

Regulatory Impact Analysis

Safer Communities by Chemical Accident Prevention Proposed Rule

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Acronyms

| Acronym | Definition |
|---------|--|
| AFPM | American Fuel & Petrochemical Manufacturers |
| API | American Petroleum Institute |
| AWWA | American Water Works Association |
| BLS | Bureau of Labor Statistics |
| CAA | Clean Air Act |
| CSAG | Chemical Safety Advocacy Group |
| CSB | U.S. Chemical Safety Board |
| CWA | Clean Water Act |
| D.C. | District of Columbia |
| E.O. | Executive Order |
| EPA | U.S. Environmental Protection Agency |
| EPCRA | Emergency Planning and Community Right to Know Act |
| FTE | full-time employee |
| HF | hydrofluoric acid |
| HHS | U.S. Department of Health & Human Services |
| ICR | Information Collection Request |
| IST | inherently safer technologies |
| IPAWS | Integrated Public Alert and Warning System |
| LEPC | Local Emergency Planning Committee |
| NAICS | North American Industrial Classification System |
| NIPA | National Income and Product Accounts |
| NPRM | Notice of Proposed Rulemaking |
| NTTAA | National Technology Transfer and Advancement Act |
| OCA | Offsite Consequences Analysis |
| OEM | Office of Emergency Management |
| OSWER | Office of Solid Waste and Emergency Response |

| | |
|------|---|
| OLEM | Office of Land and Emergency Management |
| OMB | Office of Management and Budget |
| OSHA | Occupational Safety & Health Administration |
| PHA | Process Hazard Analysis |
| PRA | Paperwork Reduction Act of 1995 |
| PSM | Process Safety Management |
| RFA | Regulatory Flexibility Act |
| RFI | request for information |
| RIA | Regulatory Impact Analysis |
| RMP | Risk Management Program or Risk Management Plan |
| SBA | Small Business Administration |
| SDS | Safety Data Sheet |
| STAA | Safer Technology and Alternatives Analysis |
| TRI | Toxic Release Inventory |
| TQ | threshold quantity |
| U.S. | United States |
| VSL | value of statistical life |
| WTP | willingness to pay |

Executive Summary

Introduction

To bolster resilience to the impacts of climate change and prioritize environmental justice through environmental policy and regulation in the United States, President Biden issued Executive Order (E.O.) 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. The E.O. directs Federal agencies to review current regulations and take action to address these issues. To support these priorities, EPA reviewed the current Risk Management Program (RMP)¹ regulations. As a result of Agency review, EPA developed a regulatory proposal to revise the RMP rule.

The purpose of this action is to propose changes to the current RMP rule in order to improve safety at facilities that use and distribute hazardous chemicals. EPA believes that the RMP regulations have been effective in preventing and mitigating chemical accidents in the United States and that the proposed revisions, by giving special consideration to concerns about climate change and environmental justice and building on lessons learned from the current regulatory program, could further protect human health and the environment from chemical hazards through advancement of process safety. These revisions are informed by EPA's review of the current RMP rule and information EPA gathered from public listening sessions held in June and July 2021.

The proposed revisions seek to improve chemical process safety, assist in planning, preparedness, and responding to RMP accidents, and improve public awareness of chemical hazards at regulated sources. To accomplish this, these proposed provisions include several changes to the accident prevention program requirements, enhancements to the emergency preparedness requirements, changes to increase public availability of chemical hazard information, and changes or clarifications to certain regulatory definitions or points of clarification. Many of the proposed provisions target stronger provisions to facilities in close proximity to certain other facilities and/or facilities that have had recent accidents.

Provisions Analyzed in this RIA

This Regulatory Impact Analysis (RIA) analyzes the following new proposed requirements and proposed revisions to current requirements:

Prevention Program

Prevention Program Provisions

Safer Technologies and Alternatives Analysis (STAA) — (Proposed revisions apply to §68.3 and §68.67):

The proposed rule would require facilities with Program 3 processes in NAICS codes 324 and 325, located within one mile of another facility having a process in NAICS code 324 or 325, to conduct a STAA. The proposed rule would also require that all facilities in NAICS 324 using hydrofluoric acid (HF) in an alkylation unit (approximately 45 facilities) conduct a STAA to consider safer alternatives to HF alkylation, regardless of proximity to another NAICS 324- or 325-regulated facility. The STAA requirement includes two parts: the initial analysis to identify alternatives, and a practicability study (also referred to in the literature as a feasibility study), to determine the costs and assess the reasonableness of implementing technology alternatives.

Root Cause Analysis — (Proposed revisions apply to §§68.60 and 68.81):

The proposed rule would require Program 2 and Program 3 facilities to conduct a root cause analysis as part of an incident investigation following an RMP-reportable accident. A root cause analysis is a formal process to identify underlying reasons for failures that lead to accidental releases. These analyses usually require staff trained in the technique.

¹ Note that the acronym RMP is used generally to refer to both the Risk Management Program and risk management plans. For clarity, throughout this RIA, RMP will refer to the Risk Management Program, and the term "risk management plan" will be written out.

Third-Party Compliance Audits — (Proposed revisions apply to §§68.58 and 68.79 and new §§68.59 and 68.80):

The proposed rule would require facilities with Program 2 and Program 3 processes to have their next scheduled compliance audit (currently required once every three years) be a third-party audit when at least one of the following conditions applies:

1. The facility has had two RMP-reportable accidents within the past five years; or
2. The facility has had one RMP-reportable accident from a Program 3 covered process at a facility in NAICS code 324 or 325 within the past five years, located within one mile of another facility having a process in NAICS code 324 or 325; or
3. An implementing agency requires a third-party audit due to conditions at the facility that could lead to an accidental release of a regulated substance, or when a previous third-party audit failed to meet the competency or independence criteria of § 68.80(c).

Employee Participation— (Proposed revisions apply to §68.83 and new §§68.62)

The proposed rule would revise employee participation requirements in three ways:

1. For Program 3 processes, it would revise 40 CFR 68.83 to require that the employee participation plan include consultation of employees and their representatives on addressing, correcting, resolving, documenting, and implementing recommendations or findings of process hazard analyses, incident investigations, and compliance audits.
2. For Program 3 processes, the employee participation plan would be required to ensure that employees and their representatives have specific stop work authorities based on the potential for a catastrophic release.
3. For Program 2 and 3 processes, it would require that employee participation plans include instructions for how to anonymously report (1) unaddressed hazards that could lead to a catastrophic release, (2) unreported RMP-reportable accidents, or (3) other RMP non-compliance.

Backup Power for Perimeter Monitors — (Proposed revisions apply to §§68.50 and 68.67):

The proposed rule would require perimeter monitoring equipment associated with prevention and detection of RMP-regulated substances to have standby or backup power.

Emergency Response

Community Notification of RMP Accidents— (Proposed revisions apply to §§68.90 and 68.95):

The proposed rule would add a requirement to RMP facility owners and operators who designate themselves as a non-responding facility to develop and implement, as necessary, procedures for informing the public and the appropriate emergency response agencies about accidental releases of RMP-regulated substances. EPA is also proposing that responding and non-responding facilities must ensure that a community notification system is in place and that the public is promptly notified of an accidental release from an RMP-covered process by providing appropriate, timely data and information to local responders and the community, detailing the current understanding and best estimates of the nature of the release.

Information Availability

Information Availability — (Proposed revisions apply to §68.210):

The proposed rule would require all facilities, upon receiving a request from a member of the public residing within 6 miles of the facility, to disclose certain chemical hazard information to the requester in the language requested by them. The facility or its parent company, if applicable, would have to make the information available in an easily accessible manner, such as on a company website, post the information at public libraries, publish it in local papers, or through other means appropriate for particular communities and facilities. The information required to be disclosed would include names of regulated substances at the facility; Safety Data Sheets (SDS); accident history information; emergency response program information; and LEPC or

local response agency contact information.

Regulatory Alternatives to the Proposed Rule

The RIA analyzed several regulatory alternatives to the proposed rule. EPA considered one regulatory alternative with lower costs and one with higher costs. The low cost regulatory alternative considers alternatives for three provisions: root cause analysis, third-party audits and employee participation. The higher cost alternative applies to the STAA and third-party audit provision. See Chapter 7 for a description of each regulatory alternative EPA considered and breakeven analyses of those alternatives.

Universe of RMP Facilities

Approximately 11,740 facilities have filed current RMPs with EPA and are potentially affected by the proposed rule. These facilities range from petroleum refineries and large chemical manufacturers to water and wastewater treatment systems; chemical and petroleum wholesalers and terminals; food manufacturers, packing plants, and other cold storage facilities with ammonia refrigeration systems; agricultural chemical distributors; midstream gas plants; and a limited number of other sources that use RMP-regulated substances. A table of the number of affected facilities by sector and NAICS code can be found in Exhibit 3-1.

Summary of Estimated Costs

Exhibit ES-1 presents a summary of the annualized costs. In total, EPA estimates annualized costs of \$75.8 million at a 3 percent discount rate and \$76.7 million at a 7 percent discount rate over a 10-year period. The provisions associated with the largest annualized cost at a 3 percent discount rate are the STAA provision (\$51.8 million), followed by third-party audits (\$10.3 million), rule familiarization (\$5.3 million), a community notification system (\$3.8 million), and information availability (\$3 million). The remaining provisions impose annualized costs of less than \$1 million, including employee participation (\$0.9 million), root cause analysis (\$0.7 million), and emergency backup power for perimeter monitors used to detect RMP-regulated substances (less than \$0.1 million).

Exhibit ES-1. Summary of Estimated Costs (millions, 2020 dollars).

| Cost Elements | Total Undiscounted | Total Discounted (3%) | Total Discounted (7%) | Annualized (3%) | Annualized (7%) |
|---|--------------------|-----------------------|-----------------------|-----------------|-----------------|
| Rule Familiarization | \$46.5 | \$45.2 | \$43.5 | \$5.3 | \$6.2 |
| Safer Technology Alternatives Analysis (STAA) | \$518.2 | \$442.0 | \$364.0 | \$51.8 | \$51.8 |
| Root Cause Analysis | \$7.3 | \$6.2 | \$5.1 | \$0.7 | \$0.7 |
| Third-party Audits | \$102.7 | \$87.6 | \$72.1 | \$10.3 | \$10.3 |
| Employee Participation Plan | \$8.6 | \$7.3 | \$6.0 | \$0.9 | \$0.9 |
| Backup Power for Perimeter Monitors | \$.4 | \$0.4 | \$0.4 | \$0.0** | \$0.0** |
| Community Notification System | \$38.0 | \$32.4 | \$26.7 | \$3.8 | \$3.8 |
| Information Availability | \$30.3 | \$25.8 | \$21.3 | \$3.0 | \$3.0 |
| Total Cost* | \$751.8 | \$646.8 | \$538.8 | \$75.8 | \$76.7 |

*Totals may not sum due to rounding.

** Totals are zero due to rounding. Unrounded totals are \$44,600 at 3% and \$52,200 at 7% discount rates.

Exhibit ES-2 provides undiscounted yearly costs for the proposed rule provisions, for both Year 1 and Years 2-10. Rule familiarization and backup power for perimeter monitors costs are incurred only in Year 1, and therefore are \$0 in subsequent years.

Exhibit ES-2. Summary of Estimated Undiscounted Yearly Costs (millions, 2020 dollars).

| Cost Elements | Year 1 Costs Undiscounted | Years 2 – 10 Costs per Year Undiscounted |
|--|---------------------------|--|
| Rule Familiarization | \$46.5 | \$0 |
| Safer Technology Alternatives Analysis | \$51.8 | \$51.8 |
| Root Cause Analysis | \$0.7 | \$0.7 |
| Third-party Audits | \$10.3 | \$10.3 |
| Employee Participation Plan | \$0.9 | \$0.9 |
| Backup Power for Perimeter Monitors | \$0.4 | \$0 |
| Community Notification System | \$3.8 | \$3.8 |
| Information Availability | \$3.1 | \$3.1 |
| Total Cost* | \$117.4 | \$70.5 |

*Totals may not sum due to rounding.

Baseline Damages

Accidents and releases from RMP facilities occur every year, causing fires and explosions and damage to property. EPA presents data on the damages that are currently caused by reportable accidents at RMP facilities each year. Data presented in Exhibit ES-3 is for the most recent five-year period for which data is available, summarizing RMP accident impacts and, when possible, monetizing them.² During this timeframe, 488 accidents with either or both onsite and offsite damages occurred at RMP facilities.

Exhibit ES-3. Summary of quantified baseline damages 2016-2020 (millions, 2020 dollars).

| | Unit Value | 5-Year Total | Average/Year | Average/Accident | Median /Accident |
|----------------------|------------|-------------------|-----------------|------------------|------------------|
| Onsite | | | | | |
| Fatalities | \$9.3 | \$111.6 | \$22.32 | \$0.23 | \$0.00 |
| Injuries | \$0.05 | \$27.50 | \$5.50 | \$0.06 | \$0.05 |
| Property Damage | | \$2,031 | \$406.20 | \$4.16 | \$0.00 |
| Onsite Total | | \$2,170.10 | \$434.02 | \$4.45 | \$0.05 |
| Offsite | | | | | |
| Fatalities | \$9.30 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| Hospitalizations | \$0.045 | \$1.40 | \$0.28 | \$0.00 | \$0.00 |
| Medical Treatment | \$0.001 | \$0.13 | \$0.03 | \$0.00 | \$0.00 |
| Evacuations* | \$0.00 | \$14.16 | \$2.83 | \$0.03 | \$0.00 |
| Sheltering in Place* | \$0.00 | \$9.39 | \$1.88 | \$0.02 | \$0.00 |
| Property Damage | | \$191.53 | \$38.31 | \$0.39 | \$0.00 |
| Offsite Total | | \$216.61 | \$43.32 | \$0.44 | \$0.00 |

²Additional data on damages caused by reportable accidents at RMP facilities for prior time periods, including from 2004 to 2013 and from 2014 to 2016, are presented in Chapter 6, Exhibit 6-7. Note that the averages include accidents for which the damages were zero in individual categories (but non-zero in at least one category). The impacts also include environmental damage categories, including soil and water contamination, among others, which EPA was not able to monetize.

| | | | | | |
|----------------|--|-------------------|-----------------|---------------|---------------|
| Total** | | \$2,386.71 | \$477.34 | \$4.89 | \$0.05 |
|----------------|--|-------------------|-----------------|---------------|---------------|

* The unit value for evacuations and for sheltering in place are less than \$300 so when expressed in rounded millions, the value represented in the table is zero.

**Totals may not sum due to rounding.

EPA monetized both onsite and offsite damages. EPA estimated total average annual *onsite* damages of \$434.0 million. The largest monetized, average annual, onsite damage category was property damage, which resulted in average annual damage of approximately \$406.2 million. The next largest impact was onsite fatalities (\$22.3 million) and injuries (\$5.5 million).

EPA estimated total average annual *offsite* damages of \$43.3 million. The largest monetized, average annual, offsite damage was property damage, which resulted in average annual damage of approximately \$38.3 million. The next largest impact was from evacuations (\$2.8 million), sheltering in place (\$1.9 million), hospitalizations (\$0.3 million), and medical treatment (\$0.03 million). In total, EPA estimated monetized damages from RMP facility accidents over the five-year period of \$477.3 million per year.³

EPA also calculated the median accident value for the 488 accidents with impacts in 2016 through 2020 period, which was \$50,000. Median values were zero in all damage categories except for onsite (worker) injuries. In addition to monetized baseline damages, there are many damage categories from accidents at RMP facilities that EPA was unable to quantify or monetize. Unquantified baseline damages include lost productivity, responder costs, transaction costs, negative impacts on property values, environmental damages, and damages related to catastrophic releases.

Summary of Benefits

EPA anticipates that promulgation and implementation of this proposed rule would result in a reduced frequency and magnitude of damages from releases, including damages that are quantified in Exhibit ES-3 such as fatalities, injuries, property damage, hospitalizations, medical treatment, sheltering-in-place and so on. EPA also expects that the proposed rule provisions would reduce baseline damages that are not quantified in Exhibit ES-3 such as lost productivity, responder costs, property value reductions, damages from catastrophes, and so on. Although EPA was unable to quantify the reductions in damages that may occur as a result of the proposed rule provisions, EPA expects that a portion of future damages would be prevented by the proposed rule.

Costs Relative to Benefits: Breakeven Analysis

EPA conducted a breakeven analysis instead of a standard cost benefit analysis because while EPA was able to quantify and monetize the costs of the proposed rule, it cannot sufficiently quantify or monetize the benefits. The proposed rule would need to reduce, or mitigate, damages valued at approximately \$76 million over any number of future accidents to achieve breakeven. Alternatively, for the proposed rule to breakeven on an annual basis given estimated annualized costs of approximately \$76 million and an estimated number of annual accidents of about 100, fewer than approximately 15 accidents, each with average monetized damages of approximately \$5 million as estimated for the most recent five-year baseline period, would need to be prevented annually by the proposed rule. A number fewer than 15 would depend on the value of the unquantified accident damages that would be avoided. When considering the rule's likely benefits that are due to avoiding some portion of the monetized accident impacts, as well as the additional nonmonetized benefits, EPA believes the costs of the rule are reasonable in comparison to its benefits.

The annualized cost of the proposed rule, estimated as \$76 million, should be considered in light of potential unquantified benefits mentioned above and described in Chapter 6.

³ See Chapter 6, Exhibit 6-7, for presentations of monetized damages for prior time periods. For 2004 to 2013, estimated monetized damages from RMP facility accidents are \$275 million (2015\$) on average per year; for 2014 to 2016, estimated monetized damages are \$214 million (2015\$) on average per year.

CHAPTER 1: Introduction and Background

1.1 History and Need for the Rule

Overview of the Risk Management Program

Serious chemical accidents occurring in the 1970s and 1980s, including accidents in Bhopal, India; Seveso, Italy; and Pasadena, Texas, led to a series of legislative reforms relating to chemical safety in industrialized countries.^{4,5} In the United States, the Emergency Planning and Community Right to Know Act (EPCRA) was enacted in 1986 to promote community emergency planning and preparedness and provide local responders and the public with information about the chemical hazards in their community (42 U.S.C. 11002 et seq.). In 1990, sections 112(r) and 304 of the Clean Air Act (CAA) were enacted to help prevent severe chemical facility accidents. Section 304 required the Occupational Safety & Health Administration (OSHA) to publish a chemical process safety standard (Process Safety Management, or PSM standard) to prevent accidental releases of chemicals that could pose a threat to employees. Section 112(r) required the Environmental Protection Agency (EPA) to publish Accidental Release Prevention Program regulations to prevent chemical releases or minimize their consequences if they occur.

CAA section 112(r) required EPA to develop a list of at least 100 regulated substances known to cause or that may reasonably be anticipated to cause death, injury, or serious adverse effects to human health or the environment (42 U.S.C. 7412(r)). EPA was also required to establish threshold quantities (TQs) for these substances that determine the applicability of rules to prevent accidental releases of these substances. Section 112(r)(7)(B) required EPA to promulgate reasonable regulations and appropriate guidance to provide, to the greatest extent practicable, for the prevention and detection of accidental releases of regulated substances and for response to such releases by the owners or operators of the sources of such releases. The section mandates that the regulations require the owner or operator of a facility “to prepare and implement a risk management plan to detect and prevent or minimize accidental releases of such substances from the facility, and to provide a prompt emergency response to any such releases in order to protect human health and the environment.” The section further mandates that the plan include:

- A hazard assessment to assess the potential effects of an accidental release of any regulated substance. This assessment must include an estimate of potential release quantities and a determination of downwind effects, including potential exposures to affected populations. Such assessment must include a previous release history of the past five years, including the size, concentration, and duration of releases, and must include an evaluation of worst case accidental releases.
- A program for preventing accidental releases of regulated substances, including safety precautions and maintenance, monitoring and employee training measures to be used at the source.
- A response program providing for specific actions to be taken in response to an accidental release of a regulated substance to protect human health and the environment, including procedures for informing the public and local agencies responsible for responding to accidental releases, emergency health care, and employee training measures.

Finally, section 112(r) requires the owner or operator of an affected facility to develop and file a Risk Management Plan with EPA, the U.S. Chemical Safety Board (CSB) (also established under the section), the State, and local response agencies. OSHA adopted its PSM standard (codified at 29 CFR 1910.119) in 1992 (57 FR 6403, Feb. 24, 1992). The applicability of the PSM standard is driven by the presence of specific chemicals in quantities above thresholds set in the standard.

⁴ Federal Emergency Management Agency. Phillips Petroleum Chemical Plant Explosion and Fire. October 1989. <https://www.usfa.fema.gov/downloads/pdf/publications/tr-035.pdf>.

⁵ Hay, Alastair, A Technical Report on What Caused Italy’s Dioxin Disaster Has Too Many Loopholes, *Nature*, 281, 521 (October 18, 1979). <http://www.nature.com/nature/journal/v281/n5732/pdf/281521a0.pdf>.

EPA published its section 112(r) regulations in two stages – a list of regulated substances and TQs in 1994 (59 FR 4478, January 31, 1994), and the Risk Management Program requirements in 1996 (61 FR 31731, June 20, 1996); both are codified at 40 CFR part 68. As required by section 112(r), part 68 includes several major requirements that were not covered by the PSM standard. These include a hazard assessment consisting of an offsite consequence analysis (OCA) and five-year accident history, and the development and submission of a risk management plan that summarizes a source's Risk Management Program. EPA also required stationary sources to develop a management system to oversee the program and included emergency response program requirements beyond those contained in the PSM standard. RMPs were first submitted to EPA in June 1999 and must be updated at least every five years. EPA has amended the rule over time to modify the list of substances, to alter data requirements, and to address other issues. The primary requirements adopted in 1996, however, remain in place.

The RMP rule establishes three program levels and requires facility owners or operators to conduct hazard assessments and submit RMPs regardless of the program level. Program 1 requirements apply to processes that would not affect the public in the case of a worst case release and with no accidents with specific offsite consequences within the past five years. Program 1 provisions impose limited hazard assessment requirements and emergency response requirements.

Program 2 provisions apply to processes not eligible for Program 1 or subject to Program 3, and imposes streamlined prevention program requirements, including safety information, hazard review, operating procedures, training, maintenance, compliance audits, and incident investigation elements. Program 2 provisions also impose hazard assessment, management, and emergency response requirements. Program 2 processes are primarily agricultural chemical distributors, chemical wholesalers, and chlorine use at publicly owned water and wastewater facilities, in States without OSHA-approved State plans. To further reduce the burden on facilities with Program 2 processes, EPA developed and published several industry-specific guidance documents⁶ and an OCA guidance document.

Program 3 requirements apply to processes not eligible for Program 1 and are either subject to OSHA's PSM standard, under Federal or State OSHA programs, or classified in one of ten specified NAICS codes (1997 version) listed at 40 CFR 68.10(d)(1). The ten NAICS codes are:

- 32211 (pulp mills)
- 32411 (petroleum refineries)
- 32511 (petrochemical manufacturing)
- 325181 (alkali and chlorine manufacturing)
- 325188 (all other basic inorganic chemical manufacturing)
- 325192 (cyclic crude and intermediate manufacturing)
- 325199 (all other basic organic chemical manufacturing)
- 325211 (plastics material and resin manufacturing)
- 325311 (nitrogenous fertilizer manufacturing)
- 32532 (pesticide and other agricultural chemical manufacturing)

Program 3 requirements impose elements nearly identical to those in OSHA's PSM standard. The Program 3 prevention program includes requirements relating to the following:

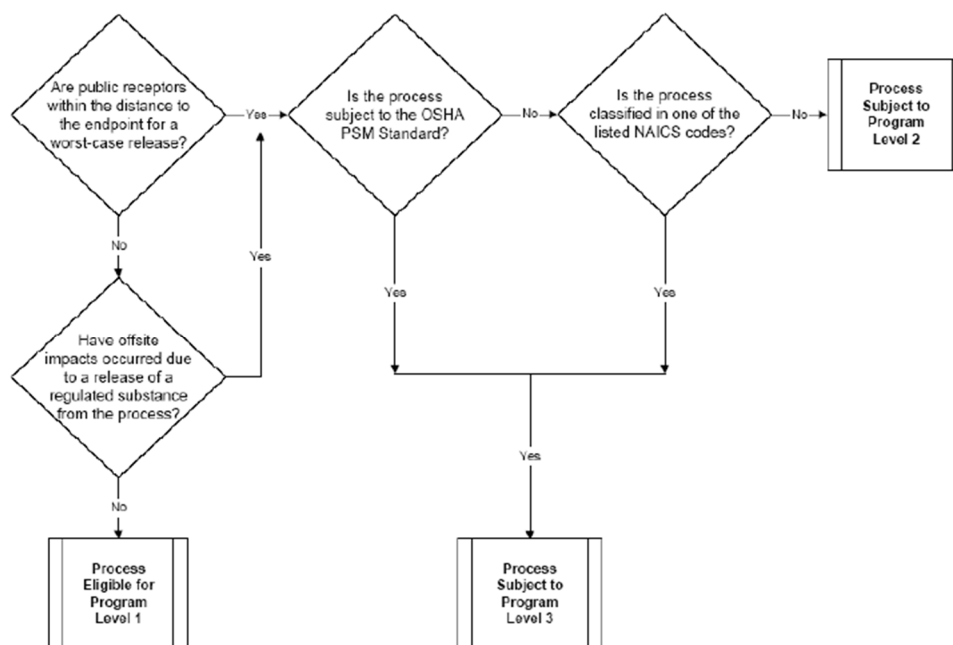
- Process safety information
- PHA
- Operating procedures

⁶ Guidance documents for propane storage, refrigeration, water/wastewater treatment, warehouses, chemical distributors, and others are available at: <https://www.epa.gov/rmp/guidance-facilities-risk-management-programs-rmp> .

- Training
- Mechanical integrity
- Management of change
- Pre-startup review
- Compliance audits
- Incident investigations
- Employee participation
- Hot work permits, and
- Contractors.

Program 3 provisions also impose the same hazard assessment, management, and emergency response requirements that are required for Program 2.

The following flow chart demonstrates how facilities determine the program level to which they are subject:⁷



Facilities that are exempt from the OSHA PSM standard may be subject to EPA requirements under the RMP rule. This occurs for several reasons. First, the lists of substances regulated are not identical; for example, EPA lists aqueous ammonia at any solution that is 20 percent ammonia or more while OSHA covers it only at concentrations of 44 percent or more. Second, because OSHA has no authority over State and local government employees, the OSHA PSM standard does not apply to publicly-owned facilities (mainly water and wastewater treatment systems) in States where Federal OSHA implements and enforces the standard (about half the States). Where States implement and enforce OSHA standards (referred to as State-plan States), the State is required to impose OSHA standards on State and local government employees as a condition of delegation.⁸ Last, regulatory

⁷ EPA. April 2004. General Guidance on Risk Management Programs for Chemical Accident Prevention (40 CFR Part 68). EPA-550-B-04-001. Chapter 2. <http://www2.epa.gov/sites/production/files/2013-10/documents/chap-02-final.pdf>.

⁸ Twenty-six States, Puerto Rico, and the Virgin Islands have OSHA-approved State Plans. In these States, publicly-owned water and wastewater treatment plants are typically in Program 2. Twenty-two State Plans (21 States and one U.S. territory)

exemptions are not identical; for example, the OSHA PSM standard exempts normally unoccupied remote facilities, but the RMP rule does not.

Other Recent Rulemakings and Related Actions

In response to catastrophic chemical facility incidents such as the 2013 explosion at the West Texas Fertilizer Company in West, Texas and others,⁹ in 2013, President Obama issued E.O. 13650, entitled Improving Chemical Facility Safety and Security.¹⁰ This E.O. required EPA and OSHA to consider whether and how to update and modernize the RMP rule and PSM standard, among other items. Both EPA and OSHA conducted public listening sessions¹¹ and issued requests for information (RFI) to seek input from the public and the regulated community on potential revisions to the rules.¹² Based on feedback received from the RFIs and public listening sessions, EPA subsequently published a Notice of Proposed Rulemaking (NPRM) on March 14, 2016 (81 FR 13637). The amendments rule was the result of EPA's consideration of the public comments received on the RFI and NPRM, recommendations from the CSB, comments received during E.O. 13650 listening sessions, and information gained by EPA through inspection of RMP facilities and enforcement of the rule over the previous 17 years. The final amendments rule was published in the *Federal Register* on January 13, 2017 (82 FR 4594, hereafter referred to as the "2017 amendments rule").

In response to the 2017 amendments rule, EPA received three petitions for reconsideration from stakeholders,^{13,14,15} expressing concerns and requesting a delay or stay in the rule's implementation. On May 30, 2018, EPA published a proposed rule reconsidering the 2017 amendments rule. The final reconsideration rule was published in the *Federal Register* on December 19, 2019 (84 FR 69834, hereafter referred to as the "2019 reconsideration rule").

Recent Events and Rationale Leading to Proposed Rule

On January 20, 2021, President Biden issued E.O. 13990, entitled Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis.¹⁶ Executive Order 13990 directed Federal agencies to review current regulations and take action to address priorities established by the current Administration, including bolstering resilience to the impacts of climate change and prioritizing environmental justice. Though the E.O. did not direct the Agency to publish a solicitation for information from the public, EPA issued a notice of virtual public listening sessions and request for public comment on May 28, 2021, to obtain

cover both private and State and local government workplaces. Publicly-owned water and wastewater plants in these States are in Program 3. The remaining six State Plans (5 States and 11 U.S. territory) cover State and local government workers only. Their publicly-owned water/wastewater plants are Program 2. <https://www.osha.gov/dcsp/osp/>.

⁹ For more detail on the West Texas explosion and other accidents that led to the 2017 amendments rule, see the Amendments rule RIA.

¹⁰ <https://www.whitehouse.gov/the-press-office/2013/08/01/executive-order-improving-chemical-facility-safety-and-security>.

¹¹ In 2013 and 2014, as part of the E.O. 13650 activities, the federal government held a dozen listening sessions, supplemented by two online webinars. For a list of locations and link to the notes for these sessions go to <https://www.regulations.gov/search?filter=DHS-2013-0075>.

¹² OSHA's RFI was published on December 9, 2013 (78 FR 73756) and EPA's RFI was published on July 31, 2014 (79 FR 44604).

¹³ RMP Coalition's Petition for Reconsideration and Request for Agency Stay Pending Reconsideration of Final RMP rule (82 FR 4594, January 13, 2017), February 28, 2017. Hogan Lovells U.S. LLP, Washington, DC. Document ID: EPA-HQ-OEM-2015-0725-0759 (RMP Coalition petition).

¹⁴ CSAG Petition and Reconsideration and Stay Request of the Final RMP rule (82 FR 4594, January 13, 2017) March 13, 2017. Hunton & Williams, San Francisco, CA. Document No. EPA-HQ-OEM-2015-0725-0766 (CSAG petition).

¹⁵ Petition for Reconsideration and Stay Submitted by The States of Louisiana, Arizona, Arkansas, Florida, Kansas, Texas, Oklahoma, South Carolina, Wisconsin, West Virginia, and the Commonwealth of Kentucky by and through Governor Matthew Bevin, March 14, 2017. Document ID: EPA-HW-OEM-2015-0725-0762 (States petition).

¹⁶ <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/>

information on the adequacy of the revisions to the RMP regulations completed, including the 2017 amendments and 2019 reconsideration rules. The virtual listening sessions were held on June 16 and July 8, 2021 and were attended by OSHA to foster continued coordination with the EPA and receive comments on the PSM Standard. Commenters discussed revisions and updates to the Prevention Program, Emergency Response, Information Availability, and regulated chemicals. Commenters also discussed the importance of incorporating climate changes risks and impacts into the RMP regulations and expanding the application of environmental justice.

The RMP regulations have contributed to the prevention and mitigation of chemical accidents in the United States. Although the accident histories submitted with RMPs have shown a reduction in the frequency of accidents since the beginning of the program, serious chemical releases from RMP-regulated processes have continued. RMP data for 2011 through 2020, the most recent 10-year period with complete information, show that each year an average of 124 accidents occurs with reportable impacts. RMP data for 2016 through 2020, the most recent five-year period with complete information, averaged an annual 98 accidents with reportable impacts. RMP-reportable accidents remain a significant concern to communities, particularly those located near the perimeter of the facilities, and impose significant social costs annually. EPA believes that the revisions to the Risk Management Program proposed in this rule will further protect human health and the environment from chemical hazards through advancement of enhanced PSM.

