ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 80, 85, 86, 94, 1027, 1033, 1039, 1042, 1043, 1045, 1048, 1051, 1054, 1060, 1065, and 1068

[EPA–HQ–OAR–2007–0121; FRL–9097–4]

RIN 2060–AO38

Control of Emissions From New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: EPA is finalizing emission standards for new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines) installed on U.S. vessels. These emission standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL Annex VI). The emission standards apply in two stages—near-term standards for newly built engines will apply beginning in 2011; long-term standards requiring an 80 percent reduction in NO_X emissions will begin in 2016. We are also finalizing a change to our diesel fuel program that will allow for the production and sale of 1,000 ppm sulfur fuel for use in Category 3 marine vessels. In addition, the new fuel requirements will generally forbid the production and sale of other fuels above 1,000 ppm sulfur for use in most U.S. waters, unless alternative devices, procedures, or compliance methods are used to achieve equivalent emissions reductions. We are adopting further provisions under the Act to Prevent Pollution from Ships, especially to apply the emission standards to engines covered by MARPOL Annex VI that are not covered by the Clean Air Act, and to require that these additional engines use the specified fuels (or equivalents).

The final regulations also include technical amendments to our motor vehicle and nonroad engine regulations; many of these changes involve minor adjustments or corrections to our recently finalized rule for new nonroad spark-ignition engines, or adjustment to other regulatory provisions to align with this recent final rule.

DATES: This final rule is effective on June 29, 2010. The incorporation by reference of certain publications listed in this regulation is approved by the Director of the Federal Register as of June 29, 2010.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2007–0121. All documents in the docket are listed on the *http://www.regulations.gov* Web site. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically in *http://www.regulations.gov* or in hard copy at the EPA–HQ–OAR–2007–0121 Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the EPA–HQ–OAR–2007–0121 is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: Amy Kopin, U.S. EPA, Office of Transportation and Air Quality, Assessment and Standards Division (ASD), Environmental Protection Agency, 2000 Traverwood Drive, Ann Arbor, MI 48105; telephone number: (734) 214–4417; fax number: (734) 214–4050; e-mail address: *Kopin.Amy@epa.gov*, or Assessment and Standards Division Hotline; telephone number: (734) 214–4636.

SUPPLEMENTARY INFORMATION:

General Information

Does This Action Apply to Me?

This action affects companies that manufacture, sell, or import into the United States new marine compression-ignition engines with per cylinder displacement at or above 30 liters for use on vessels flagged or registered in the United States; companies and persons that make vessels that will be flagged or registered in the United States and that use such engines; and the owners or operators of such U.S. vessels. Additionally, this action may affect companies and persons that rebuild or maintain these engines. Finally, this action may also affect those that manufacture, import, distribute, sell, and dispense fuel for use by Category 3 marine vessels. Affected categories and entities include the following:

Category	NAICS Code [a]	Examples of potentially affected entities
Industry	333618	Manufacturers of new marine diesel engines.
Industry	336611	Manufacturers of marine vessels.
Industry	811310	Engine repair and maintenance.
Industry	483	Water transportation, freight and passenger.
Industry	324110	Petroleum Refineries.
Industry	424710, 424720	Petroleum Bulk Stations and Terminals; Petroleum and Petroleum Products Wholesalers.
Industry	483113	Coastal and Great Lakes Freight Transportation
Industry	483114	Coastal and Great Lakes Passenger Transportation

Note:
[a] North American Industry Classification System (NAICS).

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA is now aware will be regulated by this action. Other types of entities not listed in the table may also be regulated. To determine whether your company is regulated by this action, you should carefully examine the applicability criteria in 40 CFR 80.501, 94.1, 1042.1, and 1065.1, and the final regulations. If you have questions, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Table of Contents

I. Overview

This final rule is part of a coordinated strategy to address emissions from ocean-going vessels and is an important step in EPA's ongoing National Clean Diesel Campaign. In recent years, we have adopted major new programs designed to reduce emissions from new diesel engines, including those used in highway (66 FR 5001, January 18, 2001), nonroad (69 FR 38957, June 29, 2004), locomotive, and marine applications (73 FR 25098, May 6, 2008). When fully phased in, these programs will significantly reduce emissions of harmful pollutants from these categories of engines and vehicles. This final rule sets out the next step in this ambitious effort by addressing emissions from the largest marine diesel engines, called Category 3 marine diesel engines. These are engines with per-cylinder displacement at or above 30 liters per cylinder, which are used primarily for propulsion power on ocean-going vessels (OGV).[1]

Emissions from Category 3 engines remain at high levels. These engines use emission control technology that is comparable to that used by nonroad engines in the early 1990s, and use fuel that can have a sulfur content of 30,000 ppm or more. As a result, these engines emit high levels of pollutants that contribute to unhealthy air in many areas of the U.S. Nationally, in 2009, emissions from Category 3 engines account for about 10 percent of mobile source emissions of nitrogen oxides (NO_X), about 24 percent of mobile source diesel $PM_{2.5}$ emissions (with $PM_{2.5}$ referring to particles with a nominal mean aerodynamic diameter less than or equal to 2.5 μm), and about 80 percent of mobile source emissions of sulfur oxides (SO_X). As we look into the future, however, emissions from Category 3 engines are expected to become an even more dominant inventory source. This will be due to both emission reductions from other mobile sources as new emission controls go into effect and to the anticipated activity growth for ocean transportation. Without new controls, we anticipate the contribution of Category 3 engines to national emission inventories to increase to about 24 percent, 34 percent, and 93 percent of mobile source NO_X, $PM_{2.5}$, and SO_X emissions, respectively in 2020, growing to 40 percent, 48 percent, and 95 percent respectively in 2030. The coordinated emission control strategy will lead to significant reductions in these emissions and important benefits to public health.

The evolution of EPA's strategy to control mobile source diesel emissions has followed a technology progression, beginning with the application of high-efficiency advanced aftertreatment approaches and lower sulfur fuel requirements first to highway vehicles, then to nonroad engines and equipment, followed by locomotives and smaller marine diesel engines. The benefits of this approach include maximizing air quality benefits by focusing on the largest populations of sources with the shortest service lives, allowing engine manufacturers to spread initial research and development costs over a larger population of engines, and allowing manufacturers to address the challenges of applying advanced emission controls on smaller engines first.

This approach also allowed us and the shipping community sufficient lead time to resolve technical issues with the use of advanced emission control technology and lower-sulfur fuel on the largest of these engines on vessels engaged in international trade. To that end, EPA has been working with engine manufacturers and other industry stakeholders for many years to identify and resolve challenges associated with applying advanced diesel engine technology to Category 3 engines to achieve significant NO_X emission reductions and using lower-sulfur fuels to achieve significant PM and SO_X emission reductions. This work was fundamental in developing the emission limits for Category 3 engines that we are finalizing in this action and informed the position advocated by the United States in the international negotiations for more stringent tiers of international engine emission limits.

Our coordinated strategy to control emissions from ocean-going vessels consists of actions at both the national and international levels. It includes: (1) The engine and fuel controls we are finalizing in this action under our Clean Air Act authority; (2) the proposal[2] submitted by the U.S. Government to the International Maritime Organization (IMO) to amend Annex VI of the

[1] This final rule generally applies to vessels with the largest marine diesel engines, which are called Category 3 engines in our regulations. In this preamble, we often refer to vessels using these engines as Category 3 vessels. We also refer to them as ocean-going vessels although this intended to be only a descriptive term. While the large majority of these vessels operate in the oceans, some operate solely in our internal waters such as in the Great Lakes. Therefore, we do not use the term ocean-going vessels to exclude the few vessels with Category 3 engines that operate only in fresh-water lakes or rivers or to exclude ocean-going vessels with Category 2 or Category 1 engines, but rather to reflect the way the vessels being regulated are more commonly known to the general public. Note also that, pursuant to 40 CFR 1043 which implements APPS, the fuel requirements described in this rule, unless otherwise specified, generally apply also to fuel used in gas turbines and steam boilers on marine vessels.

[2] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulphur Oxides and Particulate Matter,* Submitted by the United States and Canada. IMO Document MEPC59/6/5, 27 March, 2009. A copy of this document can be found at *http://www.epa.gov/otaq/regs/nonroad/marine/ci/mepc-59-eca-proposal.pdf.*

International Convention for the Prevention of Pollution from Ships (MARPOL Annex VI) to designate U.S. coasts as an Emission Control Area (ECA) [3] in which all vessels, regardless of flag, would be required to meet the most stringent engine and marine fuel sulfur requirements in Annex VI; and (3) the new engine emission and fuel sulfur limits contained in the amendments to Annex VI that are applicable to all vessels regardless of flag through the Act to Prevent Pollution from Ships (APPS), as well as clarification on implementation of those standards, application to domestic and foreign-flagged vessels in internal waters, and application to nonparty foreign-flagged vessels.

The amendments to APPS to incorporate Annex VI require compliance with MARPOL Annex VI by U.S. and foreign vessels that enter U.S. ports or operate in U.S. waters. In light of this, we are deciding not to revisit our existing approach with respect to foreign vessels in this rule. However, the MARPOL Annex VI Tier III NO_X and stringent fuel sulfur limits are geographically based and would not become effective absent designation of U.S. coasts as an ECA. As noted above, the United States forwarded a proposal to IMO to amend Annex VI to designate U.S. coasts as an ECA. This proposal to amend Annex VI was approved in principle and circulated for adoption. We expect the proposed ECA amendment will be adopted at MEPC 60, in March 2010. If this amendment is not adopted in a timely manner by IMO, we intend to take supplemental action to control emissions from vessels that affect U.S. air quality.

Our coordinated strategy for ocean-going vessels will significantly reduce emissions from foreign and domestic vessels that affect U.S. air quality, and the impacts on human health and welfare will be substantial. We project that by 2030 this program will reduce annual emissions of NO_X, SO_X, and particulate matter (PM) by 1.2 million, 1.3 million, and 143,000 tons, respectively, and the magnitude of these reductions would continue to grow well beyond 2030.[4] These reductions are estimated to annually prevent between 12,000 and 30,000 PM-related premature deaths, between 210 and 920 ozone-related premature deaths, 1,400,000 work days lost, and 9,600,000 minor restricted-activity days. The estimated annual monetized health benefits of this coordinated strategy in 2030 would be between $110 and $270 billion, assuming a 3-percent discount rate (or between $99 and $240 billion assuming a 7-percent discount rate). The annual cost of the overall program in 2030 would be significantly less, at approximately $3.1 billion.

A. What Are the Elements of EPA's Coordinated Strategy for Ships?

Our coordinated strategy for ocean-going vessels, including the emission standards finalized in this action under the Clean Air Act, continues EPA's program to progressively apply advanced aftertreatment emission control standards to diesel engines and reflects the evolution of this technology from the largest inventory source (highway engines), to land-based nonroad engines, to locomotives and marine diesel engines up to 30 liters per cylinder. The results of these forerunner programs are dramatic reductions in NO_X and $PM_{2.5}$ emissions on the order of 80 to 90 percent, which will lead to significant improvements in national air quality.

The combination of controls in the coordinated strategy for ocean-going vessels will provide significant reductions in $PM_{2.5}$, NO_X, SO_X, and toxic compounds, both in the near term (as early as 2011) and in the long term. These reductions will be achieved in a manner that: (1) Is very cost effective compared to additional controls on portside vehicles and equipment and other land-based mobile sources that are already subject to stringent technology-forcing emission standards; (2) leverages the international program adopted by IMO to ensure that all ships that operate in areas that affect U.S. air quality are required to use stringent emission control technology; and (3) provides the lead time needed to deal with the engineering design workload that is involved in applying advanced high-efficiency aftertreatment technology to these very large engines. Overall, the coordinated strategy constitutes a comprehensive program that addresses the problems caused by ocean-going vessel emissions from both a near-term and long-term perspective. It does this while providing for an orderly and cost-effective implementation schedule for the vessel owners and manufacturers, and in a way that is consistent with the international requirements for these vessels.

The human health and welfare impacts of emissions from Category 3 vessels, along with estimates of their contribution to national emission inventories, are described in Section II. The new tiers of engine emission standards under the Clean Air Act for addressing these emissions, and our justifications for them, are discussed in Section III. Section IV contains changes to our existing marine diesel fuel program. In Section V, we describe a key component of the coordinated strategy: The recently-submitted proposal to amend MARPOL Annex VI to designate U.S. coasts as an ECA, as well as the IMO amendment process.

In addition to the new emission limits, we are finalizing several revisions to our Clean Air Act testing, certification, and compliance provisions to better ensure emission control in use. We are also finalizing regulations for the purpose of implementing MARPOL Annex VI pursuant to the Act to Prevent Pollution from Ships (33 U.S.C. 1901 *et seq.*). These revisions are described in Section VI. Sections VII and VIII present the estimated costs and benefits of our coordinated program to address OGV emissions.

(1) What CAA Standards Is EPA Finalizing?

We are finalizing new tiers of Category 3 marine diesel engine standards under our Clean Air Act authority, as well as certain revisions to our marine fuel program.

Category 3 Engine Standards. Previous standards for Category 3 engines were adopted in 2003. These Tier 1 standards are equivalent to the first tier of MARPOL Annex VI NO_X limits and require the use of control technology comparable to that used by nonroad engines in the early 1990s. We did not adopt PM standards at that time because the vast majority of PM emissions from Category 3 engines are the result of the sulfur content of the residual fuel they use and because of measurement issues.[5] The combination of the engine and fuel standards we are finalizing and the U.S. Government proposal for ECA designation will

[3] For the purpose of this final rule, the term "ECA" refers to both the ECA and internal U.S. waters. Refer to Section VI.B. for a discussion of the application of the fuel sulfur and engine emission limits to U.S. internal waters through APPS.

[4] These emission inventory reductions include reductions from ships operating within the 24 nautical mile regulatory zone off the California Coastline, beginning with the effective date of the Coordinated Strategy program elements. The California regulation contains a provision that would sunset the requirements of the rule if the Federal program achieves equivalent emission reductions. *See http://www.arb.ca.gov/regact/2008/fuelogv08/fro13.pdf* at 13 CCR 2299.2(j)(1).

[5] As explained in the proposed rule leading to the 2003 final rule, there were concerns about measuring PM from Category 3 marine engines (67 FR 37569, May 29, 2002). Specifically, established PM test methods showed unacceptable variability when sulfur levels exceed 0.8 weight percent. However, as described in Section VI, we now believe these measurement issues have been resolved.

require all vessels that operate in coastal areas that affect U.S. air quality to control emissions of NO_X, SO_X, and PM.

We are revising our engine requirements under the Clean Air Act to include two additional tiers of NO_X standards for new Category 3 marine diesel engines installed on vessels flagged or registered in the United States. The near-term Tier 2 standards will apply beginning in 2011 and will require more efficient use of engine technologies being used today, including engine timing, engine cooling, and advanced computer controls. The long-term Tier 3 standards will apply beginning in 2016 and will require the use of more advanced technology such as selective catalytic reduction.

Because much of the operation of U.S. vessels occurs in areas that will have little, if any, impact on U.S. air quality, our Clean Air Act program will allow the use of alternative emission control devices (AECDs) that will permit a ship to meet less stringent requirements on the open sea. The use of these devices will be subject to certain restrictions, including a requirement that the AECD not disable emission controls while operating in areas where emissions can reasonably be expected to adversely affect U.S. air quality, and that the engine is equipped with a NO_X emission monitoring device. In addition, the engine will be required to meet the Tier 2 NO_X limits when the AECD is implemented, and an AECD will not be allowed on any Tier 2 or earlier engine.

In addition to the NO_X emission limits, we are finalizing standards for emissions of hydrocarbons (HC) and carbon monoxide (CO) from new Category 3 engines. As explained in Section III.B.1, below, we are not setting a standard for PM emissions for Category 3 engines. However, significant PM emissions control will be achieved through the ECA fuel sulfur requirements that will apply through APPS to ships that operate in areas that affect U.S. air quality. We are also requiring engine manufacturers to measure and report PM emissions pursuant to our authority in section 208 of the Clean Air Act.

Fuel Sulfur Limits. We are finalizing fuel sulfur limits under section 211(c) of the Clean Air Act that match the limits that apply under Annex VI in ECAs. First, we are revising our existing diesel fuel program to allow for the production and sale of 1,000 ppm sulfur fuel for use in Category 3 marine vessels. This will allow production and distribution of fuel consistent with the new sulfur limits that will become applicable, under Annex VI, in ECAs beginning in 2015. Our current diesel fuel program sets a sulfur limit of 15 ppm that will be fully phased-in by December 1, 2014 for land-based nonroad, locomotive, and marine (NRLM) diesel fuel produced for distribution, sale and use in the United States. Without this change to our existing diesel fuel regulations, fuel with a sulfur content of up to 1,000 ppm could be used in Category 3 marine vessels, but it could not be legally produced in the U.S. after June 1, 2014. Second, we are generally forbidding the production and sale of fuel oil with a sulfur content above 1,000 ppm for use in the waters within the proposed ECA (*see* Note 3, *supra*). The exception to this is if the vessel uses alternative devices, procedures, or compliance methods that achieve equivalent emission control as operating on 1,000 ppm sulfur fuel.

(2) What Is the U.S. Government Proposal for Designation of an Emission Control Area?

MARPOL Annex VI contains international standards for air emissions from ships, including NO_X, SO_X, and PM emissions. The Annex VI NO_X and SO_X/PM limits are set out in Table I–1. Annex VI was adopted by the Parties in 1997 but did not go into force until 2005, after it was ratified by fifteen countries representing at least 50 percent of the world's merchant shipping tonnage. These Annex VI NO_X standards currently apply to all engines above 130 kW installed on a ship constructed on or after January 1, 2000 and reduce NO_X emissions by about 30 percent from uncontrolled levels. As originally adopted, Annex VI included two fuel sulfur limits: A global limit of 45,000 ppm and a more stringent 15,000 ppm limit for SO_X Emission Control Areas (SECAs). This approach ensures that the cleanest fuel is used in areas that demonstrate a need for additional SO_X reductions, while retaining the ability of ships to use higher-sulfur residual fuel on the open ocean.

Annex VI was amended in October 2008, adding two tiers of NO_X limits (Tier II and Tier III) and two sets of fuel sulfur standards.[6] These amendments will enter into force on July 1, 2010. The most stringent NO_X and fuel sulfur limits are regionally based and will apply only in designated ECAs.

TABLE I–1—ANNEX VI NO_X EMISSION STANDARDS AND FUEL SULFUR LIMITS

			Less than 130 RPM	130–2,000 RPM [a]	Over 2,000 RPM
NO_X g/kW-hr	Tier I	[b] 2004	17.0	$45.0 \cdot n^{(-0.20)}$	9.8
	Tier II	2011	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
	Tier III	2016	3.4	$9.0 \cdot n^{(-0.23)}$	2.0
		Global		ECA	
Fuel Sulfur		2004	[c] 45,000 ppm	2005	[c] 15,000 ppm
		2012	[c] 35,000 ppm	2010	[c] 10,000 ppm
		2020	[c d] 5,000 ppm	2015	[c] 1,000 ppm

Notes:
[a] Applicable standards are calculated from n (maximum in-use engine speed in revolutions per minute (rpm)), rounded to one decimal place.
[b] Tier 1 NO_X standards apply for engines originally manufactured after 2004, and proposed also to certain earlier engines.
[c] Annex VI standards are in terms of percent sulfur. Global sulfur limits are 4.5%; 3.5%; 0.5%. ECA sulfur limits are 1.5%; 1.0%; 0.1%.
[d] Subject to a feasibility review in 2018; may be delayed to 2025.

To realize the benefits from the MARPOL Annex VI Tier III NO_X and most stringent fuel sulfur controls, areas must be designated as Emission Control Areas. On July 17, 2009, the IMO approved in principle a U.S.-Canada proposal to amend MARPOL Annex VI to designate North American coastal waters as an ECA (referred to as the

[6] Note that the MARPOL Annex VI standards are referred to as Tiers I, II, and III; EPA's Category 3 emission standards are referred to as Tiers 1, 2, and 3.

"U.S./Canada ECA" or the "North American ECA").[7] In addition, France has joined the ECA proposal on behalf of the Saint Pierre and Miquelon archipelago. A description of this proposal and the IMO ECA designation process is set out in Section V. ECA designation would ensure that ships that affect U.S. air quality meet stringent NO_X and fuel sulfur requirements while operating within 200 nautical miles of U.S. coasts. We expect the North American proposal will be adopted by the Parties to MARPOL Annex VI in March 2010, entering into force as early as 2012. If, however, the proposed amendment is not adopted in a timely manner, we intend to take supplemental action to control harmful emissions from vessels that affect U.S. air quality.

(3) Regulations To Implement Annex VI

The United States became a party to MARPOL Annex VI by depositing its instrument of ratification with IMO on October 8, 2008. This was preceded by the President signing into law the Maritime Pollution Prevention Act of 2008 (Pub. L. 110–280) on July 21, 2008, that contains amendments to the Act to Prevent Pollution from Ships (33 U.S.C. 1901 *et seq.*). These APPS amendments require compliance with Annex VI by all persons subject to the engine and vessel requirements of Annex VI. The amendments also authorize the U.S. Coast Guard and EPA to enforce the provisions of Annex VI against domestic and foreign vessels and to develop implementing regulations, as necessary. In addition, APPS gives EPA sole authority to certify engines installed on U.S. vessels to the Annex VI requirements. This final rule contains regulations codifying the Annex VI requirements and regulations to implement several aspects of the Annex VI engine and fuel regulations, which we are finalizing under that APPS authority. Our cost and benefit analyses for the coordinated strategy include the costs for U.S. vessels to implement the requirements of this MARPOL Annex VI program, including requirements that will apply upon entry into force of the North American ECA.

(4) Technical Amendments

The finalized regulations also include technical amendments to our motor vehicle and nonroad engine regulations. Many of these changes involve minor adjustments or corrections to our recently finalized rule for new nonroad spark-ignition engines, or adjustment to other regulatory provisions to align with this recent final rule.

(5) Summary

The emission control requirements in our coordinated strategy are the MARPOL Annex VI global Tier II NO_X standards included in the amendments to Annex VI and the ECA Tier III NO_X limits and fuel sulfur limits that will apply when the U.S. coasts are designated as an ECA through an additional amendment to Annex VI. The Annex VI requirements, including the future ECA requirements, will be enforceable for U.S. and foreign vessels operating in U.S. waters through the Act to Prevent Pollution from Ships.

We are also adopting the NO_X emission standards for Category 3 engines on U.S. vessels under section 213 of the Clean Air Act.

Finally, we are adopting additional requirements that are not part of the Annex VI program or the ECA. These are (1) limits on hydrocarbon and carbon monoxide emissions for Category 3 engines; (2) a PM measurement requirement to obtain data on PM emissions from engines operating on distillate fuel; and (3) changes to our diesel fuel program under the Clean Air Act to allow production and sale of ECA-compliant fuel. We are also changing our emission control program for smaller marine diesel engines to harmonize with the Annex VI NO_X requirements for U.S. vessels that operate internationally.

B. Why Is EPA Making This Rule?

(1) Category 3 Engines Contribute to Serious Air Quality Problems

Category 3 engines generate significant emissions of $PM_{2.5}$, SO_X, and NO_X that contribute to nonattainment of the National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$ and ground-level ozone (smog). NO_X and SO_X are both precursors to secondary $PM_{2.5}$ formation. Both $PM_{2.5}$ and NO_X adversely affect human health. NO_X is a key precursor to ozone as well. NO_X, SO_X and $PM_{2.5}$ emissions from ocean-going vessels also cause harm to public welfare, including contributing to deposition of nitrogen and sulfur, visibility impairment and other harmful environmental impacts across the U.S.

The health and environmental effects associated with these emissions are a classic example of a negative externality (an activity that imposes uncompensated costs on others). With a negative externality, an activity's social cost (the costs borne to society imposed as a result of the activity taking place) is not taken into account in the total cost of producing goods and services. In this case, as described in this section below and in Section II, emissions from ocean-going vessels impose public health and environmental costs on society, and these added costs to society are not reflected in the costs of providing the transportation services. The market system itself cannot correct this externality because firms in the market are rewarded for minimizing their production costs, including the costs of pollution control. In addition, firms that may take steps to use equipment that reduces air pollution may find themselves at a competitive disadvantage compared to firms that do not. To correct this market failure and reduce the negative externality from these emissions, we are setting a cap on the rate of emission production from these sources. EPA's coordinated strategy for ocean-going vessels will accomplish this since both domestic and foreign ocean-going vessels will be required to reduce their emissions to a technologically feasible limit.

Emissions from ocean-going vessels account for substantial portions of the country's ambient $PM_{2.5}$, SO_X and NO_X levels. We estimate that in 2009 these engines account for about 80 percent of mobile source sulfur dioxide (SO_2) emissions, 10 percent of mobile source NO_X emissions and about 24 percent of mobile source diesel $PM_{2.5}$ emissions. Emissions from ocean-going vessels are expected to dominate the mobile source inventory in the future, due to both the expected emission reductions from other mobile sources as a result of more stringent emission controls and due to growth in the demand for ocean transportation services. By 2030, the coordinated strategy will reduce annual SO_2 emissions from these diesel engines by 1.3 million tons, annual NO_X emissions by 1.2 million tons, and $PM_{2.5}$ emissions by 143,000 tons, and those reductions will continue to grow beyond 2030 as fleet turnover to the clean engines continues. While a share of these emissions occur at sea, our air quality modeling results described in Section II show they have a significant impact on ambient air quality far inland.

