

4.1 INTRODUCTION (2023)

Many railroad activities are governed by air quality regulations and, as a result, the railroad industry must expend effort to remain in compliance with those regulations. The Section introduces the regulatory program and summarizes the actions that must be taken to meet current and future requirements.

The federal Clean Air Act (CAA) was originally passed by Congress in 1954 and has had several amendments, most notably in 1970 when the federal government took over the lead role and the U. S. Environmental Protection Agency (USEPA) was established, in 1977 when new source permitting became a federal requirement, and in 1990. The 1990 amendments established the major source facility-wide permitting program (i.e Title V), designates Hazardous Air Pollutants (HAP), the continuing issues of large parts of the country not meeting the National Ambient Air Quality Standards (NAAQS) and the environmental issue of acid rain contamination of lakes and watersheds. No major amendments have been made since 1990. The CAA provides for the states and, in some locations, local air pollution control authorities to lead the efforts. On tribal lands, the local tribe may also be the lead agency. The states and local government requirements can be no less stringent than the federal rules, but in many cases are more stringent. This Section describes the federal rules, but all railroad personnel should ensure that more stringent state and local regulations are also considered and the railroad specific policies regarding applicability of these regulations are incorporated into the decision process.

The primary effect of the CAA is that permits are often required for new sources of air pollutant emissions and for modifications of existing sources. But the CAA has other goals which USEPA pursues, such as:

- Reducing air pollutant emissions across the entire country which cause smog, acid rain and regional haze,
- Reducing emissions of HAPs which cause cancer and other serious health effects,
- Protecting the air quality of the National Parks and Wilderness Areas,
- Phasing out chemicals that weaken the protective stratospheric ozone layer, and
- USEPA is, independent of the CAA, pursuing a goal of reducing greenhouse gas emissions from on road and non- road vehicle fuels.

The railroad industry plays a role in meeting each of these elements.

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Because of concern for cleaner air and global warming, air regulations have become more stringent over the last decade and this trend is expected to continue. It is highly recommended that responsible air professionals be consulted to assure that all elements of the CAA have been identified and addressed and local rules have been considered in planning for significant capital expenditures.

4.2 MOBILE SOURCES (2023)

4.2.1 Overview

Mobile sources include cars, trucks, buses, locomotives and self-propelled goods movement equipment such as fork-lifts, on- road track equipment and bulldozers, etc. There is a distinction between on-road and non-road equipment. On-road means that the equipment has a license to operate on the road. Non-road means that there is no license. Because mobile sources are a substantial portion of the air pollutants that create smog and other NAAQS violations, USEPA has been pressing these sources for reductions in emissions. The CAA has made the USEPA the lead for mobile sources with nationwide rules for emissions, both vehicle emissions and vehicle fuels. California has an exemption to impose stricter rules. The vehicle engine emission standards are requirements on manufacturers to limit the emissions of their equipment. The fuels are limits imposed on fuel distributors. The rules encourage the development and sales of low emission vehicles and fuels. A summary of the objectives, elements and impacts of the mobile source programs is shown in Table 13-4-1.

Portable devices are not self-propelled and include compressors, pumps, and other small, powered devices. These are subject to USEPA rules but may also be subject to local rules to control smog such as areas of California, Texas and the Northeast corridor. Check local rules for any restrictions.

Table 13-4-1. Regulatory Programs Governing Mobile Sources

REGULATORY PROGRAM	ELEMENTS	IMPACT
Mobile Source Emission Standards	Cars and truck	Forces manufacturers to add more controls and increase miles per gallon
	Locomotive emission standards Locomotive idling limitations	New emissions standards for manufacturers limits idling time

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REGULATORY PROGRAM	ELEMENTS	IMPACT
Fuel Quality Standards	Requires decreases in fuel volatility	Reformulation of fuels, specifically for summer driving
	Reduces allowable levels of sulfur in fuel (15 ppm)	Reduces particulate matter emissions and exhaust visibility
Off-road and Non -road Mobile Sources	Tighter emissions limits on Manufacturers	Particulate matter and nitrogen oxide emissions reductions
Limit Fleet Emissions of Ozone Depleting Substances (ODS)	Limits emissions of ODS from fleets of vehicles through proper maintenance	Fleets consist of 10 or more vehicles, capable of being fueled at one location.

4.2.2 Mobile Source Emission Standards

4.2.2.1 Locomotives

Locomotive engines can contribute to air pollution wherever they operate but are especially important sources in urban areas, near switch yards and ports. USEPA first issued locomotive emissions standards in 1998. More stringent locomotive emission standards were issued in March of 2008, when USEPA finalized a three-part program to reduce emissions from diesel locomotives within the United States. These standards require diesel engines to meet much lower emissions rates when they are manufactured or when engines which were manufactured after 1972 are re-manufactured. The rule will cut nitrogen oxide (NOx) emissions by 80% and particulate matter (PM) emissions by 90% when all engines are replaced with new or re-manufactured engines in the future. The three-part program will:

- Tighten emissions standards for existing locomotives when they are remanufactured,
- Set emission standards for newly manufactured locomotives which are now required to meet Tier 4 standards. Meeting these standards requires the use of ultra-low sulfur diesel fuel (ULSD) (less than 15 ppm of sulfur).
- Sets a separate set of emission standards for switch engines again based on year of manufacture or re-manufacture.
- Sets "smoke" standards for the visible plume from the locomotive stack.
- Requires installation of "idle reduction technology".

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These standards are set out in the USEPA tables below:

Table 13-4-2. Line-Haul Locomotive Emission Standards

YEAR OF ORIGINAL MANUFACTURE	TIER OF STANDARDS	STANDARDS (g/bhp-hr)			
		NO _x	PM	HC	CO
1973-1992 ^a	Tier 0 ^b	8.0	0.22	1.00	5.0
1993 ^a -2004	Tier 1 ^b	7.4	0.22	0.55	2.2
2005-2011	Tier 2 ^b	5.5	^e 0.10	0.30	1.5
2012-2014	Tier 3 ^c	5.5	0.10	0.30	1.5
2015 or later	Tier 4 ^d	1.3	0.03	0.14	1.5

Acronyms: NO_x means Nitrogen Oxides, PM means Particulate Matter, HC means Hydrocarbons, CO means Carbon Monoxide, g/bhp-hr means grams per brake horsepower hour.

