MEMORANDUM

TO: William Gallagher, U.S. EPA/OAQPS/SPPD – EPA Office of Air Quality Planning and Standards

FROM: Eastern Research Group, Inc. (ERG)

DATE: January 2025

SUBJECT: Clean Air Act Section 112(d)(5) GACT Standard Analysis for Pressure Relief Devices Associated with Processes Subject to the CMAS NESHAP

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) is proposing amendments to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Chemical Manufacturing Area Sources, herein referred to as the CMAS NESHAP. The CMAS NESHAP (40 CFR part 63, subpart VVVVVV) regulates the following nine area source categories:

- Agricultural Chemicals and Pesticides Manufacturing;
- Cyclic Crude and Intermediate Production;
- Industrial Inorganic Chemical Manufacturing;
- Industrial Organic Chemical Manufacturing;
- Inorganic Pigments Manufacturing;
- Miscellaneous Organic Chemical Manufacturing;
- Plastic Materials and Resins Manufacturing;
- Pharmaceutical Production; and
- Synthetic Rubber Manufacturing.

This memorandum provides details for setting generally available control technology (GACT) standards pursuant to CAA section 112(d)(5) for pressure relief devices associated with processes subject to the CMAS NESHAP. The structure of this memorandum is as follows: section 2 presents background on the CAA authority for setting GACT standards; section 3 presents the GACT standard analysis for pressure relief devices; and section 4 includes relevant references.

2.0 CAA AUTHORITY

Section 112 of the Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to establish technology-based standards for listed source categories of hazardous air pollutants (HAP). These technology-based standards are often referred to as national emissions standards for hazardous air pollutants (NESHAP) and are based on the maximum

achievable control technology (MACT). Under CAA section 112(d)(5), the Administrator may, in lieu of standards requiring maximum achievable control technology (MACT) under section 112(d)(2), elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies [GACT] or management practices by such sources to reduce emissions of hazardous air pollutants." Additional information on GACT is found in the Senate report on the legislation (Senate report Number 101–228, December 20, 1989), which describes GACT as:

"…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems."

Consistent with the legislative history, the EPA can consider costs and economic impacts in determining GACT. Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. GACT standards were set for the chemical manufacturing area source categories in 2009 (see 74 FR 56008, October 29, 2009). The CMAS NESHAP requires the use of GACT and establishes emission standards in the form of management practices for each CMPU as well as emission limits for certain emission sources including process vents and storage tanks. The rule also establishes management practices and other emission reduction requirements for wastewater systems and heat exchange systems.

3.0 GACT FOR CMAS PRESSURE RELIEF DEVICES

PRDs[1] are designed to remain closed during normal operation. PRD releases are typically the result of an operator error, a malfunction such as a power failure or equipment failure, or other unexpected cause that requires immediate venting of gas from process equipment in order to avoid safety hazards or equipment damage. Emissions vented directly to the atmosphere by a PRD in organic HAP service contain HAP that are otherwise regulated under the CMAS NESHAP requirements.

The CMAS NESHAP regulates PRDs through equipment leak management practices. These practices require owners and operators to conduct quarterly sensory-based inspections (using sight, sound, or smell) to ensure that a PRD is "sound and free of leaks"[2]. These inspections typically occur when the PRD is seated, as PRDs are designed to open only during a pressure release (*i.e.*, when the system pressure exceeds the PRD's set pressure).

The CMAS NESHAP does not explicitly regulate atmospheric pressure releases, regardless of whether they are single or multiple releases over time. Consequently, no CMAS facility is subject to numeric emission limits for PRDs that vent to the atmosphere. It is impractical to measure emissions from PRDs that release to the atmosphere, making numeric emission limits inappropriate. However, the EPA has included work practice standards that regulate atmospheric pressure releases from PRDs in other chemical sector NESHAP, such as the EMACT standards (85 FR 40386), the MON (85 FR 49084), and the HON and P&R I NESHAP

[1] The acronym "PRD" means pressure relief device and is common vernacular to describe the variety of devices regulated as pressure relief valves.