Facilities subject to the RMP regulation pose significant risks to the public and the environment because of the types and quantities of hazardous substances they store and use in chemical processes. These risks stem from potential accidental chemical releases that can cause fires, explosions, and harmful vapor clouds. Chemical accidents and their resulting impacts not only kill and injure people but can cause significant damage to property, goods produced, plant equipment and structures; and nearby industrial, commercial, and residential buildings, equipment, and furnishings. Damage can also occur to the natural environment and negatively affect nearby ecosystems and wildlife. Resources, such as emergency personnel and equipment, are diverted to address the fire, explosion, or vapor cloud. Properties located near the accident may lose value because of the perceived risks posed by proximity to a facility that has had an accident.

The benefits of a proposed rule are expected to include reductions in the number of people killed, injured, and evacuated or otherwise inconvenienced by sheltering in place; reductions in the damage caused to property onsite and offsite including product, equipment, and buildings; reductions in damages to the environment and ecosystems; and reductions in resources diverted to extinguish fires and clean up affected areas. The proposed rule would also provide other benefits, such as increased public information, as well as more efficient decisions about emergency response preparedness. The proposed provisions reduce the probability of a catastrophic release. By reducing the chance of an accidental release, the proposed rule also avoids spending on lawsuits and other transactions to address resulting accidental harms.

The result of many of the proposed provisions would be to target stronger provisions to RMP facilities in close proximity to certain other RMP facilities and/or RMP facilities that have had recent accidents. Both types of facilities increase the likelihood of exposures to nearby communities to a future accident's offsite impacts. Because communities with environmental justice concerns are over-represented in these nearby communities, adoption of the proposed provisions presented here would provide proportionately greater relief to historically marginalized fenceline communities than to the general population.

1.2 Organization of the Analysis

This RIA is organized as follows:

- Chapter 2 describes RMP provisions that EPA is adding or revising.
- Chapter 3 discusses the universe of regulated entities and the various divisions used in the analysis.
- Chapter 4 discusses the basis for cost estimates for each of the provisions and alternatives and presents the unit costs.

- Chapter 5 presents the total estimated costs for each provision and for all provisions combined.
- Chapter 6 discusses the social benefits of the rule.
- Chapter 7 discusses the regulatory alternatives analyzed.
- Chapter 8 presents the small entity impacts analysis.
- Chapter 9 presents the environmental justice analysis.
- Chapter 10 discusses limitations of the analysis and conclusions.
- Chapter 11 discusses other analyses required under applicable statutes and E.Os.

CHAPTER 2: Proposed Rule Provisions

This chapter presents a summary of the provisions in the proposed rule that EPA has determined would impose new costs. The proposed provisions include additions and revisions to existing RMP requirements.

2.1 Summary of Provisions and Applicability to Private Sector Facilities

The RIA analyzed the following proposed new requirements and revisions to current requirements:

New Prevention Program Provisions

Safer Technology and Alternatives Analysis (STAA)— (Proposed revisions apply to §68.3 and §68.67)

The current RMP rule does not require facilities to conduct a STAA. Under the proposed rule, facilities with Program 3 processes in NAICS code 324 and 325, located within one mile of another facility with a process in NAICS code 324 or 325, would be required to conduct a STAA¹⁷. The proposed rule would also require that all facilities in NAICS 324 using hydrofluoric acid (HF) in an alkylation unit (approximately 45 facilities) consider safer alternatives to HF alkylation, regardless of proximity to another NAICS 324- or 325-regulated facility. The STAA requirement includes two parts: the initial analysis to identify alternatives, and a practicability study to determine the costs and assess the reasonableness of implementing technology alternatives. Because EPA is proposing to require STAA only in industries with the most frequent and severe documented and continuing accidents, EPA expects the total burden of the STAA provision to be lower than the total burden that would have been imposed by the 2017 amendments rule's proposed STAA provision, which applied more broadly.

Root Cause Analysis— (Proposed revisions apply to §§68.60 and 68.81)

Under the current RMP rule, facilities are required to conduct an incident investigation following an incident which resulted or reasonably could have resulted in a catastrophic release. The proposed rule would require facilities to conduct a root cause analysis as part of an incident investigation following an RMP-reportable accident. A root cause analysis is a formal process to identify underlying reasons for failures that lead to accidental releases. These analyses usually require staff trained in the technique. The proposed incident investigation revisions would apply to all facilities with Program 2 and 3 processes that experience an RMP-reportable accident. Few sources would be subject to the proposed requirement because accidents occur at a small number of sources. There are approximately 100 accidents with onsite impacts per year in the baseline (see Exhibit 6-2).

Third-Party Audits— (Proposed revisions apply to §§68.58 and 68.79 and new §§68.59 and 68.80)

The current RMP rule requires facilities to conduct a compliance audit of Program 2 and Program 3 processes at least once every three years. The proposed rule also applicable to Program 2 and Program 3 processes would require the next required compliance audit to be a third-party audit when any one of the following conditions applies:

1. The facility has had two RMP-reportable accidents within five years; or
2. A facility with a Program 3 process in NAICS codes 324 or 325 has had one RMP-reportable accident from the NAICS 324 or 325 process within the past five years, located within one mile of another facility with a process in NAICS code 324 or 325; or
3. An implementing agency requires a third-party audit either due to conditions at the stationary source that could lead to an accidental release of a regulated substance, or due to a previous third-party audit that failed to meet the competency or independence criteria of § 68.80(c).

¹⁷ EPA is proposing to make RMP information publicly available to allow facilities to identify and locate proximate facilities.

EPA believes that these proposed third-party audit provisions would help ensure that owners and operators of RMP facilities objectively and adequately explore all opportunities to prevent or minimize accidental releases of regulated substances to protect human health and the environment. EPA estimates that only a small number of facilities would be subject to the third-party audit requirement each year.

Employee Participation— (Proposed Provisions apply to §68.83)

Under the current RMP rule, Program 3 process facilities' employee participation plans require the owner or operator to consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management. The owner or operator must provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this rule.

The proposed rule would revise 40 CFR 68.83 and other aspects of employee participation to require three new components:

1. The Program 3 employee participation plan must include the consultation of employees and their representatives regarding how to address, correct, resolve, document, and implement recommendations of process hazard analyses, incident investigations, and compliance audits.
2. The Program 3 employee participation plan must include and ensure that effective methods are in place so that employees and their representatives have specific stop work authorities based on a potential for a catastrophic release. The specific authorities must include:
 - a. Refusing to perform a task;
 - b. Recommending to the operator in charge of a unit that an operation or process be partially or completely shut down;
 - c. Allowing a qualified operator in charge of a unit to decide and take action to partially or completely shut down an operation or process. The stop work authority processes within employee participation plans would be required to outline how employers should document and respond to employee reports of hazards or employee recommendations to shut down or partially shut down a process, within 30 days in writing.
3. Because EPA recognizes that workers may often overlook hazards or areas that they know are non-compliant with RMP regulations out of fear that it will affect their employment, the proposed rule would also require that employee participation plans include clear instructions for how employees can safely report unaddressed hazards anonymously that could lead to a catastrophic release, unreported RMP-reportable accidents, or other issues of RMP non-compliance.

These proposed employee participation provisions would ensure that owners and operators who have not fully developed employee participation programs have additional measures in place to prevent and minimize accidental releases of RMP-regulated substances. These new provisions will not impose a burden on owners and operators who already have robust employee participation programs in place.

Backup Power for Perimeter Monitors— (Proposed revisions apply to §§68.50 and 68.67)

The proposed rule would require air control or monitoring equipment associated with prevention and detection of accidental releases from RMP-regulated processes to have standby or backup power. EPA believes that because natural hazards and power loss continue to be a factor in RMP accidents and present a growing threat to process safety at RMP facilities, a requirement to evaluate and control natural hazards should be explicitly stated in the RMP regulation. Currently many facilities voluntarily have backup power installed for perimeter monitors. This proposed provision would require it.

Emergency Response

Community Notification of RMP Accidents— (Proposed Provisions apply to §§68.90 and 68.95)

The proposed rule would add a requirement to RMP facility owners and operators who designate themselves as a non-responding facility to develop and implement, as necessary, procedures for informing the public and the appropriate emergency response agencies about accidental releases of RMP-regulated substances. EPA is also proposing that responding and non-responding facilities ensure that:

1. A community notification system is in place;
2. The public is promptly notified of an RMP accident release; and
3. The notification must provide appropriate, timely data and information to local responders and the community with the current understanding and best estimates of the nature of the release.

EPA expects that these proposed provisions, in combination with the currently required annual emergency coordination meetings and notification exercises would enhance coordinated notification to the public, improve documented accountability for the notification process, and help ensure timely decisions about notification of releases, particularly those with offsite impacts. The emergency response provisions apply to facilities with Program 2 or 3 processes. Responding facilities should already have mechanisms and procedures in place in the baseline to notify the public through emergency response programs or plans.

Information Availability

Information Availability— (Proposed revisions apply to §68.210)

The proposed rule would require all facilities to disclose certain chemical hazard information to the public residing within 6 miles¹⁸ of the facility in the language requested by the requester.¹⁹ These are new information availability requirements, not currently required. The facility or its parent company, if applicable, would also have to provide ongoing notification that the information is available upon request for those members of the public. This could include notifying on a company website that information is available, providing notification at public libraries, in local papers, or via other means appropriate for particular communities and facilities.

The information to be disclosed includes:

1. Names of regulated substances at the facility
2. Safety Data Sheets (SDS)
3. Accident history information
4. Emergency response program information
5. LEPC or local response agency contact information.

EPA believes these revised information availability provisions would improve information sharing within communities, allow affected communities to obtain information from RMP facilities, and ensure information availability in areas without LEPCs.

2.2 Applicability to Government-owned Facilities and Entities

The proposed rule is applicable to local governments that own and operate RMP facilities (primarily water and wastewater systems, but also some swimming pools²⁰). The proposed rule also would be applicable to regulated facilities owned by government entities, LEPCs, and State implementing agencies reviewing the proposed rule and LEPCs coordinating with facilities.

¹⁸ EPA believes this distance to be reasonable as 90 percent of all toxic worst-case distances to endpoints are 6 miles or less, and almost all flammable worst-case distances are less than 1 mile.

¹⁹ EPA plans to make RMP locational information for the entire regulated community available online. Currently, members of the public can determine whether a neighboring facility is an RMP facility through searching EPA's Envirofacts.

²⁰ Swimming pools will not be regulated under RMP if they use or store chlorine below the threshold amount of 2,500 lbs. There have been no RMP-reportable accidents from regulated swimming pools.

CHAPTER 3: Universe of RMP Facilities

Approximately 11,740 facilities have filed current RMPs with EPA and potentially would be affected by the proposed rule. These facilities range from petroleum refineries and large chemical manufacturers to water and wastewater treatment systems; chemical and petroleum wholesalers and terminals; food manufacturers, packing plants, and other cold storage facilities with ammonia refrigeration systems; agricultural chemical distributors; midstream gas plants; and a limited number of other sources that use RMP-regulated substances. This chapter describes these facilities and how they are categorized for the purposes of the economic analysis.

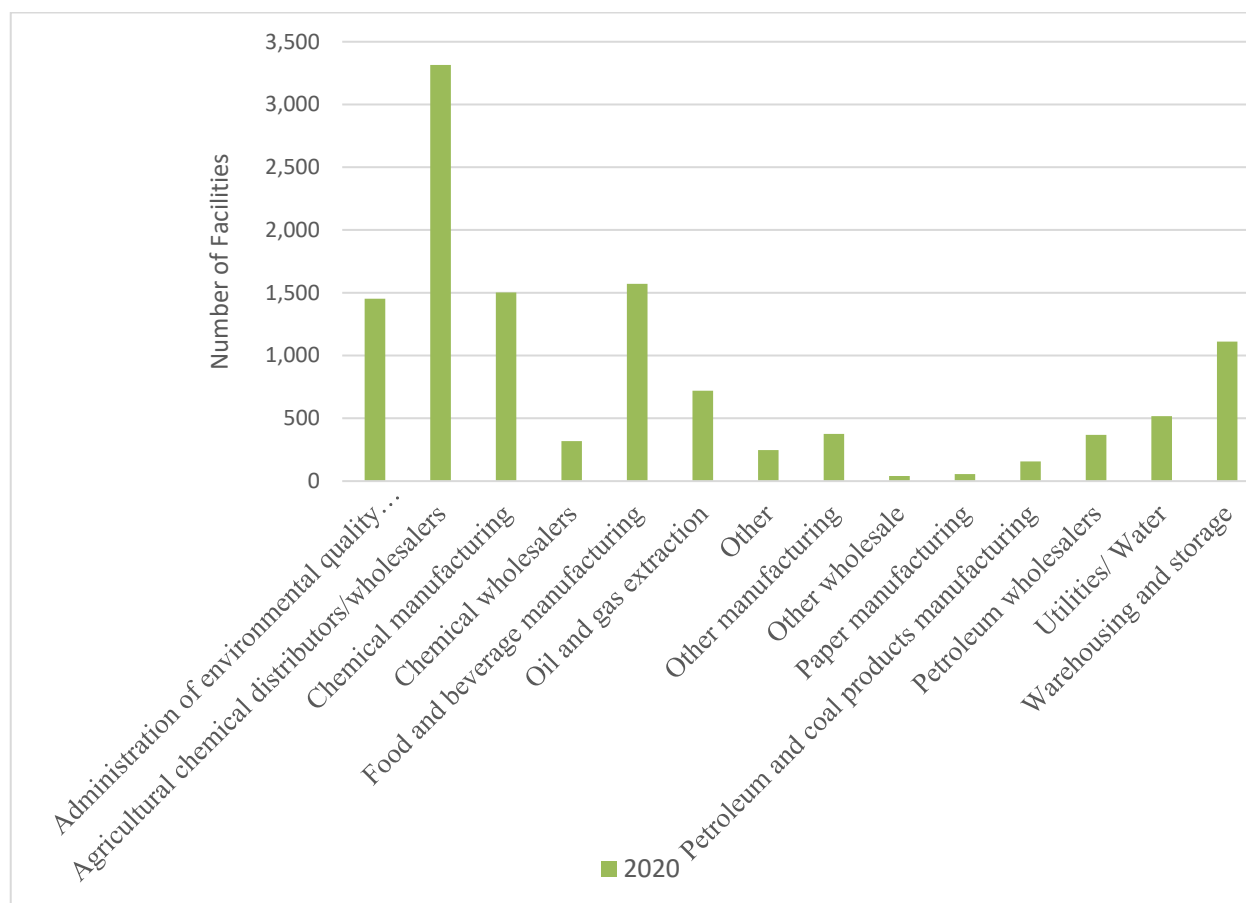
3.1 Current RMP Facilities

Exhibit 3-1 presents the numbers of facilities according to RMP reporting as of December 31, 2020, by industrial sector and chemical use. Exhibit 3-2 presents the number of facilities in each sector in the form of a bar chart.

Exhibit 3-1: Number of Affected Facilities by Sector as of December 31, 2020

| Sector | NAICS Codes | Number of facilities | Chemical Uses |
|--|--|----------------------|--|
| Administration of environmental quality programs (i.e., governments, government owned water) | 92, 2213 (Government-owned) | 1,449 | Use chlorine and other chemicals for water treatment |
| Agricultural chemical distributors/wholesalers | 11, 424 (except 4246, 4247) | 3,315 | Store ammonia for sale; some in NAICS 111 and 115 use ammonia as a refrigerant |
| Chemical manufacturing | 325 | 1,502 | Manufacture, process, store |
| Chemical wholesalers | 4246 | 317 | Store for sale |
| Food and beverage manufacturing | 311, 312 | 1,571 | Use (mostly ammonia) as a refrigerant |
| Oil and gas extraction | 211 | 719 | Intermediate processing (mostly regulated flammable substances and flammable mixtures) |
| Other | 21 (except 211), 23, 44, 45, 48, 491, 54, 55, 56, 61, 62, 71, 72, 81, 99 | 246 | Use chemicals for wastewater treatment, refrigeration, store chemicals for sale |
| Other manufacturing | 313, 314, 315, 326, 327, 33 | 375 | Use various chemicals in manufacturing process, waste treatment |
| Other wholesale | 421, 422, 423 | 39 | Use (mostly ammonia) as a refrigerant |
| Paper manufacturing | 321, 322 | 55 | Use various chemicals in pulp and paper manufacturing |
| Petroleum and coal products manufacturing | 324 | 156 | Manufacture, process, store (mostly regulated flammable substances and flammable mixtures) |
| Petroleum wholesalers | 4247 | 367 | Store for sale (mostly regulated flammable substances and flammable mixtures) |
| Utilities/Water/Wastewater | 221 (Non-government-owned water) | 519 | Use chlorine (mostly for water treatment) and other chemicals |
| Warehousing and storage | 493 | 1,110 | Use (mostly ammonia) as a refrigerant |
| Total | | 11,740 | |

Exhibit 3-2: Chart of Affected Facilities by Sector (2020).



The RMP rule applies to processes at facilities with regulated substances above threshold amounts. Processes are activities involving regulated substances including any use, storage, manufacturing, handling, or onsite movement of such substances, or combination of these activities. In general, the cost of implementing the rule provisions varies primarily by the complexity of the processes involved. Chemical manufacturers and petroleum refineries have more covered processes per facility and more complex issues to consider when evaluating hazards, designing exercises, conducting audits, investigating incidents, and explaining information to employees, responders, and the public compared to facilities that simply store or use chemicals in simple processes (e.g., refrigeration systems and water and waste treatment systems). For the purposes of the cost analysis, therefore, all facilities with NAICS 324 or 325 (petroleum and coal products manufacturing and chemical manufacturing) processes are considered complex; all other facilities are considered simple.

3.1.1 RMP

The facility universe analyzed in the RIA is based on the RMP Database as of August 1, 2021 and includes facilities active as of December 31, 2020.²¹ EPA used Microsoft Access queries and R code to pull and analyze the data. The RMP Database includes information from each RMP submission, and identifies the facility, its processes and their respective NAICS sectors and programs, any reportable accidents, as well as other information reported in the RMP.

²¹ More detail on the RMP database, including access to the RMP database is available at <https://www.epa.gov/rmp/accessing-rmp-data>.

To create the data frame of the universe of affected facilities, EPA selected among the rows in the Facility ID table for each EPA Facility ID, the row with the highest Facility ID without a deregistration date and with a receipt date prior to 2021. This data frame is merged by Facility ID with the Processes table and selected for each Facility ID, first from among the facility's complex processes (NAICS 324 or 325) and then by its highest program level. So, if a facility has any complex processes, the facility will be classified by the sector of one of those processes. Each facility is assigned the highest program level of any of its processes. So, if a facility has any Program 3 processes, the facility will be classified as Program 3.

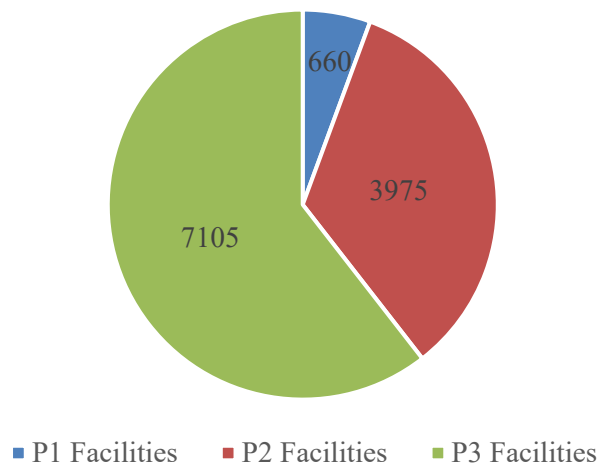
3.1.2 Manual Adjustments

While both government-owned and non-government-owned NAICS 2213 facilities perform the same functions, EPA expects that government-owned facilities will incur different burden hours than similar private facilities. Therefore, to better assess the impacts on government-owned versus non-government-owned NAICS 2213 facilities, EPA reviewed all facilities categorized as NAICS 2213 to distinguish between private and government ownership. EPA includes in government categories government-owned NAICS 2213 facilities in addition to facilities that report as NAICS 92 government administration.

3.2 Breakdowns Used in the Analysis

The RMP rule imposes different requirements on facilities based on Program levels of the facilities' processes. Program 3 processes are those that are not eligible for Program 1 and are subject to the OSHA PSM standard or are in certain NAICS codes (refineries, a limited number of chemical manufacturers and pulp mills). Of the 4,769 processes in those NAICS codes, facilities with 4,595 processes self-reported that they are subject to OSHA PSM.

Exhibit 3-3: Number of Facilities by Program Level.



A portion of Program 2 facilities (765 of 3,975) are publicly-owned water/wastewater treatment facilities in States where OSHA (rather than the State) enforces OSHA rules²². Because these facilities are publicly owned, their processes are considered Program 2. This contrasts with those not under public ownership (which are Program 3), even though the processes are the same. The remaining Program 2 facilities are agricultural distribution facilities that store anhydrous ammonia, utilities that use aqueous ammonia and other facilities that

²² See Section 1.1 History, for an explanation.

store or use chemicals not subject to OSHA PSM.²³

Exhibit 3-4 presents the number of facilities by sector and program level; publicly-owned water/wastewater treatment systems (NAICS 2213) are listed with governments (NAICS 92), while privately-owned and operated systems (NAICS 2213) are listed under utilities/water (NAICS 221).

Exhibit 3-4: Number of Facilities by Sector and Program Level (2020).

| Sector | NAICS Codes | P1 | P2 | P3 | Total |
|--|---|------------|--------------|--------------|---------------|
| Administration of environmental quality programs (i.e., governments) | 92, 2213 (Gov't-owned) | 10 | 787 | 652 | 1,449 |
| Agricultural chemical distributors/wholesalers | 11, 424 (except 4246, 4247) | 3 | 2,635 | 677 | 3,315 |
| Chemical manufacturing | 325 | 54 | 63 | 1,385 | 1,502 |
| Chemical wholesalers | 4246 | 8 | 86 | 223 | 317 |
| Food and beverage manufacturing | 311, 312 | 3 | 3 | 1,565 | 1,571 |
| Oil and gas extraction | 211 | 300 | 31 | 388 | 719 |
| Other | 21, 23, 44, 45, 48, 491, 54, 55, 56, 61, 62, 71, 72, 81, 99 | 55 | 48 | 143 | 246 |
| Other manufacturing | 313, 314, 315, 326, 327, 33 | 67 | 65 | 243 | 375 |
| Other wholesale | 421, 422, 423 | 4 | 26 | 9 | 39 |
| Paper manufacturing | 321, 322 | 1 | 1 | 53 | 55 |
| Petroleum and coal products manufacturing | 324 | 13 | 1 | 142 | 156 |
| Petroleum wholesalers | 4247 | 23 | 25 | 319 | 367 |
| Utilities/ Water | 221 (non-Gov't-owned water) | 40 | 129 | 350 | 519 |
| Warehousing and storage | 493 | 79 | 75 | 956 | 1,110 |
| Total | All | 660 | 3,975 | 7,105 | 11,740 |

3.2.1 Facilities Affected by the STAA Requirement

Applicability of the proposed provision to conduct a STAA as part of the PHA is limited to processes in two sectors that have had a high frequency of accidental releases (NAICS 324 and 325). These sectors were selected because they represent complex processes that accounted for 43 percent of all RMP-reportable accidents from 2016 to 2020.²⁴ These sectors also had costly accidents relative to other sectors.

The proposed provision applies only to Program 3 facilities with processes in NAICS 324 and 325 located within one mile of another facility with a NAICS 324 or 325 process, or facilities that have an HF alkylation unit process regardless of proximity to another NAICS 324 or 325-regulated facility. California regulations²⁵ already require a hierarchy of controls analysis for refineries with HF unit processes, which is a similar, but more involved, evaluation of inherent safety than required by the provision proposed by EPA.

²³ Some facilities listed themselves as Program 2 that have either selected the wrong Program Level on their RMP submission or have incorrectly indicated that they are not subject to PSM, even though they handle OSHA PSM chemicals in quantities far above the OSHA threshold. Because of errors in the other direction among the public systems (i.e., facilities in States not subject to PSM that listed themselves as Program 3), the analysis did not attempt to correct the errors.

²⁴ August 2021 RMP Database.

²⁵ Cal. Code Regs. tit. 8, § 5189.1(l), Process Safety Management for Petroleum Refineries, Hierarchy of Hazard Controls Analysis.

Therefore, EPA does not include the two California refineries with HF units in the analysis. Exhibit 3-5 presents the number of processes and facilities by facility size for the two sectors subject to this provision.

**Exhibit 3-5: Number of Processes and Facilities Subject to STAA Provision
(Complex Program 3 facilities within one mile of another complex facility
or with an HF unit outside California) by Facility Size and Sector (2020).**

| Sector | NAICS | FTE | Processes | Facilities | Processes per Facility |
|---|--------------|------------|------------------|-------------------|-------------------------------|
| Petroleum and Coal Products Manufacturing | 324 | 0-99 | 19 | 15 | 1.3 |
| Petroleum and Coal Products Manufacturing | 324 | 100+ | 777 | 52 | 14.7 |
| Chemical Manufacturing | 325 | 0-99 | 448 | 322 | 1.4 |
| Chemical Manufacturing | 325 | 100+ | 378 | 148 | 2.5 |
| Total | | | 1,622 | 537 | 2.9 |

*Note: The 673 processes at the 43 facilities with HF units (excluding processes at the two California facilities with HF units) are among the 777 processes at the 52 NAICS 324 facilities with 100+ FTEs.

STAA is generally a process in which facility staff analyze their current processes and practices to identify safer alternatives to their current process operations. This can range from small changes – such as upgrading valves – to large shifts such as substituting less toxic or volatile chemicals. Application of STAA for the proposed rule is divided into three activities, consistent with prior EPA rulemakings involving STAA (2017 amendments rule and 2019 reconsideration rule): the initial analysis to identify alternatives, a practicability study to determine the costs and assess the reasonableness of implementing the change in light of other costs and programs, and implementation of alternatives (not required under the proposed rule).

EPA assigned these activities separately to facilities with 100 or more full-time employees (FTEs) and those at facilities with fewer than 100 FTEs because EPA expects facilities will face different costs depending on size. EPA anticipates that some facilities would conduct practicability studies to address alternatives considered in multiple initial analyses. Therefore, EPA further broke down the facilities by NAICS (324 or 325) to analyze the cost of the practicability study for the STAA provision.

3.2.2 Facility Universe Breakdown for Provisions that Apply After an RMP-Reportable Accident

The third-party audit analysis requirement would apply to P2 and P3 facilities that have had two RMP-reportable accidents; or have had one RMP-reportable accident from a Program 3 covered process at a facility in NAICS code 324 or 325 within a five-year period, located within one mile of another facility having a process in NAICS code 324 or 325; or when an implementing agency requires a third-party audit due to certain criteria at the facility. The root cause analysis requirement would apply to P2 and P3 facilities as part of an incident investigation following an RMP-reportable accident.

For the purposes of this analysis, EPA analyzed only the RMP-reportable accidents, which are those accidents with reported impacts, between 2016 and 2020. Because accidents are low probability but high-cost events, EPA used five-year annual averages to smooth over year-to-year fluctuations to estimate the number of facilities that EPA might expect to conduct third-party audits and root cause analyses. EPA uses average annual accident estimates throughout the analysis. Exhibit 3-6 presents the five-year average annual number of RMP-reportable accidents for the 2016-2020 period by program level and facility sector. These annual average accidents for Program 2 and Program 3 facilities represent the numbers of annual root cause analyses EPA expects to be required under the proposed rule for RMP-reportable accidents. EPA estimates the cost of the root cause analysis to differ by type of facility, so the number of accidents is presented by facility type.

Exhibit 3-6: RMP-Reportable Accidents by Sector for Root Cause Analysis (2016-2020).

| Average Annual Reportable Accidents by Program Levels and Facility Type (2016-2020) | | | | |
|--|--------------------|-------------|-------------|------------|
| | Accidents | | | |
| Program Level | Simple (non-gov't) | Complex 324 | Complex 325 | Government |
| 1 | 2.4 | 0.6 | 0.2 | 0.0 |
| 2 | 10.2 | 0.0 | 0.2 | 2.6 |
| 3 | 38.4 | 10.8 | 30.4 | 1.8 |

The third-party audit proposed provision would apply to all P2 and P3 facilities with two accidents within a five-year period and to any P3 process facility with one accident in NAICS 324 or 325 that is also within one mile of another RMP facility²⁶ with a process in NAICS 324 or 325, or if an implementing agency requires it. RMP facilities within the petroleum and coal products manufacturing (NAICS 324) and chemical manufacturing (NAICS 325) industries represent over 50 percent of the facilities with two or more accidents in five years, and they have on average two and eight RMP-regulated processes, respectively, at their facilities.²⁷

Exhibit 3-7 presents the number of P2 and P3 RMP facilities with reportable accidents between 2016 and 2020 that would be subject to the third-party audit provision based only on the first two requirements. EPA expects the cost of a third-party audit to vary by facility size and type, and therefore separates facilities by their number of full-time employees (FTEs), whether they have complex processes, and whether they are government-owned.

Exhibit 3-7: RMP Facilities with Reportable Accidents and Subject to Third-party Audits (2016-2020).

| P2 and P3 Facilities with Reportable Accidents 2016-2020 by Facility Type and Size | | | | | |
|---|---|---|---|--------------------|------------|
| | Facilities | | | | |
| | With 1 Accident | With 2+ Accidents | | | |
| FTEs | Complex within 1 mile of another complex facility | Complex within 1 mile of another complex facility | Complex >1 mile from another complex facility | Simple (non-gov't) | Government |
| 0-19 | 2 | 0 | 1 | 5 | 1 |
| 20-99 | 8 | 2 | 3 | 4 | 1 |
| 100+ | 34 | 19 | 17 | 11 | 1 |

3.2.2 Universe Breakdown for Perimeter Monitors without Backup Power

The current RMP rule requires Program 2 facilities to perform a Hazard Review every five years and Program 3 facilities to perform a more formal PHA every five years. EPA proposes to amplify power loss as a hazard in regulatory text for PHAs/Hazard Reviews. The proposed rule would require facilities that already have installed perimeter monitors but have not installed backup power for the monitors to add backup power. Exhibit 3-8 provides the numbers of those facilities.

²⁶ The proximity of densely co-located refining and chemical manufacturing facilities creates a greater risk of an accident at one facility impacting safety at the nearby facility, thereby increasing the potential for a release at the second facility (a “knock-on” release)...The distance of 1 mile represents the median distance of facilities with 324 and 325 NAICS processes that have had accidents in the period from 2016 to 2020 to the nearest facility with a process in these NAICS in 324 or 325.

²⁷ Technical Background Document for Notice of Proposed Rulemaking: Risk Management Programs Under the Clean Air Act, Section 112(r)(7); Safer Communities by Chemical Accident Prevention (April 19, 2022).

Exhibit 3-8: Facilities Requiring Backup Power for Perimeter Monitors by Program Level.

| Program Level | Number of Facilities |
|---------------|----------------------|
| P2 | 18 |
| P3 | 374 |

3.3 Government Entities Affected by the Rule

The proposed rule would affect State and local government entities including entities that own RMP facilities, 2,473 LEPCs, and 13 States with delegated implementing agencies. The proposed rule would impose both direct and indirect costs. Direct costs are associated with activities required by RMP facilities owned by government entities. Indirect costs are associated with (1) RMP facilities owned by government entities, LEPCs, and State implementing agencies reviewing the proposed rule and (2) LEPCs coordinating with facilities regarding community notifications.

Most of the facilities are water or wastewater treatment facilities, but some large swimming pools would be covered as well. Most of the government entities are cities, but the universe includes larger special districts (e.g., the Metropolitan Water District of Southern California) as well as some Federal facilities. Of the 1,111 government entities directly affected, 905 have one RMP facility, 125 have two RMP facilities, 43 have 3 facilities, 19 have 4 facilities, and 19 have 5 or more. Not all facilities belonging to a government entity are located in the entity's geographic region. There are fewer than 1,200 "parent" entities listed for publicly owned systems. Because facilities do not always list the owner or they list variations of the owner's name, it is not possible to develop an accurate estimate of the number of public entities affected by the rule. It is clear, however, that some of the larger cities and counties have a substantial number of facilities. For example, the City of El Paso, Texas, owns and operates at least 16 facilities.

3.4 Number and Costs of Baseline Accidents

Owners or operators of facilities subject to the RMP rule must submit information on accidents that occurred over the previous five years if they resulted in onsite or offsite deaths, injuries, or property damage, or if they led to an evacuation, shelter-in-place event, or offsite environmental damage. EPA reviewed these data for all facilities that reported accidents during 2016 through 2020 (the last year with complete data) to provide baseline information for the most recent five-year period.²⁸ This five-year period was chosen to reflect the most recent trends regarding RMP accidents. It is the same period on which the analysis of accident data was based to develop cost estimates. Therefore, the annual average costs based on five-year accident data is matched with the average annual baseline damages.