^a Locomotive models that were originally manufactured in model years 1993 through 2001, but that were not originally equipped with a separate coolant system for intake air are subject to the Tier 0 rather than the Tier 1 standards

^b Line-haul locomotives subject to the Tier 0 through Tier 2 emission standards must also meet switch standards of the same tier.

^c Tier 3 line-haul locomotives must also meet Tier 2 switch standards.

^d Manufacturers may elect to meet a combined NO_x + HC standard of 1.4 g/bhp-hr instead of the otherwise applicable Tier 4 NO_x and HC standards, as described in paragraph (j) of this section.

^e The PM standard for newly remanufactured Tier 2 line-haul locomotives is 0.20 g/bhp-hr until January 1, 2013, except as specified in §1033.150(a).

Table 13-4-3. Switch Locomotive Emission Standards

YEAR OF ORIGINAL MANUFACTURE	TIER OF STANDARDS	STANDARDS (g/bhp-hr)			
		NO _x	PM	HC	CO
1973-2001	Tier 0	11.8	0.26	2.10	8.0
2002-2004	Tier 1 ^a	11.0	0.26	1.20	2.5
2005-2010	Tier 2 ^a	8.1	^b 0.13	0.60	2.4
2011-2014	Tier 3	5.0	0.10	0.60	2.4
2015 or later	Tier 4	^c 1.3	0.03	^c 0.14	2.4

^a Switch locomotives subject to the Tier 1 through Tier 2 emission standards must also meet line-haul standards of the same tier.

^b The PM standard for new Tier 2 switch locomotives is 0.24 g/bhp-hr until January 1, 2013.

^c Manufacturers may elect to meet a combined NO_x + HC standard of 1.4 g/bhp-hr instead of the otherwise applicable Tier 4 NO_x and HC standards, as described in paragraph (j) of this section.

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Table 13-4-4. Smoke Standards for Locomotives (Percent Opacity)

	STEADY-STATE	30-SECOND PEAK	3-SECOND PEAK
Tier 0	30	40	50
Tier 1	25	40	50
Tier 2 and later	20	40	50

4.2.2.1.1 Idling

The rules also require new and re-manufactured locomotives to be fitted with "idle reduction technology". These devices automatically shut down engines which are idling "unnecessarily".

4.2.2.1.2 Fuels

USEPA mandated in 2004 as part of the Clean Air Non-Road Diesel Rule that includes locomotives, ultra-low sulfur diesel (ULSD) fuel be used throughout the industry.

While USEPA has set fuel and miles per gallon standards for on road vehicles to reduce greenhouse gas emissions, it has not done so for locomotives.

4.2.2.2 Non-Road Mobile Sources

Non-road mobile sources are used by the industry for goods movement, track maintenance and other jobs. USEPA calls these engines non-road. These include railroad owned forklifts, cranes and other self-propelled diesel fueled equipment used in ports, switch yards, track/tie/ballast maintenance and other loading/off-loading facilities. Currently all new such equipment between 50 and 750 horsepower must be manufactured to Tier 4 emissions levels. Existing equipment must meet the emission requirements based on the year of manufacture. The diesel fuel must be ULSD and there should be a check with local regulations on use of earlier Tier equipment.

4.2.2.3 On-Road Mobile Sources

USEPA has been regulating these sources since the 1960's and has an advanced and complex program based on the year of manufacture of these vehicles and the fuels which they can use (now all ULSD for diesel fueled motor vehicles). The railroad industry owns on-road heavy-duty trucks including hi-rail equipment that must meet these standards. From a practical standpoint, care must be taken when purchasing trucks. New trucks will meet the current standards but used trucks may have to be brought up to current standards by the retrofit of approved control devices in some jurisdictions. USEPA finalized new rules in 2011 to reduce greenhouse gas emissions

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from these sources primarily through requirements for better fuel mileage from newly manufactured vehicles.

4.2.2.4 Portable Equipment

The industry uses generators, compressors, welders and other portable equipment which are not self-propelled. These engines are subject to USEPA regulations as well as local regulations. Many are required to have catalyts to convert or remove pollutants. These regulations are, as with mobile sources, subject to controls based on the year of their manufacture. Portable equipment can be used for up to a year at one fixed location without stationary source permitting issues as long as it meets the requirements for the year it was manufactured. USEPA's definition of non-road engines, which are not considered part of a stationary source, includes a provision that they cannot operate (continuously or intermittently) at one fixed site for 12 months or more. Particular care must be taken when purchasing new or used equipment to assure that federal and local standards can be met by particular engine size and configuration.

4.3 STATIONARY SOURCES (2023)

4.3.1 Overview

The original thrust of the CAA was directed at stationary sources. Within the railroad industry the most significant stationary sources are maintenance facilities followed by large switch yards. Maintenance facilities can contain boilers, paint booths, solvent cleaning stations, power generation (including emergency generators), storage tanks, and test stands among other sources. Issues related to new maintenance facilities or switch yards and changes to existing facilities are the subjects of the stationary source program and its rules.

The CAA program for stationary sources is multi-faceted and ever changing. A summary of the objectives, and elements of the programs governing stationary sources is shown in Table 13-4-5.

Table 13-4-5. Regulatory Programs Governing Stationary Sources

REGULATORY PROGRAM	ELEMENTS	IMPACT
Ambient Air Quality	National Ambient Air Quality Standards (NAAQS)	Facilities must meet the NAAQS at and beyond the fence line
	States must meet the NAAQS throughout the state	State Implementation Plans (SIP) control emissions from stationary and mobile sources

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REGULATORY PROGRAM	ELEMENTS	IMPACT
Emission Limitations	New Source Performance Standards (NSPS)	Limits emissions of NAAQS pollutants from certain types of new or modified pieces of equipment at railroad facilities
	National Emission Standards for Hazardous Air Pollutants (NESHAPS)	Limits emissions of HAP pollutants from certain types of new, modified and existing equipment at railroad facilities
New Source Permits	Construction Permits for new locations depend on amount of emissions and NAAQS status of the area Major modifications at existing facilities may trigger the same requirements	May require control technology review, modeling of air quality beyond fence line and analysis of impact areas not attaining the NAAQS and/or at National Parks, Wilderness Areas, and Wildlife Refuges designated as Class I areas
Operating Permits	Major and minor sources may be required to hold operating permits	Permits establish emission limitations, monitoring and reporting requirements, inspection procedures and enforcement rules