Both ozone and $PM_{2.5}$ are associated with serious public health problems, including premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, lost work days, and restricted activity days), changes in lung function and increased respiratory symptoms, altered

[7] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulphur Oxides and Particulate Matter, Submitted by the United States and Canada.* IMO Document MEPC59/6/5, 27 March 2009. A copy of this document can be found at *http://www.epa.gov/otaq/regs/nonroad/marine/ci/mepc-59-eca-proposal.pdf.*

respiratory defense mechanisms, and chronic bronchitis. Diesel exhaust is of special public health concern, and since 2002 EPA has classified it as likely to be carcinogenic to humans by inhalation at environmental exposures. Recent studies are showing that populations living near large diesel emission sources such as major roadways, rail yards, and marine ports are likely to experience greater diesel exhaust exposure levels than the overall U.S. population, putting them at greater health risks.[8 9 10]

EPA recently updated its initial screening-level analysis [11] of selected marine port areas to better understand the populations that are exposed to diesel particulate matter emissions from these facilities.[12 13 14 15] This screening-level analysis focused on a representative selection of national marine ports.[16] Of the 45 marine ports selected, the results indicate that at least 18 million people, including a disproportionate number of low-income households, African-Americans, and Hispanics, live in the vicinity of these facilities and are being exposed to ambient diesel PM levels that are 2.0 μg/m^3 and 0.2 μg/m^3 above levels found in areas further from these facilities. Considering only ocean-going marine engine diesel PM emissions, the results indicate that 6.5 million people are exposed to ambient diesel particulate matter (DPM) levels that are 2.0 μg/m^3 and 0.2 μg/m^3 above levels found in areas further from these facilities. Because those populations exposed to diesel PM emissions from marine ports are more likely to be low-income and minority residents, these populations would benefit from the controls being proposed in this action. The detailed findings of this study are available in the public docket for this rulemaking.

Even outside port areas, millions of Americans continue to live in areas that do not meet existing air quality standards today. With regard to $PM_{2.5}$ nonattainment, in 2005 EPA designated 39 nonattainment areas for the 1997 $PM_{2.5}$ NAAQS (70 FR 943, January 5, 2005). These areas are composed of 208 full or partial counties with a total population exceeding 88 million. The 1997 $PM_{2.5}$ NAAQS was recently revised and the 2006 $PM_{2.5}$ NAAQS became effective on December 18, 2006. As of December 22, 2008, there are 58 2006 $PM_{2.5}$ nonattainment areas composed of 211 full or partial counties. These numbers do not include individuals living in areas that may fail to maintain or achieve the $PM_{2.5}$ NAAQS in the future. Currently, ozone concentrations exceeding the 8-hour ozone NAAQS occur over wide geographic areas, including most of the nation's major population centers. As of December 2008, there are approximately 132 million people living in 57 areas (293 full or partial counties) designated as not in attainment with the 8-hour ozone NAAQS. These numbers do not include people living in areas where there is a potential that the area may fail to maintain or achieve the 8-hour ozone NAAQS.

In addition to public health impacts, there are serious public welfare and environmental impacts associated with $PM_{2.5}$ and ozone emissions. Specifically, NO_X and SO_X emissions from diesel engines contribute to the acidification, nitrification, and eutrophication of water bodies. NO_X, SO_X and direct emissions of $PM_{2.5}$ can contribute to the substantial impairment of visibility in many parts of the U.S. where people live, work, and recreate, including national parks, wilderness areas, and mandatory class I Federal areas.[17] The deposition of airborne particles can also reduce the aesthetic appeal of buildings and culturally important articles through soiling, and can contribute directly (or in conjunction with other pollutants) to structural damage by means of corrosion or erosion. Finally, ozone causes damage to vegetation which leads to crop and forestry economic losses, as well as harm to national parks, wilderness areas, and other natural systems.

EPA has already adopted many emission control programs that are expected to reduce ambient $PM_{2.5}$ and ozone levels, including the Nonroad Spark Ignition Engine rule (73 FR 59034, Oct 8, 2008), the Locomotive and Marine Diesel Engine Rule (73 FR 25098, May 6, 2008), the Clean Air Interstate Rule (CAIR) (70 FR 25162, May 12, 2005), the Clean Air Nonroad Diesel Rule (69 FR 38957, June 29, 2004), the Heavy Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements (66 FR 5002, Jan. 18, 2001), and the Tier 2 Vehicle and Gasoline Sulfur Program (65 FR 6698, Feb. 10, 2000). The additional $PM_{2.5}$, SO_X, and NO_X emission reductions resulting from the coordinated approach described in this action will assist States in attaining and maintaining the $PM_{2.5}$ and ozone NAAQS near term and in the decades to come.

Our air quality modeling projects that in 2020 at least 13 counties with about 30 million people may violate the 1997 standards for $PM_{2.5}$ and 50 counties with about 50 million people may violate the 2008 standards for ozone. These numbers likely underestimate the impacted population since they do not include the people who live in areas which do not meet the 2006 $PM_{2.5}$ NAAQS. In addition, these numbers do not include the additional 13 million people in 12 counties who live in areas that have air quality measurements within 10 percent of the 1997 $PM_{2.5}$ NAAQS and the additional 80 million people in 135 counties who live in areas

[8] U. S. EPA (2004). *Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines, Chapter 3.* Report No. EPA420–R–04–007. *http://www.epa.gov/nonroad-diesel/2004fr.htm#ria.*

[9] State of California Air Resources Board. (2004). *Roseville Rail Yard Study.* Sacramento, CA: California EPA, California Air Resources Board (CARB). Stationary Source Division. This document is available electronically at: *http://www.arb.ca.gov/diesel/documents/rrstudy.htm.*

[10] Di, P., Servin, A., Rosenkranz, K., Schwehr, B., Tran, H., (2006). *Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach.* Sacramento, CA: California EPA, California Air Resources Board (CARB). Retrieved March 19, 2009 from *http://www.arb.ca.gov/regact/marine2005/portstudy0406.pdf.*

[11] This type of screening-level analysis is an inexact tool and not appropriate for regulatory decision-making; it is useful in beginning to understand potential impacts and for illustrative purposes. Additionally, the emissions inventories used as inputs for the analyses are not official estimates and likely underestimate overall emissions because they are not inclusive of all emission sources at the individual ports in the sample.

[12] ICF International. September 28, 2007. Estimation of diesel particulate matter concentration isopleths for marine harbor areas and rail yards. Memorandum to EPA under Work Assignment Number 0–3, Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[13] ICF International. September 28, 2007. Estimation of diesel particulate matter population exposure near selected harbor areas and rail yards. Memorandum to EPA under Work Assignment Number 0–3, Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[14] ICF International, December 10, 2008. Estimation of diesel particulate matter population exposure near selected harbor areas with revised harbor emissions. Memorandum to EPA under Work Assignment Number 2–9. Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[15] ICF International. December 1, 2008. Estimation of diesel particulate matter concentration isopleths near selected harbor areas with revised emissions. Memorandum to EPA under Work Assignment Number 1–9. Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[16] The Agency selected a representative sample from the top 150 U.S. ports including coastal and Great Lake ports.

[17] These areas are defined in section 162 of the Act as those national parks exceeding 6,000 acres, wilderness areas and memorial parks exceeding 5,000 acres, and all international parks which were in existence on August 7, 1977. Section 169 of the Clean Air Act provides additional authority to address existing visibility impairment and prevent future visibility impairment in the 156 national parks, forests and wilderness areas categorized as mandatory class I Federal areas.

that have air quality measurements within 10% of the 2008 ozone NAAQS. The emission reductions resulting from this coordinated strategy will assist these and other States to both attain and maintain the $PM_{2.5}$ and ozone NAAQS.

State and local governments are working to protect the health of their citizens and comply with requirements of the Clean Air Act. As part of this effort, they recognize the need to secure additional major reductions in diesel $PM_{2.5}$, SO_X and NO_X emissions by undertaking numerous State level actions, while also seeking Agency action, including the Category 3 engine standards being finalized in this final rule and the U.S. proposal to IMO to amend Annex VI to designate U.S. coastal areas as an ECA, and related certification and fuel provisions under the Clean Air Act to complement that ECA proposal. EPA's coordinated strategy to reduce OGV emissions through engine emission controls and fuel sulfur limits will play a critical part in State efforts to attain and maintain the NAAQS through the next two decades.

In addition to regulatory programs, the Agency has a number of innovative programs that partner government, industry, and local communities together to help address challenging air quality problems. Under the National Clean Diesel Campaign, EPA promotes a variety of emission reduction strategies such as retrofitting, repairing, replacing and repowering engines, reducing idling and switching to cleaner fuels.

In 2008, Congress appropriated funding for the Diesel Emission Reduction Program under the Energy Policy Act of 2005 (EPAct 2005) to reduce emissions from heavy-duty diesel engines in the existing fleet. The EPAct 2005 directs EPA to break the funding into two different components: a National competition and a State allocation program. The National Program, with 70 percent of the funding, consists of three separate competitions: (1) The National Clean Diesel Funding Assistance Program; (2) the National Clean Diesel Emerging Technologies Program; and (3) the SmartWay Clean Diesel Finance Program. The State Clean Diesel Grant and Loan Program utilizes the remaining 30 percent of the funding. In the first year of the program, EPA awarded 119 grants totaling $49.2 million for diesel emission reduction projects and programs across the country for cleaner fuels, verified technologies, and certified engine configurations.

Through $300 million in funding provided to the Diesel Emission Reduction Program under the American Reinvestment and Recovery Act of 2009, EPA will promote and preserve jobs while improving public health and achieving significant reductions in diesel emissions.

Furthermore, EPA's National Clean Diesel Campaign, through its Clean Ports USA program, is working with port authorities, terminal operators, shipping, truck, and rail companies to promote cleaner diesel technologies and strategies through education, incentives, and financial assistance for diesel emission reductions at ports. Part of these efforts involves clean diesel programs that can further reduce emissions from the existing fleet of diesel engines. Finally, many of the companies operating in States and communities suffering from poor air quality have voluntarily entered into Memoranda of Understanding (MOUs) designed to ensure that the cleanest technologies are used first in regions with the most challenging air quality issues.

Taken together, these voluntary approaches can augment the coordinated strategy and help States and communities achieve larger reductions sooner in the areas of our country that need them the most. The Agency remains committed to furthering these programs and others so that all of our citizens can breathe clean healthy air.

(2) Advanced Emission Technology Solutions Are Available

Air pollution from marine diesel exhaust is a challenging problem. However, we believe manufacturers can apply a combination of existing and new technologies to meet the emission standards we are adopting in this final rule. Optimizing air intake fuel injection systems can substantially reduce engine-out emissions. Further NO_X control can be achieved with advanced technology such as aftertreatment devices with high-efficiency catalysts. As discussed in greater detail in Section III.C, the development of these aftertreatment technologies for highway and nonroad diesel applications has advanced rapidly in recent years, so that very large emission reductions in NO_X emissions can be achieved. Manufacturers might also deploy other advanced technologies such as water-based in-cylinder controls to reduce NO_X emissions.

While aftertreatment technologies can be sensitive to sulfur, their use will be required only in ECAs designated under MARPOL Annex VI, and they are expected to be able to operate on ECA fuel meeting a 1,000 ppm fuel sulfur. With the lead time available and the assurance of 1,000 ppm fuel for ocean-going vessels in 2015, as would be required through ECA designation for U.S. coasts, we are confident the application of advanced NO_X technology to Category 3 marine engines will proceed at a reasonable rate of progress and will result in systems capable of achieving the finalized standards on schedule. Use of this lower sulfur fuel will also result in substantial PM emission reductions, since PM emissions from Category 3 engines come mostly from the use of high sulfur residual fuel. Note that vessels may be equipped with alternative devices, procedures, or compliance methods provided they achieve equivalent emissions reductions.

C. Statutory Basis for Action

Authority for the actions proposed in this documents is granted to the Environmental Protections Agency by sections 114, 203, 205, 206, 207, 208, 211, 213, 216, and 301(a) of the Clean Air Act as amended in 1990 (42 U.S.C. 7414, 7522, 7524, 7525, 7541, 7542, 7545, 7547, 7550 and 7601(a)), and by sections 1901–1915 of the Act to Prevent Pollution from Ships (33 U.S.C. 1909 *et seq.*).

(1) Clean Air Act Basis for Action

EPA is proposing the fuel requirements pursuant to its authority in section 211(c) of the Clean Air Act, which allows EPA to regulate fuels that contribute to air pollution that endangers public health or welfare (42 U.S.C. 7545(c)). As discussed previously in EPA's Clean Air Nonroad Diesel rule (69 FR 38958) and in Section II, the combustion of high sulfur diesel fuel by nonroad, locomotive, and marine diesel engines contributes to air quality problems that endanger public health and welfare. Section II also discusses the significant contribution to these air quality problems by Category 3 marine vessels. Additional support for the procedural and enforcement-related aspects of the fuel controls in the final rule, including the recordkeeping requirements, comes from Clean Air Act sections 114(a) and 301(a) (42 U.S.C. sections 7414(a) and 7601(a)).

EPA is finalizing emission standards for new Category 3 marine diesel engines pursuant to its authority under section 213(a)(3) of the Clean Air Act, which directs the Administrator to set standards regulating emissions of NO_X, volatile organic compounds (VOCs), or CO for classes or categories of engines, such as marine diesel engines, that contribute to ozone or carbon monoxide concentrations in more than one nonattainment area. These "standards shall achieve the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the engines or vehicles, giving appropriate consideration to cost, lead time, noise, energy, and safety factors associated with the application of such technology."

EPA is finalizing a PM measurement requirement for new Category 3 marine diesel engines pursuant to its authority under section 208, which requires manufacturers and other persons subject to Title II requirements to "provide information the Administrator may reasonably require * * * to otherwise carry out the provisions of this part * * *"

EPA is also acting under its authority to implement and enforce the Category 3 marine diesel emission standards. Section 213(d) provides that the standards EPA adopts for marine diesel engines "shall be subject to Sections 206, 207, 208, and 209" of the Clean Air Act, with such modifications that the Administrator deems appropriate to the regulations implementing these sections." In addition, the marine standards "shall be enforced in the same manner as [motor vehicle] standards prescribed under section 202" of the Act. Section 213(d) also grants EPA authority to promulgate or revise regulations as necessary to determine compliance with and enforce standards adopted under section 213.

As required under section 213(a)(3), we believe the evidence provided in Section III.C and in Chapter 4 of Final Regulatory Impact Analysis (RIA) indicates that the stringent NO_X emission standards finalized in this final rule for newly built Category 3 marine diesel engines are feasible and reflect the greatest degree of emission reduction achievable through the use of technology that will be available in the model years to which they apply. We have given appropriate consideration to costs in finalizing these standards. Our review of the costs and cost-effectiveness of these standards indicate that they are reasonable and comparable to the cost-effectiveness of other mobile source emission reduction strategies that have been required. We have also reviewed and given appropriate consideration to the energy factors of this rule in terms of fuel efficiency as well as any safety and noise factors associated with these standards.

The information in Section II and Chapter 2 of the Final Regulatory Impact Analysis regarding air quality and public health impacts provides strong evidence that emissions from Category 3 marine diesel engines significantly and adversely impact public health or welfare. EPA has already found in previous rules that emissions from new marine diesel engines contribute to ozone and CO concentrations in more than one area which has failed to attain the ozone and carbon monoxide NAAQS (64 FR 73300, December 29, 1999).

The NO_X and PM emission reductions achieved through the coordinated strategy will be important to States' efforts to attain and maintain the Ozone and the $PM_{2.5}$ NAAQS in the near term and in the decades to come, and will significantly reduce the risk of adverse effects to human health and welfare.

(2) APPS Basis for Action

EPA is finalizing regulations to implement MARPOL Annex VI pursuant to its authority in section 1903 of the Act to Prevent Pollution from Ships (APPS). Section 1903 gives the Administrator the authority to prescribe any necessary or desired regulations to carry out the provisions of Regulations 12 through 19 of Annex VI.

The Act to Prevent Pollution from Ships implements Annex VI and makes those requirements enforceable domestically. However, certain clarifications are necessary for implementing Regulation 13 and the requirements of the NO_X Technical Code with respect to issuance of Engine International Air Pollution Prevention (EIAPP) certificates and approval of alternative compliance methods. Clarification is also needed with respect to the application of the Annex VI requirements to certain U.S. and foreign vessels that operate in U.S. waters.

II. Air Quality, Health and Welfare Impacts

The coordinated strategy will significantly reduce emissions of NO_X, PM, and SO_X from ocean-going vessels. Emissions of these compounds contribute to PM and ozone nonattainment and environmental effects including deposition, visibility impairment and harm to ecosystems from ozone. In addition diesel particulate matter is associated with a host of adverse health effects, including cancer.

This section summarizes the general health and welfare effects of these emissions and the modeled projections of changes in air quality due to the coordinated strategy. Interested readers are encouraged to refer to the RIA for more in-depth discussions.

A. Public Health Impacts

(1) Particulate Matter

Particulate matter is a generic term for a broad class of chemically and physically diverse substances. It can be principally characterized as discrete particles that exist in the condensed (liquid or solid) phase spanning several orders of magnitude in size. Since 1987, EPA has delineated that subset of inhalable particles small enough to penetrate to the thoracic region (including the tracheobronchial and alveolar regions) of the respiratory tract (referred to as thoracic particles). Current NAAQS use $PM_{2.5}$ as the indicator for fine particles (with $PM_{2.5}$ referring to particles with a nominal mean aerodynamic diameter less than or equal to 2.5 µm), and use PM_{10} as the indicator for purposes of regulating the coarse fraction of PM_{10} (referred to as thoracic coarse particles or coarse-fraction particles; generally including particles with a nominal mean aerodynamic diameter greater than 2.5 µm and less than or equal to 10 µm, or $PM_{10-2.5}$). Ultrafine particles are a subset of fine particles, generally less than 100 nanometers (0.1 µm) in aerodynamic diameter.

Fine particles are produced primarily by combustion processes and by transformations of gaseous emissions (*e.g.,* SO_X, NO_X and VOC) in the atmosphere. The chemical and physical properties of $PM_{2.5}$ may vary greatly with time, region, meteorology, and source category. Thus, $PM_{2.5}$ may include a complex mixture of different pollutants including sulfates, nitrates, organic compounds, elemental carbon and metal compounds. These particles can remain in the atmosphere for days to weeks and travel hundreds to thousands of kilometers.

(a) Health Effects of PM

Scientific studies show ambient PM is associated with a series of adverse health effects. These health effects are discussed in detail in EPA's 2004 Particulate Matter Air Quality Criteria Document (PM AQCD) and the 2005 PM Staff Paper.[18 19 20] Further discussion of

[18] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter.* Volume I EPA600/P–99/002aF and Volume II EPA600/P–99/002bF. Retrieved on March 19, 2009 from Docket EPA–HQ–OAR–2003–0190 at *http://www.regulations.gov/.*

[19] U.S. EPA (2005). *Review of the National Ambient Air Quality Standard for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper.* EPA–452/R–05–005a. Retrieved March 19, 2009 from *http://www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper_20051221.pdf.*

[20] The PM NAAQS is currently under review and the EPA is considering all available science on PM health effects, including information which has been published since 2004, in the development of the upcoming PM Integrated Science Assessment Document (ISA). A second draft of the PM ISA was completed in July 2009 and was submitted for

Continued

health effects associated with PM can also be found in the RIA for this rule.

Health effects associated with short-term exposures (hours to days) to ambient PM include premature mortality, aggravation of cardiovascular and lung disease (as indicated by increased hospital admissions and emergency department visits), increased respiratory symptoms including cough and difficulty breathing, decrements in lung function, altered heart rate rhythm, and other more subtle changes in blood markers related to cardiovascular health.[21] Long-term exposure to $PM_{2.5}$ and sulfates has also been associated with mortality from cardiopulmonary disease and lung cancer, and effects on the respiratory system such as reduced lung function growth or development of respiratory disease. A new analysis shows an association between long-term $PM_{2.5}$ exposure and a subclinical measure of atherosclerosis.[22] [23]

Studies examining populations exposed over the long term (one or more years) to different levels of air pollution, including the Harvard Six Cities Study and the American Cancer Society Study, show associations between long-term exposure to ambient $PM_{2.5}$ and both all cause and cardiopulmonary premature mortality.[24] [25] [26] In addition, an extension of the American Cancer Society Study shows an association between $PM_{2.5}$ and sulfate concentrations and lung cancer mortality.[27]

(b) Health Effects of Diesel Particulate Matter

Marine diesel engines emit diesel exhaust (DE), a complex mixture composed of carbon dioxide, oxygen, nitrogen, water vapor, carbon monoxide, nitrogen compounds, sulfur compounds and numerous low-molecular-weight hydrocarbons. A number of these gaseous hydrocarbon components are individually known to be toxic, including aldehydes, benzene and 1,3-butadiene. The diesel particulate matter (DPM) present in DE consists of fine particles (< 2.5 µm), including a subgroup with a large number of ultrafine particles (< 0.1 µm). These particles have a large surface area which makes them an excellent medium for adsorbing organics and their small size makes them highly respirable. Many of the organic compounds present in the gases and on the particles, such as polycyclic organic matter (POM), are individually known to have mutagenic and carcinogenic properties. Diesel exhaust varies significantly in chemical composition and particle sizes between different engine types (heavy-duty, light-duty), engine operating conditions (idle, accelerate, decelerate), and fuel formulations (high/low sulfur fuel). Also, there are emissions differences between on-road and nonroad engines because the nonroad engines are generally of older technology. This is especially true for marine diesel engines.[28]

After being emitted in the engine exhaust, diesel exhaust undergoes dilution as well as chemical and physical changes in the atmosphere. The lifetime for some of the compounds present in diesel exhaust ranges from hours to days.[29]

(i) Diesel Exhaust: Potential Cancer Effects

In EPA's 2002 Diesel Health Assessment Document (Diesel HAD),[30] exposure to diesel exhaust was classified as likely to be carcinogenic to humans by inhalation from environmental exposures, in accordance with the revised draft 1996/1999 EPA cancer guidelines. A number of other agencies (National Institute for Occupational Safety and Health, the International Agency for Research on Cancer, the World Health Organization, California EPA, and the U.S. Department of Health and Human Services) have made similar classifications. However, EPA also concluded in the Diesel HAD that it is not possible currently to calculate a cancer unit risk for diesel exhaust due to a variety of factors that limit the current studies, such as limited quantitative exposure histories in occupational groups investigated for lung cancer.

For the Diesel HAD, EPA reviewed 22 epidemiologic studies on the subject of the carcinogenicity of workers exposed to diesel exhaust in various occupations, finding increased lung cancer risk, although not always statistically significant, in 8 out of 10 cohort studies and 10 out of 12 case-control studies within several industries. Relative risk for lung cancer associated with exposure ranged from 1.2 to 1.5, although a few studies show relative risks as high as 2.6. Additionally, the Diesel HAD also relied on two independent meta-analyses, which examined 23 and 30 occupational studies respectively, which found statistically significant increases in smoking-adjusted relative lung cancer risk associated with exposure to diesel exhaust of 1.33 to 1.47. These meta-analyses demonstrate the effect of pooling many studies and in this case show the positive relationship between

review by the Clean Air Scientific Advisory Committee (CASAC) of EPA's Science Advisory Board. Comments from the general public have also been requested. For more information, *see http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=210586.*

[21] U.S. EPA (2006). *National Ambient Air Quality Standards for Particulate Matter.* 71 FR 61144, October 17, 2006.

[22] Künzli, N., Jerrett, M., Mack, W.J., *et al.* (2004). Ambient air pollution and atherosclerosis in Los Angeles. *Environ Health Perspect.,113,* 201–206

[23] This study is included in the 2006 Provisional Assessment of Recent Studies on Health Effects of Particulate Matter Exposure. The provisional assessment did not and could not (given a very short timeframe) undergo the extensive critical review by CASAC and the public, as did the PM AQCD. The provisional assessment found that the "new" studies expand the scientific information and provide important insights on the relationship between PM exposure and health effects of PM. The provisional assessment also found that "new" studies generally strengthen the evidence that acute and chronic exposure to fine particles and acute exposure to thoracic coarse particles are associated with health effects. Further, the provisional science assessment found that the results reported in the studies did not dramatically diverge from previous findings, and taken in context with the findings of the AQCD, the new information and findings did not materially change any of the broad scientific conclusions regarding the health effects of PM exposure made in the AQCD. However, it is important to note that this assessment was limited to screening, surveying, and preparing a provisional assessment of these studies. For reasons outlined in Section I.C of the preamble for the final PM NAAQS rulemaking in 2006 (*see* 71 FR 61148–49, October 17, 2006), EPA based its NAAQS decision on the science presented in the 2004 AQCD.

[24] Dockery, D.W., Pope, C.A. III, Xu, X, *et al.* (1993). An association between air pollution and mortality in six U.S. cities. *N Engl J Med, 329,* 1753–1759. Retrieved on March 19, 2009 from *http://content.nejm.org/cgi/content/full/329/24/1753.*

[25] Pope, C.A., III, Thun, M.J., Namboodiri, M.M., Dockery, D.W., Evans, J.S., Speizer, F.E., and Heath, C.W., Jr. (1995). Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. *Am. J. Respir. Crit. Care Med, 151,* 669–674.

