are the initial costs and year “1” costs are recurring costs incurred in the first year.

Table 6-50: 15-Year Stream of Annual Undiscounted Costs, Benefits, and Net Benefits (millions, 2023$)

Year	Costs				Benefits				Net Benefits			
	Low Estimate		High Estimate		Low Estimate		High Estimate		Low Estimate		High Estimate	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
0	$6.8	$4.9	$6.9	$4.9	-	-	-	-	($6.8)	($4.9)	($6.9)	($4.9)
1	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
2	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
3	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
4	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
5	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
6	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
7	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
8	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
9	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
10	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
11	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
12	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
13	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
14	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)
15	$1.2	$0.6	$1.3	$0.6	$0.29	$0.18	$0.68	$0.40	($0.9)	($0.4)	($0.6)	($0.2)

7. Economic Impact Analyses

In addition to the cost analysis presented in Chapter 4., several other types of impacts are important to consider in evaluating the effects of a regulation. This chapter presents the incremental impact of the rule on:

- The environmental health risk or safety risk to children due to the regulation, as required by Executive Order 13045–Protection of Children from Environmental Health & Safety Risks (Section 7.1);
- Small Entities, as required by the Regulatory Flexibility Act (RFA) of 1980, amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 (Section 7.2);
- Employment Impact Analysis (Section 7.3);
- Paperwork burden, as required by the Paperwork Reduction Act (Section 7.4);
- State and Local Governments, as required by the Unfunded Mandates Reform Act (Section 7.5);
- Environmental Justice, as required by Executive Order 12898–Environmental Justice (Section 7.6);
- Impacts on Technological Innovation and the National Economy (Section 7.7);
- Federalism, as required by Executive Order 13132 (Section 7.8); and
- Tribal Governments, as required by Executive Order 13175 (Section 7.9).

7.1 Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045 applies if the regulatory action is a significant regulatory action under section 3(f)(1) of Executive Order 12866 and concerns an environmental health risk or safety risk that may disproportionately affect children. Although this action concerns an environmental health risk or safety risk that may disproportionately affect children, it is not subject to Executive Order 13045 because it is not a significant regulatory action under section 3(f)(1) of Executive Order 12866 (costs are less than $200 million).

7.2 Small Entity Impacts

The Regulatory Flexibility Act (RFA) of 1980, amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, requires regulators to assess the effects of regulations on small entities including businesses, nonprofit organizations, and governments. In some instances, agencies are also required to examine regulatory alternatives that may reduce adverse economic effects on significantly impacted small entities. The RFA requires agencies to prepare an initial and final regulatory flexibility analysis for each rule unless the Agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. The RFA, however, does not specifically define “a significant economic impact on a substantial number” of small entities. Sections 603 and 604 of the RFA require that regulatory flexibility analyses identify the types and numbers of small entities to which the rule would apply, describe the rule requirements to which small entities would be subject, and describe any regulatory alternatives, including exemptions and deferral, which would lessen the rule’s burden on small entities. Under the Regulatory Flexibility Act (RFA), the definition of a “small business” is determined by the U.S. Small Business Administration’s regulations at 13 CFR 121.201 (which create small business size standards using either a sales or employment threshold, depending on the nature of the industry), unless an agency establishes an alternate definition.

To fulfill the requirements of the RFA, this analysis addresses two basic questions regarding the rule: (1) the number and type of small entities potentially affected, and (2) the extent of the rule's potential economic impact on those entities as measured by the cost-to-revenue ratio. This ratio is a good measure of entities' ability to afford the costs attributable to a regulatory requirement because comparing compliance costs to revenues or expenses provides a reasonable indication of the magnitude of the regulatory burden relative to a commonly available measure of economic activity. Where regulatory costs represent a small fraction of a typical entity's revenues or expenses, the financial impacts of the regulation on such entities may be considered as not significant.

7.2.1 Estimated Number of Affected Small Entities

For use categories where some company names of affected entities were known, data on the NAICS, employment, and revenue for entities with potential impacts was retrieved from the Dun & Bradstreet (2024) data. These data were compared against SBA's small business thresholds (SBA 2023) to determine which entities were small. For other uses where names of the specific companies are not known, county business patterns data by employment and enterprise receipt size is used to estimate the number of small entities.

