

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Socioeconomic Impact Assessment for Proposed Rule 1407.1 – Control of Toxic Air Contaminant Emissions from Chromium Alloy Melting Operations

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EXECUTIVE SUMMARY

A socioeconomic analysis was conducted to assess the potential impacts of Proposed Rule 1407.1 – Control of Toxic Air Contaminant Emissions from Chromium Alloy Melting Operations on the four-county region of Los Angeles, Orange, Riverside, and San Bernardino. A summary of the analysis and findings is presented below.

<p>Elements of Proposed Amendments</p>	<p>Proposed Rule 1407.1 – Control of Toxic Air Contaminant Emissions from Chromium Alloy Melting Operations (PR 1407.1) establishes requirements to reduce toxic air contaminant emissions from melting operations of metals that contain greater than 0.5 percent chromium content, including, but not limited to alloy steel, chromium non-ferrous alloys, stainless steel, and superalloys. PR 1407.1 was proposed in April 2018 as a bifurcation from its companion rule, Rule 1407 – Control of Emissions of Arsenic, Cadmium, and Nickel from Non-Chromium Metal Melting Operations, which was amended in October 2019 with expanded requirements for non-chromium metal melting. PR 1407.1 will regulate toxic air contaminant emissions, including hexavalent chromium, from melting of metal alloys containing chromium.</p> <p>PR 1407.1 applies to facilities that conduct metal melting of chromium alloys, such as smelters, foundries, die-casters, mills, and other establishments where metals are processed in molten form. Melting of chromium alloys has the potential to emit toxic air contaminants, including hexavalent chromium.</p> <p>PR 1407.1 establishes point source emission limits, housekeeping requirements and building enclosure provisions to address fugitive emissions, source testing requirements, material testing, and monitoring, reporting, and recordkeeping requirements.</p>
<p>Potentially Affected Facilities and Industries</p>	<p>PR 1407.1 is expected to potentially affect 11 identified facilities classified under a three North American Industry Classification System (NAICS) industry codes in the manufacturing sector (NAICS 31-33), including foundries (NAICS 3315), iron and steel mills and ferroalloy manufacturing (NAICS 3311), and other fabricated metal product manufacturing (NAICS 3329). Out of these 11 facilities, nine are in Los Angeles (LA) County, one in Orange (OR) County, and one in San Bernardino (SB) County.</p>

<p style="text-align: center;">Proposed Requirements and Cost Assumptions</p>	<p>Emission control devices (i.e. baghouses with HEPA/ULPA) and supporting equipment To comply with PR 1407.1, South Coast AQMD staff expects five new baghouses at five facilities to be installed. Staff estimates these baghouses will cost \$256,000 each including purchase, installation, and permitting along with \$275,000 annually for each baghouse’s operation and maintenance (O&M). Staff also assumes that 18 HEPA (high-efficiency particle air) systems will be installed at eight facilities. The capital cost of each HEPA system ranges from \$35,000 to \$40,000, and annual O&M cost for each HEPA system is \$35,000. One ULPA (ultra-low particulate air) system is expected for one facility with a one-time cost of \$39,000, and an annual O&M costs of \$39,000.</p> <p>In total, the present worth value of one-time costs for emission controls is estimated at \$3.5 million in 2021, and the average annualized cost is estimated at \$245,000 across all the affected facilities between 2021 and 2041. The annual O&M costs for emission controls is estimated at \$2.0 million for all the affected facilities.</p> <p>Bag leak detection systems and pressure gauges with data acquisition systems To comply with PR 1407.1, staff expects 14 baghouses (new and existing) at 11 affected facilities to use bag leak detection systems (BLDS), and 35 pressure gauges with data acquisition systems (DAS). Staff estimates one-time purchase and installation of the BLDS to be \$1,500, and purchase and installation of the pressure gauges with DAS to be \$1,200. The present worth costs for BLDS and pressure gauge with DAS systems is estimated at \$113,000 across all the identified facilities in 2021.</p> <p>Building modifications (e.g. minor building modifications and plastic strip curtains) To comply with PR 1407.1 cross-draft minimization requirements (subdivision (g)), South Coast AQMD staff expects 11 facilities to construct minor building modifications (closing roof openings near melting furnaces and where molten metal is processed) and install plastic strip curtains. Staff estimates one-time building modifications to cost \$13,750 per facility, and plastic-strip curtains to cost \$9,000 per facility. In total, PR 1407.1 is conservatively expected to result in (present worth value) of about \$250,000 in one-time costs for building enclosures across all identified facilities in 2021.</p> <p>Source tests To comply with PR 1407.1, South Coast AQMD staff expects all new and existing control equipment to require an initial source test followed by periodic source testing every 60 months, provided that the facility complies with the required parameter monitoring pursuant to subdivision (j). Staff</p>
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estimates each source test will cost \$20,000. It is also assumed that eight facilities would conduct only one source test; two facilities would conduct two source tests; and one facility would conduct nine source tests.

Staff estimates the total (present worth value) cost of source testing to be \$1.4 million in 2021 or \$95,000 annually between 2021 to 2041.

Smoke tests, anemometers, and slot velocity testing

To comply with PR 1407.1, South Coast AQMD staff expects all the affected 11 facilities to require an anemometer, smoke tests, and slot velocity tests. Staff estimates a one-time cost for an anemometer to be \$1,000 each. Smoke tests and slot velocity testing are required every six months for each piece of control equipment, for an estimated 60 emission collection devices across 11 facilities. Each piece of equipment requires a smoke test every six months at a cost of \$1,000 per test (\$2,000 annually), and slot velocity tests of \$180 annually per piece of equipment.

In total, PR 1407.1 is expected to result in \$11,000 in one-time costs for anemometers in 2021, along with an additional \$130,000 annual cost for smoke and slot velocity tests starting in 2021.

Housekeeping and Roof Cleaning

To comply with PR 1407.1, South Coast AQMD staff expects the purchase of HEPA vacuum equipment to comply with the required housekeeping procedures. All 11 facilities are expected to incur an annual expense of \$1,000 in additional labor for housekeeping requirements. Roof cleaning is expected to cost \$1,400 annually for each facility. Four facilities are expected to purchase rider HEPA vacuums at a cost of \$11,600 each, and the remaining seven will purchase backpack (portable) HEPA vacuums at a cost of \$600 each.

All facilities are expected to purchase HEPA-equipped shop vacuums at a cost of \$500 each. HEPA vacuum replacement parts (HEPA filters) are expected to cost each facility \$2,000 annually, while rider vacuums parts and cleaning supplies are expected to cost \$15,000 and \$10,000, respectively. One-time cost for housekeeping equipment is estimated at \$155,000 in 2021. The average annual cost of housekeeping and roof cleaning expenses including labor and equipment is estimated at \$140,000 across all the identified affected facilities between 2021 and 2041.

Butterfly Cap Installation

Purchase and installation of a butterfly cap in place of a weather cap is expected to cost about \$9,100 per stack for 17 stacks across 11 facilities. One-time costs for butterfly caps including purchase and installation is estimated at \$276,000, or \$19,000 annualized average between 2021 and 2041.