Some accidents that occurred at RMP facilities during the five-year period were not reported to EPA either because the facility closed subsequent to the accident, decommissioned the process, or removed the regulated substance from the process involved in the accident before it was required to submit a report to the RMP Database. For example, Philadelphia Energy Solutions Refining and Marketing LLC facility in Philadelphia, PA, had a fire and explosions in the PES Girard Point refinery HF alkylation unit on June 21, 2019, which resulted in the release of HF.²⁹ This facility deregistered the affected process before the deadline for their subsequent RMP report. Due to the omission of such accidents, the five-year baseline may under-represent the number and magnitude of RMP chemical accidents.

²⁸ The accidents included those that occurred at facilities that may have subsequently deregistered from the RMP Program. As such, some accidents analyzed may have occurred at facilities no longer subject to the RMP rule. Offsetting this, however, is the registration of new facilities subsequent to 2020.

²⁹ CSB Report, Fire and Explosions at Philadelphia Energy Solutions Refinery Hydrofluoric Acid Alkylation Unit, Factual Update, October 16, 2019, <https://www.phila.gov/media/20191204161826/US-CSB-PES-Factual-Update.pdf>.

The RMP accident database contains information on the initiating event and contributing factors for each accident. The impacts reported should be those attributable to, or resulting from, direct exposure to toxic concentrations, radiant heat, or overpressures from accidental releases or from indirect consequences of a vapor cloud explosion from the accidental release. EPA reviewed RMP-reportable accidents in detail based on industry information and other resources, such as reports by the CSB, to attempt to ensure that only impacts attributable to the release of a regulated substance were included.

3.4.1 Onsite RMP-reportable Accidents in the Five-year Baseline

Exhibit 3-9 presents the five-year data (2016 to 2020), by year, for onsite impacts of accidents. Deaths and injuries are either to employees or members of the public.

Exhibit 3-9: Onsite Impacts by Year: 2016-2020 (millions, 2020 dollars).

| Year | Impact Accidents | Employee Deaths | Employee Injuries | Public Injuries | Public Deaths | Value of Property Damage |
|-------------------------|------------------|-----------------|-------------------|-----------------|---------------|--------------------------|
| 2016 | 127 | 4 | 136 | 0 | 0 | \$451.4 |
| 2017 | 109 | 3 | 108 | 20 | 0 | \$234.4 |
| 2018 | 92 | 2 | 140 | 0 | 0 | \$770.8 |
| 2019 | 100 | 1 | 110 | 0 | 0 | \$546.2 |
| 2020 | 60 | 2 | 56 | 0 | 0 | \$28.8 |
| Annual Average | 97.6 | 2.4 | 110 | 4 | 0 | \$406.3 |
| Total Reportable | 488 | 12 | 550 | 20 | 0 | \$2,031.5 |

* Property damage values were obtained from the EPA RMP Database of self-reported information from regulated facility owners or operators and adjusted to 2020 dollars.

Twelve onsite fatalities occurred over the five-year analysis period, which is an annual average of 2.4 fatalities. There were no large accidents and each accident resulted in one fatality. One of the single deaths resulted from sulfur dioxide gas in Salt Lake City, Utah.³⁰ Another single fatality resulted from an accident which caused a fire in Big Lake, Texas.³¹ In 2020, an ammonia leak in North Carolina caused the death of one employee as well.³² One accident due to an ammonia leak resulted in 20 injuries to members of the public in Big Spring, Texas.³³ No deaths among the public occurred during this five-year period.

The current RMP rule does not require facilities to disaggregate reported onsite injuries by severity. However, under the RMP accident history requirements, an RMP-reportable accident *injury* means “any effect on a human that results either from direct exposure to toxic concentration; radiant heat; or overpressure from accidental releases or from the direct consequences of a vapor cloud explosion (such as flying glass, debris, or other projectiles) from an accidental release and that requires medical treatment or hospitalization.”

³⁰ Officials ID Rio Tinto Kennecott worker killed by toxic gas <https://gephardtaily.com/local/toxic-gas-kills-worker-at-rio-tinto-kennecott/>.

³¹ West Texas Gas subsidiaries fined for Big Lake leak, fatal accident <https://www.gosanangelo.com/story/news/crime/2021/10/01/west-texas-gas-company-settles-big-lake-chemical-leak-fatal-accident/5954744001/>.

³² One dead, multiple injured in Statesville ammonia leak <https://www.wcnc.com/article/news/local/statesville-ammonia-hazmat-spill/275-7936486e-03fc-40e0-96b8-ccdbc499bdb4#>.

³³ Several Injured in Big Spring, TX, Ammonia Leak Accident <https://www.texas-wrongful-death-lawyer.net/79294/water-treatment-ammonia-leak-accident-big-spring-tx.htm>.

Medical treatment means “treatment, other than first aid, administered by a physician or registered professional personnel under standing orders from a physician” (40 CFR 68.3). For some accidents for which accident reports could be located from other sources, serious injuries (i.e., those requiring hospitalization) range from none (e.g., SGL Carbon LLC July 2017 and East Dubuque Nitrogen Fertilizers June 2017 where all workers were treated and released) to at least 29 reported injuries (Tyson Fresh Meats 2018); in the largest accident (Valero Benicia Refinery 2017), 68 civilians received medical treatment.³⁴ Injuries described in reports varied from those that were treated with first aid alone at the scene, to severe burns and some disability. Although the RMP rule limits reportable injuries to those that require medical treatment other than first aid, in some accidents, minor injuries treated with first aid have been reported. Onsite property damage reports include a variety of damages including to buildings, machinery, equipment and other plant infrastructure. Around \$1.3 billion of the \$2 billion in property damage reported occurred in accidents that had no other reportable impacts onsite or offsite.

3.4.2 Offsite Reportable Impacts in the Five-year Baseline

Exhibit 3-10 presents the reported offsite impacts for the baseline including members of the public or emergency responders who were injured or killed offsite, were required to evacuate or shelter in place, or who incurred property damage as a result of the accidents. Of the 488 reportable accidents, 113 had reportable offsite impacts.

Exhibit 3-10: Offsite Impacts by Year: 2016-2020 (millions, 2020 dollars).

| Year | Impact Accidents with Offsite Impacts | Number of Deaths | Hospital Visits | People Undergoing other Medical Treatment | Number of People Evacuated | Number of People Sheltered in Place | Value of Property Damage |
|-------------------------|---------------------------------------|------------------|-----------------|---|----------------------------|-------------------------------------|--------------------------|
| 2016 | 27 | 0 | 11 | 3 | 1,668 | 13,430 | \$4.2 |
| 2017 | 31 | 0 | 6 | 94 | 7,866 | 32,011 | \$.05 |
| 2018 | 30 | 0 | 4 | 19 | 3,942 | 469 | \$.3 |
| 2019 | 27 | 0 | 6 | 15 | 51,002 | 38,284 | \$155.0 |
| 2020 | 18 | 0 | 4 | 3 | 261 | 1,614 | \$.1 |
| Annual Average | 26.6 | 0 | 6.2 | 26.8 | 12,948 | 17,162 | \$32.0 |
| Total Reportable | 133 | 0 | 31 | 134 | 64,739 | 85,808 | \$191.5 |

In the five-year baseline, the total number of offsite individuals evacuated as well as the value of property damage are skewed by a single incident where 50,000 people were evacuated for exposure to smoke and particles from a fire at a TPC Group facility in Port Neches, TX, in 2019.³⁵ For sheltering in place, two accidents in 2019 with approximately 12,000 evacuations accounted for their high numbers. The accident at Benicia, CA in 2017 accounted for 28,000 of that year’s evacuations as well.³⁶

³⁴ After Two Major Refinery Accidents, Valero and Benicia Take Steps To Work Better Together <https://www.kqed.org/news/11756861/after-two-major-refinery-accidents-valero-and-benicia-take-steps-to-work-better-together>.

³⁵ PC Group Explosion and Fire <https://www.csb.gov/tpc-group-explosion-and-fire/>.

³⁶ <https://www.kqed.org/news/11756861/after-two-major-refinery-accidents-valero-and-benicia-take-steps-to-work-better-together>.

3.4.3 Distribution of Accident Impacts Across Sectors

In the five-year baseline, fatal accidents occurred primarily in the petroleum refining and chemical manufacturing sectors, which accounted for eight of the 12 fatalities. Combined with the paper manufacturing sector, these sectors accounted for 69 percent of the onsite property damage (refineries alone accounted for 53 percent of the total). The number of accidents per facility is highest in these three sectors. Exhibit 3-11 presents a breakdown of RMP-reportable accidents, deaths, and injuries by sector, including accidents with no impacts. The food and beverage manufacturers and warehouses are generally ammonia refrigeration systems and the agricultural chemical distributors store ammonia for use as a fertilizer. The right hand column of Exhibit 3-11 shows the number of facilities by NAICS code that had more than one reportable accident between 2016 and 2020.

Exhibit 3-11: Accidents, Fatalities and Injuries by Sector, 2016-2020.

| Sector (NAICS) | Total 5-Year Accidents | Average Number of Accidents per Facility | Onsite Fatalities | Onsite Injuries | Offsite Injuries | Number of Facilities with >1 Accident |
|---|------------------------|--|-------------------|-----------------|------------------|---------------------------------------|
| 324: Petroleum and Coal Products Manufacturing | 137 | 0.88 | 2 | 59 | 0 | 14 |
| 325: Chemical Manufacturing | 316 | 0.21 | 2 | 176 | 0 | 29 |
| 311/312: Food/Beverage Manufacturers | 28 | 0.02 | 0 | 30 | 0 | 2* |
| 322: Paper Manufacturing | 38 | 0.70 | 0 | 30 | 0 | 5 |
| 331, 332, 333, 334, 336, 339: Other Manufacturing | 4 | 0.03 | 0 | 1 | 0 | 3* |
| 11, 12, 15, 42491: Agricultural Chemical Distributors | 91 | 0.03 | 0 | 6 | 0 | 5** |
| 4246, 4247: Chemical/petroleum wholesale | 12 | 0.02 | 0 | 5 | 0 | |
| 4244, 4245: Other wholesale | 0 | 0.00 | 0 | 0 | 0 | |
| 493: Warehouse | 33 | 0.03 | 2 | 28 | 0 | 2 |
| 22131, 22132: Water/POTW | 20 | 0.02 | 0 | 10 | 0 | 3 |
| 211: Oil/Gas exploration | 81 | 0.11 | 4 | 13 | 0 | 6 |
| Other | 263 | 0.11 | 2 | 192 | 20 | 2*** |
| Total | 1,023 | | 12 | 550 | 20 | 71 |

* NAICS 311; **424; ***326 and 336.

3.4.4 Monetized Costs of Chemical Accidents

While the RMP Database provides values of property damage, it includes only counts of fatalities, non-fatal injuries, evacuations, and the number of people required to shelter in place. EPA has applied estimates of the values of these impacts to better understand the magnitude of accident impacts during the five-year baseline. To monetize fatalities, EPA applied the value of statistical life (VSL) recommended in EPA's *Guidelines for*

Preparing Economic Analysis (2010) (hereafter the *Guidelines*). For non-fatal injuries, EPA gathered data on hospital costs from the U.S. Department of Health & Human Services (HHS) Agency for Healthcare and Research and Quality Data (2020).³⁷ Finally, for evacuations and shelter-in-place events, values of labor time were drawn from the BLS (2020).³⁸

3.4.4.1. Fatalities and Injuries

Fatalities were valued using the *Guideline's* value of a statistical life of \$7.9 million (2008 dollars) inflated to \$9.3 million (2020 dollars). In principle, valuation of injuries includes multiple components. The *Guidelines* explain that the willingness to pay (WTP) to reduce the risk of experiencing an illness is the preferred measure of value for morbidity effects and cites Freeman (2003)³⁹. As described in Freeman (2003), WTP consists of four components:

- “Averting costs” to reduce the risk of illness.
- “Mitigating costs” for treatments such as medical care and medication.
- Indirect costs such as lost time from paid work, maintaining a home, and pursuing leisure activities.
- Less easily measured, but equally real, costs of discomfort, anxiety, pain, and suffering.

EPA had available data to estimate only the components identified in the second bullet, “Mitigating costs” for treatments such as medical care and medication. The cost categories in bullets 1, 3 and 4 are not included in EPA’s estimates. For onsite injury and offsite hospitalization, the analysis reviewed the accident data to determine the percentage of the accidents that involved explosions and fires and the percentage that involved the release of toxics. The analysis then transferred the HHS data on the current costs for hospitalizations for poisoning (other than by medicinal substances) to injuries from toxic releases; for burns to injuries associated with fire; and for open wounds, to injuries from explosions. Because the costs for open wounds and poisoning were close (\$49,430 and \$44,820, respectively), the analysis used the average of these two values for onsite injuries; the cost for burns was \$96,000. The analysis then created a weighted value of an onsite injury based on the percentage of burn-related injury versus other impacts (fires were involved in 18 percent of the injury incidents; open wounds were assumed to be the remainder of injury costs). This weighted value was approximately \$50,000.

The analysis used the cost of hospitalization for poisoning (rounded to \$36,000) for hospitalizations associated with offsite injuries because in the five-year baseline, these injuries were usually related to exposure to toxic chemicals. For medical treatment other than hospitalization (offsite), the analysis used an estimate of \$1,000, which is above the \$750 per person paid to the 14,000 people who sought medical treatment from the Richmond refinery fire, and slightly below the average emergency room cost. Offsite treatments for exposure to fumes usually involves relatively low-cost treatments (e.g., oxygen, eye washes, skin washes).

The \$50,000 total cost estimate for onsite injuries has several limitations. As mentioned above for all injuries, hospital costs are only one of four categories of social costs incurred. Costs could not be estimated for the other categories, which could be substantial in some cases, due to a lack of data. However, as an estimate of hospital costs, it is an over-estimate for an unknown percentage of the injuries onsite that did not require hospitalization and may not involve any medical costs or for injuries and toxic exposures that led to hospitalization and were minor enough that the person was released within a day (the HHS cost estimates are based on a 3-day stay for poisonings and injuries and an 8-day stay for burns). In the opposite direction, however, the \$50,000 cost estimate is an underestimate for those workers who were severely injured and for

³⁷ <http://hcupnet.ahrq.gov>.

³⁸ https://www.bls.gov/oes/2020/may/oes_nat.htm.

³⁹ Freeman III, A.M. 2003. *The Measurement of Environmental and Resource Values: Theory and Methods*. 2nd Ed. Washington, D.C.: Resources for the Future.

whom the medical costs would certainly have involved more than hospitalization, e.g., costs associated with further medical treatment as well as physical and occupational therapy.

3.4.4.2 Evacuations and Shelter-in-Place Events

The five-year baseline data do not provide any basis for estimating the time involved in the average evacuation or sheltering-in-place, which EPA assumes is less disruptive than an evacuation. To estimate costs for evacuations and sheltering in place, the analysis assumed the value of time of \$27.35 per hour,⁴⁰ sheltering required 4 hours⁴¹, and evacuations required 8 hours.⁴²

3.4.4.3 Summary of Monetized Accident Impacts

The dominant monetized element of RMP facility reportable accidents is onsite property damage, followed by offsite property damage. The total monetized five-year cost of the accidents is about \$2.3 billion. Of that amount, \$2.2 billion was caused by onsite impacts largely attributed to property damage and fatalities. The offsite property damage derived largely from one accident in Port Neches, TX in 2019 causing \$153 million of offsite property damage.

Exhibit 3-12: Average Impacts per Year and Accident: 2016-2020.

| | 5-Year Total | Average/Year | Average/Accident |
|---------------------|---------------|----------------|------------------|
| Onsite | | | |
| Fatalities | 12 | 2.4 | 0.025 |
| Injuries | 550 | 110 | 1.13 |
| Property Damage | \$2.0 billion | \$406 million | \$4.2 million |
| Offsite | | | |
| Fatalities | 0 | 0 | 0 |
| Hospitalizations | 31 | 6.2 | 0.064 |
| Medical Treatment | 134 | 26.8 | 0.275 |
| Evacuations | 64,739 | 12,948 | 132.662 |
| Sheltering in Place | 85,808 | 17,162 | 175.836 |
| Property Damage | \$191 million | \$31.9 million | \$0.39 million |

The monetized cost of accidents shown in Exhibit 3-13 for the period 2016 to 2020 should be viewed in light of monetized costs of RMP accidents for other time periods. EPA analyses for two prior RMP rulemakings, the 2017 amendments rule and the 2019 reconsideration rule, estimated monetized baseline damages using the same categories as were used for Exhibit 3-13. For those analyses, EPA estimated annualized monetized baseline damages for the 10-year period from 2004 to 2013 and for the three-year period from 2014 to 2016. The estimates were calculated in 2015 dollars and appear in Exhibit 3-14⁴³.

⁴⁰ BLS data estimate the mean hourly wage at \$27.35 across all workers. <http://www.bls.gov/news.release/ecec.t01.htm>.

⁴¹ The sheltering length assumption is consistent with that used in the amendments rule RIA. In addition, CDC suggests sheltering in place in response to a chemical accident will be “a few hours” but recognizes that every emergency is different. <https://emergency.cdc.gov/planning/Shelteringfacts.asp>.

⁴² The evacuation length is assumption is consistent with that used in the amendments rule RIA. CDC data has previously suggested that evacuations can last from 0.5 hours to 30 days, with a median duration of 2 hours. Another study by Kim and Cho (2020) report that evacuations are completed in 5 hours <https://pubmed.ncbi.nlm.nih.gov/33339315/>.

⁴³ For discussion of these estimates, see Chapter 6 in the Aamendments Rule RIA. *Regulatory Impact Analysis Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7)*. U.S. Environmental Protection Agency (EPA), Office of Land and Emergency management (OLEM), Office of Emergency

Exhibit 3-13: Monetized Accident Costs including Average per Year and per Accident for 2016-2020 (millions, 2020 dollars).

| | Unit Value | 5-Year Total | Average/Year | Average/Accident | Median/Accident |
|----------------------|------------|-------------------|-----------------|------------------|-----------------|
| Onsite | | | | | |
| Fatalities | \$9.3 | \$111.6 | \$22.32 | \$0.23 | \$0.00 |
| Injuries | \$0.05 | \$27.50 | \$5.50 | \$0.06 | \$0.05 |
| Property Damage | | \$2,031 | \$406.20 | \$4.16 | \$0.00 |
| Onsite Total | | \$2,170.10 | \$434.02 | \$4.45 | \$50,000 |
| Offsite | | | | | |
| Fatalities | \$9.30 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| Hospitalizations | \$0.045 | \$1.40 | \$0.28 | \$0.003 | \$0.00 |
| Medical Treatment | \$0.001 | \$0.13 | \$0.03 | \$0.0003 | \$0.00 |
| Evacuations* | \$0.00 | \$14.16 | \$2.83 | \$0.029 | \$0.00 |
| Sheltering in Place* | \$0.00 | \$9.39 | \$1.88 | \$0.019 | \$0.00 |
| Property Damage | | \$191.53 | \$38.31** | \$0.39 | \$0.00 |
| Offsite Total | | \$216.61 | \$43.32 | \$0.44 | \$0.00 |
| Total | | \$2,386.71 | \$477.34 | \$4.89 | \$0.05 |

*The unit value for evacuations and sheltering in place are less than \$300 so when presented in rounded \$ millions, the value in the table is zero.

** Large offsite property damage is influenced by high offsite consequences reported from the 2019 TPC Group Explosion and Fire in Port Neches, TX (see: <https://www.csb.gov/tpc-group-explosion-and-fire/>).

Exhibit 3-14: Monetized Accident Costs including Average per Year and per Accident for 2004-2013 and 2014-2016 (millions, 2015 dollars)

| | | 2004-2013 | | | 2014-2016 | | |
|---------------------|------------|------------------|------------------|----------------------|----------------|------------------|----------------------|
| | Unit Value | 10-Year Total | Average per Year | Average per Accident | 3-Year Total | Average per Year | Average per Accident |
| Onsite | | | | | | | |
| Fatalities | \$8.6 | \$497.8 | \$49.8 | \$0.33 | \$103.0 | \$34.3 | \$0.3 |
| Injuries | \$0.05 | \$105.2 | \$10.5 | \$0.07 | \$19.7 | \$6.6 | \$0.06 |
| Property Damage | | \$2,054.9 | \$205.5 | \$1.4 | \$509.7 | \$169.9 | \$1.5 |
| Onsite Total | | \$2,657.9 | \$265.8 | \$1.8 | \$632.4 | \$210.8 | \$1.9 |
| Offsite | | | | | | | |
| Fatalities | \$8.6 | \$8.6 | \$0.86 | \$0.01 | \$0 | \$0 | \$0 |
| Hospitalizations | \$0.04 | \$6.8 | \$0.68 | \$0.004 | \$0.7 | \$0.2 | \$0.002 |

Management (OEM) 1200 Pennsylvania Ave., NW (Mail Code 5104A), Washington, DC 20460. February 14, 2016. Also see Chapter 6 in the Reconsideration Rule RIA, *Regulatory Impact Analysis Reconsideration of the 2017 Amendments to the Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7),*). U.S. Environmental Protection Agency (EPA), Office of Land and Emergency management (OLEM), Office of Emergency Management (OEM) 1200 Pennsylvania Ave., NW (Mail Code 5104A), Washington, DC 20460. November 18, 2019.

| | | | | | | | |
|----------------------|---------|------------------|----------------|---------------|----------------|----------------|---------------|
| Medical Treatment | \$0.001 | \$14.8 | \$1.5 | \$0.01 | \$0.03 | \$0.01 | \$0.0001 |
| Evacuations* | \$0.0 | \$7.0 | \$0.70 | \$0.005 | \$1.0 | \$0.3 | \$0.003 |
| Sheltering in Place* | \$0.0 | \$40.9 | \$4.1 | \$0.03 | \$3.4 | \$1.1 | \$0.01 |
| Property Damage | | \$11.4 | \$1.1 | \$0.008 | \$5.1 | \$1.7 | \$0.02 |
| Offsite Total | | \$89.5 | \$8.9 | \$0.06 | \$10.3 | \$3.4 | \$0.03 |
| Total | | \$2,747.3 | \$274.7 | \$1.8 | \$642.7 | \$214.2 | \$1.9 |

* The unit value for evacuations is less than \$200 and for sheltering in place is less than \$100 so when expressed in rounded millions, the value represented in the table is \$0.

The estimates of monetized accident damages for the two prior time periods give lower values; for example, the average per year is \$275 million for 2004 to 2013, and is \$214 million for 2014 to 2016. The average per accident is \$1.8 million for 2004 to 2013 and is \$1.9 million for 2014 to 2016. Significant contributing factors to the higher values appearing in Exhibit 3-13 estimated for the most recent five-year period are the high property damage and number of evacuations from the TPC Group Chemical Plant explosion and fire in Port Neches, TX in 2019.

3.5 Limitations

While it is standard practice for EPA to assume that every facility subject to the RMP rule has registered with EPA and filed an RMP; EPA recognizes that assumption may not be accurate. EPA and delegated implementing agencies search for and occasionally identify RMP facilities that have failed to submit RMPs. Historically, relatively few of these “non-filers” have been found, but EPA is unable to determine the full extent of such non-compliance. In addition, EPA recognizes that the RMP Database may include facilities that are no longer operational after December 31, 2020 but failed to follow the requirements to deregister.

The numbers of RMP facilities and processes are expected to change over the period of analysis because of firms that will grow, shrink, close, or open in the near or distant future. Despite these expected changes and other limitations, the analysis relies on the number and nature of RMP facilities and processes in the RMP Database as of December 31, 2020, using the August 1, 2021, RMP Database as a constant estimate of future RMP facilities/processes. EPA selected this database version to reflect the most recent information about RMP facility numbers and characteristics and because facilities are required to report accidents within six months; therefore, a cutoff date of August 1, 2021, should include all facilities reporting accidents as of December 31, 2020. However, some facilities may have not reported their accidents as they are required to do.

CHAPTER 4: Costs of Proposed Rule Revisions

This chapter outlines the assumptions EPA used to estimate the incremental costs of the proposed revisions to the Risk Management Program. This RIA does not estimate the baseline costs incurred to comply with the current RMP regulations – baseline costs, which include costs to comply with the current RMP regulations, have been accounted for in previous RMP RIAs and therefore have not been repeated here. The Agency sought to quantify and monetize costs where possible. The time frame of analysis is 10 years. As several of the rule elements are required once in a five-year period, EPA included a time span long enough to capture two five-year periods. Specific assumptions are outlined for each rule provision below. The analysis employs a model facility approach in which representative facility categories were developed to reflect a variety of features expected to influence costs (e.g., process complexity, number of FTEs, etc.). Cost assumptions were developed for each model facility type and addressed factors such as number of staff hours involved in implementing a provision, equipment costs, and fixed costs for contractor involvement. Prevailing wage rates were used to estimate per facility costs for rule provisions. With a model facility approach, the unit cost estimates represent averages that cover a wide variation in expected costs even within a single sector..

4.1 Analysis Baseline

This analysis estimates only the incremental impacts of the proposed rule for those provisions that would impose new costs. Components of the Hazards Evaluation Amplification and the Emergency Response provisions impose no new burden because they codify existing industry practice or RMP requirements. The proposed rule revises regulatory text for Program 2 and Program 3 hazard evaluations to explicitly address both external events such as natural hazards, including those caused by climate change or other triggering events that could lead to an accidental release, and standby or emergency power systems. The revised regulatory text for Program 2 and Program 3 hazard evaluations also explicitly defines stationary source siting as inclusive of the placement of processes, equipment, buildings within the facility, hazards posed by proximate facilities, and accidental release consequences posed by proximity to the public and public receptors. These requirements reflect existing industry practice, and therefore, EPA assumes that these hazard evaluation amplifications would impose no new costs.

The proposed rule also revises emergency response provisions. The additional provision would revise regulatory text to require facilities to develop and implement, as necessary, procedures for informing the public and the appropriate emergency response agencies about accidental releases of RMP-regulated substances. Under current regulatory requirements, responding and non-responding facilities should already have mechanisms and procedures in place to notify the public through their emergency response programs or plans, or through coordination with local responders. Therefore, EPA does not estimate any new costs associated with these components of the emergency response provisions. EPA does quantify the cost to ensure that a community notification system is in place to warn the public within the area threatened by a release; the discussion can be found later in this chapter.

4.2 Wage Rates

The Agency used the Bureau of Labor Statistics (BLS) May 2020 Occupational Employment and Wage Estimates⁴⁴ to construct a weighted wage rate for different occupational categories. For all rule provisions, labor hours were assumed to be distributed across six general labor categories: Management, Corporate Management, Attorneys, Engineers, Production Staff, and Local Responders. The weighted wage rates for complex facilities (NAICS 324 and 325) were estimated separately from simple facilities because wages paid by these facilities are higher than in wholesale and government sectors, which dominate the simple facilities category. For each of the NAICS codes representing industries in the simple facilities category that are affected by the rule provisions (Food and Beverage, Agricultural Facilities, etc.), standardized BLS Occupation Titles were identified to correspond to the six general labor categories. BLS wages were then adjusted to account for fringe benefits and

⁴⁴ See https://www.bls.gov/oes/2020/may/oes_nat.htm.

overhead. Fringe benefits includes payments to cover items such as paid leave, supplemental pay, insurance, and retirement. Overhead includes resources to cover items such as office space and administrative personnel issues. Applying the June 2020 national average benefit ratio of 0.46⁴⁵ and an overhead cost ratio not inclusive of benefits of 0.3, the Agency multiplied the wage rates for each BLS Occupation Title by a factor of 1.76 to create a fully loaded wage rate.⁴⁶ After loaded wage rates were established for each industry, they were combined to form a weighted average based on the prominence of each industry within its universe of facilities, either simple or complex. Exhibit 4-1 presents the wage rates EPA used in the analysis.

Exhibit 4-1: Weighted-Average Loaded Hourly Wage Rates (2020 Dollars).

| Labor Category | Simple Facilities | Complex Facilities |
|----------------------|-------------------|--------------------|
| Management | \$103.06 | \$135.63 |
| Corporate Management | \$105.24 | \$134.46 |
| Attorneys | \$132.14 | \$157.85 |
| Engineers | \$69.31 | \$100.43 |
| Production Staff | \$39.69 | \$56.61 |
| Local Responders | \$71.19 | \$71.19 |

Source: https://www.bls.gov/oes/2020/may/oes_nat.htm and <http://www.bls.gov/news.release/ecec.nr0.htm>.

4.3 Rule Familiarization

RMP facility staff will spend time to review the final rule and determine which provisions apply to their facility. Most of the proposed provisions revise current requirements rather than introducing completely new provisions. Many of the provisions are straightforward, e.g., those regarding Information Availability. Others apply only after an RMP-reportable accident, e.g., root cause analysis. Still others, such as the STAA, are expected to take time to understand -- however they apply to a limited number of facilities. As such, EPA has adopted a methodology that assigns labor estimates based on facility types to reflect that certain facilities will have to dedicate more time to familiarize themselves with rule provisions that apply only to them.

EPA projects that the time facilities spend to review the final rule and determine which provisions apply will be consistent with the time they spent to review the 2017 amendments rule because the number and content of provisions are similar. EPA projects that all facilities with simple processes would need four hours to review the rule as would the few complex facilities in Program 1 and Program 2. Complex facilities in Program 3 are projected to spend 292 hours reviewing the rule. LEPC's are projected to spend five hours reviewing the rule. Delegated State and local implementing agencies are projected to spend four hours reviewing the rule. Exhibit 4-2 presents the unit burden hour and cost estimates for rule familiarization.

Exhibit 4-2: Estimated Unit Burden and Cost for Rule Familiarization (2020 Dollars).

| Facility Type | Labor Hours | | | | | Facility Cost |
|--------------------|-------------|-----------------|-----------|-----------|------------|---------------|
| | Managers | Corporate Mgmt. | Attorneys | Engineers | Production | |
| Simple | 4 | 0 | 0 | 0 | 0 | \$412 |
| P1 and P2: Complex | 4 | 0 | 0 | 0 | 0 | \$543 |

⁴⁵ Bureau of Labor Statistics Employer Costs for Employee Compensation. For June 2020, Table 1 shows that for civilian workers, on average for the nation, fringe benefits were 31.5% of total compensation, and 46.0% of wages.

⁴⁶ For details explaining this approach, please see Handbook on Valuing Changes in Time Use Induced by Regulatory Requirements and Other EPA Actions, National Center for Environmental Economics, EPA-236-B-15-001 December 9, 2020.

| Facility Type | Labor Hours | | | | | Facility Cost |
|---------------------------------|-------------|-----------------|-----------|-----------|------------|---------------|
| | Managers | Corporate Mgmt. | Attorneys | Engineers | Production | |
| P3: Complex | 20 | 48 | 12 | 87 | 125 | \$26,874 |
| LEPCs | 5 | 0 | 0 | 0 | 0 | \$515 |
| Delegated Implementing Agencies | 4 | 0 | 0 | 0 | 0 | \$412 |

4.4 Prevention Program Provisions

Safer Technology and Alternatives Analysis (STAA)

The STAA proposed provision would require facilities with Program 3 regulated processes in NAICS 324 (petroleum and coal products manufacturing) and 325 (chemical manufacturing) located within one mile of another RMP-regulated facility process in NAICS 324 and 325, and all regulated facilities in NAICS 324 using HF in an alkylation unit, to conduct a STAA as part of their PHA, which occurs every five years. STAA is generally a process in which facility staff analyze their current processes and practices to determine whether there are safer alternatives to their current operating practice. This can range from small changes – such as upgrading valves – to large shifts like substituting less toxic or volatile chemicals.

This RIA divides the STAA process into two parts:

1. The initial analysis to identify and document alternatives.
2. A practicability study to determine the practicability of implementing identified alternatives and assess the reasonableness of implementing the change.