Industries with Some Known Individual Affected Entities

Table 7 -51 presents the estimated total number of affected entities and the estimated number of affected entities defined as small businesses for the industries where Dun & Bradstreet (2024) data for known affected entities was used to make the small business determinations.

Table 7-51: Data for Identifying Small Entities for Known Facilities Affected by the Proposed Regulation

Parent Company [a]					SBA Threshold		Small
Name	Revenues (millions)	Employees	NAICS	NAICS Description	Revenues (millions)	Employees	
Axalta Coating Systems Ltd.	$5,180	13,000	325510	Paint and Coating Manufacturing	-	1,000	No
PPG Industries, Inc.	$18,250	53,000	325510	Paint and Coating Manufacturing	-	1,000	No
Sherwin-Williams	$23,050	64,088	325510	Paint and Coating Manufacturing	-	1,000	No
Kansai Paint Co, Ltd.	$3,900	16,844	325510	Offices of Other Holding Companies	$45.5	-	No
Akzo Nobel N.V.	$11,530	35,100	551112	Paint and Coating Manufacturing	-	1,000	No
Wuthelam Holdings Limited	$17	35,000	424950	Paint, Varnish, and Supplies Merchant Wholesalers	-	150	No
Lindéngruppen AB	$91	10	561499	All Other Business Support Services	$21.5	-	No
BASF SE	$74,490	111,590	325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	-	650	No
DIC Group	$7,400	22,255	325910	Printing Ink Manufacturing	-	750	No

Source: Dun & Bradstreet (2024) data
a. DIC is in the PV29 manufacturing and intermediate processing use category; BASF SE is in the PV29 importing and processing into automotive paints and coatings category; all others are in the processing into automotive paints and coatings category.

Industries without Known Individual Affected Entities

Statistics of U.S. Businesses (SUSB) data by enterprise receipt size (U.S. Census Bureau 2021) and by employment size (U.S. Census Bureau 2023) is used to estimate the number of small entities in the use categories without known individual affected entities. Since the U.S. Census Bureau (2021) SUSB data reflects 2017 receipts, they were inflated to 2023$ using the GDP deflator (BEA 2024b).

Table 7 -52 presents the applicable small business size thresholds, the number of affected facilities, the percentage of facilities estimated to be small, and the percentages and numbers of affected small businesses.

Table 7-52: Identification of Small Businesses for Industries with Unknown Affected Facilities

Use Category	NAICs	Industry	SBA Threshold		Affected U.S. Facilities[1]	Affected Small Businesses	
			Revenues (millions)	Number of Employees		Percent	Number
Processing into plastic and rubber products	325211	Plastics Material and Resin Manufacturing	-	1,250	4.36	91%	-
	325991	Custom Compounding of Purchased Resins	-	600	1.64	88%	-
		Subtotal			***6***	***90%***	***5***
Automotive painting (new vehicles)	336111	Automobile Manufacturing	-	1,500	154	89%	-
	336112	Light Truck and Utility Vehicle Manufacturing	-	1,500	49	75%	-
	336211	Motor Vehicle Body Manufacturing	-	1,000	629	94%	-
		Subtotal			***832***	***92%***	***763***
Recycling	423140	Motor Vehicle Parts (Used) Merchant Wholesalers	-	125	1,412	97%	-
	423930	Recyclable Material Merchant Wholesalers	-	125	6,317	97%	-
	562920	Materials Recovery Facilities	$25	-	1,013	89%	-
		Subtotal			***8,742***	***96%***	***8,412***
Disposal	221320	Sewage Treatment Facilities	$35	-	366	92%	-
	562111	Solid Waste Collection	$47	-	7,039	98%	-
	562212	Solid Waste Landfill	$47	-	689	94%	-
	562213	Solid Waste Combustors and Incinerators	$47	-	27	70%	-
	562219	Other Nonhazardous Waste Treatment and Disposal	$47	-	225	94%	-
		Subtotal			***8,346***	***97%***	***8,094***
Automotive refinishing	**811121**	***Automotive Body, Paint, and Interior Repair and Maintenance***	***$9***	-	***31,728***	***98%***	***31,117***

[1]The estimated number of affected facilities in each use category is described in section 3.1 and is distributed to the affected NAICS according to the overall relative numbers of firms in each NAICS.
Sources: U.S. Census Bureau 2021; U.S. Census Bureau 2023; BEA 2024b; SBA 2023.