	<p>Standards and Calibration Materials Facility operators can perform on-site material testing pursuant to the requirements in subdivision (i). Conducting in-house material testing requires the purchase of chemical standards for method development and calibration, which is estimated for a one-time cost of \$20,000. Only one facility is expected to incur this cost, which results in an average annualized cost of \$1,000 between 2021 and 2041.</p>									
<p>Compliance Costs</p>	<p>PR 1407.1 Industry-Wide Expected Compliance Costs (2021-2041)</p> <table border="1" data-bbox="472 520 1419 745"> <thead> <tr> <th>Real interest rate scenario</th> <th>Total cost if all expenses incurred in 2021</th> <th>Annualized cost</th> </tr> </thead> <tbody> <tr> <td>High-rate scenario (4% interest rate)</td> <td>\$39,659,000</td> <td>\$2,794,000</td> </tr> <tr> <td>Low-rate scenario (1% interest rate)</td> <td>\$53,821,000</td> <td>\$2,749,000</td> </tr> </tbody> </table> <p>Note: A higher assumed real interest rate means future expenses have lower current value. The real interest rate corrects for inflation and is closely approximated by the nominal interest rate minus inflation.</p> <p>PR 1407.1’s overall compliance cost is expected to be incurred almost entirely by the industries of iron and steel mills and ferroalloy manufacturing (NAICS 3311), Foundries (NAICS 3315), and other fabricated metal product manufacturing (NAICS 3329). Total annualized compliance cost for PR 1407.1 from 2021 to 2041 is expected to be about \$2.8 million.</p> <p>Based on the high-rate scenario, nearly 80 percent of the costs of PR 1407.1 stem from purchasing, engineering, and installation, of new pollution control devices (baghouses, HEPA and ULPA systems) and annual operation and maintenance of all (existing and new) baghouses with HEPA/ULPA controls. The remaining costs of PR 1407.1 stem from minor building modifications, HEPA vacuums, source testing, smoke testing, housekeeping, pressure gauges with DAS, and anemometers.</p> <p>PR 1407.1 targets air toxic contaminant emissions from chromium alloy melting operations, which occurs almost exclusively in the foundry industry. Nearly 79 percent of the total compliance costs in the high rate (4%) scenario fall under the foundry industry (NAICS 3315), which includes nine of the 11 affected facilities. The other affected industries; iron and steel mills and ferroalloy manufacturing (NAICS 3311) and other fabricated metal product manufacturing (NAICS 3329) incur the remaining 21% of the total compliance costs. Compliance costs of emission control equipment such as baghouses, HEPA, and ULPA systems apply to nine of 11 facilities, eight of which are designated to the foundry industry (NAICS 3315). Accordingly, the recurring costs of O&M for baghouses, HEPA, and ULPA systems which constitute nearly 74 percent of the total recurring cost, fall primarily onto the foundry industry facilities as a result of PR 1407.1.</p>	Real interest rate scenario	Total cost if all expenses incurred in 2021	Annualized cost	High-rate scenario (4% interest rate)	\$39,659,000	\$2,794,000	Low-rate scenario (1% interest rate)	\$53,821,000	\$2,749,000
Real interest rate scenario	Total cost if all expenses incurred in 2021	Annualized cost								
High-rate scenario (4% interest rate)	\$39,659,000	\$2,794,000								
Low-rate scenario (1% interest rate)	\$53,821,000	\$2,749,000								

PR 1407.1 Average Expected Compliance Cost Per Facility by Facility Category (2021-2041)			
Facility Category	Number potentially affected facilities	Total cost if all PR 1407.1 expenses incurred in 2021 (4% scenario)	Annualized cost (2021-2041)
Iron and steel mills and ferroalloy manufacturing	1	\$6,866,000	\$483,000
Foundries	9	\$30,567,000	\$2,156,000
Other fabricated metal product manufacturing	1	\$2,227,000	\$156,000
Total	11	\$39,659,000	\$2,794,000

Jobs and Other Socioeconomic Impacts	PR 1407.1 Expected Annual Forgone Jobs (2021-2041)	
	Cost scenario	Annual forgone jobs (% of total jobs in LA, OR, RV, and SB counties)
	High-rate scenario (4% interest rate)	100 (0.001%)
Low-rate scenario (1% interest rate)	98 (0.001%)	

Based on the above assumptions, the compliance cost of PR 1407.1, and the application of the Regional Economic Models, Inc. (REMI) model, it is projected 98 to 100 jobs will be forgone on average annually from 2021 to 2041 in total across all South Coast AQMD industries. The projected job forgone impacts represent about 0.001% of total employment in the four-county region for both the low- and high-rate scenarios. Jobs foregone can come from current jobs lost, or potential future created jobs no longer being created.

PR 1407.1 is expected to impact the manufacturing industry (NAICS 31-33) an average of 27 jobs forgone annually, with 14 jobs forgone from the foundries industry (NAICS 3315) alone from 2021 to 2041. Iron and steel mills and ferroalloy manufacturing (NAICS 3311) and other fabricated metal product manufacturing (NAICS 3329) industries are expected to forego one or fewer jobs annually. Management, scientific, and technical services (NAICS 5416) industry is expected to gain an average of 11 jobs annually from 2021 to 2041 due to increased demand for source tests, smoke tests, and control equipment maintenance related to PR 1407.1.

Due to most expenditures from PR 1407.1 expected to be made outside the South Coast AQMD jurisdiction, PR 1407.1 is expected to reduce disposable income in the local economy, dampening the demand for local goods and services. Lower demand for local goods and services is expected to result in

	<p>jobs forgone across the local economy, with 45 of the 100 foregone jobs (in the high-rate scenario) projected to be from construction (NAICS 23), retail trade (NAICS 44-45), administrative, support, waste management, and remediation services (NAICS 56), health care and social assistance (NAICS 62), accommodation and food services (NAICS 72), and other services (NAICS 81). State and local government (NAICS 92) also account for eight of the 100 jobs foregone.</p>
Competitiveness	<p>Due to PR 1407.1, the relative cost of production is expected to increase in the foundry industry (NAICS 3315) by less than 0.9% for any given year between 2021 and 2041, while iron and steel mills and ferroalloy manufacturing (NAICS 3311) and other fabricated metal product manufacturing (NAICS 3329) industries are expected to see increases of less than 0.04%. Relative delivered prices are expected to increase for the foundry industry by less than 0.3% for any given year between 2021 and 2041, while iron and steel mills and ferroalloy manufacturing and other fabricated metal product manufacturing industries are expected to see increases of less than 0.02%.</p>

INTRODUCTION

Proposed Rule 1407.1 – Control of Toxic Air Contaminant Emissions from Chromium Alloy Melting Operations (PR 1407.1) establishes requirements to reduce toxic air contaminant emissions from melting operations of metals that contain greater than 0.5 percent chromium content, including, but not limited to alloy steel, chromium non-ferrous alloys, stainless steel, and superalloys. PR 1407.1 was proposed in April 2018 as a bifurcation from its companion rule, Rule 1407, which was amended in October 2019 with expanded requirements for non-chromium metal melting. PR 1407.1 will regulate toxic air contaminant emissions, including hexavalent chromium, from melting of metal alloys containing chromium. PR 1407.1 applies to facilities that conduct chromium alloy melting, such as smelters, foundries, die-casters, mills, and other establishments where metals are processed in molten form. Melting of chromium alloys has the potential to emit toxic air contaminants, including hexavalent chromium.

PR 1407.1 proposes: (1) to establish collection efficiency requirements and hexavalent chromium mass emission limits to control point source emissions. Aggregate emission limits (milligram/hour) that are determined by the distance of a stack (or centroid of stacks) to the nearest property line of the closest sensitive receptor, and emission limit tiers are specified by distance to the closest sensitive receptor: less than 50 meters, 50 to 100 meters, and greater than 100 meters; (2) to use emission collection systems at a minimum capture velocity specified in paragraph (d)(2) using baghouse controls with HEPA or ULPA systems; (3) to require housekeeping and building provisions to limit fugitive emissions including: material storage, disposal, and transport requirements; routine cleaning of floors, roofs, emission control equipment, storage areas; HEPA-equipped shop or rider vacuums for routine cleaning of operations areas; and building requirements to prevent cross-drafts and fugitive dust emissions including closing roof openings and openings on opposite sides of a building; and (4) to require source testing, material testing, parameter monitoring, and recordkeeping.

Additional details about emission limits and emission controls are available in the staff report and in an independently conducted source test study.¹ PR 1407.1 parameter monitoring provisions in subdivision (j) ensure proper operation and maintenance of pollution controls.

Facilities that melt no more than one ton of chromium alloys per year are exempt from PR 1407.1. PR 1407.1 also identifies educational facilities and jewelers exempt from PR 1407.1, as well as facilities already subject to rules 1420.1 and 1420.2 (Lead melting facilities). Also exempt from PR 1407.1 are brazing, dip soldering, and wave soldering operations, as well as metal cutting, and metal grinding activities performed for maintenance of equipment and structures not associated with chromium alloy melting operations.

¹ Additional details of this source test study are available in the PR 1407.1 Source Testing page: <http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/proposed-rule-1407-1-source-testing>; Accessed 11/30/2020.

LEGISLATIVE MANDATES

The legal mandates directly related to the assessment of the proposed amended rule include South Coast AQMD Governing Board resolutions and various sections of the California Health & Safety Code.