[2] See 40 CFR 63.11495(a)(3).

(89 FR 42932). The EPA also added PRD work practice standards to the petroleum refining NESHAP for similar reasons (81 FR 45241). These PRD work practice standards (in all these listed NESHAP) require owners and operators to: (1) implement at least three prevention measures[3]; (2) perform root cause analysis and corrective action if a PRD releases emissions directly to the atmosphere; and (3) monitor PRDs using a system that can identify and record the time and duration of each pressure release and notify operators when a pressure release occurs.

We assessed whether the same PRD work practice standards, already included in the previously mentioned NESHAPs, represent GACT (*i.e.*, in the form of management practices) for chemical manufacturing area sources. These standards would regulate emissions from CMAS PRDs during a pressure release. The PRD work practice standards require monitoring systems that can alert an owner or operator when a PRD release occurs. We find this equipment to be "generally available" according to CAA section 112(d)(5). As noted, this type of monitoring equipment is already mandated under other chemical sector regulations, including the HON and the MON. Given its widespread use in similar chemical manufacturing facilities, we consider the PRD work practice standards, which include the use of monitoring systems capable of alerting an owner or operator when a PRD release occurs, to be "generally available."

Additionally, we reviewed the requirements in the EPA's Chemical Accident Prevention Provisions (40 CFR part 68) and Occupational Safety and Health Administration's (OSHA) Process Safety Management rule (29 CFR 1910.119). These rules focus on planning for and minimizing or preventing scenarios which would result in releases of chemicals. For example, as stated in Appendix C to the OSHA rule: "Process safety management is the proactive identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures or equipment." The rules are applicable to any equipment in the process, and relief valves are identified in each rule as an applicable source to evaluate. The EPA and OSHA rules have similar requirements, except that applicability determination is unique to each rule. Owners or operators are subject to EPA's Chemical Accident Prevention Provisions at 40 CFR part 68 if a process has more than a threshold quantity of a regulated substance; regulated substances and their thresholds are listed at 40 CFR 68.130. Owners or operators are subject to OSHA's Process Safety Management rule at 29 CFR 1910.119 if a process involves a chemical above threshold quantities (listed in Appendix A to 29 CFR 1910.119) or a Category 1 flammable gas or liquid. CMAS facilities may be subject to the Chemical Accident Prevention Provisions rule, as identified in their Title V permit (40 CFR 68.215 requires permits to list part 68 as an applicable requirement, if subject); as a result, we further reviewed this rule for consideration in developing the work practice standard.

The EPA's Chemical Accident Prevention Provisions require a prevention program. CMAS facilities would fall under prevention program 1 or 3 (due to the NAICS code). We evaluated program 3, which is more stringent, because it is our understanding that CMAS facilities would not meet the program 1 criteria, based on a review of the rule's applicability requirements and preamble rationale. 40 CFR 68.10(b)(2) specifies certain distance criteria that

[3] Examples of prevention measures include the following: Flow indicators, level indicators, temperature indicators, pressure indicators, routine inspection and maintenance programs, operator training, inherently safer designs, safety instrumentation systems, deluge systems, and staged relief systems where the initial PRD discharges to a control system.