Summary of Affected Small Entities by Use Category

Table 7-53 presents a summary of the numbers of affected small entities (see Table 7-51 and Table 7-52).

Table 7-53: Summary of Small Businesses by Use Category

Use Category	NAICs codes	Affected facilities	Affected small facilities
PV29 manufacturing	325910	1	0
PV29 importing	325998	1	0
Processing into automotive paints and coatings	325510	14	0
Processing into plastic and rubber products	325211; 325991	6	5
Recycling	423140; 23930; 562920	8,742	8,412
Automotive painting (new vehicles)	336111; 36112; 336211	832	763
Automotive refinishing	811121	31,728	31,117
Disposal	221320; 62111; 562212; 562213; 562219	8,346	8,094
Total		**49,670**	**48,391**
Sources: See Table 7-51 and Table 7-52.			

7.2.2 Costs, Revenues and Cost-Revenue Ratios for Affected Small Entities

Table 7-54 presents a summary of the estimated cost impacts and cost-revenue impact ratios for the affected small businesses. To calculate the cost-revenue ratios, annualized costs per firm were compared with revenues for firms in the affected NAICS.

To estimate revenues for affected firms, EPA used the U.S. Census Bureau (2021) county business patterns data by enterprise receipt size. Since the U.S. Census Bureau (2021) reflects 2017 receipts, they were inflated to 2023$ using the GDP deflator (BEA 2024b). A revenue distribution was estimated from these data using the number of firms by revenue bracket and assuming that revenues are distributed uniformly within each revenue bracket. Affected small firms are assumed to have revenues that are no smaller than the fully loaded salaries for the number of workers for which costs are assumed to be incurred. This is a conservative assumption in that the assumed minimum revenue is likely to be lower than the revenue of a firm with the number of employees for which we are including costs for (i.e., revenues at viable firms need to be higher than payroll costs). This is shown in Table 7-54 as the revenue floor.

About 29 percent of the firms in NAICS 325211 and 325991 (the NAICS for the *processing into plastic and rubber products* use) with revenues above the revenue floor are estimated to have revenues that are less than $8,053,100, and therefore about 2 of the 6 the *processing into plastic and rubber products* small firms are estimated to have cost impacts that are between 1 and 3 percent of their revenues. All other cost-revenue impacts are estimated to be less than 1 percent of revenues.

Note that estimating the revenue distribution by assuming that revenues can be as low as the fully loaded salaries of the affected employees likely results in an overstatement of the cost-revenue impacts. According to RMA Statement Studies industry benchmark data (RMA 2018, 2019)[19], the ratio of sales to operating costs, of which payroll is only a portion of, is higher than 3 to 1. If the analysis had used a revenue floor of three times the fully loaded salaries of the affected employees, there would be no estimated cost-revenue impacts above 1 percent.

[19] **The most recent Statement Study with benchmark data for firms with revenues between 2 and 10 million are from 2018 and 2019 for NAICS 325211 and 32599, respectively.**

Table 7-54: Costs and Cost-Revenue Ratios for Affected Small Firms

Use Category	Affected small firms	Revenue floor	Annualized costs per facility (high)	Number of Firms by Cost-Revenue Impact Threshold		
				<1 Percent	1-3 Percent	>3 Percent
Processing into plastic and rubber products	5	$3,421,642	$80,531	4	1	-
Recycling	8,412	$91,354	$7	8,412	-	-
Automotive painting (new vehicles)	763	$87,734	$7	763	-	-
Automotive refinishing	31,117	$74,589	$7	31,117	-	-
Disposal	8,094	$91,354	$7	8,094	-	-
Total	**48,391**	**-**	**$15**	**48,390**	**1**	**-**

7.3 Employment Effects

. Employment impacts of environmental regulations include a mix of potential declines and gains in different sectors of the economy over time. Impacts on employment can vary according to labor market conditions and may differ across occupations, industries, and regions. Isolating employment impacts of regulation is difficult as they are a challenge to disentangle from employment impacts caused by a wide variety of ongoing concurrent economic changes.