An initial analysis and documentation is required of all facility processes. EPA believes that some facilities may already have conducted such analyses but has taken the conservative approach of assuming that all facilities subject to the STAA provision will conduct them for all processes as a result of the proposed rule. Following the initial analysis, EPA is proposing that a practicability assessment be conducted if the initial analysis determines the existence of inherently safer alternatives. EPA expects a practicability assessment to occur only when warranted by the outcome of an initial analysis. EPA also anticipates that some facilities will conduct practicability studies to address alternatives considered in multiple initial analyses. Consequently, some complex firms are assumed to conduct practicability studies that address up to 12 different alternatives. EPA is retaining the estimates of the hours required to conduct an initial analysis from the 2017 amendments rule RIA and updating the costs to 2020 dollars. For large complex facilities, EPA estimates that a total of 738 engineering hours will be required,⁴⁷ for Small/Medium facilities, a total of 130 hours will be required (20 hours of management, 0.5 hours of corporate management, 3.5 hours of attorney time, 82.5 hours of engineering, and 23.5 hours of production staff support).⁴⁸ See Exhibit 4-7.

The technical practicability assessment considers the extent of process redesign, its engineering implications, and possible costs. To estimate the cost of the practicability study, referred to in some literature and comments as a feasibility study, EPA maintains the approach developed for the amendments rule RIA. That approach is to identify “reference” STAA projects for the sectors affected by the provision, estimate costs of the reference projects, and apply a percentage to the project cost to calculate the practicability study cost. Public comments received on the proposed amendments rule provided practicability study cost information specifically for STAA projects. This information was provided by American Water Works Association (AWWA), American Fuel & Petrochemical Manufacturers (AFPM), American Petroleum Institute (API), and Chemical Safety

⁴⁷ Labor hours taken from average unit cost estimate submitted by Public Comment EPA-HQ-OEM-2015-0725-0579 provided by AFPM. EPA derived labor hours from the unit cost estimate provided by the commenter using standard wage rates.

⁴⁸ Labor hours taken from the midpoint of the high and low labor hour estimates submitted by Public Comment EPA-HQ-OEM-2015-0725-0594 made by CSAG. EPA used the midpoint of the commenter’s high and low labor hour estimates to represent the labor burden of small/medium complex facilities.

Advocacy Group (CSAG). EPA also identified sources examining feasibility studies of mining projects including Mackenzie and Cusworth (2007)⁴⁹. Since the amendments rule was promulgated, EPA identified an additional paper, McLeod (2021)⁵⁰, which summarizes lessons learned about practicability studies from the literature but does not provide additional data on costs. EPA was unable to locate new information on practicability study costs or those costs in relation to project costs. Thus, EPA adopts the same 1.2 percent of project costs that was estimated for the amendments rule RIA.⁵¹

The approach to estimating the costs of practicability studies identifies relevant reference projects for each affected sector, and cost estimates for each reference project. EPA then applies the 1.2 percentage estimate to project costs to estimate the practicability study cost. To estimate the cost of reference projects, EPA gathered new data combined with data used for the amendments rule RIA. Several commenters on the proposed amendments rule RIA provided estimates of the costs of potential STAA projects. AWWA offered cost estimates for four STAA projects (see Exhibit 4-3 below and Table 4-10 in the comments, p. 4-21).⁵² These cost estimates are presented in Exhibit 4-5. The water industry would not be affected by the proposed rule STAA provision, but EPA used these project costs to benchmark similar reference project costs for the chemical manufacturing sector.

Exhibit 4-3: AWWA Comment on Estimated Project Costs (2016)
(millions, 2020 dollars).

| Disinfection Technology | Capital Costs (\$) |
|--------------------------------|---------------------------|
| Hypochlorite | \$2.0 |
| Chlorine Dioxide | \$0.9 |
| Ultraviolet | \$12.2 |
| Ozone | \$24.6 |

An important potential STAA project for the proposed rule is the consideration by petroleum refiners of converting an HF alkylation to safer technologies that replace HF with substitutes such as sulfuric acid, ionic liquids, or solid acid. EPA was able to locate nine estimates of the costs to modify or replace an HF alkylation unit. Two were already identified for the amendments rule RIA (including one provided by AFPM through public comments)⁵³ and seven became available subsequent to development of that RIA. Appendix A presents the cost estimates, which range from \$50 million to \$900 million, with a mean of \$270 million, a median of \$155 million, and a mode of \$300 million. Thus, EPA has adopted an estimate of \$300 million for this analysis, which is unchanged from the amendments rule RIA. This may be a conservative estimate as recent advancements in technology target HF conversion and may be lowering conversion costs. Several recent articles discuss a new,

⁴⁹ Mackenzie, W. and N. Cusworth. 2007. "The Use and Abuse of Feasibility Studies." Project Evaluation Conference. Melbourne, Vic, 19-20 June 2007. Noort, D J and Adams, C, 2006. Effective mining project management systems, in Proceedings International Mine Management Conference, pp 87-96 (The Australasian Institute of Mining and Metallurgy: Melbourne). <http://www.enthalpy.com.au/wp-content/uploads/2013/09/The-Use-and-Abuse-of-Feasibility-Studies-Enthalpy.pdf>

⁵⁰ McLeod, S. 2021. "Feasibility studies for novel and complex projects: Principles synthesized through an integrative review," Project Leadership and Society.

⁵¹ For a detailed explanation of how the estimate was developed, see Appendix D in the amendments Rule Final RIA: US EPA. Regulatory Impact Analysis. Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7). Dec 16, 2016. (EPA-HQ-OEM-2015-0725-0734).

⁵² See AWWA comments on the proposed RMP amendments rule (EPA-HQ-OEM-2015-0725-0554).

⁵³ AFPM provided a range of estimates from \$100 million to \$500 million, which EPA represents with a single value of \$300 million. See AFPM comments on the proposed RMP amendments rule (EPA-HQ-OEM-2015-0725-0579).

lower cost technology that converts existing HF alkylation units to use sulfuric acid and simultaneously allows an expansion of production capacity.⁵⁴

Additional STAA projects that might be considered by petroleum refiners include piping replacement and miscellaneous small projects. For chemical manufacturers, STAA projects might include chemical conversion, piping replacement, and other miscellaneous small projects. See Appendix D in the 2016 RIA for a description of these projects and their estimated costs.⁵⁵ Note that the costs of the most expensive STAA projects will drive the majority of expenditures for practicability studies. The cost is then multiplied by the number of facilities in the affected sector (assuming the costs are spread over five years), and the costs for each sector are summed to calculate the overall costs of practicability studies.

Exhibit 4-4 illustrates the estimated costs for practicability studies using this approach; that is, it approximates the costs of practicability studies as 1.2 percent of reference project costs. EPA developed a unit cost estimate of the practicability study for each sector (petroleum refining and chemical manufacturing) by weighting the reference projects by the number of facilities estimated to require that type of practicability study.

Exhibit 4-4: STAA Practicability Study Cost Table (millions, 2020 dollars).

| Sector | Reference Project | Reference Project Unit Cost | Number of Facilities | Total Project Cost | Weighted Average [(Number of facilities x unit cost)/total number facilities] | 1.2 percent of Weighted Average |
|------------------------|------------------------------|-----------------------------|----------------------|--------------------|--|---------------------------------|
| Petroleum refining | HF alkylation conversion* | \$326.0 | 43 | \$14,018.9 | \$195.5 | \$2.5 |
| Petroleum refining | 2 major piping replacements | \$10.9 | 26 | \$565.1 | | |
| Petroleum refining | 10 other small STAA projects | \$0.1 | 69 | \$75.0 | | |
| Chemical manufacturing | Chemical conversion** | \$5.4 | 102.2 | \$555.3 | \$2.3 | \$.03 |
| Chemical manufacturing | Piping replacement | \$1.1 | 408.8 | \$444.3 | | |
| Chemical manufacturing | 5 other small STAA projects | \$0.1 | 511 | \$277.7 | | |

*Assumes all refineries with HF alkylation processes study conversion, remainder study two major piping replacement projects and all study 10 small STAA projects.

**Assumes 20 percent of Program 3 chemical facilities study conversion, remainder study minor piping replacement and all study five small STAA projects.

Based on this analysis, the STAA practicability study cost for a facility in petroleum refining is \$2.5 million over a five-year period (\$.5 million annualized) and for a facility in chemical manufacturing, the cost is \$30,000 (\$6,000 annualized).

⁵⁴ See Jenkins, Scott (2017) “Lower costs for converting alkylation units from hydrofluoric to sulfuric acid,” *Chemical Engineering*. Nov 1.; Menachery, Martin (2017) “DuPont launches hydrofluoric acid alkylation conversion, expansion technology,” *Refining & Petrochemicals*. Sep 7 and Presley, Shane, Randy Peterson, Diwakar Rana, and Jason Nunez (2017) “Advances in HF acid alkylation conversion and expansion,” *Digital Refining*. December.

⁵⁵ See Appendix D “STAA Project Cost Data” and “Estimating Practicability Study Costs”, pp 148-152. US EPA, 2016. Regulatory Impact Analysis, Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7).

Exhibit 4-5 displays the hours and costs assumed for each task by labor category and type of facility, and the resulting per facility cost estimates.

Exhibit 4-5: Hourly Labor and Unit Costs for STAA (2020 dollars).

| Sector | Labor Hours | | | | | Facility Cost |
|-------------------------|-------------|-----------------|---------------|-----------|------------|---------------|
| | Manager | Corporate Mgmt. | Attorneys | Engineers | Production | |
| Initial Analysis | | | | | | |
| Refineries | 0 | 0 | 0 | 738 | 0 | \$74,000 |
| Chemical Manufacturers | 20 | 0.5 | 3.5 | 82.5 | 23.5 | \$13,000 |
| Sector | | | Facility Cost | | | |
| Practicability Analysis | | | | | | |
| Refineries | | | \$2.5 million | | | |
| Chemical Manufacturers | | | \$30,000 | | | |

Root Cause Analysis

This proposed rule provision would require that facilities in Programs 2 and 3 that have had an RMP-reportable accident determine the underlying causes as part of their incident investigation. A root cause analysis is a structured process led by a person trained in the methodology. The time required may vary considerably based on the complexity of the processes involved.

In the baseline, facilities are already required to conduct incident investigations. Management time is expected to be devoted primarily to decisions concerning resolution of corrective actions arising from the investigation. EPA assumes that these activities would require roughly the same amount of time whether corrective actions relate to root causes or other contributing causes. For simple facilities, EPA assumed that labor for root cause analyses would require management time and additional time evenly distributed between production staff and engineers. For complex facilities, in addition to facility management, EPA estimated that due to the facility's size and complexity, attorney hours would be required, along with the acknowledgment of corporate management, requiring 0.5 hours of corporate manager time. EPA also estimated that multiple hours of engineering and production staff would be required to conduct the analysis.

Complex facilities are estimated to require 132.5 total hours (68 hours of management, 0.5 hours of corporate management, 6 hours of attorneys, 30 hours of engineers, and 28 hours of production staff) for a root cause analysis and simple facilities are estimated to require 14 total hours (6 hours of management, 4 hours of engineering, and 4 hours of production). These hour estimates apply to root cause analyses of RMP-reportable accidents and reflect the additional time required for root cause analyses over and above incident investigation.

EPA is retaining the estimate in the amendments rule RIA that simple facility costs include \$1,000 for a trained facilitator to assist with the investigation and updating it to 2020 dollars. Complex facilities generally have staff familiar with the methodology and would conduct the root cause analysis in-house. Exhibit 4-6 displays the hours assumed for each labor category for each type of facility, and the estimated cost per facility.

Exhibit 4-6: Unit Cost for Root Cause Analysis (2020 dollars).

| Facility Type | Labor Hours | | | | | Other Costs | Facility Cost |
|---------------|-------------|-----------------|-----------|-----------|------------|-------------|---------------|
| | Managers | Corporate Mgmt. | Attorneys | Engineers | Production | | |
| P2 - Simple | 6 | 0 | 0 | 4 | 4 | \$1,087 | \$2,141 |
| P2 - Complex | 68 | 0.5 | 6 | 30 | 28 | \$0 | \$14,835 |
| P3 - Simple | 6 | 0 | 0 | 4 | 4 | \$1,087 | \$2,141 |
| P3 - Complex | 68 | 0.5 | 6 | 30 | 28 | \$0 | \$14,835 |

Third-party Audits

The current rule requires Program 2 and Program 3 facilities to conduct a compliance audit at least once every three years. The proposed rule would require Program 2 and Program 3 facilities that have had two RMP-reportable accidents within the past five years, or facilities with a Program 3 process in NAICS codes 324 or 325 within one mile of another facility with a process in NAICS codes 324 or 325, to contract with an independent third-party to conduct the next required audit. The amendments rule RIA estimated the cost of hiring a third-party to conduct an audit. The audit required under this proposed rule would have the same estimated cost, so the estimated costs here are based on the unit costs and labor hours estimated under the amendments rule, updated to 2020 dollars.⁵⁶

The third-party audit analysis estimates assume that the time required to contract for a third-party audit would vary with the complexity of the processes to be covered and multiple facility staff would be involved, except for the smallest category of facilities. At a minimum, one manager and one engineer would be involved to identify potential auditors and write the statement of work on which the auditor would base its bid. For larger firms that routinely contract and have contracting departments, a contracts specialist and attorney would be part of the process. Many large firms and all governments are assumed to have standard contract language. Governments are estimated to spend more time on the contracting process, however, because most are required to solicit competitive bids and document the basis for the selection. Private firms may use a similar process but are not required to do so. Private firms are likely to spend time negotiating contract language after the award. Hourly assumptions and costs for a third-party audit are shown in Exhibit 4-7.

Exhibit 4-7: Hourly Labor and Unit Costs for Hiring Third-party Auditors (2020 dollars).

| Facility Type | Total Hours for Contracting Process | | | Facility Labor Cost | Auditor Fee | Total Facility Cost |
|----------------------|-------------------------------------|-----------|-----------|---------------------|-------------|---------------------|
| | Mgm't | Attorneys | Engineers | | | |
| Simple w/ 0-19 FTEs | 64 | 8 | 0 | \$7,653 | \$32,602 | \$40,255 |
| Simple w/ 20-99 FTEs | 88 | 8 | 36 | \$12,622 | \$32,602 | \$45,224 |
| Simple w/ 100+ FTEs | 60 | 8 | 112 | \$15,004 | \$32,602 | \$47,606 |

⁵⁶ BEA National Income and Product Accounts (NIPA) Table 1.1.9. Implicit Price Deflators for Gross Domestic Product. https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&nipa_table_list=13&categories=survey.

| Facility Type | Total Hours for Contracting Process | | | Facility Labor Cost | Auditor Fee | Total Facility Cost |
|-----------------------|-------------------------------------|-----------|-----------|---------------------|-------------|---------------------|
| | Mgm't | Attorneys | Engineers | | | |
| Complex w/ 0-19 FTEs | 64 | 8 | 0 | \$9,943 | \$86,939 | \$96,882 |
| Complex w/ 20-99 FTEs | 88 | 8 | 36 | \$16,814 | \$86,939 | \$103,753 |
| Complex w/ 100+ FTEs | 60 | 8 | 112 | \$20,648 | \$86,939 | \$107,587 |
| Small Government | 60 | 0 | 50 | \$9,649 | \$32,602 | \$42,252 |
| Large Government | 120 | 0 | 78 | \$24,109 | \$86,939 | \$111,048 |

Employee Participation Plan

EPA is proposing to require employers to consult with employees when making decisions on implementing recommendations from PHAs, compliance audits, and incident investigations; provide employees the opportunity to stop work under certain circumstances; and provide opportunities for employees to anonymously report certain problems. Specifically, the proposed rule would require that the employee participation plan, at 40 CFR 68.83, include and ensure effective methods are in place so that employees and their representatives have authority to refuse to perform a task when doing so could reasonably result in a catastrophic release and to recommend to the operator in charge of a unit that an operation or process be partially or completely shut down based on the potential for a catastrophic release. The proposed rule would require facilities with Program 3 processes to include in their employee participation plan explicit language that includes information for reporting of RMP-reportable accidents or other related RMP non-compliance issues. This would require facilities with Program 3 processes to update their current employee participation plans.

Facilities with Program 2 processes are not currently required to have an employee participation plan. Therefore, they would need to develop an employee participation plan. Training employees on the employee participation plan or the updated plan is assumed to be covered by ongoing training related to the prevention program. Therefore, EPA estimates the cost for Program 2 facilities to develop a new employee participation plan and Program 3 facilities to make minor adjustments to current employee participation plans.

EPA assumes that the development of an employee participation plan for a facility with Program 2 processes is a comparable burden to that for developing an employee participation plan for a facility with Program 3 processes. The 1996 RMP RIA did not include costs for employee participation plans for facilities with Program 3 processes, based on the assumption that those costs were already adequately accounted for under the OSHA PSM program. EPA therefore relied on the 1992 OSHA PSM RIA as the basis for the costs for employee participation plans for facilities with Program 2 processes. The resulting estimates of hours by labor category for each facility type are presented in Exhibit 4-8.

**Exhibit 4-8: Hourly Labor and Unit Costs for Employee Participation Plan Development:
Facilities with Program 2 Processes (2020 dollars).**

| Facility Type | Mgr. | Corp. Mgr. | Atty. | Eng. | Prod. Staff | Facility Cost |
|-------------------|------|------------|-------|------|-------------|---------------|
| Simple (<20 FTE) | 0 | 0 | 0 | 1 | 0.5 | \$89 |
| Simple (20+ FTE) | 0 | 0 | 0 | 3 | 0.5 | \$228 |
| Complex (<20 FTE) | 0 | 0 | 0 | 1 | 0.5 | \$129 |
| Complex (20+ FTE) | 0 | 0 | 0 | 3 | 0.5 | \$330 |

Facilities with Program 3 processes will need to update current employee participation plans. EPA assumes that this would be a minimal effort, and that regardless of facility complexity, 0.5 hours for an engineer and 0.5 hours for a production level staff would be required. The resulting unit costs, and these assumptions, are presented in Exhibit 4-9.

Exhibit 4-9: Hourly Labor and Unit Costs for Employee Participation Plan Update (2020 dollars).

| Facility Type | Mgr. | Corp Mgr. | Atty. | Eng. | Prod. Staff | Facility Cost |
|---------------|------|-----------|-------|------|-------------|---------------|
| Simple | 0 | 0 | 0 | 0.5 | 0.5 | \$55 |
| Complex | 0 | 0 | 0 | 0.5 | 0.5 | \$79 |

Emergency Backup Power for Perimeter Monitors

EPA is proposing to require perimeter monitoring equipment associated with prevention and detection of accidental releases from RMP-regulated processes to have standby or backup power to ensure compliance with the intent of the rule. Facilities with perimeter monitoring equipment that do not have backup power would need to acquire backup power. Many continuous emissions monitoring systems have low power requirements.⁵⁷ EPA assumes that affected facilities will implement backup power using a small generator at a total cost of \$1,000 for their monitoring equipment.⁵⁸

4.5 Emergency Response

Community Notification of RMP Accidents

The proposed rule would require all facilities with Program 2 or 3 processes to provide accidental release notification and data to local responders and ensure that a community notification system is in place. The presence of State and/or local Integrated Public Alert and Warning System (IPAWS)⁵⁹ alerting authorities covering all 50 States plus D.C., Puerto Rico, and the U.S. Virgin Islands implies that the infrastructure is in place nationwide for facilities to ensure community notification. Therefore, the direct cost associated with the proposed provision would be coordination between the facilities and local responders.

EPA assumes all facilities with Program 2 or 3 processes will have to take some additional steps to coordinate with local responders to ensure a process is in place to transfer accidental release notification and data to local responders and ensure the ability to use a community notification system. EPA assumes simple facilities would require an additional 2 hours of facility management time and an additional 1 hour of local responder time for them to communicate with each other about a community notification system and for the facility to provide any additional information necessary for coordination and document this additional coordination. EPA assumes

⁵⁷ Power requirements for a variety of continuous emissions monitoring systems can be found in reports at <https://www.epa.gov/emc/emc-continuous-emission-monitoring-systems>. For example, Ammonia CEMS specification tables list power requirements, https://www.epa.gov/sites/default/files/2020-08/documents/04-nh3_cems.pdf.

⁵⁸ <https://www.forbes.com/advisor/home-improvement/generator-cost-guide/>

⁵⁹ <https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system>

the additional coordination time will be approximately double for complex facilities. The unit costs are shown in Exhibit 4-10.

Exhibit 4-10: Hourly Labor and Unit Costs for Community Notification (2020 dollars).

| Facility Type | Managers | Local Responders | Facility Cost |
|--------------------|----------|------------------|---------------|
| Simple Facilities | 2 | 1 | \$277 |
| Complex Facilities | 4 | 2 | \$685 |

4.6 Information Availability

The proposed rule would require facilities to make certain information available upon request to community members living within 6 miles of a facility either through file sharing, providing information at a public library or other public offices, or providing it via e-mail or on the facility's website. The provision would require facilities to inform the public about how to obtain the requested information. The information elements should be readily available to facility managers because most of the information is already compiled for compliance with various health and safety regulations. The SDSs are documents that OSHA requires every facility to have available for its employees, and which contain chemical hazard information required under 29 CFR 1910.1200. The names of chemicals and five-year accident history are already collected for reporting in the RMP. Especially for simple facilities, this information is unlikely to change much from year to year; the only cost associated with this element is the time required to collect and review the information for accuracy.

EPA has estimated that 50 percent of facilities will receive one information request in any given year. The analysis estimates that simple facilities would spend 2 hours reviewing the information to ensure that it is up-to-date. Complex facilities may have more information to review because they may manufacture, process, and use multiple regulated substances in multiple processes. The analysis estimates that small complex facilities would spend 4 hours collecting and reviewing the information. Large complex facilities were estimated to spend 54 hours because management and possibly counsel would need to ensure that the information was not subject to any restrictions related to security or confidential business information concerns. Labor and facility costs are presented in Exhibit 4-11.

Exhibit 4-11: Hourly Labor and Facility Costs for Information Availability (2020 dollars).

| Facility Type | Annual Frequency | Labor Hours | | | Other Costs | Facility Costs |
|-------------------|------------------|-------------|----------|----------|-------------|----------------|
| | | Management | Attorney | Engineer | | |
| Simple Facilities | 0.5 | 1 | 0 | 1 | \$0 | \$172 |
| Small Complex | 0.5 | 2 | 0 | 2 | \$0 | \$472 |
| Large Complex | 0.5 | 8 | 10 | 36 | \$0 | \$6,279 |

CHAPTER 5: Total Estimated Costs of the Proposed Rule

This chapter presents the estimated costs of each proposed rule provision as well as estimated total, undiscounted, discounted, and annualized proposed rule costs projected over 10 years and discounted at 3 percent and 7 percent, as required by the Office of Management and Budget (OMB).⁶⁰ The 10-year annualization period was chosen because it covers two cycles of the activities which occur least frequently, every five years. Total estimated costs are developed by applying the estimated unit costs discussed in Chapter 4 to the universe of affected facilities presented in Chapter 3.

This chapter is organized as follows:

- Section 5.1 presents the broad analytical assumptions used in the analysis focusing primarily on the annual frequency of rule provision activities.
- Section 5.2 presents the estimated rule familiarization costs.
- Section 5.3 describes the estimated total costs for new prevention program rule provisions, including STAA, root cause analysis, third-party audits and the employee participation plan.
- Section 5.4 describes the estimated total costs associated with the emergency response proposed rule provisions, including emergency backup power and community notification system.
- Section 5.5 describes the estimated total costs associated with the proposed provision for information availability.
- Section 5.6 discusses uncertainties associated with the cost estimates.
- Section 5.7 shows the estimated total costs for each rule provision, as well as the estimated total cost for the proposed rule.

5.1 Analytical Assumptions

Annual Frequency

The analysis generally divided total costs into initial year costs and ongoing costs. For provisions in which the activity occurs in multiple-year increments, the annual frequency is a fraction representing the portion of facilities assumed to implement the provision in any given year. For example, if an activity is expected to be conducted once every five years, the annual frequency would be 0.2, with 20 percent of the applicable facilities assumed to implement the activity in any given year. The assumption that implementation would be distributed evenly across time may overstate the costs for some years and understate them for others. This issue primarily concerns the STAA and third-party audits. The STAA is part of the Process Hazard Analysis (PHA), which must be updated every five years or more frequently because of process or procedural changes, accidental releases, or information on risks that triggered an updated PHA or compliance audit.

Initial and Ongoing Costs

Ongoing costs differ from the initial costs only for rule familiarization (Section 5.2). The analysis used an ongoing cost when costs for years 2 through 10 were different from the initial cost components. If costs for years 2 through 10 were the same as the initial year (with some variation based on the annual frequency), then multiplying the initial cost by the annual frequency accounted for any continuing costs.

Capital Costs

The analysis included the capital cost associated with acquiring a generator to provide backup power for perimeter monitoring. The costs of equipment purchased for facilities required to implement backup power are not amortized. Although individual equipment items are relatively low cost, some facilities may choose to finance equipment purchases to spread the costs over several years, while others may treat them as an operating expense and pay them in a single year. By not amortizing equipment costs in this analysis, EPA is making the conservative assumption that facilities will pay these initial costs in a single year (year 1), which is likely given

⁶⁰ Office of Management and Budget Circular A-4, Regulatory Analysis. September 17, 2003.

that EPA assumes the generator for backup power cost will cost \$1,000 and that each facility will purchase only one generator that will last for the entire 10 year period of analysis and beyond.

5.2 Rule Familiarization

EPA analyzed the cost of rule familiarization, which while not a provision of the proposed rule, is an activity that occurs under every rulemaking. See Exhibit 5-1.

Exhibit 5-1: Rule Familiarization (2020 dollars).

| Facility Type | Unit Cost | Facilities | Total Cost (incurred in Year 1) |
|---------------------------------|-----------|---------------|---------------------------------|
| Simple | \$412 | 10,082 | \$4,156,336 |
| Program 1 and Program 2 Complex | \$543 | 131 | \$71,070 |
| Program 3 Complex | \$26,874 | 1,527 | \$41,036,980 |
| LEPCs | \$515 | 2,473 | \$1,274,378 |
| Delegated Implementing Agencies | \$412 | 13 | \$5,359 |
| Total | | 14,226 | \$46,544,124 |

5.3 Prevention Program Rule Provisions

Safer Technology Alternatives Analysis (STAA)

The RMP rule currently does not require facilities to conduct a STAA. The proposed rule's STAA provision would apply to a subset of processes – those in NAICS 324 (petroleum and coal products manufacturing) and 325 (chemical manufacturing) that either have an HF unit or are within one mile of another facility with processes in NAICS 324 or 325. The provision would require owners/operators to conduct an initial evaluation and practicability study of potential safer technologies every five years as part of the PHA. EPA believes States with existing requirements similar to the proposed STAA requirement are likely already conducting activities that would satisfy EPA's proposed requirement. EPA also believes this cost would be reduced over 10 years after the first five-year PHA cycle because after the initial PHA, EPA requires owner/operators to update and revalidate a PHA to ensure that the PHA is consistent with the current processes. This is a much less costly activity than conducting the initial PHA and STAA. In order to estimate costs conservatively, EPA estimates this cost as identical in both the first and second year cycles in the period of analysis. EPA is not proposing to require implementation of any particular alternative technologies identified in the STAA. Exhibit 5-2 presents the estimated costs for the provision.

Exhibit 5-2: Estimated Annualized Costs for STAA Provision (2020 dollars).

| Facility Type | Annual Frequency | Unit Cost | Processes | Total Annualized Cost |
|--------------------------------|------------------|-------------|--------------|-----------------------|
| Initial Phase Analysis | | | | |
| Refineries | 0.2 | \$74,115 | 796 | \$11,799,138 |
| Chemical Manufacturers | 0.2 | \$12,881 | 826 | \$2,127,881 |
| Total | | | 1,622 | \$13,927,019 |
| Practicability Analysis | | | | |
| Refineries | 0.2 | \$2,549,389 | 67 | \$35,072,025 |
| Chemical Manufacturers | 0.2 | \$29,994 | 470 | \$2,819,429 |
| Total | | | 537 | \$37,891,454 |

| | | | | |
|--------------------|--|--|--|---------------------|
| Grand Total | | | | \$51,818,473 |
|--------------------|--|--|--|---------------------|

*Totals may not sum due to rounding.

Root Cause Analysis

The RMP rule currently requires the owner or operator of a facility to investigate each incident that resulted in or could have reasonably resulted in a catastrophic release. The proposed rule would require all Program 2 and Program 3 facilities to conduct a root cause analysis for any RMP-reportable accident. Accident numbers are drawn from the data on RMP-reportable accidents, referenced in Exhibit 3-9. The total costs of this provision are provided in Exhibit 5-3.

Exhibit 5-3: Total Undiscounted Costs for Root Cause Incident Investigation (2020 dollars).

| Facility Type | Unit Cost | Avg. Annual Number of Accidents (2016-2020) per year | Total Annualized Cost |
|-----------------------|------------------|---|------------------------------|
| P2 Accident - Simple | \$2,141 | 12.8 | \$27,406 |
| P2 Accident - Complex | \$14,835 | 0.2 | \$2,967 |
| P3 Accident - Simple | \$2,141 | 40.2 | \$86,073 |
| P3 Accident - Complex | \$14,835 | 41.2 | \$611,205 |
| Total | | 94.4 | \$727,651 |

Third-party Audits

The RMP rule currently requires Program 2 and Program 3 facilities to conduct a compliance audit at least once every three years. The proposed rule would require that the next scheduled compliance audit be conducted by a contracted third-party for any Program 2 or Program 3 facility that had two or more reportable accidental releases in the past five years; and for any facility with a NAICS 324 or 325 Program 3 process with one or more reportable accidental releases in the past five years that is located within a mile of another facility with 324 or 325 processes.

Accident numbers are based on the RMP data from RMP-reportable accidents, referenced in Exhibit 3-9. Numbers of affected facilities are estimated based on the number of facilities (active as of December 31, 2020) that had two or more reportable accidents from 2016 to 2020 and the number of active facilities with a NAICS 324 or 325 process that had one reportable accident from 2016 to 2020. The RMP Database contains data on accidents with and without reportable impacts. Because this proposed provision does not require third-party audits for accidents with no reportable impacts, EPA deducted those accidents from the total in the RMP Database.

The analysis projects that the annual number and distribution of accidents among types of facilities will remain the same and that in any one year, the number of facilities conducting a third-party audit will be equal to the number of active facilities with two or more accidents, or one accident at a facility with a NAICS 324 or 325 Program 3 process within 1 mile of another facility with a 324 or 325 process within a five-year period.⁶¹ That is, although the approximately 109 third-party audits for the Program 2 and Program 3 facilities that had two or more reportable accidents (and facilities with a Program 3 NAICS 324 or 325 process that had one reportable accident) from 2016 to 2020 may occur up to three years after the five-year period of releases, depending on when the previous audit occurred, the analysis projects over time that 109 facilities would conduct such an audit each year.⁶² The breakout for total costs is shown in Exhibit 5-4:

⁶¹ EPA recognizes that subsequent to the proposed rule being finalized, accident rates may change.

⁶² The number of audits may be overstated because some facilities will have the same set of reportable accidents in multiple five-year periods.

Exhibit 5-4: Total Annual Undiscounted Costs for Third-party Audits (2020 dollars).

| Facility Type | Annual Frequency | Unit Cost | Facilities | Total Initial Cost |
|-----------------------|------------------|-----------|------------|---------------------|
| Simple w/ 0-19 FTEs | 1 | \$40,255 | 5 | \$201,276 |
| Simple w/ 20-99 FTEs | 1 | \$45,224 | 4 | \$180,896 |
| Simple w/ 100+ FTEs | 1 | \$47,606 | 11 | \$523,668 |
| Complex w/ 0-19 FTEs | 1 | \$96,882 | 3 | \$290,646 |
| Complex w/ 20-99 FTEs | 1 | \$103,753 | 13 | \$1,348,783 |
| Complex w/ 100+ FTEs | 1 | \$107,587 | 70 | \$7,531,114 |
| Small Government | 1 | \$42,252 | 2 | \$84,503 |
| Large Government | 1 | \$111,048 | 1 | \$111,048 |
| Total | | | 109 | \$10,271,934 |

Employee Participation Plan

The RMP rule currently requires only facilities with Program 3 processes to develop an employee participation plan. The proposed rule would require all facilities with a Program 2 process to newly develop an employee participation plan, in addition to facilities with Program 3 processes. These newly developed employee participation plans, as well as all facilities with Program 3 processes which already have an employee participation plan, would need to include newly explicit language for reporting RMP-reportable accidents or other related RMP non-compliance issues. Exhibit 5-5 presents the costs for the provision.