South Coast AQMD Governing Board Resolutions

On March 17, 1989 the South Coast AQMD Governing Board adopted a resolution that calls for an economic analysis of regulatory impacts that includes the following elements:

- Affected industries
- Range of probable costs
- Cost-effectiveness of control alternatives
- Public health benefits

Health & Safety Code Requirements

Health and Safety Code sections 40440.8(a) and (b) require a socioeconomic analysis to be prepared for any proposed rule or rule amendment that "will significantly affect air quality or emissions limitations."

Specifically, the scope of the analysis should include:

- Type of affected industries
- Impact on employment and the regional economy
- Range of probable costs, including those to industry
- Availability and cost-effectiveness of alternatives to the rule
- Emission reduction potential
- Necessity of adopting, amending or repealing the rule in order to attain state and federal ambient air quality standards

Further, Health and Safety Code section 40728.5 requires the South Coast AQMD Governing Board to actively consider the socioeconomic impacts of regulations and make a good faith effort to minimize adverse socioeconomic impacts. It also expands socioeconomic impact assessments to include small business impacts, specifically:

- Type of industries or business affected, including small businesses
- Range of probable costs, including costs to industry or business, including small business

Finally, Health and Safety Code section 40920.6 requires incremental cost-effectiveness be performed for a proposed rule or amendment that imposes Best Available Retrofit Control Technology or "all feasible measures" requirements relating to ozone, carbon monoxide (CO), oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and their precursors. This statute does not apply to PR 1407.1 as it addresses toxic pollutants, not criteria pollutants listed in the statute. Moreover, cost effectiveness in terms of dollars per ton is

not meaningful for toxics-based regulations, since many other factors besides the amount of pollution affect the toxic risk such as the toxic potency and the location of receptors.

AFFECTED INDUSTRIES/FACILITIES

Affected Industries and Industry Profile

PR 1407.1 extends toxic emission controls for facilities not covered in the 2019 amendment to Rule 1407, specifically targeting the melting of chromium-containing alloys. Facilities that conduct chromium alloy melting, such as smelters, foundries, die-casters, mills, and other establishments where metals are processed in molten form, are potentially subject to PR 1407.1 because the provisions aim to reduce emissions of toxic air contaminants from chromium-containing alloys. PR 1407.1 primarily applies to foundries.

PR 1407.1 is expected to potentially affect 11 facilities classified under a three industry codes in the manufacturing sector (NAICS 31-33), including iron and steel mills and ferroalloy manufacturing (NAICS 3311), foundries (NAICS 3315), and other fabricated metal product manufacturing (NAICS 3329). Of the 11 identified facilities potentially affected by PR 1407.1, nine are in Los Angeles (LA) County, one in Orange (OR) County, and one in San Bernardino (SB) County. PR 1407.1 requirements for foundries comprise the majority of PR 1407.1 compliance costs due to the purchase and installation of baghouses with HEPA/ULPA emission controls.

Table 1: PR 1407.1 Potentially Affected Facilities by Industry Description

NAICS	Industry description	Potentially affected facilities
331110	Iron and Steel Mills and Ferroalloy Manufacturing	1
331512	Steel Investment foundry	4
331513	Steel Foundry	3
331529	Non-Ferrous Foundry, except Aluminum and Copper	2
332912	Fluid Power Valves and Hose Fittings	1
	TOTAL	11

Table 2 presents a 2020 economic profile of the general metal melting industries located in LA, OR, RV, and SB counties, of which PR 1407.1 facilities are a subset. This broader industry category consists of about 176 facilities; with average annual revenue of about \$5.2 million. These industries have nearly 9,000 employees with an average annual salary of about \$108,000.

Table 2: PR 1407.1 Potentially Affected Industries Industry Profile

Key statistics of PR 1407.1 potentially affected industries in 2020 in LA, OR, RV, and SB counties	
Approximate Number of Facilities	176
Approximate Number of Employees	8,987
Approximate Average Number of Employees per Facility	51
Approximate Annual Average Salary per Employee	\$108,345
Approximate Annual Average Revenue per Facility (2019)	\$5,204,545

Note: Data estimated and provided by Economic Modeling Specialists International (EMSI 2020) for all industries with facilities expected to be affected by PR 1407.1, specifically NAICS 331110, 331512, 331513, 331524, 331529, 332912.

Having an understanding of whether an industry is growing or declining can provide additional information about the extent to which an industry can bear additional costs of regulation without substantial negative consequences. Determining financial success of an industry requires information on industry profit. Industry profit is unknown to South Coast AQMD staff, however information is available about historical employment of PR 1407.1 potentially affected industries.

As illustrated by Figure 1, total employment in LA, OR, RV, and SB counties in the industries potentially affected by PR 1407.1 was 8,763 in 2010 and 8,987 in 2020. This indicates about a 2.5 percent growth in employment in the general metal melting industries from 2010 to 2020, while there has been a 2.9 percent growth for the same industries throughout all of California.

General metal melting industries on average employ more men; men account for nearly 80 percent and women 20 percent of their workforce. As illustrated by Figure 2, these industries on average employ more Hispanic/Latino individuals, with 57 percent of the workforce Hispanic/Latino, 28 percent White, 10 percent Asian, and three percent Black/African American.

Figure 1: General Metal Melting Industries Employment in LA, OR, RV, and SB Counties in 2010-2020

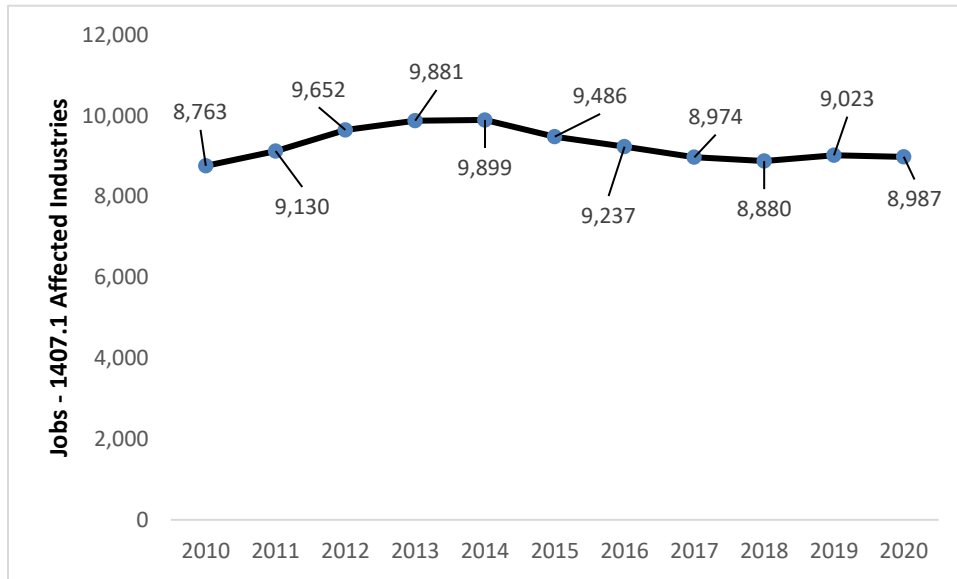
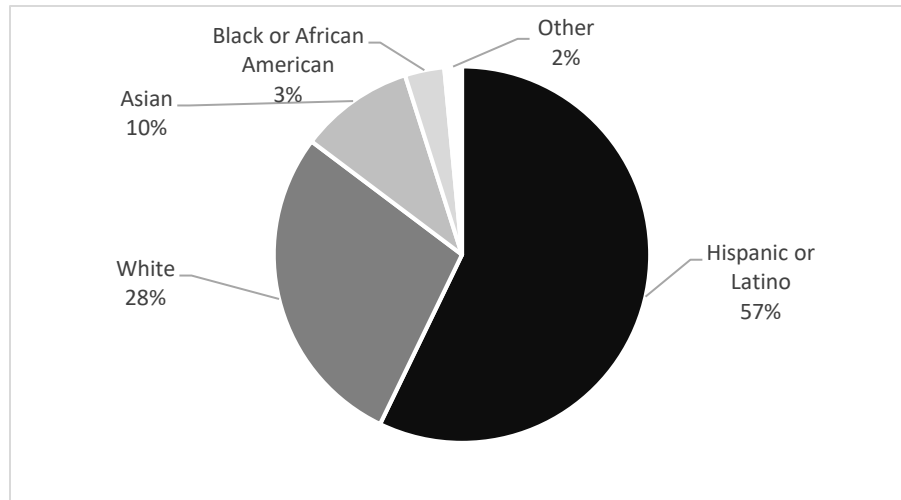


Figure 2: General Metal Melting Industries Employment Ethnicity Distribution in LA, OR, RV, and SB Counties



Small Businesses

South Coast AQMD defines a "small business" in Rule 102 as one which employs 10 or fewer persons and which earns less than \$500,000 in gross annual receipts. South Coast AQMD also defines "small business" for the purpose of qualifying for access to services from the South Coast AQMD's Small Business Assistance Office as a business with an annual receipt of \$5 million or less, or with 100 or fewer employees.

