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

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1.0 Introduction

This document presents analyses and discussion to support proposed revisions to certain provisions and other discussions of the Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7); Proposed rule. The proposed rule contains regulatory text amplifications, modified and new provisions, and further topics associated with the existing Risk Management Program regulations at 40 CFR Part 68 ("the RMP rule"). Rationale for proposed rule modifications and associated topics are described in the preamble of the proposed rule. Several analyses for the proposal were completed using data from the RMP Database, a national database collection of information from facilities' Risk Management Plans, 40 CFR Part 68, Subpart G. A description of those datasets from the RMP database for this proposed rule is described in Sections 2.0 and 3.0 below. Sections 4.0 – 12.0 of this document includes a description of EPA's methods for data analyses from discussions in the preamble or points of further discussion for each topic.

2.0 Current Active RMP Facilities

For the purposes of this proposed rulemaking, EPA conducted its analyses of current active RMP facilities as of December 31, 2020, using RMP Database data from August 1, 2021. EPA used Microsoft Access queries and R code to pull and analyze the data. Approximately 11,740 facilities are included in this dataset. The dataset includes information from each RMP submission, and identifies the facility, its processes and their respective NAICS sectors and program levels, any reportable accidents, as well as other information reported in the RMP. Specific section numbers for input fields in the RMP can be found in the Risk Management Plan RMP*eSubmit User's Manual (RMPEM)[1] (pages 22-106).

A comprehensive description of the universe of current active RMP facilities used for the proposed rule can be found in Chapter 3 of the RIA.

3.0 RMP-reportable Accidents

For the purposes of this proposed rulemaking, EPA conducted its RMP accident analyses based on data from RMP-reportable accidents as of December 31, 2020, using RMP Database data from August 1, 2021. For the purposes of this proposed rulemaking, EPA conducted its analyses using RMP-reportable accidents, which are those accidents with reported impacts (as required by 40 CFR 68.42), and those occuring from January 1, 2004, to December 31, 2020. Approximately 2,436 accidents are included in this dataset. An Excel spreadsheet that lists required reporting details of these 2436 RMP-reportable

[1] https://www.epa.gov/sites/default/files/2019-03/documents/rmpesubmit_user_guide_-_march_2019_final_0.pdf

accidents is included as Appendix A. The following describes how EPA obtained this final accident number.

EPA analyzed the number of accidents reported between 2004 and 2020. Prior to 2004, some facilities were still completing initial implementation of the rule. Between 2004 and 2020, the database shows 3,425 accidents reported to the database. The existing rule requires reporting for accidental releases from covered processes with impacts that resulted in deaths, injuries, or significant property damage onsite, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage. In practice, however, some facilities have reported accidental releases with no reported impacts. After filtering by what EPA considers a reportable accident, EPA reports 2,493 accidents. EPA removed four duplicates as well as 57 accidents which reported "Environmental Impacts Other" but listed "None" in the open text box field. These 57 accidents did not have any other impacts reported, resulting in a final accident database of 2,436 accidents between 2004 and 2020. Accidents are listed in Appendix A, tab "All_accidents_2004_2020".

4.0 Hazard Evaluation Amplifications

4.1 Natural Hazards

Excerpt 1

"Despite this general knowledge that natural hazards are process hazards that should be evaluated and addressed during hazard reviews and PHAs, EPA's recent review of the RMP National Database indicates that when reporting accidents, some RMP facilities report "natural" and "unusual weather conditions" as the respective initiating event or as a contributing factor to their accidents. According to the Agency's data from 2004–2020, facilities reported 38 RMP-reportable accidents as having a natural cause as the initiating event of their accident and another 46 RMP-reportable accidents as having unusual weather conditions as a contributing factor of their accident."

Accidents with natural hazard as an initiating event are identified by a "c" in column AY of Appendix A, tab "All_accidents_2004_2020". Accidents with unusual weather conditions as a contributing factor are identified by a "1" in column BI of Appendix A, tab "All_accidents_2004_2020". Below is the entry description from the RMPEM:

> *Natural (weather conditions, earthquake): Weather conditions, such as lightning, hail, ice storms, tornados, hurricanes, floods, high winds, or earthquakes caused the accident. d. Unknown.*
>
> *Unusual weather conditions: Weather conditions, such as lightning, hail, ice storms, tornados, hurricanes, floods, high winds, or earthquakes caused the accident.*

Excerpt 2

"In addition to these natural hazard-linked accidents, RMP data indicate that the location of many RMP facilities leave them exposed to natural hazards. In a review of NOAA's Storm Events Database[2] from the last two decades, EPA generally found that extreme weather events are common in counties with RMP facilities. For example, during 2000-2020, over 90 percent of counties with RMP facilities experienced flooding, one in four counties with RMP facilities suffered damage from hurricanes, and counties with RMP facilities have on average experienced 30 floods (over one per year) and 40 extreme winter weather events (approximately two per year), such as blizzards. Some counties with RMP facilities also

[2] https://www.ncdc.noaa.gov/stormevents/

experience extreme weather events much more often than average. For instance, many regions in Florida, Louisiana, and South Carolina were impacted by more than 30 hurricanes over the prior 20 years. Similarly, regions of northern California and Oregon suffered from over 500 days of wildfires during the same period."

Tables 1-3 and Maps 1-3 below detail this information. The full report, *Natural Hazards and Technological Disasters by the Center for Environmental Economics* is included as Appendix B of this document.

Table 1. Percent of RMP Facilities with an Extreme Weather Event (2000-2020)

	All-time Percentage	Annual Percentage
Hurricanes	0.279	0.058
Coastal Flood	0.115	0.020
Non-coastal Flood	0.905	0.520
Winter Weather	0.906	0.612
Extreme Heat	0.606	0.085
Tornadoes	0.724	0.271
Wildfire	0.341	0.060
Drought	0.678	0.152
RMP Facility(-Year) Observations	11,689	245,469

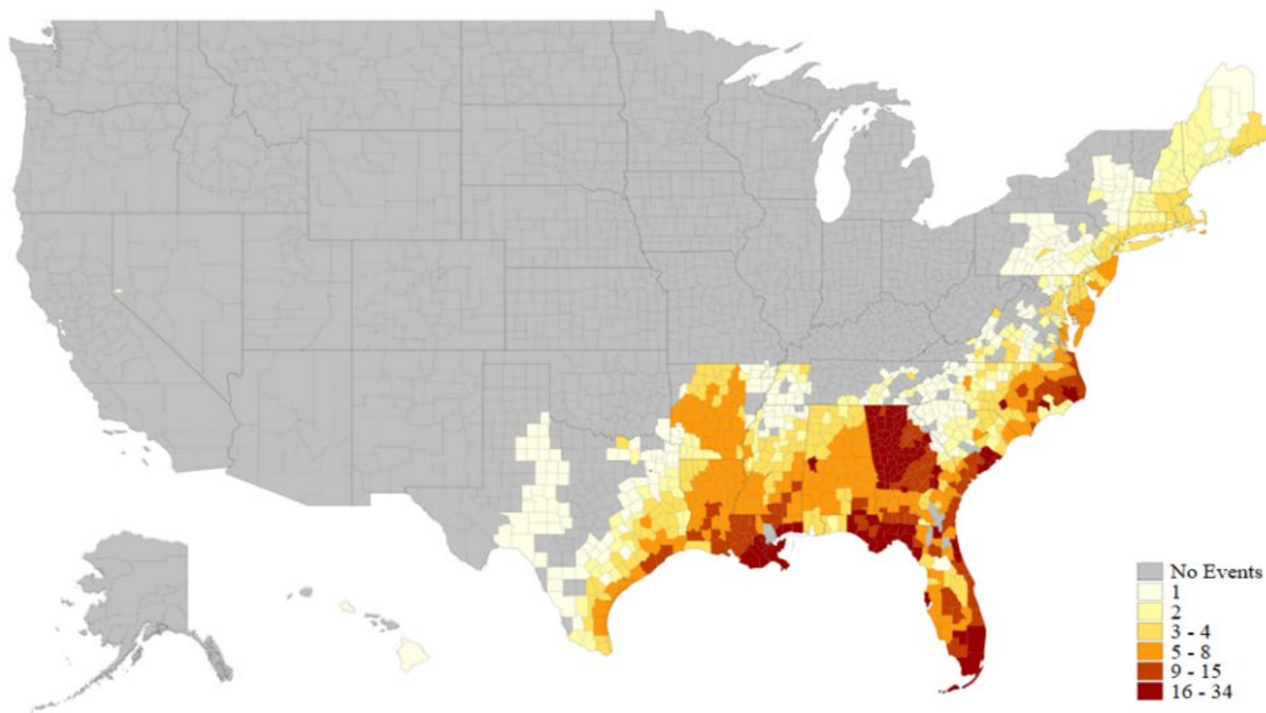
Table 2. Total Extreme Weather Events in Counties with an RMP Facility (2000-2020)

	Mean	Standard deviation	Minimum	Maximum
Hurricanes	1.68	3.98	0	34
Coastal Flood	0.65	3.88	0	54
Non-coastal Flood	30.69	34.32	0	447
Winter Weather	39.55	36.79	0	308
Extreme Heat	2.84	5.29	0	46
Tornadoes	7.48	8.80	0	65
Wildfire days	11.47	62.13	0	1808
Drought days	393.88	567.54	0	4324
County Observations	2,150			

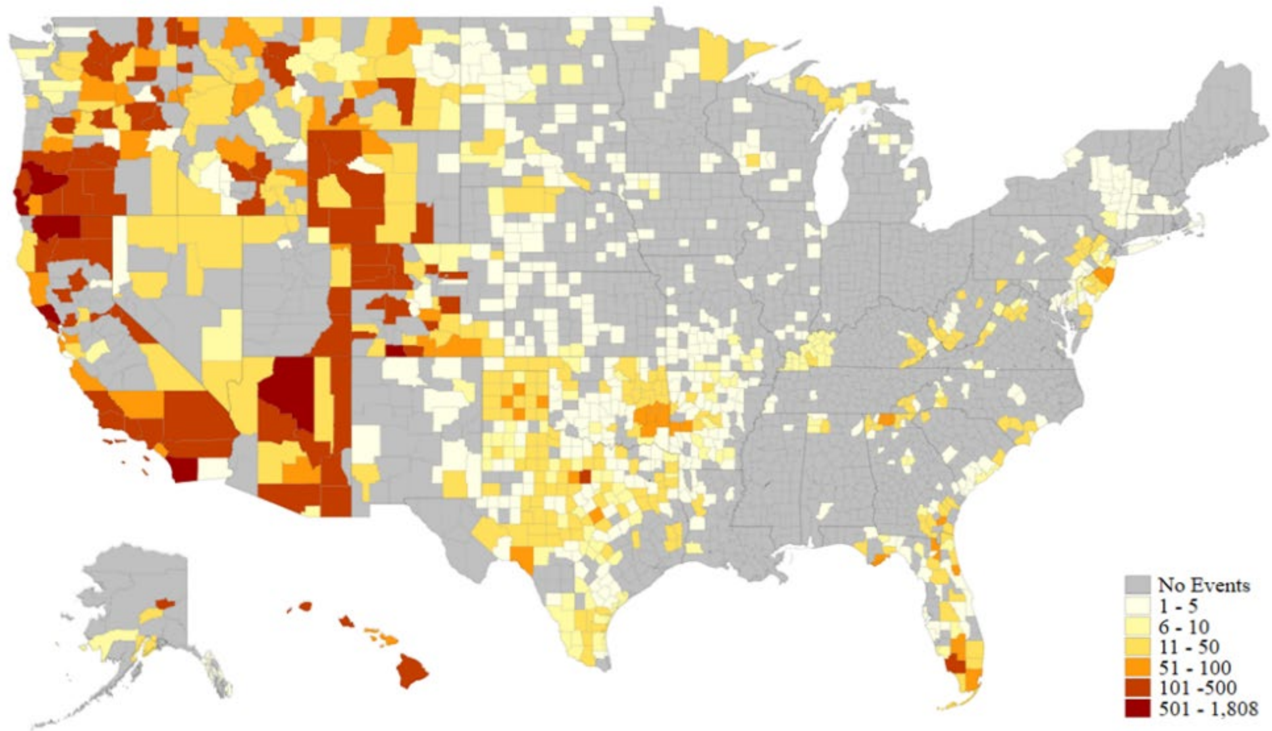
Table 3. Annual Extreme Weather Events in Counties with an RMP Facility (2000-2020)

	Mean	Standard deviation	Minimum	Maximum
Hurricanes	0.08	0.38	0	9
Coastal Flood	0.03	0.32	0	11
Non-coastal Flood	1.46	2.52	0	59
Winter Weather	1.88	2.49	0	39
Extreme Heat	0.14	0.59	0	15
Tornadoes	0.36	0.77	0	14
Wildfire days	0.55	5.67	0	307
Drought days	18.72	57.43	0	365
County-Year Observations	45,150			

Map 1: Total Hurricanes or Tropical Storm Events by County (2000-2020)



Map 2: Total Wildfire Days by County (2000-2020)



4.2 Power Loss

Excerpt 3

"National Response Center (NRC) data also include information on 3,077 reported accidents from 2004-2020 that were associated with power loss."

