



TOXC102-CI:

**Regulation of
Hazardous Air
Pollutants (HAPs)
from Stationary
Sources**



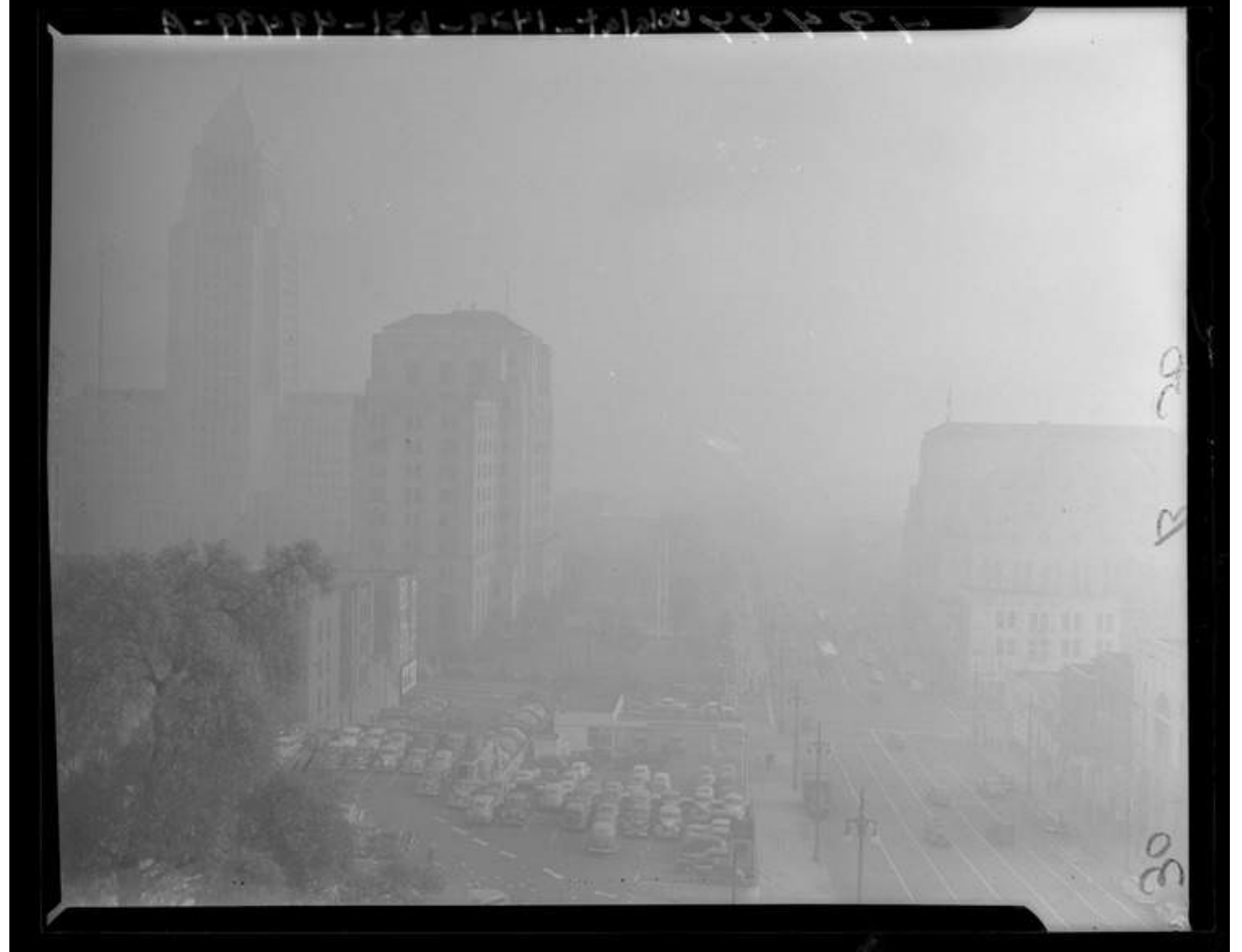


Introductions

Agenda

Scheduled Time	Topic	Duration
9:00 am – 9:15 am	Introductions	15 minutes
9:15 am – 9:30 am	Why Are We Here?	15 minutes
9:30 am – 9:45 am	Course Scope and Learning Objectives	15 minutes
9:45 am – 10:30 am	Introduction to the Regulatory Framework/Identification of HAPs and HAPs Sources	45 minutes
10:30 am – 10:45 am	Break	15 minutes
10:45 am – 12:00 pm	Regulation of Sources of Listed HAPs	90 minutes
12:00 pm – 1:00 pm	Lunch Break	60 minutes
1:00 pm – 1:45 pm	Group Exercises	45 minutes
1:45 pm – 2:30 pm	Overview of the Review of Emissions Standards	45 minutes
2:30 pm – 2:45 pm	Break	15 minutes
2:45 pm – 3:15 pm	Exam and Group Discussion	30 minutes
3:30 pm	Adjourn	

Why Are We Here?