U.S. Small Business Administration (SBA) definitions of small businesses vary by six-digit NAICS code, as shown in Table 3.²

Table 3: PR 1407.1 Potentially Affected Industries U.S. Small Business Administration (SBA) Small Business Classification

Employee Range	NAICS (Industry Description)
≤ 500	331513 (Steel Foundries (except Investment)), 331524 (Aluminum Foundries (except Die-Casting)), 331529 (Other Nonferrous Metal Foundries (except Die-Casting))
≤ 1,000	331512 (Steel Investment Foundries) 332912 (Fluid Power Valve and Hose Fitting Manufacturing)
≤ 1,500	331110 (Iron and Steel Mills and Ferroalloy Manufacturing)

In addition to South Coast AQMD's and SBA's definitions of a small business, the federal Clean Air Act Amendments (CAAA) of 1990 also provides a definition of a small business. The CAAA classifies a business as a "small business stationary source" if it: (1) employs 100 or fewer employees, (2) emits less than 10 tons per year of any single pollutant and less than 20 tons per year of all pollutants, and (3) is a small business as defined under the federal Small Business Act (15 U.S.C. Sec. 631, et seq.).

Revenue and employee data from the Dun and Bradstreet Enterprise Database was available for all PR 1407.1 potentially affected facilities. The number of facilities potentially affected by PR 1407.1 that are classified as small businesses and classification definition are listed in Table 4 below:

Table 4: PR 1407.1 Potentially Affected Facilities Small Business Tabulation

Small Business Definition	# Small Businesses
South Coast AQMD (Rule 102)	2 out of 11
South Coast AQMD (Small Business Assistance Office)	6 out of 11
U.S. Small Business Administration (SBA)	11 out of 11
1990 Clean Air Act Amendments (CAAA)	6 out of 11

COMPLIANCE COSTS

Methods and Sources of Data

Analysis Timeframe

To estimate meaningful costs associated with any rule, one must decide on a relevant time horizon over which to estimate the rule's costs. This analysis considers the cost of this rule, PR 1407.1, from 2021-2041. This timeframe is considered as some facilities are expected to incur compliance costs from PR 1407.1 as early as 2021 (requirement outlined in paragraph (g)(2) specifies building requirements are effective January 1, 2022), and 20

² The latest SBA definition of small businesses by industry can be found at the following website: <http://www.sba.gov/content/table-small-business-size-standards>.

years encompasses the longest life expectancy of PR 1407.1 required capital expenditures, which is building modifications. Capital costs with a shorter replacement interval assumes replacement according to the recommended life expectancy of equipment within the 20 year analysis horizon.

One-Time and Recurring Costs

The main requirements of PR 1407.1 which have cost impacts for potentially affected facilities can be split into two categories: “one-time costs,” which are larger expenses seldom occurring (e.g. once every 10 and 20 years), and “recurring costs,” which are smaller expenses frequently occurring (e.g. annually, twice a year, once every five years).³ The one-time costs of PR 1407.1 include capital and installation costs for emission control equipment (baghouses with HEPA or ULPA systems), building modifications (roof enclosures and plastic strip curtains), bag leak detection systems (BLDS), pressure gauges with data acquisition systems, anemometers, stack modifications (butterfly cap installation), housekeeping equipment (HEPA vacuums), and standards and calibration materials.

Annual recurring costs of PR 1407.1 include housekeeping (e.g. cleaning furnace operation areas and rooftops), baghouse operating cost (e.g. electricity), emission control equipment maintenance (replacement of baghouse and HEPA/ULPA system filters), housekeeping equipment maintenance (replacement filters for HEPA vacuums and cleaning supplies), testing and reporting (e.g. additional source test, smoke tests, and slot velocity tests), and annual permit renewal fees for control equipment.

Cost assumptions are conservative estimates and represent a “worst-case scenario.” Due to recently amended rules such as Rule 1407, many facilities may already be equipped for PR 1407.1 requirements such as building requirements for cross-draft minimization or owning vacuum equipment necessary for housekeeping requirements.

Cost Estimate Sources

Staff used the following sources to estimate costs of PR 1407.1:

- 1) U.S. EPA Control Cost Manual to estimate one-time and recurring costs associated with baghouses and butterfly cap installations.⁴
- 2) South Coast AQMD 2010 Final Socioeconomic Assessment for Rule 1420.1 for HEPA systems.
- 3) Camfil USA and Ceko Environmental for ULPA systems.
- 4) Dwyer Instruments for emissions control device bag leak detection systems.
- 5) Omega Engineering for emissions control device pressure gauges with data acquisition systems.
- 6) South Coast AQMD Rule 301 for permitting costs for baghouses.

³ A rule’s “one-time costs” are expected to have direct costs (e.g. equipment, installation, engineering, etc.), as well as indirect costs from not using the resources devoted to direct costs for other investments. By dividing up costs into “one-time” and “recurring” costs, the opportunity cost of lost investment value is estimated and included into the total cost of this rule for costs classified as “one-time” costs.

⁴ U.S. EPA Air Pollution Control Cost Manual, Sixth Edition
(https://www3.epa.gov/ttnecat1/dir1/c_allchs.pdf).

- 7) South Coast AQMD Rule 1407 building enclosures.
- 8) W.W. Grainger, Inc. for plastic strip curtains and anemometers.
- 9) Almega Environmental for source testing.
- 10) Accurate Environmental Services, Inc. for smoke tests.
- 11) Nassco Inc. for housekeeping (furnace and casting operation area cleaning).
- 12) Stakeholder provided costs for housekeeping (cleaning supplies and operation and maintenance costs for cleaning equipment)

Cost Estimate Year

All costs presented in this report are estimated 2020 dollars. The per-unit costs used for any expense required from PR 1407.1 passing are either 2020 reported costs, or costs from earlier years inflated to 2020 values using the all-industry producer price index reported by the CoreLogic® Marshall & Swift® Equipment Cost Index (M&S index).

Emissions Point Source Controls (Baghouses, HEPA/ULPA Systems)

Proposed Rule 1407.1 establishes requirements to reduce toxic air contaminant emissions from melting operations of metals that contain greater than 0.5 percent chromium content, including, but not limited to alloy steel, chromium non-ferrous alloys, stainless steel, and superalloys, metal melting operations, such as smelters, foundries, die-casters, mills, and other establishments where metals are processed in molten form. Melting of chromium alloys have the potential to emit toxic air contaminants, including hexavalent chromium.

PR 1407.1 establishes collection efficiency requirements and hexavalent chromium mass emission limits to control point source emissions; housekeeping and building provisions to limit fugitive emissions; and source testing, material testing, parameter monitoring, and recordkeeping requirements. Facilities which do not already meet the PR 1407.1 collection efficiency or mass emission limits are expected to install point-source emission controls. Cost assumptions in this analysis use baghouses as the primary emission controls in conjunction with HEPA or ULPA systems in order to meet the mass emission limits.

Of the identified 11 potentially affected facilities, staff expects five facilities to install a total of five new baghouses to comply with PR 1407.1. This is the same figure used in the socioeconomic impact assessment for Rule 1407 amendments adopted in October 2019, which used guidance for baghouse cost estimation contained in the U.S. EPA's Control Cost Manual.⁵

Staff estimates baghouses installed to comply with PR 1407.1 to cost \$256,000 each for purchase and installation and permitting,⁶ along with \$275,000 for annual operation and

⁵ Cost per square foot estimates come from the U.S. EPA Air Pollution Control Cost Manual, with costs inflated to 2019 values using the CoreLogic® Marshall & Swift® Equipment Cost Index (M&S index).