EPA queried the NRC database, https://nrc.uscg.mil/, for these totals using the following methods:

- *Queried all incidents reported from 2004 through 2020 with the term "power" in the Incident Description field with Incident Types "FIXED", "PIPELINE, "STORAGE TANK", "CONTINUOUS", and "UNKNOWN SHEEN"*
- *Manually filtered results to attempt to identify incidents at industrial facilities related to power loss. To do this, excluded incidents in various ways:*
    - *Filtered on terms such as "power equipment", "power washer", etc. where the incident was obvious to not be related to power loss.*
    - *Filtered out incidents occurring at non-industrial facilities such as residences, schools, commercial shops.*
    - *Filtered out incidents related to vehicles impacting power poles and power lines where the impact did not appear to include industrial facilities (e.g., vehicle impacts power pole and transformer breaks open releasing mineral oil).*
    - *Filtered out leaks and mechanical failures at power plants with no apparent downstream impact to an industrial facility.*
- *Filtered out power loss incidents leading to sewage/wastewater overflows.*

- *Filtered out incidents in certain non-U.S. state locations including Bahamas, Guam, and Germany and included Puerto Rico and the Virgin Islands.*

<u>Excerpt 4</u>
"EPA believes many facilities with RMP processes are managing the hazard of power loss. However, some recent RMP accidents are linked to power loss. EPA's review of RMP accident history data from 2004–2020 shows that at least 20 accident history reports have specifically indicated that power failure was a contributing factor to an accident."

In identifying these 20 accident records, EPA searched the open text field in column BK for accident contributing factors and searched for instances that described power loss. The accidents EPA chose to represent this situation are identified in column CG of Appendix A, tab "All_accidents_2004_2020."

<u>Excerpt 5</u>
"However, only 63 percent (310) and 44 percent (1,971) of facilities with Program 2 and Program 3 processes have implemented backup power at their facilities, despite identifying that the loss of cooling, heating, electricity, and instrument air is a major potential hazard to their process operations."

In identifying these unique facilities, EPA searched for current active RMP facilities which answered "Yes" to questions in Section 7.4.D.11 in the RMP, "loss of cooling, heating, electricity, instrument air" as a major hazard and indicated "Yes" to Section 7.4.E.12., "emergency power" as a process control. Below is the entry description from the RMPEM.

> *d. Major hazards identified: Select any major hazards that were identified for the Program 3 process or part of the process as a result of the PHA...:*
>
> > *11. Loss of cooling, heating, electricity, instrument air. These losses could be major hazards if they could lead to releases. For example, loss of cooling could lead to an increase in pressure and failure of a vessel or pipe and a loss of heating or power could lead to unstable processes. These conditions are less likely to be major hazards for substances handled at atmospheric temperatures and pressures.*
>
> *12. Emergency Power Backup power systems.*

<u>5.0 Safer Technologies and Alternatives Analysis</u>

<u>Excerpt 6</u>
The sector accident rates [*between 2016 and 2020*] (number of accidents per sector divided by the number of facilities in each sector) for petroleum and coal manufacturing were seven times higher (21 percent, n = 40 out of 184) and two times higher for chemical manufacturing (6 percent, n = 94 out of 1607).

These accidents are identified in column BZ of Appendix A, tab "All_accidents_2004_2020".

<u>Excerpt 7</u>
Moreover, of the 70 facilities experiencing two or more incidents between 2016 and 2020, 43 (60 percent) of these facilities were NAICS 324 and 325.

These accidents are identified in column CF of Appendix A, tab "All_accidents_2004_2020".

Excerpt 8
"This increased accident frequency in facility-dense areas has resulted in considerably larger offsite impacts, including over 47,000 people sheltering in place, 56,800 people evacuating, and over 153 million dollars in offsite property damage."

This data can be calculated by aggregating the impacts of accidents in column CF of Appendix A, tab "All_accidents_2004_2020". A summary is provided in Table 1.

Table 1. Consequences of accidents between 2016 and 2020 in NAICS 324 and 325 for facilities located within one mile of another NAICS 324 and 325 process facility, as compared to those with no other 324 or 325 process facilities located within one mile.

Accident Consequence	No 324/325 facilities within 1 mile	Another 324/325 facility within 1 mile
Deaths Workers	2	0
Injuries Workers	72	88
Onsite Property Damage	577,763,636	691,524,558
Hospitalization	4	1
Medical Treatment	6	72
Evacuated	2,973	56,769
Sheltered In Place	17,260	47,141
Offsite Property Damage	257,430	153,000,000
Count of accidents	68	66

Excerpt 9
"While accident rates for the paper manufacturing sector (NAICS 322, 17 percent, 20 accidents at 11 out of 65 facilities between 2016 and 2020) were similar to NAICS 324, EPA has not proposed STAA requirements at facilities in NAICS 322 due to the low number of incidents and comparatively fewer accident consequences."

"While 30 workers were injured (non-fatally) as a result of these accidents, the accidents resulted in no other reported offsite consequences (i.e., sheltering in place, evacuation, or offsite property damage)."

These accidents are identified in column BX of Appendix A, tab "All_accidents_2004_2020". Worker fatalities and consequences are calculated by summing columns AJ (Injuries Workers) and offsite consequence variables (Injuries public, evacuated, shelter in place, offsite property damage and environmental damage).

Excerpt 10
"EPA recognizes that HF is an extremely toxic chemical used for alkylation at 27 percent of facilities in NAICS 324 (45 of 163)."

These facilities are identified in tab "Facilities_324_HF" of Appendix A.

Excerpt 11
"Based on accidents occuring between 2016 and 2020, communities located near facilities in NAICS 324/325 that are located within one mile of another 324/325 facility are 1.5 times more likely to have

been exposed to accidents at these facilities as compared to communities near facilities in NAICS 324/325 that are not located within one mile of another 324/325 facility."

EPA calculated this as the probability of an accident in NAICS 324/325 in a facility dense area divided by the total facilities in NAICS 324/325 in a facility dense area, divided by the probability of accidents in NAICS 324/325 among all NAICS 324/325 active facilities. The below calculation uses the number in Table 2 and provides the corresponding location of each input.

$P(A) = N(A)/N(T) = 137/1800 = 0.076$

$P(A \mid D) = P(A \cap D)/P(D)$ given $P(A \cap D) = N(A \cap D)/N(T)$ and $P(D) = N(D)/N(T) = 66/563$

$P(A \cap D) = N(A \cap D)/N(D) = 66/563 = 0.1172$

$P(A \cap D)/P(A) = 0.1172/0.076 = 1.5$

Table 2. Probability of accidents within NAICS 324 and 325 located within one mile of another 324 or 325 process facility.

Count 2016-2020	**Count facilities**	**Calculation**	**Facilities location**
Count unique facilities 324/325	1800	T (Total)	RMP database as of August 1, 2021
Count accidents 324/325	137	A (Accidents)	Column BZ of the Appendix A, tab "All_accidents_2004_2020".
Count unique facilities 324/325 in facility dense areas (one or more facility within a one mile buffer)	563	D (Density)	Tab "Facilities_324_325_1_mile" of the RMP Accidents Excel file in Appendix A.
Count accidents 324/325 in facility dense areas (one or more facility within one mile buffer)	66	A ∩ D (Accidents in dense areas)	Column CF, tab "All_accidents_2004_2020" of the RMP Accidents Excel file in Appendix A.

6.0 Incident Investigation Root Cause Analysis

Excerpt 12

"This holds true for the updated analysis, with only 3 percent (n = 382) of facilities between 2016 and 2020 reporting one RMP-reportable accident and 0.5 percent (n = 70) of all RMP facilities reporting two or more RMP-reportable accidents during that period."

"For example, between 2016 and 2020, these facilities accounted for 36 percent (n = 176) of all accidents reported (n = 488)."

These accidents and facilities are identified in column CA of Appendix A, tab "All_accidents_2004_2020".

Excerpt 13
"Additionally, of these 70 facilities, 61 percent (n = 43) had experienced another accident prior to 2016."

These accidents are identified in column CB of Appendix A, tab "All_accidents_2004_2020".

Excerpt 14
"Between 2004 and 2020, 18 facilities had more than 10 accidents each, with two facilities reporting over 20 incidents each to EPA."

These accidents are identified in column CC of Appendix A, tab "All_accidents_2004_2020".

Excerpt 15
"EPA finds that of the 70 facilities with multiple accidents between 2016 and 2020, 60 percent (n = 42) reported repeat causal factors within the same process."

These accidents are identified in column CD of Appendix A, tab "All_accidents_2004_2020".

7.0 Third Party Compliance Audits

Excerpt 16
"Facilities responsible for two or more accidents in those 5 years generally were within industry sectors where regulated facilities have multiple RMP-regulated processes. RMP facilities within the chemical manufacturing (NAICS 325) and petroleum and coal products manufacturing (NAICS 324) industries represent over 50 percent of the facilities with two or more accidents in 5 years, and they have on average two and eight RMP-regulated processes, respectively, at their facilities."

These facilities are based on the unique facilities in column CE divided by the unique facilities in Appendix A, column CA, tab "All_accidents_2004_2020".

8.0 Employee Participation

8.1 Recommendation Decisions

Excerpt 17
"EPA analyzed OSHA PSM violations from 2018 to 2020 to better understand the breadth of unresolved or improper closure of recommendations from process hazard analyses, compliance audits, and incident investigations. In these 3 years, there were 70 violations of non-compliance where PHA, incident investigation, or compliance audit recommendations were not addressed, resolved, completed, documented, or communicated to employees. Of these violations, the majority (56 percent) were violations associated with PHA recommendations, 38 percent were from compliance audits, and 6 percent were from incident investigations. Some of these violations were associated with RMP-reportable accidents, which suggests that worker involvement may have been useful in making sure options were appropriately considered."

EPA conducted this analysis by obtaining data from the Department of Labor, Data Enforcement website[3], and downloaded 'osha_violation' data on January 13, 2022. EPA filtered data by the

[3] https://enforcedata.dol.gov/views/data_summary.php

19100119 standard, then filtered those having a 'final_order_date' between January 1, 2018, and December 31, 2020. EPA then performed a search for the following applicable OSHA PSM standard violations:

> *19010119 E05*
> *29 CFR 1910.119(e)(5) The employer shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.*
>
> *19010119 M05*
> *29 CFR 1910.119(m)(5) The employer shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.*
>
> *19010119 O0*
> *29 CFR 1910.119(o)(4) The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.*

8.2 RMP Accident Non-Compliance Reporting

Excerpt 18
"Although facilities with Program 2 processes account for only approximately 15 percent of all RMP-reportable accidents (83 percent are Program 3; 3 percent are Program 1) their accidents still have the potential to affect public receptors."

The Program level of each process at the time of the accident is identified in column N of Appendix A, tab "All_accidents_2004_2020".

9.0 Emergency Response

Excerpt 19
"RMP-regulated facilities must indicate on their RMP whether they are a non-responding facility (i.e., by indicating compliance with mandatory elements of emergency response plans required in 40 CFR 68.95(a)(1)) and identify the plans and procedures in place should an accidental release occur. EPA's review of the RMP database has shown that approximately 47 percent of RMP facilities claim to be non-responding facilities."

In identifying unique non-responding facilities, EPA searched the current active RMP facilities dataset for facilities which only answered "Yes" to question 9.1.a and did not answer "Yes" to any other questions for 9.1.b – 9.4. EPA determined unique responding facilities to be those which indicated "Yes" for two or more questions in 9.1.a – 9.4. Below is the entry description from the RMPEM.