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Donora, Pennsylvania: October 26, 1948



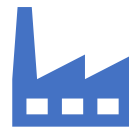
Course Scope

Clean Air Act (CAA) section 112 requires the Environmental Protection Agency (EPA) to identify (list) those toxic air pollutants that are known to cause, or may reasonably be anticipated to cause, adverse effects to human health or adverse environmental effects. These pollutants are called **hazardous air pollutants (HAPs)**. Section 112 of the CAA also provides for regulatory protection of human health and the environment from listed HAPs that are emitted from certain **stationary sources**.

While there are many provisions (also called subsections) included as part of Section 112, this course covers those provisions that relate to the **key elements of the regulatory framework for hazardous air pollutants (HAPs) from stationary sources**. These elements are:



Identification of HAPs and Sources of Emissions



Regulation of Identified Source Categories through Emissions Standards



Review of Emissions Standards

Clean Air Act Section 112

(a) Definitions

(b) List of pollutants

(c) List of source categories

(d) Emission standards

(e) Schedule for standards and review

(f) Standard to protect health and environment

(g) Modifications

(h) Work practice standards and other requirements

(i) Schedule for compliance

(j) Equivalent emission limitation by permit

(k) Area source program

(l) State programs

(m) Atmospheric deposition to Great Lakes and coastal waters

(n) Other provisions

(o) National Academy of Sciences study

(p) Mickey Leland National Urban Air Toxics Research Center

(q) Savings provision

(r) Prevention of accidental releases

(s) Periodic report



Learning Objectives

After completion of this course, learners will be able to:

1. Identify the key elements of the regulatory framework for HAPs from stationary sources.
2. Explain how HAPs are identified (listed) and delisted under the CAA.
3. Define major and area stationary sources.
4. Explain the requirements for identifying (listing) major and area sources under the CAA.
5. Identify the types of emissions standards.
6. Describe the components of emissions standards.
7. Explain how emissions standards are set for major and area sources.
8. Explain technology and residual risk review of emissions standards.

Key elements of the regulatory framework for HAPs from stationary sources

Identify

- List HAPs
- Identify (list) source categories (or subcategories) that emit listed HAPs

Regulate

- Establish emission standards to regulate and control emissions of HAPs from identified source categories

Review

- Assess whether each emission standard should be revised

Identify – Listing and Delisting HAPs

- The CAA Amendments of 1990 originally listed 189 HAPs in section 112(b). Under CAA section 112(b)(3)(A), the EPA is required to review, and revise as appropriate, the HAP list periodically.
- Section 112 of the CAA also outlines the criteria to be applied in deciding whether to add or delete particular substances. This process is commonly referred to as **listing and delisting**.

The Process for Listing and Delisting HAPs

CAA Section 112(b)(2) identifies pollutants that should be **listed** as:

“pollutants which present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects (including, but not limited to, substances which are known to be, or may reasonably be anticipated to be, carcinogenic, mutagenic, teratogenic, neurotoxic, which cause reproductive dysfunction, or which are acutely or chronically toxic) or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or otherwise.”

For **delisting**, to delete a substance from the HAP list, CAA section 112(b)(3)(C) provides that the Administrator must determine that:

“there is adequate data on the health and environmental effects of the substance to determine that emissions, ambient concentrations, bioaccumulation or deposition of the substance may not reasonably be anticipated to cause any adverse effects to the human health or adverse environmental effects.”

The Process for Listing and Delisting HAPs (Continued)

- The process for listing and delisting specifically allows for members of the public to submit a petition to the EPA Administrator to modify the list.
- The EPA proposes listing or delisting through a rulemaking process, which includes providing an opportunity for the public to comment on the proposal. After considering public comments, the EPA then finalizes the EPA Administrator's decision through a final rulemaking in order to revise the HAP list.

The HAP list

Initial List of Hazardous Air Pollutants with Modifications

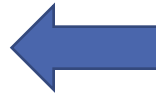
Under the Clean Air Act, EPA is required to regulate emissions of hazardous air pollutants. This original list included 189 pollutants. Since 1990, EPA has [modified](#) the list through rulemaking to include 188 hazardous air pollutants.

CAS Number	Chemical Name
75070	Acetaldehyde
60355	Acetamide
75058	Acetonitril
98862	Acetophen
53963	2-Acetylan

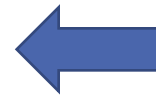
Urban Air Toxic Pollutants

There are 188 hazardous air pollutants (HAPs) that EPA is required to control. From these HAPs, EPA identified 30 that pose the greatest potential health threat in urban areas. These HAPs are referred to as the 30 urban air toxics. EPA also identified an additional three HAPs, but these HAPs are not generally emitted by area sources and, as such, were not included as part of the 30 urban air toxics. The three additional HAPs are coke oven emissions, 1,2-dibromoethane and carbon tetrachloride.