4.3.2 Air Quality

Ambient air quality limits known as the National Ambient Air Quality Standards (NAAQS) have been established for six (6) common pollutants which are deemed to be of national scope. They are called criteria pollutants because USEPA decides on the numerical value based on a document summarizing effects with respect to health and welfare-based criteria. They are ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter and lead. The NAAQS have changed over the years and the pace of the reduction of the limits has increased over the last decade. Of special concern to the railroad industry are nitrogen dioxide, particulate matter and ozone. Ambient ozone is regulated by controlling emissions of its precursor pollutants, oxides of nitrogen and Volatile Organic Compounds (VOCs)

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Each state, local air pollution control district, and Indian tribe measures the air quality in its geographic area to determine if they violate the standard. If an area is found to be in violation, then USEPA requires the area to prepare a State Implementation Plan (SIP) or a tribal or local plan, to reduce emissions sufficiently to get the concentrations in the air below the NAAQS. The SIP includes rules to lower emissions of sources within the area. Areas which are measured to be over the NAAQS are called "nonattainment".

For railroad facilities that are in nonattainment areas, their emissions may be limited more severely than in areas that are attaining the NAAQS. Over the years since this program began in 1970, most sources have been highly controlled in nonattainment areas. In the last decade or more, states with nonattainment problems have looked more and more toward railroad emissions with an eye to reducing those emissions. In ozone nonattainment areas, emissions of nitrogen oxides (from any combustion) and volatile organic compounds (for instance from painting and solvent cleaning) have been the focus of emissions reductions. Many SIPs have specific and detailed emissions requirements for these sources. The switch to ULSD fuel and engines with lower emissions of both particulate matter and nitrogen oxides has helped railroad facilities meet these requirements. Control of emissions from solvent operations and painting are generally required and often include lower organic content paints and solvents or incineration of the hydrocarbon gases.

The switch to ULSD fuels has also helped the railroad industry meet the sulfur dioxide NAAQS. Because ULSD is a clean fuel, reductions of particulate matter and metals emissions also occur. Meeting the particulate matter and nitrogen oxide NAAQS remain as significant challenges to railroad sources at large rail yards and intermodal facilities.

4.3.3 Emissions Limitations

Federally directed emission limitations help the states to control the major sources of emissions that would otherwise need to be controlled by local rules.

The New Source Performance Standards (NSPS) apply to new emission sources and modified emission sources on an industry by industry or equipment by equipment basis. For instance, there are NSPS for boilers, storage tanks, stationary diesel engines, paint booths and other stationary devices which might be at railroad facilities. NSPS are for the control of the criteria pollutants which have NAAQS. NSPS include emission limitations, monitoring requirements and reporting rules for these individual sources. NSPS regulations potentially applicable to railyards include Subpart Dc, Subpart IIII and Subpart JJJJ.

40 CFR Part 60, Subpart Dc - NSPS Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units. This NSPS affects steam generating units (e.g. boilers)

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with a maximum heat input greater than or equal to 10 MMBtu/hr, constructed or modified after June 9, 1989. Solid and liquid fuel-fired boilers are subject to PM and SO₂ standards. All new boilers subject to the standard, including gas-fired boilers, are subject to notification and fuel monitoring requirements. .

40 CFR Part 60, Subpart Kb - NSPS Standards of Performance for Volatile Organic Liquid Storage Vessels Including Petroleum Storage Vessels. This NSPS affects storage tanks with a capacity greater than or equal to 19,812 gallons (75 m³), constructed or modified after June 23, 1984. Applicable vessels storing liquids with a vapor pressure greater than 5.2 kPa may be subject to the emissions control requirements of this section. All storage tanks subject to the standard are subject to notification and record keeping requirements.

40 CFR Part 60, Subpart IIII - NSPS Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. This NSPS affects compression ignition engines with greater than 30 liters per cylinder displacement constructed or modified by the owner after July 11, 2005. Newly purchased engines are required to meet the requirements at manufacture. Non-emergency and emergency engines must meet NO_x and PM standards which vary based on several factors. Certified fire pump engines are exempt. Emergency engines are defined by less than 100 hours of operation annually, primarily for periodic testing. Recording the operating hours and reason for operation may be required for emergency engines, unless they meet non-emergency engine standards. Shop stand-by generators may fall into this class.

40 CFR Part 60, Subpart JJJJ - NSPS Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. This NSPS affects spark ignition engines of greater than 25 horsepower that are constructed or modified by the owner after June 12, 2006. Manufacturers after that date must sell only compliant engines. Emergency engines (less than 100 hours of operation annually) must record operating hours and reason for operation, unless they meet non-emergency engine standards. Shop stand-by generators may fall into this class.

Another set of standards is called the National Emission Standards for Hazardous Air Pollutants (NESHAP). These are for the control of emissions of one or more of 187 Hazardous Air Pollutants (HAP) which do not have NAAQS. These are also called Maximum Achievable Control Technology (MACT) standards. There are MACT standards for boilers, paint booths and stationary engines. For instance, all stationary diesel engines greater than 500 horsepower need to have oxidation catalyst control devices unless they are truly for emergencies only. More information on these requirements is in Section 13.4.4.

Care must be taken that new equipment meets these NSPS and NESHAP standards. Care must also be taken that modifications of existing equipment or repair/replacement of such equipment do not trigger these standards without applying the necessary controls.

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Finally, as stated above, state agencies will likely have regulations beyond Federal NSPS and NESHAP regulations. These can be pollutant-specific as well as source category-specific.

Examples of how state emission limits may apply to railyard operations:

- **Opacity Limits.** These limits typically apply to any point source of particulate matter such as combustion sources, sand blasting operations, coating booths and sand silo operations.
- **Particulate Matter Limits.** A state generally has a process weight rate limit formula for determining PM limits for sources based on throughput. These will apply to any source of PM such as sand blasting, coating and sand silo operations. PM limits for combustion sources may be in place as well, especially for liquid and solid fuel combustion.
- **Fugitive Dust.** States generally have a requirement to prevent dust from crossing the property line. Depending on the areas (usually driven by attainment status for PM), fugitive dust plans may be required. Common sources of fugitive dust include paved and unpaved roads, and outdoor storage piles.
- **Volatile Organic Compounds (VOC) Regulations:** States will regulate sources of VOC such as parts washing/cleaning and coating operations, through limits on the VOC content of the materials used and work practices.
- Many States have separate air toxic regulations focused on risk to the public and having chemical by chemical emission and/or ambient standards. Many painting and cleaning chemicals fall into this category.