> *9.1 Written emergency response (ER) plan:*
> *a. Is your facility included in the community emergency response plan?*

If your facility is subject to part 68 because it has one or more regulated toxic substances above threshold quantities, it is probably included in a local emergency response plan under the Emergency Planning and Community Right-to-Know Act (EPCRA). Under Section 303 of EPCRA, local emergency planning committees (LEPCs) must prepare an emergency response plan for facilities in their planning district having toxic substances listed under EPCRA 302 in excess of the threshold planning quantity established under that section. Most of the toxic substances listed in Part 68 are also listed under EPCRA 302, and the EPCRA thresholds for those substances are generally the same or lower than the Part 68 thresholds for the same substances. Consequently, Part 68 facilities with toxic substances listed under both EPCRA and Part 68 should be included in community emergency response plans. In addition, facilities subject to Part 68 as a result of flammable substances may also be covered by community emergency response plans, since LEPCs can, and sometimes do, include other hazardous substances, including flammables, in their plans. If you are not sure whether your facility is included in your community's local emergency plan, check with your LEPC. As noted above, if your employees are not going to respond to releases of regulated substances at your facility and you have one or more Part 68 regulated toxic substances over threshold quantities, your facility must be included in the local emergency response (ER) plan under EPCRA. Click the check box for this question if your facility is included in the community's emergency response plan.

b. Does your facility have its own written emergency response plan?

Click the check box for this question if you have a response plan (not just an emergency action plan as required by OSHA under 29 CFR 1910.38).

9.2 Does your facility's ER plan include specific actions to be taken in response to accidental releases of regulated substances?

These data elements (9.2, 9.3, 9.4) reflect the three mandatory components of the emergency response plan required under Section 68.95(a)(1). For an emergency response plan to be in compliance with this requirement, you must be able to answer "yes" to each of these questions. Click the check box for this question if your facility's ER plan includes specific actions to be taken in response to accidental releases of regulated substance(s).

9.3 Does your facility's ER plan include procedures for informing the public and local agencies responding to accidental releases?

Click the check box for this question if your facility's ER plan includes procedures for informing the public and local agencies responding to accidental releases.

9.4 Does your facility's ER plan include information on emergency health care?

Click the check box for this field to respond with "yes" if your ER plan includes information on emergency health care.

<u>Excerpt 20</u>

"While EPA acknowledges that the accident rate from RMP facilities has declined, EPA also recognizes that approximately 39 percent (n = 962) of reported accidents from 2004 to 2020 had offsite impacts."

These accidents have a value in one or more columns from AH-AI, AK-AL, AN-AX, of Appendix A, tab "All_accidents_2004_2020".

<u>Excerpt 21</u>

"Further analysis shows that no offsite responders were notified in 192 of the 962 accidents with offsite impacts (19 percent)."

These accidents have a value in one or more columns from AH-AI, AK-AL, AN-AX, AND lists "no, not notified" in column BM of the Appendix A, tab "All_accidents_2004_2020".

__Excerpt 22__
"Furthermore, approximately 19 percent (n = 36) of the facilities with the 192 accidents self-identified as non-responders and relied on local responders to handle the release and public communication efforts."

These accidents have a value in one or more columns from AH-AI, AK-AL, AN-AX, AND lists "no, not notified" in column BM of the Appendix A, tab "All_accidents_2004_2020". From this subset of accidents, EPA identified non-responding facilities, by which at the time of the accident, the facility only answered "Yes" to questions 9.1.a and did not indicate "Yes" for any other questions in 9.1b – 9.4. EPA determined responding facilities to be those which indicated "Yes" for two or more questions in 9.1 a – 9.4. See question descriptions in Excerpt 19 above.

__Excerpt 23__
"Moreover, only 10 of these 192 accident investigations indicated that there was a revised emergency response plan because of the accident."

These accidents have a value in one or more columns from AH-AI, AK-AL, AN-AX, AND lists "no, not notified" in column BM of the Appendix A, tab "All_accidents_2004_2020". From this subset of accidents, EPA identified those facilities with a revised emergency response plan as having a "1" in column BS of the same tab of Appendix A.

10. Information availability of non-offsite consequence analysis data: variables slated for inclusion

The following table describes the variables slated for inclusion in EPA's non-offsite consequence (non-OCA) database. The sections correspond with the sections required during RMP submission. Further description of each variable and section can be found in the RMPEM. Sections not described here include those with offsite consequence (OCA) protected information: Toxics - Worst-case (Section 2); Toxics – Alternatives Release (Section 3); Flammables – Worst-Case (Section 4); Flammables – Alternative Release (Section 5).

SECTION	DESCRIPTION	VARIABLE DESCRIPTION
1	Facility Information	Name; Address; Relevant LEPC; Latitude/Longitude; Full time employees; EPA Facility ID
	Other regulatory information	Coverage by OSHA PSM; Covered under EPCRA 302; Covered under CAA Title V; Safety Inspection Date
	Program administrative data	Receipt date; Deregistration date; Anniversary date; Deregistration reason code
	Process information	Process NAICS code; Process ID; Process chemical; Quantity; Program level
6	Accident Chemical ID	Accident chemical; Quantity released; Percent weight
	Accident information	Accident date; Accident time; Accident NAICS code; Accident release duration; Release event type; Release source; Weather conditions at the time of release; Initiating event; Casual factors; Emergency responders notified; Changes introduced as a result of the accident
	Accident consequences	Deaths workers; Deaths public responders; Deaths public; Injuries workers; Injuries public responders; Injuries public; Onsite property damage; Offsite property damage; Offsite Deaths; Hospitalization; Medical treatment;

SECTION	DESCRIPTION	VARIABLE DESCRIPTION
		Evacuated; Sheltered in Place; Offsite property damage; Environmental impacts
7	Prevention Program 3 Information	Process NAICS; PHA technique used; Major hazards identified; Process controls; Mitigation systems in use; Monitoring detection systems in PLACE; Changes made since the last PHA; Training and training competency tests; Maintenance; Management of Change; Pre-startup reviews; Incident investigations; Hot work permit review; Compliance audits; Employee participation plan review; Contractor safety review
8	Prevention Program 2 Information	Process NAICS code; Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement; Hazard review date; Major hazards identified; Process controls; Mitigation systems; Monitoring and detection systems in place; Changes implemented since last hazard review; Date of operating procedure review; Training type and competency test used; Maintenance review date and equipment inspected; Compliance audit dates; Incident investigation date
9	Emergency response information	Facility included in emergency response plan (Y/N); Facility written emergency response plan (Y/N); Does the facility's ER plan include specific actions to be taken in response to accidental releases of regulated substances?; Does the facility's ER plan include procedures for informing the public and local agencies responding to accidental releases?; Does the facility's ER plan include information on emergency health care?; Review date of ER plan; Date of the most recent ER training for the facility’s employees; Local agency with which the facility's ER plan or response actions are coordinated.
	Other Federal regulations	Other regulations the facility is subject to including: OSHA 1910.38; OSHA 1910.120; SPCC; RCRA; OPA 90; and EPCRA.
Executive Summary	Executive summary of the above described RMP submission elements	Accidental release prevention and emergency response policies; facility and regulated substances handled; general accidental release prevention program and chemical-specific prevention steps; five-year accident history summary; emergency response program summary; planned changes to improve safety.

11.0 Safer Technologies and Alternatives Assessment Clearinghouse Example

Facilities subject to proposed Safer Technologies and Alternatives Analysis (STAA) requirements

As part of implementation of the proposed STAA provisions, conducted as part of the Process Hazard Analysis (PHA), EPA intends to collect information relevant to any inherently safer design/technology identified and implemented. Information collected is envisioned as a simple form, similar to the manner of information currently collected in the RMP*eSubmit process. EPA solicits comment on the additional information that should be collected.

Deregistering facilities

EPA also intends to collect this information from deregistering facilities. Though facilities may deregister for a number of reasons (e.g., terminated operations), one scenario is the reduction of regulated substances in a process less than the threshold quantity. EPA intends to request information from deregistering facilities, though information is voluntary given deregistration indicates a facility is no longer subject to RMP program requirements. Therefore, all areas identified below would be optional for deregistering facilities. EPA solicits comment on the additional information that should be collected.

Draft outline of STAA information collection form. Information collected is an open text field unless otherwise specified.

1) **Section 1:** Facility information
   a) Regulated substance and CAS number
   b) Process NAICS code
   c) Facility identifier information[4]
2) **Section 2:** Categories of safer design identified
   a) PHA: Process hazards identified leading to the initiation of safer design
   b) Type of IST/ISD identified:
      i) Substitution of substance (check box and name and CAS of subsituted substance)
      ii) Moderation of substance (check box and open text description of moderation)
      iii) Minimization of substance (check box and quantity reduced (pounds))
      iv) Simplification of substance (check box and open text description of simplification)
      v) Any other technique identified
      vi) Description of the safer design identified
   c) Any industry standards or publicly available documents relied upon
   d) Practicability:
      i) Practicability determination (Y/N)
      ii) Technological practicability
      iii) Environmental factors considered
      iv) Social factors considered
      v) Legal factors considered (includes regulatory factors)
      vi) Economic factors considered (including estimated cost to implement)
      vii) Executive summary of practicability determination (narrative description of above factors).
3) **Section 3** ***(optional):*** Categories of safer design implemented
      i) Substitution of substance (check box and name and CAS of subsituted substance)
      ii) Moderation of substance (check box and open text description of moderation)
      iii) Minimization of substance (check box and quantity reduced (pounds))
      iv) Simplification of substance (check box and open text description of simplification)
      v) Any other technique identified
      vi) Description of the safer design identified
      vii) Estimated cost savings from implementation
4) **Section 4** ***(optional):*** Causal factors for initiating safer design implementation.
   a) Regulatory requirements (Y/N)
   b) Cost savings (Y/N)
   c) Accident prevention (Y/N)
   d) Other

Section 12 - Additional Considerations for Future Action

A. Expanding List of Regulated Substances to Include Ammonium Nitrate (AN) and Other Substances

1. Background on list development and revision

EPA's authority to list substances for regulation under the RMP derives from paragraphs (3) and (4) of CAA section 112(r). These paragraphs required EPA to establish an initial list of at least 100 substances that pose the greatest risk of death, injury, or serious adverse effect to human health and the environment in the event of an accidental release and use the EPCRA extremely hazardous substances (EHS) list with

[4] For deregistering facilities, EPA Facility ID would allow information to be linked back to previous RMP submissions.

appropriate modifications. CAA section 112(r) specified 16 substances that must be part of the initial list. Furthermore, CAA section 112(r) paragraph (3) also states that, "The list may be revised from time to time by the Administrator on the Administrator's own motion or by petition and shall be reviewed at least every 5 years" and that the procedures for adding or deleting substances shall be consistent with the procedures for adding or deleting hazardous air pollutants under CAA section 112(b). According to CAA 112(r)(3), when EPA lists a substance, it must explain the basis for the listing. Section 112(r)(4) provides the factors to be considered in listing substances, including the severity of acute health effects of an accident release, the likelihood of accidental release and the potential magnitude of human exposure. (112(r)(4)(A)(i-iii)). According to CAA 112(r)(5), EPA must also promulgate a regulatory threshold. Having at least a TQ of a listed "regulated substance," in turn, makes the rules issued under CAA 112(r)(7)(B), such as the original 1996 RMP rule, apply to a stationary source. In section 112(r)(5), authority is given to establish threshold quantities for 112(r)(3) listed substances taking into account various chemical properties, including reactivity.