must be met to be eligible for program 1; because CMAS facilities may be in close proximity to the public given their status as area sources, we assumed this criterion was not met, which would trigger their eligibility for program 3. The program 3 prevention program (part 68, subpart D) includes: documentation of process safety information, conducting a hazard analysis, documentation of operating procedures, employee training, on-going maintenance, and incident investigations. The process safety information documented (detailed at 40 CFR 68.65) must include information pertaining to the hazards of the regulated substances in the process, the technology of the process, and the process equipment. The information pertaining to the process equipment specifically includes the relief system design and design basis (see 40 CFR 68.65(d)(1)(iv)). When conducting the hazard analysis (detailed at 40 CFR 68.67), facilities must identify, evaluate, and control the hazards in the process; controls may consider the application of detection methodologies (e.g., process monitoring and control instrumentation) to provide early warning of releases. The operating procedures (detailed at 40 CFR 68.69) must address multiple operating scenarios (e.g., normal operations, startup, emergency shutdown) and provide instructions for safely conducting process activities. Conducting the hazard analysis and documenting operating procedures are similar to prevention measures, discussed below, though we note a specific number of measures or controls is not specified for the program 3 prevention program. Incident investigations (detailed at 40 CFR 68.81) must document the factors that contributed to an incident and any resolutions and corrective actions (incident investigations are consistent with root cause analysis and corrective action, discussed below). This information is documented in a Risk Management Plan that must be updated at least every five years (detailed at 40 CFR 68.190).

3.1 Control Option Summary

The EPA is proposing new GACT requirements for PRDs in the CMAS NESHAP. The EPA is proposing PRD management practices that require owners and operators to: (1) implement at least three prevention measures (as described above); (2) perform root cause analysis and corrective action if a PRD releases emissions directly to the atmosphere; and (3) monitor PRDs using a system that can identify and record the time and duration of each pressure release and notify operators when a pressure release occurs. The EPA is also proposing to define "pressure relief device or valve" to mean "a valve, rupture disk, or similar device used only to release an unplanned, nonroutine discharge of gas from process equipment in order to avoid safety hazards or equipment damage. A pressure relief device discharge can result from an operator error, a malfunction such as a power failure or equipment failure, or other unexpected cause. Such devices include conventional, spring-actuated relief valves, balanced bellows relief valves, pilot-operated relief valves, rupture disks, and breaking, buckling, or shearing pin devices. Devices that are actuated either by a pressure of less than or equal to 2.5 pounds per square inch gauge or by a vacuum are not pressure relief devices." Finally, the EPA is proposing to define "pressure release" to mean "the emission of materials resulting from the system pressure being greater than the set pressure of the pressure relief device. The release can be one release or a series of releases over a short time period."

3.2 Costs and Emissions Impacts

The cost for CMAS facilities to implement the work practice standard and install monitors for PRDs that vent to atmosphere are calculated from the number of PRDs at a facility. However, we do not have actual equipment counts for CMAS facilities. To estimate the number

of PRDs at CMAS facilities nationwide, we used HON-specific PRD data that was submitted in response to the EPA's 2022 CAA Section 114 request (ERG, 2023). We calculated an average PRD count of 14 atmospheric PRDs in organic HAP service per CMAS CMPU. Multiplying this average (14) by the total CMAS processes nationwide (247[4], assuming one CMPU per CMAS facility), we estimated there are 3,458 atmospheric PRDs in organic HAP service nationwide. We excluded 33 facilities[5] from this analysis given that we anticipate that these facilities are likely to only operate PRDs in EtO service that already have PRD monitoring installed. Similarly, using HON-specific data from the EPA's 2022 CAA Section 114 request, we calculated an average of three atmospheric PRDs in organic HAP service per CMAS CMPU that have a monitoring system installed capable of identifying releases and recording the time and duration of each pressure release. Therefore, multiplying the average of 11 (14 atmospheric PRDs less the three that already have monitoring systems installed) atmospheric PRDs in organic HAP service per CMAS CMPU that do not have a monitoring system by the total CMAS processes nationwide (247, assuming one CMPU per CMAS facility), we estimated that of the 3,458 PRDs in organic HAP service nationwide, 2,717 PRDs in organic HAP service nationwide vent to the atmosphere without a device or monitoring system capable of identifying releases and recording the time and duration of each pressure release. We used this total count to estimate the cost associated with installing monitors.