[26] Krewski, D., Burnett, R.T., Goldberg, M.S., *et al.* (2000). *Reanalysis of the Harvard Six Cities study and the American Cancer Society study of particulate air pollution and mortality.* A special report of the Institute's Particle Epidemiology Reanalysis Project. Cambridge, MA: Health Effects Institute. Retrieved on March 19, 2009 from *http://es.epa.gov/ncer/science/pm/hei/Rean-ExecSumm.pdf.*

[27] Pope, C. A., III, Burnett, R.T., Thun, M.J., Calle, E.E., Krewski, D., Ito, K., Thurston, G.D., (2002). Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *J. Am. Med. Assoc., 287,* 1132–1141.

[28] U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust.* EPA/600/8–90/057F Office of Research and Development, Washington DC. Retrieved on March 17, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.* pp. 1–1 1–2.

[29] U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust.* EPA/600/8–90/057F Office of Research and Development, Washington, DC. Retrieved on March 17, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.*

[30] U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust.* EPA/600/8–90/057F Office of Research and Development, Washington DC. Retrieved on March 17, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.* pp. 1–1 1–2.

diesel exhaust exposure and lung cancer across a variety of diesel exhaust-exposed occupations.[31 32]

In the absence of a cancer unit risk, the Diesel HAD sought to provide additional insight into the significance of the diesel exhaust-cancer hazard by estimating possible ranges of risk that might be present in the population. An exploratory analysis was used to characterize a possible risk range by comparing a typical environmental exposure level for highway diesel sources to a selected range of occupational exposure levels. The occupationally observed risks were then proportionally scaled according to the exposure ratios to obtain an estimate of the possible environmental risk. A number of calculations are needed to accomplish this, and these can be seen in the EPA Diesel HAD. The outcome was that environmental risks from diesel exhaust exposure could range from a low of 10^{-4} to 10^{-5} to as high as 10^{-3}, reflecting the range of occupational exposures that could be associated with the relative and absolute risk levels observed in the occupational studies. Because of uncertainties, the analysis acknowledged that the risks could be lower than 10^{-4} or 10^{-5}, and a zero risk from diesel exhaust exposure was not ruled out.

(ii) Diesel Exhaust: Other Health Effects

Noncancer health effects of acute and chronic exposure to diesel exhaust emissions are also of concern to the EPA. EPA derived a diesel exhaust reference concentration (RfC) from consideration of four well-conducted chronic rat inhalation studies showing adverse pulmonary effects.[33 34 35 36] The RfC is 5 μg/m³ for diesel exhaust as measured by DPM. This RfC does not consider allergenic effects such as those associated with asthma or immunologic effects. There is growing evidence, discussed in the Diesel HAD, that exposure to diesel exhaust can exacerbate these effects, but the exposure-response data are presently lacking to derive an RfC. The EPA Diesel HAD states, "With DPM [diesel particulate matter] being a ubiquitous component of ambient PM, there is an uncertainty about the adequacy of the existing DE [diesel exhaust] noncancer database to identify all of the pertinent DE-caused noncancer health hazards." (p. 9–19). The Diesel HAD concludes "that acute exposure to DE [diesel exhaust] has been associated with irritation of the eye, nose, and throat, respiratory symptoms (cough and phlegm), and neurophysiological symptoms such as headache, lightheadedness, nausea, vomiting, and numbness or tingling of the extremities."[37]

(iii) Ambient $PM_{2.5}$ Levels and Exposure to Diesel Exhaust PM

The Diesel HAD also briefly summarizes health effects associated with ambient PM and discusses the EPA's annual $PM_{2.5}$ NAAQS of 15 μg/m³. There is a much more extensive body of human data showing a wide spectrum of adverse health effects associated with exposure to ambient PM, of which diesel exhaust is an important component. The $PM_{2.5}$ NAAQS is designed to provide protection from the noncancer and premature mortality effects of $PM_{2.5}$ as a whole.

(iv) Diesel Exhaust PM Exposures

Exposure of people to diesel exhaust depends on their various activities, the time spent in those activities, the locations where these activities occur, and the levels of diesel exhaust pollutants in those locations. The major difference between ambient levels of diesel particulate and exposure levels for diesel particulate is that exposure accounts for a person moving from location to location, proximity to the emission source, and whether the exposure occurs in an enclosed environment.

Occupational Exposures

Occupational exposures to diesel exhaust from mobile sources, including marine diesel engines, can be several orders of magnitude greater than typical exposures in the non-occupationally exposed population.

Over the years, diesel particulate exposures have been measured for a number of occupational groups. A wide range of exposures have been reported, from 2 μg/m³ to 1,280 μg/m³, for a variety of occupations. As discussed in the Diesel HAD, the National Institute of Occupational Safety and Health (NIOSH) has estimated a total of 1,400,000 workers are occupationally exposed to diesel exhaust from on-road and nonroad vehicles including marine diesel engines.

Elevated Concentrations and Ambient Exposures in Mobile Source-Impacted Areas

Regions immediately downwind of marine ports may experience elevated ambient concentrations of directly-emitted $PM_{2.5}$ from diesel engines. Due to the unique nature of marine ports, emissions from a large number of diesel engines are concentrated in a small area.

A 2006 study from the California Air Resources Board (CARB) evaluated air quality impacts of diesel engine emissions within the Ports of Long Beach and Los Angeles in California, one of the largest ports in the U.S.[38] The port study employed the ISCST3 dispersion model. With local meteorological data used in the modeling, annual average concentrations were substantially elevated over an area exceeding 200,000 acres. Because the ports are located near heavily-populated areas, the modeling indicated that over 700,000 people lived in areas with at least 0.3 μg/m³ of port-related diesel PM in ambient air, about 360,000 people lived in areas with at least 0.6 μg/m³ of diesel PM, and about 50,000 people lived in areas with at least 1.5 μg/m³ of ambient diesel PM directly from the port. This study highlights the substantial contribution ports can make to elevated ambient concentrations in populated areas.

EPA recently updated its initial screening-level analysis of a representative selection of national marine port areas to better understand the populations that are exposed to DPM emissions from these facilities.[39 40 41 42] As part of this study,

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[31] Bhatia, R., Lopipero, P., Smith, A. (1998). Diesel exposure and lung cancer. *Epidemiology, 9(1),* 84–91.

[32] Lipsett, M. Campleman, S. (1999). Occupational exposure to diesel exhaust and lung cancer: a meta-analysis. *Am J Public Health, 80(7),* 1009–1017.

[33] Ishinishi, N. Kuwabara, N. Takaki, Y., *et al.* (1988). Long-term inhalation experiments on diesel exhaust. In: *Diesel exhaust and health risks.* Results of the HERP studies. Ibaraki, Japan: Research Committee for HERP Studies; pp.11–84.

[34] Heinrich, U., Fuhst, R., Rittinghausen, S., *et al.* (1995). Chronic inhalation exposure of Wistar rats and two different strains of mice to diesel engine exhaust, carbon black, and titanium dioxide. *Inhal Toxicol, 7,* 553–556.

[35] Mauderly, J.L., Jones, R.K., Griffith, W.C., *et al.* (1987). Diesel exhaust is a pulmonary carcinogen in rats exposed chronically by inhalation. *Fundam. Appl. Toxicol., 9,* 208–221.

[36] Nikula, K.J., Snipes, M.B., Barr, E.B., *et al.* (1995). Comparative pulmonary toxicities and carcinogenicities of chronically inhaled diesel exhaust and carbon black in F344 rats. *Fundam. Appl. Toxicol, 25,* 80–94.

[37] U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust.* EPA/600/8–90/057F Office of Research and Development, Washington, DC. Retrieved on March 17, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.* p. 9–9.

[38] Di, P., Servin, A., Rosenkranz, K., Schwehr, B., Tran, H., (2006). *Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach.* Sacramento, CA: California EPA, California Air Resources Board (CARB). Retrieved March 19, 2009 from *http://www.arb.ca.gov/regact/marine2005/portstudy0406.pdf.*

[39] ICF International. September 28, 2007. Estimation of diesel particulate matter concentration isopleths for marine harbor areas and

Continued

a computer geographic information system (GIS) was used to identify the locations and property boundaries of 45 marine ports.[43] Census information was used to estimate the size and demographic characteristics of the population living in the vicinity of the ports. The results indicate that at least 18 million people, including a disproportionate number of low-income households, African-Americans, and Hispanics, live in the vicinity of these facilities and are being exposed to annual average ambient DPM levels that are 2.0 μg/m^3 and 0.2 μg/m^3 above levels found in areas further from these facilities. These populations will benefit from the coordinated strategy. This study is discussed in greater detail in Chapter 2 of the RIA and detailed findings of this study are available in the public docket for this rulemaking.

(2) Ozone

Ground-level ozone pollution is typically formed by the reaction of VOC and NO_X in the lower atmosphere in the presence of heat and sunlight. These pollutants, often referred to as ozone precursors, are emitted by many types of pollution sources, such as highway and nonroad motor vehicles and engines, power plants, chemical plants, refineries, makers of consumer and commercial products, industrial facilities, and smaller area sources.

The science of ozone formation, transport, and accumulation is complex.[44] Ground-level ozone is produced and destroyed in a cyclical set of chemical reactions, many of which are sensitive to temperature and sunlight. When ambient temperatures and sunlight levels remain high for several days and the air is relatively stagnant, ozone and its precursors can build up and result in more ozone than typically occurs on a single high-temperature day. Ozone can be transported hundreds of miles downwind from precursor emissions, resulting in elevated ozone levels even in areas with low local VOC or NO_X emissions.

(a) Health Effects of Ozone

The health and welfare effects of ozone are well documented and are assessed in EPA's 2006 Air Quality Criteria Document (ozone AQCD) and 2007 Staff Paper.[45] [46] Ozone can irritate the respiratory system, causing coughing, throat irritation, and/or uncomfortable sensation in the chest. Ozone can reduce lung function and make it more difficult to breathe deeply; breathing may also become more rapid and shallow than normal, thereby limiting a person's activity. Ozone can also aggravate asthma, leading to more asthma attacks that require medical attention and/or the use of additional medication. In addition, there is suggestive evidence of a contribution of ozone to cardiovascular-related morbidity and highly suggestive evidence that short-term ozone exposure directly or indirectly contributes to non-accidental and cardiopulmonary-related mortality, but additional research is needed to clarify the underlying mechanisms causing these effects. In a recent report on the estimation of ozone-related premature mortality published by the National Research Council (NRC), a panel of experts and reviewers concluded that short-term exposure to ambient ozone is likely to contribute to premature deaths and that ozone-related mortality should be included in estimates of the health benefits of reducing ozone exposure.[47] Animal toxicological evidence indicates that with repeated exposure, ozone can inflame and damage the lining of the lungs, which may lead to permanent changes in lung tissue and irreversible reductions in lung function. People who are more susceptible to effects associated with exposure to ozone can include children, the elderly, and individuals with respiratory disease such as asthma. Those with greater exposures to ozone, for instance due to time spent outdoors (*e.g.,* children and outdoor workers), are of particular concern.

The 2006 ozone AQCD also examined relevant new scientific information that has emerged in the past decade, including the impact of ozone exposure on such health effects as changes in lung structure and biochemistry, inflammation of the lungs, exacerbation and causation of asthma, respiratory illness-related school absence, hospital admissions and premature mortality. Animal toxicological studies have suggested potential interactions between ozone and PM with increased responses observed to mixtures of the two pollutants compared to either ozone or PM alone. The respiratory morbidity observed in animal studies along with the evidence from epidemiologic studies supports a causal relationship between acute ambient ozone exposures and increased respiratory-related emergency room visits and hospitalizations in the warm season. In addition, there is suggestive evidence of a contribution of ozone to cardiovascular-related morbidity and non-accidental and cardiopulmonary mortality.

(3) NO_X and SO_X

Nitrogen dioxide (NO_2) is a member of the NO_X family of gases. Most NO_2 is formed in the air through the oxidation of nitric oxide (NO) emitted when fuel is burned at a high temperature. SO_2, a member of the sulfur oxide (SO_X) family of gases, is formed from burning fuels containing sulfur (*e.g.,* coal or oil derived), extracting gasoline from oil, or extracting metals from ore.

SO_2 and NO_2 can dissolve in water vapor and further oxidize to form sulfuric and nitric acid which react with ammonia to form sulfates and nitrates, both of which are important components of ambient PM. The health effects of ambient PM are discussed in Section II.A.1 of this preamble. NO_X along with non-methane hydrocarbon (NMHC) are the two major precursors of ozone. The health effects of ozone are covered in Section II.A.2.

(a) Health Effects of NO_X

Information on the health effects of NO_2 can be found in the U.S. Environmental Protection Agency

rail yards. Memorandum to EPA under Work Assignment Number 0–3, Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[40] ICF International. September 28, 2007. Estimation of diesel particulate matter population exposure near selected harbor areas and rail yards. Memorandum to EPA under Work Assignment Number 0–3, Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[41] ICF International, December 10, 2008. Estimation of diesel particulate matter population exposure near selected harbor areas with revised harbor emissions. Memorandum to EPA under Work Assignment Number 2–9. Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[42] ICF International. December 1, 2008. Estimation of diesel particulate matter concentration isopleths near selected harbor areas with revised emissions. Memorandum to EPA under Work Assignment Number 1–9. Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[43] The Agency selected a representative sample from the top 150 U.S. ports including coastal, inland, and Great Lake ports.

[44] U.S. EPA (2006). Air Quality Criteria for Ozone and Related Photochemical Oxidants (Final). EPA/600/R–05/004aF–cF. Washington, DC: U.S. EPA. Retrieved on March 19, 2009 from Docket EPA–HQ–OAR–2003–0190 at *http://www.regulations.gov/.*

[45] U.S. EPA (2006). Air Quality Criteria for Ozone and Related Photochemical Oxidants (Final). EPA/600/R–05/004aF–cF. Washington, DC: U.S. EPA. Retrieved on March 19, 2009 from Docket EPA–HQ–OAR–2003–0190 at *http://www.regulations.gov/.*

[46] U.S. EPA (2007). Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper. EPA–452/R–07–003. Washington, DC, U.S. EPA. Retrieved on March 19, 2009 from Docket EPA–HQ–OAR–2003–0190 at *http://www.regulations.gov/.*

[47] National Research Council (NRC), 2008. *Estimating Mortality Risk Reduction and Economic Benefits from Controlling Ozone Air Pollution.* The National Academies Press: Washington, DC.

Integrated Science Assessment (ISA) for Nitrogen Oxides.[48] The U.S. EPA has concluded that the findings of epidemiologic, controlled human exposure, and animal toxicological studies provide evidence that is sufficient to infer a likely causal relationship between respiratory effects and short-term NO_2 exposure. The ISA concludes that the strongest evidence for such a relationship comes from epidemiologic studies of respiratory effects including symptoms, emergency department visits, and hospital admissions. The ISA also draws two broad conclusions regarding airway responsiveness following NO_2 exposure. First, the ISA concludes that NO_2 exposure may enhance the sensitivity to allergen-induced decrements in lung function and increase the allergen-induced airway inflammatory response at exposures as low as 0.26 ppm NO_2 for 30 minutes. Second, exposure to NO_2 has been found to enhance the inherent responsiveness of the airway to subsequent nonspecific challenges in controlled human exposure studies of asthmatic subjects. Enhanced airway responsiveness could have important clinical implications for asthmatics since transient increases in airway responsiveness following NO_2 exposure have the potential to increase symptoms and worsen asthma control. Together, the epidemiologic and experimental data sets form a plausible, consistent, and coherent description of a relationship between NO_2 exposures and an array of adverse health effects that range from the onset of respiratory symptoms to hospital admission.

Although the weight of evidence supporting a causal relationship is somewhat less certain than that associated with respiratory morbidity, NO_2 has also been linked to other health endpoints. These include all-cause (nonaccidental) mortality, hospital admissions or emergency department visits for cardiovascular disease, and decrements in lung function growth associated with chronic exposure.

(b) Health Effects of SO_X

Information on the health effects of SO_2 can be found in the U.S. Environmental Protection Agency Integrated Science Assessment for Sulfur Oxides.[49] SO_2 has long been known to cause adverse respiratory health effects, particularly among individuals with asthma. Other potentially sensitive groups include children and the elderly. During periods of elevated ventilation, asthmatics may experience symptomatic bronchoconstriction within minutes of exposure. Following an extensive evaluation of health evidence from epidemiologic and laboratory studies, the EPA has concluded that there is a causal relationship between respiratory health effects and short-term exposure to SO_2. Separately, based on an evaluation of the epidemiologic evidence of associations between short-term exposure to SO_2 and mortality, the EPA has concluded that the overall evidence is suggestive of a causal relationship between short-term exposure to SO_2 and mortality.

B. Environmental Impacts

(1) Deposition of Nitrogen and Sulfur

Emissions of NO_X and SO_X from ships contribute to atmospheric deposition of nitrogen and sulfur in the U.S. Atmospheric deposition of nitrogen and sulfur contributes to acidification, altering biogeochemistry and affecting animal and plant life in terrestrial and aquatic ecosystems across the U.S. The sensitivity of terrestrial and aquatic ecosystems to acidification from nitrogen and sulfur deposition is predominantly governed by geology. Prolonged exposure to excess nitrogen and sulfur deposition in sensitive areas acidifies lakes, rivers and soils. Increased acidity in surface waters creates inhospitable conditions for biota and affects the abundance and nutritional value of preferred prey species, threatening biodiversity and ecosystem function. Over time, acidifying deposition also removes essential nutrients from forest soils, depleting the capacity of soils to neutralize future acid loadings and negatively affecting forest sustainability. Major effects include a decline in sensitive forest tree species, such as red spruce (*Picea rubens*) and sugar maple (*Acer saccharum*), and a loss of biodiversity of fishes, zooplankton, and macro invertebrates.

In addition to the role nitrogen deposition plays in acidification, nitrogen deposition also causes ecosystem nutrient enrichment leading to eutrophication that alters biogeochemical cycles. Excess nitrogen also leads to the loss of nitrogen sensitive lichen species as they are outcompeted by invasive grasses as well as altering the biodiversity of terrestrial ecosystems, such as grasslands and meadows. Nitrogen deposition contributes to eutrophication of estuaries and the associated effects including toxic algal blooms and fish kills. For a broader explanation of the topics treated here, refer to the description in Section 2.3.1 of the RIA.

There are a number of important quantified relationships between nitrogen deposition levels and ecological effects. Certain lichen species are the most sensitive terrestrial taxa to nitrogen with species losses occurring at just 3 kg N/ha/yr in the Pacific Northwest, southern California and Alaska. A United States Forest Service study conducted in areas within the Tongass Forest in Southeast Alaska found evidence of sulfur emissions impacting lichen communities.[50] The authors concluded that the main source of nitrogen and sulfur found in lichens from Mt. Roberts (directly north of the City of Juneau in southeastern Alaska) is likely the burning of fossil fuels by cruise ships and other vehicles and equipment in Juneau. According to the Alaska DEC, damage to lichen populations has widespread effects in Alaskan ecosystems.[51]

Across the U.S., there are many terrestrial and aquatic ecosystems that have been identified as particularly sensitive to nitrogen deposition. The most extreme effects resulting from nitrogen deposition on aquatic ecosystems are due to nitrogen enrichment which contributes to "hypoxic" zones devoid of life. Three hypoxia zones of special concern in the U.S. are the zones located in the Gulf of Mexico, the Chesapeake Bay in the mid-Atlantic region, and Long Island Sound in the northeast U.S.[52]

(2) Deposition of Particulate Matter and Air Toxics

The coordinated strategy will reduce NO_X, SO_X, and $PM_{2.5}$ emissions from ships. Ship emissions of $PM_{2.5}$ contain small amounts of metals: Nickel,

[48] U.S. EPA (2008). *Integrated Science Assessment for Oxides of Nitrogen—Health Criteria (Final Report).* EPA/600/R–08/071. Washington, DC: U.S. EPA. Retrieved on March 19, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=194645.*

[49] U.S. EPA (2008). *Integrated Science Assessment (ISA) for Sulfur Oxides—Health Criteria (Final Report).* EPA/600/R–08/047F. Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198843.*

[50] Dillman, K., Geiser, L., & Brenner, G. (2007). *Air Quality Bio-Monitoring with Lichens.* The Togass National Forest. USDA Forest Service. Retrieved March 18, 2009 from *http://gis.nacse.org/lichenair/?page=reports.*

[51] Alaska Department of Environmental Conservation, "Statement in Support of EPA Considering Alaska as Part of a Marine Emission Control Area," October 1, 2008.

[52] U.S. EPA (2008). *Nitrogen Dioxide/Sulfur Dioxide Secondary NAAQS Review: Integrated Science Assessment (ISA).* Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=180903.*

vanadium, cadmium, iron, lead, copper, zinc, and aluminum.[53] [54] [55] Investigations of trace metals near roadways and industrial facilities indicate that a substantial burden of heavy metals can accumulate on vegetative surfaces. Copper, zinc, and nickel are directly toxic to vegetation under field conditions.[56] While metals typically exhibit low solubility, limiting their bioavailability and direct toxicity, chemical transformations of metal compounds occur in the environment, particularly in the presence of acidic or other oxidizing species. These chemical changes influence the mobility and toxicity of metals in the environment. Once taken up into plant tissue, a metal compound can undergo chemical changes, accumulate and be passed along to herbivores, or can re-enter the soil and further cycle in the environment.

Although there has been no direct evidence of a physiological association between tree injury and heavy metal exposures, heavy metals have been implicated because of similarities between metal deposition patterns and forest decline.[57] [58] This correlation was further explored in high elevation forests in the northeast U.S. and the data strongly imply that metal stress causes tree injury and contributes to forest decline in the Northeast.[59] Contamination of plant leaves by heavy metals can lead to elevated soil levels. Trace metals absorbed into the plant frequently bind to the leaf tissue, and then are lost when the leaf drops. As the fallen leaves decompose, the heavy metals are transferred into the soil.[60] [61]

Ships also emit air toxics, including polycyclic aromatic hydrocarbons (PAHs), a class of polycyclic organic matter (POM) that contains compounds which are known or suspected carcinogens. Since the majority of PAHs are adsorbed onto particles less than 1.0 µm in diameter, long range transport is possible. Particles of this size can remain airborne for days or even months and travel distances up to 10,000 km before being deposited on terrestrial or aquatic surfaces.[62] Atmospheric deposition of particles is believed to be the major source of PAHs to the sediments of Lake Michigan, Chesapeake Bay, Tampa Bay and other coastal areas of the U.S.[63] [64] [65] [66] [67] PAHs tend to accumulate in sediments and reach high enough concentrations in some coastal environments to pose an environmental health threat that includes cancer in fish populations, toxicity to organisms living in the sediment, and risks to those (*e.g.,* migratory birds) that consume these organisms.[68] [69] PAHs tend to accumulate in sediments and bioaccumulate in fresh water, flora and fauna.

Atmospheric deposition of pollutants can reduce the aesthetic appeal of buildings and culturally important articles through soiling, and can contribute directly (or in conjunction with other pollutants) to structural damage by means of corrosion or erosion.[70] Atmospheric deposition may affect materials principally by promoting and accelerating the corrosion of metals, by degrading paints, and by deteriorating building materials such as concrete and limestone. Particles contribute to these effects because of their electrolytic, hygroscopic, and acidic properties, and their ability to adsorb corrosive gases (principally sulfur dioxide). The rate of metal corrosion depends on a number of factors, including the deposition rate and nature of the pollutant; the influence of the metal protective corrosion film; the amount of moisture present; variability in the electrochemical reactions; the presence and concentration of other surface electrolytes; and the orientation of the metal surface.

(3) Impacts on Visibility

Emissions from ships contribute to poor visibility in the U.S. through their primary $PM_{2.5}$ emissions, as well as their NO_X and SO_X emissions which contribute to the formation of secondary $PM_{2.5}$.[71] Visibility can be defined as the degree to which the atmosphere is transparent to visible light. Airborne particles degrade visibility by scattering and absorbing light. Visibility is important because it has direct significance to people's enjoyment of daily activities in all parts of the country. Individuals value good visibility for the well-being it provides them directly, where they live and work and in places where they enjoy recreational opportunities. Visibility is also highly valued in significant natural areas such as national parks and

[53] Agrawal H., Malloy Q.G.J., Welch W.A., Wayne Miller J., Cocker III D.R. (2008) In-use gaseous and particulate matter emissions from a modern ocean going container vessel. *Atmospheric Environment, 42(21),* 5504–5510.

[54] Miller, W., *et al.* (2008 June 10). *Measuring Emissions from Ocean Going Vessels.* Presentation presented at the Fuel, Engines, and Control Devices Workshop, San Pedro, California.

[55] Isakson J., Persson T.A., E. Selin Lindgren E. (2001) Identification and assessment of ship emissions and their effects in the harbour of Gteborg, Sweden. *Atmospheric Environment, 35(21),* 3659–3666.

[56] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter (AQCD).* Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903.*

[57] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter (AQCD).* Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903.*

[58] Gawel, J.E.; Ahner, B.A.; Friedland, A.J.; Morel, F.M.M. (1996) Role for heavy metals in forest decline indicated by phytochelatin measurements. *Nature (London), 381,* 64–65.

[59] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter (AQCD).* Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903.*

[60] Cotrufo M.F., De Santo A.V., Alfani A., Bartoli G., De Cristofaro A. (1995) Effects of urban heavy metal pollution on organic matter decomposition in Quercus ilex L. Woods. *Environmental Pollution, 89(1),* 81–87.