4.3.4 New Source Permits (Pre-Construction)

4.3.4.1 PSD

In an area which is attaining the NAAQS for the pollutants to be emitted by a new source, the permit program is called "Prevention of Significant Deterioration" (PSD) of air quality. For a new location of railroad operations, the source would be defined as all the emissions of all the equipment to be placed at the new location. The emissions of mobile equipment such as locomotives or on-road vehicles and equipment are not included in the total. If the total for any one of the NAAQS pollutants is greater than 250 tons/year (termed a "major" source) a federally required but usually state issued pre-construction permit is needed. The tons of emissions are based on the "potential to emit" which is the maximum emission rate times 8760 hours per year unless the permit limits those emissions. The permitting authority could be the USEPA Regional office for your state, the state agency, or a local air pollution control district or tribe. Most railroad facilities are less than major sources.

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A more common concern in the industry is adding new equipment or making considerable modifications to existing equipment at an existing railroad facility. The need for a federal permit is based on whether the current facility is "major". If the current source is major, Table 13-4-6 shows the emission increases that would trigger the need for a PSD permit.

Additionally, only the pollutants which are increasing above the thresholds need to be reviewed under PSD rules in the permit application.

Table 13-4-6. Major Modification Thresholds for PSD Regulated Pollutants

PSD-REGULATED POLLUTANTS	MAJOR MODIFICATION THRESHOLD (tons/year)
Sulfur Dioxide (SO ₂)	40
Nitrogen Oxides (NO _x)	40
Particulate Matter (PM)	25
Course PM (PM ₁₀)	15
Fine PM (PM _{2.5}) ^a	10
Carbon Monoxide	100
Volatile Organic Compounds (VOC)	40
Lead (Pb)	0.6
Fluorides (F)	3
Sulfuric Acid Mist (H ₂ SO ₄)	7
Hydrogen Sulfide and/or Total Reduced Sulfur Compounds	10
Greenhouse Gases ^b	75,000

a The major modification threshold is 10 tons/year of direct emissions. However, emissions of SO₂ and NO_x can also produce PM_{2.5} through chemical processes in the atmosphere. A threshold of 40 t/y for these precursor pollutants also triggers PSD permitting for PM_{2.5}.

b If greenhouse gases is the only pollutant above the threshold, PSD is not triggered

The PSD permit application is highly complex and requires an analysis and implementation of currently available emissions control technology called Best Available Control Technology (BACT), modeling for compliance with ambient air quality limits, PSD allowable concentration increments, and evaluation of the impact on Class I National Parks, Wilderness Areas, and Wildlife Refuges. Assistance of a professional is recommended for evaluating PSD applicability and helping to prepare a PSD permit application if needed.

4.3.4.2 New Source Review

In nonattainment areas, the pre-construction permitting program is called New Source Review (NSR). You must know the NAAQS attainment status of the area where the facility is located for

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each criteria pollutant. Depending on your location you may be subject to NSR for some pollutants and PSD for other pollutants. A combined PSD/NSR permit will be issued when there are both attainment and nonattainment pollutants whose emissions exceed the major permit or major modification thresholds.

The emission increase thresholds for nonattainment areas are 100 tons/year or less and differ by the severity of the nonattainment problem in the area of the facility. Table 13-4-7 provides the NSR thresholds.

Table 13-4-7. Nonattainment Classifications and Thresholds

POLLUTANT	NONATTAINMENT CLASSIFICATION	MAJOR SOURCE THRESHOLD (tons/year)	MAJOR MODIFICATION THRESHOLD (tons/year)
Ozone (thresholds apply to precursor emissions of NO _x and VOC)	Marginal or Moderate	100	40
	Serious	50 ^a	25
	Severe	25	25
	Extreme	10	any increase
PM ₁₀	Moderate	100	15
	Serious	70	15
PM _{2.5}	Not applicable	100	10 ^c
CO	Moderate	100	100
	Serious	50 ^b	50 ^b
SO ₂	Not Applicable	100	40
NO _x	Not Applicable	100	40
Lead (Pb)	Not Applicable	100	0.6

a A major source threshold of 50 tons/year also applies to the Ozone Transport Region (23 States east of the Mississippi)

b Only applies if USEPA determines that source is a major contributor to a CO nonattainment problem.

c The major modification threshold is 10 tons/year of direct emissions. However, emissions of SO₂ and NO_x can also produce PM_{2.5} through chemical processes in the atmosphere. A threshold of 40 t/y for these precursor pollutants also triggers PSD permitting for PM_{2.5}.

If a NSR permit is needed there are two major requirements. One is an analysis of control technology called Lowest Achievable Emission Rate (LAER), which is based on the best technology available at the time of the application to reduce emissions from the source in question regardless of cost. This is a case by case determination made by the permitting authority. The second major requirement is that any increase in emissions, after the application of LAER, be offset with reductions from other existing sources at the facility or reductions

purchased by the applicant from other facilities in the nonattainment area. Assistance of a professional is recommended for NSR permitting actions.

4.3.4.3 State and Local Permits

If a new facility or major modification of an existing facility is not going to increase emissions at greater than the thresholds for PSD or NSR permits, almost all states and local districts require a preconstruction permit based on their own rules for minor sources. These agencies should be consulted regarding applicability of the thresholds and requirements. Even the most knowledgeable applicants prepare a summary of expected emissions and ask the agency for an applicability determination. The more difficult the attainment situation in an area, the more likely it is that even small new units or small changes in existing units will need permitting.

Most states also have lists of sources that are exempt from permitting, but some exemptions actually have conditions. It is important to know the exemptions and associated conditions and be able to demonstrate the unit meets the exemption conditions.

4.3.4.4 Other Federal and State Pre-Construction Requirements

The National Environmental Policy Act (NEPA) requires that projects which include federal funds or federal approval, must consider the impact on the environment. This may require a cursory review or a detailed Environmental Impact Statement (EIS). Preparing an EIS is a long, highly consultative process. Many States have equivalent programs where State funding or State approval is required.