EPA promulgated the initial "list rule" in 1994 (59 FR 4478; January 31, 1994) and significantly amended it in 1998 (63 FR 640; January 6, 1998). EPA's listing approach identified the most hazardous substances primarily by applying criteria to pre-existing lists of chemicals based on the inherent properties of the substances. For example, in identifying toxic substances for regulation, EPA used the list of extremely hazardous substances under EPCRA as an acute toxicity criterion, identified a subset of those chemicals (gases and volatile liquids) that were more likely to be released to the ambient air in accidental releases, and identified two chemicals that were not on the extremely hazardous substances list but had comparable toxicity and volatility. EPA also reviewed the accident history of one proposed substance, sulfuric acid, to modify the listing to only apply to oleum (fuming sulfuric acid). The list of regulated substances included 77 acutely toxic gases and liquids. In addition to listing these toxic substances, EPA also listed 63 flammable substances that met the NFPA's highest flammability classification, NFPA 4, and the Department of Transportation (DOT) Division 1.1 high explosives listed in 49 CFR 172.10. Tables 1 through 4 in 40 CFR 68.130—and their respective footnotes—indicate the basis for listing each chemical. The list rule also identified reactive substances as a type of chemical of concern but deferred listing these chemicals to conduct further research. EPA set thresholds for toxic regulated substances in "bins" ranging from 500 to 20,000 pounds based on an index that reflected toxicity and volatility of the substances; applied a 10,000-pound threshold to flammable regulated substances based on the quantity needed for a vapor cloud explosion; and set a 5,000-pound threshold for high explosives based on the quantity of high explosive needed to generate an overpressure of 3.0 pounds per square inch at 100 meters (a proxy for fencelines).[5]

Various parties sought judicial review over each class of listed substances. Ultimately, EPA settled each challenge to the list by modifying the listing for some substances based on particular properties of the substances. Most significantly for this discussion, high explosives were delisted, a decision that was based in part on an agreement with the litigant (Institute of Makers of Explosives) to undertake a program to inform local emergency responders about the presence of an explosive chemical, provide notifications of safe practices to customers and intermediaries, and undertake other measures to reduce the risk of accidental releases (63 FR 640; January 6, 1998).

In the years since issuing the list rule and its amendments, incidents involving the broad category of reactive chemicals, and explosions and fires involving ammonium nitrate (AN), have led to continued questions about regulatory coverage of these chemicals. With respect to reactive chemicals, the Chemical Safety Board (CSB) issued a study of the regulatory status of reactive chemicals in 2002 that, among other things, reviewed both the Occupational Safety and Health Administration (OSHA) Process Safety

[5] A discussion of how EPA calculated TQs is in the Notice of Proposed Rulemaking for the list rule (58 FR 5102, 5112; January 19, 1993). The final list rule set the maximum bin for regulated toxic substances at 20,000 (59 FR 4495; January 31, 1994).

Management (PSM) standard and EPA RMP lists, as well as substantive provisions under these programs, to recommend a set of changes that CSB believed would improve chemical safety.[6] The differences between CSB's recommended approach for addressing reactive substances and the approach EPA adopted in the list rule include regulating reactive chemicals as a class rather than a list of specific substances, regulating combinations of chemicals, and regulating the class of reactive chemicals based on process-specific factors rather than inherent properties of specific substances.[7] The report identified over 40 classes of reactive chemicals; it also noted that, in its review of 167 accidents between 1980 and 2001, slightly over 80 percent of reactive accidents were attributable to incompatible chemicals, runaway reactions, and impact-sensitive or thermally sensitive materials.[8]

Incidents involving AN may be among the most severe and highest-profile accidental releases both in the United States and around the world. AN is classified as an oxidizer, which is one of the classes of reactive chemicals identified by CSB. After the West Fertilizer explosion and fire, the chairman of CSB testified to Congress that, had EPA adopted its 2002 recommendation, "[AN] likely would have been included."[9] On August 4, 2020, what some cite as the largest non-nuclear explosion in history—involving an estimated 2,750 tons of unsafely stored AN—occurred in Beirut, Lebanon.[10] More recently, on January 31, 2022, the Weaver Fertilizer plant in Winston-Salem, North Carolina, caught fire with nearly 600 tons of AN in storage. Although firefighters applied lessons learned from the West event and other incidents, avoiding any immediate fatalities or explosions, the fire still burned for 4 days, resulting in the evacuation of approximately 6,500 persons.[11]

The West incident led to EO 13650, which directed the Secretaries of Labor, Homeland Security, and Agriculture to address AN and directed EPA and the Department of Labor to determine whether the lists of chemicals under RMP and PSM should be expanded.[12] EPA raised a number of issues that needed to be considered in developing a listing of AN or reactive chemicals in its Request for Information (RFI) (79 FR 44609-13; July 31, 2014). More broadly, the RFI sought comment on a range of issues connected to adding or deleting regulated substances. While the RFI led to some valuable input on listing issues, EPA focused exclusively on CAA section 112(r)(7) regulatory improvements in the 2017 amendments and the 2019 reconsideration rule, due in part to the numerous issues that needed to be addressed when expanding the list and prioritizing changes to prevention, emergency response, and information access under the RMP rule. While EPA deferred list expansion, EPA, OSHA, and the Bureau of Alcohol, Tobacco, Firearms, and Explosives issued a joint chemical advisory on the safe storage, handling, and management of AN prills (*i.e.,* small beads) used as a technical-grade blasting agent and as fertilizer.[13]

Trade associations for portions of the fertilizer industry have developed new safety measures since the 2014 RFI. In particular, The Fertilizer Institute and the Agricultural Retailers Association have developed

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[6] CSB, *Hazard Investigation—Improving Reactive Hazard Management* (2002), *https://www.csb.gov/improving-reactive-hazard-management/.*

[7] CSB, *Hazard Investigation,* pp. 12–13, 81–84.

[8] CSB, *Hazard Investigation,* p. 7.

[9] CSB, "In Safety Message, CSB Chairperson Rafael Moure-Eraso Calls for Regulatory Coverage of Reactive Chemicals Following the West Fertilizer Explosion and Fire," last modified August 20, 2013, *https://www.csb.gov/in-safety-message-csb-chairperson-rafael-moure-eraso-calls-for-regulatory-coverage-of-reactive-chemicals-following-the-west-fertilizer-explosion-and-fire-/.*

[10] Mazen J. El Sayed, "Beirut Ammonium Nitrate Explosion: A Man-Made Disaster in Times of the COVID-19 Pandemic," *Disaster Medicine and Public Health Preparedness* 1, no. 5 (2020): doi:10.1017/dmp.2020.451.

[11] "Plant Fire Renews Calls for EPA to Regulate Ammonium Nitrate Under RMP," last modified February 18, 2022, *https://insideepa.com/daily-news/plant-fire-renews-calls-epa-regulate-ammonium-nitrate-under-rmp.*

[12] See "Executive Order 13650 of August 1, 2013, Improving Chemical Facility Safety and Security," sections 6(b) and 6(c); *https://obamawhitehouse.archives.gov/the-press-office/2013/08/01/executive-order-improving-chemical-facility-safety-and-security.*

[13] EPA, OSHA, and Bureau of Alcohol, Tobacco, Firearms, and Explosives, *Chemical Advisory: Safe Storage, Handling, and Management of Solid Ammonium Nitrate Prills* (2015), *https://www.epa.gov/sites/default/files/2015-06/documents/an_advisory_6-5-15.pdf.*

"Guidelines for Transportation and Storage of Ammonium Nitrate"[14] and "ResponsibleAg."[15] It is not yet clear whether Weaver Fertilizer had been following either of these programs. The statute asserts that voluntary programs shall, as appropriate, be considered when EPA regulates substances under CAA 112(r)(7)(B).

2. Issues specific to Listing AN

EPA contends there are numerous issues that make regulating AN and other reactive substances complex and distinct. EPA plans to address proper regulation of AN specifically when conducting its next review of the list of regulated substances under CAA section 112(r)(3).

The Agency remains interested in whether the RMP rule is reasonable for AN, in contrast to more specific rules that could be developed under either CAA section 112(r)(7)(A), EPCRA, or another authority. The reasonableness may depend on the types of sources subject to any future program. For example, West, Beirut, and Weaver all had two or three orders of magnitude more AN present than the highest threshold under the RMP. Should the Agency focus the RMP on large quantities of AN, at least initially, by setting a high threshold, and perhaps address smaller quantities under CAA 112(r)(7)(A)?

AN is subject to a number of specific safe-handling regulations under OSHA,[16] the Chemical Facility Anti-Terrorism Standards,[17] the Bureau of Alcohol, Tobacco, Firearms, and Explosives,[18] DOT,[19] and other codes. In contrast, the RMP involves several provisions that require stationary sources to develop and implement various practices based on process-specific analyses. EPA solicits comments, as well as supporting examples and information, on which approach—specific safe-handling codes or individualized engineering analyses—is better for regulating AN. The answer may somewhat depend on which sources are subject to regulation under CAA section 112(r)(7). A more standardized and specific list of safeguards (*e.g.,* do not store AN in containers made of combustible material; estimate the quantity present and ensure a minimal setback distance to public receptors based on a table of quantities and overpressures; *etc.*) may be simpler for a smaller business without a large safety staff, while the RMP approach may be more suitable for a chemical manufacturer that has AN among other chemicals and a dedicated safety staff. On the other hand, regulating reactives such as AN under 40 CFR 68 would have the benefit of allowing for the use of RAGAGEP, namely NPFA 400, the Hazardous Materials Code, which provides guidance for managing reactive hazards. EPA raises the question, is the authority for a prescriptive approach better under another program, statute, or agency?

EPA also raises the question, is the gap in public safety from the risks of AN less a matter of the codes that apply to AN handling, storage, and management and more a matter of communication among facilities, emergency responders, and the public? If the safety gap that needs to be filled is providing information to the public about the presence of AN, then is EPCRA's emergency planning program a better vehicle? The West and Weaver incidents were both subject to the chemical inventory and safety data information requirements of EPCRA. In posing this question, the Agency recognizes that various states restrict access to EPCRA information despite requirements for public access. If the public safety gap is primarily due to a lack of publicly available information about the presence of AN, and if changes to the Agency's statutory authority may be needed to adopt CSB's approach to listing reactive chemicals,

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[14] The Fertilizer Institute and the Agricultural Retailers Association, Safety and Security Guidelines for the Storage and Transportation of Fertilizer Grade Ammonium Nitrate at Fertilizer Retail and Distribution Facilities (2018), *https://www.tfi.org/sites/default/files/tfi-ara_ammonium_nitrate_guidelines_final_for_print_-_may_17_-_km_0.pdf.*

[15] ResponsibleAg, accessed February 25, 2022, *https://www.responsibleag.org/.*

[16] 29 CFR 1910.109

[17] 6 CFR 27

[18] 27 CFR 555.206(c)(2)

[19] 46 CFR 148

then, are amendments to EPCRA that address public information access more appropriate than amending the list and threshold provisions of CAA section 112(r) to accomplish public access through the RMP?

3. Issues in listing reactive substances

In addition to specific considerations for AN, EPA is seeking comment and updated information on integrating management of reactive hazards under 40 CFR part 68. The following describes prior reactives hazards incidents, what a potential revision to 40 CFR part 68 incorporating reactives might consist of, and a request for comments on additional considerations.

A 2002 CSB report noted 167 incidents between 1980 and 2001 that occurred because of uncontrolled, runaway reactions, 60 percent of which were not covered by the RMP program.[20] As a result, CSB recommended that EPA regulate reactive hazards under 40 CFR part 68.[21] Since CSB's 2002 recommendation, CSB has investigated incidents involving reactive chemicals and uncontrolled runaway reactions, including: the 2002 fire and explosion at the First Chemical Corporation facility in Pascagoula, Mississippi;[22] the 2004 release of toxic allyl alcohol at MFG Chemical in Dalton, Georgia;[23] the 2007 flammable vapor release and explosion at Synthron, LLC in Morgantown, North Carolina;[24] the 2007 explosion and fire at T2 Laboratories in Jacksonville, Florida;[25] the 2008 explosion and fire at the Bayer CropScience facility in Institute, West Virginia;[26] the 2013 fire and explosion involving ammonium nitrate at the West Fertilizer Company in West, Texas;[27] and the 2017 combustion of 350,000 pounds of organic peroxides following Hurricane Harvey at the Arkema Crosby facility in Crosby, Texas.[28] EPA believes these accidents are likely an undercount of the number of annual reactive incidents, as CSB investigates only a small portion of the average 1.5 incidents per day reported to its Incident Screen Database.[29]

In response to a recommendation from CSB,[30] EPA integrated a question into its RMP submission process that allows responders to note if an accidental release event involved an uncontrolled or runaway reaction. Since 2004, 25 incidents have resulted in RMP-reportable accidents, with the majority of these occurring in process vessels (60 percent, n = 15).