[61] Niklinska M., Laskowski R., Maryanski M. (1998). Effect of heavy metals and storage time on two types of forest litter: Basal respiration rate and exchangeable metals. *Ecotoxicological Environmental Safety, 41,* 8–18.

[62] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter (AQCD).* Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903.*

[63] Dickhut R.M., Canuel E.A., Gustafson K.E., Liu K., Arzayus K.M., Walker S.E., Edgecombe G., Gaylor M.O., MacDonald E.H. (2000). Automotive Sources of Carcinogenic Polycyclic Aromatic Hydrocarbons Associated with Particulate Matter in the Chesapeake Bay Region. *Environmental Science & Technology, 34(21),* 4635–4640.

[64] Simcik M.F., Eisenreich, S.J., Golden K.A., *et al.* (1996). Atmospheric Loading of Polycyclic Aromatic Hydrocarbons to Lake Michigan as Recorded in the Sediments. *Environmental Science and Technology, 30,* 3039–3046.

[65] Simcik M.F., Eisenreich S.J., Lioy P.J. (1999). Source apportionment and source/sink relationship of PAHs in the coastal atmosphere of Chicago and Lake Michigan. *Atmospheric Environment, 33,* 5071–5079.

[66] Poor N., Tremblay R., Kay H., *et al.* (2002). Atmospheric concentrations and dry deposition rates of polycyclic aromatic hydrocarbons (PAHs) for Tampa Bay, Florida, USA. *Atmospheric Environment, 38,* 6005–6015.

[67] Arzavus K.M., Dickhut R.M., Canuel E.A. (2001). Fate of Atmospherically Deposited Polycyclic Aromatic Hydrocarbons (PAHs) in Chesapeake Bay. *Environmental Science & Technology, 35,* 2178–2183.

[68] Simcik M.F., Eisenreich, S.J., Golden K.A., *et al.* (1996). Atmospheric Loading of Polycyclic Aromatic Hydrocarbons to Lake Michigan as Recorded in the Sediments. *Environmental Science and Technology, 30,* 3039–3046.

[69] Simcik M.F., Eisenreich S.J., Lioy P.J. (1999). Source apportionment and source/sink relationship of PAHs in the coastal atmosphere of Chicago and Lake Michigan. *Atmospheric Environment, 33,* 5071–5079.

[70] U.S. EPA (2005). Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper. Retrieved on April 9, 2009 from *http://www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper_20051221.pdf.*

[71] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter (AQCD).* Volume I Document No. EPA600/P–99/002aF and Volume II Document No. EPA600/P–99/002bF. Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903.*

wilderness areas, and special emphasis is given to protecting visibility in these areas. For more information on visibility, *see* the final 2004 PM AQCD as well as the 2005 PM Staff Paper.[72] [73]

EPA is pursuing a two-part strategy to address visibility. First, EPA has set secondary $PM_{2.5}$ standards which act in conjunction with the establishment of a regional haze program. In setting the secondary $PM_{2.5}$ standard, EPA has concluded that $PM_{2.5}$ causes adverse effects on visibility in various locations, depending on PM concentrations and factors such as chemical composition and average relative humidity. Second, section 169 of the Clean Air Act provides additional authority to address existing visibility impairment and prevent future visibility impairment in the 156 national parks, forests and wilderness areas categorized as mandatory class I Federal areas (62 FR 38680–81, July 18, 1997).[74] In July 1999, the regional haze rule (64 FR 35714) was put in place to protect the visibility in mandatory class I Federal areas. Visibility can be said to be impaired in both $PM_{2.5}$ nonattainment areas and mandatory class I Federal areas.

(4) Plant and Ecosystem Effects of Ozone

Elevated ozone levels contribute to environmental effects, with impacts to plants and ecosystems being of most concern. Ozone can produce both acute and chronic injury in sensitive species depending on the concentration level and the duration of the exposure. Ozone effects also tend to accumulate over the growing season of the plant, so that even low concentrations experienced for a longer duration have the potential to create chronic stress on vegetation. Ozone damage to plants includes visible injury to leaves and impaired photosynthesis, both of which can lead to reduced plant growth and reproduction, resulting in reduced crop yields, forestry production, and use of sensitive ornamentals in landscaping. In addition, the impairment of photosynthesis, the process by which the plant makes carbohydrates (its source of energy and food), can lead to a subsequent reduction in root growth and carbohydrate storage below ground, resulting in other, more subtle plant and ecosystems impacts.

These latter impacts include increased susceptibility of plants to insect attack, disease, harsh weather, interspecies competition and overall decreased plant vigor. The adverse effects of ozone on forest and other natural vegetation can potentially lead to species shifts and loss from the affected ecosystems, resulting in a loss or reduction in associated ecosystem goods and services. Lastly, visible ozone injury to leaves can result in a loss of aesthetic value in areas of special scenic significance like national parks and wilderness areas. The final 2006 ozone AQCD presents more detailed information on ozone effects on vegetation and ecosystems.

C. Air Quality Modeling Results

Air quality modeling was performed to assess the impact of the coordinated strategy. We looked at impacts on future ambient $PM_{2.5}$ and ozone levels, as well as nitrogen and sulfur deposition levels and visibility impairment. In this section, we present information on current levels of pollution as well as model projected levels of pollution for 2020 and 2030.[75]

The air quality modeling uses EPA's Community Multiscale Air Quality (CMAQ) model. The CMAQ modeling domain is rectangular in shape and encompasses all of the lower 48 States, portions of Canada and Mexico, and areas extending into the ocean up to 1,000 nautical miles (nm), depending on the coast. The smallest area of ocean coverage is over the northeast U.S. In places like Maine and Cape Cod, the easternmost points of the contiguous U.S., the distance to the edge of the CMAQ modeling domain is approximately 150 nm. The rest of the U.S. shoreline has at least 200 nm between the shoreline and boundary of the air quality modeling. The CMAQ modeling domain is described in more detail in Section 2.4.5.2 of the RIA. The performance of the CMAQ modeling was evaluated using a 2002 base case simulation. More detail about the performance evaluation is contained within the Section 2.4.5.4 of the RIA. The model was able to reproduce historical concentrations of ozone and $PM_{2.5}$ at land-based monitors with low amounts of bias and error. While we are not able to evaluate the model's performance over the ocean due to the absence of surface monitors, there is no evidence to suggest that model performance is unsatisfactory over the ocean.

The emission control scenarios used in the air quality modeling are slightly different than the final coordinated strategy emission control scenarios. For example, the 2020 air quality impacts are based on inventory estimates that were modeled using incorrect ECA boundary information off of the western coast of the U.S. A calculation error placed the western 200 nautical mile (nm) ECA boundary approximately 50 nm closer to shore. Additionally, the 2020 air quality control case does not reflect emission reductions related to global controls for areas that are beyond 200 nm but within the CMAQ air quality modeling domain. Finally, the emission control scenarios do not consider the exemption of Great Lakes steamships from the final fuel sulfur standards. The impact of these differences is expected to be minimal.

(1) Particulate Matter

The coordinated strategy described in this final rule will significantly reduce ambient PM concentrations through reductions in emissions of direct PM, as well as NO_X and SO_X which contribute to secondary PM.

(a) Current Levels

$PM_{2.5}$ concentrations exceeding the level of the $PM_{2.5}$ NAAQS occur in many parts of the country. In 2005, EPA designated 39 nonattainment areas for the 1997 $PM_{2.5}$ NAAQS (70 FR 943, January 5, 2005). These areas are composed of 208 full or partial counties with a total population exceeding 88 million. The 1997 $PM_{2.5}$ NAAQS was recently revised and the 2006 24-hour $PM_{2.5}$ NAAQS became effective on December 18, 2006. On October 8, 2009, the EPA issued final nonattainment area designations for the 24-hour $PM_{2.5}$ NAAQS (74 FR 58688, November 13, 2009). These designations include 31 areas composed of 120 full or partial counties.

(b) Projected Levels

A number of State governments have told EPA that they need the reductions the coordinated strategy will provide in order to meet and maintain the $PM_{2.5}$

[72] U.S. EPA (2004). *Air Quality Criteria for Particulate Matter (AQCD).* Volume I Document No. EPA600/P–99/002aF and Volume II Document No. EPA600/P–99/002bF. Washington, DC: U.S. Environmental Protection Agency. Retrieved on March 18, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903.*

[73] U.S. EPA (2005). *Review of the National Ambient Air Quality Standard for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper.* EPA–452/R–05–005. Washington, DC: U.S. Environmental Protection Agency.

[74] These areas are defined in section 162 of the Act as those national parks exceeding 6,000 acres, wilderness areas and memorial parks exceeding 5,000 acres, and all international parks which were in existence on August 7, 1977.

[75] As discussed in Section 3.7 of the RIA, the inventories used for the air quality modeling in 2020 and 2030 differ slightly from each other. The difference between 2020 and 2030 is small and was due to an error in calculating the 200 nautical miles distance. In addition, as discussed in Section 3.7 of the RIA, the 2020 air quality control case does not include global controls for areas that are beyond 200 nautical miles but within the air quality modeling domain. The impact of this latter difference is expected to be minimal.

NAAQS.[76] Most areas designated as not attaining the 1997 $PM_{2.5}$ NAAQS will need to attain the 1997 standards in the 2010 to 2015 time frame, and then maintain them thereafter. The 2006 24-hour $PM_{2.5}$ nonattainment areas will be required to attain in the 2014 to 2019 time frame and then maintain thereafter. The fuel sulfur emission standards will become effective in 2010 and 2015, and the NO_X engine emission standards will become effective in 2016. Therefore, the coordinated strategy emission reductions will be useful to States in attaining or maintaining the $PM_{2.5}$ NAAQS.

EPA has already adopted many emission control programs that are expected to reduce ambient $PM_{2.5}$ levels and which will assist in reducing the number of areas that fail to achieve the $PM_{2.5}$ NAAQS. Even so, our air quality modeling for this rule projects that in 2020, with all current controls but excluding the reductions expected to occur as a result of the coordinated strategy, at least 13 counties with a population of almost 30 million may not attain the 1997 annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ and 47 counties with a population of over 53 million may not attain the 2006 24-hour $PM_{2.5}$ standard of 35 $\mu g/m^3$. These numbers do not account for those areas that are close to (*e.g.,* within 10 percent of) the $PM_{2.5}$ standards. These areas, although not violating the standards, will also benefit from the additional reductions from this rule ensuring long term maintenance of the $PM_{2.5}$ NAAQS.

Air quality modeling of the expected impacts of the coordinated strategy shows that in 2020 and 2030 all of the modeled counties will experience decreases in their annual and 24-hour $PM_{2.5}$ design values. For areas with current annual $PM_{2.5}$ design values greater than 15$\mu g/m^3$, the modeled future-year, population-weighted annual $PM_{2.5}$ design values are expected to decrease on average by 0.8 $\mu g/m^3$ in 2020 and by 1.7 $\mu g/m^3$ in 2030. For areas with current 24-hour $PM_{2.5}$ design values greater than 35$\mu g/m^3$, the modeled future-year, population-weighted annual $PM_{2.5}$ design values are expected to decrease on average by 1.3 $\mu g/m^3$ in 2020 and by 3.4 $\mu g/m^3$ in 2030. In 2030, the maximum projected decrease for an annual $PM_{2.5}$ design value is 6.0 $\mu g/m^3$ in Miami, FL, and the maximum projected decrease for a 24-hour $PM_{2.5}$ design value is 11.7 $\mu g/m^3$ in Los Angeles, CA. The air quality modeling methodology and the projected reductions are discussed in more detail in Chapter 2 of the RIA.

(2) Ozone

(a) Current Levels

In 2008, the U.S. EPA amended the ozone NAAQS (73 FR 16436, March 27, 2008). The final 2008 ozone NAAQS rule set forth revisions to the previous 1997 NAAQS for ozone to provide increased protection of public health and welfare. As of July 31, 2009 there are 54 areas designated as nonattainment for the 1997 8-hour ozone NAAQS, comprising 282 full or partial counties with a total population of almost 127 million people. These numbers do not include the people living in areas where there is a future risk of failing to maintain or attain the 1997 8-hour ozone NAAQS. The numbers above likely underestimate the number of counties that are not meeting the ozone NAAQS because the nonattainment areas associated with the more stringent 2008 8-hour ozone NAAQS have not yet been designated.[77] Table II–1 provides an estimate, based on 2005–07 air quality data, of the counties with design values greater than the 2008 8-hour ozone NAAQS of 0.075 ppm.

TABLE II–1—COUNTIES WITH DESIGN VALUES GREATER THAN THE 2008 OZONE NAAQS BASED ON 2005–2007 AIR QUALITY DATA

	Number of counties	Population[a]
1997 Ozone Standard: counties within the 54 areas currently designated as nonattainment (as of 7/31/09)	282	126,831,848
2008 Ozone Standard: additional counties that would not meet the 2008 NAAQS[b]	227	41,285,262
Total	509	168,117,110

Notes:

[a] Population numbers are from 2000 census data.

[b] Attainment designations for the 2008 ozone NAAQS have not yet been made. Nonattainment for the 2008 Ozone NAAQS will be based on three years of air quality data from later years. Also, the county numbers in this row include only the counties with monitors violating the 2008 Ozone NAAQS. The numbers in this table may be an underestimate of the number of counties and populations that will eventually be included in areas with multiple counties designated nonattainment.

(b) Projected Levels

States with 8-Hour ozone nonattainment areas are required to take action to bring those areas into compliance in the future. Based on the final rule designating and classifying 8-hour ozone nonattainment areas for the 1997 standard (69 FR 23951, April 30, 2004), most 8-hour ozone nonattainment areas will be required to attain the 1997 ozone NAAQS in the 2007 to 2013 time frame and then maintain the NAAQS thereafter. In addition, there will be attainment dates associated with the designation of nonattainment areas as a result of the reconsideration of the 2008 ozone NAAQS. Many of these nonattainment areas will need to adopt additional emission reduction programs, and the NO_X reductions that will result from the coordinated strategy will be particularly important for these States.

EPA has already adopted many emission control programs that are expected to reduce ambient ozone levels and assist in reducing the number of areas that fail to achieve the ozone NAAQS. Even so, our air quality modeling projects that in 2020, with all

[76] *See* the Advanced Notice of Proposed Rule Making at Docket Number: EPA–HQ–OAR–2007–0121.

[77] On September 16, 2009, the Administrator announced that the EPA is reconsidering the 2008 ozone standards to determine whether they adequately protect public health and the environment. She also announced that the Agency will propose to temporarily stay the 2008 standards for the purpose of attainment and nonattainment area designations. Under the stay, all activities to designate areas for the 2008 ozone standards would be suspended for the duration of the reconsideration period. EPA intends to complete the reconsideration by August 31, 2010. If, as a result of the reconsideration, EPA determines that the 2008 ozone standards are not supported by the scientific record and promulgates different ozone standards, the new 2010 ozone standards would replace the 2008 ozone standards and the requirement to designate areas for the 2008 standards would no longer apply. If EPA promulgates new ozone standards in 2010, EPA intends to accelerate the designations process to that the designations would be effective in August 2011.

current controls but excluding the reductions achieved through the coordinated strategy, up to 50 counties with a population of almost 50 million may not attain the 2008 ozone standard of 0.075 ppm. These numbers do not account for those areas that are close to (*e.g.,* within 10 percent of) the 2008 ozone standard. These areas, although not violating the standards, will also benefit from the additional reductions from this rule ensuring long-term maintenance of the ozone NAAQS.

These air quality modeling results suggest that emission reductions achieved through the coordinated strategy will improve both the average and population-weighted average ozone design value concentrations for the U.S. in 2020 and 2030. In addition, the air quality modeling shows that on average the coordinated program described in this action will help bring counties closer to ozone attainment as well as assist counties whose ozone concentrations are within 10 percent below the standard. For example, in projected nonattainment counties, on a population-weighted basis, the 8-hour ozone design value will on average decrease by 0.5 ppb in 2020 and 1.6 ppb in 2030. The air quality modeling methodology and the projected reductions are discussed in more detail in Chapter 2 of the RIA.

It should be noted that even though our air quality modeling predicts important reductions in nationwide ozone levels, three counties (of 661 that were part of the analysis) are expected to experience an increase in their ozone design values in 2030. There are two counties in Washington, Clallam County and Clark County, and Orange County, CA, which will experience 8-hour ozone design value increases due to the NO_X disbenefits which occur in these VOC-limited ozone nonattainment areas. Briefly, NO_X reductions at certain times and in some areas can lead to increased ozone levels. The air quality modeling methodology (Section 2.4.5), the projected reductions (Section 2.4), and the limited NO_X disbenefits (Section 2.4.2.2.2), are discussed in more detail in Chapter 2 of the RIA.

(c) Case Study of Shipping Emissions and Ozone Impacts on Forests

The section below attempts to estimate the impacts of the coordinated strategy on forests through a case study.

Assessing the impact of ground-level ozone on forests in the United States involves understanding the risk/effect of tree species to ozone ambient concentrations and accounting for the prevalence of those species within the forest. As a way to quantify the risk/effect of particular plants to ground-level ozone, scientists have developed ozone-exposure/tree-response functions by exposing tree seedlings to different ozone levels and measuring reductions in growth as "biomass loss."[78]

With knowledge of the distribution of sensitive species and the level of ozone at particular locations, it is possible to estimate a "biomass loss" for each species across their range. EPA performed an analysis for 2020 in which we examined biomass loss with and without ship emissions to determine the benefit of reducing these emissions on sensitive tree species in the U.S.[79] The biomass loss attributable to shipping appears to range from 0 to 6.5% depending on the particular species. The species most sensitive to ozone related biomass loss in the U.S. is black cherry (*Prunus serotina*); the area of its range with more than 10% total biomass loss in 2020 decreased by 8.5% in the case in which emissions from ships were removed. Likewise, yellow-poplar (*Liriodendron tulipifera*), eastern white pine (*Pinus strobus*), aspen (*Populus spp.*), and ponderosa pine (*Pinus ponderosa*) saw areas with more then 2% biomass loss reduced by 2.1% to 3.8% in 2020. This 2% level of biomass loss is important, because a consensus workshop on ozone effects reported that a 2% annual biomass loss causes harm due to the potential for compounding effects over multiple years as short-term negative effects on seedlings affect long-term forest health.[80 81]

(3) Nitrogen and Sulfur Deposition

(a) Current Levels

Over the past two decades, the EPA has undertaken numerous efforts to reduce nitrogen and sulfur deposition across the U.S. Analyses of long-term monitoring data for the U.S. show that deposition of both nitrogen and sulfur compounds has decreased over the last 17 years although many areas continue to be negatively impacted by deposition. Deposition of inorganic nitrogen and sulfur species routinely measured in the U.S. between 2004 and 2006 were as high as 9.6 kg N/ha/yr and 21.3 kg S/ha/yr. The data shows that reductions were more substantial for sulfur compounds than for nitrogen compounds. These numbers are generated by the U.S. national monitoring network and they likely underestimate nitrogen deposition because NH_3 is not measured. In the eastern U.S., where data are most abundant, total sulfur deposition decreased by about 36% between 1990 and 2005 while total nitrogen deposition decreased by 19% over the same time frame.[82]

(b) Projected Levels

The emissions reductions that result from the coordinated strategy will significantly reduce the annual total sulfur and nitrogen deposition occurring in sensitive U.S. ecosystems including forests, wetlands, lakes, streams, and estuaries. For sulfur deposition, adopting the coordinated strategy will result in reductions ranging from 5% to 20% in 2020 along the entire Atlantic and Gulf coasts with higher levels of reduction, exceeding 25%, occurring in the near-land coastal waters of the U.S. In a few land areas on the Atlantic and Gulf coasts, such as the southern parts of the States of Louisiana, Texas, and Florida, 2020 sulfur deposition reductions will be much higher, *i.e.,* over 30%. Along the Pacific Coast, sulfur deposition reductions will exceed 25% in the entire Southern California area, and the Pacific Northwest. For a map of 2020 sulfur reductions and additional information on these impacts *see* Section 2.4.3 of the RIA.

Overall, nitrogen deposition reductions in 2020 resulting from the coordinated strategy described in this action are less than sulfur deposition reductions. Nitrogen deposition reductions will range from 3% to 7% along the entire Atlantic, Pacific and Gulf Coasts. As with sulfur deposition reductions, a few areas such as the southern parts of the States of Louisiana, Texas, and Florida will experience larger reductions of nitrogen up to 9%. The Pacific coastal waters will see higher nitrogen reductions, exceeding 20% in some instances. *See* Section 2.4.3 of the RIA for a map and additional information on nitrogen deposition impacts.

[78] Chappelka, AH, Samuelson, LJ. (1998). Ambient ozone effects on forest trees of the Eastern United States: a review. *New Phytologist, 139,* 91–108.

[79] Note that while the coordinated strategy does not eliminate ship emissions, it will be directionally helpful in reducing ship emissions.

[80] Prasad A.M, Iverson L.R. (2003). Little's range and FIA importance value database for 135 eastern U.S. tree species. Northeastern Research Station, USDA Forest Service, Delaware, Ohio. [online] Retrieved on March 19, 2009, from *http://www.fs.fed.us/ne/delaware/4153/global/littlefia/index.html.*

[81] Heck W.W., Cowling E.B. (1997) The need for a Long Term Cumulative Secondary Ozone Standard—an Ecological Perspective. *Air and Waste Management Association, EM,* 23–33.

[82] U.S. EPA. U.S. EPA's 2008 Report on the Environment (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–07/045F (NTIS PB2008–112484).

(4) Visibility

(a) Current Levels

As mentioned in Section II.C.1, millions of people live in nonattainment areas for the $PM_{2.5}$ NAAQS. These populations, as well as large numbers of individuals who travel to these areas, are likely to experience visibility impairment. In addition, while visibility trends have improved in mandatory class I Federal areas, the most recent data show that these areas continue to suffer from visibility impairment. In summary, visibility impairment is experienced throughout the U.S., in multi-State regions, urban areas, and remote mandatory class I Federal areas.

(b) Projected Levels

The air quality modeling conducted for the coordinated strategy was also used to project visibility conditions in 133 mandatory class I Federal areas across the U.S. in 2020 and 2030. The results indicate that improvements in visibility due to OGV emissions reductions will occur in all 133 mandatory class I Federal areas in the future, although all areas will continue to have annual average deciview levels above background in 2020 and 2030.[83] The average visibility on the 20 percent worst days at these scenic locales is projected to improve by 0.22 deciviews, or 1.4 percent in 2020 and by 0.43 deciviews or 2.7% in 2030.

The greatest improvements in visibilities will occur in coastal areas. For instance, the Agua Tibia Wilderness area (near Los Angeles) will see a 9% improvement (2.17 DV) in 2020 and a 17% improvement (4.6 DV) in 2030 as a result of the emission reductions from the coordinated strategy. National parks and national wilderness areas in other parts of the country will also see improvements. For example, in 2030 the Swanquarter National Wildlife Refuge (North Carolina) will have a 5% improvement in visibility (1.11 DV) and Acadia National Park (Maine) will have a 6% improvement (1.27 DV) with the coordinated strategy. Even inland mandatory class I Federal areas are projected to see improvements as a result of the controls from the coordinated strategy. For example in 2030, the Grand Canyon National Park, located in the State of Arizona, will see a 54% improvement in visibility (0.42 DV) with the coordinated strategy. For the table which contains the full visibility results over the 133 analyzed areas *see* Section 2.2.4.2 of the RIA.

D. Emissions From Ships With Category 3 Engines

(1) Overview

This section describes the contribution of Category 3 vessels to national emission inventories of NO_X, $PM_{2.5}$, and SO_2. A Category 3 vessel has a Category 3 propulsion engine. Emissions from a Category 3 vessel include the emissions from both the propulsion and auxiliary engines on that vessel. Propulsion and auxiliary engine emissions were estimated separately to account for differences in emission factors, engine size and load, and activity.

We estimate that in 2009, Category 3 vessels will contribute almost 913,000 tons (10 percent) to the national mobile source NO_X inventory, about 71,000 tons (24 percent) to the mobile source diesel $PM_{2.5}$ inventory, and nearly 597,000 tons (80 percent) to the mobile source SO_2 inventory. Expressed as a percentage of all anthropogenic emissions, Category 3 vessels contribute 6 percent to the national NO_X inventory, 3 percent to the national $PM_{2.5}$ inventory, and 11 percent to the total SO_2 inventory in 2009. In 2030, absent the strategy discussed in this rule, these vessels will contribute about 2.1 million tons (40 percent) to the mobile source NO_X inventory, 168,000 tons (75 percent) to the mobile source diesel $PM_{2.5}$ inventory, and about 1.4 million tons (95 percent) to the mobile source SO_2 inventory. Expressed as a percentage of all anthropogenic emissions, Category 3 vessels will contribute 19 percent to the national NO_X inventory, 5 percent to the national $PM_{2.5}$ inventory, and 15 percent to the total SO_2 inventory in 2030. Under this strategy, by 2030, annual NO_X emissions from these vessels will be reduced by 1.2 million tons, $PM_{2.5}$ emissions by 143,000 tons, and SO_2 emissions by 1.3 million tons.[84]

Each sub-section below discusses one of the three affected pollutants, including expected emission reductions that will result from the combination of the proposed CAA NO_X standards along with the ECA designation through amendment to MARPOL Annex VI and related fuel standards. Table II–2 summarizes the impacts of these reductions for 2020 and 2030 on a national basis. Chapter 3 of the RIA also presents regional emissions inventories, such as those for the Great Lakes. Table II–3 provides the estimated 2030 NO_X emission reductions (and PM reductions) for the coordinated strategy compared to the Locomotive and Marine rule, Clean Air Nonroad Diesel (CAND) program, and the Heavy-Duty Highway rule. Further details on our inventory estimates are available in Chapter 3 of the RIA. Note that the inventories presented here do not consider the exemption of Great Lakes steamships from the final fuel sulfur standards. This change to the program is not expected to have a significant impact on national inventory estimates. We intend to follow up with a more detailed study of the impacts of the emission control program on Great Lakes carriers which may provide information that will help us refine our Great Lakes emission inventories.