List of 30 Urban Air Toxics		
Acetaldehyde	Dioxin	Mercury compounds
Acrolein	Propylene dichloride	Methylene chloride (dichloromethane)
Acrylonitrile	1,3-dichloropropene	Nickel compounds
Arsenic compounds	Ethylene dichloride (1,2-dichloroethane)	Polychlorinated biphenyls (PCBs)



There are currently [188 HAPs](#) (as of late 2022). These HAPs include individual compounds (such as benzene and ethylene oxide) and classes of compounds (such as metals and polycyclic organic matter).



From these listed HAPs, the EPA has identified [30 urban air toxics](#) that pose the greatest potential health threat in urban areas.

Air toxics tend to pose greater health risks in urban areas because these areas are generally located near major roadways, have a higher concentration of sources, and have a large number of people exposed.

Identify – Listing HAPs Sources

Under section 112 of the CAA, the EPA must identify (list) source categories (industry groups) or subcategories (e.g, fuel type) of stationary sources that emit listed HAPs above certain emission threshold levels.

Two types of stationary sources are listed under CAA section 112:
Major Sources and Area Sources.

MAJOR SOURCE:

a stationary source that emits or has the potential to emit **10 tons or more per year** of any of the listed HAP, or **25 tons or more per year** of any combination of these pollutants.

AREA SOURCE:

any stationary source that emits HAPs and that is not a major source.

Source Category Examples

Examples of source categories for major sources include:

- Petroleum refineries,
- Integrated iron and steel manufacturing, and
- Municipal solid waste landfills.



Examples of source categories for area sources include:

- Certain gasoline dispensing facilities,
- Hospital ethylene oxide sterilizers, and
- Plating and polishing operations.



Requirements for Listing Major Sources

- Under CAA section 112(c)(1), all categories and subcategories of sources that meet the definition of a major source must be listed.
- Major sources can be reclassified as area sources if:
 - They demonstrate that they no longer qualify as major sources. (<10/25 tons per year)

List of Major Source Categories and their regulations can be found at:

<https://www.epa.gov/stationary-sources-air-pollution/national-emission-standards-hazardous-air-pollutants-neshap-8>

Requirements for Listing Area Sources

The EPA is required to list all categories and subcategories of sources that meet the definition of an area source only if they meet one of the following criteria:

1. The EPA determines that the category of area sources presents a threat of adverse effects to human health or the environment in a manner that warrants regulation under CAA section 112(c)(3).
2. The EPA determines that a category of area sources (in addition to major sources) is required to be regulated **consistent with CAA section 112(c)(6)**.

Requirements for Listing Area Sources: CAA Section 112(c)(6)

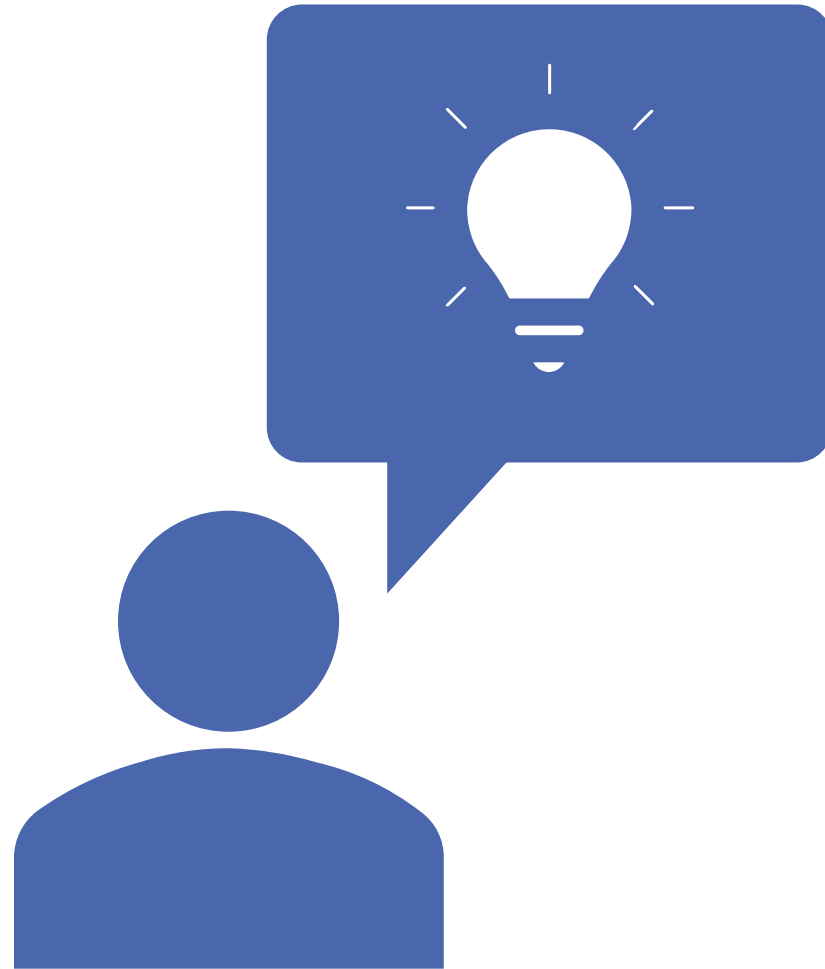
CAA section 112(c)(6) pertains to seven specific HAPs that are considered pollutants of particular concern because of their persistence and tendency to bioaccumulate in the environment.