4.3.4.5 Conformity

For projects involving direct federal funding, Section 176(c) of the CAA requires that these projects meet the requirements of implementation plans issued by state and local authorities. The implementation plan refers to any state or local plan (rules, standards, etc.) to implement requirements of the CAA, as approved by USEPA. Section 176 also has several specific clauses related to transportation plans and projects, upon which Transportation Conformity rules are based. Transportation and General Conformity rules apply on a pollutant-by-pollutant basis only to projects in areas that are designated as nonattainment or maintenance with respect to a NAAQS. A maintenance area is an area that was previously designated nonattainment within the past 20 years but has since achieved attainment of the NAAQS.

Transportation Conformity rules (40 CFR 93, Subpart A) apply to Federally funded transportation projects. Such projects generally include work on Federally funded or approved highways and on Federally funded or approved passenger rail transit projects. Freight railroad facilities are usually not directly affected by transportation conformity rules. However, highways

or interchanges built to help accommodate rail intermodal facilities, for example, generally receive Federal funding and/or approval. While Transportation Conformity rules may not directly apply to an intermodal facility, the possibility of meeting some conformity requirements must be considered.

General Conformity rules (40 CFR 93, Subpart B) apply to most other Federal agency actions (funding, approvals, permits) not covered by Transportation Conformity rules. However, some small projects are exempted if emissions are less than certain thresholds. There are a few types of projects that are specifically exempted from General Conformity, but the exemptions generally don't apply to federal agency actions that would affect freight or passenger service.

Care must be taken to ensure that these processes are completed or not needed before beginning a project.

4.3.5 Operating Permits

4.3.5.1 Title V Operating Permits

The federal program requiring operating permits for all major sources comes from Title V of the CAA. They are therefore called "Title V" permits. All states (and some local and tribal air quality agencies) have the authority to issue Title V permits, but the terms and conditions in the permit are all federally reviewable and enforceable. The term of the permit is universally 5 years after which it must be renewed after reapplication (time of reapplication identified by State rules). These permits are primarily a listing of the emission limits, record keeping, monitoring and reporting requirements with which the facility must comply. Mobile sources are not included in the permit. The Title V permit conditions are federally enforceable and flow from preconstruction permits, NSPS, NESHAP, and other federal and federally approved state rules which apply to the facility. The purpose of the Title V permit program is to consolidate all air emission related requirements in one permit to provide for ease of enforcement of these terms and conditions. Title V permits require reporting of compliance or noncompliance every six months and a plant manager certification of compliance every year. Title V operating permits do not replace preconstruction permits; they merely consolidate the terms and conditions of those permits.

Title V applies to major facilities, in this case defined as facilities which the potential to emit more than 100 tons per year of any one criteria pollutant or 10 tons/per year of a single HAP, or 25 tons per year of the combination of all HAPS. For facilities located in non-attainment areas or ozone transport regions, the major source threshold will be lower depending on the attainment status of the area. Again, the potential to emit applies unless limited by the permit. Examples of these limits include annual fuel usage restrictions, hours of operating, and limits on annual

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throughput. Sources that restrict emissions below the major source thresholds are referred to as synthetic minors. In addition, many states require minor sources to obtain operating permits fashioned on Title V.

Title V is the basis for states or local agencies to collect annual permit fees. Sources are required to pay annual fees calculated based on a cost per ton of emitted pollutant. Per ton costs are adjusted periodically based on the Consumer Price Index. An inventory of actual emissions is due each year for sources with Title V permits, but some states and local jurisdictions also require annual emission inventories (and in some cases annual fees) for sources with minor (non-Title V) operating permits.

4.4 TOXIC/HAZARDOUS AIR POLLUTANTS (2023)

4.4.1 Overview

Toxic (hazardous) air pollutants may cause human health issues in the immediate area of the emissions. Railroads may deal with toxic or hazardous pollutants in painting and cleaning operations and emissions from diesel engines may be considered toxic. They are not nationwide problems because they are generally associated with a specific source. For this reason they are treated differently than the criteria pollutants. A summary of the regulatory programs and impacts of these programs is presented in Table 13-4-8.

Table 13-4-8. Regulatory Programs Governing Toxic/Hazardous Air Pollutants

REGULATORY PROGRAM	ELEMENTS	COMMENTS
Hazardous Air Pollutants	List of 187 HAPs	Many "air toxics" not on list
	Defines major source as 10 tpy of any one or 25 tpy of all HAPS	Minor sources (area sources) are also subject to regulation
	Regulation of HAP emissions by industrial source category	MACT standards promulgated for many stationary source categories
State Air Toxics Programs	Focused on ambient air	Requires meeting state ambient air standards for toxics
	Health risk	Many states also require health risk assessments
Accidental Releases	Risk Management Planning Rule	Stationary sources may require plans
	Chemical Safety Board	Investigates accidents and calls for revisions to safety plans

4.4.2 Hazardous Air Pollutants

4.4.2.1 Stationary Sources

The original CAA of 1970 directed USEPA to identify hazardous air pollutants (HAPs) and create standards for each HAP. This process resulted in a number of HAP-specific NESHAP regulations that can be found at 40 CFR Part 61. This was a slow process and, as a result, the CAA Amendments of 1990 specifically identified 189 Hazardous Air Pollutants (HAP) by name and required USEPA to develop standards for each type of source that emits HAPs. These NESHAP regulations can be found at 40 CFR Part 63. USEPA lists the industrial categories of stationary sources which require controls of the emissions of these HAPs. The language of the standards is Maximum Available Control Technology (MACT). In general MACT standards apply to major source facilities, but several apply to minor sources as well based on the size of the equipment (the USEPA calls minor sources "area" sources in the MACT program). MACT standards apply to new, modified and existing sources.

Diesel particulate emissions are not on the list of HAPs but some compounds in diesel exhaust are. Mobile sources are not subject to MACT standards. Stationary source railroad operations are subject to the MACT program, primarily maintenance facilities. A summary of the MACT standards is presented in Table 13-4-9.