As described in Chapter 3 of the RIA, the Category 3 vessel emission inventories presented in this section are estimated by combining two sets of emissions inventories, one for U.S. port areas and one for operation on the open ocean. With regard to operation on the open ocean, it was necessary to specify an outer boundary of the modeling domain; otherwise, emissions from ships operating as far away as Asia or Europe would be included in the U.S. emission inventory. For simplicity, we set the outer boundary for inventory modeling roughly equivalent to the U.S. Exclusive Economic Zone (EEZ). It consists of the area that extends 200 nautical miles (nm) from the official U.S. baseline, which is recognized as the low-water line along the coast as marked on the official U.S. nautical charts in accordance with the articles of the Law of the Sea. The U.S. region was then clipped to the boundaries of the U.S. EEZ. While this area will exclude emissions that occur outside the 200 nm boundary but that are transported to the U.S. landmass, it has the advantage of corresponding to an area in which the United States has a clear environmental interest. This area also corresponds well to the CMAQ modeling domain for most coasts.

[83] The level of visibility impairment in an area is based on the light-extinction coefficient and a unit less visibility index, called a "deciview", which is used in the valuation of visibility. The deciview metric provides a scale for perceived visual changes over the entire range of conditions, from clear to hazy. Under many scenic conditions, the average person can generally perceive a change of one deciview. The higher the deciview value, the worse the visibility. Thus, an improvement in visibility is a decrease in deciview value.

[84] These emission inventory reductions include reductions from ships operating within the 24 nautical mile regulatory zone off the California Coastline, beginning with the effective date of the Coordinated Strategy program elements. The California regulation contains a provision that would sunset the requirements of the rule if the Federal program achieves equivalent emission reductions. *See http://www.arb.ca.gov/regact/2008/fuelogv08/fro13.pdf* at 13 CCR 2299.2(j)(1).

TABLE II–2—ESTIMATED NATIONAL (50 STATE) REDUCTIONS IN EMISSIONS FROM CATEGORY 3 COMMERCIAL MARINE VESSELS [a]

Pollutant [short tons]	2020	2030
NO_X:		
NO_X Emissions without Coordinated Strategy	1,361,000	2,059,000
NO_X Emissions with Coordinated Strategy	952,000	878,000
NO_X Reductions Resulting from Coordinated Strategy	409,000	1,181,000
Direct $PM_{2.5}$:		
$PM_{2.5}$ Emissions without Coordinated Strategy	110,000	168,000
$PM_{2.5}$ Emissions with Coordinated Strategy	16,000	25,000
$PM_{2.5}$ Reductions Resulting from Coordinated Strategy	94,000	143,000
SO_2:		
SO_2 Emissions without Coordinated Strategy	928,000	1,410,000
SO_2 Emissions with Coordinated Strategy	51,000	78,000
SO_2 Reductions Resulting from Coordinated Strategy	877,000	1,332,000

Notes:
[a] Emissions are included within 200 nautical miles of the U.S. coastline.

TABLE II–3—PROJECTED 2030 EMISSIONS REDUCTIONS FROM RECENT MOBILE SOURCE RULES

[Short Tons] [a]

Rule	NO_X	$PM_{2.5}$
Category 3 Marine	1,181,000	143,000
Locomotive and Marine	795,000	27,000
Clean Air Nonroad Diesel	738,000	129,000
Heavy-Duty Highway	2,600,000	109,000

Notes:
[a] Locomotive and Marine Rule (73 FR 25098, May 6, 2008) Clean Air Nonroad Diesel Rule (69 FR 38957, June 29, 2004) Heavy-Duty Highway Rule (66 FR 5001, January 18, 2001).

(2) NO_X Emission Reductions

In 2009, annual emissions from Category 3 marine vessels will total about 913,000 tons. Earlier Tier 1 NO_X engine standards became effective in 2000, but the reductions due to the Tier 1 standards are offset by the growth in this sector, resulting in increased NO_X emissions of 1.4 million tons and 2.1 million tons in 2020 and 2030, respectively.

As shown in Table II–2, the coordinated strategy will reduce annual NO_X emissions from the current national inventory baseline by 409,000 tons in 2020 and 1,181,000 tons in 2030.

As shown in Table II–3, the 2030 NO_X reductions for the coordinated strategy will exceed those for the other two nonroad rules.

(3) $PM_{2.5}$ Emissions Reductions

In 2009, annual emissions from Category 3 marine vessels will total about 71,000 tons. By 2030, these engines, absent the coordinated strategy, would contribute about 168,000 tons.

As shown in Table II–2, the coordinated strategy will reduce annual $PM_{2.5}$ emissions by 94,000 tons in 2020 and 143,000 tons in 2030. As seen in Table II–3, the 2030 $PM_{2.5}$ emission reduction will be larger than any of the reductions achieved with other recent rules.

(4) SO_2 Emissions Reductions

In 2009, annual emissions from Category 3 marine vessels will total about 597,000 tons. By 2030, these engines, absent the coordinated strategy, will contribute about 1.4 million tons.

As shown in Table II–2 the coordinated strategy will reduce annual SO_2 emissions by 877,000 tons in 2020 and 1.3 million tons in 2030.

III. Engine Standards

This section details the emission standards, implementation dates, and other major requirements being finalized under the Clean Air Act. A discussion of the technological feasibility of the finalized NO_X standards follows the description of the proposed program.

Other elements of our coordinated strategy to control emissions from ships are discussed in subsequent sections. Provisions related to our Clean Air Act fuel controls are described in Section IV. Section V summarizes the U.S. and Canada's recent proposal to amend MARPOL Annex VI to designate much of the U.S. and Canadian coasts as an Emission Control Area.[85] Finally, provisions revising our Clean Air Act test procedures and related certification requirements, provisions to implement MARPOL Annex VI through APPS, and various changes we are making to our Category 1 and 2 (marine diesel engines with per cylinder displacement less than 30 liters per cylinder) marine diesel engine program are described in Section VI.

A. What Category 3 Marine Engines Are Covered?

Consistent with our existing marine diesel emission control program, the engine emission standards being finalized will apply to any new marine diesel engine with per-cylinder displacement at or above 30 liters installed on a vessel flagged or registered in the United States.

With regard to marine diesel engines on foreign vessels that enter U.S. ports, we are retaining our current approach and not applying this Clean Air Act program to those engines. This is appropriate because engines on foreign vessels are subject to the same NO_X limits through MARPOL Annex VI, and the United States can enforce compliance pursuant to Annex VI and the recent amendments to the Act to Prevent Pollution from Ships (33 U.S.C. 1901 *et seq.*). At the same time, however, the effectiveness of this approach is contingent on the designation of U.S. coasts as an ECA

[85] The ECA proposal and associated Technical Support Document can be found at *http://www.epa.gov/otaq/oceanvessels.htm.* France has since joined the ECA proposal on behalf of the Saint Pierre and Miquelon archipelago.

pursuant to MARPOL Annex VI, since the Annex VI Tier III NO_X limits are geographic in scope and apply only if an ECA has been adopted. We anticipate that MARPOL Annex VI will be amended to include the North American ECA proposal. However, if the proposed amendment is not adopted in a timely manner by IMO, we will reconsider whether additional action is necessary to control harmful emissions from all vessels affecting U.S. air quality. Section V contains a description of the ECA designation process.

The combination of this Clean Air Act program, MARPOL Annex VI, and APPS will apply comparable emission standards to the vast majority of vessels entering U.S. ports or operating in U.S. waters.[86] Most significantly, these vessels will be required to meet the NO_X limits described below. As described later in this Section III and in Section VI, there will be some minor differences between the finalized Clean Air Act program and the requirements that apply under MARPOL Annex VI. Nevertheless, with respect to U.S. air quality, these differences will have a negligible effect on emissions from foreign vessels.

B. What Standards Are We Finalizing for Newly Manufactured Engines?

This subsection details the emission standards (and implementation dates) we are finalizing for freshly manufactured (*i.e.,* new) Category 3 engines on U.S. vessels. As described in Section III.C, we believe the standards will be challenging to manufacturers, yet ultimately feasible and cost-effective within the finalized lead time. These standards, along with other parts of our program, are the outcome of our work with stakeholders to resolve the challenges associated with applying advanced diesel engine technology to Category 3 engines to achieve significant NO_X reductions.

(1) NO_X Standards

We are finalizing new Tier 2 and Tier 3 NO_X emission standards for Category 3 marine diesel engines. Our existing Tier 1 NO_X standards for Category 3 engines were dependent on the rated speed of the engine for speeds between 130 revolutions per minute (rpm) and 2,000 rpm. Fixed standards applied for lower and higher speeds. Thus, the standards were expressed as an equation that applies for speeds between 130 rpm and 2,000 rpm, along with fixed values that were calculated from the equation for 130 rpm and 2,000 rpm that apply for lower and higher speeds. This was done to account for the fact that brake-specific NO_X emissions are inherently higher for lower speed engines (and lower for higher speed engines). Note that this same approach is used by the IMO for the same technical reasons. We are continuing this approach for Tier 2 and Tier 3, as shown in Table III–1.

TABLE III–1—NO_X EMISSION STANDARDS FOR CATEGORY 3 ENGINES

[g/kW-hr]

		Less than 130 RPM	130–2,000 RPM [a]	Over 2,000 RPM
Tier 1	[b] 2004	17.0	$45.0 \cdot n^{(-0.20)}$	9.8
Tier 2	2011	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier 3	2016	3.4	$9.0 \cdot n^{(-0.20)}$	2.0

Notes:
[a] Applicable standards are calculated from n (maximum in-use engine speed in RPM), rounded to one decimal place.
[b] Tier 1 NO_X standards applied for engines originally manufactured after 2004, and also to certain earlier engines.

Our analysis, which is described in the RIA, shows that these standards will give the greatest degree of emission control achievable considering compliance costs, lead time, and other relevant factors. The technological bases are also discussed briefly below.

Note that other important provisions related to compliance with these standards are described in Section VI. This includes provisions to ensure effective control of NO_X emissions over a broad range of operating conditions.

(a) Tier 2 NO_X Limits

We are finalizing the proposed Tier 2 NO_X emission standards for Category 3 marine diesel engines. In-cylinder emission control technology for Category 3 marine engines has progressed substantially in recent years. Significant reductions can be achieved in the near term with little or no impact on overall vessel performance. These technologies include traditional engine-out controls such as electronically-controlled high-pressure common-rail fuel systems, turbocharger optimization, compression-ratio changes, and electronically-controlled exhaust valves. We are setting a near-term NO_X emission standard requiring a reduction of approximately 20 percent below the current Tier 1 standard beginning 2011.

(b) Tier 3 NO_X Limits

While the Tier 2 standards will achieve modest reductions quickly, the finalized Tier 3 standards are intended to achieve much greater emission reductions through the use of more advanced emission control technology. These standards will achieve reductions of about 80 percent from the current Tier 1 standards. As explained in the RIA, we evaluated the possibility of requiring the Tier 3 limits on an earlier schedule than 2016. However, we found that a schedule requiring Tier 3 limits prior to 2016 had significant feasibility issues, and are therefore finalizing the 2016 implementation date for Tier 3 standards. Under the finalized approach, manufacturers of Category 3 engines will have about the same amount of lead time allowed manufacturers for smaller diesel marine engines and for locomotives.

(2) PM and SO_X Standards

We are not establishing new engine standards for PM or SO_X emissions. We intend to rely instead on the use of cleaner fuels as described in Section IV and V. SO_X emissions and the majority of the direct PM emissions from Category 3 marine engines operated on residual fuels are a direct result of fuel quality, most notably the sulfur in the fuel, and engine-based PM controls are not currently feasible for engines using these higher sulfur fuels. Other components of residual fuel, such as ash and heavy metals, also contribute directly to PM.

Using cleaner distillate fuel is the most effective means to achieve significant PM and SO_X reductions for

[86] Certain public vessels such as military vessels and foreign vessels in innocent passage may be exempt.

Category 3 engines. We are finalizing requirements to substantially reduce the sulfur content of fuel purchased in the U.S. for use in an ECA. This complements Annex VI which requires that fuels used in ECAs around the world have sulfur levels no higher than 1,000 ppm. This sulfur limit is expected to necessitate the use of distillate fuel which will result not only in reductions in sulfate PM emissions, but also reductions in organic PM and metallic ash particles in the exhaust.

Even though the sulfur limit is much lower than current levels, it is not clear if this fuel sulfur level would be low enough to allow Category 3 engines to be equipped with the catalytic PM filters similar to those being used by trucks today. If we were to require technology that needs lower sulfur fuel, such as 15 ppm, ship operators would need to have access to this fuel around the world and at this time, it is not clear if 15 ppm sulfur fuel could be made available globally. Operating on higher sulfur fuel, such as for outside of our waters, could otherwise result in damage to the PM control equipment. In any case, the 1,000 ppm sulfur fuel requirement alone will eliminate 85 percent of PM emissions from ships operating in ECAs.

To further our understanding of PM emissions from ships, we are requiring engine manufacturers to measure and report PM emissions even though we are not finalizing a PM standard. The information gathered will help support our efforts as we continue to evaluate the feasibility of achieving further PM reductions. It will also help us to better characterize the PM emission rates associated with operating Category 3 engines on distillate fuel. If we determine that further PM reductions are feasible or that a specific PM limit is necessary to ensure anticipated reductions in PM emissions from ships, we may propose PM standards for Category 3 engines in the future.

(3) HC and CO Standards

We are finalizing HC and CO standards of 2.0 g/kW-hr and 5.0 g/kW-hr, respectively. Emission control technologies for Category 3 marine engines have been concentrated on reducing NO_X and PM emissions, but these emission standards will prevent increases in emissions of HC and CO that might otherwise occur as a result of use of certain technologies for controlling NO_X, such as those that significantly degrade combustion efficiency.

(4) CO_2 Standards

We are not adopting CO_2 standards for marine diesel engines at this time. Marine diesel engines are included in other ongoing Agency actions, including our Advance Notice of Proposed Rulemaking (ANPRM) for mobile sources (73 FR 44353, July 30, 2008) and our Greenhouse Gas Reporting Rule (74 FR 16448, April 10, 2009). In addition, EPA is participating in the U.S. Government delegation to IMO, which is currently engaged in negotiations for an international program to address greenhouse emissions from ships.

C. Are the Standards Feasible?

We have analyzed a variety of technologies available for NO_X reduction in the Category 3 marine sector. As described in more detail in our RIA, we are projecting that marine diesel engine manufacturers will choose to use in-cylinder, or engine design-based emission control technologies to achieve the NO_X reductions required to meet the final Tier 2 standard.

The in-cylinder, or engine-out, NO_X emissions of a diesel engine can be controlled by utilizing engine design and calibration parameters (*e.g.,* fuel delivery and valve timing) to limit the formation of NO_X. NO_X formation rate has a strong exponential relationship to combustion temperature. Therefore, high temperatures result in high NO_X formation rates.[87] [88] Any changes to engine design and calibration which can reduce the peak temperature realized during combustion will also reduce NO_X emissions. Many of the approaches and technologies for reducing in-cylinder NO_X emissions are discussed in our RIA.

To achieve the 80 percent NO_X reductions required to meet the final Tier 3 standard, we believe many manufacturers will choose selective catalytic reduction (SCR) exhaust aftertreatment technology. SCR is a commonly-used technology for meeting stricter NO_X emissions standards in diesel applications worldwide. Stationary power plants fueled with coal, diesel and natural gas have used SCR for three decades as a means of controlling NO_X emissions, and European heavy-duty truck manufacturers are currently using this technology to meet Euro 5 emissions limits. To a lesser extent, SCR has been introduced on diesel engines in the U.S. market, but the applications have been limited to marine ferryboat and stationary electrical power generation demonstration projects in California and several of the Northeast States. SCR systems are currently being designed and developed for use on ocean-going vessels worldwide, and we project that SCR will continue to be a viable technology for control of Category 3 NO_X emissions.

When operating in the ECA, SCR units would be active, meaning that urea would be injected into the exhaust to facilitate catalytic reduction of NO_X emissions. When outside of the ECA, the unit would likely be inactive, meaning that urea would not be injected into the exhaust. When the SCR unit is inactive, the exhaust flow could either continue to pass through the SCR unit or be diverted around the catalyst. Under the MARPOL NO_X Technical Code, a means for monitoring the use of urea must be provided which must include "sufficient information to allow a ready means of demonstrating that the consumption of such additional substances is consistent with achieving compliance with the applicable NO_X limit." In addition, where a NO_X reducing device, such as SCR, is used, one of the options for providing verification of compliance with the NO_X standard is through direct measurement and monitoring of NO_X emissions. A more detailed discussion of SCR technology can be found in our RIA.

SCR is not the only approach under consideration for meeting the Tier 3 standards. Manufacturers may choose a combination of other in-cylinder technologies, such fuel-water emulsification, direct water injection, intake air humidification, or exhaust gas recirculation (EGR) to reduce NO_X emissions and meet the final standards. These "in-cylinder" approaches could be calibrated and applied in one manner to achieve Tier 3 NO_X levels when operating with an ECA, and then adjusted, or re-calibrated, in another manner to achieve Tier 2 NO_X levels when operating outside an ECA. This is discussed in more detail in the RIA.

Another technology, which is currently under investigation, is the use of an exhaust gas cleaning unit (EGCS) to reduce NO_X emissions. One significant technological issue that must be addressed is the prevention of nitrates from being introduced into the water. In a typical diesel exhaust gas mixture, NO_X is composed of roughly 5–10% NO_2, with the majority of the remainder in the form of NO. NO_2 is soluble in water, and therefore may be removed by the water in the scrubber. It is possible to treat the exhaust upstream of the scrubber to convert

[87] Flynn, P., *et al.,* "Minimum Engine Flame Temperature Impacts on Diesel and Spark-Ignition Engine NO_X Production", SAE 2000–01–1177, 2000.

[88] Heywood, John B., "Internal Combustion Engine Fundamentals", McGraw-Hill, 1988.

more of the NO_X to NO_2, thereby facilitating the use of a scrubber to remove NO_2. However, we are concerned that this would add to nitrogen loading of the water in which the ship is operating. As discussed in Section II.B.1, nitrogen loading can lead to serious water quality impacts. This issue is addressed in the IMO EGCS guidelines by limiting the amount of nitrates that may be removed by the scrubber, and washed overboard. However, a scrubber design may be acceptable if it removes nitrates from the wash water, which in turn are disposed of properly, or prevents nitrates from forming in the wash water. One manufacturer has stated that their unique EGCS design converts NO_X to nitrogen (N_2), rather than nitrates. This is discussed in more detail in the RIA.

IV. Fuel Standards

A. Background

EPA is finalizing standards for fuel manufactured or distributed in the U.S. that are consistent with those recently adopted as amendments to MARPOL Annex VI. As amended, Annex VI includes revised fuel sulfur standards for use in engines onboard ships, and it also set more stringent fuel sulfur limits for "any fuel oil used onboard ships * * * operating within an Emission Control Area" (Annex VI, Regulation 14).

Under the Annex, the process by which an Emission Control Area (ECA) is to be designated is through amendment of the Annex. The U.S. and Canadian governments have submitted a proposal to amend MARPOL Annex VI to designate an ECA to include waters off much of the U.S. and Canada. Specifically, the proposed ECA includes the waters off of the contiguous 48 States, Southeastern Alaska, and the Main Hawaiian Islands, extending to a distance of 200 nautical miles from the coastline. This amendment was considered at the July 2009 Marine Environment Protection Committee (MEPC 59), and we expect that the amendment will be adopted in March 2010, at MEPC 60. If this amendment is not adopted in a timely manner by IMO, we intend to take supplemental action to control emissions from vessels that affect U.S. air quality.

EPA is in this notice finalizing fuel sulfur limits under section 211(c) of the Clean Air Act that match the limits that apply under Annex VI in ECAs. The adoption of such standards will: (1) Allow for the production and sale of up to 1,000 ppm sulfur fuel for use in Category 3 marine vessels; and (2) forbid the production and sale of fuel oil above 1,000 ppm sulfur for use in the waters within an ECA and ECA associated areas (per 40 CFR 1043.20) except as allowed under 40 CFR Part 1043, as described below.[89] [90]

There are a few exceptions that will allow for the use of fuel greater than 1,000 ppm sulfur in an ECA. First, as an alternative to using lower sulfur fuel, Annex VI allows for the use of approaches, such as exhaust gas scrubbers, that can achieve equivalent emission reductions even when the fuel is operating on high sulfur residual fuel. In the event that a vessel is using an alternative device, procedure, or compliance method, provided they achieve equivalent emissions reductions, fuel oil above 1,000 ppm sulfur may be purchased in the U.S. for use in an ECA and ECA associated areas. This is discussed in more detail in Section V of this preamble. As discussed further in Section VI.B.5, existing steamships operating exclusively on the Great Lakes are not subject to the 1,000 ppm sulfur requirement, and vessels that have been granted temporary relief on the basis of serious economic hardship are also not subject to the standard. These three exceptions are all set out in the regulations at 40 CFR Part 1043.

The majority of vessels with a Category 3 propulsion engine operate on high-sulfur, heavy fuel oil (HFO) (also known as residual, or bunker, fuel). Due to their use of heavy fuel, these marine diesel engines have very high PM and SO_2 emissions. Sulfur in the fuel is emitted from engines primarily as SO_2; however a small fraction is emitted as sulfur trioxide (SO_3) which immediately forms sulfate and is emitted as PM by the engine. In addition, much of the SO_2 emitted from the engine reacts in the atmosphere to form secondary PM. Reductions in residual fuel sulfur levels will lead to significant sulfate PM and SO_2 emission reductions which will provide dramatic environmental and public health benefits. However, in most cases, fuels that meet the long-term fuel sulfur standards will likely be distillate fuels, rather than HFO. In addition to reductions in sulfate PM, switching from HFO to distillate fuel may reduce black carbon emissions, fine particle counts, organic carbon, and metallic ash particles. Further information on these impacts as well as a discussion of the technological feasibility of fuel switching, or using alternative approaches, is discussed in Section V.

HFO sold for use by these vessels is currently not subject to any EPA sulfur limits (as it is not regulated by our current sulfur program) and generally has very high levels of sulfur. The finalized modifications to our existing diesel fuel program prohibit the production and sale of this fuel for use in an ECA associated area, and fuel sold for use in such areas will not be allowed to exceed a sulfur content of 1,000 ppm, except as allowed under 40 CFR Part 1043. In a complementary fashion, the amendment to MARPOL Annex VI designating the North American ECA will ensure that fuel used in an ECA, including fuel purchased in another country but used within the North American ECA, also either meets a 1,000 ppm sulfur limit or meets required emissions limits through the use of alternative devices, procedures, or compliance methods, provided they achieve equivalent emissions reductions (equivalents). Under our finalized regulations, fuel sold for use by Category 3 vessels without equivalents in an ECA and ECA associated areas will be allowed to have a sulfur content as high as this 1,000 ppm sulfur limit (except as otherwise allowed under 40 CFR Part 1043), while fuel sold for use in Category 1 (marine diesel engines up to 7 liters per cylinder displacement) and Category 2 (marine diesel engines from 7 to 30 liters per cylinder) vessels will continue to be subject to the nonroad, locomotive, and marine[91] (NRLM) diesel fuel sulfur requirements. In the event that the North American ECA is not approved in a timely manner, we will revisit the standards being finalized here in that context.

B. Diesel Fuel Standards Prior to This Final Rule

The Nonroad Diesel program (finalized on June 29, 2004 (69 FR 38958)) reduces the sulfur content of NRLM diesel fuel from uncontrolled levels down to a maximum sulfur level of 15 ppm. Refiners and importers are

[89] Per 40 CFR 1043.20, "ECA associated areas" are U.S. internal waters that are navigable from the ECA. This term does not include internal waters that are shoreward of ocean waters that are not part of an emission control area. Though the outer limits of the sulfur limitation are the same as for the proposed ECA, the sulfur limitation in this final rule is not dependent on adoption of the ECA.

[90] For the purpose of the discussion in this section with regard to the CAA fuel standards in 40 CFR 80, "Category 3 vessel" refers to a commercial vessel with a Category 3 propulsion engine; "Category 2 vessel" refers to a commercial or recreational vessel with a Category 2 propulsion engine; and "Category 1 vessel" refers to a commercial or recreational vessel with only Category 1 or smaller engines. The fuel provisions being finalized today apply to all of the engines on a given vessel.