- The EPA must identify categories and subcategories of sources of these seven HAPs, assuring that sources accounting for *not less than 90 percent of the aggregate emissions* of each of the seven pollutants are subject to standards.

CAA Section 126(c)(6) HAPs:

alkylated lead compounds
polycyclic organic matter
hexachlorobenzene
mercury
polychlorinated biphenyls
2,3,7,8 tetrachlorodibenzofurans
2,3,7,8 tetrachlorodibenzo-p-dioxin

Let's Check
Your
Knowledge!



Identify each of the elements of the regulatory framework for HAPs from stationary sources

1

Assess remaining health risks and/or new technology-based developments since the standard was set to determine whether the standard should be revised.

2

List hazardous air pollutants and identify source categories or subcategories that emit listed HAPs above certain emission thresholds.

3

Develop emissions standards, referred to as NESHAPs, to regulate and control emissions from sources of listed HAPs.

Which of the following statements explain(s) the criteria for listing a HAP?

- A. The pollutant presents or may present a threat of adverse human health effects.
- B. The pollutant is located in rural areas.
- C. The pollutant forms through a complex chemical reaction.
- D. The pollutant presents or may present a threat of adverse environmental effects.

Fill in the Blank. A "major" source is defined under CAA section 112(a)(1) as a stationary source that emits or has the potential to emit ___ tons or more per year of any of the listed HAPs, or ___ tons or more per year of any combination of these pollutants.

A. 5 or 10

B. 10 or 25

C. 25 or 30

Which one is it?

All categories and subcategories of sources that meet the definition of this type of source must be listed under CAA section 112(c)(1).

**Key elements of
the regulatory
framework for
HAPs from
stationary
sources**

Identify

Regulate

- Establish emission standards to regulate and control emissions of HAPs from identified source categories

Review

- Assess whether each emission standard should be revised

15 Minute Break



**Key elements of
the regulatory
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Identify

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- Establish emission standards to regulate and control emissions of HAPs from identified source categories

Review

- Assess whether each emission standard should be revised

Regulate Listed HAPs Sources

The EPA is required to regulate and control emissions of HAPs listed from identified sources through **National Emission Standards for Hazardous Air Pollutants (NESHAPs)**.

- There are two types of NESHAPs:
 1. Major sources - Maximum Achievable Control Technology (**MACT**) standards.
 2. Area sources - Generally Available Control Technology (**GACT**) standards.

Regulate Listed HAPs Sources

- NESHAPs apply to the "affected source(s)" identified in the rule.
- NESHAPs promulgated under the 1990 Clean Air Act Amendments (CAAA) are codified at 40 CFR Part 63.
- NESHAPs promulgated prior to the 1990 CAAA are codified at 40 CFR Part 61.

Components of a NESHAP rule

Applicability criteria

Emission limits

Testing and monitoring requirements

Reporting requirements

Recordkeeping requirements

Components of a NESHAP rule (continued)

Applicability Criteria

Provisions that identify which stationary sources are subject to a rule, and include the applicable requirements.

[Let's look at an example from the Secondary Lead Smelting NESHAP.](#)

Example Language

Applicability.

(a) You are subject to this subpart if you own or operate any of the following affected sources at a secondary lead smelter:

Blast, reverberatory, rotary, and electric furnaces; refining kettles; agglomerating furnaces; dryers; process fugitive emissions sources; buildings containing lead bearing materials; and fugitive dust sources. The provisions of this subpart do not apply to primary lead processors, lead refiners, or lead smelters.

(b) Table 1 to this subpart specifies the provisions of subpart A of this part that apply to owners and operators of secondary lead smelters subject to this subpart.

(c) If you are subject to the provisions of this subpart, you are also subject to title V permitting requirements under 40 CFR parts 70 or 71, as applicable.

(d) Emissions standards in this subpart apply at all times.