Table 13-4-9. MACT Standards That May Impact Railroad Operations (40CFR Part 63)

SUBPART	TITLE
MMMM	Surface Coating of Miscellaneous Metal Parts and Products
ZZZZ	Stationary Reciprocating Internal Combustion Engines (RICE)
DDDDD	Major Sources: Industrial, Commercial and Institutional Boilers and Process Heaters
JJJJJ	Industrial, Commercial and Institutional Boilers Area Sources
PPPPP	Engine Test Cells/Stands
CCCCC	Gasoline dispensing facilities
HHHHH	Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources

As indicated in Table 13-4-9, seven MACT standards currently have the potential to affect railroad operations, depending on major source status and types of emission units present at the facility. They are:

40 CFR Part 63, Subpart MMMM -NESHAP for Surface Coating of Miscellaneous Metal Parts and Products. Painting of railcars and locomotives are specifically cited as a subject

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activity and may affect larger rail maintenance facilities. Facilities that are a major source of HAPs and that use more than 250 gallons of HAP-containing coatings and thinners per year must both purchase and use coatings that contain limited amounts of HAPs or control the emissions by capturing and incinerating the vapors coming off the painting operation.

40 CFR Part 63, Subpart ZZZZ - NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE). The rule affects any stationary engine located at an area or major source of HAPs, including emergency engines and fire water pumps. Requirements for emergency engines and fire water pumps include installing a run-time totalizer on each engine, recording the time of operation and reason for operation each time the engine runs, and annual oil changes and maintenance inspections.

Non-emergency engines can be subject to additional requirements such as emission limitations and controls, monitoring and reporting requirements depending on the size and type of engine, age of the engine, and facility HAP status (area or major).

40 CFR Part 63, Subpart DDDDD - NESHAP for Major Sources: Industrial, Commercial and Institutional Boilers and Process Heaters. Boilers burning solid or liquid fuels are subject to emission limitations for CO, PM, HCl and mercury, depending on the boiler size, fuel type and age. Work practices that may include energy assessments and boiler tune-ups apply to solid, liquid and gas-fired boilers, again based on the boiler size, fuel type and age.

40 CFR Part 63, Subpart JJJJJ - NESHAP for Industrial, Commercial and Institutional Boilers Area Sources. For solid fuels there are limits on mercury, PM and CO emissions. For oil fired boiler >10 MMBTU/hour heat input there are limits on particulate matter emissions. For smaller boilers there are best management practices such as yearly tune-ups and energy audits. Natural gas boilers are exempt.

40 CFR Part 63, Subpart PPPPP - NESHAP for Engine Test Cells/Standards. This MACT applies to major HAP sources containing test stands for uninstalled engines (once installed on the locomotive they are a mobile source). Large maintenance facilities that are major HAP sources must be in compliance with this MACT, which includes emission limitations for CO or total hydrocarbons.

40 CFR Part 63, Subpart CCCCC - NESHAP for Source Category: Gasoline Dispensing Facilities. This standard applies to area HAP sources with a stationary gasoline tank from which gasoline is dispensed into any gasoline engine, including on and off-road motor vehicles, lawn and landscaping equipment, generators, pumps and other gasoline-fueled engines and equipment. Proper gasoline management practices and fuel usage records are required. Additional requirements apply for facilities with monthly gasoline throughput of 10,000 gallons or more.

40 CFR Part 63, Subpart HHHHHH - NESHAP: Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources. This standard applies to the spray application of coatings that contain target HAPs (cadmium, chromium, lead, nickel, manganese), as well as any paint stripping using methylene chloride. Requirements include work practices and training.

There are no other categories affecting railroads on the list. These 7 NESHAPS will be up for evaluation in eight years (circa 2024) after their original promulgation and could be tightened if the emissions of HAPs still affect the public.

In addition to the MACT standards found at Part 63, the National Emission Standard for Asbestos, which is a Part 61 NESHAP found at 40 CFR Part 61, Subpart M, potentially applies to all railyards. This standard applies to any demolition or renovation project that may occur at the railyard and is not dependent on a potential to emit for asbestos. Notification and work practices apply to any renovation project involving at least 260 linear feet, 160 square feet, or 35 cubic feet of regulated asbestos containing material, and to any demolition project regardless of the amount or presence of asbestos. State and local agencies implement the program and often add fees and lower asbestos thresholds.

4.4.2.2 Mobile Sources

There are fuel standards that affect automobiles and trucks, including ULSD fuel which limit the amount of benzene in the fuel. Except for issues of performance of railroad owned mobile sources on these fuels, there are no specific requirements for railroad mobile sources.

4.4.2.3 State Air Toxics Programs

There are 35 states with air toxics programs that go beyond the federal HAP programs. They usually encompass 500 or more air toxic compounds. Some of these programs have listed diesel particulate matter as an air toxic. These programs are focused on the ambient air concentration of the air toxic at the facility fence line. A concentration not to be exceeded at or beyond the fence line is adopted through a state review process and the facility must demonstrate that it will not be exceeded. Options to meet such limits include taller stacks or additional emissions controls as a way to reduce impact on the public. Most programs are triggered by the permitting process at which time an evaluation is made. About half of these states require that a Health Risk Assessment (HRA) accompany the permit application.

A HRA is a process to determine the possibility that emissions could result in adverse health effects for residents near a facility. Adverse health effects can include an increased lifetime possibility of developing cancer, long term non-cancer illness, or immediate reactions to exposure. The HRA for rail projects usually focuses on just the inhalation of air pollutants since for rail-related emissions the primary concern is direct inhalation of various air contaminants.

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Some states (California, for example) have their own published maximum recommended exposure thresholds and chemicals of concern. In other states, there is no state or local guidance on pollutants to be evaluated or maximum acceptable thresholds. However, the USEPA maintains an Internet-accessible database referred to the Integrated Risk Information System (IRIS) that provides reference concentrations and estimated cancer risk threshold concentrations for numerous substances. The IRIS database can be used as a reference basis for conducting a HRA in areas where there is no state or local program providing HRA guidance.

4.4.2.4 Accidental Releases

The CAA under Section 112(r) addresses issues related to accidental releases. For listed chemicals stored in greater than threshold quantities at stationary sources, the CAA requires that the facility prepare a Risk Management Plan (RMP) which identifies the risks of explosion, fires, and toxicity of vapors and aerosols due to potential accidental releases to the air. The RMP must address how to forestall those releases and minimize the risk to the public. Fuels are not on the RMP list except for propane which can be found at railyards. At this time, propane, though listed, is exempt from RMP if it is used as a fuel (as opposed to in a process). While it is not expected that many railroad facilities participate in this program, RMP does include a general duty clause that requires facilities to identify hazards at the facility, and to manage those hazards in a manner that will minimize the consequences of an accidental release. Railyards should be aware of hazards that may result from accidental releases and ensure such hazards are properly managed.