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[20] CSB, "Improving Reactive Hazard Management," last modified September 17, 2002, *https://www.csb.gov/improving-reactive-hazard-management/.*

[21] 2001-01-H-3: Revise the Accidental Release Prevention Requirements, 40 CFR 68, to explicitly cover catastrophic reactive hazards that have the potential to seriously impact the public, including those resulting from self-reactive chemicals and combinations of chemicals and process-specific conditions. Take into account the recommendations of this report to OSHA on reactive hazard coverage. Seek congressional authority if necessary to amend the regulation.

[22] CSB, "First Chemical Corp. Reactive Chemical Explosion," last modified October 15, 2003, *https://www.csb.gov/first-chemical-corp-reactive-chemical-explosion/.*

[23] CSB, "MFG Chemical Inc. Toxic Gas Release," last modified April 11, 2006, *https://www.csb.gov/mfg-chemical-inc-toxic-gas-release/.*

[24] CSB, "Synthron Chemical Explosion," last modified July 31, 2007, *https://www.csb.gov/synthron-chemical-explosion/.*

[25] CSB, "T2 Laboratories Inc. Reactive Chemical Explosion," last modified September 15, 2009, *https://www.csb.gov/t2-laboratories-inc-reactive-chemical-explosion/.*

[26] CSB, "Bayer CropScience Pesticide Waste Tank Explosion," last modified January 20, 2011, *https://www.csb.gov/bayer-cropscience-pesticide-waste-tank-explosion/.*

[27] CSB, "Completed Investigations," accessed March 21, 2022, *https://www.csb.gov/investigations/completed-investigations/?F_InvestigationId=3577.*

[28] CSB, "Arkema Inc. Chemical Plant Fire," last modified May 24, 2018, *https://www.csb.gov/arkema-inc-chemical-plant-fire-/.*

[29] Anenberg, S.C., & Kalman, C., "Extreme Weather, Chemical Facilities, and Vulnerable Communities in the US Gulf Coast: A Disastrous Combination," *GeoHealth,* 3, no.5 (2019), pp. 122–126.

[30] 2001-01-H-4: Modify the accident reporting requirements in RMP* Info to define and record reactive incidents. Consider adding the term "reactive incident" to the four existing "release events" in EPA's current 5-year accident reporting requirements (Gas Release, Liquid Spill/Evaporation, Fire, and Explosion). Structure this information collection to allow EPA and its stakeholders to identify and focus resources on industry sectors that experienced the incidents; chemicals and processes involved; and impact on the public, the workforce, and the environment.

These 25 uncontrolled or runaway reaction accidents have a value in column X of the Appendix A, tab "All_accidents_2004_2020". From this subset of accidents, EPA identified those occuring in process vessels as having a "1" in column AA of the same tab of Appendix A. Below are the entry descriptions from the RMPEM.

> *Uncontrolled/Runaway Reaction: An indication that the release event involved an uncontrolled or runaway reaction. A release event caused by an uncontrolled chemical reaction that generates excessive heat, pressure, or harmful reaction products. Such events may involve highly exothermic chemical reactions, self-reactive substances (e.g., substances that undergo polymerization), unstable, explosive, or spontaneously combustible substances, substances that react strongly with water or other contaminants, oxidizers, peroxide-forming substances, or other types of chemical reactions that generate harmful products or byproducts. This category of release event may often occur in conjunction with one of the previous categories. In such cases, be sure to check this category in addition to any other applicable release event category (e.g., explosion). The burning of ordinary flammable substances is not typically included in this category.*
>
> *Process Vessel: A process vessel is a container in which regulated substances are manufactured, reacted, or mixed.*

Given that EPA does not regulate reactive hazards or substances, it is not surprising that only a small portion of RMP-reportable accidents are actually reported. Although EPA has not promulgated regulations addressing reactive hazards, EPA has undertaken other initiatives, such as involving collaboration with industry and OSHA to provide safety workshops on reactive chemicals, a free software program to identify chemical reactivity hazards (CAMEO[31]), and working with CCPS, who developed industry guidance for managing chemical reactivity hazards. In 2014, EPA sought comments on information relating to the regulation of reactive hazards under RMP.[32]

In addressing reactive hazards under 40 CFR part 68, EPA would need to consider how to add reactives under various parts including: 40 CFR 68.65 ("Process Safety Information"); 40 CFR 68.67 ("Process Hazard Analysis"); 40 CFR 68.50 ("Hazard Review"); 40 CFR 68.22 ("Offsite Consequence Analysis Parameters"); 40 CFR 68.25 ("Worst-Case Release Scenario Analysis"); 40 CFR 68.28 ("Alternative Release Scenario Analysis"); and 40 CFR part 68, subpart F ("Regulated Substances for Accidental Release Prevention").

In formulating a potential path forward for addressing reactive hazards in 40 CFR part 68, EPA can look to New Jersey's Toxic Catastrophe Prevention Act (TCPA), which already regulates reactive hazards. The New Jersey Administrative Code (NJAC), which incorporates by reference 40 CFR part 68, regulates both individual reactive hazards and reactive mixtures through functional groups as part of NJAC 7:31 TCPA Rules.[33] NJAC 7:31-1.5 defines a "reactive hazard substance" (RHS) as an EHS or combination of substances that is capable of producing toxic or flammable EHSs or undergoing unintentional chemical transformations producing energy and causing an extraordinarily hazardous accident risk. Additionally, NJDEP regulates reactive hazard substance mixtures, which it defines as a combination of substances that are intentionally mixed in a process vessel and are capable of undergoing an exothermic chemical reaction that produces toxic or flammable EHSs or energy. These RHS mixtures must consist of a reactant, product, or byproduct that is a chemical substance or a mixture of substances having one or more chemical functional groups specified in NJAC 7:31-6.3 (a), Table I, Part D, Group II. NJAC also defines

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[31] National Oceanic and Atmospheric Administration, "CAMEO Chemicals," accessed March 21, 2022, *https://cameochemicals.noaa.gov/.*

[32] EPA-HQ-OEM-2014-0328.

[33] NJDEP, "NJAC 7.31—Toxic Catastrophe Prevention Act Rules," last modified January 27, 2022, ***https://www.nj.gov/dep/rules/njac7_31.html.***

a functional group in 7:31-1.5 as a group of chemical compounds that have similar structural and/or molecular features that impart similar physical characteristics to the compounds in that group.

In response to its 2014 RFI,[34] EPA received thorough comments from NJDEP regarding the TCPA and how NJDEP approached regulating reactive hazards. In looking at potential sources for "Process Safety Information" (68.65), CSB recommended that EPA require owners/operators to consult multiple sources of information to understand and control potential reactive hazards.[35] CSB suggested that these resources could include Bretherick's "Handbook of Reactive Chemical Hazards;" Sax's "Dangerous Properties of Industrial Materials;" ASTM International's CHETAH Software; the National Oceanic and Atmospheric Administration's "Chemical Reactivity Worksheet;" chemical safety data sheets (SDSs); chemical reactivity test data produced by employers or obtained from other sources; and incident reports. Regarding process hazard analyses, CSB suggested augmenting 40 CFR 68.67 to explicitly require an evaluation of factors contributing to reactive hazards, including rate and quantity of heat or gas generated; maximum operating temperature; thermal stability of reactants, byproducts, and products; and consequences of runaway reactions.[36]

In classifying reactive hazard substances that may cause an accident, NJDEP identified the two most common scenarios for reactive incidences.[37] Under the first scenario, the release is attributable to the inherent properties of the chemical; in other words, the chemical is unstable, self-reacting, or may react when exposed to air or water. Under the second scenario, the accident results by intentional mixing of two or more chemicals in a process. NJDEP outlined for EPA a detailed process whereby it determined which reactive substances are likely to be involved in these two scenarios and result in accidents with offsite consequences. For the first scenario, NJDEP focused on NFPA Level 4 unstable substances, which are defined as materials capable of detonation, explosive decomposition or explosive reaction at normal temperatures and pressures, including water reactive substances. NJDEP also reviewed DOT's "Hazardous Materials Table" at 49 CFR 172, focusing on 172.101, Class 4, Divisions 4.1, 4.2, and 4.3. NJDEP evaluated these lists for their potential impact on health and public impacts using the list of functional groups that present an inherent hazard or when reacted with other chemicals in L. Bretherick's "Handbook of Reactive Chemical Hazards."[38] NJDEP also added several chemicals based on prior accident history. The final list of substances and functional groups are listed in Table 1, part D, Group 1, "List of Individual Reactive Hazard Substances," NJAC 7:31-6.3(a). NJDEP determined thresholds based on the amount of reactive hazard needed to impact the public beyond an assumed property boundary of 100 meters using an overpressure value of 2.3 pounds per square inch (psi)—the average distance from the covered process to the property line for New Jersey facilities. NJDEP chose a pressure of 2.3 psi because, at this pressure, the damage to nearby buildings and structures would be severe enough to cause serious injuries. NJDEP then used these values in a trinitrotoluene (TNT) equivalency method to calculate thresholds for unintentional reactions. EPA currently uses this TNT equivalency method in its guidance document for offsite consequences of flammable substance explosions[39]. NJDEP selected a value of 28 percent of the heat of combustion, as the ratio of energy explosion to heat of combustion for many highly reactive substances (e.g., TNT) is 28 percent. The result of NJDEP's calculations was a threshold quantity of 2,500 pounds for all but three substances. Finally, for the second scenario involving intentional mixtures, NJDEP chose functional groups listed in Table 1, Part D, Group II at NJAC 7:31-6.3(a). For intentional mixtures involving at least one chemical containing Group II listed function groups,

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[34] EPA-HQ-OEM-2014-0328.

[35] EPA-HQ-OEM-2014-0328-0689.

[36] EPA-HQ-OEM-2014-0328-0689.

[37] EPA-HQ-OEM-2014-0328-0338.

[38] Bretherick, L., *Handbook of Reactive Chemical Hazards, 6th Edition* (1999).

[39] EPA, *General Risk Management Programs Guidance, Ch. 4: Offsite Consequence Analysis* (2004), p. 4-10, *https://www.epa.gov/sites/default/files/2013-11/documents/chap-04-final.pdf.*

owners/operators must test to determine the heat of reaction, with threshold quantity based on using the TNT equivalency with a 100 percent yield factor.

With respect to reactive chemicals, EPA seeks public input on several issues that it would want to assess prior to any proposal. Should the Agency prioritize categories of reactive chemicals based on accident history? Is the approach suggested by CSB consistent with EPA's statutory authority?[40] Would an approach like the New Jersey TCPA uses for reactive mixtures be consistent with CAA 112(r)(3)-(5)? Under CAA section 112(r), is the appropriate authority for chemicals that only become hazardous due to site-specific and process-specific conditions the GDC under CAA section 112(r)(1) rather than the RMP rule? On the other hand, are chemicals that can only be handled safely under active controls like refrigeration, such as the organic peroxides involved in the fire at Arkema-Crosby,[41] a greater priority for listing than other reactive chemicals that may release when present with incompatible materials?

B. Fenceline Monitoring

Fenceline communities most at risk from the effects of chemical accidents have indicated that they are not prepared for an accidental release, citing a lack of knowledge about the chemicals. The following section lays out considerations for a potential RMP facility fenceline air monitoring program requirement, including a summary of public comments EPA has received about the issue, examples of existing fenceline monitoring programs, challenges for a regulatory program, and general costs and benefits of such a program.

1. Summary of Public Comments

EPA solicited comment on the potential for a fenceline monitoring program under the RMP rule in 2014.[42] EPA also received public comments on fenceline air monitoring during the 2021 listening sessions as part of a more general effort to solicit public feedback on the RMP regulations.[43]

a. 2014 RFI

Some commenters were generally supportive of establishing a fenceline air monitoring program.[44] Other commenters specified that support would be contingent upon the program being technically feasible and cost effective.[45] CSB highlighted the benefits of perimeter monitoring for identifying fugitive emissions and alerting nearby communities to potential offsite effects, citing the BP Texas City, Bayer, Millard Refrigerated Services, and DuPont Belle incident reports. [46] [47] [48] [49] [50]

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40 Potentially relevant to this issue is the discussion in the Senate's report on its version of the Clean Air Act Amendments of 1990 regarding adopting a criteria-based approach to listing. See Senate Report No. 101-549 (November 15, 1990), p. 220. Is the statute as enacted flexible enough for the suggested but not mandated approach outlined by the Senate?