In the long run, environmental regulation is expected to cause a shift of employment among employers rather than affect the general employment level (Arrow, Cropper et al. 1996). Even if they are mitigated by long-run market adjustments to full employment, many regulatory actions have transitional effects in the short run (OMB 2015). These movements of workers in and out of jobs in response to environmental regulation are potentially important distributional impacts of interest to policy makers. Of particular concern are transitional job losses experienced by workers operating in declining industries, exhibiting low migration rates, or living in communities or regions where unemployment rates are high.

Compliance with environmental regulation can result in increased demand for the inputs or factors (including labor) used in the production of environmental protection. However, the regulated sector generally relies on revenues generated by their other market outputs to cover the costs of supplying increased environmental quality. This can lead to reduced demand for labor and other factors of production used to produce the market output. Employment impacts, both positive and negative, in sectors upstream and downstream from the regulated sector, or in sectors producing substitute or complimentary products, may also occur.

7.4 Paperwork Burden Analysis

This section presents a summary of the burden and associated costs for the respondents associated with the recordkeeping and reporting requirements of the proposed action. It provides the average annual burden and cost estimates for the next three years of the program.

The paperwork burden and associated costs include the activity types listed below.

- Rule Familiarization
    - 49,670 entities are assumed to have rule familiarization costs. Note that this includes entities that only have a rule familiarization burden associated with determining that they need not take action to comply with any of the rule's requirements (they do not manufacture, process or use regulated PV29). These entities are estimated to have a one-time labor burden of 1 hour, with a weighted average wage rate of $97.79 (reflecting a mix of managerial wage rates for the manufacturing sector ($93.07), the trade, transportation and utilities sector ($94.70), and service sector ($99.58).
- Downstream Notification
    - One entity is estimated to have downstream notification costs associated with a one-time one-hour labor burden at the manufacturing managerial wage rate of $93.07.
- Labeling
    - The economic analysis includes an estimated a one-time labor cost of $100 to $200 for one entity for labeling. For the paperwork reduction act analysis, it is assumed that this reflects a labor burden of 1.61 hours at the manufacturing managerial wage rate of $93.07 (i.e., a one-time labor cost of $150). There is also a one-time materials cost of $600.
- PPE Program
    - There are 8 respondents with an 8-hour initial labor burden for establishing a PPE program and a 2-hour annually recurring labor burden. The labor cost is estimated using the industrial hygienist wage rate of $74.12 (Abt Global 2024).
- Equipment and Area Cleaning Recordkeeping
- There are 22 respondents with an initial managerial labor burden of 4 hours and a production worker annual labor burden of 15 minutes per week (or 13 hours per year). The weighted average wage reflecting a mix of manufacturing managerial and production worker labor is $62.16.

Table 7 -55 presents the summary of the average annual burden hours and costs per facility over the first three years, as well as the three-year total burden hours and costs associated with the primary option. See Chapter 4. for a more detailed description of how the time burden and wage rates were estimated. The burden and cost estimates provided reflect the figures provided in the accompanying ICR for the rule.

Table 7-55: Summary of Three Year Average Incremental Burden Hours and Costs for Primary Option (2023$)

Activity	Number of Respondents	Average Annual Responses Per Respondent	Average Annual Burden Per Respondent	Average Annual Total Labor Burden	Average Annual Total Labor Costs	Average Annual Total Non-Labor Costs	Average Annual Total Costs
Agency Burden	-	-	-	-	-	-	-
Rule Familiarization	49,670	0.33	0.33	16,557	$1,619,063	-	$1,619,063
Downstream Notification	1	0.33	0.67	1	$62	-	$62
Labeling	1	0.33	0.54	1	$50	$200	$250
PPE Program	22	1.00	4.67	103	$7,610	-	$7,610
Equipment and Area Cleaning Recordkeeping	22	1.00	14.33	315	$19,600	-	$19,600
Total	**49,670**	**0.33**	**0.34**	**16,976**	**$1,646,384**	**$200**	**$1,646,584**

7.5 Unfunded Mandates Reform Act (UMRA)

Title II of the Unfunded Mandates Reform Act of 1995, Pub. L. 104-4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and Tribal governments, and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that might result in expenditures by State, local, and Tribal governments, in the aggregate, or by the private sector, of $100 million or more (when adjusted annually for inflation) in any one year. The rule is not expected to affect state, local, or Tribal governments because the rule affects entities that manufacture, process, or use PV29 and the use of regulated PV29 by government entities is expected to be minimal if at all. In addition, the cost of the rule to the private sector does not exceed the inflation-adjusted UMRA threshold of $100 million.