Cost Methodology

Work practice costs were previously estimated in a 2015 memo that documented PRD impacts for petroleum refineries (EPA, 2015). PRD monitor costs were previously estimated in a 2017 memo that evaluated PRD options for Off-Site Waste and Recovery Operations (EPA, 2017). We used costs from these memos, but adjusted those costs to reflect year 2022 dollars and annualized the capital costs using 8.5 % interest over 15 years. The total capital investment (TCI) and total annual costs (TAC) for the work practice include implementing three redundant prevention measures, conducting root cause and analysis for releases, and implementing corrective actions. Table 1 summarizes the capital and annual costs for the PRD work practice and monitor.

Table 1. PRD Work Practice and Monitor Costs

Cost Item	TCI	TAC
PRD Work Practice		
Implement Prevention Measures (cost per PRD)	$5,926	$714
Root Cause Analysis and Corrective Action (cost per release event)	$0	$7,407
PRD Monitor	$3,581	$631

[4] As of May 1, 2024, there were 247 facilities that are area sources of HAP emissions in operation that are subject to the CMAS NESHAP. However, we excluded CMAS facilities that may have PRDs in EtO service given that we evaluated more stringent standards for PRDs in EtO service. The list of facilities located in the United States that are area sources of HAP and part of at least one of the nine area source categories with processes subject to the CMAS NESHAP is available in "List of Facilities Subject to the CMAS NESHAP" (ERG, 2025).

[5] These facilities are already subject to, or may become subject to, the CMAS NESHAP if EtO were to be added to Table 1 to 40 CFR 63, subpart VVVVVV, as proposed.

Nationwide Cost Estimate

To calculate the total costs to the industry, we assumed that many PRDs at CMAS facilities have already implemented prevention measures, in order to comply with the EPA's Chemical Accident Prevention Provisions and OSHA's Process Safety Management rule. As such, we applied the prevention measures cost to 30% of the PRDs that vent to atmosphere. A review of information collected from the EPA's 2022 CAA section 114 request indicated that HON facilities reported 1.6 percent of atmospheric PRDs in organic HAP service at HON processes would discharge to the atmosphere each year. However, to be more conservative than this, we assumed that 10 percent of PRDs at CMAS facilities would have a release every year. Additionally, the PRD monitor cost was applied to only the 2,717 PRDs where we estimated (as described above) the PRD does not have a device(s) or a monitoring system that is capable of identifying releases and recording the time and duration of each pressure release. We calculated the costs for each facility by applying these assumptions, along with the costs in Table 1. Table 2 summarizes the nationwide costs for CMAS facilities to implement the work practice standard for PRDs that vent to atmosphere.

Table 2. Nationwide PRD Work Practice and Monitor Costs for PRDs that Vent to Atmosphere for CMAS[a]

Cost Item	Applicable PRD Count	TCI	TAC
PRD Work Practice	3,458		
Implement 3 Prevention Measures	1,037	$6,150,000	$740,000
Root Cause Analysis and Corrective Action	346	$0	$2,560,000
PRD Monitor	2,717	$9,730,000	$1,440,000
TOTAL		**$15,900,000**	**$4,740,000**

[a] Costs were rounded to three significant figures.

4.0 REFERENCES

EPA, 2015. Coburn, Jeff, RTI International. Pressure Relief Device Control Option Impacts for Final Refinery Sector Rule. July 30, 2015. EPA Docket No. EPA-HQ-OAR-2010-0682.

EPA, 2017. Carey, Angela, EPA/OAQPS. Pressure Relief Device Control Options and Impacts for Off-Site Waste and Recovery Operations (OSWRO). June 26, 2017. EPA Docket No. EPA-HQ-OAR-2012-0360.

ERG, 2023. Data Received from Information Collection Request for Chemical Manufacturers. March 2023. EPA Docket No. EPA-HQ-OAR-2022-0730.

ERG, 2025. List of Facilities Subject to the CMAS NESHAP. January 2025. EPA Docket No. EPA-HQ-OAR-2024-0303.