41 CSB, "Arkema Inc. Chemical Plant Fire," last modified May 24, 2018, *https://www.csb.gov/arkema-inc-chemical-plant-fire-/.*

38 *Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act,* section 112(r)(7); Rule Modernization Under Executive Order 13650; Request for Information; EPA-HQ-OEM-2014-0328.

43 *Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act*, section 112(r)(7); Rule Retrospection Under Executive Order 13990; Virtual Public Listening Sessions; Request for Public Comment; EPA-HQ-OLEM-2021-0312.

44 EPA-HQ-OEM-2014-0328-0579; 0546, 0588, 0680, 0689, 0690.

45 EPA-HQ-OEM-2014-0328-0121; 0638, 0616.

46 EPA-HQ-OEM-2014-0328-0689.

47 CSB, "BP America Refinery Explosion," last modified March 20, 2007, *https://www.csb.gov/bp-america-refinery-explosion/.*

48 CSB, "Bayer CropScience Pesticide Waste Tank Explosion," last modified January 20, 2011, *https://www.csb.gov/bayer-cropscience-pesticide-waste-tank-explosion/.*

49 CSB, "DuPont Corporation Toxic Chemical Releases," last modified September 20, 2011, *www.csb.gov/dupont-corporation-toxic-chemical-releases/.*

50 CSB, "Millard Refrigerated Services Ammonia Release," last modified January 15, 2015, *https://www.csb.gov/millard-refrigerated-services-ammonia-release/.*

Numerous commenters were supportive of fenceline monitoring requirements under the RMP rule and/or offered suggestions for structuring a regulatory requirement for fenceline monitoring. There were concerns that broad monitoring requirements would not appropriately address the many facility- and chemical-specific elements of a potential fenceline monitoring program.[51] Other commenters were concerned about the costs and that implementing broad, general requirements for monitoring systems for a large number of facilities would make them more expensive and less effective.[52] Stakeholders recommended a risk-based approach to ensure facilities would have adequate monitoring to fit their specific needs.[53] One idea was to base installation of monitors or sensors on the results of PHAs.[54]

Key feedback addressed the real-time monitoring component of a fenceline air monitoring program. Stakeholders provided input on who should have access to real-time monitoring data. Some commenters felt that this information should be communicated to health care providers, emergency responders, and the public.[55] CSB cited the DuPont Belle facility releases as an example of delays in promptly sharing critical information with the community.[56] [57] Commenters stated that monitoring data should be continuous so that releases can be identified.[58]

Other commenters raised concerns about the inherent value of fenceline monitoring compared with process monitoring, which is specifically focused on preventing releases.[59] [60] Commenters felt the monitoring already required under existing state/federal regulations and through permits was enough to prevent major releases. For example, commenters argued EPA already had in place a robust set of requirements, including rules involving the use of detection methodologies to provide early warning of releases, as part of its comprehensive PHA requirements in 40 CFR 68.67(c)(3). Commenters stated that additional requirements under the RMP rule would duplicate existing ones. For example, commenters pointed out that automated monitoring is already required by the leak detection and repair provisions of multiple MACT standards and NSPS rules, as well as many Title V permits, and can fall under the PHA component of PSM standards.[61] Others argued that regulations would be too confusing because of exceptions and exemptions that they believe would be required for facilities under specific circumstances.[62] It was suggested that the RMP rule should remain performance-based and not have specific monitoring requirements and that facilities should opt to install monitors based on industry standards and guidelines, not regulatory restrictions.[63]

Commenters also expressed concerns about the high costs of fenceline air monitoring systems, stating that systems are costly to install and that retrofitting a facility with sensors is more expensive than incorporating them into a new facility.[64] Commenters noted that an air monitoring program could involve

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51 EPA-HQ-OEM-2014-0328-0560; 0617.

52 EPA-HQ-OEM-2014-0328-0543.

53 EPA-HQ-OEM-2014-0328-0543; 0584, 0609, 0614, 0632, 0646, 0663, 0689.

54 EPA-HQ-OEM-2014-0328-0121; 0548, 0614, 0616, 0626, 0633, 0691.

55 EPA-HQ-OEM-2014-0328-0579; 0121, 0680, 0689.

56 CSB, "DuPont Corporation Toxic Chemical Releases," last modified September 20, 2011, *www.csb.gov/dupont-corporation-toxic-chemical-releases/.*

57 EPA-HQ-OEM-2014-0328-0689.

58 EPA-HQ-OEM-2014-0328-0546; 0680, 0689.

59 EPA-HQ-OEM-2014-0328-0560.

60 EPA-HQ-OEM-2014-0328-0121.

61 EPA-HQ-OEM-2014-0328-0560; 0616, 0617, 0667.

62 EPA-HQ-OEM-2014-0328-0616.

63 EPA-HQ-OEM-2014-0328-0605; 0624.

64 EPA-HQ-OEM-2014-0328-0616; 0621,0629, 0638, 0640, 0665.

thousands of sensors and miles of connectors to create a fenceline monitoring network, with high costs for sensor upkeep and maintenance that could be burdensome for small- or medium-sized facilities.[65]

EPA also received comments about the availability and challenges of fenceline monitoring technology. Commenters stated that sensors do not exist for many RMP-regulated substances and that appropriate industry standards have likewise not been developed for fenceline detection of many RMP substances.[66] Commenters also expressed concerns about the reliability of data from monitors located outdoors and questioned whether sensors would effectively detect releases because of environmental variables such as wind, humidity, and temperature.[67] Some commenters felt the data should only be used as an internal alert system for the facility and not be publicly available.[68] In contrast, CSB[69] provided several examples of petrochemical facilities where fenceline monitoring systems are successfully operating: Phillips 66 Rodeo refinery,[70] Chevron's Richmond California Refinery,[71] and BP's Whiting, Indiana, facility.[72] A company also submitted an example of their interface that automatically connects data from monitors with stakeholders and emergency operators.[73]

b. 2021 Virtual Public Listening Sessions and Request for Public Comment

During the summer 2021 listening sessions, EPA received numerous public comments expressing support for an RMP fenceline air monitoring requirement.[74] Stakeholders felt that fenceline monitoring could provide early warnings about an incident, give people information about the specific chemical to which they have been exposed, and potentially save lives, with commenters citing the 2012 fire at the Chevron refinery in Richmond, California as an example of the consequences of air pollution from industrial accidents.[75] [76] Commenters emphasized their concerns about the lack of available air monitoring data and the need for data for people to determine if they have been exposed to an RMP-regulated chemical. Commenters also pointed out that smaller releases are often a leading indicator of a future major accident; consequently, their detection is important in identifying facilities at risk.[77]

EPA received public comments offering specific suggestions for implementing a fenceline air monitoring program. Commenters felt that fenceline monitoring should be required at facilities with previous incidents as well as facilities with multiple regulated processes.[78] Commenters stated that EPA should expand benzene fenceline monitoring requirements—currently regulated for petroleum refineries under EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) program—to other toxic air pollutants.[79] Commenters pointed out that no current regulations require real-time fenceline monitoring data for hazardous substances to be reported to nearby communities.[80] Commenters stated that air

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65 EPA-HQ-OEM-2014-0328-0560; 0614, 0616, 0675.

66 EPA-HQ-OEM-2014-0328-0614; 0616, 0621, 0633, 0638, 0640, 0665, 0675, 0691, 0624.

67 EPA-HQ-OEM-2014-0328-0616; 0633, 0640, 0665, 0675, 0691.

68 EPA-HQ-OEM-2014-0328-0546; 0548, 0584, 0605, 0616, 0617, 0667.

69 EPA-HQ-OEM-2014-0328-0689.

70 Argos Scientific, "Phillips 66 Rodeo Refinery Fenceline Data," accessed March 7, 2022, *https://www.fenceline.org/rodeo/data.php.*

71 Chevron Richmond, Richmond Air Monitoring, accessed March 7, 2022, *https://www.richmondairmonitoring.org/.*

72 AECOM, "BP Refinery Whiting, Indiana," accessed March 7, 2022, *http://raqis.aecomonline.net/pls/raqis/bpw.whiting.*

73 EPA-HQ-OEM-2014-0328-0680.

74 EPA-HQ-OLEM-2021-0312-0035; 0170, 0149, 0040, 0034, 0148, 0080, 0043, 0388.

75 EPA-HQ-OLEM-2021-0312-0170.

76 See CSB, "Chevron Refinery Fire," last modified January 28, 2015, *https://www.csb.gov/chevron-refinery-fire/* for a description of the incident.

77 EPA-HQ-OEM-2014-0328-0689.

78 EPA-HQ-OLEM-2021-0312-0035.

79 EPA-HQ-OLEM-2021-0312-0170.

80 EPA-HQ-OLEM-2021-0312-0094.

monitoring should incorporate Federal Reference Methods, seek community input on monitor placement, and remain operational during crises and natural disasters.[81] [82] Many commenters referenced Hurricane Harvey as an example of when air monitors were turned off in advance of the disaster.[83] Finally, commenters stated that, in addition to mandates, EPA should provide guidance on appropriate monitoring techniques, such as where to place monitoring devices.[84] Stakeholders offered input on monitoring systems and data availability, stating that monitoring data should be reported in real time, posted on the facility's website, and available to EPA, first responders, and the public.[85]

2. Authority for Fenceline Air Monitoring Under the RMP

EPA has the authority to require monitoring under CAA sections 112(r)(7)(A) and 112(r)(7)(B). In CAA section 112(r)(7)(A), EPA is specifically given authority "to promulgate release prevention, *detection, and correction* requirements which may include *monitoring*" (emphasis added).

In CAA section 112(r)(7)(B)(i), EPA is given authority to issue "reasonable regulations" for the "prevention and detection of accidental releases" and for the responses to such releases by owners and operators of stationary sources. Fenceline monitors would fall under a type of equipment to monitor such accidental releases.

3. Examples of Fenceline Air Monitoring Programs

a. EPA's Refinery Sector Risk and Technology Review and NSPS

Commenters cited EPA's NESHAP for Petroleum Refineries Sector Risk and Technology Review requiring fenceline monitoring of benzene for petroleum refineries. On September 29, 2015, EPA issued a final rule that requires petroleum refineries to monitor benzene concentrations around their fencelines.[86] Monitors must encircle the facility so that sources of pollution can be identified under any wind direction. Implementation of the regulation has resulted in the identification and mitigation of emissions that were previously not fully understood and not characterized in emission inventories.

EPA points out several issues with benzene fenceline monitoring requirements that would need to be addressed for an RMP fenceline air monitoring program. First, the monitoring requirements are not real time and are instead based on average concentrations of emissions over a 2-week sampling period; therefore, they are not suitable for emergency response purposes. In its 2015 final rule (80 FR 75254), EPA discussed that, at the time, there were not commercially available, real-time open path monitors capable of detecting benzene at the concentrations necessary to demonstrate compliance with fenceline requirements. EPA did not propose real-time open-path systems, as the real-time systems reviewed were less sensitive than the 9 $\mu g/m^3$ "Action Level"—the level sensitive enough to detect 9 $\mu g/m^3$. This action level was established based on petroleum refinery emissions inventories and was intended to trigger investigative action, including an RCA and correction of fugitive emissions. EPA currently requires passive tube monitoring, as this allows a larger spatial coverage, offers more sensitive detection capabilities, can be applied continuously, and is low cost and easily implemented. Additionally, benzene is a well-known carcinogen, and it is important to note the varying regulatory authorities of hazardous air pollutants and the EPA Risk Management Program. Hazardous air pollutant regulations are intended to

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[81] *Federal reference method* means a method of sampling and analyzing the ambient air for an air pollutant that is specified as a reference method in an appendix to 40 CFR part 50, or a method that has been designated as a reference method in accordance with 40 CFR part 50.

[82] EPA-HQ-OLEM-2021-0312-0040.

[83] EPA-HQ-OLEM-2021-0312-0040; 0035.

[84] EPA-HQ-OLEM-2021-0312-0072.

[85] EPA-HQ-OLEM-2021-0312-0035; 0170, 0149, 0040, 0034, 0148, 0080, 0043, 0388.