7.6 Executive Order 12898 – Environmental Justice Impacts

EPA's "Technical Guidance for Assessing Environmental Justice in Regulatory Analysis[20]" provides recommendations that encourage analysts to conduct the highest quality analysis feasible, recognizing that data limitations, time and resource constraints, and analytic challenges will vary by media and circumstance (EPA 2016c). Given the information on which specific facilities are affected by this proposed regulation and the information on the risks of PV29 developed in the risk evaluation, this analysis presents information about the workforce potentially affected by the regulatory options under current conditions before the rule goes into effect. It draws on publicly available data provided by EPA and U.S. Census, including the Chemical Data Reporting (CDR), the American Community Survey (ACS), and the Quarterly Workforce Indicators (QWI).

As discussed in Chapter 1., EPA found unreasonable risk for numerous uses to workers and ONUs. EPA also concluded that general population exposures to PV29 are expected to be minimal due to the limited releases of C.I. Pigment Violet 29 to the environment as a result of engineering controls on manufacturing releases. Furthermore, the risk evaluation stated that physical and chemical properties and fate endpoints would also result in minimal exposure to air, water, sediment, and groundwater via biosolids and landfill leaching and that inhalation of PV29 is expected to be low due to limited fugitive and incineration air releases. Based on these findings, the risk evaluation did not analyze exposure to the general population or evaluate potential unreasonable risk to the general population. Therefore, this analysis focuses solely

[20] **https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf**

on characterizing the baseline conditions faced by workers[21] affected by the proposed regulation to identify the potential for disproportionate impacts on minority and low-income populations.

The benefits chapter (Section 4.5.1) does not discuss the sociodemographic characteristics of the affected workers. While EPA lacks information on the characteristics of the workers in the specific regulated facilities, this analysis provides sociodemographic information on workers in the affected industries and locations as a proxy for the likely characteristics of affected workers.

Data limitations prevent EPA from conducting a more comprehensive EJ analysis that would identify the incremental impacts of the regulatory options and assess the extent to which they mitigate or exacerbate any disproportionate impacts in communities with environmental justice concerns. Uncertainties include the information on the specific location of affected facilities using regulated PV29, sociodemographic characteristics of the specific individuals affected by the use categories, and the substitute technologies and practices that would be adopted at regulated entities in response to the proposed rule.

7.6.1 All Identified PV29 Facilities

Section 3.1 estimates the number of facilities potentially affected by the proposed rule. EPA was only able to determine the specific location of a single facility known to be using regulated PV29. That facility, DCL Corporation, is located at Goose Creek, SC, is both the sole manufacturer of PV29 and the sole processor of PV29 as an intermediate to make other perylene pigments. This section characterizes the baseline demographics of workers at that facility. The Goose Creek facility falls under the NAICs code *325130 (Synthetic Dye and Pigment Manufacturing* sector). However, demographic data were not available at that level of detail so data are presented for NAICS 3251, Basic Chemical Manufacturing. This analysis assumes that the demographic composition of workers in the county in which the facility is located is representative of the demographics of workers at the facility. Data are taken from the Census' QWI data averages indicator values for four quarters of 2020 (U.S. Census Bureau, 2022). Table 7 -56 shows the data for workers in Berkely County in which the facility is located.

The data suggests that worker populations for Berkely County have a higher percentage of Black workers than the national average for workers in the Basic Chemical Manufacturing sector. Additionally, Berkely County, which is rural, has a higher percentage of Black workers than the national average (including both urban and rural averages) for all workers.