<https://www.epa.gov/stationary-sources-air-pollution/secondary-lead-smelting-national-emissions-standards-hazardous-air>

Components of a NESHAP rule

Emission limits

The emissions standards that limit the pollution the source can emit. Generally expressed as mass of the pollutant emitted per unit volume of effluent gas (PPM, ug/m³).

Testing and monitoring requirements

Sources subject to NESHAPs are usually required to perform an initial performance test through stack testing to demonstrate compliance. To demonstrate continuous compliance, sources may be required to monitor control device operating parameters which are established during the initial performance test.

Components of a NESHAP rule

Reporting requirements

Reporting provisions often require compliance reports (called "Notification of Compliance Status") to be submitted to the relevant air agency with a certain frequency (e.g., semi-annually).

Recordkeeping requirements

NESHAPs contain provisions requiring the maintenance of records relevant to whether the emission limitations were met.

MACT Standards

- MACT standards apply to **major** stationary sources. They can also apply to an area source under certain circumstances.
- There are **three main steps** involved in setting a MACT standard:

1

Establish “the MACT floor,” which is the minimum degree of emissions reductions that sources must achieve without consideration of cost.

2

Evaluate whether more stringent “beyond-the-floor” controls are appropriate, considering cost and non-air quality health and environmental impacts and energy requirements.

3

Establish the MACT standard at either the MACT floor or beyond-the-floor level.

1. Establishing the MACT Floor: Existing Sources

- For **Existing Sources**, the MACT floor must be:
 - at least as stringent as the average emission limitation achieved by the best performing **12 percent** of the existing sources

Or:

- if fewer than 30 sources, the average emission limitation achieved by the best performing **5 sources** in the category or subcategories with fewer than 30 sources

1. Establishing the MACT Floor: New Sources

- For **New Sources**, the MACT floor must be at least as stringent as “the emission control that is achieved in practice by the best controlled similar source.”
 - Therefore, the MACT floor is based on the single best-performing source.

2. Evaluating “Beyond the Floor” Controls

- CAA section 112(d) requires the maximum degree of reduction in emissions through application of measures, processes, methods, systems or techniques including, but not limited to, measures which:
 - reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications,
 - enclose systems or processes to eliminate emissions,
 - collect, capture or treat such pollutants when released from a process, stack, storage or fugitive emissions point,
 - are design, equipment, work practice, or operational standards (including requirements for operator training or certification), or
 - are a combination of the above.

“Beyond the Floor”- Evaluation of Control Options

- Identify all commercially available and demonstrated control technologies that are reasonably applicable to each source.
- Create a list of control technologies that are reasonably applicable to each source.
- Evaluate each control technology to consider:
 - Costs,
 - Non-air quality health and environmental impacts,
 - Energy requirements associated with using each control technology.

3. Establish the MACT Standard

- Establish the emission limit (the MACT standard), at either the MACT floor or the “Beyond the Floor” for each pollutant.
- The MACT emission limit could be expressed as:
 - A numerical emission limit for each HAP in tons per year (tpy),
 - Production ratio (e.g., 10 lbs of HAP/100 lbs of polymer),
 - Concentration limit (e.g., 10 ppm HAP),
 - Performance standard based on the expected efficiency of MACT in reducing HAP emissions,
 - Work practice standards.

MACT Standards – Compliance Deadlines

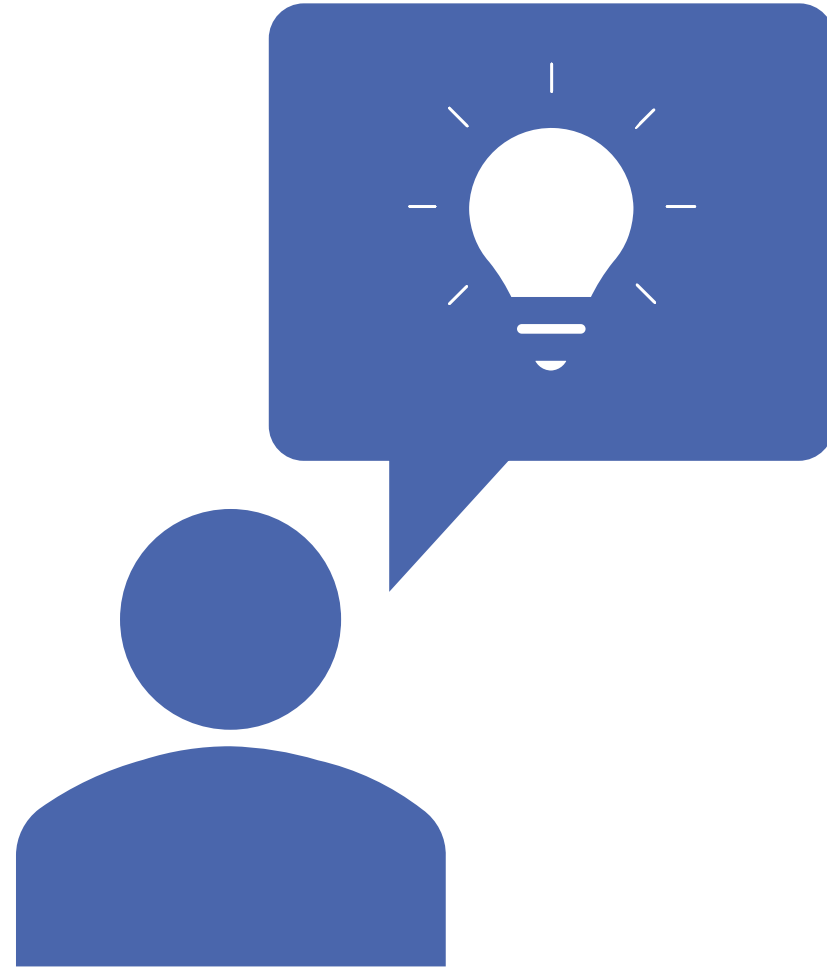
- After issuance of the final MACT rule, compliance timelines for the MACT standards differ for new and existing sources.
 - New sources must comply upon startup of their operations.
 - Existing sources must comply as expeditiously as practicable.
- The EPA determines the compliance period, which can be no more than 3 years after issuance of the rule.