[86] Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 80 FR 74965, p. 75178 (December 1, 2015) (codified at 40 CFR part 63, subpart CC).

reduce cancer risk and address chronic exposures, while the RMP regulation has the authority to prevent accidents and mitigate accident consequences.

b. State and Local Government Regulations

California Health and Safety Code section 42705.6 requires petroleum refineries to install fenceline monitoring systems and, to the extent that is feasible, make the data publicly available as quickly as possible.[87] California Air Quality Management Districts (AQMD) were charged with determining which compounds to measure. For example, in 2017, the South Coast AQMD adopted Rule 1180, which required the seven petroleum refineries in its jurisdiction to install and operate real-time fenceline air monitoring systems to measure two criteria pollutants (sulfur dioxide and nitrogen oxides), six volatile organic compounds, and six other compounds, including hydrogen fluoride.[88] The regulation relies upon reference exposure levels established by the California Office of Environmental Health Hazard Assessment for acute and chronic exposures. Real-time data can be accessed through a government website.[89] The Bay Area AQMD has a similar program for its petroleum refineries.[90]

Two states have initiated steps to creating fenceline monitoring programs, though the programs have yet to be implemented. In 2021, the Maine legislature passed an act that requires fenceline monitoring for above-ground petroleum storage tanks 39,000 gallons or larger.[91] The act stipulates that continuous monitoring data are required to be collected by a third party and reported to Maine's Department of Environmental Protection. The Department will make the data available on a publicly accessible website. As a first step, the act set a March 2022 deadline for the Department to submit a report on recommendations for implementing the program. Also in 2021, Colorado passed House Bill 21-1189.[92] This act applies to stationary sources that reported at least 10,000 pounds of hydrogen cyanide, 5,000 pounds of hydrogen sulfide, or 5,000 pounds of benzene in 1 year in their federal toxics release inventory filing.[93] It requires them to conduct real-time fenceline monitoring of covered air toxics and publicly report the results in real time. Monitoring is required to begin on January 1, 2023, for petroleum facilities and on January 1, 2024, for all other covered facilities.

c. Fenceline Monitoring at Individual Facilities

In addition to those subject to the California requirements, fenceline monitoring has been implemented at other facilities in the United States. For example, the public can access real-time or near real-time monitoring information from BP's Whiting Indiana Facility.[94] Several non-real-time passive fenceline monitoring programs have been established through enforcement actions for benzene such as Shell's Norco Manufacturing Complex in Louisiana and four ExxonMobil facilities: Baytown Chemical Plant in Texas, Baytown Olefins Plant in Texas, Beaumont Chemical Plant in Texas, and Baton Rouge Chemical

[87] California Health and Safety Code section 42705.6, *https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=26.&title=&part=4.&chapter=5.&article=.*

[88] *See* South Coast AQMD, *Refinery Fenceline and Community Air Monitoring,* Rule 1180 (December 2017), *http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1180.pdf.*

[89] South Coast AQMD, "Rule 1180 Community Air Monitoring," last updated February 2, 2022, *http://www.aqmd.gov/home/rules-compliance/rules/support-documents/rule-1180-refinery-fenceline-monitoring-plans/rule-1180-community-air-monitoring.*

[90] Bay Area AQMD, "Fenceline Monitoring Plans," last updated July 6, 2021, *https://www.baaqmd.gov/plans-and-climate/emission-tracking-and-monitoring/fenceline-monitoring-plans.*

[91] Maine Legislature, *License Terms,* Maine statute title 38, section 590 (2021).

[92] Colorado House Bill 21-1189 (2021), *https://leg.colorado.gov/sites/default/files/2021a_1189_signed.pdf.*

[93] *Protection of Environment,* 40 CFR part 372 (February 16, 1988).

[94] AECOM, "BP Refinery Whiting, Indiana," accessed March 7, 2022, *http://raqis.aecomonline.net/pls/raqis/bpw.whiting.*

Plant.[95] [96] [97] [98] [99] Bi-weekly air samples are collected, analyzed for benzene, and then posted to public websites. EPA seeks comment on whether the thresholds and reporting of substances by these facilities could be replicated and whether they have contributed to better community emergency response and preparedness.

4. Opportunities for a Fenceline Air Monitoring Program Under the RMP Rule
A significant consideration when creating a fenceline air monitoring regulatory program for RMP is the inherent value of process monitoring (*i.e.,* sensors placed near facility equipment to detect leaks) versus fenceline monitoring for RMP-regulated substances. Process monitoring assists in preventing accidents and warning communities because it takes place close to the release source and can quickly trigger an alarm. For example, flammable RMP-regulated substances are listed in 40 CFR 68.130 based on their capability to create a vapor cloud explosion. To create a vapor cloud capable of exploding, both a high concentration of the chemical and an ignition source are needed, conditions likely to be found near the leak versus at the perimeter of a facility. Other RMP substances are regulated for their acute toxicity. Process monitoring near the source would detect high concentrations faster—concentrations that may be below an acute toxicity threshold by the time the substance reaches a fenceline monitoring system. For both RMP flammable and toxic substances, knowing the concentration remaining in the community after an event could be useful in determining when it is safe to reenter, but this may be more efficiently accomplished by using response equipment rather than fixed fenceline monitors. Process monitoring can also generally help to reduce emissions by providing better LDAR capability.[100] Although the current RMP regulation requires facility owners or operators to collect information and evaluate how they will detect releases at their facility, given RMP is a performance-based standard, it does not specify detection requirements, technological or otherwise. The RMP regulation allows facilities to identify the most effective method of detecting releases of their specific substances, from their specific process operations, based on recognized and generally accepted good engineering practices. EPA seeks comment on the value and benefits of real-time process monitoring versus fenceline monitoring. Also see section IV.B.1.b of the proposal for specific questions on proposed updates to the RMP process monitoring reporting requirements.

Despite these limitations, stakeholders and EPA believe there could be value in a fenceline air monitoring program. The intent of fenceline monitoring under the RMP program would be to identify emissions that are crossing the facility's boundary and entering the adjacent community. While process monitoring can identify significant localized leaks capable of causing a catastrophic disaster, fenceline monitoring is designed to look more holistically at the emissions escaping the facility.

Following implementation of EPA's benzene fenceline monitoring requirements for petroleum refineries, a study of 100 petroleum refineries across the nation found that 10 refineries exceeded the EPA action level for benzene.[101] Exceedances ranged from 11 to 444 percent above the allowed average benzene action level of 9 $\mu g/m^3$ of air over a 1-year period.[102] Although the data are average concentrations over

95 Shell, "Benzene Fenceline Monitoring Program," accessed March 7, 2022, *https://www.shell.us/about-us/projects-and-locations/norco-manufacturing-complex/benzene-fenceline-monitoring-program.html.*

96 ExxonMobil, "Baytown Complex," accessed March 7, 2022, *https://complex.fencelinemonitoring.exxonmobilbaytown.com/en/.*

97 ExxonMobil, "Baytown Olefins Plant," accessed March 7, 2022, *https://olefins.fencelinemonitoring.exxonmobilbaytown.com/en/.*

98 ExxonMobil, "Beaumont Chemical," accessed March 7, 2022, *https://chemical.fencelinemonitoring.exxonmobilbeaumont.com/en/.*

99 ExxonMobil, "Baton Rouge Chemical Plant," accessed March 7, 2022, *https://chemical.fencelinemonitoring.exxonmobilbr.com/en/.*

100 *https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=CEMM&dirEntryId=350905.*

101 Environmental Integrity Project, *Monitoring for Benzene at Refinery Fencelines* (2020), *https://environmentalintegrity.org/wp-content/uploads/2020/02/Benzene-Report-Final-2.7.20.pdf.*

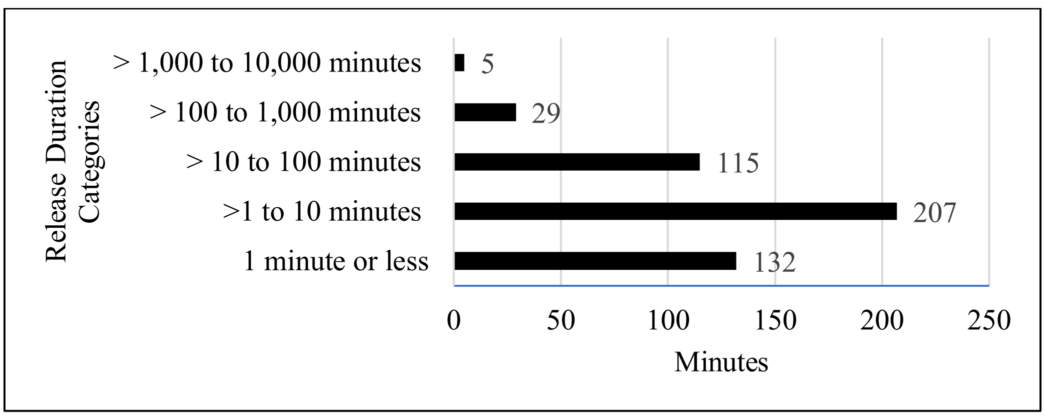
102 The 9 micrograms per cubic meter of air action level is measured as an annual average of only the facility's contribution [the highest benzene concentration minus the background level (lowest benzene concentration measurement)].

2-week sampling periods, they demonstrate that emissions can reach the fenceline and that fenceline monitoring has value in identifying otherwise undetected emissions.

Finally, to understand the extent to which fenceline monitoring would potentially provide useful data to communities, EPA analyzed the average duration of reported RMP accidental releases. RMP accident data from the 488 reported releases that occurred from 2016 to 2020 show that about 30 percent (149 facilities) of RMP accidents persisted for more than 10 minutes in duration. For the 70 percent (339 facilities) of releases that lasted 10 minutes or less, it would be especially important to quickly communicate information to the facility, first responders, and affected community members. Any delay for these short-duration releases could result in people receiving the warning after the danger has passed.

> **These data can be reproduced by categorizing the accident release durations in column S of Appendix A, tab "All_accidents_2004_2020" for all accidents between January 1, 2016, and December 31, 2020. A summary is provided in Chart 1.**

Chart 1. RMP-reportable Accident Release Durations 2016-2020 (488 accidents)



5. Potential Challenges for a Regulatory Fenceline Air Monitoring Program

EPA has identified challenges and options for potentially designing a fenceline air monitoring program for RMP. Many of these challenges and options come from the contributions of public commenters. Though commenters recommended a real-time, fenceline monitoring program[103], EPA seeks specific comments on how it would implement such a program, particularly given the 140 substances regulated under RMP and the diverse types of facilities regulated. Commenters assume that real-time monitoring technology exists for all—or even a portion of—RMP-regulated chemicals, without providing any information as to whether this technology is commercially available.[104] EPA believes it is unlikely any implemented program will cover all substances and all facilities, but rather, seeks targeted information on which substances and which facilities would result in the greatest prevention of chemical accidents. To that end, EPA seeks comment on information, circumstances, and chemicals wherein real-time information has been used to "prevent the accidental release and to minimize the consequences of any such release," which is EPA's authority for the RMP regulation under CAA section 122(r)(1).

a. Whom to Regulate

First, EPA seeks comment on the regulated entities and surrounding communities that would benefit most from a fenceline air monitoring program, as such a program may be better suited to some types of

[103] EPA-HQ-OEM-2014-0328-0579; 0546, 0588, 0680, 0689, 0690; EPA-HQ-OEM-2021-0312; 0034, 0035, 0040, 0043, 0080, 0148, ,0149, 0170, 0388.