[21] **Throughout this section, the term workers also includes ONUs.**

Table 7-56: Characteristics of General Worker Populations at National Level and Sector Worker Populations in Areas nearby PV29 Manufacturing Facility

Region	National/ County Employees in Industry	Percent Local Employees in Industry	Percent Asian	Percent Black	Percent Pacific Islander	Percent Hispanic	Percent Native American	Percent 2 of More Races	Percent White
National	326,569,308		5.60%	12.60%	0.20%	18.20%	0.80%	5.20%	70.40%
Urban	266,435,744		6.60%	14.20%	0.20%	21.70%	0.60%	5.70%	66.50%
Rural	60,133,564		1.20%	5.80%	0.10%	2.40%	1.70%	2.80%	87.60%
Basic Chemical Manufacturing[1]									
National			4.20%	10.90%	0.10%	9.90%	0.60%	1.20%	82.90%
Berkely County, SC	433	0.80%	1.39%	24.02%	0.00%	3.23%	0.46%	0.92%	72.98%

[1]NAICS code for this facility is 325130 (Synthetic Dye and Pigment Manufacturing), however, data were not available at the 6-digit NAICS so data at the 4-digit NAICS 3251 (Basic Chemical Manufacturing) are presented.

7.6.2 Conclusions

Briefly, the findings of this baseline characterization suggest that workers in the PV29 manufacturing facility are more likely people of color than those working in the same industry nationwide. Additionally, these workers are also more likely people of color than workers in all sectors nationwide. In the baseline, the analysis suggests that workers at the manufacturing facility may be disproportionately black. To the extent that this reflects the actual distribution of workers at the facility, the proposed regulation, which is designed to protect workers, would improve human health conditions for this population.

7.7 Impacts on Technological Innovation and the National Economy

With respect to the anticipated effects of this rule on the national economy, as described in the preamble, EPA considered the number of businesses and workers that would be affected and the costs and benefits to those businesses and workers and did not find that there would be a measurable impact on the national economy. Guidance issued by the Office of Management and Budget indicates that the economic impact of a regulation on the national economy becomes measurable only if the economic impact of the regulation reaches 0.25 percent to 0.5 percent of Gross Domestic Product (GDP) (See Memorandum from Sally Katzen, "Guidance for Implementing Title II of [UMRA]," March 31, 1995). Given the current real GDP, this is equivalent to a cost of $69 billion to $139 billion (BEA 2024a). Therefore, EPA has concluded that this rule is highly unlikely to have any measurable effect on the national economy.

With respect to this rule's effect on technological innovation, because this rule does not prohibit the use of PV29, requiring the use of alternatives, EPA expects this rule would not be likely to spur innovation nor hinder it.

7.8 Executive Order 13132 – Federalism

Executive Order 13132, entitled Federalism (64 FR 43255, August 10, 1999), directs federal agencies to consider whether a rule has federalism implications (i.e., whether it has substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132). The

EPA has concluded that this action has federalism implications because regulation under TSCA section 6(a) may preempt state law. The Agency consulted with state and local officials early in the process of developing the proposed action to permit them to have meaningful and timely input into its development. This included a consultation meeting on May 13, 2021. EPA invited the following national organizations representing State and local elected officials to this meeting: National Association of Attorneys General, Western States Water Council, National Water Resources Association, Association of State Drinking Water Administrators, Association of Clean Water Administrators, Association of Metropolitan Water Agencies, American Water Works Association, National Governors Association; National Conference of State Legislatures, National League of Cities, U.S. Conference of Mayors, National Association of Counties, County Executives of America, and Environmental Council of States.

7.9 Executive Order 13175 – Tribal Implications

Executive Order 13175, entitled *Consultation and Coordination with Indian Tribal Governments* (59 FR 22951, November 6, 2000), directs federal agencies to consider whether a rule has tribal implications (i.e., whether it has substantial direct effects on tribal governments, on the relationship between the Federal government and the Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes). This rulemaking would not have substantial direct effects on tribal government because PV29 is not manufactured, processed, or distributed in commerce by tribes and would not impose substantial direct compliance costs on tribal governments. Thus, Executive Order 13175 does not apply to this action. EPA nevertheless consulted with tribal officials during the development of this action on May 24 and June 3, 2021, consistent with the EPA Policy on Consultation and Coordination with Indian Tribes.

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