[91] For the purposes of this final rule (and the final 40 CFR Part 80 regulations), the term "marine" as it is used here refers to Category 1 and 2 marine diesel engines unless otherwise stated.

required to produce or import all NRLM diesel fuel at a sulfur level of 15 ppm or less by June 1, 2014. The main compliance mechanism of the diesel sulfur program is the Designate and Track (D&T) provisions, which allows NRLM diesel fuel to be distinguished from similar products (*e.g.,* heating oil) and yet provides a means for diesel fuel to be fungibly transported through the fuel production and distribution system. Under D&T, refiners and importers are required to designate the type and sulfur level of each batch of fuel produced or imported. As this fuel is transferred through the distribution system, product transfer documents (PTDs) must be exchanged each time the batch changes custody. Along with PTDs, other required elements of D&T include quarterly and annual reporting, fuel pump labeling, and recordkeeping.

The Nonroad Diesel program also contains certain provisions to ease refiners' transition to the lower sulfur standards and to enable the efficient distribution of all diesel fuels. These provisions, as discussed more below in Section IV.B.2, include special provisions for qualified small refiners, transmix processors, and entities in the fuel distribution system.

(1) Scope of the Nonroad Diesel Fuel Program

The sulfur standards finalized by the Nonroad Diesel rule apply to all the diesel fuel that is produced and sold for use in NRLM diesel applications (all fuel used in NRLM diesel engines, except for fuels heavier than a No. 2 distillate used in Category 2 and 3 marine engines [92] and any fuel that is exempted for national security or other reasons). While the Nonroad Diesel rule did not set sulfur standards for other distillate fuels (such as jet fuel, heating oil, kerosene, and No. 4 fuel oil), it did implement provisions to prevent the inappropriate use of heating oil and other higher sulfur distillate fuels in NRLM and locomotive and marine (LM) diesel applications. Sale of distillate fuels for use in nonroad, locomotive, or marine diesel engines will generally be prohibited unless the fuel meets the diesel fuel sulfur standards of 40 CFR Part 80.[93] The regulated fuels under our diesel fuel sulfur program include those fuels listed in the regulations at 40 CFR 80.2(qqq).

The sulfur standards do not apply to: (1) No. 1 distillate fuel used to power aircraft; (2) Number 4, 5, and 6 fuels (*e.g.,* residual fuels or residual fuel blends, intermediate fuel oil (IFO) Heavy Fuel Oil Grades 30 and higher), used for stationary source purposes; (3) any distillate fuel with a T–90 distillation point greater than 700 °F, when used in Category 2 or 3 marine diesel engines (this includes Number 4, 5, and 6 fuels (*e.g.,* IFO Heavy Fuel Oil Grades 30 and higher), including fuels meeting the American Society for Testing and Materials (ASTM) specifications DMB, DMC, and RMA–10 and heavier); and (4) any fuel for which a national security or research and development exemption has been approved or fuel that is exported from the U.S. The criterion that any distillate fuel with a T–90 greater than 700 °F will not be subject to the sulfur standards when used in Category 2 or 3 marine engines was intended to exclude fuels heavier than No. 2 distillate, including blends containing residual fuel. In addition, residual fuel was not subject to the sulfur standards.

While many marine diesel engines use No. 2 distillate, ASTM specifications for marine fuels identify four kinds of marine distillate fuels: DMX, DMA, DMB, and DMC. DMX is a special light distillate intended mainly for use in emergency engines. DMA (also called marine gas oil, or "MGO") is a general purpose marine distillate that contains no trace of residual fuel. These fuels can be used in all marine diesel engines but are primarily used by Category 1 engines. DMX and DMA fuels intended for use in any marine diesel engine are subject to EPA's fuel sulfur standards.

DMB, also called marine diesel oil, is not typically used with Category 1 engines, but is used for Category 2 and 3 engines. DMB is allowed to have a trace of residual fuel, which can be high in sulfur. This contamination with residual fuel usually occurs due to the distribution process, when distillate is brought on board a vessel via a barge that has previously contained residual fuel, or using the same supply lines as are used for residual fuel. DMB is produced when fuels such as DMA are brought on board the vessel in this manner. EPA's fuel sulfur standards do apply to the distillate that is used to produce the DMB, for example the DMA distillate, up to the point that it becomes DMB. However, DMB itself is not subject to the EPA fuel sulfur standards when it is used in Category 2 or 3 engines.

DMC is a grade of marine fuel that may contain some residual fuel and is often a residual fuel blend. This fuel is similar to No. 4 diesel, and can be used in Category 2 and Category 3 marine diesel engines. DMC is produced by blending a distillate fuel with residual fuel, for example at a location downstream in the distribution system. EPA's fuel sulfur standards apply to the distillate that is used to produce the DMC, up to the point that it is blended with the residual fuel to produce DMC. However, DMC itself is not subject to the EPA fuel sulfur standards when it is used in Category 2 or 3 marine engines.

Residual fuel was not previously covered by the sulfur content standards as it is not a distillate fuel. Residual fuel is typically designated by the prefix RM (*e.g.,* RMA, RMB, *etc.*). These fuels are also identified by their nominal viscosity (*e.g.,* RMA10, RMG35, *etc.*). Most residual fuels require treatment by an onboard purifier-clarifier centrifuge system, although RMA and RMB do not require this.

The distillation criterion adopted by EPA, T–90 greater than 700 °F, was designed to identify those fuels that are not subject to the sulfur standards when used in Category 2 or 3 marine diesel engines. It is intended to exclude DMB, DMC, and other heavy distillates or blends, when used in Category 2 or 3 marine diesel engines. We are not amending this provision in this action. However, under this final rule, all of these fuels, and any other diesel fuels or fuel oils, will be subject to a 1,000 ppm sulfur limit if they are produced or sold for use in an ECA, except as otherwise allowed under 40 CFR Part 1043.

(2) Flexibilities

Compliance flexibilities were provided in the nonroad diesel sulfur regulations for qualified small refiners (69 FR 39047; Section IV.B.1) and for transmix processors (69 FR 39045; Section IV.A.3.d). Small refiners were provided, among other flexibility options, additional time for compliance with the 15 ppm NRLM standard, until June 1, 2014. Transmix processors, who distill off-specification interface mixtures of petroleum products from pipeline systems into gasoline and distillate fuel, have a simple refinery configuration that does not make it cost-effective for them to install and operate a hydrotreater to reduce distillate fuel sulfur content. As a result, transmix processors were provided with the flexibility to continue to produce all of their NRLM diesel fuel to meet the 500 ppm sulfur standard until June 1, 2014, and all of their LM diesel fuel to meet a 500 ppm sulfur limit indefinitely. The

[92] Category 3 marine engines frequently are designed to use residual fuels and include special fuel handling equipment to use the residual fuel.

[93] For the purposes of the diesel sulfur program, the term heating oil basically refers to any No. 1 or No. 2 distillate other than jet fuel, kerosene, and diesel fuel used in highway or NRLM applications. For example, heating oil includes fuel which is suitable for use in furnaces and similar applications and is commonly or commercially known or sold as heating oil, fuel oil, or other similar trade names.

latter flexibility also allows for an outlet for off-spec fuel that may be produced in the distribution system.

The D&T provisions, first established to distinguish highway from nonroad 500 ppm fuel, were thus continued beyond 2014 to ensure that 500 ppm NRLM could be distinguished from similar fuel (*e.g.,* heating oil that has a sulfur level of 500 ppm). In 2014 and beyond, D&T is essential to ensure that heating oil is not being inappropriately shifted downstream of the refiner into the NRLM and LM diesel fuel markets, circumventing the NRLM standards (as mentioned above in Section IV.B.1). Provisions in the Nonroad Diesel rule to ensure that heating oil is not used in NRLM applications include the use of a fuel marker to distinguish heating oil from NRLM and LM diesel fuel, dye solvent yellow 124, which is added to heating oil at the terminal level. The D&T provisions also provided parties in the diesel fuel industry with inherent flexibility. D&T maximizes the efficiency of the distribution system by allowing for fungible distribution of physically similar products, and minimizing the need for product segregation. Under D&T, diesel fuel with similar sulfur levels can be fungibly shipped up to the point of distribution from a terminal (where off-highway diesel fuels must be dyed red, pursuant to Internal Revenue Service (IRS) requirements, to indicate its tax exempt status).

(3) Northeast/Mid-Atlantic Area

In the Northeast, heating oil is distributed in significant quantities. Discussions with terminal operators in the Northeast (and other representatives of heating oil users and distributors) during the development of the Nonroad Diesel rule revealed concerns that the heating oil marker requirement would represent a significant burden on terminal operators and users of heating oil given the large volume of heating oil used in the Northeast. These parties suggested that if EPA prohibited the sale and use of diesel fuel produced by those utilizing the flexibilities described above, this area could be exempted from the marker requirement.

Thus, the Northeast/Mid-Atlantic (NE/MA) area was developed (69 FR 39063, Section IV.D.1.b.ii; *see also* 40 CFR 80.510(g) for the specific States and counties that comprise the NE/MA area). As there would be no way to distinguish heating oil from 500 ppm NRLM and 500 ppm LM diesel fuel in 2014 and beyond without the fuel marker, these fuel types are not allowed to be produced/imported, distributed and/or sold in the NE/MA area during this time period (500 ppm NRLM diesel fuel may not be produced/imported, distributed and/or sold in the NE/MA area after 2012).

Similarly, high sulfur NRLM (HSNRLM) produced through the use of credits is not allowed in Alaska. However, EPA-approved small refiners in Alaska may produce HSNRLM diesel fuel. To receive this approval, a small refiner must provide EPA with a compliance plan showing how their HSNRLM diesel fuel will be segregated from all other distillate fuels through its distribution to end-users.

(4) Nonroad Diesel Program Transition Schedule

The transition to lower sulfur diesel fuel for NRLM equipment is depicted in Figure VI–1 below. The transition for urban (areas served by the Federal Aid Highway System) and rural Alaska are shown below in Figure VI–2.

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Highway and Nonroad Diesel Fuel Standards										
Who	**Covered Fuel**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
	Highway Diesel Fuel	80% 15 ppm/ 20% 500 ppm				100% 15 ppm (including small refiner fuel)				
Large Refiners/ Importers	***NR***		500	500	500	15	15	15	15	15
Large Refiners/ Importers	***LM***		500	500	500	500	500	15	15	15
	NRLM w/ credits(not in NE/MA or AK)		HS	HS	HS	500	500	500	500	15
Small Refiners	***NRLM (not in NE/MA, w/ approval in AK)***		HS	HS	HS	500	500	500	500	15
Transmix Processor & In-use	***NR (not in NE/MA or AK)***		HS	HS	HS	500	500	500	500	15
Transmix Processor & In-use	***LM (not in NE/MA or AK)***		HS	HS	HS	500	500	500	500	500

***2006 dates for HW diesel fuel**: June 1 for refiners/importers, September 1 for downstream parties, and October 15 for retailers and wholesale purchaser-consumers.*

***2010 dates for HW diesel fuel**: As of the following dates, all HW diesel fuel must meet the 15 ppm standard- June 1 for refiners/importers, October 1 for downstream parties, and December 1 for retailers and wholesale purchaser-consumers (WPCs).*

***2007 dates for NRLM diesel fuel**: June 1 for refiners, downstream requirements for NE/MA area* only (August 1 for terminals, October 1 for retailers/WPCs, and December 1 for in-use).*

***2010+ dates for NRLM diesel fuel**: June 1 for refiners, August 1 for terminals, October 1 for retailers/WPCs, and December 1 for in-use.*

***** Anti-downgrading provisions begin October 15, 2006 *****

**Note*- No small refiner or credit NRLM can be used in the NE/MA area. Thus, the large refiner NRLM standard is also the in-use standard in the NE/MA area.*

Figure IV-1 Highway, Nonroad, Locomotive, and Marine Diesel Fuel Sulfur Standards Prior to This Final Rule

Urban AK (areas served by the FAHS)

HW-

- Pre-2006: HS/uncontrolled.
- 2006: 6/1/06- refiners to 15; 9/1/06- pipelines & terminals to 15; 10/15/06- retail & WPC to 15.

NRLM-

- Pre-2007: HS/uncontrolled.
- 2007: 6/1/07- refiners to 500; 8/1/07- pipelines & terminals to 500; 10/1/07- retail & WPC to 500; 12/1/07- in-use, farm & construction tanks to 500 (*note- urban AK is on same downstream schedule as NE/MA*).
- 2010: 6/1/10- refiners to 15 NR; 8/1/10- pipelines & terminals to 15 NR; 10/1/10- retail & WPC to 15 NR; 12/1/10- in-use, farm & construction tanks to 15 NR.
- 2012: 6/1/12- refiners to 15 LM; 8/1/12- pipelines & terminals to 15 LM; 10/1/12- retail & WPC to 15 LM; 12/1/12- in-use, farm & construction tanks to 15 LM.

** *Urban AK is on the same schedule as the main HW & NR diesel programs (except they're on the same downstream schedule as the NE/MA for NRLM in 2007); permanently exempt from dye & marker requirements.* **

Rural AK

HW-

- Pre-2010: HS/uncontrolled.
- 2010: 6/1/10- refiners to 15 HW; 8/1/10- pipelines & terminals to 15 HW; 10/1/10- retail & WPC to 15 HW; 12/1/10- in-use, farm & construction tanks to 15 HW.

NRLM-

- Pre-2010: HS/uncontrolled.
- 2010: 6/1/10- refiners to 15 NRLM; 8/1/10- pipelines & terminals to 15 NRLM; 10/1/10- retail & WPC to 15 NRLM; 12/1/10- in-use, farm & construction tanks to 15 NRLM.

** Downstream transition dates are same for HW & NRLM in rural AK; permanent exemption from dye & marker requirements. **

General Note- Credit & transmix fuel cannot be used in any area of AK; small refiner fuel can be used with approval (and only if properly labeled and segregated).

Figure IV-2 Highway, Nonroad, Locomotive, and Marine Diesel Fuel Sulfur Standards for Alaska Prior to This Final Rule

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C. Applicability

Assuming adoption of an amendment to MARPOL Annex VI establishing a U.S. ECA, pursuant to Annex VI, the fuel used in that ECA cannot exceed 1,000 ppm sulfur beginning January 1, 2015.[94] As mentioned above, we are incorporating a similar 1,000 ppm sulfur limit into our CAA regulations at 40 CFR Part 80 through both a prohibition on the production and sale of fuel oil above 1,000 ppm sulfur for use in any marine vessels (Categories 1, 2, and 3) in an ECA and ECA associated areas except as allowed under 40 CFR Part 1043, and an allowance for the production and use of 1,000 ppm sulfur fuel to be used in Category 3 marine vessels. Fuel produced and sold for use in any engine on Category 1 and Category 2 marine vessels will continue to be subject to the existing diesel sulfur requirements which are more stringent than those being finalized in this action for Category 3 marine vessels. We requested comment on whether or not Category 1 and 2 engines installed on Category 3 marine vessels should be allowed to use 1,000 ppm sulfur fuel. To reduce burden that could potentially be caused by requiring that these engines burn 15 ppm diesel fuel (which could result in a vessel needing to carry three different types of fuel onboard), we are finalizing that Category 1 and 2 auxiliary engines installed on Category 3 marine vessels will be allowed to use 1,000 ppm fuel.

Discussions with stakeholders in the diesel fuel production and distribution industry have indicated that they anticipate that most (if not all) fuel oil that could meet a 1,000 ppm sulfur standard would be considered a distillate or diesel fuel, because at a 1,000 ppm sulfur level it is nearly impossible for fuel to have a T–90 distillation point at or above 700 °F (*i.e.,* be considered residual fuel). As discussed in Section IV.B.1, fuel with a T–90 less than 700 °F will be required to meet the standards of our existing diesel sulfur program which, in 2014 and beyond, is 15 ppm. We believe that because of the limits on the sulfur content of fuel used in ECAs, the existing diesel fuel sulfur program should be revised to allow for the production, distribution, purchase, and use of 1,000 ppm sulfur fuel oil for use in Category 3 marine vessels. Therefore, we are finalizing a new 1,000 ppm sulfur category for fuel oil produced and purchased for use in Category 3 marine vessels (called "ECA marine fuel"). This finalized fuel sulfur requirement will largely supplement the existing diesel fuel sulfur requirements and will harmonize EPA's diesel sulfur program with the requirements of Annex VI. Under this final action, owners of Category 3 marine vessels will be able to purchase and use 1,000 ppm sulfur ECA marine fuel, which will allow those vessels to comply with the sulfur limits in any ECA worldwide and in ECA associated areas.

D. Fuel Sulfur Standards

As discussed above in Section IV.C, in addition to the prohibition on the sale of fuel greater than 1,000 ppm sulfur for use in marine vessels (except as allowed under 40 CFR Part 1043) operating within an ECA and ECA associated areas, we are also finalizing the allowance of the production, distribution, and sale of 1,000 ppm sulfur ECA marine fuel, which we discuss more in this section.

Prior to this action, and pending the establishment of the North American ECA, the kind of fuel produced and sold for use by Category 3 marine vessels had uncontrolled sulfur levels as it was not subject to the NRLM sulfur limits. This was reflected in the regulations by exempting these kinds of fuel from the definition of NRLM diesel fuel and the NRLM sulfur limits (40 CFR 80.2(nnn)). The combined effect of Annex VI and these regulations is to require that any fuel sold for use in a Category 3 marine vessel operating in an ECA be 1,000 ppm sulfur or lower, except as allowed under 40 CFR Part 1043. Fuel oil used or sold for use in Category 3 marine vessels in an ECA and ECA associated areas will therefore go from uncontrolled, high sulfur levels to no higher than 1,000 ppm sulfur (except as otherwise allowed under 40 CFR Part 1043). Under Annex VI, fuel with sulfur levels greater than 1,000 ppm cannot be used in a marine vessel without sulfur abatement technology operating in an ECA, no matter where the fuel is purchased. Consistent with this, the finalized section 211(c) controls will prohibit the production and sale of any fuel for use in an ECA and ECA associated areas that is above 1,000 ppm sulfur, except as allowed under 40 CFR Part 1043.

The requirements for 1,000 ppm sulfur fuel oil will apply to the North Sea, the Baltic Sea, and any other ECAs established around the world, so this fuel will be produced by refiners in other countries. Under EPA's NRLM program prior to this final rule, 1,000 ppm sulfur fuel would have been subject to the 15 ppm NRLM sulfur limit in 2014 and later. If EPA were to require that fuel produced, distributed, and sold for use for Category 3 vessels in the North American ECA and ECA associated areas meet the 15 ppm sulfur standard after 2014, we believe that Category 3 vessel owners would simply purchase 1,000 ppm sulfur fuel elsewhere to be used here in the North American ECA. This could be an extremely inefficient process for ship owners. It would also mean a loss of sales for U.S. refiners of fuel that these Category 3 vessel owners purchase. These impacts would add to the costs and burdens of the program with no corresponding environmental benefit. Therefore, we believe that it is reasonable to allow U.S. refiners and importers to produce 1,000 ppm sulfur fuel for use by Category 3 vessels. Thus, we are finalizing a new fuel sulfur standard of 1,000 ppm for fuel produced, distributed, and sold for use in Category 3 marine vessels. While we expect use of this fuel to be concentrated in the area of the North American ECA and ECA associated areas (and any other ECA), we are allowing its use by Category 3 marine vessels in all locations, to encourage its general use. After 2014, no fuel above 15 ppm can be used in Category 1 or Category 2 vessels.

We note that the combination of the Annex VI ECA provisions and the modifications proposed in this action for the diesel sulfur program will achieve very significant benefits compared to the existing program. The production and use of 1,000 ppm ECA marine fuel, as well as 15 ppm NRLM diesel fuel, will replace much higher sulfur fuel usage, and there is no additional benefit to be gained by requiring the sale of 15 ppm sulfur diesel fuel for use by Category 3 vessels as a practical matter because we believe Category 3 vessels would simply purchase 1,000 ppm sulfur fuel elsewhere. In order to incorporate these modifications into our existing program under the Clean Air Act, we needed to create a new fuel designation for allowable fuel under our program.

(1) Amendments to the Diesel Fuel Sulfur Program

We are prohibiting the production, distribution, and sale or offer for sale of any fuel for use in any marine diesel vessels (Categories 1, 2, and 3) operating in the North American ECA and ECA associated areas that is greater than 1,000 ppm sulfur, except as otherwise allowed under 40 CFR Part 1043. We are also finalizing a sulfur standard of 1,000 ppm for fuel produced, distributed, and sold or offered for sale for use in Category 3 marine vessels operating in

[94] Annex VI, Regulation 14 (located in the rulemaking docket, EPA–HQ–OAR–2007–0121–0107).

an ECA and ECA associated areas. To simplify the existing diesel fuel sulfur program, we are also eliminating the 500 ppm LM diesel fuel standard once the 1,000 ppm ECA marine fuel standard becomes effective. Under the diesel sulfur program prior to this final rule, 500 ppm LM diesel fuel could be produced by transmix processors indefinitely, and could be used by locomotives and marine vessels that do not require 15 ppm. The original intent of allowing for this fuel was to serve as an outlet for interface and downgraded diesel fuel post-2014 that would otherwise not meet the 15 ppm sulfur standard. However, we believe that the 1,000 ppm sulfur ECA marine fuel can now serve as this outlet. We believe that transmix generated near the coasts would have ready access to marine applications, and transmix generated in the mid-continent could be shipped via rail or fuel barge to markets on the coasts.

Elimination of the 500 ppm LM diesel fuel standard will simplify the diesel sulfur program such that sulfur can serve as the distinguishing factor for fuels available for use after 2014 (the designated products under the diesel fuel program will thus be: 15 ppm motor vehicle, nonroad, locomotive, and marine (MVNRLM) diesel fuel, heating oil, and 1,000 ppm ECA marine fuel). With this approach, beginning in 2014, only 15 ppm NRLM diesel fuel can be used in locomotive and Category 1/Category 2 marine diesel applications (and 1,000 ppm ECA marine fuel could be used in Category 3 marine vessels). Further, this will help to streamline the D&T program as there will no longer be a need for a fuel marker to distinguish 500 ppm LM diesel fuel from heating oil. Below, we discuss the aspects of D&T that we are changing, which we believe will greatly simplify the diesel sulfur program.

(a) Compliance and Implementation

(i) Northeast/Mid-Atlantic Area and the Fuel Marker

With the elimination of the 500 ppm LM designation in 2014, parties in the fuel production and distribution industry will still be required to register and designate their products and adhere to PTD, fuel pump labeling, and recordkeeping requirements. But we believe that the tracking portion of D&T can be simplified. Annual reporting was required under § 80.601 for D&T through June 30, 2015 (the final annual report is due August 31, 2015). The final reporting period was set to ensure that heating oil was not being inappropriately shifted into the 500 ppm LM diesel fuel pool. However, with the elimination of this fuel designation, the final annual reporting period will instead be July 1, 2013 through May 31, 2014, with the report due to EPA on August 31, 2014.

As stated in the preamble to the proposed rule, we believe that the elimination of the 500 ppm LM diesel fuel designation will also, beginning June 1, 2014, negate the need for the heating oil marker and the NE/MA area. After 2014, the heating oil marker requirement in the diesel sulfur program prior to this final rule was for the sole purpose of distinguishing heating oil from 500 ppm LM diesel fuel, to prevent heating oil from swelling the 500 ppm LM diesel fuel pool. Also, as there is no marker requirement for heating oil in the NE/MA area, the diesel sulfur program did not allow for 500 ppm LM diesel fuel to be produced, distributed, or purchased for use in the NE/MA area after 2012. As also noted in the proposed rule, without 500 ppm LM diesel fuel there is no need for the heating oil marker; fuel designations and sulfur level could serve as the distinguishing factor between the available fuels (15 ppm MVNRLM diesel fuel, 1,000 ppm ECA marine fuel, and heating oil). Further, there is no need for the NE/MA area without the heating oil marker. Thus, we are finalizing to remove the NE/MA area designation and the heating oil marker requirement.

(ii) PTDs and Labeling

We are finalizing new PTD language for the 1,000 ppm ECA marine fuel designation at regulation § 80.590. As stated in regulation § 80.590(a)(7)(vii), we are adding the following statement to PTDs accompanying 1,000 ppm sulfur ECA marine fuel: “1,000 ppm sulfur (maximum) ECA Marine Fuel. For use in Category 3 marine vessels only. Not for use in engines not installed on Category 3 marine vessels.”

Appendix V of Annex VI also includes language that is required on bunker delivery notes. Compliance requirements of this action, such as PTDs, are not intended to supplant or replace requirements of Annex VI (and we encourage regulated entities to consult Annex VI to ensure that they are fully aware of all requirements that must be met in addition to EPA’s requirements). However, if a party’s bunker delivery note also contains the information required under our regulations for PTDs, we will consider the bunker delivery note to also suffice as a PTD.

We are also finalizing new pump labeling language for the 1,000 ppm sulfur ECA marine fuel designation at regulation § 80.574. Diesel fuel pump labels required under the existing diesel sulfur regulations must be prominently displayed in the immediate area of each pump stand from which diesel fuel is offered for sale or dispensing. However, we understand that there may be cases where it is not feasible to affix a label to a fuel pump stand due to space constraints (such as diesel fuel pumps at marinas) or where there is no pump stand, thus the current regulations allow for alternative labeling with EPA approval. Previously approved alternative labeling has included the use of permanent placards in the immediate vicinity of the fuel pump; and we will also allow other reasonable alternatives to labeling for situations where pump labeling may not be feasible. As stated in regulation § 80.574, we are replacing the 500 ppm LM diesel fuel pump label language with the following fuel pump label language for 1,000 ppm sulfur ECA marine fuel: “1,000 ppm SULFUR ECA MARINE FUEL (1,000 ppm Sulfur Maximum). For use in Category 3 marine vessels only. **Warning—**Federal law prohibits use in any engine that is not installed on a Category 3 marine vessel; use of fuel oil with a sulfur content greater than 1,000 ppm in an ECA is prohibited, except as allowed by 40 CFR Part 1043.”