The CAA also established the Chemical Safety Board which investigates and reports on accidental releases which might happen at railroad facilities. Of course, accidents on the rails are investigated by the National Transportation Safety Board rather than the Chemical Safety Board.

4.5 OZONE DEPLETING SUBSTANCES (2023)

The United States is a party to the Montreal Protocol and Title VI of the CAA is the US implementation of that treaty. It requires the phase out of freons, halons and Hydrochlorofluorocarbons (HCFC) over the period ending in 2030. USEPA has been advancing toward that goal with requirements to change to new refrigerants that become available and phasing out the old ones. USEPA has promulgated a list of Ozone Depleting Substances (ODS). The railroads have significant stocks of refrigerated trucks and railcars that need to be in step with the changes of refrigerants.

There are two aspects of the program that are specific to individual facilities. If a facility has a fleet of vehicles which use ODS in their air conditioning systems, it must demonstrate and include that the air conditioning systems of that fleet of vehicles are maintained by certified

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technicians. If railyard technicians maintain the ODS units, the railyard must certify to USEPA that it has obtained approved ODS servicing equipment and each employee authorized to use the equipment is trained and certified. Proof of employee training must be maintained on-site. A fleet of vehicles is any more than ten vehicles capable of being fueled at the same location. Likewise, if the facility has building/comfort air conditioners which use ODS, then that set of air conditioners must be serviced by a certified technician. In addition, if any of the units have a full charge capacity greater than 50 pounds of ODS, certain maintenance and leak rate records must be maintained to demonstrate ODS leaks remain below established leak rates (15% for comfort cooling units). If the facility has a Title V permit, then that permit must reflect compliance with the ODS requirements.

4.6 PROVISIONS RELATED TO ENFORCEMENT (2023)

The CAA Amendments of 1990 granted USEPA significantly increased enforcement powers. These include administrative penalty orders, administrative consent orders and referral to the Department of Justice for civil or criminal prosecution. The Amendments provide for increased enforcement avenues as described in Table 13-4-10:

Table 13-4-10. Regulatory Enhancements of the 1990 Amendments

ENFORCEMENT PROGRAM	ELEMENTS	IMPACT
Penalties	Increased fines	\$5,000 /day increased to \$25,000/day to be increased by CPI; Now at \$37,500/day
		Fine from date violated for each day until date corrected.
Compliance Certification	Title V requires compliance certification by plant manager	Compliance violations can be criminal for plant manager individually
Citizen Suit Provisions	Citizen can sue for CAA violations	Penalties imposed
Whistle Blower	Any individual can make \$10,000 for revealing violations	Must be something that would not have discovered in normal process of enforcement

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Inspection Fines	Authority for USEPA Inspector to fine at the time of an inspection	\$5,000/violation
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The fines authorized by the CAA Amendments of 1990 can be significant. In additions, felony criminal charges are authorized for individuals who knowingly commit or fail to report violations. The Title V and PSD/NSR compliance certifications require the responsible official to make an informed inquiry into compliance before signing the certification and failure to do so invites criminal prosecution.

4.7 GREENHOUSE GASES (2023)

4.7.1 Overview of Greenhouse Gases

Greenhouse Gases (GHGs) absorb and emit radiant energy within the thermal infrared range causing what is referred to as the greenhouse effect in Earth's atmosphere. Without the presence of any GHGs, Earth's average surface temperature would be about 0 °F, rather than the present average of 59 °F. The primary GHGs in Earth's atmosphere are water vapor (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and ozone (O₃). Secondary GHGs also present in the atmosphere due to human activity include Chlorofluorocarbons (CFCs) and Hydrofluorocarbons (includes HCFCs and HFCs). Details on the primary GHGs that contribute to the greenhouse effect include:

- **Water Vapor (H₂O).** The most abundant greenhouse gas in the atmosphere. Water vapor increases as the Earth's atmosphere warms, but so does the possibility of clouds and precipitation, making these some of the most significant indicators of the greenhouse effect.
- **Carbon Dioxide (CO₂).** A minor, but very important component, of the atmosphere. CO₂ is released through natural processes such as respiration, volcano eruptions and through human activities such as burning fossil fuels.
- **Methane (CH₄).** A hydrocarbon gas produced both through natural sources and human activities, including the decomposition of wastes in landfills, agriculture, as well as animal digestion and manure management associated with domestic livestock. On an individual basis, methane is a far more active GHG than carbon dioxide, but also one which is much less abundant in the atmosphere.

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- **Nitrous oxide (N₂O).** A powerful GHG produced by soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.
- **Chlorofluorocarbons (CFCs).** Synthetic compounds entirely of industrial origin used in several applications, but now largely regulated in production and release to the atmosphere by international agreement for their ability to contribute to destruction of the ozone layer. CFCs are also GHGs.

4.7.2 Global Warming Potential

As discussed in prior sections, different GHGs have different abilities to absorb solar energy and reflect it as thermal heat. Global Warming Potential (GWP) is the heat absorbed by any GHG in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of CO₂. Since the definition of GWP is relative to CO₂, its GWP is 1.0 by definition. Other GHGs, like CH₄, have large GWP, since a ton of CH₄ absorbs much more heat than a ton of CO₂. Additionally, some GHGs, break down over time, and their heat absorption, or GWP, over the next 20 years is larger than their heat absorption will be over longer periods of time, like 100 or 500 years. Values of GWP are estimated and updated periodically.

For the purposes of evaluating GHG emissions, Carbon dioxide equivalent (CO₂e) is calculated using GWP as presented in the equation below:

$$\text{CO}_2\text{e} = \text{GHG Emissions} \times \text{GWP}$$

The CO₂e convention provides a common scale for measuring the climate effects of different gases. Carbon dioxide has a GWP of exactly 1 (since it is the baseline unit to which all other greenhouse gases are compared).

Table 13-4-11 Global Warming Potentials of Select Greenhouse Gases

GREENHOUSE GAS	LIFETIME (Years)	GLOBAL WARMING POTENTIAL		
		20 Year	100 Year	500 Year
Carbon Dioxide, CO ₂	Variable	1	1	1
Methane, CH ₄	9-15	56	21	6.5
Nitrous Oxide, N ₂ O	120	280	310	170
Sulphur hexafluoride, SF ₆	3,200	16,300	23,900	34,900

Source: United Nations, IPCC Second Assessment Report

4.7.3 GHG Emission Scopes

Organizational activities can generate GHG emissions that occur inside the organizational boundary as well by separate organizations due to a company's operations. To distinguish between these activities, GHG emissions are categorized into three categories or scope based on where they occur: scope 1, scope 2 or scope 3 emissions.