GACT Standards

- Under CAA section 112(d)(5), the EPA Administrator may elect to set GACT standards for **area sources**.
- Considering the control technologies and management practices that are “generally available” to the area sources in the source category.
- GACT may include control requirements.

In determining what constitutes GACT, the EPA has considerable discretion and can evaluate, among other things, the cost of achieving the emission reductions.

Let's Check
Your
Knowledge!



Match the NESHAP components with their descriptions

Applicability Criteria

1

Provisions requiring the maintaining of records for the source parameters relevant to meeting the emissions limitations.

Emission Limits

2

Provisions that require compliance reports to be submitted with certain frequency.

Testing and Monitoring Requirements

3

Provisions that identify which stationary sources are subject to a NESHAP.

Reporting Requirements

4

Emissions standards that limit the pollution a source can emit.

Recordkeeping Requirements

5

Requirements to perform an initial performance test and continuous monitoring to show compliance.

Here are the answers....

Applicability Criteria

1

Emission Limits

2

Testing and Monitoring Requirements

3

Reporting Requirements

4

Recordkeeping Requirements

5

5

Provisions requiring the maintaining of records for the source parameters relevant to meeting the emissions limitations.

4

Provisions that require compliance reports to be submitted with certain frequency.

1

Provisions that identify which stationary sources are subject to a NESHAP.

2

Emissions standards that limit the pollution a source can emit.

3

Requirements to perform an initial performance test and continuous monitoring to show compliance.

Lunch Break!



What are the three steps for setting a MACT standard? What happens during each step?

SPLIT INTO BREAKOUT GROUPS

MACT or GACT?: Group Exercise



Using what you've learned in class so far today and Clean Air Act section 112(d)(2) in your handout, please answer the following questions:

- a) In 1993, the EPA proposed Emissions Standards for “Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks.” (58 FR 65768). The proposed rule identified major and area source facilities performing hard chromium electroplating, decorative chromium electroplating, and chromium anodizing. They included emissions data from both major and area sources in calculating “the floor” under Clean Air Act section 112(d)(2). Were area sources proposed under this rule to be regulated by MACT or GACT? Why do you think so?
- b) In 2006, the EPA proposed the first national regulations for gasoline dispensing facilities (i.e., gas stations) while they were revising the existing rule for gasoline distribution facilities and bulk terminals. For these area sources of HAPs, they considered the cost effectiveness of various control alternatives before proposing “alternative 2”, replacing splash filling of the underground tanks with submerged fill. Were area sources proposed to be regulated under MACT or GACT? Why do you think so?

Review of the Answers

Group Exercise: Applicability



Please use what you've learned today and the 40 CFR Part 63, Subpart TTTT handout to answer the following questions:

- a) The Big Old Boot Company (BOBCO) owns a facility in Springfield. The Springfield facility has the potential to emit 30 tons per year of HAPs. At this plant, they tan cowhides into leather and then further process the leather by a multistage application of finishing materials to produce water-resistant leather used in making their boots. Is the Springfield facility subject to Subpart TTTT, NESHAP for Leather Finishing Operations? Why or why not?
- b) BOBCO also owns a leather finishing operation at its facility in Franklin. The Franklin facility is an area source of HAP. Is this facility subject to Subpart TTTT? Why or why not?
- c) BOBCO's third facility in Greenville has already been determined to be subject to Subpart TTTT. It has a solvent degreasing process that is already subject to the Halogenated Solvent Cleaning NESHAP ([40 CFR part 63, Subpart T](#)) used in making chamois products. Is the solvent degreasing process also subject to Subpart TTTT? Why or why not?