Exhibit 5-5: Estimated Costs for Employee Participation Plan Provision (2020 dollars).

| Facility Type | Annual Frequency | Unit Cost | Facilities | Total Cost |
|--|------------------|-----------|---------------|------------------|
| Program 2 requirement to develop new employee participation plan | | | | |
| Simple 0-19 FTEs | 1 | \$89 | 3,415 | \$304,476 |
| Simple 20+ FTEs | 1 | \$228 | 496 | \$112,982 |
| Complex 0-19 FTEs | 1 | \$129 | 29 | \$3,733 |
| Complex 20+ FTEs | 1 | \$330 | 35 | \$11,536 |
| Total | | | 3,975 | \$432,726 |
| Program 3 requirement to update current employee participation plan | | | | |
| Simple | 1 | \$55 | 5,578 | \$304,009 |
| Complex | 1 | \$79 | 1,527 | \$119,898 |
| Total | | | 7,105 | \$423,906 |
| Grand Total | | | 11,080 | \$856,633 |

*Totals may not sum due to rounding.

Emergency Backup Power for Perimeter Monitors

The proposed rule's backup power provision would require facilities with processes that have perimeter monitors and have identified power loss as a major hazard to implement emergency backup power for their perimeter monitors. Among these facilities, those that have not yet implemented emergency backup power will incur a cost to purchase and install a backup generator for their perimeter monitors. EPA assumes the life of the backup generator to be longer than the 10 year time frame of analysis. EPA makes the conservative assumption that facilities will pay for the backup generator in a lump sum in year 1. Exhibit 5-6 presents the costs for the

provision.

Exhibit 5-6: Total Undiscounted Costs for Backup Generator for Perimeter Monitors at Facilities with a Process that has a Perimeter Monitor and Power Loss Hazard without Backup Power (2020 Dollars).

| Facility Type | Unit Cost | Facilities | Total Cost (incurred in Year 1) |
|---------------|-----------|------------|---------------------------------|
| Total | \$1,000 | 392 | \$392,000 |

5.4 Emergency Response

Community Notification of RMP Accidents

The RMP rule currently requires only responding Program 2 and 3 facilities to have procedures in place for informing the public and the appropriate Federal, State, and local emergency response agencies about accidental releases. The proposed rule would require both responding and non-responding Program 2 and 3 facilities to ensure a community notification system is in place. Facility counts are drawn from Exhibit 3-6. This analysis assumes that facilities are coordinating annually with LEPCs to ensure a community notification system is used to communicate information about RMP-reportable accidents. Exhibit 5-7 presents the cost for this provision.

Exhibit 5-7: Costs for Coordinating Community Notification (2020 dollars).

| Facility Type | Annual Frequency | Unit Cost | Facilities | Total Cost |
|-------------------------------|------------------|-----------|---------------|--------------------|
| Facility Burden | | | | |
| Simple P2/3 | 1 | \$206 | 9,288 | \$1,914,504 |
| Complex P2/3 | 1 | \$543 | 1,792 | \$972,199 |
| Total | | | 11,080 | \$2,886,703 |
| LEPC Burden | | | | |
| Simple P2/3 | 1 | \$71 | 9,288 | \$661,231 |
| Complex P2/3 | 1 | \$142 | 1,792 | \$255,152 |
| Total | | | 11,080 | \$916,383 |
| Facility + LEPC BURDEN | | | | |
| Grand Total | | | | \$3,803,086 |

5.5 Information Availability to the Public

The RMP rule currently does not require facilities to conduct information availability activities. The proposed rule would require all facilities, including those with Program 1 processes, to make information related to RMP compliance available upon request in a manner that is easily accessible to community members living within 6 miles of the facility. The information would include the names and Safety Data Sheets of regulated substances used at the facility, the facility's accident history, emergency response program information, and LEPC contact information. The assumption is that each facility receives 1 request per year from a community member residing within 6 miles of the facility. The breakout of costs related to Information Availability is in Exhibit 5-8. EPA does not consider the costs to the public in requesting this information but expects these costs to be minimal.

Exhibit 5-8: Costs for Information Availability Information Sharing Provision (2020 dollars).

| Facility Type | Annual Frequency | Unit Cost | Facilities | Total Annualized Cost |
|----------------------|-------------------------|------------------|-------------------|------------------------------|
| Simple | 1 | \$172 | 10,082 | \$868,953 |
| Small Complex | 1 | \$472 | 1,050 | \$247,860 |
| Large Complex | 1 | \$6,279 | 608 | \$1,908,780 |
| Total | | | 11,740 | \$3,025,593 |

5.6 Cost Uncertainties Associated with Prevention Program Provisions

This section highlights some of the uncertainties associated with estimating the costs of the proposed rule provisions of the STAA, the root cause analysis and the third-party audit provisions. In particular, it considers the potential indirect, follow-on costs that facilities could incur if they were to implement recommendations resulting from those provisions.

STAA

The proposed STAA requirement is intended to reveal potential opportunities for certain complex regulated facilities to eliminate or substantially reduce the hazards associated with regulated processes by performing a detailed analysis of alternative process technologies. The STAA provision would require the owner or operator to consider process hazard controls in the following descending order of preference: inherently safer technology (IST) or design, passive measures, active measures, and procedural measures. The provision also would require the owner or operator to determine the feasibility of the IST and designs considered.

The proposed STAA provision is targeted at two sectors – petroleum and coal products manufacturing, and chemical manufacturing (NAICS codes 324 and 325, respectively) – that have had a high frequency of RMP-reportable accidents relative to other RMP-regulated industry sectors. The provisions would apply only to facilities in these two sectors with an HF unit and not currently conducting STAAs, or facilities within one mile of another facility in these two sectors.

The current RMP rule already require owners and operators of most facilities in these sectors to perform a PHA. The PHA provision requires facilities to identify, evaluate, and control process hazards using appropriate engineering and administrative controls. However, the baseline requirement does not explicitly require the owner or operator to consider IST. EPA believes that requiring owners and operators of higher risk facilities to consider safer technologies and alternatives – with an emphasis on IST – may identify alternative hazard controls that were not considered in the baseline PHA requirement.

The proposed STAA provision does not require implementation of any process or operational changes identified as feasible. While implementation would be voluntary and therefore, beyond both the baseline and proposed rule STAA requirements, EPA believes that some facilities may voluntarily implement IST as a result of conducting the STAA. This is, in part, because the proposed definition of “feasible” may result in the adoption of alternatives that previously were not considered feasible (i.e., where barriers such as costs or environmental and legal factors previously had been judged as too high to warrant implementation). Additionally, after review of the STAA and practicability analysis, the facility owner or operator may re-assess and decide to implement inherently safer alternatives.

The costs of implementing recommendations resulting from the proposed STAA provision are uncertain. A facility owner or operator may voluntarily implement a high-cost change if they believe its benefits warrant the expense. EPA did not attempt to estimate the costs of voluntary implementation of alternative technologies identified in a STAA because of a high degree of uncertainty associated with which and how many facilities might actually implement STAA projects. Judgments regarding which changes are considered safer or inherently safer, and the feasibility of implementing such changes, is subjective.

Root Cause Analysis

The RMP rule currently requires facilities to conduct incident investigations and address their findings. However, the proposed rule contemplates a more thorough “root cause” investigation to identify underlying causes of an accident. The outcome of a root cause investigation could reveal more substantial system-related reasons why an incident occurred and identify correctable failures in management systems. These underlying causes may not be identified under the baseline incident investigation provision. Similar to compliance audits, incident investigations can reveal a wide variety of causes for an incident. These can range from the immediate or proximate causes of an incident to its underlying, system-related cause or causes. For example, an investigation may reveal that the immediate cause of an incident was equipment failure (e.g., failure of a corroded pipe), or operator error (e.g., an operator performed procedural steps in an incorrect sequence). A deeper “root cause” investigation would go beyond these findings and identify the underlying reasons for why the equipment failed (e.g., underlying deficiencies in the facility’s mechanical integrity program) or why the operator made the error (e.g., underlying deficiencies in the facility’s operator training program).

The baseline incident investigation provision requires the owner or operator to determine “the factors that contributed to the incident,” but does not explicitly require the owner to perform a root cause investigation. Some regulated facilities may already interpret the baseline provision as requiring root cause investigations or may opt for a root cause investigation in an effort to uncover systemic problems, but EPA believes that many others do not. Because the proposed root cause investigation requirement is likely to result in many facilities identifying deeper, system-related causes of incidents, actions taken to resolve these issues may require greater expenditures what would occur under the baseline investigation requirement. For example, instead of replacing a single piece of failed piping, a root cause investigation could lead to facility-wide enhancements in piping inspections, and replacement of numerous additional piping sections where excessive corrosion was subsequently identified. Similarly, instead of providing additional training for a single operator, the root cause investigation could prompt an overhaul of the facility’s operator training program, including use of new training techniques and additional training for all process operators. Root cause investigations may also reveal multiple systemic accident causes. For example, in addition to identifying systemic training problems, the investigation may reveal other underlying root causes such as an equipment design problem that led the operator to make the error (e.g., confusing labeling or equipment configuration), or unclear operating procedures.

Resolving system-related deficiencies is expected, on average, to require greater expenditures than resolving investigation findings related to baseline (i.e., non-root-cause) investigations. However, similar to audits, EPA expects that resolving underlying problems will, in the long term, reduce the probability and magnitude of a future accident. Similar to the audit, the incident investigation is intended to bring facilities into compliance by revealing deficient areas of facility operations – in this case, areas that have caused an accident and may cause future accidents. However, EPA does not have information or data showing the increment in costs faced by a facility implementing changes recommended by a root cause analysis relative to a less deep incident investigation. Due to these uncertainties and this lack of information, EPA did not estimate potential costs from follow-up actions.

Third-party audits

The purpose of a compliance audit is to examine whether the facility’s accident prevention program – PHA, mechanical integrity program, operating procedures, etc. – is properly implemented and in compliance with 40 CFR part 68 requirements. Compliance audits can produce a wide range of findings. Changes recommended in the third-party audit relative to in-house compliance audits may be more costly.

Rigorous auditing by trained experts provides a detailed and thorough examination of potential problems and presents potential solutions to remedy those problems. Currently, compliance audits may be conducted by staff with less expertise or in-house staff that is not arms-length from the facility. The remedies suggested by a third-party audit are expected to be more efficient at identifying deficiencies and correcting hazards than remedies that would be recommended in the baseline. From this perspective, EPA expects that the more effective remedies suggested by third-party audits will impose different, but not necessarily additional, costs. They may

reveal underlying problems and remedies that result in a more efficient allocation of the resources targeted at bringing the facility into compliance with the RMP rule.

Examples of potential actions resulting from third-party audits include more frequent equipment inspections, use of different or additional inspection methods, equipment upgrade or replacement, installation and use of different or additional hazard controls, altering process operating conditions, materials, or chemistry, modification of operating procedures, additional training, and staffing changes, among others. The wide scope of compliance audits and variation in potential follow up actions create uncertainty in estimating expected costs, which is exacerbated by a lack of information about the incremental difference in changes that result from a third-party audit compared to a baseline audit. Due to these uncertainties and this lack of information, EPA did not estimate the potential costs from follow-up actions.

5.7 Total Estimated Costs

The analysis presents total costs as total undiscounted costs over the 10-year period of analysis, total discounted (at 3 percent and 7 percent), and annualized (at 3 percent and 7 percent). When annual costs for different years are equal across the analysis time period, which is the case for all but two proposed rule provisions (rule familiarization and backup power for perimeter monitors), the annualized costs calculated using different discount rates (e.g., 3 and 7 percent) are equal. Exhibit 5-9 presents the total estimated costs for the proposed rule. In total, the proposed rule would cost \$75.8 million per year (annualized at 3 percent) and \$76.7 million per year (annualized at 7 percent).

Exhibit 5-9: Total Estimated Costs of the Proposed Rule (millions, 2020 dollars).

| Cost Elements | Total Undiscounted | Total Discounted (3%) | Total Discounted (7%) | Annualized (3%) | Annualized (7%) |
|--|---------------------------|------------------------------|------------------------------|------------------------|------------------------|
| Rule Familiarization | \$46.5 | \$45.2 | \$43.5 | \$5.3 | \$6.2 |
| Safer Technology Alternatives Analysis | \$518.2 | \$442.0 | \$364.0 | \$51.8 | \$51.8 |
| Root Cause Analysis | \$7.3 | \$6.2 | \$5.1 | \$0.7 | \$0.7 |
| Third-party Audits | \$102.7 | \$87.6 | \$72.1 | \$10.3 | \$10.3 |
| Employee Participation Plan | \$8.6 | \$7.3 | \$6.0 | \$0.9 | \$0.9 |
| Backup Power for Perimeter Monitors | \$0.4 | \$0.4 | \$0.4 | \$0.0** | \$0.0** |
| Community Notification System | \$38.0 | \$32.4 | \$26.7 | \$3.8 | \$3.8 |
| Information Availability | \$30.3 | \$25.8 | \$21.3 | \$3.0 | \$3.0 |
| Total Cost* | \$751.8 | \$646.8 | \$538.8 | \$75.8 | \$76.7 |

* Totals may not sum due to rounding.

** Totals are zero due to rounding. Unrounded totals are \$44,600 at 3% and \$52,200 at 7% discount rates.

Exhibit 5-10 provides undiscounted yearly costs for the proposed rule provisions, for both Year 1 and Years 2-10. Rule familiarization and backup power for perimeter monitors costs are incurred only in Year 1, and therefore are \$0 in subsequent years.

Exhibit 5-10. Summary of Estimated Undiscounted Yearly Costs (millions, 2020 dollars).

| Cost Elements | Year 1 Costs Undiscounted | Years 2 – 10 Costs per Year Undiscounted |
|---|--------------------------------------|---|
| Rule Familiarization | \$46.5 | \$0 |
| Safer Technology Alternatives Analysis | \$51.8 | \$51.8 |
| Root Cause Analysis | \$0.7 | \$0.7 |
| Third-party Audits | \$10.3 | \$10.3 |
| Employee Participation Plan | \$0.9 | \$0.9 |
| Backup Power for Perimeter Monitors | \$0.4 | \$0 |
| Community Notification System | \$3.8 | \$3.8 |
| Information Availability | \$3.1 | \$3.1 |
| Total Cost* | \$117.4 | \$70.5 |

*Totals may not sum due to rounding.

CHAPTER 6: Total Benefits of the Proposed Rule

Facilities subject to the RMP regulation pose significant risks to the public and the environment. As EPA has discussed in prior RMP rulemaking RIAs, it is not possible to estimate quantitative benefits for the proposed rule as EPA has no data to project the specific contribution of each proposed rule provision to an accident's impacts. As shown by accident trends, accident frequency and severity are difficult to predict. Based on RMP accident data and other data, chemical accidents can impose substantial costs on firms, employees, emergency responders, the community, and the broader economy. Reducing the risk of such accidents and the severity of the impacts when accidents occur, and improving information availability, as the proposed provisions intend, would provide benefits to the potentially affected members of society. Therefore, the discussion in this section qualitatively explains how the proposed rule provisions could prevent and mitigate accidents.

These risks stem from potential accidental chemical releases that can cause fires, explosions, and harmful vapor clouds. Chemical accidents and their impacts not only kill and injure people, but also can do tremendous damage to property. Property damage can include damage to goods produced, plant equipment and structures, and nearby industrial, commercial, and residential buildings, equipment, and furnishings. Damage can also occur to the natural environment and negatively affect nearby ecosystems and wildlife. Resources, such as emergency personnel and equipment, are diverted to address the fire, explosion, or vapor cloud. Properties located near the accident may lose value as a result of the perceived risks and other disamenities created by proximity to the facility. Risks posed by RMP facilities are reduced by lowering the probability and magnitude of accidents, which is the objective of the proposed rule. While many of the proposed provisions reduce risks for a large segment of regulated facilities, several proposed provisions are more targeted. The third party audit and root cause analysis requirements are focused on lowering risks in industrial sectors with greater rates of accidents or at facilities that have experienced one or more recent accidents. The STAA and third party audit provisions focus on lowering risks in areas with more than one RMP facility.

By lowering risks of accidents, the benefits of the proposed rule include reductions in the numbers of fatalities and injuries both onsite and offsite and residents evacuated or otherwise inconvenienced by sheltering in place; reductions in the damage caused to property onsite and offsite of the facility including damages to product, equipment, and buildings; reductions in damages to the environment and ecosystems; and reductions in resources diverted to extinguish fires and clean-up affected areas.

The proposed rule also would generate other benefits, such as from increased public information availability. In addition to helping to minimize the impacts of accidents on the public, including reductions in the numbers of onsite and offsite injuries and fatalities, and residents evacuated, this proposed provision may also lead to more efficient property markets in areas near RMP facilities. More detailed information about nearby risks allows participants in property markets to refine the values they place on nearby properties and decisions about where to locate. The outcome should be values that more closely reflect actual risks and decisions that better reflect true preferences.

EPA presents this benefits analysis based on the proposed rule. The 2017 amendments rule contained various new provisions applicable to RMP-regulated facilities addressing prevention program elements (including STAA, root cause analysis, and third-party audits), emergency response coordination with local responders (including emergency response exercises), and information availability to the public. The RIA for that rule qualitatively and quantitatively discussed benefits related to accident prevention, mitigation, and information disclosure. In December 2019, the 2019 reconsideration rule

rescinded certain information disclosure provisions of the 2017 amendments rule, removed most new accident prevention requirements added by the 2017 amendments rule, and modified some other provisions. The benefits that would have been generated by the modified and rolled back provisions were also eliminated. Under this proposed rule, those benefits would be restored to the extent that provisions are the same. For example, the STAA provision is being restored, although it would apply to a smaller set of facilities compared to the 2017 amendments rule. The benefits generated by those provisions are expected to again be realized if the proposed rule is finalized in its current form. EPA presents and updates much of the benefits analysis developed for the 2017 amendments rule that discusses the types of benefits that would be generated, and monetizes historic accident data that allows for some comparisons of the costs of the proposed rule to expected benefits.

6.1 Benefit Categories

Exhibit 6-1 illustrates the social benefits associated with each proposed rule provision. EPA identified four primary social benefit categories:

- *Prevention of Future RMP Accidents:* Several proposed rule provisions would help prevent accidents by triggering improvements in plant design, equipment, procedures, or operator training. Preventing serious accidents avoids numerous direct costs, including worker, responder, and public fatalities and injuries, public evacuations, public sheltering in place, and property and environmental damage. It also avoids indirect costs, such as lost productivity due to lost or damaged property and business interruption both onsite and offsite, expenditure of emergency response resources and attendant transaction costs, and reduced offsite property values.
- *Mitigation of Future RMP Accidents:* Several proposed rule provisions would reduce the impacts or severity of accidents by promoting a more rapid and efficient response to these incidents. If a serious chemical accident or major catastrophe occurs, mitigating its impacts benefits society by reducing the number of fatalities and injuries, reducing the magnitude of property damage and lost productivity both onsite and offsite, and reducing the extent of public evacuations, sheltering in place and expenditure of emergency response resources.
- *Improved Public Information Availability:* EPA is proposing that notification procedures be available upon request to the public living within 6 miles of an RMP facility. EPA is also proposing that facilities be required to ensure a community notification system is in place to warn the public within the area threatened by a release. In addition, EPA would require facilities to provide entities, including the public, with initial RMP accidental release information during releases of regulated substances. EPA expects this requirement to generate benefits because it may result in more efficient allocation of public response resources by improving the ability of planners and responders to make appropriate decisions concerning equipment, training, and procedures. Improved information may also improve local contingency planning and training of emergency responders. In addition, more timely information and accessible alerts through the community notification system ensure the public can receive authenticated emergency and life-saving alerts when there is an accident.
- *Prevention and Mitigation of Future non-RMP Accidents at RMP Facilities:* Actions that prevent or reduce the severity of accidents in RMP-covered processes are also likely to prevent or mitigate non-RMP accidents at the same facilities because the same or similar actions can be taken for processes and equipment not subject to the regulation, often at minimal additional cost. For example, new operational safety policies implemented by an owner or operator to prevent or respond to an RMP-related emergency will also improve their ability to respond to any

emergency or accident at the facility.

Exhibit 6-1: Social Benefits of Proposed Rule Provisions.

| Rule Provision | Social Benefits (primary social benefit in bold) |
|--|--|
| 1. Safer Technology and Alternatives Analysis* | Prevention of future RMP facility accidents Mitigation of future RMP facility accidents Prevention and mitigation of future non-RMP accidents at RMP facilities |
| 2. Root cause analysis* | |
| 3. Third-party audits* | |
| 4. Employee Participation Plan | |
| 5. Emergency Response Provisions | Improved information Mitigation of future RMP facility accidents Mitigation of future non-RMP accidents at RMP facilities |
| 6. Information Availability | Improved information Mitigation of future RMP facility accidents Mitigation of future non-RMP accidents at RMP facilities Prevention of future non-RMP accidents at RMP facilities |

*A wide variety of potential process changes might result from this provision, depending on a variety of factors including the industry, the findings of the audit or analysis, the specific facility, and more. The provision increases the likelihood that RMP facilities adopt process changes superior to those that would have occurred in the baseline. This incremental improvement results in the social benefits that appear in the right hand column.

As Exhibit 6-1 indicates, each rule provision produces social benefits in multiple benefit categories. The primary social benefit category for each rule provision is indicated in bold type. Exhibit 6-1 indicates, for example, that performing accident root cause analysis primarily helps prevent future similar accidents and that emergency response provisions requiring a community notification system helps improve information available to the public and mitigate future accident impacts. Employee participation plans will improve and expand worker involvement in process safety and could help prevent and mitigate accidents. Information availability will ensure that residents within a 6-mile radius of regulated facilities are able to access the information that will help them understand risks and allow a resident to make an emergency plan in case of an accident. Note that the table also identifies other benefit categories listed below the boldface primary one. For example, better informed neighbors may have improved responses to warnings that lower their potential exposure and panic, thereby mitigating damages.

6.1.1 Prevention

Proposed rule provisions for STAA, root cause analysis and third-party audits involve changes to the current RMP rule's accident prevention program elements and are intended to lower the likelihood of future accidents of the same or similar type.

The STAA analysis requirement is proposed for facilities with a Program 3 process in NAICS 324 or 325 that are located within one mile of another facility with a process in NAICS code 324 or 325, or that have an HF alkylation unit. The STAA should result in identification of potential process changes that, if implemented, result in owners or operators using less hazardous substances, minimizing the amount of regulated substances present in a process, moderating process conditions, or reducing process complexity. Such changes help reduce the prevalence of higher risk processes and thereby prevent accidents by either eliminating the possibility of an accidental release entirely, by making a process more fault-tolerant, such that a minor process upset, or equipment malfunction is less likely to result in a serious accidental release, and by making releases that may occur, less severe. The STAA analysis provision does not require the owner or operator to implement any changes, so it will only provide benefits if the facility voluntarily decides to implement changes. EPA has not estimated the costs of implementation in the cost analysis.⁶³

The root cause analysis provision is expected to prevent future accidents by identifying the underlying causes and corrective actions for serious accidents. Over time, EPA expects that implementing the corrective actions and lessons learned through root cause analyses should prevent future accidents and result in a reduction of onsite and offsite impacts.

The third-party audit provision requires regularly scheduled compliance audits to be conducted by an independent third-party for facilities that have had multiple accidental releases, or those in Program 3 NAICS 324 or 325 that are located within one mile of another facility in NAICS 324 or 325, or when required by an implementing agency. This differs from the current compliance audit requirement, which did not set out clear requirements regarding auditor independence for these or other facilities. The proposed rule specifies third-party auditor qualifications including both competency and independence requirements. These safeguards regarding competency and independence should improve auditor objectivity and performance. In fact, peer-reviewed empirical literature has found that auditors are less likely to be lenient or biased when sufficient safeguards are in place to ensure auditor independence from the facility under review. Relative to the baseline, the third-party audit requirement increases the likelihood that audits will result in identification of safety problems and necessary process improvements before such deficiencies can result in accidents.

EPA expects the employee participation plan provision to prevent future accidents as well. Although employees may be involved in the development of plans and procedures (through 40 CFR 68.83 or otherwise), they may not be guaranteed “a seat at the table” when final decisions are made about process operations that they are directly involved in that pose hazards that could threaten their health and safety. Employees may have practicable recommendations for hazard evaluations, incident investigations, and compliance audits that may reduce hazards at RMP facilities. Involving directly affected employees in these discussions and decisions will help ensure that the most effective recommendations for reducing hazards and mitigating risks to employees and the public are given the proper consideration.

In addition to preventing future accidents, these provisions have additional social benefits, including mitigation of future RMP facility accidents, prevention of future non-RMP accidents at RMP facilities, and mitigation of future non-RMP accidents at RMP facilities. These provisions can identify process improvements that result in less severe releases (e.g., an audit or investigation that identifies improvements to a release detection or mitigation system).

⁶³ Although the costs associated with those changes may in some cases be high, it is unlikely that a facility would implement costly changes unless it determined that its own private benefits (for example, production efficiency improvements as well as safety enhancements) would be equal to or exceed those costs.

6.1.2 Mitigation

Proposed rule provisions for emergency response and hazard evaluation amplifications are primarily focused on mitigating consequences of accidents. One component of the emergency response provision ensures that a community notification system is in place to warn the public within the area threatened by release. The emergency response provision expands recordkeeping and implementation related to a community notification system to non-responding facilities. EPA expects that this expansion will ensure that all facilities subject to emergency response requirements have documented knowledge of the public notification process that would occur when there is an accidental release at the facility. The provision also will help clarify the facility's role in the implementation of the notification process by requiring the owner or operator to provide the information needed to initiate a public release notification. In combination with required annual emergency coordination meetings and notification exercises, this will enhance coordinated notification to the public, improve documented accountability for the notification process, and help ensure timely decisions about notification of releases, particularly those with offsite impacts. These changes will result in faster and better coordinated responses, including effective and efficient notification of the public, that would reduce human health impacts and property damage, and limit the number of onsite and offsite impacts, should any result. Finally, fires and releases under control more quickly and ensuring that workers and responders know the most effective actions to take for a particular facility under particular conditions could reduce the duration of incidents as well as the likelihood of injuries to emergency responders. Exposures may also be limited—particularly for long-duration events.

Hazard evaluation amplifications can mitigate the consequences of accidents by requiring facilities with Program 2 and Program 3 processes to explicitly address external events such as natural hazards, including those caused by climate change or other triggering events that could lead to an accidental release. Accident consequences should also be mitigated through an explicit requirement that facilities address standby or emergency power systems. Finally, mitigation should result from EPA explicitly defining stationary source siting as inclusive of the placement of processes, equipment, buildings within the facility, and hazards posed by proximate facilities, and accidental release consequences posed by proximity to the public and public receptors. Natural hazards continue to be a factor in RMP accidents and present a growing threat to process safety at RMP facilities, so a requirement to evaluate and control natural hazards will at a minimum allow for accidents to have lower consequences when natural hazards do occur. For example, the provision requires facilities with perimeter monitors to implement backup power if they do not have it already also can mitigate the consequences of accidents. Should there be a natural cause for loss of power, this requirement will ensure that perimeter monitors are able to continue to detect releases at the fenceline and allow for a quicker response should there be one. This may also mitigate consequences of some accidents that might otherwise occur when releases are not detected early enough.

6.1.3 Improved Information

Several of the proposed rule provisions target information provision including community notification under the emergency response provision and information availability – specifically, the proposed provision requiring facilities to disclose information upon request by nearby residents. The community notification provisions would improve coordination with the local community by ensuring systems are in place to provide quick information when there is an accidental release. The other components of the emergency response provisions would ensure the public and emergency responders are aware of the chemicals stored and processes used at RMP facilities, equipment, and materials. In addition, if local residents and businesses understand the potential risks from a facility accident, they will be better able to understand recommendations or orders from local officials for sheltering in place or evacuation and take appropriate actions should an actual incident occur. Residents and businesses would be better

prepared for possible incident thereby mitigating the impacts of the event. Better public information will improve efficiency of nearby property markets. Better information to emergency responders will improve the efficiency of their decisions regarding preventive measures to take and equipment and materials to purchase.

6.1.4 Evidence from the Literature

Evidence of the effectiveness of several of the rule provisions can be found in the peer reviewed literature. When independent third-party auditing is necessary and appropriate, the literature indicates that without sufficient safeguards to ensure auditor independence, auditors are more likely to provide lenient or biased audit reports that can fail to accurately identify problems and violations by the regulated entity. For example, Duflo, et al. (2013) found that plants in India reduced actual pollution emissions following a strengthening of requirements regarding third- party audits.⁶⁴ Kunreuther, McNulty, and Kang (2002) characterized as successful a variety of third- party inspection programs, several of which included insurance components. The programs included third- party inspections of US steam boilers, Los Angeles hygiene services, and a Massachusetts waste cleanup program. Based on case studies, the authors concluded, “The use of third-party inspections has had very beneficial effects on reducing the risks associated with different activities.”⁶⁵

Regarding root cause analysis, Carroll et al. (2002) concluded that the cultural legacy of a root cause analysis at a chemical plant “was embodied in managers’ increased openness to new ideas, individuals’ questioning attitude and disciplined thinking, and a root cause analysis process that provided continual opportunities to learn and improve.”⁶⁶ Root cause analysis is widely used in health care where its effectiveness was studied by Percarpio, et al. (2008). Case studies of root cause analysis were gathered from 38 articles, 11 of which measured its effectiveness. Safety improvement following root cause analysis was reported by all 11 articles. However, the authors noted that the evidence of improved safety was anecdotal and that further formal studies are still needed.⁶⁷ A later empirical analysis by Percarpio and Watts (2013) of data on root cause analysis for 139 medical centers from 2004 through 2006 concluded that facilities that completed fewer than four analyses per year had higher rates of postoperative complications but it was not clear that root cause analyses directly improved patient safety.⁶⁸ CSB investigations have indicated that root cause analyses helps eliminate or substantially reduce the risk of reoccurrence of the incident and other similar incidents. These CSB investigations of the 2004 Formosa Plastics Corporation incident,⁶⁹ the 2005 BP Texas City Refinery incidents,⁷⁰ and the

⁶⁴ Duflo, Esther, Michael Greenstone, Rohini Pande, and Nicholas Ryan. “Truth-Telling by Third-Party Auditors and The Response of Polluting Firms: Experimental Evidence from India,” 128 Q. J. OF ECON. 4 at 1499-1545 (2013).

⁶⁵ Kunreuther, Howard C., Patrick J. McNulty, and Yong Kang. “Third-Party Inspection as an Alternative to Command and Control Regulation.” Risk Analysis Vol 22, Issue 2, April 2002, pp 309-318.

⁶⁶ Carroll, J.S., J.W. Rudolph, and S. Hatakenaka. “Lessons Learned from Non-Medical Industries: Root Cause Analysis as Culture Change at a Chemical Plant.” Qual Saf Health Care. 2002 Sep, 11(3) 266-9.

⁶⁷ Percarpio, Katherine B., Vince B. Watts, and William B. Weeks. “The Effectiveness of Root Cause Analysis: What Does the Literature Tell Us?” The Joint Commission Journal on Quality and Patient Safety, 34(7). 2008, July. 391-8.

⁶⁸ Percarpio, Katherine B., and Vince Watts. “A Cross-Sectional Study on the Relationship Between Utilization of Root Cause Analysis and Patient Safety at 139 Department of Veterans Affairs Medical Centers.” The Joint Commission Journal on Quality and Patient Safety, 39(1). 2013. January. pp 32-7.

⁶⁹ CSB, “Formosa Plastics Vinyl Chloride Explosion,” last modified Mar. 6, 2007, <https://www.csb.gov/formosa-plastics-vinyl-chloride-explosion/>.

⁷⁰ CSB, “BP America Refinery Explosion,” last modified Mar. 20, 2007, <https://www.csb.gov/bp-america-refinery-explosion/>.

2010 Millard Refrigerated Services incident⁷¹ found that root causes of prior, similar incidents were not identified, a lack that contributed to subsequent incidents.