⁶ Assumptions made to derive this estimate are the following: Baghouse purchased and installed has pulse-jet filters using a common housing; bags have a maximum gross cloth area of 4,000 square feet; bags have diameter of 4.875 inches and is made of nomex – resulting in a bag cost of \$9.89/square foot; bags use pulse jet cartridge cleaning (discussion with Donaldson Torid and South Coast AQMD source-testing staff verified this is the most common type of baghouse used by metal melting facilities); sales tax assumed to be 9%, as most cities in South Coast AQMD jurisdiction have sales tax rates around this value (range from

maintenance (O&M) of each baghouse.⁷ Staff also assumes that 14 HEPA systems at eight facilities will cost up to \$40,000 each, with annual O&M costs of \$35,000 each. One ULPA system is expected for one facility with a one-time cost of \$39,000, with annual O&M costs of \$39,000.

In total, the present worth value of one-time expenses for emission controls is estimated at \$3.5 million. The total average annualized cost of this requirement is estimated at \$245,000 across the affected facilities. The annual cost of recurring O&M costs for emission controls (baghouse, HEPA/ULPA systems) is \$2.0 million for all affected facilities between 2021 and 2041.

Bag Leak Detection Systems and Pressure Gauges with Data Acquisition Systems

PR 1407.1 requires all emission control devices at facilities subject to PR 1407.1 to operate, calibrate, and maintain a bag leak detection system (BLDS). Moreover, each emission control device is required to use a gauge to continuously monitor the pressure drop across the emission control device. Each gauge is required by PR 1407.1 to be equipped with a continuous data acquisition system (DAS) which will record gauge output data at least once every 60 minutes. The gauge reading provides an indication of whether the filters are operating within the proper range of pressure differential recommended by the manufacturer or whether they may be clogged or have leaks.

To provide a conservative estimate of this cost of PR 1407.1, each new and existing baghouse is assumed to need a new BLDS and pressure gauge with a DAS. The HEPA or ULPA system also requires an additional pressure gauge, plus existing seven electrostatic precipitators (ESP) with HEPA systems will require a pressure gauge with DAS. In addition to the five new baghouses staff estimates to be installed due to PR 1407.1, staff also estimates facilities potentially affected by PR 1407.1 have nine existing baghouses. Therefore, staff expects 14 new bag leak detection systems and 35 gauges with data acquisition systems to be purchased and installed.

Each BLDS is assumed to be purchased in addition to the baghouse itself on July 1, 2024, with a one-time cost of \$1,500.⁸ Staff also assumes installation of a bag leak detection system to take up to 5 hours, that the installation will be performed by a facility's own

7.75% to 10.25%, <https://www.cdtfa.ca.gov/taxes-and-fees/ArchiveRates-04-01-19-06-30-19.pdf>). This estimates additionally assumes a South Coast AQMD baghouse permit fee of \$5,900, which is the highest cost permit fee for baghouses which operate at temperatures below 350 degrees Fahrenheit.

⁷ Assumptions made to derive this estimate, on top of those made for the purchase and installation cost estimate, are the following: Staff average wage rate of \$40/hour; complete bag replacement every two years; a discount/real interest rate of 4%; complete baghouse replacement every 20 years (recommended by U.S. EPA Air Pollution Control Cost Manual, Chapter 6, subsection 1.5.2) and an industrial electricity price of \$0.11/kilowatt-hour (U.S. Energy Information Administration's Electric Power Monthly 04/2019, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a). This estimation leaves out additional operating materials cost, fuel, water, and dust disposal, all of which are expected to either not occur or be relatively small.

⁸ <http://www.dwyer-inst.com/Product/ProcessControl/Particulate-DustorBrokenBag-Transmitters/SeriesPMT2> (accessed 11/23/20).

staff, and that the wage rate received by a facility's own staff is \$54 per hour.⁹ Thus the total one-time cost of purchasing and installing bag leak detection systems due to PR 1407.1 is expected to be \$38,000 if purchased in 2021.

Pressure gauges with the ability to log output data in line with PR 1407.1's DAS requirement are assumed to be around \$1,200 on the high-range.¹⁰ Staff again assumes installation to take up to 5 hours, that installation will be performed by a facility's own staff, and that the wage rate received by a facility's own staff is \$54 per hour. Each facility is expected to pay \$1,200 to purchase and install each pressure gauge with a DAS, resulting in a total cost one-time cost of purchasing and installing pressure gauges and data acquisition systems due to PR 1407.1 to be expected to be \$75,000 if purchased in 2021.

Building Requirements

PR 1407.1 requires affected facilities to conduct all chromium alloy melting operations in a building by no later than July 1, 2021. By January 1, 2022, the buildings that house melting furnaces for chromium containing alloys must implement cross-draft minimization measures by enclosing one or more of the openings on opposite ends of the building using one or more of the following:

- Automated doors
- Overlapping plastic strip curtains
- Vestibules
- Barriers
- Airlock system
- Or alternative methods approved by the executive officer

For the cost assumptions in this analysis, staff considered the installation of plastic strip curtains and closing roof openings as the most likely minimum compliance route for facilities.

Staff expects all facilities affected by PR 1407.1 to potentially construct minor building modifications due to PR 1407.1. Affected facilities are expected to install plastic strip curtains. Staff expects purchase and installation costs associated with plastic strip curtains to be \$9 per square foot,¹¹ with a maximum area covered by plastic strip curtains of 1,000

⁹ According to EMSI data, average annual salary at PR 1407.1 potentially affected facilities is \$108,345. Assuming 2,000 hours of work in a year (40 hours per week for 50 weeks) results in an average hourly wage of \$54 per hour.

¹⁰ Some models are closer to \$600 (<https://www.instrumart.com/products/43974/monarch-track-it-pressure-transmitter-data-logger>, <https://www.instrumart.com/products/42075/monarch-track-it-pressure-data-logger>, <https://www.instrumart.com/products/43295/wika-cpg1500-pressure-gauge>, accessed 11/23/2020), while some are closer to \$1,200 (<https://www.transcat.com/fluke-700g30-fluke-700g30>, <https://www.omega.com/en-us/sensors-and-sensing-equipment/pressure-and-strain/pressure-gauges/p/DPG4000>, accessed 11/23/2020).

¹¹ Search for plastic curtains from Grainger Industrial Supply provided a range of costs for plastic strip curtains (https://www.grainger.com/search/material-handling/dock-equipment/strip-doors-replacement-strips-and-hardware?sst=1&ts_optout=true&searchQuery=curtains, accessed 7/24/2019). The lowest cost was \$1,437.88 for 14 feet by 14 feet smooth strip doors from TMI Incorporated. The highest cost was \$1,850.91 for 14 feet by 14 feet ribbed strip doors from TMI Incorporated. South Coast AQMD staff

square feet. A facility is also expected to install plastic strip curtains at a cost of \$9,000 by January 1, 2022. The total cost of plastic strip curtains due to PR 1407.1 is estimated at \$99,000 by January 1, 2022.

Staff expects construction costs associated with minor building modifications to enclose roof openings to potentially affect all 11 facilities under PR 1407.1.¹² Any facility expected by staff to perform such building modifications is estimated to pay up to \$13,750 by January 1, 2022. The total one-time cost of minor building modifications due to PR 1407.1 is estimated at \$163,000 by January 1, 2022.

Source Tests

PR 1407.1 requires all chromium alloy melting facilities to perform source testing on all furnaces or their respective emissions control devices according to CARB Method 425 – *Determination of Total Chromium and Hexavalent Emissions from Stationary Sources*, pursuant to PR 1407.1 paragraph (h)(6). Emission limits for hexavalent chromium are set by aggregate levels (summation of measured levels for all operational furnaces under normal conditions), with a minimum run time of eight hours demonstrating the aggregate reporting limit of 0.05 micrograms or less. The source test deadline for existing furnaces is July 1, 2024 and must be conducted within 120 days of the source test protocol approval pursuant to paragraph (h)(1).

PR 1407.1 also requires an initial source test followed by periodic source tests every 60 months, provided that facilities comply with required parameter monitoring protocols in the period between valid source tests. Staff expects each source test to cost about \$20,000 and eight affected facilities are expected to conduct only one initial source test, two facilities to conduct two source tests, and one facility to conduct nine source tests. Staff expects 21 HEPA or ULPA exhaust stacks to require source testing due to PR 1407.1. Staff estimates each source test will cost around \$20,000.¹³ Staff estimates the total cost of source testing to be \$420,000 in 2021 and every subsequent 60 months.