Review of the Answers

**Key elements of
the regulatory
framework for
HAPs from
stationary
sources**

Identify

Regulate

Review

- Assess whether each emission standard should be revised

Review of Emissions Standards

Within eight years of setting MACT or GACT standards, the CAA sections 112(d)(6) and 112(f)(2) require the EPA to review the standards.

The results of these reviews, either amending the standards or determining that no revisions are necessary, are proposed and finalized through a rulemaking process.

There are two types of reviews that are conducted:

- **technology review** for MACT or GACT standards, and
- **residual risk review** for MACT standards

Review of Emissions Standards: Technology Review

- CAA section 112(d)(6) directs the EPA to review **MACT or GACT standards** considering developments in practices, processes, and control technologies, and to revise the standards if necessary. This review is commonly referred to as a **“Technology Review.”**

The EPA can consider cost in deciding whether to revise a MACT or GACT standard under section 112(d)(6).

- For MACT, the EPA is not required to recalculate the MACT floor as part of its technology review.
- The technology review is iterative. It must be conducted no less frequently than every 8 years.

Review of Emissions Standards: Residual Risk Review

- CAA section 112(f)(2) establishes an additional requirement to evaluate the risk to public health remaining **after the implementation of MACT standards**, and to determine whether additional standards are needed to address any remaining risk.
- This risk-based approach is commonly referred to as the **residual risk review**.
- Unlike the technology review, which is iterative, the residual risk review is a one-time requirement. It must be conducted within 8 years after a MACT standard has been set.

Review of Emissions Standards: Residual Risk Review (Continued)

1

Review for Risk Acceptability

2

Review for Ample Margin of Safety

Review of Emissions Standards: Residual Risk Review (Continued)

Review for Risk Acceptability

If health risks from a source category are unacceptable, then the EPA must tighten standards regardless of cost in order to reduce risks to an acceptable level.



Go Back

Review of Emissions Standards: Residual Risk Review (Continued)

Review for Ample Margin of Safety

If health risks from a source category are acceptable but above levels that might be of concern, then the EPA evaluates the available options to reduce risks considering costs, technological feasibility, risk information, and other relevant factors.

The EPA is also required to set more stringent standards if necessary to prevent adverse environmental effects (considering energy, costs and other relevant factors).

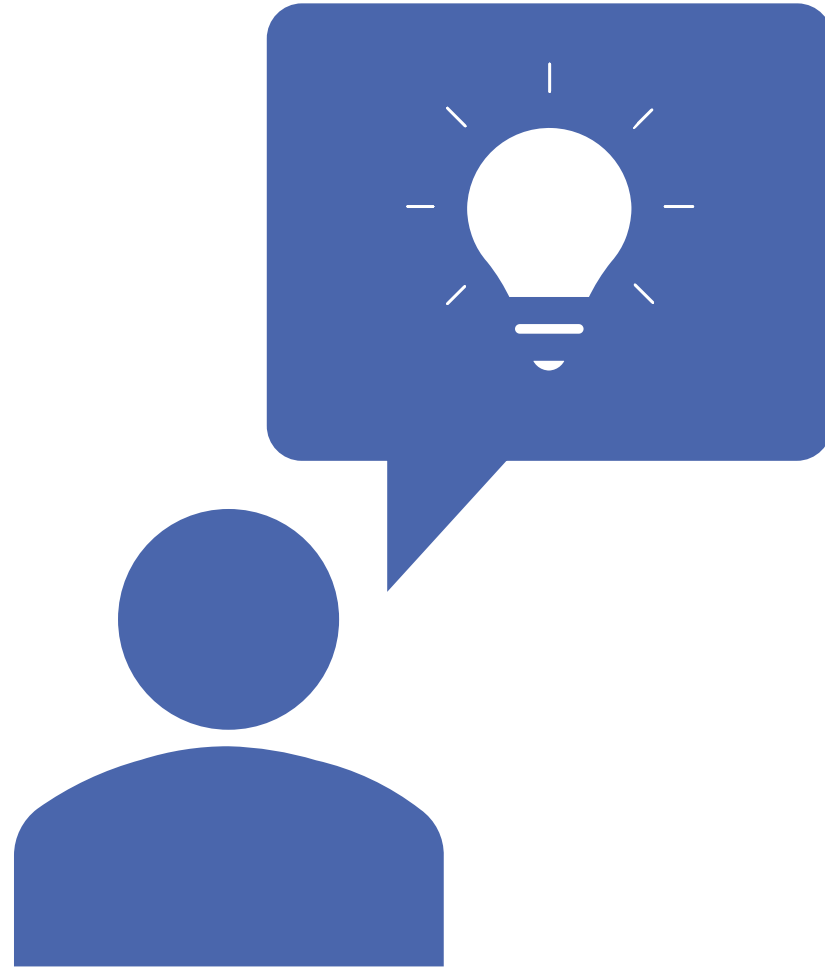
Review of Emissions Standards: Risk and Technology Review (RTR)