Under this program, we are also eliminating MVNRLM diesel fuel labeling requirements from EPA’s regulations. In 2014 and beyond, EPA will not require “visible evidence” of red dye in off-road fuels; however this requirement still exists in IRS’s taxation regulations to denote that off-road fuels are untaxed. EPA’s required label for 15 ppm NRLM diesel fuel (instead of one 15 ppm MVNRLM diesel fuel label) is mainly to denote that 15 ppm NRLM will be dyed red, while 15 ppm MV diesel fuel will not. Further, after October 1, 2014, all MVNRLM diesel fuel available for purchase and/or distribution will be 15 ppm. We believe that it is not appropriate for EPA to retain a labeling requirement for MVNRLM diesel fuel given the fact that the red dye provision is no longer EPA’s requirement. Please note, however, that marketers and wholesale purchaser-consumers are still free to continue to label their pump stands to help with consumer awareness. Labeling will continue to be required for heating oil and, as proposed above, for 1,000 ppm sulfur ECA marine fuel.

Additionally, EPA will consult with IRS regarding handling labels in IRS’s regulations at Title 26 of the Code of Federal Regulations.

(b) Timing of the Standard

Currently, all refiners and importers are required to produce all of their NRLM diesel fuel to meet the 15 ppm standard beginning June 1, 2014. To allow transition time for the distribution system, terminals are allowed until August 1, 2014 to begin dispensing 15 ppm NRLM diesel fuel, retailers and wholesale purchaser-consumers are allowed until October 1, 2014, and end-users are allowed until December 1, 2014. To be consistent with the existing diesel program, we are allowing refiners to begin producing 1,000 ppm sulfur ECA marine fuel beginning June 1, 2014, and downstream parties will follow the current NRLM transition schedule (August, October, and December). We believe that following the same transition schedule as the existing diesel sulfur program would best facilitate the availability of 1,000 ppm ECA marine fuel for purchase and use by the Annex VI January 1, 2015 date.

(2) Proposed Alternative Options

We identified two potential alternatives in the proposed rule to the changes to the existing diesel fuel sulfur program discussed above: The creation of an expanded NE/MA area and the retention of the 500 ppm LM diesel fuel designation. We requested comment on these alternative options, as well as any additional alternative options. We received a comment stating that the 500 ppm sulfur designation should be retained because, the commenter stated, Category 3 engines can use both 500 ppm and 1,000 ppm sulfur fuel. Another commenter who supported the elimination of this fuel category noted that if it is determined that the 500 ppm LM designation is necessary for the locomotive industry, it would support the concept of an expanded NE/MA area as a secondary option.

E. Technical Amendments to the Current Diesel Fuel Sulfur Program Regulations

Following publication of the technical amendments to the Highway and Nonroad Diesel Regulations (71 FR 25706, May 1, 2006), we discovered additional errors and clarifications within the diesel regulations at 40 CFR Part 80, Subpart I that we are addressing in this action. These items are merely typographical/printing error and grammar corrections. A list of the changes that we are making to Subpart I is below in Table IV–1.

TABLE IV–1—TECHNICAL AMENDMENTS TO THE DIESEL FUEL SULFUR REGULATIONS

Section	Description of change
80.525(a)–(d)	Removal of the term "motor vehicle" from this section.
80.551(f)	Correction of printing error.
80.561	Correction of typographical error in title.
80.570(a) and (b)	Amended to correct date ("November 30, 2010" instead of "September 30, 2010".
80.593	Correction of typographical error in introductory text.
80.599(e)(4)	Correction of printing error in definition of terms "#1MV15$_I$" and "NPMV15$_I$".
80.600(a)(12)	Amended to correct date ("May 31, 2014" instead of "June 1, 2014").
80.600(i)	Amended to remove duplicate sentence.
80.601(b)(3)(x)	Amended to correct dates ("August 31" instead of "August 1").
80.612(b)	Amended to fix typographical error in paragraph.

V. Emission Control Areas for U.S. Coasts

The finalized Clean Air Act standards described above are part of a coordinated strategy for ensuring that all ships that affect U.S. air quality will be required to meet stringent NO_X and fuel sulfur requirements. Another component of this strategy consists of pursuing ECA designation for U.S. and Canadian coasts in accordance with Annex VI of MARPOL. ECA designation will ensure that all ships, foreign-flagged and domestic, are required to meet stringent NO_X and fuel sulfur requirements while operating within 200 nautical miles of most U.S. coasts. This section describes what an ECA is, the process for obtaining ECA designation at the International Maritime Organization, and summarizes the U.S. and Canadian proposal for an amendment to MARPOL Annex VI designating most U.S. and Canadian coasts as an ECA (referred to as the "North American ECA"), submitted to IMO on March 27, 2009.[95]

This section also discusses technological approaches to comply with the fuel standards. These approaches include switching to lower sulfur fuel and equivalents, such as exhaust gas cleaning units. We also discuss how emissions from foreign-flagged ships may be covered should approval of the U.S. ECA be delayed.

A. What Is an ECA?

(1) What Emissions Standards Apply in an ECA?

MARPOL Annex VI contains international standards to control air emissions from ships. The NO_X and SO_X/PM programs each contain two sets of standards. The global standards for the sulfur content of fuel and NO_X emissions from engines apply to ships at all times. In recognition that some areas may require further control, Annex VI also contains more stringent NO_X and SO_X/PM geographic-based standards that apply to ships operating in designated Emission Control Areas. Once a North American ECA is designated through amendment to MARPOL Annex VI, the requirements will be enforceable for most vessels through the Act to Prevent Pollution from Ships (*see* Section VI.B).

The current global fuel sulfur (S) limit is 45,000 ppm[96] S and will tighten to 35,000 ppm S in 2012. Depending on a 2018 fuel availability review, the MARPOL Annex VI global fuel sulfur limit will be further reduced to 5,000 ppm S as early as 2020. In contrast, ships operating in designated ECAs are subject to a fuel sulfur limit of 15,000 ppm S. The ECA limit is reduced to 10,000 ppm S in July 2010 and 1,000 ppm S in 2015. In addition, Tier 3 NO_X standards will apply to new engines operating in ECAs beginning in 2016. These Tier 3 NO_X standards represent an 80 percent reduction in NO_X beyond current Tier 1 standards and are anticipated to require the use of aftertreatment technology such as SCR. We are adopting similar Tier 3 standards as part of our Clean Air Act program (*see* Section III).

There are currently two ECAs in effect today, exclusively controlling SO_X; thus they are called Sulfur Emission Control Areas, or SECAs. The first SECA was designated to control the emissions of SO_X in the Baltic Sea area and entered into force in May 2005. The second SECA was designated to control the emissions of SO_X in the North Sea area and entered into force in November 2006.

[95] *Proposal to Designate an Emission Control Area for Nitrogen Oxides, Sulphur Oxides and Particulate Matter,* Submitted by the United States and Canada. IMO Document MEPC59/6/5, 27 March 2009. A copy of this document can be found at *http://www.epa.gov/otaq/regs/nonroad/marine/ci/mepc-59-eca-proposal.pdf.*

[96] Note that MARPOL Annex VI expresses these standards in units of % (m/m) sulfur. 10,000 ppm S equals 1 percent S.

(2) What Is the Process for Obtaining ECA Designation?

A proposal to amend Annex VI to designate an ECA can be submitted by a party to Annex VI. A party is a country that ratified Annex VI. The proposal for amendment must be approved by the Parties to MARPOL Annex VI; this would take place at a meeting of the Marine Environment Protection Committee (MEPC). The U.S. deposited its Instrument of Ratification with the IMO on October 8, 2008. Annex VI entered into force for the U.S. on January 8, 2009, making the U.S. eligible to apply for an ECA.

The criteria and procedures for ECA designation are set out in Appendix III to MARPOL Annex VI. A proposal to designate an ECA must demonstrate a need to prevent, reduce, and control emissions of SO_X, PM, and/or NO_X from ships operating in that area. The specific criteria are summarized below:

- A delineation of the proposed area of application;
- A description of the areas at risk on land and at sea, from the impacts of ship emissions;
- An assessment of the contribution of ships to ambient concentrations of air pollution or to
- Adverse environmental impacts;
- Relevant information pertaining to the meteorological conditions in the proposed area of
- Application to the human populations and environmental areas at risk;
- Description of ship traffic in the proposed ECA;
- Description of the control measures taken by the proposing Party or Parties;
- Relative costs of reducing emissions from ships compared with land-based controls; and
- An assessment of the economic impacts on shipping engaged in international trade.

An amendment to designate an ECA must be adopted by the Parties to Annex VI, as an amendment to Annex VI. The proposal to amend Annex VI was approved at MEPC 59, and circulated for adoption. The earliest possible adoption date is at MEPC 60, which will take place in March 2010 entering into force as early as August 2012.

B. U.S. Emission Control Area Designation

EPA worked with the U.S. Coast Guard, State Department, the National Oceanic and Atmospheric Administration and other agencies to develop the analysis supporting ECA designation for U.S. coasts contained in the U.S. and Canadian submittal to IMO. In addition, we collaborated with Environment Canada and the California Air Resources Board. In developing the ECA proposal, EPA consulted with stakeholders including representatives from the shipping industry, ports, master mariners, environmental interests and representatives from State and local governments. EPA began conducting outreach in advance of this year's ECA proposal; in fact we have been engaged with this industry for many years with regards to the development of an Emission Control Area for the United States. Stakeholders also had the opportunity to comment on the strategy we announced in the Advance Notice of Proposed Rulemaking (ANPRM) for the Category 3 Marine Diesel Engine Rule, published on December 7, 2007. In the ANPRM, EPA outlined an approach to regulating emissions from both new and existing vessels using a framework that aligns with MARPOL Annex VI, including applying the standards for Emission Control Areas along U.S. coasts.

The proposal for ECA designation that the USG submitted to IMO earlier this year is for a combined U.S./Canada ECA submission. This approach has several advantages. First, the emission reductions within a Canadian ECA will lead to air quality improvements in the U.S. Second, a joint ECA helps minimize any competitive issues between U.S. and Canadian ports, such as in the Puget Sound area, which could arise from ECA standards. Third, IMO encourages a joint submittal where there is a common interest in emission reductions on neighboring waters. In addition, France has since joined the ECA proposal on behalf of the Saint Pierre and Miquelon archipelago.

(1) What Areas Would Be Covered in a North American ECA?

The area included in the North American ECA submittal to IMO for ECA designation generally extends 200 nautical miles from the coastal baseline, except where this distance would enter the Exclusive Economic Zones (EEZ) of a neighboring country. This area would include the Pacific Coast, the Atlantic/Gulf Coast and the Southeastern Hawaiian Islands. On the Pacific Coast, the ECA would be bounded in the north such that it includes the approaches into Anchorage, Alaska, but not the Aleutian Islands or points north. It would continue contiguously to the south including the Pacific coasts of Canada and the U.S., with its southernmost boundary at the point where California meets the border with Mexico. In the Atlantic/Gulf Coast, the ECA would be bounded in the west by the border of Texas with Mexico and continue contiguously to the east around the peninsula of Florida and north up the Atlantic coasts of the U.S. and Canada and would be bounded in the north by the 60th North parallel. The Southeastern Hawaiian Islands that were included in the ECA submittal are Hawaii, Maui, Oahu, Molokai, Niihau, Kauai, Lanai, and Kahoolawe.

Not included in the ECA submittal were the Pacific U.S. territories, smaller Hawaiian Islands, the U.S. territories of Puerto Rico and the U.S. Virgin Islands, Western Alaska including the Aleutian Islands, and the U.S. and Canadian Arctic. The U.S. and Canada did not make a determination or imply that these areas suffer no adverse impact from shipping. Rather, we concluded that information must be gathered to properly assess these areas. If further information supports the need for an ECA designation in any of these areas, we would submit a future, proposal for ECA designation of these areas.

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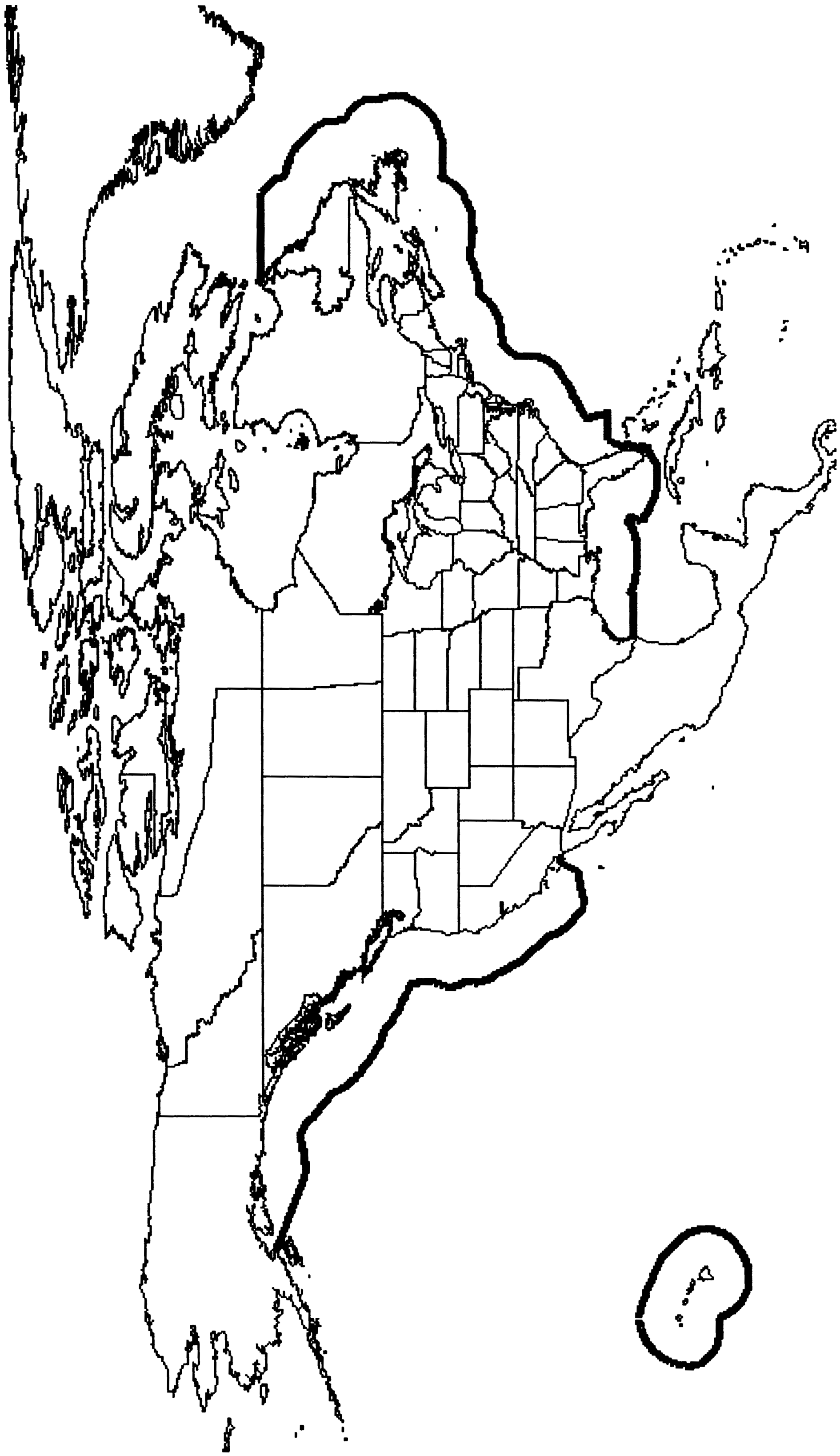

Figure V-1 Proposed North American Emission Control Area

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We are currently performing the analyses necessary to support an ECA designation for Puerto Rico and the U.S. Virgin Islands and will be engaging stakeholders as part of that effort. That outreach will include neighboring countries, shipping companies, environmental organizations, and other stakeholders. Puerto Rico has a population of 4 million people, sees significant shipping traffic and experiences the highest asthma rate in the United States. Addressing the impact of ship emissions on Puerto Rico and U.S. Virgin Islands is a top priority for the Agency. We plan to complete the appropriate analysis and stakeholder outreach regarding an ECA designation for these U.S. territories such that the U.S. with any interested Caribbean neighbors could make a proposal to the IMO in advance of MEPC 61 with the intent to *see* the ECA adopted at MEPC 62 (July 2011) and enter into force 28 months later (December 2013). In this way, we can be confident that there will be ample time for consideration and adoption of such an ECA well in advance of January 1, 2015 when the 1,000 ppm fuel sulfur standard enters into effect.

Establishing the ECA boundary for Puerto Rico and the U.S. Virgin Islands would require vessels operating in this area to meet Tier 3 NO_X requirements that become effective in 2016. EPA will remove the Tier 3 NO_X exemption from applying to Puerto Rico and the U.S. Virgin Islands through an appropriate rule amendment once the Caribbean ECA boundary is established.

(2) What Analyses Were Performed in Support of a North American ECA?

We performed a comprehensive analysis to estimate the degree of human health risk and environmental degradation that is posed by air emissions from ships operating in their ports and along our coasts. To evaluate the risk to human populations, state-of-the-art assessment tools were used to apply widely accepted methods with advanced computer modeling techniques. The analyses incorporated detailed ship traffic data, the most recent emissions estimates, detailed observed meteorological data, current scientific understanding of exhaust plume behavior (both physical dispersion and photochemical reaction) and the latest epidemiologic databases of health effects attributable to pollutant exposure levels to estimate the current impacts of shipping on human health and the environment. In addition, sulfate and nitrate deposition modeling was performed to assess the impacts of nitrogen nutrient loading and acidification on U.S. ecosystems.

Two contrasting future scenarios were evaluated: One in which ships continue to operate with current emissions performance while operating in the specified area, and one in which ships comply with ECA standards. The analysis demonstrated that ECA designation for U.S. coasts could save thousands of lives each year, relieve millions of acute respiratory symptoms, and benefit many of the most sensitive ecosystems. This analysis is consistent with, and incorporated in, the benefits estimates presented in Section VIII.

C. Technological Approaches To Comply With Fuel Standards

When operating within the ECA, all ships would have to comply with the 0.1 percent fuel sulfur limit beginning in 2015 and vessels built after December 31, 2015 would have to comply with the Tier 3 NO_X limits described above. This section describes how ships would comply with the fuel standards. Approaches for compliance with the NO_X standards are discussed in Section 3 above.

(1) Fuel Switching

As discussed above, the MARPOL Annex VI fuel sulfur limit for ships operating in an ECA is 15,000 ppm today and reduces to 10,000 ppm in July 2010 and further to 1,000 ppm in 2015. We anticipate that the 1,000 ppm fuel sulfur limit, beginning in 2015, will likely result in the use of distillate fuel for operation in ECAs. This would require the vessel to switch from a higher sulfur fuel to 1,000 ppm S fuel before entering the ECA. The practical implications of fuel switching are discussed below.

Currently, the majority of ocean-going vessels use residual fuel (also called HFO or IFO) in their main propulsion engines, as this fuel is relatively inexpensive and has a good energy density. This fuel is relatively dense ("heavy") and is created as a refining by-product from typical petroleum distillation. Residual fuels typically are composed of heavy, residuum hydrocarbons and can contain various contaminants such as heavy metals, water and sulfur compounds. It is these sulfur compounds that cause the SO_X emissions when the fuel is combusted. If the vessel does not employ the use of a sulfur scrubber or other technology, it will most likely operate on a marine distillate fuel while in an ECA in order to meet the sulfur emission requirements.

The sulfur in marine fuel is primarily emitted as SO_2; however, a small fraction (about 2 percent) is converted to SO_3. SO_3 almost immediately forms sulfate and is emitted as direct PM by the engine. Consequently, emissions of SO_2 and sulfate PM are very high for engines operating on residual fuel. Switching from high sulfur residual fuel to lower sulfur distillate fuel results in large reductions in SO_2 and sulfate PM emissions. In addition to high sulfur levels, residual fuel contains relatively high concentrations of low volatility, high molecular weight organic compounds and metals. Organic compounds that contribute to PM can be present either as a nucleation aerosol or as a material adsorbed on the surfaces of agglomerated elemental carbon soot particles and metallic ash particles. The sulfuric acid aerosol in the exhaust provides a nucleus for agglomeration of organic compounds. Operation on higher volatility distillate fuel reduces both nucleation and adsorption of organic compounds into particulate matter. Therefore, in addition to direct sulfate PM reductions, switching from residual fuel to distillate fuel reduces organic PM and metallic ash particles in the exhaust.

In the majority of vessels which operate on residual fuel, marine distillate fuel is still used for operation during routine maintenance, prior to and immediately after engine shut-down, or in emergencies. Standard procedures today have been established to ensure that this operational fuel switchover is performed safely and efficiently. Mainly, in order for the vessel to completely switch between residual and distillate fuel, the fuel pumps and wetted lines will need to be completely purged by the new fuel to ensure that the ship is burning the correct fuel for the area. This purging will vary from ship to ship due to engine capacity, design, operation, and efficiency. Provided the ship has separate service tanks for distillate and residual fuel (most, if not all, vessels do), fuel switching time should be limited only by maximum allowable rate of fuel temperature change. Additionally, for a longer operation period such as would occur while in an ECA, we investigated several other fuel switching topics to ensure that vessels would not have long-term issues from operating on the marine distillate fuels.

Marine distillate fuels are similar in composition and structure to other petroleum-based middle distillate fuels such as diesel and No. 2 heating oil, but they have a much lower allowable sulfur content than residual fuels. This lower sulfur content means that by combusting marine distillate fuel in their propulsion engines, vessels operating within the ECA would meet the stricter SO_X requirements. However, sulfur content is not the only difference between the marine residual and distillate fuels; they also have different densities, viscosities, and other specification limits.

The maritime industry has analyzed the differences between residual and distillate fuel compositions to address any potential issues that could arise from switching operation of a Category 3 engine from residual fuel to distillate fuel. The results from this research has evolved into routine operational switching procedures that ensure a safe and efficient way for the Category 3 engines to switch operation between the residual and distillate fuels. Engine manufacturers, fuel suppliers, the American Bureau of Shipping, and the U.S. Coast Guard have provided guidance on fuel switching procedures.[97 98 99 100 101] A brief summary of the fuel differences, as well as any potential issues and their usual solutions, is presented below.

(a) Fuel Density

Due to its chemical composition, residual fuel has a slightly higher density than marine distillates. Using a less dense fuel could affect the ballast of a ship at sea and would have to require compensation. Therefore, when beginning to operate on the distillate fuel, the vessel operator would have to pay attention to the vessel's ballast and may have to compensate for any changes that may occur. We anticipate that these procedures would be similar to operating the vessel with partially-full fuel tanks.

Another consideration when switching to a lower density fuel is the change in volumetric energy content. Distillate fuel has a lower energy density content on a per gallon basis when compared to the residual fuel; however, per ton, distillate fuel's energy density is larger than the residual fuel. This means that when switching from residual fuel to distillate fuel, if the vessel's tanks are volumetrically limited (*i.e.,* the tanks can only hold a set quantity of fuel gallons), the distance a vessel can travel on the distillate fuel may be slightly shorter than the distance the vessel could travel on the residual fuel due to the lower volumetric energy content of distillate fuel, which could require compensation. This distance reduction would be approximately 5 percent and would only be of concern while the vessel was operating on the distillate fuel (*i.e.,* while in the U.S. ECA) as the majority of the time the vessel will be operating on the residual fuel. However, if the vessel is limited by weight (draft), the higher energy content per ton of fuel would provide an operational advantage.

(b) Kinematic Viscosity

Residual fuel's kinematic viscosity is much higher than marine distillate fuel's viscosity. Viscosity is the "thickness" of the fuel. If this parameter is lowered from the typical value used within a pump, some issues could arise. If a distillate fuel is used in a system that typically operates on residual fuel, the decrease in viscosity could cause problems with high-pressure fuel injection pumps due to the increased potential for internal leakage of the thinner fuel through the clearances in the pumping elements. Internal leakage is part of the design of a fuel pump and is used in part to lubricate the pumping elements. However, if this leakage rate is too high, the fuel pump could produce less than optimal fuel injection pressures. If the distillate fuel's lower viscosity becomes an issue, it is possible to cool the fuel and increase the viscosity above 2 centistokes, which is how most vessels operate today during routine fuel switchovers.

(c) Flash Point

Flash point is the temperature at which the vapors off the fuel ignite with an outside ignition source. This can be a safety concern if the owner/operator uses an onroad diesel fuel rather than a designated "marine distillate" fuel for operation because marine fuels have a specified minimum flash point of 60 °C (140 °F) to ensure onboard safety, whereas onroad diesel has a minimum specified flash point of 52 °C (125.6 °F). However, since most distillate fuels are created in the same fashion, typical flash points of onroad diesel are above 60 °C (140 °F), and would meet the marine fuel specification for this property. Bunker suppliers ensure that marine fuels meet a minimum flash point of 60 °C (140 °F) through fuel testing as designated on the bunker delivery note.