Smoke Tests and Slot Velocity Tests

PR 1407.1 requires a smoke test be performed on every emission collection system leading to emissions control devices (e.g. baghouses) by January 1, 2022, and every six months thereafter. Staff estimates 60 total emission control devices across the 11 affected facilities. Each control device will be required to have a smoke test performed by January 1, 2022,

expects PR 1407.1 to not require the most expensive equipment, but also recognizes associated with installation are not included in these costs. Therefore, South Coast AQMD staff assumes a per square foot strip curtain cost equal to the average of the lowest and highest cost curtains, i.e. \$9 per square foot (rounded up).

¹² Construction costs estimated using the RSMeans Construction Cost Index (<https://www.rsmeansonline.com/references/unit/refpdf/hci.pdf>, accessed 11/29/2020).

¹³ Source test cost estimates from Rule 1407 were used and were provided by Charles Figueroa of Almega Environmental for baghouses. The cost assumes submittal of a source-test protocol, setup and field blank collection, followed by three 12 hour work days in which an 8-hour M425 test run is conducted per location for total metals and hexavalent chromium analysis (Tier IV data package), plus three 1-hour gas density samples, and compiling a final report. The total cost including labor and testing was \$20,000, conservatively, as overtime premium rates can vary.

and every six months thereafter, with a cost of \$1,000 per test, per device. The same devices require a biannual slot velocity test at a cost of \$90 per device. The annual cost of smoke and slot tests is estimated at \$130,000 across all 11 identified facilities in 2021.

Anemometers and Butterfly Cap Installation

PR 1407.1 requires using a calibrated anemometer to measure the slot velocity at each slot and pressure at each push air manifold of every emission collection system by January 1, 2021, and every six months thereafter. Staff estimates that each of the PR 1407.1 potentially affected facilities will be required to purchase a new anemometer. Staff expects each anemometer to cost at most \$1,000, as many hot-wire and rotating-vane digital anemometers are sold for less than \$1,000.¹⁴ Staff estimates total anemometer one-time cost to be \$11,000 in January 1, 2022.

PR 1407.1 prohibits the use of a furnace emission stack weather cap (paragraph (e)(3)). The installation of a butterfly cap in place of a weather cap is a permissible alternative to a weather cap and is expected to cost about \$9,100 per stack for 17 stacks at 11 facilities. This one-time expense is expected to cost a total of \$276,000 in January 1, 2022.

Housekeeping and Recordkeeping

All of the 11 PR 1407.1 potentially affected facilities are expected to incur labor costs for required housekeeping from PR 1407.1. The provisions within PR 1407.1 subdivision (f) outline the following routine cleaning requirements for chromium alloy melting operations:

- Daily cleaning of all floor areas within 20 feet of chromium alloy melting operation(s)
- Weekly cleaning of all floor areas within 20 feet of specified areas (subdivision (f))
- Quarterly inspections for and cleaning of blockages from accumulated dust in vents, openings, and ducting for each emission control device
- Biannual cleaning of all floor areas outside of the building subject to foot or vehicle traffic
- Annual cleaning of the entire facility, including any area not specified in cleaning provisions, excluding roof areas
- Biennial cleaning of roof areas of buildings housing chromium alloy melting operations
- Cleaning is also required within an hour of any construction or maintenance/repair activity

Carrying out the routine cleaning requirements for PR 1407.1 varies by size of facility, so the following vacuum equipment was assumed for purchase for facilities as follows:

- Rider HEPA-equipped industrial sweeper/vacuum for four facilities (\$11,600 each)
 - Annual maintenance, HEPA filter replacement, and cleaning supplies totaling \$25,000 per rider vacuum

¹⁴ <https://www.grainger.com/category/test-instruments/air-movement/air-velocity-meters-and-anemometers?sortKey=price&sortOrder=desc> (accessed 7/27/19).

- Backpack HEPA-equipped vacuums for the remaining seven facilities (\$600 each)
 - Annual maintenance and replacement HEPA filters totaling \$2,000
- HEPA-equipped shop vacuums for all 11 facilities (\$500 each)
 - Annual maintenance and replacement HEPA filters totaling \$2,500

The present worth value of all housekeeping expenditures (including labor, purchase and maintenance of equipment, cleaning supplies, and replacement filters for cleaning equipment) if they were all made in 2021 is \$2.4 million for all facilities. The annualized capital and recurring costs associated housekeeping requirements is \$175,000 across all 11 facilities.

PR 1407.1 outlines recordkeeping requirements in subdivision (k), and requires a facility owner/operator to maintain records for five years for the following:

- Quarterly quantities of raw materials processed, including purchase records
- Material testing data
- Source test protocols and reports
- Housekeeping activities conducted
- Maintenance and repair and construction activities
- Documentation of repairs to unintended breaches and log of notifications to 1-800-CUT-SMOG
- Inspection, calibration documentation, and maintenance of emission control devices and parameter monitoring equipment
- Parameter monitoring data
- Reporting log of failed parameter monitoring to 1-800-CUT-SMOG
- Documentation of repairs or replacements performed to correct failed parameter measurement

South Coast AQMD staff assumes that recordkeeping costs will be carried out by existing facility staff and costs a facility about \$5,000 annually for each of the 11 affected facilities. In total, recordkeeping costs total around \$56,000 annually across all facilities.

Cost Summary

Table 6 presents the distribution of overall predicted costs of PR 1407.1 by selected cost categories. Table 6 indicates the present worth value and annualized cost of each cost category. The present worth value in 2020 dollars presents the estimated total PR 1407.1 cost from 2021-2041 by cost category if all costs paid over this timeframe due to PR 1407.1 were paid in 2021. The annualized cost presents the estimated total PR 1407.1 annual cost from 2021-2041 by cost category, where one-time costs are spread over an equipment's lifetime while including lost investment value to facilities where the investments are assumed to have either a 4% or 1% real rate of return (nominal interest rate net inflation).

The majority of predicted costs, about \$2.0 million annually, is attributed to annual operation and maintenance of baghouses, HEPA systems, and ULPA systems installed, or about 74 percent of the PR 1407.1 total capital and recurring cost. Costs for purchase and installation of baghouses and HEPA systems represent the largest portion of one-time

expenditures with \$3.5 million or 80 percent of the total one-time costs (4% scenario). The low-rate scenario assumes a real interest rate of 1%, while the high-rate scenario assumes a 4% real interest rate.¹⁵ The average annual cost of PR 1407.1 is estimated to be \$2.75 to \$2.79 million between 2021 and 2041, for the low- and high-rate scenarios respectively. The relatively small difference in costs by real interest rate scenario is because capital costs associated with the rule (subject to interest rates) are small compared to the recurring costs (not subject to interest rate) of the rule requirements.

¹⁵ The real interest rate can be viewed as the percentage return on an investment net inflation. A higher real interest rate entails a higher cost of using facility funds to meet regulatory requirements.

Table 6: PR 1407.1 Projected Total and Average Annual Cost by Cost Category for Potentially Affected Facilities (2020 Dollars)

Cost Categories	Present Worth Value (2020)		Annual Average (2021-2041)	
	1% Discount Rate	4% Discount Rate	1% Real Interest Rate	4% Real Interest Rate
One-Time Cost				
Anemometer	\$23,000	\$20,000	\$1,000	\$1,000
Backpack HEPA vacuum	\$14,000	\$12,000	\$1,000	\$1,000
Bag leak detection system	\$44,000	\$38,000	\$2,000	\$3,000
Baghouse	\$2,560,000	\$2,160,000	\$131,000	\$153,000
Building Enclosure Modifications	\$167,000	\$163,000	\$9,000	\$11,000
HEPA	\$1,483,000	\$1,251,000	\$76,000	\$89,000
Install butterfly cap	\$321,000	\$276,000	\$16,000	\$19,000
Plastic curtains	\$99,000	\$97,000	\$5,000	\$7,000
Pressure gauge with DAS	\$88,000	\$75,000	\$4,000	\$5,000
Rider HEPA vacuum	\$157,000	\$128,000	\$8,000	\$9,000
Shop HEPA vacuum	\$19,000	\$15,000	\$1,000	\$1,000
Standard & Calibration Materials	\$22,000	\$21,000	\$1,000	\$1,000
ULPA	\$77,000	\$65,000	\$4,000	\$5,000
Total one-time cost	\$5,074,000	\$4,321,000	\$259,000	\$305,000
Recurring Cost				
Baghouse annual maintenance	\$26,067,000	\$18,834,000	\$1,333,000	\$1,333,000
HEPA annual maintenance	\$12,717,000	\$9,188,000	\$650,000	\$650,000
Housekeeping	\$216,000	\$159,000	\$11,000	\$11,000
Permit Renewal Fees	\$479,000	\$346,000	\$24,000	\$24,000
Recordkeeping	\$1,098,000	\$807,000	\$56,000	\$56,000
Replacement HEPA filters for shop vacuum	\$467,000	\$337,000	\$24,000	\$24,000
Roof Cleaning	\$303,000	\$223,000	\$15,000	\$15,000
Slot velocity test	\$207,000	\$151,000	\$11,000	\$11,000
Smoke test	\$2,336,000	\$1,703,000	\$119,000	\$119,000
Source test	\$1,887,000	\$1,417,000	\$95,000	\$95,000
ULPA annual maintenance	\$728,000	\$526,000	\$37,000	\$37,000
Rider Vacuum Parts & Maintenance	\$1,180,000	\$867,000	\$60,000	\$60,000
Backpack HEPA vacuum parts	\$275,000	\$202,000	\$14,000	\$14,000
Cleaning Supplies	\$786,000	\$578,000	\$40,000	\$40,000
Total recurring cost	\$48,746,000	\$35,338,000	\$2,489,000	\$2,489,000
Total	\$53,821,000	\$39,659,000	\$2,749,000	\$2,794,000