- For the MACT standards, the proposed and finalized results of the initial technology review and residual risk review are typically issued in one rulemaking, referred to as the residual "**risk and technology review (RTR)**" rulemaking.
- When conducting an RTR, the EPA has discretion to consider previously unregulated processes and hazardous air pollutants, and to make technical corrections.

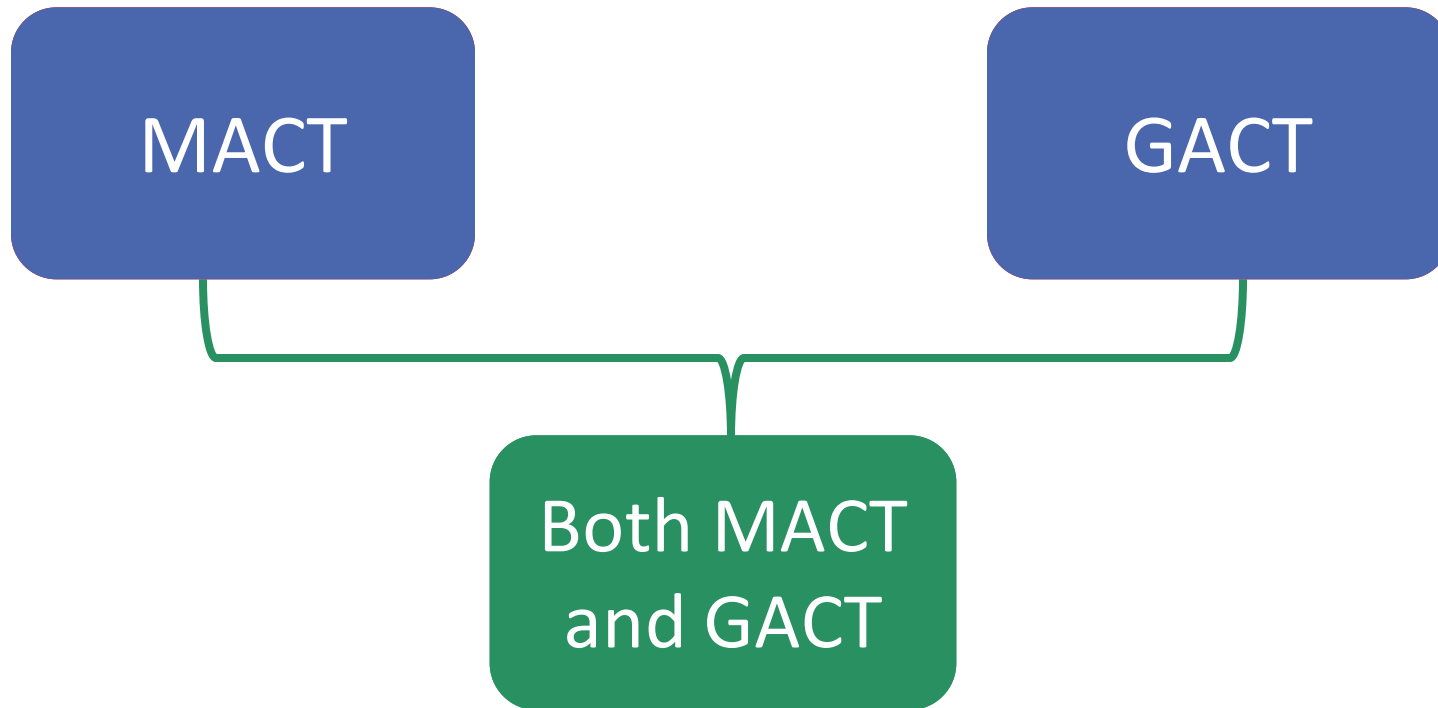
The latest list of source categories that have undergone RTR rulemaking can be found at:

<https://www.epa.gov/stationary-sources-air-pollution/risk-and-technology-review-national-emissions-standards-hazardous#status>

Let's Check
Your
Knowledge!



Does the technology review apply to MACT or GACT standards or both?



For the residual risk review for MACT standards, match the terms with their definition.

A

Review for Risk Acceptability

B

Review for Ample Margin of Safety

If health risks are unacceptable, then the EPA must tighten standards regardless of cost in order to reduce risks.

If health risks are acceptable but above levels that might be of concern, then available options to reduce risk are evaluated.

Course Completion: Exam and Discussion