Scope 1 emissions are direct greenhouse (GHG) emissions that occur from sources that are controlled and/or owned by an organization. These sources can include stationary combustion equipment (e.g., boilers, furnaces, generators, etc.), mobile sources (e.g. train engines, vehicle fleets, etc.), fugitive (e.g. refrigerant leaks) and process emissions. Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although scope 2 emissions physically occur at facilities outside of the organizational boundary, they are accounted for in an organization's GHG inventory because they are resulting from an organization's energy use which they are in control of.

Scope 3 emissions are all indirect emissions, not otherwise included in scope 2, that occur in the value chain of the reporting company linked to the company's operations. Scope 3 emissions are generally divided into upstream and downstream sources:

- Upstream sources of GHG that should be included in an organization's GHG inventory include business travel; employee commuting; waste generation; purchase goods and services; and transportation of purchased goods and services.
- Downstream sources of GHG that should be included in an organization's GHG inventory include investments and franchises; transportation of sold products; and leased assets.

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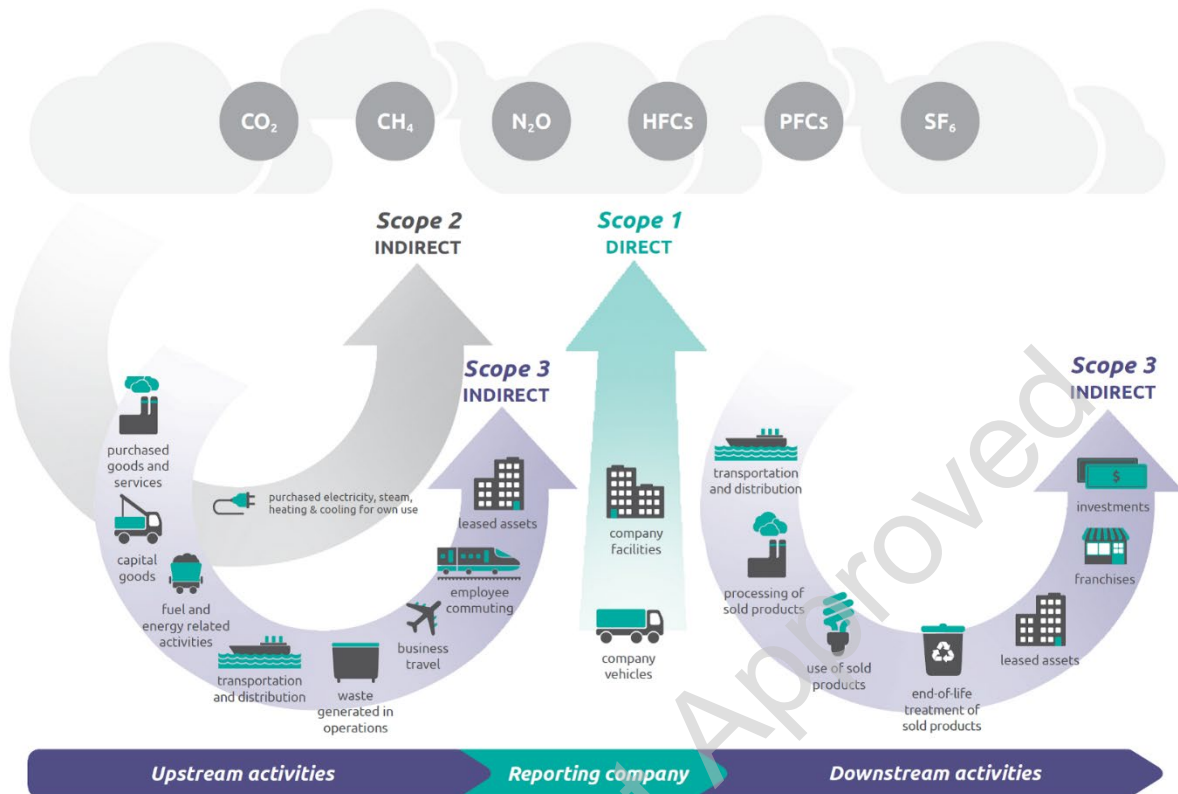


Figure 13-4-1 Overview of GHG Protocol Scopes (Source: WRI/WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard (PDF), page 5.)

The USEPA's Center for Corporate Climate Leadership and the various corporate disclosure protocols have guidance to help companies determine GHG emissions and develop their corporate inventory.

4.7.4 Regulation of GHG Emissions

The USEPA and many states have regulations to report on and reduce emissions of GHG. These efforts include:

- Control of emissions for light duty and heavy-duty trucks and automobiles through increase in required manufacturers' fleet average miles per gallon. USEPA has not proposed rules based on greenhouse gas emissions that would affect locomotives or non-road equipment, but some states are considering them.
- USEPA had promulgated rules to reduce power plant greenhouse gas emissions on a state-by-state basis. On February 9, 2016, these rules were stayed by the US Supreme Court. Many states have and are still developing plans to reduce greenhouse gas

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emissions which in general do not require emission reductions from railroad industry operations.

- USEPA adopted greenhouse gas rules for sources which need PSD or NSR preconstruction permits, for the evaluation of BACT options for greenhouse gas emissions. However, the US Supreme Court vacated a substantial portion of those rules, mandating that greenhouse gas emissions, by themselves, cannot trigger the need for a PSD or NSR permit, due to lack of CAA support. As allowed by the court, USEPA is planning to revise its PSD rules to require greenhouse gas BACT to be applied to projects with a CO₂-equivalent (CO₂e) emission increase of 75,000 tons/year or more if such projects already require a PSD permit for other pollutants.
- USEPA and the States are preparing yearly inventories of greenhouse gas emissions for stationary sources with at least 25,000 tons/year of CO₂e emissions, in accordance with USEPA's Mandatory Greenhouse Gas Reporting Rules (40 CFR 98). Some states or local jurisdictions may require reporting at lower thresholds, so railroad facilities with CO₂e emissions less than 25,000 tons/year should check with state and local authorizes on whether they need to participate.
- Many states have adopted specific GHG emission reduction regulations that may impact rail operations including (but not limited to) California, New York and Oregon.