Note: Values rounded to nearest thousand dollars. Column total values may not add up due to rounding.

Table 7 presents total and average annual compliance costs of PR 1407.1 by industry. Most of the cost due to PR 1407.1 is expected to be incurred by foundries (\$30.6 million to \$41.5 million or about 77 percent of the total cost for both the low- and high-rate scenarios). The industry which incurs the second-highest expected cost due to PR 1407.1 is iron and steel mills and ferroalloy manufacturing (\$6.9 to \$9.3 million of the total cost or 17 percent for

both the low- and high-rate scenarios). The remaining expected cost due to PR 1407.1 is expected to be incurred almost entirely by other fabricated metal manufacturing (\$2.2 to 3.0 million of the total cost or about 5 percent for both low- and high-rate scenarios).

Table 7: PR 1407.1 Projected Total and Average Annual Compliance Cost by Industry for Potentially Affected Facilities (2020 Dollars)

Industry description	NAICS Code	Present Worth Value (2020)		Average Annual Costs (2021-2041)	
		1% Discount Rate	4% Discount Rate	1% Discount Rate	4% Discount Rate
Iron and steel mills and ferroalloy manufacturing	3311	\$9,291,000	\$6,866,000	\$474,000	\$483,000
Foundries	3315	\$41,523,000	\$30,567,000	\$2,121,000	\$2,156,000
Other fabricated metal product manufacturing	3329	\$3,007,000	\$2,227,000	\$153,000	\$156,000
Total		\$53,821,000	\$39,659,000	\$2,749,000	\$2,794,000

Note: Values rounded to nearest thousand dollars.

PR 1407.1 sets aggregate emission limits for hexavalent chromium based on distance of a furnace stack (or centroid of multiple stacks) to a sensitive receptor's nearest property line. Table 8 shows that nine of 11 identified facilities fall under the *Greater than 100 meters* category (least stringent PR 1407.1 aggregate emission limit). One facility falls in the *50 to 100 meter* category, and one facility is in the *Less than 50 meters* of a sensitive receptor category (most stringent emission limit). The higher cost per facility figures in the one *Less than 50 meters* facility and the nine *Greater than 100 meters* facilities are driven by the high cost (\$276,000 each) of new baghouse installations. Therefore, cost per facility is not only a function of distance to a sensitive receptor, but rather by distance-determined emission rate requirement and the associated required emission reductions specific to a facility.

Table 8: PR 1407.1 Average Expected Compliance Cost Per Facility by Distance to Sensitive Receptors from 2021-2041

Facility Distance to Sensitive Receptor (meters)	Number of Facilities	Present Worth Value (2020)		Average Annual Costs (2021-2041)	
		1% Discount Rate	4% Discount Rate	1% Discount Rate	4% Discount Rate
Less than 50	1	\$7,109,000	\$5,224,000	\$363,000	\$369,000
50 to 100	1	\$1,238,000	\$921,000	\$63,000	\$64,000
Greater than 100	9	\$5,053,000	\$3,724,000	\$258,000	\$262,000
Total	11	\$13,400,000	\$9,869,000	\$684,000	\$695,000

JOBS AND OTHER SOCIOECONOMIC IMPACTS

The REMI model (PI+ v2.4.1) was used to assess the total socioeconomic impacts of the regulatory change from PR 1407.1.¹⁶ The model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino, and for each county, it is comprised of five interrelated blocks: (1) output and demand, (2) labor and capital, (3) population and labor force, (4) wages, prices and costs, and (5) market shares.¹⁷

The assessment herein is performed relative to a baseline (“business as usual”) where PR 1407.1 would not be adopted. The baseline of this model has been calibrated with the latest data, made available in August 2020, which reflects the recent regional impacts on the local economy as a result of COVID-19. Adoption of PR 1407.1 would create a regulatory scenario under which the potentially affected facilities would incur average annual compliance costs totaling \$2.75 - \$2.79 million for low- and high-rate scenarios respectively. Direct effects of proposed rules/amendments must be estimated and used as inputs into the REMI PI+ model in order for the model to assess secondary and induced impacts for all actors in the four-county economy on an annual basis and across a user-defined horizon (2021 - 2041). Direct effects of PR 1407.1 include additional costs to the potentially affected facilities and additional sales by local vendors of equipment, devices, or services supplying the necessary goods/services to help the potentially affected facilities meet the proposed requirements of PR 1407.1.

While compliance expenditures may increase the cost of doing business for affected facilities, the purchase and installation of additional equipment combined with spending on operating and maintenance may increase sales in other sectors. Table 9 lists the industry sectors modeled in REMI PI+ that would either incur a cost or benefit from the compliance expenditures.¹⁸

All compliance costs expected due to PR 1407.1 are included fully into the REMI PI+ model as spending in the industry categories listed in Table 9. This could substantially mute negative regional effects on employment if the REMI PI+ model assumed all spending from any industry in the South Coast AQMD jurisdiction was spent within the South Coast AQMD jurisdiction. However, each industry is provided a set of “regional purchase coefficients” within the REMI PI+ model, which accounts for industries within

¹⁶ Regional Economic Modeling Inc. (REMI). Policy Insight® for the South Coast Area (160-sector model). Version 2.4.1, 2020.

¹⁷ Within each county, producers are made up of 156 private non-farm industries and sectors, three government sectors, and a farm sector. Trade flows are captured between sectors as well as across the four counties and the rest of U.S. Market shares of industries are dependent upon their product prices, access to production inputs, and local infrastructure. The demographic/migration component has 160 ages/gender/race/ethnicity cohorts and captures population changes in births, deaths, and migration. (For details, please refer to REMI online documentation at <http://www.remi.com/products/pi>.)

¹⁸ Improved public health due to reduced air pollution may improve worker productivity and other economic factors. However, public health benefit assessment requires modeling air quality improvements. Current air-quality modeling employed by South Coast AQMD performs poorly with changes in air pollution less than 10 tons per day of criteria pollutants since such changes are hard to distinguish from random variation in the model. Toxic air pollutants present additional analytical challenges to estimate monetized public health benefit due to the localized nature of their air quality impact.