The proposed rule would require RMP facilities to make certain types of information available to the public upon request; including chemical hazard information, names of regulated substances; SDSs; accident history information; and more. As stated by Oberholzer-Gee and Mitsunari (2006), "... if individuals pay attention to information regulation, this type of regulation can possibly lead to the spatial reallocation of resources in the metropolitan economy." There are many studies of the effect of publicly available information on market transactions, including property markets. Many have focused on potential impacts of the Toxic Release Inventory (TRI). For example, Oberholzer-Gee and Mitsunari (2006) examined property values in the Philadelphia region from 1988 to 1990 - one year prior and one year after publication of the TRI. The researchers concluded that after the release of TRI data, the predicted effect of pollution on property values changed and on average property values declined.⁷² Not all studies of pollution information found significant effects. Mastromonaco (2015) states "...evidence that the public internalizes information on toxic emissions, for example in the housing and stock markets, is mixed."⁷³ The current RMP rule makes additional information beyond toxic emissions available to the public. Mastromonaco (2015) looked beyond the impact of emissions data and examined a regulatory change in 2001 that lowered the threshold for required reporting for lead to the TRI. The paper studied San Francisco property value data to explore whether the new listing of existing facilities using lead that previously did not report to the TRI affected values of houses located near those facilities. The conclusion was that identifying a plant as a TRI plant significantly reduced nearby property values, suggesting that nearby residents adjusted their risk perceptions upward following newly available public risk information.⁷⁴

6.1.5 Conclusion

The discussion in this section has qualitatively discussed how the proposed rule provisions would aid in the prevention and mitigation of accidents and improve information available to the public and LEPCs. EPA has no data or empirical estimates of the precise impact of each rule provision on the probability and magnitude of an accident, or on improved efficiency due to better information. To shed light on the landscape in the baseline, in the next section EPA describes in detail the number and costs of accidents currently associated with RMP facilities. To the extent practicable, the analysis monetizes the costs of damages to partially estimate the baseline costs that EPA expects will decline due to the proposed rule. It also qualitatively discusses other expected benefits of the proposed rule.

6.2 Avoided Accident Impacts: Breakeven Analysis

As mentioned, EPA has no data or empirical estimates of the precise impact of each rule provision on the probability and magnitude of an accident, or on improved efficiency due to better information. In section 4.2, EPA describes the number and costs of accidents currently associated with RMP facilities based on RMP accident history, and monetizes the costs of damages, summarized per year

⁷¹ CSB, "Millard Refrigerated Services Ammonia Release," last modified Jan. 15, 2015, <https://www.csb.gov/millard-refrigerated-services-ammonia-release/>.

⁷² Oberholzer-Gee, F. and M. Mitsunari. "Information Regulation: Do the Victims of Externalities Pay Attention?" *Journal of Regulatory Economics*. 2006. 30: 141.

⁷³ Mastromonaco, Ralph. "Do Environmental Right-to-Know Laws Affect Markets? Capitalization of Information in the Toxic Release inventory," *Journal of Environmental Economics and Management*, 71. 2015. May. Pp 54-70. To support this statement, the author cites [Hamilton \(1995\)](#), [Khanna et al. \(1998\)](#), [Bui \(2005\)](#), [Bui and Mayer \(2003\)](#), [Banzhaf and Walsh \(2008\)](#) and [Konar and Cohen \(1997\)](#).

⁷⁴ See footnote 43 for the full Mastromonaco (2015) citation.

and per accident in Exhibit 6-2. These accidents do not include a major catastrophe (e.g., an accident on the scale of Bhopal).

Exhibit 6-2: Monetized Average per Year and per Accident Costs for 2016-2020 (millions, 2020 dollars).

| | Average/Year | Average/Accident |
|----------------------|-----------------|------------------|
| Onsite | | |
| Fatalities | \$22.32 | \$0.23 |
| Injuries | \$5.50 | \$0.06 |
| Property Damage | \$406.20 | \$4.16 |
| Onsite Total | \$434.02 | \$4.45 |
| Offsite | | |
| Fatalities | \$0.00 | \$0.00 |
| Hospitalizations | \$0.28 | \$0.00 |
| Medical Treatment | \$0.03 | \$0.00 |
| Evacuations* | \$2.83 | \$0.03 |
| Sheltering in Place* | \$1.88 | \$0.02 |
| Property Damage | \$38.31** | \$0.39 |
| Offsite Total | \$43.32 | \$0.44 |
| Total | \$477.34 | \$4.89 |

*The unit value for evacuations and sheltering in place are less than \$300 so when presented in rounded \$ millions, the value in the table is zero.

** Large offsite property damage is influenced by high offsite consequences reported from the 2019 TPC Group Explosion and Fire in Port Neches, TX (see: <https://www.csb.gov/tpc-group-explosion-and-fire/>).

Based on these monetized accident costs, EPA performed a breakeven analysis to give a sense of the decline in damages from accidents that would be needed to equal, or offset, the estimated costs of the proposed rule. EPA conducted a breakeven analysis instead of a standard cost benefit analysis because while EPA was able to quantify and monetize the costs of the proposed rule, it cannot sufficiently quantify or monetize the benefits. The proposed rule would need to reduce, or mitigate, annual damages valued at approximately \$76 million to achieve breakeven. Alternatively, for the proposed rule to break even on an annual basis given estimated annualized costs of approximately \$76 million (see Exhibit 5-9) and an estimated number of annual accidents of about 100 (see Exhibit 3-9), fewer than approximately 15 accidents per year, each with average monetized damages of approximately \$5 million as estimated for the most recent five-year baseline period, would need to be prevented by the proposed rule. The number fewer than 15 would depend on the value of the unquantified accident damages that would be avoided, including the value of avoided lost productivity, responder costs, transaction costs, negative impacts on property values, environmental damages, and damages related to catastrophic releases.

This analysis requires EPA to note several caveats. First, the monetized value per accident is highly variable. For example, the average per accident damage estimate of \$5 million includes values in some accident categories in the five-year baseline that could be considered outliers. These include the total number of offsite individuals evacuated in a single incident, where, for example, 50,000 people were evacuated for exposure to smoke and particles from a fire at a TPC Group facility in Port Neches, TX, in

2019. Two accidents in 2019 with approximately 12,000 evacuations and an accident at Benicia, CA in 2017 accounted for 28,000 of that year's evacuations, as well.

Overall, monetized damages from accidents in the RMP Accident Database from 2016 through 2020 ranged from a low of \$100 in Seaboard Foods LLC in Guymon, OK in 2019 to a high of \$615.5 million in the TPC Group facility accident in Port Neches, TX in 2019. The median value for the accidents with monetized damages which EPA analyzed during the 2016-2020 period was \$50,000, all of which was attributable to onsite injuries (e.g., that was the only damage category where fewer than half the accidents reported a non-zero value).

Finally, when comparing the analysis EPA conducted for this proposed rule with the analyses EPA conducted for the 2017 amendments rule and the 2019 reconsideration rule, the monetized baseline damages are larger for the current proposed rule because damages for the most recent 5-year period, from 2016 to 2020, are high. The estimates of monetized accident damages for the two prior time periods give lower values; for example, the average per year is \$275 million for 2004 to 2013, and is \$214 million for 2014 to 2016. The average per accident is \$1.8 million for 2004 to 2013 and is \$1.9 million for 2014 to 2016.⁷⁵ As already mentioned, significant contributing factors to the higher values appearing in Exhibit ES-3 estimated for the most recent five-year period are the high property damage and number of evacuations from the TPC Group Chemical Plant explosion and fire in Port Neches, TX in 2019.

When considering the rule's likely benefits that are due to avoiding some portion of the monetized accident impacts, as well as the additional nonmonetized benefits described previously, EPA believes the costs of the rule are reasonable in comparison to anticipated benefits.

6.3 Avoided Catastrophes

In enacting section 112(r), Congress was focused on catastrophic accidents such as Bhopal, which are extremely rare, but very high consequence events. The large chemical facility accidents that have occurred in the United States and Europe have not approached this level of damage, although it is possible that could happen. The single largest chemical accident in the United States, the explosion at Phillips in Pasadena, TX, in 1989 killed 23 workers (\$197 million in current dollars), injured at least 150 more (\$7.5 million), and caused \$1.4 billion in property damage.⁷⁶ The five-year baseline period included in this analysis does not include a major catastrophe, nor were any reflected in the Amendments RIA time frame of 2004 to 2013. If the proposed rule provisions were to prevent or substantially mitigate even one accident of this magnitude, the benefits generated would be dramatic.

6.4 Additional Benefit Categories Associated with Accident Prevention and Mitigation

In addition to the avoided costs from the reduced likelihood of an accident or a catastrophe, the rule would generate benefits in other important benefit categories, including avoided impacts of non-RMP accidents at RMP facilities; the information benefits described above; and additional benefit categories not reported in the RMP data that result from accident prevention and mitigation. Additional benefit categories include lost productivity; avoided responder costs; avoided transaction costs; protected property values; and avoided environmental impacts. The sections below present a discussion of these additional benefit categories.

⁷⁵ See Exhibit 6-7 for more details.

⁷⁶ Marsh, The 100 Largest Losses, 1974-2013, Large Property Damage Losses in the Hydrocarbon Industry, 23rd Edition. <https://uk.marsh.com/Portals/18/Documents/100%20Largest%20Losses%2023rd%20Edition%202014.pdf>.

6.4.1 Avoided Lost Productivity

A major cost associated with some chemical accidents that is not captured in the five-year-baseline estimates presented above is the lost productivity that can result if a facility or process unit must be shut down or is destroyed. The RMP data include estimates of property damage but specifically exclude estimates of lost productivity.⁷⁷ EPA has not estimated these costs because of a lack of data. Such costs are highly variable based on the type of release, the extent of the damage, the location of the facility, and product being produced. Marsh, a risk management and energy consultancy, has collected data on 10,000 accidents in the petrochemical sector over 40 years and published 26 editions of its “100 Largest Losses” reports. These limited data suggest that lost productivity may range from zero to four to five times the cost of property damage.⁷⁸ Many chemical accidents do not result in property damage and, therefore, have a limited impact on business beyond the loss of the chemical itself. Explosions and fires, however, can produce substantial damage.

The Marsh accident summaries provide examples of the extent of damage and the impact on production as well as the variability in those impacts. One refinery facility had \$240 million in damage but continued to operate; another that experienced the same level of damage was shut down for 6 months. Production units affected by major explosions have been shut down for weeks, months or more than a year. Some accident reports indicate production continued but at a reduced rate for weeks or even months. A refinery accident that shuts down one or more units will affect the firm involved, especially if it has no other refinery in the area or its other units do not have the capacity to increase production. In some cases, such reduced production may be offset by increased production at other firms. Refining capacity in the United States is located primarily in the Gulf Coast and West Coast regions; accidents that shut down units in those areas may be less likely to have economic impacts beyond the firm owning the refinery if other nearby refineries can increase production. However, in some cases regional impacts may occur.

According to a RAND Corporation study, lost production capacity resulting from the August 12, 2012 Chevron Richmond refinery accident cost California consumers an additional \$447 million in increased gasoline costs.⁷⁹ The study also estimated that the February 18, 2015 accident at ExxonMobil in Torrance cost California consumers more than \$2.4 billion due to shutdown of a production unit. In addition to lost production, accidents at refineries in other regions could impose additional social costs because even if other refineries can increase production, higher costs of transporting products longer distances may result.

Broader losses could occur in the petrochemical sector where some facilities may be the sole source for some products. Even in that sector, however, losses may be limited to the firm involved. For example, the 1989 explosion at the Phillips plant in Pasadena, TX, which destroyed two units at the facility appears to have had a limited impact on the economy even though the plant was the only domestic source for one product.⁸⁰ Appendix A provides a list of the major U.S. accidents cited by Marsh in its most recent 2020 publication, with losses adjusted by Marsh to 2019 dollars. These accidents are limited to those that might have occurred at RMP facilities (offshore oil and distribution accidents were omitted) and where the damage was the result of flooding or wind, the accident was caused by a chemical release

⁷⁷ EPA instructions for RMP submissions specifically direct the owner or operator not to include any losses incurred as a result of business interruption. See page 74 of the RMP*Submit User’s Manual (EPA, August 2019); <http://www.epa.gov/rmp/rmpsubmit-users-manual>.

⁷⁸ Marsh, The 100 Largest Losses, 1974-2019, Large property damage losses in the Hydrocarbon Industry 26th Edition. Marsh provides estimates of property damage in current dollars and in a few cases, business loss costs.

⁷⁹ RAND, Cost-Benefit Analysis of Proposed California Oil and Gas Refinery Regulations. https://www.rand.org/content/dam/rand/pubs/research_reports/RR1400/RR1421/RAND_RR1421.pdf.

⁸⁰ <http://www.nytimes.com/1989/10/25/us/reverberations-for-industries-but-not-for-us-households.html>.

and not a natural disaster. The accident list does not include all serious accidents because Marsh excluded any accident that produced less than \$130 million in property damage (the publication covers accidents worldwide). Nonetheless, the list indicates the range of property damage and the lost productivity.

6.4.2 Avoided Emergency Response Costs

EPA was unable to locate data summarizing the costs associated with responding to a chemical release, fire, or explosion. Those costs are very likely to vary widely depending on the incident. A response may involve facility fire brigades, community fire departments, volunteer fire departments, and mutual aid organizations. There is also the cost associated with equipment depreciation and fire suppressant used. The level of effort and equipment use can be seen in two incidents reported by Marsh. In 1999, approximately 300 firefighters and 33 fire trucks participated in the 2 ½ hour effort to control a fire at a refinery in California. Foam concentrate consumption totaled 3,200 gallons.⁸¹ At a foam concentrate cost between \$20 and \$60 per gallon, the cost of the fire suppressant alone would range from \$64,000 to almost \$192,000. In sum, EPA expects that these costs are significant.

6.4.3 Avoided Transaction Costs

Chemical accidents result in transactions between parties that consume time and other resources that would otherwise be directed to other productive activities. For example, litigation can impose substantial transaction costs. Particularly when the public is affected, facilities are often sued; a 1988 refinery explosion led to more than 5,000 property claims.⁸² Substantial costs are associated with making and responding to such claims and the associated litigation, both on behalf of plaintiffs and defendants. Rule provisions that reduce the number or severity of accidents could reduce the number of lawsuits and the resources expended on litigation.

6.4.4 Avoided Property Value Impacts

After an RMP facility experiences a chemical accident, values of nearby properties will adjust to reflect changes in perceived risk, changes in the aesthetic appeal of the surrounding area, and potentially reduced ecological services. The economics literature has estimated the property value impacts of a wide variety of environmental disamenities including air emissions and contaminated, toxic, or potentially toxic sites.⁸³ A variety of papers have specifically examined the impact on property prices of hazardous industrial facilities, usually finding that prices increase with distance from the facility.⁸⁴ To improve understanding of the benefits of the proposed rule, research on the property value impact of *accidents* is highly relevant. Carroll et al (1996) studied property prices in neighborhoods surrounding the Pepcon

⁸¹ See Marsh, 3/25/1999 Richmond, CA explosion.

⁸² See Marsh, Shell Norco explosion.

⁸³ For examples of studies of the impact of air quality on property values see Currie, Janet, Lucas Davic, Michael Greenstone, and Reed Walker. 2015. Environmental Health Risks and Housing Values: Evidence from 1,600 Toxic Plant Openings and Closings. *American Economic Review*. 105(2): 678-709; or Lang, Corey. 2015. The dynamics of house price responsiveness and locational sorting: Evidence from air quality changes. *Regional Science and Urban Economics*. 52: 71-82. For reviews of the literature, see Boyle, M. A. and K. A. Kiel. 2001. A Survey of House Price Hedonic Studies of the Impact of Environmental Externalities. *Journal of Real Estate Literature* 9(2): 117-144. or Banzhaf, S. and E. McCormick, 2012. "Moving Beyond Cleanup" The Political Economy of Environmental Justice. Ed by H. Spencer Banzhaf. University Press or Stanford Scholarship Online: June 2013.

⁸⁴For a review of papers that have estimated the impacts of hazardous industrial facilities on property values, see Grislain-Letrémy, C. and A. Katosky 2014. The impact of hazardous industrial facilities on housing prices: A comparison of parametric and semiparametric hedonic price models. *Regional Science and Urban Economics* 49: 93-107 for a review of the literature. (Their Appendix A.1 summarizes findings.)

chemical facility in Nevada before and after a dramatic explosion in 1988.⁸⁵ Data for around 5,000 property transactions from 1986 to 1990 showed that the explosion was followed by a 17.6 percent decline in property values in the two closest towns of Green Valley and Henderson.

Two studies have examined the effects of pipeline explosions on nearby property values. While the explosions were not from chemical facilities, the property value impacts may be comparable.⁸⁶ Preliminary findings by Cheng, et al. (2021) of nationwide property value impacts of accidents at natural gas pipelines suggest that values within 1 km of natural gas distribution pipelines declined by 7 percent compared to properties 1 to 2 km from an explosion.⁸⁷ Hansen et al. (2006) studied the effect of a 1999 fuel pipeline explosion in Bellingham, Washington.⁸⁸ Following the pipeline explosion, prices of properties within a mile were significantly adversely affected, with the mean property price discounted by 4.6 percent for a property 50 feet from the pipeline, and declining at further distances.

These studies suggest that preventing or mitigating an accident at a chemical facility may prevent or mitigate property value losses in nearby neighborhoods. Note that any avoided property value losses represent part of society's combined valuation of reduced risks to human health, reduced ecosystem services, and negative impacts on aesthetic appeal. Property value losses apply only to nearby homeowners, and not other affected parties such as employees who do not reside in the immediate neighborhood.

6.4.5 Avoided Environmental Impacts

In addition to data on deaths, injuries, property damage, evacuations, and sheltering in place, the current RMP rule requires owners and operators to report within the five-year accident history those accidental releases that result in environmental damage. However, the environmental damage information contained in the RMP database is limited for two reasons. First, most releases of RMP-regulated substances do not result in lingering contamination issues because most regulated substances are either highly volatile toxics that will rapidly disperse in air or highly flammable substances which ignite if released in the presence of an ignition source. The other reason is that RMP accident history reports indicate general categories of environmental damage (e.g., fish or animal kills, tree, lawn, shrub, or crop damage, etc.), but do not contain estimates of damage valuation or other specific information on reported impacts.

Rule provisions that prevent or mitigate the extent of accidental releases are therefore likely to prevent or reduce the environmental impacts associated with those releases. These benefits cannot be quantified using the available data.

6.4.6. Potential benefits to communities with environmental justice concerns

While EPA is unable to estimate the incremental changes in accident risks from the provisions proposed by this proposed rule, the baseline distribution of population (see: Chapter 9) suggests that the

⁸⁵ Carroll, T.M., Clauretie, T.M., Jensen, J. and Waddoups, M. September 1996. The Economic Impact of a Transient Hazard on Property Values: The 1988 PEPCON Explosion in Henderson, Nevada. *The Journal of Real Estate Finance and Economics*, Volume 13, Issue 2, pp 143-167.

⁸⁶ An important difference between a pipeline and a chemical facility is that pipelines may not be as noticeable. Pipeline accidents may increase awareness of baseline risks as well as change perceptions of post-accident risks.

⁸⁷ Cheng, N., M. Li, P. Liu, Q. Luo, C. Tang, and W. Zhang. 2021. Pipeline and Property Values: A Nationwide Hedonic Analysis of Pipeline Accidents Over the Past Three Decades. Poster presentation at 2021 Annual AAEEA meeting. Available at: <https://ideas.repec.org/p/ags/aaea21/312676.html>.

⁸⁸ Hansen, J. L., E. D. Benson and D. A. Hagen. 2006. Environmental Hazards and Residential Property Values: Evidence from a Major Pipeline Event. *Land Economics* 82(4): 529-541.

benefits of the provisions may reduce potential exposure for historically underserved and overburdened populations. Specifically, EPA believes that several of the proposed provisions will benefit underserved populations, including the stationary source siting requirements, increased information availability for fenceline communities, backup power for perimeter monitoring, and community notification and related response planning improvements.

6.5 Conclusions

EPA is unable to estimate quantitative benefits for the proposed rule because the agency has no data to project the specific impact on potential future accidents of each proposed rule provision. As the data show, past accidents have generated highly variable impacts so the impacts of future accidents are difficult to predict. However, it is clear from the RMP accident data and other data, such as that reported by Marsh, that chemical accidents can impose substantial costs on firms, employees, emergency responders, the community, and the broader economy. The proposed rule's objective of reducing the risk of such accidents and the severity of the impacts when accidents occur, and improving information availability to the public, would provide benefits to potentially affected members of the public.

Exhibit 6-3 summarizes the benefit or accident cost categories described in this chapter. Four broad benefit categories are related to accident prevention and mitigation including RMP accidents, non-RMP accidents at RMP facilities, and potential major catastrophes. The exhibit explains each and identifies ten associated specific benefit categories. Exhibit 6-3 also highlights and explains the Information Availability benefit category and identifies two specific benefits associated with it.

EPA also conducted a breakeven analysis instead of a standard cost benefit analysis because while EPA was able to quantify and monetize the costs of the proposed rule, it cannot sufficiently quantify or monetize the benefits. The proposed rule would need to reduce, or mitigate, damages valued at approximately \$76 million over any number of future accidents to achieve breakeven. Alternatively, in order for the proposed rule to achieve breakeven on an annual basis given estimated annualized costs of approximately \$76 million and an estimated number of annual accidents of about 100, fewer than approximately 15 accidents, each with average monetized damages of approximately \$5 million as estimated for the most recent five-year baseline period, would need to be prevented annually by the proposed rule. The number fewer than 15 would depend on the value of the unquantified accident damages that would be avoided. When considering the rule's likely benefits that are due to avoiding some portion of the monetized accident impacts, as well as the additional nonmonetized benefits described previously, EPA believes the costs of the rule are reasonable in comparison to its benefits.

Exhibit 6-3: Summary of Social Benefits.

| Broad Benefit Category | Explanation | Specific Benefit Categories |
|--|---|---|
| Accident Prevention | Prevention of future RMP facility accidents | <ul style="list-style-type: none"> • Reduced Fatalities • Reduced Injuries • Reduced Property Damage • Fewer People Sheltered in Place • Fewer Evacuations • Avoided Lost Productivity • Avoided Emergency Response Costs • Avoided Transaction Costs • Avoided Property Value Impacts* • Avoided Environmental Impacts |
| Accident Mitigation | Mitigation of future RMP facility accidents | |
| Non-RMP Accident Prevention and Mitigation | Prevention and mitigation of future non-RMP accidents at RMP facilities | |
| Avoided Catastrophes | Prevention of rare but extremely high consequence events | |
| Information Availability | Provision of information to the public and emergency responders | <ul style="list-style-type: none"> • Improved efficiency of property markets • Improved resource allocation |

*These impacts partially overlap with several other categories.

CHAPTER 7: Regulatory Alternatives Considered

The RIA analyzed two regulatory alternatives to the proposed rule; one alternative with lower costs and one with higher costs. The lower cost alternative considers alternatives for three provisions: root cause analysis, third-party audits and employee participation. The higher cost regulatory alternative considered includes more costly versions of the STAA and third-party audit provisions.

7.1 Lower Cost Regulatory Alternative

Root Cause Analysis – (Proposed revisions apply to §§68.60 and 68.81)

The proposed rule revises the incident investigation provisions to require a root cause analysis following an RMP-reportable accident. The proposed incident investigation revisions would apply to all facilities with Program 2 and 3 processes that experience an RMP-reportable accident. The low cost regulatory alternative would apply to only facilities with Program 3 processes that experience an RMP-reportable accident. Accident numbers are based on the RMP data from RMP-reportable accidents, referenced in Exhibit 3-6, and are estimated based on the five-year annual average. The unit costs applied to the accidents are consistent with the unit costs presented in Exhibit 4-3. The total initial cost of the low cost root cause analysis provision is summarized in Exhibit 7-1.

**Exhibit 7-1: Total Annual Undiscounted Costs for Root Cause Analysis
Lower Cost Regulatory Alternative (2020 Dollars).**

| Facility Type | Unit Cost | Accidents | Total Initial Cost |
|------------------------|-----------|-----------|--------------------|
| P3 Accidents - simple | \$2,141 | 40 | \$86,073 |
| P3 Accidents - complex | \$14,835 | 41 | \$611,205 |
| Total | | 81 | \$697,278 |

Third- party audits – (Proposed revisions apply to §§68.58 and 68.79 and new §§68.59 and 68.80))

The proposed rule would revise the 2017 amendments rule compliance audit provision by requiring (1) facilities having two RMP-reportable accidents within five years, or (2) facilities with a Program 3 process in NAICS codes 324 or 325 within one mile of another facility with a process in NAICS codes 324 or 325 having one accident, to contract with a third party to conduct the next scheduled compliance audit. The lower cost alternative would revise the 2017 amendments rule compliance audit provisions by requiring only facilities with two RMP-reportable accidents within five years to contract with a third party to conduct the next scheduled compliance audit.

Accident numbers are based on the RMP data from RMP-reportable accidents, referenced in Exhibit 3-7, and are estimated based on the five-year annual average. The unit costs applied to the third-party audit alternative are consistent with the unit costs presented in Exhibit 4-7. The total cost of the low cost third-party audit provision is summarized in Exhibit 7-2.

**Exhibit 7-2: Total Annual Undiscounted Costs for Third-party Audits
Lower Cost Regulatory Alternative (2020 Dollars).**

| Facility Type | Annual Accident Frequency | Unit Cost | Facilities | Total Initial Cost |
|-----------------------|----------------------------------|------------------|-------------------|---------------------------|
| Simple w/ 0-19 FTEs | 1 | \$40,255 | 5 | \$201,276 |
| Simple w/ 20-99 FTEs | 1 | \$45,224 | 4 | \$180,896 |
| Simple w/ 100+ FTEs | 1 | \$47,606 | 11 | \$523,668 |
| Complex w/ 0-19 FTEs | 1 | \$96,882 | 1 | \$96,882 |
| Complex w/ 20-99 FTEs | 1 | \$103,753 | 5 | \$518,763 |
| Complex w/ 100+ FTEs | 1 | \$107,587 | 36 | \$3,873,144 |
| Small Government | 1 | \$42,252 | 2 | \$84,503 |
| Large Government | 1 | \$111,048 | 1 | \$111,048 |
| Total | | | 65 | \$5,590,180 |

Employee participation – (Proposed revisions apply to §68.83)

EPA is proposing to revise employee participation for owners and operators of regulated facilities with Program 3 processes to require that the employee participation plan include consultation of employees and their representatives on addressing, correcting, resolving, documenting, and implementing recommendations or findings of process hazard analyses, incident investigations, and compliance audits, at a minimum. In addition, the proposed rule would require that the Program 3 employee participation plan include and ensure that effective methods are in place so that employees and their representatives have the authority (1) to refuse to perform a task when doing so could reasonably result in a catastrophic release, and (2) to recommend to the operator in charge of a unit that an operation or process be partially or completely shut down, or (3) allow a qualified operator in charge of a unit to partially or completely shut down an operation or process based on the potential for a catastrophic release. Last, EPA is proposing to require that an employee participation employee participation plan for Program 2 and Program 3 processes include explicit language addressing worker participation and reporting, along with information on how to report RMP-reportable accidents or related RMP non-compliance issues.

The lower cost regulatory alternative would add provisions to the employee participation requirements only for owners and operators of regulated facilities with Program 3 processes. To estimate the cost of this option EPA applied the unit cost estimates from Exhibit 4-9 to facilities with Program 3 processes. The total cost estimate is presented in Exhibit 7-3.

**Exhibit 7-3: Total Annual Undiscounted Costs for Employee Participation
(Lower Cost Regulatory Alternative (2020 Dollars)).**

| Facility Type | Annual Frequency | Unit Cost | Facilities | Total Initial Cost |
|---------------|------------------|-----------|--------------|--------------------|
| Simple | 1 | \$55 | 5,578 | \$304,009 |
| Complex | 1 | \$79 | 1,527 | \$119,898 |
| Total | | | 7,105 | \$423,906 |

7.2 Higher Cost Regulatory Alternative

The higher cost regulatory alternative includes more stringent STAA and third-party audit provisions than the proposed rule, combined with the proposed version of all other provisions.

The more stringent STAA provision would require a STAA analysis for all complex (NAICS 324 or NAICS 325) facilities with a Program 3 process. The unit costs applied to the STAA provision are consistent with the unit costs presented in Exhibit 4-5 except that the weighting of facilities is based on a smaller portion of facilities with HF units (43 facilities with HF units out of 142 refineries with Program 3 processes), resulting in a lower per facility cost for the refinery practicability analysis. The total costs of the high cost STAA provision are summarized in Exhibit 7-4.

**Exhibit 7-4: Total Undiscounted Costs for STAA Provision
Higher Cost Regulatory Alternative (2020 Dollars).**

| Facility Type | Annual Frequency | Unit Cost | Processes | Total Initial Cost |
|--------------------------------|------------------|-------------|--------------|---------------------|
| Initial Phase Analysis | | | | |
| Refineries | 0.2 | \$74,115 | 1,663 | \$24,650,712 |
| Chemical Manufacturers | 0.2 | \$12,948 | 2,848 | \$7,375,104 |
| Subtotal | | | 4,511 | \$32,025,816 |
| Practicability Analysis | | | | |
| Refineries | 0.2 | \$1,431,002 | 142 | \$40,640,462 |
| Chemical Manufacturers | 0.2 | \$29,994 | 1,385 | \$8,308,317 |
| Subtotal | | | 1,527 | \$48,948,779 |
| Grand Total | | | | \$80,974,595 |

*Totals may not sum due to rounding

The more stringent third-party audit provision would require all scheduled compliance audits at facilities with Program 3 processes to be conducted every three years by a contracted third party. The analysis projects that one-third of affected facilities would, therefore, conduct a third-party audit every year. The unit costs applied to the third-party audit alternative are consistent with the unit costs presented in Exhibit 4-7. The total costs of the higher cost third-party compliance provision are summarized in Exhibit 7-5.

**Exhibit 7-5: Total Annual Undiscounted Costs for Third-party Audits
Higher Cost Regulatory Alternative (2020 Dollars).**

| Facility Type | Annual Frequency | Unit Cost | Facilities | Total Initial Cost |
|-----------------------|------------------|-------------|--------------|----------------------|
| Simple w/ 0-19 FTEs | 0.33 | \$40,255.3 | 1383 | \$18,557,680 |
| Simple w/ 20-99 FTEs | 0.33 | \$45,224.1 | 1313 | \$19,793,076 |
| Simple w/ 100+ FTEs | 0.33 | \$47,606.2 | 2230 | \$35,387,252 |
| Complex w/ 0-19 FTEs | 0.33 | \$96,882.0 | 271 | \$8,751,676 |
| Complex w/ 20-99 FTEs | 0.33 | \$103,752.5 | 679 | \$23,482,656 |
| Complex w/ 100+ FTEs | 0.33 | \$107,587.3 | 577 | \$20,692,631 |
| Small Government | 0.33 | \$42,251.6 | 632 | \$8,901,000 |
| Large Government | 0.33 | \$111,047.9 | 20 | \$740,319 |
| Total | | | 7,105 | \$136,306,289 |

7.3 Summary of Regulatory Alternatives

EPA compared the total cost of the regulatory alternatives to the proposed rule. Each regulatory alternative consists of the alternative provisions presented above, combined with the proposed version of all remaining provisions. The analysis presents total costs as total undiscounted costs over the 10 year period of analysis, total discounted (3 percent and 7 percent), and annualized (3 percent and 7 percent). When annual costs for different years are equal across the analysis period, the annualized costs calculated using different discount rates (e.g., 3 and 7 percent) are equal. Exhibit 7-6 summarizes the costs and highlights the provisions that are different from the proposed rule under each regulatory alternative.

As described in Chapter 5, EPA estimates the proposed rule would cost \$75.8 million (annualized 3 percent) or \$76.7 (annualized 7 percent). The low cost regulatory alternative would cost \$70.6 million (annualized 3 percent) or \$71.5 million (annualized 7 percent). The high cost regulatory alternative would cost \$231.0 million (annualized at 3 percent) or \$231.9 million (annualized at 7 percent).

Because EPA does not quantify the benefits of the regulatory alternatives, EPA assumes that the benefits would move higher or lower qualitatively with the stringency of the the alternatives considered. Therefore, EPA believes a reduction in regulatory measures would be associated with reduced benefits and that the high cost alternatives would increase benefits. In selecting between the alternatives, EPA has tried to balanced proposed prevention program requirements with costs incurred by the regulated community.