[104] EPA-HQ-OEM-2014-0328-0121; 0616, 0638.

facilities. For example, the benefits of detecting releases at high-hazard facilities—such as petroleum refineries, Program 3 RMP facilities, or other facilities with histories of releases—may be high because these facilities potentially pose greater hazards to their communities than other types of facilities.

b. Manned Versus Unmanned Facilities

In developing a fenceline air monitoring program, EPA seeks information on considerations for the conditions of remote unmanned facilities. EPA assumes that the approaches for manned versus unmanned facilities may need to differ, as unmanned facilities may be geographically remote. EPA notes that 10 percent (N = 1,190) of RMP-regulated facilities have only one or zero full-time employees, which EPA considers here as a proxy for an unmanned facility. In considering a fenceline monitoring program, EPA would need to review the locations of these facilities to determine if they are also geographically isolated.[105] EPA would also need to consider information on whether these sites may lack easy access to electricity to power a network of monitoring stations, as well as challenges to the ability to remotely control sensors that are geographically distant.[106]

c. Type of Monitoring

EPA seeks comment on the type of fenceline air monitoring program that it should implement and how EPA would implement such a program. While EPA has received comments stating that it should implement real-time fenceline monitoring, these comments have not addressed how this would be implemented. EPA is soliciting comment on whether facilities should be required to continuously monitor substances and share information as it is collected. One potential consideration to this approach is that real-time monitors are restricted by their detection limits and may not be able to detect substances at low concentrations. Would facilities only be triggered to record and report data when a concentration at or above a certain threshold is detected for the target chemical? If so, what thresholds should EPA use, particularly given that EPA's authority is for accidental releases, in which a higher threshold may be more appropriate than those for chronic health hazards? Should EPA rely on an already-established acute toxicity value as the threshold, or choose something lower so there is time to mitigate the release or take actions within the community before an acutely toxic concentration is reached? Would EPA rely upon the facility to establish a threshold, or are there thresholds that EPA would need to promulgate for each chemical? How would these thresholds compare to other release notification reporting programs? Additionally, is this type of monitoring available for the 140 RMP-regulated substances, or should EPA look into only a program that would regulate toxic substances, which may be more relevant for releases than flammable or explosive substances? Examples of potential thresholds for substances EPA could consider include Acute Exposure Guideline Levels[107] Level 1 criteria, Immediately Dangerous to Life and Health[108] values, and limits set by the American Conference of Governmental Industrial Hygienists[109] or OSHA.[110] Are there other metrics EPA should consider? How should EPA balance setting the threshold too low, triggering unneeded responses, with protecting fenceline communities? Should different thresholds also be considered for remote facilities versus ones immediately adjacent to a community? How should EPA consider the surrounding community in setting notification thresholds, and how would EPA adjust this parameter over time as the population may change?

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105 EPA-HQ-OEM-2014-0328-0121; 0680.

106 EPA-HQ-OEM-2014-0328-0617.

107 EPA, "Acute Exposure Guideline Levels for Airborne Chemicals," last modified August 12, 2021, *https://www.epa.gov/aegl.*

108 National Institute for Occupational Safety and Health, "Immediately Dangerous to Life or Health (IDLH) Values," last modified May 10, 2019, *https://www.cdc.gov/niosh/idlh/default.html*.

109 American Conference of Governmental Industrial Hygienists, *https://www.acgih.org/*.

110 EPA-HQ-OEM-2014-0328-0546; 0584.

d. Automatic Release Notifications

In the event a threshold could be established for regulated substances and the community should be notified, EPA seeks comment on potential notification requirements. If an alarm is triggered, it is important to quickly notify relevant parties of the potential release. However, there needs to be a balance between sharing the information in a way that benefits the community rather than causing unintended harm. A challenge would be to determine who would receive automatic notifications of releases. For example:

i. Facilities

Facilities may be best equipped to verify if a release is occurring, address it, and notify other relevant parties, if needed.

ii. LEPCs

Some LEPCs are well-equipped to address the specific needs of a chemical release at a facility whereas others are not, especially those in remote areas. However, LEPCs are generally positioned to effectively notify the public if evacuation or shelter-in-place measures are needed. CSB provides examples—DuPont's Belle, West Virginia facility[111] and Bayer CropScience's Institute, West Virginia facility[112]—where faster notifications to LEPCs would have been useful in addressing the releases.

iii. The public

CSB cites three examples where direct notifications to the public could have been useful in preventing injuries: DuPont's Belle, West Virginia facility; Bayer CropScience's Institute, West Virginia facility, and Millard Refrigerated Service's Theodore, Alabama facility.[113] [114] Although commenters request real-time monitoring data provided directly to the public, EPA seeks additional comment on how facilities would ensure that an increase in information directly to the public does not create complacency when notifications are provided for real emergencies. Given the short duration of accidental releases, EPA seeks comment on the appropriateness of only notifying the public when the nature of the accident does not allow for interim steps, and information that should be provided directly to the public. Additionally, EPA requests comment on how facilities would implement direct public notification, given that a facility cannot be the implementing authority for many of the commonly used community notification systems, such as the Federal Emergency Management Agency's Integrated Public Alert and Warning System.[115]

e. Quality Assurance of Real-Time Data

One of the challenges of publicly posting real-time data is ensuring its accuracy. Inaccurate data could lead to false alarms and unneeded panic in the community. Additionally, real-time active monitoring that provides interpretable, quantitative data may not be available for all substances. For data to be real-time, monitoring must be active, and EPA seeks comment on whether there is active monitoring for any of the 140 substances regulated by the RMP. EPA also seeks comment on whether owner/operators should provide direct concentration readings, and if so, how such concentrations should be interpreted (*i.e.,* against what threshold as described above). Furthermore, EPA seeks comment on how it would account for the performance of monitors in variable environmental conditions—such as wind, humidity, and

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[111] CSB, "DuPont Corporation Toxic Chemical Releases," last modified September 20, 2011, *https://www.csb.gov/dupont*-corporation-*toxic*-chemical-*releases/.*

[112] CSB, "Bayer CropScience Pesticide Waste Tank Explosion," last modified January 20, 2011, *https://www.csb.gov/bayer-cropscience-pesticide-waste-tank-explosion/.*

[113] CSB, "DuPont Corporation Toxic Chemical Releases," last modified September 20, 2011, *https://www.csb.gov/dupont-corporation-toxic-chemical-releases/.*

[114] CSB, "Millard Refrigerated Services Ammonia Release," last modified January 15, 2015, *https://www.csb.gov/millard-refrigerated-services-ammonia-release/.*

[115] FEMA IPAWS is the national system for community notification; *https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system.*

temperature—and how to verify the accuracy of the data. A fenceline air monitoring program will need to consider how to balance the benefits of real-time access to data with the consequences of data errors.

f. Monitoring Technologies and Standards

Technology is advancing quickly and new field-designed monitors are being developed, with monitors available to detect some substances such as benzene, butadiene, toluene, ethylbenzene, xylenes and other hazardous air pollutants.[116] [117] [118] However, to develop a fenceline monitoring provision, EPA would need to evaluate the accuracy, active versus passive ability, and feasibility of monitoring for all RMP-regulated substances. EPA seeks comment on how it would address requirements for the number of sensors that would be needed to accurately monitor the perimeter of a facility or process unit. Ultimately, a fenceline air monitoring program may need to focus on RMP-regulated substances where technologies exist and exclude substances without them. For substances with no currently available technology, how would EPA set about updating and revising monitoring thresholds and considering available technology? As commenters have suggested, are there industry standards that already address fenceline monitoring and placement of fenceline monitors for monitoring of acute accidental releases? If so, for which industries and substances does this exist, and what types of facilities are already implementing these requirements? It is important to reiterate that a monitoring program under EPA's RMP regulation will not mirror other EPA monitoring regulations because of its authority to prevent accidents and mitigate consequences.

6. Designing a Fenceline Air Monitoring Program

In the questions outlined above, EPA demonstrates that designing a fenceline air monitoring or process unit monitoring program for RMP-regulated substances requires far more information and study into the feasibility and applicability of such a program. Based on its initial review, EPA highlights what it might consider the most important aspects of a fenceline air monitoring or process unit monitoring program and requests comment on other aspects that are of concern for regulated facilities and their surrounding communities in proposing an air monitoring program.

First, EPA seeks comment on whether an initial fenceline air monitoring or process unit monitoring program should focus on a subset of high-toxicity substances with existing real-time monitoring technology, facilities with multiple sources, and Program 3 RMP facilities. For example, hydrofluoric acid (HF) is a highly toxic gas; EPA asks for information about the availability of real-time monitoring technology for HF or other toxic chemicals and comments on whether these would be appropriate substances for an air monitoring program. EPA also seeks comment on whether it should prioritize complex facilities with multiple processes, such as refineries or petrochemical plants. Finally, Program 3 RMP facilities already adhere to additional regulations under the RMP rule as they are subject to the OSHA PSM standard or classified in specific NAICS codes; EPA seeks comment on whether these facilities should be prioritized.

EPA seeks comment on the scope of substances that should be included in a fenceline or process unit monitoring program. As stated earlier, there are 140 substances regulated under the RMP; should air monitoring be required for all of them? Alternatively, what approach should EPA use to select a subset of substances for which a fenceline or process unit monitoring program would be beneficial to nearby communities? For example, EPA could prioritize substances with accidental releases and/or offsite consequences, as captured in the accident history list in Appendix A of this Technical Background

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[116] Industrial Scientific, "Fence-Line and Perimeter Monitoring," accessed March 7, 2022, *https://www.indsci.com/en/solutions/by-application/fence-line---perimeter-monitoring/*.

[117] SGS Group, "Fenceline Monitoring," accessed March 7, 2022, *https://www.sgsgroup.us.com/en/environment-health-and-safety/sampling-and-monitoring/air-sampling-and-monitoring/fenceline-monitoring*.

[118] SENSIT Technologies, "Welcome to SENSIT Technologies," *https://www.gasleaksensors.com/index.html.*

Document. Are there other considerations, like substance toxicity or prevalence, that EPA should use in selecting substances for a fenceline or process unit monitoring program?

EPA also seeks comment on establishing minimum requirements for a real-time monitoring system that allows for site-specific flexibility depending on the substances involved and the location of the facility in relation to population centers and ecologically sensitive areas. EPA seeks comment on how facilities should involve public participation as part of the process to establish public trust (see BP Whiting facility as an example).[119] EPA seeks comment on whether such a program should include provisions for automatically notifying the facility and LEPCs in instances where a chemical has been detected at or above a threshold and on which thresholds should be used. EPA also seeks comment on other considerations relevant to implementing a continuous monitoring program, such as whether data would be publicly available in near- or real-time via a public website; quality assurance; how long data would be stored; information on the start-up; and ongoing costs of implementing such a program. Finally, EPA seeks specific information on how real-time monitoring prevents chemical accidents and mitigates consequences. Would facilities' resources (time and costs) be better spent improving coordination between emergency responders and communities in the event of a release? If so, what gaps has EPA not addressed in its coordination requirements that would better improve communication between facilities and emergency responders/communities to ensure that release information is communicated in a timely manner to communities? Is real-time fenceline monitoring or process unit monitoring a benefit if the community lacks the resources to respond to incidents, and are facility efforts better spent contributing to community preparedness activities?

7. Cost-Benefit Analysis

A fenceline air monitoring program has the capacity to provide public health benefits, but any program would need to consider the magnitude of those benefits with the monetary expenses of installing and maintaining monitoring equipment. Below are some preliminary benefits and costs of a fenceline air monitoring program. EPA invites public comment on additional qualitative and quantitative information for a cost-benefit analysis.

a. Benefits

Monitoring data can identify immediate issues of concern so that timely corrective actions can be taken to protect public health. The monitoring would allow fenceline communities to learn about elevated emissions and potentially enact shelter-in-place warnings, warnings for vulnerable populations to limit their exposure by staying inside, or in extreme cases, potential evacuations. Fenceline monitoring may also serve as an alert such that the facility can take action to prevent an accident. For both these scenarios, benefits are difficult to quantify because of the challenges of attributing the prevention of an accident to any specific provision in the RMP. There may be some monetary cost savings from reducing the amount of lost product because of faster leak detection via fenceline monitoring.

b. Costs

Monitoring equipment may be expensive to install and maintain. EPA's Economic Impact Analysis for the NESHAP for Petroleum Refineries Sector (Risk and Technology Review) included a capital cost estimate for real-time benzene monitoring (open path monitoring system) at petroleum refineries. The cost of equipment, its installation, and operations and maintenance were included in the capital costs. The analysis assumed four monitors at each of 142 petroleum refineries for a capital cost of $71,000,000 (using 2009 dollars) for all refineries, combined. Dividing this number by the 142 petroleum refineries, the estimated capital cost for a single facility is $500,000 (see Table 3-4[120]). EPA also received one public comment stating that the installation of a new gas or vapor detection system for an existing facility

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[119] AECOM, "BP Refinery Whiting, Indiana," accessed March 7, 2022, *http://raqis.aecomonline.net/pls/raqis/bpw.whiting*.

[120] EPA-HQ-OAR-2010-0682-0228.

can cost more than $500,000 for one project involving a single source process. Installation costs will be expensive when perimeter monitors are installed over long distances and/or there is a lack of an existing power supply or infrastructure—common in remote locations.[121] EPA seeks specific information on fenceline monitoring program start-up costs, as well as costs for the whole life cycle of the system (installing it, maintaining it, storing/sharing data, *etc.*).

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121 EPA-HQ-OEM-2014-0328-0616.