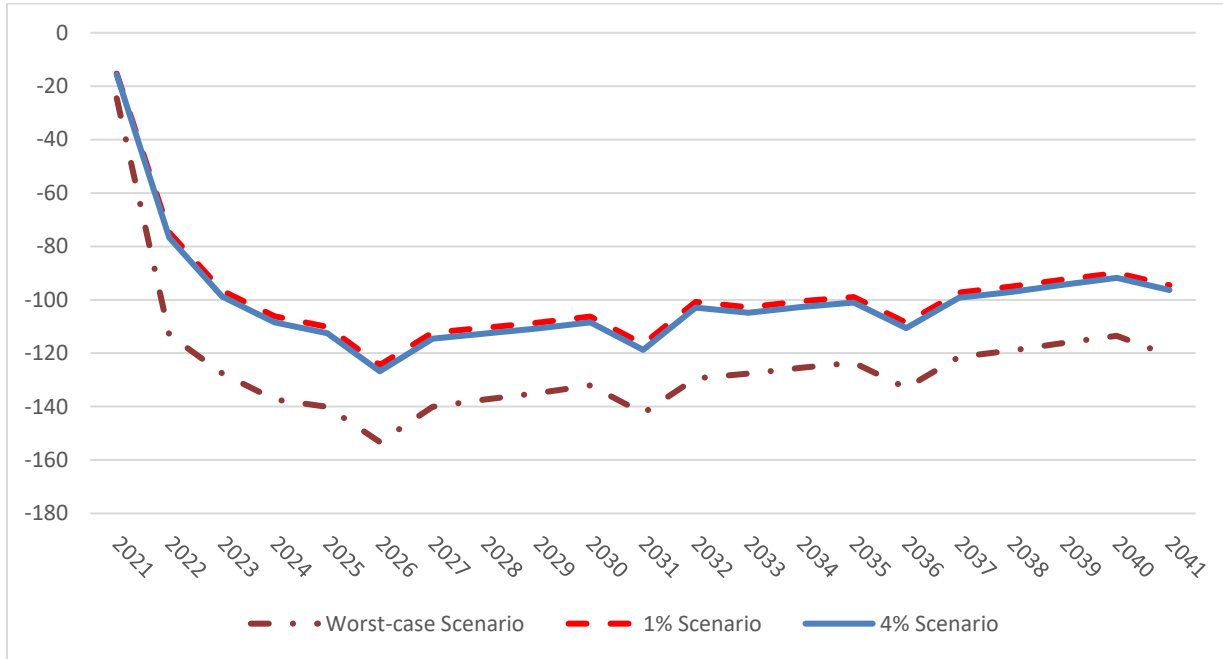
the South Coast AQMD jurisdiction spending often going to other facilities outside the South Coast AQMD jurisdiction.

Table 9: Industries Incurring Costs or Benefitting from PR 1407.1 Compliance

Compliance Cost Source	REMI Industries Incurring Compliance Costs (NAICS)	REMI Industries Benefitting from Compliance Spending (NAICS)
Baghouse	Iron and steel mills and ferroalloy manufacturing (NAICS 3311); Foundries (NAICS 3315); Other fabricated metal product manufacturing (NAICS 3329)	<i>One-time-Capital:</i> Construction (NAICS 23)
Bag leak detection system		
Pressure gauge with DAS		
HEPA system		
ULPA System		<i>One-time-Capital:</i> Ventilation, Heating, Air-conditioning, and commercial refrigeration equipment manufacturing (NAICS 3334)
Anemometer		<i>One-time-Capital:</i> Navigational, Measuring, Electromedical, and Control Instruments (NAICS 3345)
Building enclosure		<i>One-time-Capital:</i> Electrical Equipment Manufacturing (NAICS 3353)
Plastic curtains		<i>Recurring Cost:</i> Architectural, Engineering, and Related Services (NAICS 5413)
Baghouse annual maintenance		<i>Recurring Cost:</i> Ventilation, heating, air-conditioning and commercial refrigeration (NAICS 3334)
Smoke test		<i>Recurring Cost:</i> Wholesale Trade (NAICS 42)
Source test		<i>Recurring Cost:</i> Management, scientific, and technical consulting services (NAICS 5416)
Slot velocity test		<i>Recurring Cost:</i> State & Local Government (NAICS 92)
Rider HEPA vacuum		
Backpack HEPA vacuum		
HEPA shop vacuum		

As presented in Figure 3, PR 1407.1 is expected to result in an average of 98 to 100 jobs foregone annually from 2021 to 2041 for the low- and high-rate scenarios respectively. The projected job impacts represent about a 0.001 percent decrease of total employment in the four-county region for both low- and high-rate scenarios. A “worst-case” scenario, where all purchases made due to PR 1407.1 went to suppliers outside the four-county region, resulted in approximately 124 jobs on average expected to be foregone annually from 2021 to 2041.

Figure 3: PR 1407.1 Projected Regional Foregone Jobs, 2021 - 2041



Jobs foregone can come from currently existing jobs or future new jobs. Table 10 presents expected job impacts of PR 1407.1 for the top 12 industries with negative job impacts, one industry with expected positive job impacts, and the remaining industries grouped together. Jobs are expected to be forgone in the overall economy throughout the time period considered (2021 - 2041). The foundry industry (NAICS 3315) is expected to bear most of the estimated total compliance cost of PR 1407.1, with an expected total 14 jobs forgone annually between 2021 and 2041. The remainder of the projected reduction in employment due to PR 1407.1 implementation is spread across many other major sectors of the economy due to secondary and induced impacts of PR 1407.1, occurring mainly in retail trade (NAICS 44-45), construction (NAICS 23), and health care and social assistance (NAICS 62).¹⁹

Positive job impacts from adoption of PR 1407.1 in the management, scientific, and technical consulting services sector (NAICS 5416) are due to PR 1407.1 potentially

¹⁹ Secondary impacts on jobs are changes in jobs to supplying industries of the affected industries, while induced impacts on jobs are changes in jobs due to overall disposable income changes in the South Coast AQMD economy.

affected facilities completing baghouse annual maintenance, smoke testing, source testing, and slot velocity testing.

Table 10: PR 1407.1 Job Impacts (High-Rate Scenario)

Industries (NAICS)	2021	2026	2031	2036	2041	Average Annual Job Changes (2021-2041)	Average Annual Baseline Jobs (2021-2041)	% Change from Baseline Jobs
Manufacturing (33-33)	-4	-32	-32	-30	-28	-27	606,000	-0.004%
Retail Trade (44-45)	-2	-13	-12	-11	-10	-10	939,000	-0.001%
Construction (23)	1	-18	-10	-7	-3	-9	507,000	-0.002%
Health care and social assistance (62)	-1	-10	-11	-11	-11	-9	1,549,000	-0.001%
State and Local Government (92)	0	-8	-9	-9	-8	-8	944,000	-0.001%
Transportation and warehousing (48, 492-493)	-1	-8	-8	-8	-7	-7	703,000	-0.001%
Accommodation and food services (72)	-1	-7	-8	-8	-7	-6	904,000	-0.001%
Other services (except public administration) (81)	-1	-7	-7	-6	-6	-6	759,000	-0.001%
Administrative, support, waste management, and remediation services (56)	-1	-6	-6	-5	-5	-5	812,000	-0.001%
Real estate and rental and leasing (53)	-1	-6	-5	-5	-4	-4	650,000	-0.001%
Wholesale trade (42)	1	-5	-5	-4	-4	-4	415,000	-0.001%
Finance and insurance (52)	-1	-4	-4	-4	-3	-3	513,000	-0.001%
Other Industries	-1	-4	-3	-2	-0	-1	2,161,000	-0.001%
All Industries Total	-16	-127	-119	-111	-96	-100	11,462,000	-0.001%
Select Sub-Industry Totals*								
Foundries (3315)	-3	-17	-16	-15	-14	-14	3,000	-0.467%
Local Government (92)	0	-7	-8	-8	-7	-7	788,000	-0.001%
Management, scientific, and technical consulting services (5416)	0	12	11	11	10	11	171,000	0.006%

* Sub-Industries fall within main industry values (i.e. Foundries – 3315 is a subset of manufacturing – 31-33, so the 14 jobs foregone in foundries is contained within the 25 jobs foregone in manufacturing).

Competitiveness

Although there is no legal requirement by California Health & Safety Code to provide analysis about competitiveness of industries possibly affected by any rule, it may still be

useful to consider. An in-depth competitiveness analysis of the industries affected by any rule is time and data prohibitive, requiring discussion of the competitiveness of facilities in the South Coast AQMD region compared to facilities outside the region. Nonetheless, two results of the modeling exercise performed to estimate job impacts could be useful when considering regional competitiveness: estimated changes in regional costs of production and delivered prices relative to the rest of the U.S.

Due to PR 1407.1, the relative cost of production is expected to increase in the foundry industry (NAICS 3315) by less than 0.9% for any given year between 2021 and 2041, while iron and steel mills and ferroalloy manufacturing (NAICS 3311) and other fabricated metal product manufacturing (NAICS 3329) industries are expected to see increases of less than 0.04%. Relative delivered prices are expected to increase for the foundry industry by less than 0.3% for any given year between 2021 and 2041, while iron and steel mills and ferroalloy manufacturing and other fabricated metal product manufacturing industries are expected to see increases of less than 0.02%.

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