**Exhibit 7-6: Annualized Estimated Costs of Regulatory Alternatives
Compared to Proposed Rule (millions, 2020 Dollars).**

| Cost Elements | Low Cost Regulatory Alternative (Annualized) | | Proposed Rule (Annualized) | | High Cost Regulatory Alternative (Annualized) | |
|----------------------|--|-------|----------------------------|-------|---|-------|
| | 3% | 7% | 3% | 7% | 3% | 7% |
| Rule Familiarization | \$6.2 | \$6.2 | \$6.2 | \$6.2 | \$6.2 | \$6.2 |

| Cost Elements | Low Cost Regulatory Alternative (Annualized) | | Proposed Rule (Annualized) | | High Cost Regulatory Alternative (Annualized) | |
|-----------------------------|--|---------------|----------------------------|---------------|---|----------------|
| | 3% | 7% | 3% | 7% | 3% | 7% |
| STAA | \$51.8 | \$51.8 | \$81.0 | \$81.0 | \$81.0 | \$81.0 |
| Root Cause Analysis | \$0.70 | \$0.70 | \$0.73 | \$0.73 | \$0.73 | \$0.73 |
| Third-party Audits | \$5.6 | \$5.6 | \$10.3 | \$10.3 | \$136.3 | \$136.3 |
| Employee Participation Plan | \$0.42 | \$0.42 | \$0.86 | \$0.86 | \$0.86 | \$0.86 |
| Backup Power** | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 |
| Community Notification | \$3.8 | \$3.8 | \$3.8 | \$3.8 | \$3.8 | \$3.8 |
| Information Availability | \$3.0 | \$3.0 | \$3.0 | \$3.0 | \$3.0 | \$3.0 |
| Total Cost* | \$70.6 | \$71.5 | \$75.8 | \$76.7 | \$231.0 | \$231.9 |

*Totals may not sum due to rounding.

** Totals are zero due to rounding, Unrounded totals are \$44,600 at 3% and \$52,200 at 7% discount rates.

EPA also conducted breakeven analyses for the two regulatory alternatives to give a sense of the decline in damages from accidents that would be needed to equal, or offset, the estimated costs of the proposed rule under each alternative. Under the low cost alternative, annualized costs are approximately \$71 or \$72 million at discount rates of 3% and 7% respectively, and annualized costs are \$231 or \$232 million at 3% and 7% respectively for the high cost alternative. For the proposed rule under the low cost regulatory alternative to breakeven on an annual basis given estimated annualized costs of approximately \$71 million and an estimated number of annual accidents of about 100, approximately 14 accidents per year, each with average monetized damages of approximately \$5 million as estimated for the most recent five-year baseline period, would need to be prevented. For the proposed rule under the high cost regulatory alternative to breakeven on an annual basis given estimated annualized costs of approximately \$231 million and an estimated number of annual accidents of about 100, approximately 46 accidents per year, each with average monetized damages of approximately \$5 million as estimated for the most recent five-year baseline period, would need to be prevented. Keep in mind that EPA expects that that the number of accidents would increase with weakened provisions under the low cost alternative and would decrease with more stringent provisions under the high cost alternative.

The numbers of prevented accidents would depend again on the value of the unquantified accident damages that would be avoided, including the value of avoided lost productivity, responder costs, transaction costs, negative impacts on property values, environmental damages, and damages related to catastrophic releases.

CHAPTER 8: Small Entity Analysis

The Regulatory Flexibility Act (RFA), as amended (5 U.S.C. 601-612), requires agencies to determine whether a rule will have a “significant economic impact on a substantial number of small entities.” The Small Business Administration (SBA) sets the standard for defining a small entity by 5 or 6-digit NAICS code, for businesses (13 CFR part 121); governments are considered small if they serve fewer than 50,000 residents.⁸⁹ Although “significant economic impact” is not defined by either the RFA or SBA, EPA guidance provides example thresholds of one percent and three percent of revenues.⁹⁰ This analysis, however, uses the more stringent one percent threshold because almost 30 percent of the small entities affected by the rule are agricultural chemical distributors; data from the Department of Agriculture indicates that net income in this sector is less than three percent of sales.⁹¹

This chapter presents the analysis of impacts of the rule on small entities. The first section discusses the industrial sectors reported by RMP facilities. The second section describes the approach to determining how many facilities and firms subject to the rule are small based on SBA size standards. The third section discusses the economic impacts of the rule on small entities.

8.1 RMP Affected Sectors

The RMP rule affects a broad range of sectors (296 separate NAICS codes are listed in RMP filings; 240 of these are associated with small entities). The primary sectors subject to the rule and the SBA size standards for defining a small parent entity are shown in Exhibit 8-1.⁹² A dollar value size standard refers to firm revenues in millions; the full-time-equivalent employees applies to the firm’s total FTE, not the number at any one facility belonging to that entity. For governments, the size standard is based on the population served by the government entity. The NAICS codes are presented at the 2- to 6-digit level based on whether the SBA size standard varies for the 5- and 6-digit codes and whether there are a substantial number of RMP facilities in the sector.⁹³ For example, the SBA size standard for the wholesale trade sector, NAICS 42, is the same across all codes (100 FTEs).

Exhibit 8-1: SBA Industry Sector Small Entity Size Standards.

| NAICS | Sector | Size Standard |
|--------|---|------------------------|
| 111 | Crop Production | \$0.75 million |
| 112 | Animal Production and Aquaculture | \$0.75 - \$15 million |
| 115 | Support Activities for Agriculture and Forestry | \$7.5 - \$27.5 million |
| 211111 | Crude Petroleum and Natural Gas Extraction | 1,250 FTE |
| 221112 | Fossil Fuel Electric Power Generation | 750 FTE |
| 22131 | Water Supply and Irrigation Systems | \$27.5 million |
| 22132 | Sewage Treatment Facilities | \$20.5 million |

⁸⁹ Some small governments serve substantial populations associated with businesses, particularly irrigation districts that serve large farming areas but few residences, and small cities that have large tourist-related businesses.

⁹⁰ See Chapter 2 of Final Guidance for EPA Rulewriters: Regulatory Flexibility Act, <http://www.epa.gov/rfa/documents/Guidance-RegFlexAct.pdf>.

⁹¹ <http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/10/0199.xml>.

⁹² SBA definitions of small businesses apply to a firm’s parent company and all affiliates as a single entity.

⁹³ In some cases, NAICS codes are disaggregated to 5 digits and in others 6 digits. SBA does not include all 6-digit codes in its regulation.

| NAICS | Sector | Size Standard |
|-------|---|-------------------|
| 3111 | Animal Food Manufacturing | 500 - 1,000 FTE |
| 3112 | Grain and Oilseed Milling | 500 - 1,000 FTE |
| 3113 | Sugar and Confectionery Product Manufacturing | 750 - 1,250 FTE |
| 3114 | Fruit and Vegetable Preserving and Specialty Food Manufacturing | 750 - 1,250 FTE |
| 3115 | Dairy Product Manufacturing | 750 - 1,250 FTE |
| 3116 | Animal Slaughtering and Processing | 750 - 1,250 FTE |
| 3117 | Seafood Product Preparation and Packaging | 750 FTE |
| 3118 | Bakeries and Tortilla Manufacturing | 750 - 1,250 FTE |
| 3119 | Other Food Manufacturing | 750 - 1,250 FTE |
| 3121 | Beverage Manufacturing | 750 - 1,250 FTE |
| 322 | Paper Manufacturing | 500 - 1,500 FTE |
| 32411 | Petroleum Refineries | 1,500 FTE |
| 3254 | Pharmaceutical and Medicine Manufacturing | 1,000 - 1,250 FTE |
| 3255 | Paint, Coating, and Adhesive Manufacturing | 500 - 1,000 FTE |
| 3256 | Soap, Cleaning Compound, and Toilet Preparation Manufacturing | 750 - 1,250 FTE |
| 3259 | Other Chemical Product and Preparation Manufacturing | 500 - 1,500 FTE |
| 326 | Plastics and Rubber Products Manufacturing | 500 - 1,250 FTE |
| 327 | Nonmetallic Mineral Product Manufacturing | 500 - 1,250 FTE |
| 331 | Primary Metal Manufacturing | 500 - 1,250 FTE |
| 332 | Fabricated Metal Product Manufacturing | 500 - 1,500 FTE |
| 333 | Machinery Manufacturing | 500 - 1,500 FTE |
| 334 | Computer and Electronic Product Manufacturing | 500 - 1,250 FTE |
| 335 | Electrical Equipment, Appliance, and Component Manufacturing | 500 - 1,500 FTE |
| 336 | Transportation Equipment Manufacturing | 1,000 - 1,500 FTE |
| 337 | Furniture and Related Product Manufacturing | 500 - 1,000 FTE |
| 339 | Miscellaneous Manufacturing | 500 - 1,000 FTE |
| 42 | Wholesale Trade | 100 - 150 FTE |
| 44422 | Nursery, Garden Center, and Farm Supply Stores | \$11m |
| 45431 | Fuel Dealers | 100 FTE |
| 48691 | Pipeline Transportation of Refined Product | 1,500 FTE |
| 48821 | Support Activities for Rail Transportation | \$15m |

8.2 Estimating the Number of Small Entities

This analysis of small entities is based on a unique list of entities associated with the current universe of RMP regulated facilities. To create the unique list, EPA relied on (1) data from Data Axle, a business data provider, which indicated the company name or parent company name based on facility addresses, and (2) parent company names from the RMP Database. The RMP Database provides facility-level counts of employees and NAICS codes for processes within the facility; however, the small entity

classification requires data on all employees, or revenue for sectors with a revenue size standard, across all locations owned by the entity or entity's parent company. In addition, the appropriate NAICS code for the small entity analysis is not necessarily the NAICS associated with the RMP process, but the one associated with the largest source of revenue for the entity or parent company. Therefore, for each unique business EPA retrieved data from Data Axle on the revenue, NAICS code, and employee count for each entity, parent company, or corporate entity as appropriate. A summary of the number of facilities, the number of unique entities, the breakdown of private sector and government entities, and their size classifications is provided in Exhibit 8-2.

Exhibit 8-2: RMP Facility and Entity Counts.

| | Number | Percent of |
|-------------------------|--------|--------------------------------|
| Total Facilities | 11,740 | |
| Total Entities | 5,649 | |
| Private Sector Entities | 4,538 | 80% of total entities |
| Small | 2,911 | 64% of private sector entities |
| Non-small | 1,627 | 36% of private sector entities |
| Government Entities | 1,111 | 20% of total entities |
| Small | 630 | 57% of government entities |
| Non-small | 481 | 43% of government entities |

EPA identified 5,649 unique entities owning RMP regulated facilities. Of those 5,649 unique entities, EPA was able to determine that 1,111 (20 percent) are government entities and the remaining 4,538 (80 percent) are private sector entities.

8.2.1 Private Sector Entities

Of the 4,538 private sector entities, EPA was able to obtain data matches of revenue and/or employee data for 3,123. EPA then classified each private sector entity as small or non-small based on the SBA size standard for the entity's NAICS code and the relevant employee- or revenue-based size standard. EPA determined that of the total 4,548 private sector entities, 2,007 are small based on their employee or revenue data. These small private sector entities have an average of 150 employees and average annual revenue of approximately \$49.50 million. Of these small private sector entities, 1,935 had revenue data available from Data Axle.

To assess the remaining unmatched entities (1,306), EPA extrapolated the results of the size classification. At the 3-digit NAICS level, EPA estimated the percent of small and non-small entities and assumed that unmatched entities within those NAICS codes would have the same distribution of small and non-small. For example, in NAICS sector 424 (Merchant Wholesalers, Nondurable Goods) there are 979 total parent entities. Of those, 318 were classified as small, 214 as non-small, and 447 did not have employee data to classify. To classify the 447 entities as small or non-small the percent of small entities in the matched data (59.7 percent or 318 out of 532) was used to classify 267 of the 447 unmatched entities as small. Across all sectors, 906 unmatched entities were classified as small and 509 unmatched entities were classified as non-small. The totals presented in Exhibit 8-2 above, therefore represent the 2,005 classified as small using Data Axle data and the estimated 906 entities classified as small using the extrapolation analysis, resulting in 2,911 total small private sector entities (64 percent of private sector entities).

Exhibit 8-3 presents an analysis of facilities and the size of entity they are associated with to provide an understanding of the distribution of private sector owned facilities by Program Level. The results show that Program 3 has a larger proportion of facilities owned by non-small private sector entities than Program 2 and facilities. That is, almost 59 percent of Program 3 facilities (3,781 of 6,422) are owned by a non-small private sector entity compared to 48 percent of Program 2 facilities (1,526 of 3,163) and 43 percent of Program 1 facilities (282 out of 651).

Exhibit 8-3: Analysis of Private Sector Facility Ownership by Program Level.

| | Number of P1 Facilities | Number of P2 Facilities | Number of P3 Facilities |
|--|-------------------------------|-------------------------------|-------------------------------|
| Total Facilities | 660 | 3,975 | 7,105 |
| # of facilities owned by: Private Sector Entities | 651 | 3,162 | 6,422 |
| Small | 369 | 1,636 | 2,641 |
| Non-small | 282 | 1,526 | 3,781 |

8.2.2 Government Entities

The RFA defines small governments as governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than 50,000.⁹⁴ Most governmental RMP facilities are water and wastewater treatment systems and listed a city or county as the owner entity. A check of budgets that were available for some of the smallest cities indicated that the systems (1) are sub agencies of the city/county and (2) obtain some revenues from the general fund, although most of their revenues are derived from user fees. EPA checked the 2019 population estimates from the Census for the associated city or county to identify which facilities belong to small governments. For government entities that owned multiple facilities, the combined population of the facility cities or towns was used for classification. Government entities were classified as small if the population was less than 50,000. Based on the Census data, 630 of the total 1,111 government entities are small (57 percent).

Exhibit 8-4 presents an analysis of facilities and the size of entity they are associated with to provide an understanding of the distribution of government owned facilities by Program Level. Just over 48 percent of Program 3 facilities (331 facilities out of 683) are owned by non-small government sector entities compared to 45 percent of Program 2 facilities (369 facilities out of 813). There are few Program 1 government-owned facilities.

⁹⁴ 5 U.S.C. 602.

Exhibit 8-4: Analysis of Government Sector Facility Ownership by Program Level.

| | Number of of P1 Facilities | Number of P2 Facilities | Number of P3 Facilities |
|--|---|--|------------------------------------|
| Total Facilities | 660 | 3,975 | 7,105 |
| # of facilities owned by: Government Entities | 9 | 813 | 683 |
| Small | 2 | 444 | 352 |
| Non-small | 7 | 369 | 331 |

8.3 Economic Impact on Small Entities

To understand the distribution of impacts on small entities, EPA estimated the cost for each facility to comply with the proposed rule. This was done by applying cost estimates for the following cost categories to facilities in the affected universe, per facility or per process:

- Third-Party Audits
- Information Availability
- STAA
- Root Cause Analysis
- Rule Familiarization
- Community Notification Plan
- Emergency Backup Power
- Employee Participation Plan

The costs used for each cost category are consistent with the costs described in Chapter 4: Unit Costs of Proposed Rule Provisions. EPA provides a summary of relevant NAICS codes for provisions with a smaller number of impacted sectors in Exhibit 8-5. After calculating the cost for each facility to comply with the proposed rule, the costs for all facilities owned by each unique small entity were summed to estimate the total impact to each small parent entity. These costs were then compared to revenue data for each small entity to develop an estimate of the percent of revenue impacted. EPA takes a conservative approach to estimating costs for small entities by assuming that facilities will face all costs in the same year (the first year). That is, if a facility incurs costs from a provision that does not necessarily occur in the first year (such as third-party audits, which would occur when the next compliance audit is due, or STAA, which would occur in a year prior to the PHA), the analysis assumed that an annualized cost of those provisions occurs in the first year when other costs such as rule familiarization occur. In practice, facilities are not likely to face costs of each provision in the first year.

To estimate the number of impacted small businesses with reportable accidents between 2016 and 2020 (n=488 accidents, 382 among unique facilities), EPA used the percent (%) of affected facilities that are small businesses for each NAICS code (small entities divided by total RMP regulated facilities in that NAICS code for 2020), and applied this percentage to the number of facilities with accidents in that sector between 2016 and 2020. Using this method, EPA estimates that 2% (n=8) of the facilities with accidents subject to this proposed regulation may be small businesses. Of these, 50% (n=4) are in NAICS 324 and 325.

Exhibit 8-5: Impact on Small Private Sector Entities by Provision and NAICS.

| Provision | Impacted Entity NAICS Code | Impacted Entity Sector Description | Average Cost Per Impacted Entity | Number of Entities |
|--------------------------------------|-----------------------------------|---|---|---------------------------|
| Root Cause Analysis | 211 | Oil and Gas Extraction | \$6,423 | 1 |
| | 311 | Food Manufacturing | \$2,141 | 1 |
| | 325 | Chemical Manufacturing | \$25,961 | 4 |
| | 326 | Plastics and Rubber Products Manufacturing | \$14,835 | 1 |
| | 327 | Nonmetallic Mineral Product Manufacturing | \$2,141 | 1 |
| | 331 | Primary Metal Manufacturing | \$2,141 | 1 |
| | 424 | Merchant Wholesalers, Nondurable Goods | \$2,141 | 1 |
| | 523 | Securities, Commodity Contracts, and Other Financial Investments and Related Activities | \$2,141 | 1 |
| Community Notification System | Many* | | \$206 - \$2,409*** | 1850 |
| Employee Participation Plan | Many* | | \$54 - \$464*** | 1850 |
| Third-Party Audit | 211 | Oil and Gas Extraction | \$90,448 | 1 |
| | 221 | Utilities | \$45,224 | 1 |
| | 311 | Food Manufacturing | \$47,606 | 1 |
| | 324 | Petroleum and Coal Products Manufacturing | \$107,587 | 1 |
| | 325 | Chemical Manufacturing | \$93,354 | 5 |
| | 326 | Plastics and Rubber Products Manufacturing | \$107,587 | 2 |
| | 327 | Nonmetallic Mineral Product Manufacturing | \$47,606 | 1 |
| | 332 | Fabricated Metal Product Manufacturing | \$107,587 | 1 |
| | 493 | Warehousing and Storage | \$45,224 | 1 |
| | 523 | Securities, Commodity Contracts, and Other Financial Investments and Related Activities | \$107,587 | 2 |
| Information Availability | Many** | | \$172 - \$13,907*** | 1969 |
| Rule Familiarization | Many** | | \$412 - \$74,138*** | 1969 |
| STAA | 211 | Oil and Gas Extraction | \$53,168 | 1 |

| Provision | Impacted Entity NAICS Code | Impacted Entity Sector Description | Average Cost Per Impacted Entity | Number of Entities |
|--|-----------------------------------|---|---|---------------------------|
| | 213 | Support Activities for Mining | \$53,168 | 1 |
| | 236 | Construction of Buildings | \$53,168 | 1 |
| | 238 | Specialty Trade Contractors | \$53,168 | 2 |
| | 312 | Beverage and Tobacco Product Manufacturing | \$106,336 | 1 |
| | 314 | Textile Product Mills | \$53,168 | 1 |
| | 321 | Wood Product Manufacturing | \$53,168 | 1 |
| | 324 | Petroleum and Coal Products Manufacturing | \$788,374 | 4 |
| | 325 | Chemical Manufacturing | \$74,030 | 41 |
| | 326 | Plastics and Rubber Products Manufacturing | \$69,680 | 4 |
| | 332 | Fabricated Metal Product Manufacturing | \$53,168 | 3 |
| | 335 | Electrical Equipment, Appliance, and Component Manufacturing | \$53,168 | 1 |
| | 423 | Merchant Wholesalers, Durable Goods | \$2,955,349 | 1 |
| | 424 | Merchant Wholesalers, Nondurable Goods | \$58,122 | 13 |
| | 441 | Motor Vehicle and Parts Dealers | \$53,168 | 1 |
| | 446 | Health and Personal Care Stores | \$53,168 | 1 |
| | 452 | General Merchandise Stores | \$53,168 | 1 |
| | 486 | Pipeline Transportation | \$3,177,695 | 1 |
| | 522 | Credit Intermediation and Related Activities | \$53,168 | 1 |
| | 523 | Securities, Commodity Contracts, and Other Financial Investments and Related Activities | \$62,829 | 4 |
| | 524 | Insurance Carriers and Related Activities | \$53,168 | 2 |
| | 541 | Professional, Scientific, and Technical Services | \$1,020,562 | 3 |
| | 561 | Administrative and Support Services | \$53,168 | 1 |
| Backup Power for Perimeter Monitors | 111 | Crop Production | \$1,000 | 1 |
| | 211 | Oil and Gas Extraction | \$1,000 | 2 |
| | 213 | Support Activities for Mining | \$1,000 | 1 |

| Provision | Impacted Entity NAICS Code | Impacted Entity Sector Description | Average Cost Per Impacted Entity | Number of Entities |
|------------------|-----------------------------------|---|---|---------------------------|
| | 221 | Utilities | \$1,000 | 3 |
| | 238 | Specialty Trade Contractors | \$1,000 | 4 |
| | 311 | Food Manufacturing | \$1,000 | 12 |
| | 321 | Wood Product Manufacturing | \$1,000 | 1 |
| | 322 | Paper Manufacturing | \$1,000 | 2 |
| | 325 | Chemical Manufacturing | \$1,182 | 11 |
| | 326 | Plastics and Rubber Products Manufacturing | \$1,500 | 6 |
| | 327 | Nonmetallic Mineral Product Manufacturing | \$1,000 | 2 |
| | 331 | Primary Metal Manufacturing | \$1,000 | 1 |
| | 332 | Fabricated Metal Product Manufacturing | \$1,000 | 1 |
| | 333 | Machinery Manufacturing | \$1,000 | 2 |
| | 334 | Computer and Electronic Product Manufacturing | \$1,000 | 2 |
| | 339 | Miscellaneous Manufacturing | \$1,000 | 1 |
| | 424 | Merchant Wholesalers, Nondurable Goods | \$2,400 | 5 |
| | 443 | Electronics and Appliance Stores | \$1,000 | 1 |
| | 445 | Food and Beverage Stores | \$1,200 | 5 |
| | 453 | Miscellaneous Store Retailers | \$1,000 | 1 |
| | 484 | Truck Transportation | \$1,000 | 1 |
| | 486 | Pipeline Transportation | \$1,714 | 7 |
| | 488 | Support Activities for Transportation | \$1,000 | 2 |
| | 493 | Warehousing and Storage | \$1,000 | 1 |
| | 517 | Telecommunications | \$1,000 | 1 |
| | 523 | Securities, Commodity Contracts, and Other Financial Investments and Related Activities | \$1,000 | 2 |
| | 531 | Real Estate | \$1,000 | 3 |
| | 541 | Professional, Scientific, and Technical Services | \$1,000 | 4 |
| | 551 | Management of Companies and Enterprises | \$1,000 | 1 |
| | 624 | Social Assistance | \$1,000 | 1 |

* The provision impacts all small entities owning P2 and P3 facilities, encompassing 73 NAICS Sectors.

** The provision impacts all small entities, encompassing 75 NAICS Sectors.

*** Range is an average small entity provision cost across NAICS.

8.3.1 Cost Impacts on Private Sector Small Entities

The result of the analysis for private sector small entities is presented in Exhibit 8-6, below. The result is that 96.9 percent of small entities will incur estimated cost impacts that are less than 1 percent of their revenue and an estimated 0.2 percent of small entities are assumed to be impacted at the greater than 3 percent level. Combined, only 3.1 percent of small private sector entities are assumed to be impacted at the greater than 1 percent level. Another way to express this is that of the total estimated 2,911 small private sector entities, an estimated 2,822 entities will be impacted at less than 1 percent of revenue, 84 entities will be impacted at between 1 percent and 3 percent of revenue, and 5 will be impacted at greater than 3 percent of revenue.

Exhibit 8-6: Cost Impacts as a Proportion of Total Revenue for Small Private Sector Entities.

| Proportion of Revenue Impacted | Number of Small Entities | % of Small Entities | Average Small Entity Cost | Average Small Entity Revenue |
|--------------------------------|--------------------------|---------------------|---------------------------|------------------------------|
| < 1% | 2,822 | 96.9% | \$10,618 | \$51,340,929 |
| 1% - 3% | 84 | 2.9% | \$108,921 | \$6,638,322 |
| Total >3% | 5 | 0.2% | \$636,278 | \$4,955,000 |

8.3.2 Cost Impacts on Government Small Entities

A combined total of 798 facilities are owned and operated by small governments (i.e., the government serves less than 50,000 residents). EPA has not been able to obtain data on government revenue. The Census Bureau has not published recent data on revenues for cities (the most recent data are from 2002) and does not cover cities of less than 25,000 population. The Census Bureau provides revenue data for total local government revenues by county (covering all government entities including special districts within the country) and a per capita revenue estimate. The Census data indicated that the lowest per capita revenue for a covered county was around \$1,024 in 2002 dollars (DeKalb County, MO, with 3 facilities) (\$1,481 in 2020 dollars).⁹⁵ The smallest town covered by the proposed rule has approximately 440 residents and a number of others have fewer than 1,000. However, in many of these cases it is not clear whether the town owns and operates the facility or whether it is operated by a district that serves multiple communities. In a few cases, EPA was able to locate budget data from small towns and special districts. Revenues per resident ranged from \$196⁹⁶ for a special district that serves 9,200 people to \$1,955 for a city that serves 15,421⁹⁷ people.⁹⁸ The sample, however, is so small that it would not be appropriate to generalize from it. There are some exceptions on the high end as well. One city with a population of less than 8,000 has revenues of close to \$200 million (based on tourist business); another

⁹⁵ U.S. Census Bureau, Census of Governments. <https://www.census.gov/programs-surveys/gov-finances/data/historical-data.html>.

⁹⁶ Norton Virginia CNW Sewer Authority, <https://www.nortonva.gov/72/CNW-Sewer-Authority>. Accessed March 4, 2022

⁹⁷ U.S. Census Bureau 2020. QuickFacts: Eden city, North Carolina. Retrieved from <https://www.census.gov/quickfacts/fact/table/edencitynorthcarolina/BZA210219>.

⁹⁸ City of Eden Financial Statements. June 30, 2020. <https://www.edennnc.us/home/showpublisheddocument/3781/637623947334730000>.

small city operates a combined water system, power system, and cable system; although the water system produces revenues of \$2.5 million, the combined system reported revenues of \$190 million.

Exhibit 8-7 and Exhibit 8-8 summarize the impacts of the proposed rule on small governments. To understand the impacts, Exhibit 8-7 presents the number of small government entities with costs that fall into certain ranges. Exhibit 8-8 presents the same data in percentage terms. From the results, the majority of small governments, regardless of the number of residents, would experience total impacts from the proposed rule estimated at less than \$1,000.

For all small governments, 77 percent have cost impacts less than \$1,000 and there is only 1 small government with an impact greater than \$10,000. The largest impact to a small government is \$48,210 for a facility that serves an estimated population of 46,500. For the rule to have a larger than 1 percent impact, this entity would need to have revenue of less than \$4.8 million, or less than \$103 per resident. For small governments with populations less than 5,000, the cost impacts are smaller: 60 have impacts less than \$1,000 (88 percent) and there are no small governments with populations less than 5,000 with cost impacts greater than \$3,000. The smallest government in the data is for a facility located in Avinger, TX; population 440 with a cost of \$879.92 from the proposed rule. To experience an impact larger than 1 percent this entity would need to have revenue of less than \$87,992, or less than \$199.98 per resident.

Exhibit 8-7: Cost Impacts to Small Governments
(Number of Small Governments with Costs in the Given Range).

| Category | Number of Governments | <\$1,000 | \$1,000-\$2,000 | \$2,000-\$3,000 | \$3,000-\$10,000 | >\$10,000 |
|---------------------------|-----------------------|----------|-----------------|-----------------|------------------|-----------|
| Small | 630 | 488 | 109 | 18 | 14 | 1 |
| 15,000 - 50,000 Residents | 327 | 240 | 66 | 14 | 6 | 1 |
| <15,000 Residents | 300 | 245 | 43 | 4 | 8 | 0 |
| <10,000 Residents | 187 | 159 | 22 | 3 | 3 | 0 |
| <5,000 Residents | 68 | 60 | 7 | 1 | 0 | 0 |

Exhibit 8-8: Distribution of Cost Impacts to Small Governments
(Percent of Small Governments with Costs in the Given Range).

| Category | Number of Governments | <\$1,000 | \$1,000-\$2,000 | \$2,000-\$3,000 | \$3,000-\$10,000 | >\$10,000 |
|---------------------------|-----------------------|----------|-----------------|-----------------|------------------|-----------|
| Small | 630 | 77% | 17% | 3% | 2% | 0% |
| 15,000 - 50,000 Residents | 327 | 73% | 20% | 4% | 2% | 0% |
| <15,000 Residents | 300 | 82% | 14% | 1% | 3% | 0% |
| <10,000 Residents | 187 | 85% | 12% | 2% | 2% | 0% |
| <5,000 Residents | 68 | 88% | 10% | 1% | 0% | 0% |

8.4 Conclusion

The small entity analysis indicates that the proposed rule would not impose a significant economic burden on small entities by imposing a cost to a substantial number of entities exceeding the threshold amount of 1 percent of small entity revenues. For private sector entities, EPA estimates that 3.1

percent of small entities would experience costs exceeding 1 percent of revenue and only 0.2 percent of entities would have costs greater than 3 percent of revenue. For small governments, EPA does not have data to estimate the percent of entities with different percent of revenue impacts. However, based on the size of costs to small governments and their respective populations, EPA concludes that it is unlikely that a small government would experience a cost impact larger than 1 percent of revenue. Accordingly, the Administrator of the EPA hereby certifies that that this proposed rule would not have a significant economic impact on a substantial number of small entities.

CHAPTER 9: Communities with Environmental Justice Concerns

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations and Executive Order 14008: Tackling the Climate Crisis at Home and Abroad

EPA believes that this action does not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations, as specified in E.O. 12898 (59 FR 7629, February 16, 1994), and E.O. 14008 (86 FR 7619; January 27, 2021). Accidental releases of regulated chemicals from facilities regulated by this action would likely pose disproportionate risks to historically marginalized communities. EPA has concluded that the regulatory requirements will advance fair treatment of those populations by reducing the disproportionate damages that RMP-reportable accidents might otherwise inflict on those populations.

9.1 Background

Each Federal agency must make the achievement of environmental justice part of its mission “by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” Section 2-2 of E.O. 12898 provides that each Federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures such programs, policies, and activities do not have the effect of (1) excluding persons (including populations) from participation in; or (2) denying persons (including populations) the benefits of; or (3) subjecting persons (including populations) to discrimination under, such programs, policies, and activities because of their race, color, or national origin.

E.O. 14008 (86 FR 7619, January 27, 2021) calls on Federal agencies to make achieving environmental justice part of their missions “by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.” It also declares a policy “to secure environmental justice and spur economic opportunity for disadvantaged communities that have been historically marginalized and overburdened by pollution and under-investment in housing, transportation, water and wastewater infrastructure and health care.” Under E.O. 13563 (76 FR 3821, January 21, 2011), Federal agencies may consider equity, human dignity, fairness, and distributional considerations, where appropriate and permitted by law. E.O. 14008 directs Federal agencies to develop programs, policies and activities to address the disproportionate health, environmental, economic, and climate impacts on disadvantaged historically marginalized and overburdened communities.

The Agency defines “environmental justice” as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.⁹⁹ The Agency defines the term “fair treatment” to mean both that no people should bear disproportionate burdens of environmental harms and risks, and that the distribution of reduction in risk from EPA actions does not exclude particular communities. The incorporation of environmental justice into EPA rulemaking is guided by two EPA documents: (1) *Technical Guidance for Assessing Environmental Justice in*

⁹⁹EPA (2022). Learn About Environmental Justice. <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice>. Accessed February 10, 2022.

*Regulatory Analysis*¹⁰⁰ and (2) *Guidance on Considering Environmental Justice During the Development of Regulatory Action*.¹⁰¹ The *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis*¹⁰² establishes the expectation that analysts conduct the highest quality environmental justice analysis feasible in support of rulemakings, recognizing that what is possible will be context-specific.

When assessing the potential for disproportionately high and adverse health or environmental impacts of regulatory actions on historically underserved and overburdened communities, EPA strives to answer three broad questions: (1) Is there evidence of potential environmental justice concerns in the baseline (the state of the world absent the regulatory action)? Assessing the baseline will allow EPA to determine whether pre-existing disparities are associated with the pollutant(s) under consideration (e.g., are the effects of the pollutant(s) more concentrated in some population groups?). (2) Is there evidence of potential environmental justice concerns for the regulatory option(s) under consideration? Specifically, how are the pollutant(s) and its (their) effects distributed for the regulatory options under consideration? And (3) do the regulatory option(s) under consideration exacerbate or mitigate environmental justice concerns relative to the baseline?¹⁰³ It is not always possible to quantitatively assess all three questions. For instance, in some regulatory contexts it may only be possible to quantitatively characterize the baseline due to data and modeling limitations.

One method recommended by the guidance documents is to screen for potential environmental justice concerns by identifying the proximity of regulated sources to historically underserved and overburdened communities. E.O. 12898 places a responsibility on Federal agencies for “identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States[.]” This section explains how EPA has addressed environmental justice issues associated with this proposed rulemaking.

Environmental risks may result from industrial or commercial activities by private actors, or from governmental activities or programs. When those risks are disproportionately borne by historically underserved, and overburdened communities, environmental justice is achieved through Fair Treatment and Meaningful Involvement.¹⁰⁴

- *Fair treatment* means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies.

¹⁰⁰ EPA EPA (2016). *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis*. https://www.epa.gov/sites/production/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf.

¹⁰¹ U.S. EPA (2018). *Guidance on Considering Environmental Justice During the Development of Regulatory Actions*. <https://www.epa.gov/sites/default/files/2015-06/documents/considering-ej-in-rulemaking-guide-final.pdf>

¹⁰² U.S. EPA. (2016). *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis*. https://www.epa.gov/sites/production/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf.

¹⁰³ Differential impacts on population groups of concern can only be identified in relation to a comparison group. A comparison group can be defined in multiple ways, for instance in terms of individuals with similar socioeconomic characteristics located at a broader geographic level or with different socioeconomic characteristics within an affected area. The goal is to select a comparison group that allows one to identify how the effects of the regulation vary by race, ethnicity, and income separate from other systematic differences across groups or geographic areas.

¹⁰⁴ EPA (1994b). *Environmental Justice Task Force Draft Final Report*. EPA 540/R-94/004, April 1994. OSWER. U.S. EPA (2018). *Guidance on Considering Environmental Justice During the Development of Regulatory Actions*. <https://www.epa.gov/sites/default/files/2015-06/documents/considering-ej-in-rulemaking-guide-final.pdf>.

- *Meaningful involvement* refers to inclusion of potentially affected populations in decisions about activities or programs to address those risks. Meaningful involvement may include facilitating the involvement of populations potentially affected by those activities or programs. It also entails ensuring that potentially affected populations have an opportunity to participate in decisions and influence decisions about those activities or programs. “Empowering communities” is a specific goal established by the Office of Solid Waste and Emergency Response (OSWER) Environmental Justice Task Force.¹⁰⁵ To further ensure that the regulation is addressing needs of those specific communities, this regulation would empower EPA Regional Administrators to regulate facilities that potentially affect communities of environmental justice concern if they are otherwise not captured by the applicability criteria.

9.2 Methods

EPA seeks to characterize potential environmental justice concerns associated with risks from RMP-regulated facilities. EPA assessed data using EPA tools and Census information on risks to underserved and overburdened communities. The Agency’s environmental justice screening tool, EJSCREEN,¹⁰⁶ was developed to combine environmental and demographic indicators to screen communities for those at potentially greater risk of environmental exposures. EJSCREEN is a pre-decisional tool not designed to be the basis for agency-decision making or to designate communities as “communities with environmental justice concerns.”¹⁰⁷ Here, EPA conducted a proximity-based analysis using variables from EJSCREEN to combine information on RMP facilities. To assess the environmental justice implications of this proposed regulation, EPA quantified community sociodemographic variables surrounding current, actively regulated facilities (n=11,740) as of August 1, 2021. EPA applied several distance buffers, including one and three miles, to the universe of facilities. As of March 2022, EJSCREEN does not allow for the analysis of thousands of facilities, therefore EPA aggregated information surrounding the RMP facilities universe by exporting EJSCREEN variables and conducting geospatial analysis in R 4.0.3.

9.3 Results characterizing the baseline conditions

The environmental justice analysis shows that historically underserved and overburdened populations live within close proximity to RMP-regulated facilities (and thus at greater risk) than other populations. For facilities that have previously experienced an accident between 2004 and 2020, the percent of low income and non-Hispanic white populations is even higher. Low-income is defined here as less than twice the Census Bureau’s poverty threshold. Historically underserved and overburdened race and ethnicity are defined as any race or ethnicity designation except for “Non-Hispanic, White” including those identifying as Hispanic white or as multiracial white.

The average percentage of historically underserved and overburdened racial and ethnic persons in the U.S. is 37 percent, while 50 percent of inhabitants located within one mile of RMP facilities fall into that category. Similarly, while 35 percent of the United States is low-income, defined here as less than

¹⁰⁵ U.S. EPA. (1994). Environmental Justice Task Force Draft Final Report. EPA 540/R-94/004, April 1994. OSWER.

U.S. EPA. (1994). Integration of Environmental Justice into OSWER Policy, Guidance, and Regulatory Development. OSWER directive No. 9200, 3-17. OSWER. September 1994.

¹⁰⁶ <https://www.epa.gov/ejscreen>.

¹⁰⁷ The EJ Screen technical background document states, “*ESCREEN is a pre-decisional screening tool and was not designed to be the basis for agency decision-making or determinations regarding the existence or absence of environmental justice concerns. It also should not be used to identify or label an area as an ‘environmental justice Community.’*” page 9. U.S. EPA. (2019). EJSCREEN Technical Documentation. EJSCREEN Environmental Justice Screening and Mapping Tool. September 2019. <https://www.epa.gov/ejscreen/technical-documentation-ejscreen>.

twice the Census Bureau’s poverty threshold, among communities within one mile of RMP facilities, the percentage of low-income is 42 percent.

| Exhibit 9-1. Sociodemographic composition of RMP fenceline communities | Buffer distance (miles) | Total population | Historically underserved and overburdened race and ethnicity | Low income |
|---|--|-----------------------------|---|-------------------|
| | | n | n (%) | n (%) |
| Facilities with accidents 2004- 2020 | 1-mile | 7,444,700 | 4,263,400 (57%) | 3,305,300 (46%) |
| | 3-mile | 85,567,300 | 45,352,400 (53%) | 32,233,500 (39%) |
| All active facilities | 1-mile | 24,407,100 | 12,270,500 (50%) | 10,026,700 (42%) |
| | 3-mile | 127,716,500 | 60,409,400 (47%) | 46,516,200 (37%) |
| United States | National average | | 37% | 35% |

9.4 Conclusions

In the baseline, communities near RMP facilities and accidents have higher percentages of low income people and higher percentages of people belonging to historically underserved and overburdened race and ethnic groups. To the extent that populations living closer to RMP-regulated facilities are more likely to be exposed if an accidental release at an RMP facility occurs, these releases pose a greater risk to these demographic groups of interest. While EPA is unable to estimate the incremental changes in accident risks from the provisions proposed by this rule, the baseline distribution of population suggests that the benefits of the provisions may reduce potential exposure for historically underserved and overburdened populations. Specifically, EPA believes that several of the proposed provisions will benefit underserved populations, including the stationary source siting requirements, increase information availability for fenceline communities, backup power for perimeter monitoring, and community notification and related response planning improvements.

9.5 Climate Change Impacts

EPA also considered the potential impacts of climate change and of the proposed provisions on communities about which there are environmental justice concerns. Climate change is associated with extreme weather events that can trigger accidental releases. EPA is proposing to address climate change impacts in the proposed regulation by clarifying language in the process hazard analysis requiring owners and operators to consider the impacts of natural hazards and climate change-related weather events. To the extent that the proposed provisions mitigate the potential consequences of accidents at regulated facilities as the result of natural hazards, EPA expects these provisions to benefit nearby communities about which there are environmental justice concerns.

CHAPTER 10: Limitations and Conclusions

10.1 Limitations and Conclusions

The analyses of costs, benefits, and other impacts contained in this RIA faced many limitations. The primary ones are discussed below. As discussed in detail in prior chapters, the data on which some of the cost analyses and the baseline damage analyses are based include information provided to EPA by regulated facilities in their 5 year reports. These data are necessarily limited. EPA has attempted to correct obvious errors, such as removing accidents reported more than once and reclassifying some facilities to more appropriate NAICS codes (government owned wastewater treatment), identifying owners of facilities, acquiring revenue and employee data for the small entity analysis. EPA could not add accidents that had not been reported or correct accident impact data where they may have been inaccurate. The estimated baseline damages, as well as the estimates of costs for third-party audits and root cause analysis reflect these limitations plus the latter also project past accident rates into the future.

While what constitutes safer technologies will vary for each specific process, judgment should be based on what each industry identifies as recognized approaches by chemical process designers. EPA realizes these designations will be somewhat open to interpretation among facilities as well as what is considered to be practicable and entailed in a practicability analysis. Some operators may adopt a narrow interpretation of safer technologies (e.g., only equipment level changes versus process level) while others may adopt a broad interpretation. Questions related to interpretation apply to most performance-based rules where few, if any, bright line define what constitutes compliance. To estimate the costs of the practicability study of safer technologies, EPA relied on estimates of costs of example technologies. Actual technologies studied will vary from those assumed by EPA for purposes of cost estimation. In addition, the assumption that a practicability study costs approximately 1.2% of reference project costs is highly simplistic. The result for EPA's analysis of the STAA requirement is that costs for some facilities may be overestimated, while costs for others may be underestimated.

The cost estimates for rule familiarization, STAA, and emergency response coordination are based in part on public comment made in response to EPA requests for information during the proposed rule stage of the 2017 amendments rule. For this proposed rule which restored aspects of those provisions, cost estimates were based on some of those same public comments EPA received on the 2017 amendments rule. However, there may have been subsequent changes to these costs. A more accurate cost analysis would rest on data compiled by independent researchers or on an EPA survey of regulated facilities. However, time and resource constraints prevented EPA from compiling such data.

The analysis used a model facility approach so that each estimate represents the average for a group of facilities, not a point estimate for any one facility. This analysis has attempted to develop reasonable central estimates, recognizing that the range of costs incurred by individual facilities could be wide. For example, the estimated third-party auditor cost for a complex facility is the same for all complex facilities, but it is unlikely that an auditor would charge the largest facility, which has more than 30 covered processes, the same fee as a facility with only one or two covered processes.

EPA's benefits analysis is qualitative. EPA did not have data to connect the proposed rule provisions with specific reductions in expected probabilities or magnitudes of RMP chemical accidents. In addition, many of the accident impacts EPA expects to be reduced by the rule, such as lost productivity or emergency response costs, could not be quantified even for the five-year baseline accident record. Finally, some accidents may not be reported because the facility goes out of business resulting in an underestimate of historical damages. Lack of data also meant that other benefits of the rule such as improved information could not be quantified.

Of note is the timing of costs incurred to comply with the rule versus the timing of benefits. The rule is expected to lower *future* accident risks and costs; in other words, the costs incurred today lead to benefits experienced in a later time period. Conceptually, these future benefits should be discounted relative to current costs.

CHAPTER 11: Analyses Required Under Applicable Statutes and Executive Orders

11.1 Executive Order 12866: Regulatory Planning and Review

This action is an economically significant regulatory action that was submitted to the Office of Management and Budget (OMB) for review. Any changes made in response to OMB recommendations have been documented in the docket.

11.2 Unfunded Mandates Reform Act

This action does not include any Federal mandate that may result in the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector, of \$100 million or more (adjusted for inflation) in any one year and does not significantly or uniquely affect small governments, as described in the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1531–1538).

11.3 Federalism

E.O. 13132 (64 FR 43255, August 10, 1999) requires Agencies to develop an accountable process to ensure “meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.” Policies that have federalism implications are defined in the E.O. to include regulations that have “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.”

Under section 6 of E.O. 13132, Agencies may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments or unless the agency consults with State and local officials early in the process of developing the regulation. The Agency also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the regulation.

The proposed rule would affect State and local government entities including entities that own RMP-regulated facilities, LEPCs, and 13 States with delegated implementing agencies. The proposed rule imposes both direct and indirect costs. Direct costs are associated with activities required by regulated facilities owned by government entities. Indirect costs are associated with (1) regulated facilities owned by government entities, LEPCs, and State implementing agencies reviewing the proposed rule and (2) LEPCs coordinating with facilities.

Most of the government-owned facilities are water or wastewater treatment facilities, but some large swimming pools are covered as well. Most of the government entities are cities, but the universe includes larger special districts (e.g., the Metropolitan Water District of Southern California). In addition, 13 States with delegated implementing agencies would face small costs from the proposed rule.

The EPA has concluded that this action would not have Federalism implications. The maximum annual cost to State and local government entities, including LEPCs and the 13 delegated implementation agencies, is estimated to be \$3.8 million in 2020 dollars. Therefore, the proposed rule would not have substantial and direct effect on State and local governments when compared to the \$25 million threshold which triggers Federalism implications. In addition, the proposed rule does not change the relationship

between State and local governments and the Federal government or delegate new responsibilities from the Federal government to State and local governments.

11.4 Employment Impacts

Employment impacts of environmental regulations are generally composed of a mix of potential declines and gains in different areas of the economy over time. Regulatory employment impacts can vary across occupations, regions, and industries; by labor and product demand and supply elasticities; and in response to other labor market conditions. There are significant challenges when trying to isolate the employment effects due to an environmental regulation from employment effects due to a wide variety of other economic changes, including the impact of the coronavirus pandemic on labor markets and the state of the macroeconomy generally. Considering these challenges, the economics literature provides a constructive framework and empirical evidence. To simplify, the analysis focuses on impacts on labor demand. Environmental regulation may also affect labor supply through changes in worker health and productivity.¹⁰⁸

Economic research evaluating the employment impacts of environmental regulation has shown that the net employment effect is ambiguous. Employment impacts may occur in the directly regulated sector, the environmental protection sector, and in upstream and other related sectors. Multiple impacts are experienced by firms in regulated industries. New costs that are incurred to protect the environment may include labor, energy, capital, materials, and other costs; although for the current rulemaking, costs are largely for labor hours. As environmental protection costs increase, firms may pass along to consumers increased costs from environmental protection, demand for output may decrease, which could cause a decrease in labor demand. There may also be operational impacts experienced by regulated firms as they modify operations to comply with new regulatory requirements; the direction of that impact on labor demand is a function of the interaction between the regulatory requirements and the firm's labor intensity of production. In general, the net effect of an environmental regulation on employment in regulated sectors, the sectors providing environmental protection, and the overall economy is indeterminate. Berman and Bui (2001)¹⁰⁹ provide a theoretical model of employment effects of environmental regulation.

This RIA does not include a complete analysis of labor market effects of the proposed rule. However, in a year where a large complex facility would have to conduct a third-party audit, a root cause analysis and an initial analysis of safer technologies, the total labor hours would average significantly less than a single full time equivalent worker (FTE). This suggests that the proposed rule is unlikely to have significant impacts on employment. The STAA practicability study may involve the use of labor, though EPA does not estimate labor hours. Finally, third-party audit and root cause analysis provisions may generate work for consultants, but the number of hours involved per facility is estimated to be significantly less than a single FTE.

11.5 Paperwork Reduction Act of 1995

The Paperwork Reduction Act of 1995 (PRA) (superseding the PRA of 1980), 44 U.S.C. 3501 et seq, is implemented by OMB and requires that agencies submit a supporting statement to OMB for any information collection that solicits the same data from more than nine parties. The PRA seeks to ensure that Federal agencies balance their need to collect information with the paperwork burden imposed on the public by the collection.

¹⁰⁸ Zivin Joshua Graff and Neidell Matthew. "Air Pollution's Hidden Impacts." *Science* 359, no. 6371 (January 5, 2018): 39–40. <https://doi.org/10.1126/science.aap7711>.

¹⁰⁹ Berman, Eli, and Linda Bui. "Environmental Regulation And Productivity: Evidence From Oil Refineries." *The Review of Economics and Statistics* 83, no. 3 (2001): 498–510.

The definition of “information collection” includes activities required by regulations, such as permit development, monitoring, record keeping, and reporting. The term “burden” refers to the “time, effort, or financial resources” the public expends to provide information to or for a Federal agency, or to otherwise fulfill statutory or regulatory requirements. PRA paperwork burden is measured in terms of annual time and financial resources the public devotes to meet one-time and recurring information requests (44 U.S.C. 3502(2); 5 C.F.R. 1320.3(b)). Information collection activities may include:

- Reviewing instructions;
- Using technology to collect, process, and disclose information;
- Adjusting existing practices to comply with requirements;
- Searching data sources;
- Completing and reviewing the response; and
- Transmitting or disclosing information.

Agencies must provide information to OMB on the parties affected, the annual reporting burden, the annualized cost of responding to the information collection, and whether the request significantly impacts a substantial number of small entities. An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a currently valid OMB control number. The information collection requirements in this proposed action have been submitted for approval to OMB under the PRA. The proposed Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2725.01. A copy of the ICR is provided in the docket for this rule.

EPA has carefully considered the burden imposed upon the regulated community by the proposed regulations. EPA believes that the activities required are necessary and, to the extent possible, has attempted to minimize the burden imposed.

Respondents/affected entities: The industries that are likely to be affected by the requirements in the proposed regulations fall into numerous NAICS categories. The types of facilities affected by the proposed rule range from petroleum refineries and large chemical manufacturers to water and wastewater treatment systems; chemical and petroleum wholesalers and terminals; food manufacturers, packing plants, and other cold storage facilities with ammonia refrigeration systems; agricultural chemical distributors; midstream gas plants; and a limited number of other sources that use RMP-regulated substances.

Respondent’s obligations to respond: Mandatory ((CAA sections 112(r)(7)(B)(i) and (ii), CAA section 112(r)(7)(B)(iii), 114(c), CAA 114(a)(1))).

Estimated number of respondents: 14,226.

Frequency of response: On occasion.

Total estimated burden: 797,642 hours (per year). Burden is defined at 5 CFR 1320.3(b).

Total estimated costs: \$79,248,522 (per year); includes \$2,817,907 annual operations and maintenance costs and \$78,400 annual capital costs.

11.6 National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act (NTTAA) of 1995, Pub L. No. 104-113, Sec. 12(d) directs EPA to use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standard bodies. The NTTAA directs the EPA to provide Congress, through the OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

The regulatory options do not involve technical standards, for example in the measurement of pollutant loads. Nothing in the regulatory options would prevent the use of voluntary consensus standards for such measurement where available, and the EPA encourages permitting authorities and regulated entities to do so. Therefore, the EPA is not considering the use of any voluntary consensus standards.

11.7 Consultation and Coordination with Indian Tribal Governments

E.O. 13175 (65 FR 67249, November 6, 2000) requires EPA to develop an accountable process to ensure “meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.” “Policies that have tribal implications” is defined in the E.O. to include regulations that have “substantial direct effects on one or more Indian Tribes, 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 action has Tribal implications. However, it will neither impose substantial direct compliance costs on federally recognized Tribal governments, nor preempt Tribal law. There are approximately 260 RMP facilities located on Tribal lands. Tribes could be impacted by the final rule either as an owner or operator of an RMP-regulated facility or as a Tribal government when the tribal government conducts emergency response or emergency preparedness activities under EPCRA. One Tribal government owns three facilities that combined would incur less than \$2,100 in costs and another Tribal government owns one facility that would incur less than \$900 in costs.

11.8 Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

E.O. 13211 requires Agencies to prepare a Statement of Energy Effects when undertaking certain agency actions. Such Statements of Energy Effects shall describe the effects of certain regulatory actions on energy supply, distribution, or use, notably: (i) any adverse effects on energy supply, distribution, or use (including a shortfall in supply, price increases, and increased use of foreign supplies) should the proposal be implemented, and (ii) reasonable alternatives to the action with adverse energy effects and the expected effects of such alternatives on energy supply, distribution, and use. The OMB implementation memorandum for E.O. 13211 outlines specific criteria for assessing whether a regulation constitutes a “significant energy action” and would have a “significant adverse effect on the supply, distribution or use of energy.”¹¹⁰ Those criteria include:

- Reductions in crude oil supply in excess of 10,000 barrels per day.
- Reductions in fuel production in excess of 4,000 barrels per day.
- Reductions in coal production in excess of 5 million tons per year.
- Reductions in natural gas production in excess of 25 million mcf per year.

¹¹⁰ Executive Order 13211 was issued May 18, 2002. The OMB later released an Implementation Guidance memorandum on July 13, 2002.

- Reductions in electricity production in excess of 1 billion kilowatt-hours per year, or in excess of 500 megawatts of installed capacity.
- Increases in the cost of energy production in excess of 1 percent.
- Increases in the cost of energy distribution in excess of 1 percent.
- Significant increases in dependence on foreign supplies of energy.
- Having other similar adverse outcomes, particularly, unintended ones.

The proposed rule would not impose adverse effects on the supply, distribution, or use of energy. Some refineries may face costs from the proposed rule, for example from STAA; however, the combined costs would result in a *de minimis* increase in cost of energy production. As such, the proposed rule does not constitute a significant regulatory action under E.O. 13211 and the EPA did not prepare a Statement of Energy Effects.

APPENDIX A: Cost Estimates of Hydrofluoric Acid Alkylation Conversion

| Cost estimate (millions) | Technology or Location | Year of Estimate | Barrels per day (BPD) | Description |
|--------------------------|---------------------------------------|------------------|-----------------------|---|
| \$50 | Exelus, a chemical technology company | 2011 | Not Avail-able | Conversion to Solid acid catalyst ¹¹¹ to replace traditional liquid acids (no bpd provided). ¹¹² |
| \$87 | Chevron Salt Lake City | 2016 | 4,500 | Converting existing HF unit to ionic liquids (Honeywell process) 4,500 bpd. “Chevron will convert the existing 4,500-b/d HF alkylation unit at Salt Lake City to ISOALKY, a proprietary alkylation technology developed by Chevron USA Inc. and now licensed by Honeywell International Inc.’s UOP LLC, that uses ionic liquids instead of HF or sulfuric acids as a liquid alkylation catalyst for production of high-octane fuels, UOP said.” In <i>Oil & Gas Journal</i> , 10/4/2016 and cost estimates for two contracts appear in <i>Oil & Gas Journal</i> 2/1/17: \$67 million + \$20 million. ¹¹³ |
| \$900 | Torrance Refinery in Torrance CA | 2017 | 30,000 | Conversion to new sulfuric acid unit using Sulfuric Acid Alkylation Technology to produce 30,000 BPD of alkylate product: \$600m for alkylation unit; \$300m for acid regeneration plant. ¹¹⁴ |
| \$300 | American Fuel and | 2015 | Not Avail-able | AFPM members estimate costs to |

¹¹¹ EPA located two additional estimates of Solid Acid alkylation projects estimated as costing \$25m and \$23m but given that this technology is relatively new, EPA limited the representation of it to a single conservative data point – the \$50m estimate included in the table. For a description of the two additional estimates see Zhang, S., L. Wilkinson, L. Ogunde, R. Todd, C. Steves, and S Haydel. 2016. Norton Engineering: Alkylation Technology Study: Final Report. South Coast Air Quality Management District (SCAQMD). September 9. <https://www.aqmd.gov/docs/default-source/permitting/alkylation-technology-study-final-report.pdf>

¹¹² Hamby, Chris. 2011. “New oil refinery in South Dakota says it will use alternative to toxic acid.” The Center for Public Integrity. March 28. Citing James Nehlsen, a process development manager at Exelus, Inc. Available at: <https://publicintegrity.org/inequality-poverty-opportunity/workers-rights/worker-health-and-safety/fueling-fears/new-oil-refinery-in-south-dakota-says-it-will-use-alternative-to-toxic-acid/>.

¹¹³ *Oil and Gas Journal*, “Chevron’s Salt Lake City refinery plans alkylation unit revamp.” Oct 4, 2016. Available at: <https://www.ogj.com/refining-processing/article/17250762/chevrans-salt-lake-city-refinery-plans-alkylation-unit-revamp>; *Oil and Gas Journal*, “Chevron’s Utah refinery lets contract for alkylation technology retrofit.” Feb 8, 2017. Available at: <https://www.ogj.com/refining-processing/article/17290342/chevrans-utah-refinery-lets-contract-for-alkylation-technology-retrofit>.

¹¹⁴ Letter from Torrance Refining Company, Torrance, CA to Bruce Moe, City Manager, Manhattan Beach CA, dated March 16, 2018. Burns/McDonnell, PBF Energy, Report Brief: Alkylation Study & Estimate, Torrance Refinery, Project No. 98037. July 2017, see Tab 1. Available at: <https://torrancerefinery.com/wp-content/uploads/2018/03/TORC-Comment-Letter-with-Attachments-Agenda-Item-No.-K.11.pdf>; South Coast AQMD, Governing Board Meeting, “Status Update on PR 1410 – Hydrogen Fluoride Storage and Use at Petroleum Refineries.” Diamond Bar, CA February 1, 2019. Available at: <http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2019/2019-feb1-025.pdf?sfvrsn=6>; Buhl, Larry. “Activists and Oil Refiners Square Off Over Hydrofluoric Acid,” *Undark*. October 10, 2018. Available at: <https://undark.org/2018/10/10/hydrofluoric-acid-oil-refining-explosion/>.

| Cost estimate (millions) | Technology or Location | Year of Estimate | Barrels per day (BPD) | Description |
|----------------------------------|--|----------------------------|-----------------------|---|
| (from a range of \$100 to \$500) | Petrochemicals Manufacturers (AFPM) an association representing larger petroleum facilities. | | | modify or replace an HF alkylation unit would more realistically range from \$100 million to \$500 million in capital, depending on facility-specific considerations. ¹¹⁵ |
| \$100 | Delek Louisiana | 2018 | 6,000 | New conventional sulfuric acid alkylation unit 6,000 bpd . “HOUSTON (ICIS)--US refiner Delek US Holdings will install a 6,000 bbl/day alkylation unit at its Krotz Springs, Louisiana, refinery, according to information made available on Tuesday. . . Total cost is estimated at \$103m, according to the filing.” ¹¹⁶ |
| \$300 | Valero Houston | 2016 | 13,000 | New conventional sulfuric acid alkylation unit 13,000 BPD. “The \$300 million Houston alkylation project announced in January entered the detailed engineering, procurement, and construction phase of the development process during the quarter. This 13,000 BPD unit, which upgrades low-cost natural gas liquids into premium-value alkylate, is expected to be completed in the first half of 2019.” ¹¹⁷ |
| \$400 | Valero, St. Charles, Louisiana | 2017 | 25,000 | New advanced sulfuric acid (requires less acid, and size equals the Torrance refinery in LA) 25,000 BPD. “Included in the growth investments is the construction of a new 25,000 barrels per day alkylation unit at the St. Charles refinery, which received final approval from the company’s Board of Directors last week. Total cost for the alkylation unit is estimated at \$400 million, and completion is expected in the second half of 2020.” ¹¹⁸ |
| \$155 | DuPont Stratco | 2016 with 2010 labor rates | 25,000 | Stratco Sulfuric Acid Alkylation unit to produce 25,000 BPD alkylate plus • an Order of Magnitude cost estimate for a 250 STPD Sulfuric Acid Regeneration |

¹¹⁵ See public comment on 2015 proposed RMP amendments rule EPA-HQ-OEM-2015-0725-0579, pp 142. Comment submitted by AFPM.

¹¹⁶ Communities for a Better Environment citing (<https://www.cbecal.org/wp-content/uploads/2019/02/CBE-fact-sheet-MHF-replacement-COST-greatly-exaggerated-01312019.pdf>): US Delek Holdings to add alkylation unit at Louisiana refinery, Independent Commodity Intelligence Services (ICIS) News, 2018/01/16, from refinery SEC filing: <https://www.icis.com/explore/resources/news/2018/01/16/10183692/us-delek-holdings-to-add-alkylation-unit-at-louisiana-refinery/>.

¹¹⁷ Communities for a Better Environment citing (<https://www.cbecal.org/wp-content/uploads/2019/02/CBE-fact-sheet-MHF-replacement-COST-greatly-exaggerated-01312019.pdf>): Valero Energy Reports First Quarter 2016 Results, 13,000 bpd unit, GlobeNewsWire, 05/03/2016. Available at: <https://www.globenewswire.com/news-release/2016/05/03/835929/0/en/Valero-Energy-Reports-First-Quarter-2016-Results.html>.

¹¹⁸ Communities for a Better Environment citing (<https://www.cbecal.org/wp-content/uploads/2019/02/CBE-fact-sheet-MHF-replacement-COST-greatly-exaggerated-01312019.pdf>): Valero Energy Reports First Quarter 2016 Results, 13,000 bpd unit, GlobeNewsWire, 05/03/2016. Available at: <https://www.globenewswire.com/new-s-release/2016/05/03/835929/0/en/Valero-Energy-Reports-First-Quarter-2016-Results.html>.

| Cost estimate (millions) | Technology or Location | Year of Estimate | Barrels per day (BPD) | Description |
|---------------------------------|-------------------------------|----------------------------|------------------------------|--|
| | | | | Plant (required capacity for a 25,000 BPD Alky Unit) is \$45 million USD. ¹¹⁹ |
| \$145 | ExxonMobil | 2016 with 2010 labor rates | 25,000 | ExxonMobil sulfuric acid for 25,000bpd plus an Order of Magnitude cost estimate for a 250 STPD Sulfuric Acid Regeneration Plant (required capacity for a 25,000 BPD Alky Unit) is \$45 million USD. ¹²⁰ |

¹¹⁹ Zhang, S.; L. Wilkinson; L. Ogunde; R. Todd; C. Steves; S. Haydel. Norton Engineering: Alkylation Technology Study: FINAL REPORT. South Coast Air Quality Management District, 09/09/2016. Available at: <https://www.aqmd.gov/docs/default-source/permitting/alkylation-technology-study-final-report.pdf>.

¹²⁰ Zhang, S.; L. Wilkinson; L. Ogunde; R. Todd; C. Steves; S. Haydel. Norton Engineering: Alkylation Technology Study: FINAL REPORT. South Coast Air Quality Management District, 09/09/2016. Available at: <https://www.aqmd.gov/docs/default-source/permitting/alkylation-technology-study-final-report.pdf>.

APPENDIX B: Property and Business Losses in the Petrochemical Industry

| Type of Facility | Location | Date | Property Damage \$M (2019 Dollars) | Business Loss (\$M) | Notes |
|------------------|-------------|------------|---------------------------------------|---------------------|---|
| Refinery | Texas City | 5/30/1978 | \$224 | | |
| Refinery | Romeoville | 7/23/1984 | \$515 | | |
| Petrochemical | Port Neal | 12/13/1994 | \$430 | | |
| Petrochemical | Pampa | 11/14/1987 | \$549 | \$240 | |
| Petrochemical | Henderson | 5/4/1988 | \$737 | | Plant destroyed |
| Refinery | Norco | 5/5/1988 | \$708 | | Unit demolished and rebuilt |
| Refinery | Richmond | 4/10/1989 | \$215 | | 25% of capacity lost for 5 months |
| Petrochemical | Pasadena | 10/23/1989 | \$1,615 | | Full production not restored for 2 years |
| Petrochemical | Sea Drift | 3/12/1991 | \$206 | \$165 | Production reduced for a year |
| Petrochemical | Sterlington | 5/1/1991 | \$274 | \$270 | One unit destroyed |
| Refinery | Wilmington | 10/8/1992 | \$175 | | Production reduced by more than half for 7 months |
| Petrochemical | Belpre | 5/27/1994 | \$386 | | Production unit destroyed |
| Petrochemical | Cedar Bayou | 10/20/1994 | \$276 | | Includes business loss |
| Petrochemical | Port Neal | 12/13/1994 | \$370 | | |
| Petrochemical | Deer Park | 6/22/1997 | \$267 | | |
| Refinery | Richmond | 3/25/1999 | \$218 | | Unit shut down for year |
| Refinery | Carson City | 4/23/2001 | \$217 | | Unit shut down for 2 months |
| Refinery | Lemont IL | 8/14/2001 | \$422 | | Unit shut down for year |
| Petrochemical | Illioipolis | 4/23/2004 | \$234 | | Most of plant destroyed |
| Refinery | BP/TX | 3/23/2005 | \$298 | | |
| Petrochemical | TX | 4/29/2006 | \$285 | | Plant closed for 6 months |
| Refinery | TX | 2/18/2008 | \$483 | | Plant continued to operate |

| Type of Facility | Location | Date | Property Damage \$M (2019 Dollars) | Business Loss (\$M) | Notes |
|------------------|--------------|------------|---------------------------------------|---------------------|-----------------|
| Refinery | Wisconsin | 4/26/2018 | \$650 | | |
| Refinery | Philadelphia | 6/21/2019 | \$750 | | Refinery closed |
| Petrochemical | Houston | 11/27/2019 | \$500 | | |

Source: Marsh, The 100 Largest Losses, 1974-2019, Large Property Damage Losses in the Hydrocarbon Industry, 23rd Edition. <https://www.marsh.com/us/industries/energy-and-power/insights/100-largest-losses-in-the-hydrocarbon-industry.html>. The table includes 25 accidents that reflect only U.S. incidents in the refinery and petrochemical sectors from 1978 forward, only incidents that may have been related to a release of a regulated substance, and only damage unrelated to natural disasters.