(d) Lubricity

Lubricity is the ability of the fuel to lubricate the engine/pump during operation. Fuels with higher viscosity and high sulfur content tend to have very good lubricity without the use of specific lubricity-improving additives. Refining processes that lower fuel sulfur levels and their viscosities can also remove some of the naturally-occurring lubricating compounds. Severe hydrotreating of fuel to obtain ultra-low sulfur levels can result in poor fuel lubricity. Therefore, refineries commonly add lubricity improvers to ultra-low sulfur diesel. This will most likely become a concern when very low levels of sulfur are present in the fuel and/or the fuel has been hydrotreated to reduce sulfur, *e.g.,* if ultra-low sulfur highway diesel (ULSD) is used in the engine. Several groups have conducted studies on this subject, and for some systems where fuel lubricity has become an issue, lubricity additives can be utilized or the owner/operator can install a lubricating system for the fuel pump.

(e) Lube Oil

Lube oils are used to neutralize acids formed in combustion, most commonly sulfuric acids created from sulfur in the fuel. The quantity of acid-neutralizing additives in lube oil should match the total sulfur content of the fuel. If excessive amounts of these additives are used, they may create deposits on engine components. Marine engine manufacturers have recommended that lube oil only needs to be adjusted if the fuel is switched for more than one week, but the oil feed rate may need to be reduced as well as engine operating power. Additional research has been conducted in this area and several oil companies have been working to create a lubricating oil that would be compatible with several different types of fuel.

(f) Asphaltenes

Asphaltenes are heavy, non-volatile, aromatic compounds which are contained naturally in some types of crude oil. Asphaltenes may precipitate out of the fuel solution when a fuel rich in carbon disulfide, such as residual fuel, is mixed with a lighter hydrocarbon fuel, such as *n*-pentane or *n*-heptane found in some distillate fuels. When these heavy aromatic compounds fall out of the fuel solution, they can clog filters, create deposition along the fuel lines/combustion chamber, seize the fuel injection pump, or cause other system troubles. This risk can be minimized through onboard test kits and by purchasing distillate and residual fuel from the same refiner. However, according to the California Air Resources Board, the formation of asphaltenes is not seen as an issue based on data from previous maritime rules.

As can be seen, if vessel operators choose to operate on marine distillate fuel while in the ECA, some prudence is required. However, as described above, issues that could arise with switching between residual and distillate fuel are addressed through changes to operating procedures. To conduct a successful switchover between the residual and marine

[97] MAN B&W Diesel, "Operation on Low-Sulphur Fuels; Two-Stroke Engines," 2004.

[98] Wartsila, "Low Sulphur Guidelines," January 9, 2006.

[99] American Petroleum Institute, "Technical Considerations of Fuel Switching Practices," API Technical Issues Workgroup, June 3, 2009.

[100] American Bureau of Shipping, "ABS Notes: Use of Low-Sulphur Marine Fuel for Main and Auxiliary Diesel Engines," Fuel Oil Piping, EWZ–001–02–P04–W007, Attachment G—Revision 1.

[101] United States Coast Guard, "Avoiding Propulsion Loss from Fuel Switching: American Petroleum Institute, Technical Considerations," Marine Safety Alert 03–09, June 16, 2009.

distillate fuels, vessel operators will need to keep the above issues in mind and follow the engine manufacturer's standard fuel switching procedure.

(g) Boilers

Steamships operate through the use of steam produced by boilers. In addition, boilers are often used on diesel-propelled ships for auxiliary power. Many of these boilers are designed to operate on heavy fuel oil. As such, the fuel must be heated and the system optimized to atomize heavy fuel oil and then mix it with air for combustion. To operate these systems on distillate fuel, certain modifications to the boiler may be necessary to the burner and fuel systems. These modifications are more likely to be necessary for older boilers. First, as with diesel engines, residual fuel needs to be heated to flow through the pumps. Distillate fuel does not. In addition, the fuel pumps and injection nozzles must be matched to the viscosity and lubricity of the fuel. Second, the fuel burners and air mixing system must be matched to the fuel. In modern boilers, burners generally are able to operate on distillate fuel and heavy fuel oil. The air mixing generally needs to be reduced when using distillate fuel which evaporates easier. The control system must be adjusted so that the main burner does not accidently re-ignite after a flame-out. If the boiler loses its ignition source (flame) too high of a mass of fuel may be vaporized for the boiler to be safely re-lighted. In this case, the boiler should be purged before relighting the flame. Third, proper monitoring of the boiler operation will optimize flame supervision and minimize the risk of problems when operating on distillate fuel.

(2) Equivalents

Regulation 4 of Annex VI allows for alternative devices, procedures, or compliance methods if they are "at least as effective in terms of emissions reductions as that required by this Annex." As an alternative to operating on lower sulfur fuel, an exhaust gas cleaning device may be used to remove SO_X and PM emissions from the exhaust. These devices are colloquially known as SO_X scrubbers. This section describes the technological feasibility of SO_X scrubbers and how they may be used to achieve equivalent emission reductions as fuel switching.

SO_X scrubbers are capable of removing up to 95 percent of SO_X from ship exhaust using the ability of seawater to absorb SO_X. SO_X scrubbers have been widely used in stationary source applications, where they are a well-established SO_X reduction technology. In these applications, lime or caustic soda are typically used to neutralize the sulfuric acid in the washwater. While SO_X scrubbers are not widely used on ocean-going vessels, there have been prototype installations to demonstrate their viability in this application such as the Krystallon systems installed on the P&O ferry Pride of Kent and the Holland America Line cruise ship the ms Zaandam. These demonstrations have shown scrubbers can replace and fit into the space occupied by the exhaust silencer units and can work well in marine applications.

There are two main scrubber technologies. The first is an open-loop design which uses seawater as exhaust washwater and discharges the treated washwater back to the sea. Such open-loop designs are also referred to as seawater scrubbers. In a seawater scrubber, the exhaust gases are brought into contact with seawater, either through spraying seawater into the exhaust stream or routing the exhaust gases through a water bath. The SO_2 in the exhaust reacts with oxygen to produce sulfur trioxide which then reacts with water to form sulfuric acid. The sulfuric acid in the water then reacts with carbonate and other salts in the seawater to form sulfates which may be removed from the exhaust. The washwater is then treated to remove solids and raise the pH prior to discharge back to the sea. The solids are collected as sludge and held for proper disposal ashore.

A second type of SO_X scrubber which uses a closed-loop design is also feasible for use on marine vessels. In a closed loop system, fresh water is used as washwater, and caustic soda is injected into the washwater to neutralize the sulfur in the exhaust. A small portion of the washwater is bled off and treated to remove sludge, which is held and disposed of at port, as with the open-loop design. The treated effluent is held onboard or discharged at open sea. Additional fresh water is added to the system as needed. While this design is not completely closed-loop, it can be operated in zero discharge mode for periods of time.

Exhaust gas scrubbers can achieve reductions in particulate matter as well. By removing sulfur from the exhaust, the scrubber removes most of the direct sulfate PM. Sulfates are a large portion of the PM from ships operating on high sulfur fuels. By reducing the SO_X emissions, the scrubber will also control much of the secondary PM formed in the atmosphere from SO_X emissions. However, simply mixing alkaline water in the exhaust does not necessarily remove much of the carbonaceous PM, ash, or metals in the exhaust. While SO_2 associates with the washwater, particles can only be washed out of the exhaust through direct contact with the water. In simple scrubber designs, much of the mass of particles can reside in gas bubbles and escape out the exhaust.

Manufacturers have been improving their scrubber designs to address carbonaceous soot and other fine particles. Finer water sprays, longer mixing times, and turbulent action would be expected to directionally reduce PM emissions through contact impactions. One scrubber design uses an electric charge on the water to attract particles in the exhaust to the water. In another design, demisters are used that help effectively wash out PM from the exhaust stream. In either of these designs, however, the systems would be effective at removing SO_2 from the exhaust even if the additional hardware needed for non-sulfate PM reduction were not used.

Annex VI does not present specific exhaust gas limits that are deemed to be equivalent to the primary standard of operating on lower sulfur fuel. Prior to the recent amendments to Annex VI, Regulation 14 included a limit of 6 g/kW-hr SO_2 as an alternative to the 15,000 ppm sulfur limit for sulfur emission control areas. Under the amended requirements, the specific SO_2 limit was removed and more general language on equivalents was included.

IMO has developed guidelines for the use of exhaust gas cleaning systems (EGCS) such as SO_X scrubbers as an alternative to operating on lower sulfur fuel.[102] These guidelines include a table of SO_2 limits intended to correspond with various fuel sulfur levels. Based on the methodology that was used to determine the SO_2 limit of 6.0 g/kW-hr for existing ECAs, the corresponding limit is 0.4 g/kW-hr SO_2 for a 1,000 ppm fuel sulfur limit. This limit is based on an assumed fuel consumption rate of 200 g/kW-hr and the assumption that all sulfur in the fuel is converted to SO_2 in the exhaust. The IMO guidelines also allow for an alternative approach of basing the limit on a ratio of SO_2 to CO_2. This has the advantage of being easier to measure during in-use monitoring. In addition, this ratio holds more constant at lower loads than a brake-specific limit, which would approach infinity as power approaches zero. For the existing 15,000 ppm fuel sulfur limit in ECAs, a SO_2 (ppm)/CO_2 (%) limit of 65 was

[102] International Maritime Organization, "2009 Guidelines for Exhaust Gas Cleaning Systems," Resolution MEPC.184(59), Adopted on 17 July 2009, MEPC 59/24/Add.1/Annex 9.

developed. The equivalent limit for a 1,000 ppm fuel sulfur level is 4.0 SO_2 (ppm)/CO_2 (%).

It is our intent that the IMO guidelines will be used by the U.S. Government in making the determination whether an EGCS meets the requirements of MARPOL Annex VI, Regulation 4. We are currently working with the U.S. Coast Guard on developing the U.S. Government process for approving equivalents. It is not yet clear if a request for an equivalent determination will be made to EPA or the U.S. Coast Guard. To prevent multiple requests from having to be made, today's regulations require such a request to be made to EPA only. This could change as a result of the discussions between EPA and the U.S. Coast Guard. If so, we will update the regulatory text accordingly.

Scrubbers are effective at reducing SO_2 emissions and sulfate PM emissions from the exhaust. However, as discussed above, the effectiveness of the scrubber at removing PM emissions other than sulfates is dependent on the scrubber design. In addition to sulfate PM reductions, switching from residual fuel to distillate fuel results in reductions in organic PM and metallic ash particles in the exhaust. We expect that ECGS designs will achieve similar PM reductions as fuel switching; however, if this turns out to not be the case, we will address this issue, as appropriate, through further action.

Water-soluble components of the exhaust gas such as SO_2, SO_3, and NO_2 form sulfates and nitrates that are dissolved into the discharge water. Scrubber washwater also includes suspended solids, heavy metals, hydrocarbons and polycyclic aromatic hydrocarbons (PAH). Before the scrubber water is discharged, there are several approaches that may be used to process the scrubber water to remove solid particles. Heavier particles may be trapped in a settling or sludge tank for disposal. The removal process may include cyclone technology similar to that used to separate water from residual fuel prior to delivery to the engine. However, depending on particle size distribution and particle density, settling tanks and hydrodynamic separation may not effectively remove all suspended solids. Other approaches include filtration and flocculation techniques. Flocculation, which is used in many waste water treatment plants, refers to adding a chemical agent to the water that will cause the fine particles to aggregate so that they may be filtered out. Sludge separated from the scrubber water would be stored on board until it is disposed of at proper facilities.

The IMO guidelines for the use of exhaust gas cleaning devices such as SO_X scrubbers include recommended monitoring and water discharge practices. The washwater should be continuously monitored for pH, PAHs and turbidity. Further, the IMO guidance include specifications for these same items, as well as nitrate content when washwater is discharged in ports, harbors or estuaries. Finally, the IMO guidance recommends that washwater residue (sludge) be delivered ashore to adequate reception facilities and not discharged to the sea or burned on board.

Any discharges directly into waters of the United States may be subject to Clean Water Act or other U.S. regulation. To the extent that the air pollution control technology results in a wastewater discharge, such discharge will require a permit under the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) permit program. For example, the NPDES Vessel General Permit in Section 2.2.26 contains conditions for Exhaust Gas Scrubber Washwater Discharge. Also, the Act to Prevent Pollution for Ships may apply to such discharge.

D. ECA Designation and Foreign-Flagged Vessels

In our previous marine diesel engine rulemakings, EPA did not extend our Clean Air Act standards to engines on vessels flagged by other countries. In our 2003 rule, many States and localities expressed concern about the high levels of emissions from ocean-going vessels. We examined our position and concluded that no change was necessary at that time because the Tier 1 standards we adopted for Category 3 engines on U.S. vessels were the same as those contained in MARPOL Annex VI. We indicated we would re-examine this issue in our current rulemaking and would also review the progress made by the international community toward the adoption of new more stringent international standards that reflect the application of advanced emission control technologies.

We received comments from a broad range of interested parties on the Advanced Notice of Proposed Rulemaking (ANPRM) for this rulemaking. Generally, those commenters remained concerned about the contribution of ocean-going vessels to air quality problems. Many took the position that EPA should cover engines on foreign-flagged OGV under Clean Air Act section 213 since they account for the vast majority of OGV emissions in the United States and because of their perception, at the time these comments were submitted, that the international process to set stringent standards was stalled.

In the Notice of Proposed Rulemaking (NPRM) for this rulemaking, we provided background on EPA's past statements with regard to the application of our Clean Air Act section 213 standards to engines on foreign-flagged vessels, and summarized comments we received on this issue in response to our ANPRM. Because the NO_X standards adopted in the amendments to Annex VI are comparable in stringency and timing to our final CAA NO_X standards, we did not believe it necessary to extend our Clean Air Act Tier 2 and 3 standards to engines on foreign-flagged vessels. Therefore, we did not seek to resolve the issue of whether section 213 of the Act allows us to set standards for engines on foreign-flagged vessels. However, we stated that our proposed decision rested on the timely adoption of an amendment to Annex VI designating the U.S. coastal waters as an ECA, since the most stringent of the NO_X standards will be applicable in such areas. We maintain the position we expressed in the NPRM, particularly in light of the recent approval, and circulation for adoption, of the North American ECA. If the amendment designating a U.S. ECA is not timely adopted by the Parties to IMO, we will revisit this issue.

EPA received a number of comments in response to the NPRM on the issue of whether EPA should or could address emissions from engines on foreign-flagged vessels. Most commenters reiterate their positions as stated in comments received on the ANPRM.[103] Environmental group commenters who previously expressed their position that EPA has authority—and even obligation—within the Clean Air Act to regulate foreign-flagged vessels, maintain that position and recognize that application of the new standards to all vessels, including those that are foreign-flagged, is necessary to achieve the new standards' public health and environmental benefits. While some commenters accept EPA's position that it will revisit this issue without delay in

[103] Ohio Environmental Council, Earth Day Coalition, Marsh Area Regional Council, Ohio League of Conservation Voters, OAR–2007–0121–0314; Northeast States for Coordinated Air Use Management, OAR–2007–0121–0227; American Lung Association with Environmental Defense Fund, OAR–2007–0121–0366 and OAR–2007–0121–0227; Santa Barbara Air Pollution Control District, OAR–2007–0121–0231; Clean Air Task Force, OAR–2007–0121–0264 and OAR–2007–0121–0227; South Coast Air Quality Management District, OAR–2007–0121–0309 and OAR–2007–0121–0232.

the event that a U.S. ECA designation is not timely adopted by the Parties to the IMO,[104] others are concerned about the potential for delay within the IMO and, thus, urge EPA to commence a parallel rulemaking as a backstop to that potential delay.[105] Still others find EPA's reliance on an ECA designation to be insufficient and suggest that EPA should presently assert authority and extend this rule's application to foreign-flagged vessels.[106] That suggestion also includes a concern that too much reliance on the IMO for authority to regulate foreign-flagged vessels could expose a gap wherein ships that are flagged in nations that are not parties to Annex VI would go unregulated in U.S. waters.[107] To close that gap, the commenter recommends direct application of CAA standards to all foreign-flagged vessels. That concern echoes industry commenters' calls for equal application of the standards to all vessels in U.S. waters to ensure a "level playing field" and "uniform treatment of the entire merchant fleet."[108]

We appreciate the comments we received and are committed to revisiting the issue if the U.S. ECA proposal is not timely adopted. However, we continue to believe we need not revisit this issue at this time given that foreign-flagged vessels will be subject to standards under APPS that are comparable to those for U.S.-flagged vessels under section 213 of the CAA. The issue of whether EPA is compelled to cover foreign-flagged vessels under section 213 of the CAA was raised in *Bluewater* v. *EPA,* 372 F.3d 404 (DC Cir. 2004), a challenge to EPA's decision in 2003 not to revisit the issue of whether foreign-flagged vessels may and should be covered by nonroad emissions standards issued under section 213 of the CAA. In finding Bluewater's claim to be premature, the *Bluewater* court referred back to its determination in *Engine Mfrs. Ass'n* v. *EPA,* 88 F.3d at 1086–87, that "new nonroad engine" as used in 213(a)(3) is ambiguous and reiterated EPA's undisputed finding that there would be no significant loss of emission reductions by not revisiting the issue. We do not believe circumstances have changed to call into question the *Bluewater* court's finding as applied to today's setting. In fact, the only changed circumstances further support EPA's decision not to revisit the issue. Since issuance of the 2003 final rule and the court's decision in *Bluewater,* Annex VI has entered into force, and the United States has become a Party to Annex VI and has successfully negotiated significant new emission and fuel standards. In addition, Congress has adopted amendments to the Act to Prevent Pollution from Ships to implement both the original and amended Annex VI requirements. Therefore, given that foreign-flagged vessels are subject to the original and new Annex VI NO_X and fuel requirements under the operation of APPS, we do not believe it is currently necessary to address whether EPA may or should cover foreign-flagged vessels under section 213 of the CAA. *See South Coast* v. *EPA,* 554 F.3d 1076, 1081 (DC Cir. 2009) ("Deferring resolution of the issue until it will have an effect remains reasonable and the petitioners' objection therefore remains premature.").

However, as noted above, we are committed to revisiting this issue if the proposed ECA, within which the most stringent NO_X and fuel requirements are applicable, is not timely adopted. Meetings to discuss adoption of the U.S.-proposed ECA are scheduled shortly after this rule is finalized, and thus, taking into consideration the lead times adopted, little time is lost in not revisiting this issue in this rulemaking. We also note that ships that are flagged in nations that are not a Party to Annex VI are subject to Annex VI requirements in U.S. waters under the Act to Prevent Pollution from Ships. Our regulations to implement the requirements of Annex VI with respect to such vessels make clear the applicability of those provisions to such vessels.

VI. Certification and Compliance Program

This section describes the regulatory changes being finalized for the CAA Category 3 engine compliance program. In general, these changes are being finalized to ensure that the benefits of the standards are realized in-use and throughout the useful life of these engines, and to incorporate lessons learned over the last few years from the existing test and compliance program.

The most obvious change is that we are applying the plain language regulations of 40 CFR part 1042 to Category 3 engines. These part 1042 regulations were adopted in 2008 for Category 1 and Category 2 engines (73 FR 25098, May 6, 2008). They were structured to contain the provisions that are specific to marine engines and vessels in part 1042, and apply the parts 1065 and 1068 for other provisions not specific to marine engines. This approach is not intended to significantly change the compliance program from the program currently applicable to Category 3 engines under 40 CFR part 94, except as specifically noted in this notice. These plain language regulations supersede the regulations in part 94 for Category 3 engines beginning with the 2011 model year. *See* Section VI.E for additional discussion of the transition from part 94 to part 1042.

The changes from the existing programs are described below along with other notable aspects of the compliance program. These changes are necessary to implement the new standards as well as to implement the Annex VI program as required under the amendments to the Act to Prevent Pollution from Ships.

Finally, we are also including several changes and clarifications to the compliance program that are not specific to Category 3 engines. Some of these apply only for marine diesel engines below 30 liters per cylinder displacement.

A. Compliance Provisions for Category 3 Engines

In general, we are retaining the certification and compliance provisions adopted with the Tier 1 standards for Category 3 engines. These include testing, durability, labeling, maintenance, prohibited acts, *etc.* However, we believe additional testing and compliance provisions will be necessary for new standards requiring more advanced technology and more sophisticated emission control systems. These changes, as well as other modifications to our certification and compliance provisions for Category 3 engines, are discussed below.

Our certification process is similar to the process specified in the Annex VI NO_X Technical Code (NTC) for pre-certification. However, the Clean Air Act specifies certain requirements for our certification program that are different from the NTC requirements. The EPA approach differs most significantly from the NTC in three areas. First, the NTC allows but does not require certification of engines before installation (known as pre-certification

[104] Ohio Environmental Council, Earth Day Coalition, Marsh Area Regional Council, Ohio League of Conservation Voters, OAR–2007–0121–0314; Northeast States for Coordinated Air Use Management, OAR–2007–0121–0227; American Lung Association with Environmental Defense Fund, OAR–2007–0121–0366 and OAR–2007–0121–0227.

[105] Santa Barbara Air Pollution Control District, OAR–2007–0121–0231.

[106] Clean Air Task Force, OAR–2007–0121–0264 and OAR–2007–0121–0227; South Coast Air Quality Management District, OAR–2007–0121–0309 and OAR–2007–0121–0232; Earthjustice, Friends of the Earth, and Center for Biological Diversity, OAR–2007–0121–0320.

[107] Earthjustice, Friends of the Earth, and Center for Biological Diversity, OAR–2007–0121–0320.

[108] World Shipping Council, OAR–2007–0121–0227 and OAR–2007–0121–0325; Marine Engineers Beneficial Association, OAR–2007–0121–0259.

under the NTC), while EPA does require it. Second, we include various provisions to hold the engine manufacturer responsible for the durability of emission controls, while the NTC holds the engine manufacturer liable only before the engine is placed into service. Finally, we specify broader temperature ranges and allow manufacturers less discretion in setting engine parameters for testing, with the goal of adopting test procedures that represent a wide range of normal in-use operation. We believe the regulations in this final rule are sufficiently consistent with NTC that manufacturers can continue to use a single harmonized compliance strategy to certify under both systems.

(1) Testing

We are largely continuing the testing requirements that currently apply for Category 3 engines with a few exceptions.

(a) General Test Procedures

We are applying the general engine testing procedures of 40 CFR part 1065 to Category 3 engines. This is part of our ongoing initiative to update the content, organization and writing style of our regulations. For each engine sector for which we have recently promulgated standards (such as smaller marine diesel engines), we refer to one common set of test procedures in part 1065. This is because we recognized that a single set of test procedures would allow for improvements to occur simultaneously across engine sectors. A single set of test procedures is easier to understand than trying to understand many different sets of procedures, and it is easier to move toward international test procedure harmonization if we only have one set of test procedures.

These procedures replace those currently published in parts 92 and 94 and are fundamentally similar to those procedures. The primary differences are related to tighter tolerances to reduce test-to-test variability. In most cases, a manufacturer should be able to comply with 1065 using its current test equipment. Nevertheless, full compliance with part 1065 would take some effort on the part of manufacturers. As such, we are including some flexibility to make a gradual transition from the part 92 and 94 procedures. For several years, manufacturers will be able to optionally use the part 1065 procedures. Part 1065 procedures will generally be required for any new testing by 2016 (except as noted below). This is very similar to the allowance already provided with respect to Category 1 and Category 2 engines.

Several manufacturers raised in their comments general objections to applying the 1065 test procedures. However, since we proposed to allow Category 3 manufacturers to submit data collected using the test equipment, test fuels, and procedures specified in the NO_X Technical Code, we believe that the requirement should be finalized as proposed. The procedures in 1065 will still be the official test procedures, however, and manufacturers will be liable with respect to any test results from 1065 testing. We do not believe this allowance will have any effect on the stringency of the standards, or how manufacturers design and produce their engines.

(b) Test Fuel

Appropriate test procedures need to represent in-use operating conditions as much as possible, including specification of test fuels consistent with the fuels that compliant engines will use over their lifetimes. Our Part 94 regulations allow Category 3 engine testing using distillate fuel, even though many vessels with these engines currently use less expensive residual fuel. This provision is consistent with the specifications of the NO_X Technical Code. We are continuing this approach for Tier 2 and Tier 3. Our primary reason for continuing this approach is that we expect these Category 3 engines will generally be required to use distillate fuels in areas that will affect U.S. air quality for most of their operational lives. (We expect this because we expect IMO to approve our proposal to amend Annex VI to designate the U.S. coastal waters as an ECA.) However, since these engines will not be required to use low-sulfur or ultra low-sulfur fuel, we are also adding an explicit requirement that a high-sulfur distillate test fuel be used for both Tier 2 and Tier 3 testing. Our testing regulations (40 CFR 1065.703) are being revised to specify that high-sulfur diesel test fuels contain 800 to 2,500 ppm sulfur. This will be lower than the prior specification of 2,000 to 4,000 ppm. This will allow manufacturers to test with fuels near the ultimate in-use limit of 1,000 ppm.

(c) Testing Catalyst-Equipped Engines

In our existing programs that require compliance with catalyst-based engines (such as the Category 1 & 2 engine program), we have required manufacturers to test prototype engines equipped with prototype catalyst systems. However, it is not clear that this approach would be practical for Category 3 engines. These are problematic because of their size and because they tend to be a least partially custom built on a vessel by vessel basis. Requiring a manufacturer to construct a full-scale catalyst system for each certification test would be extremely expensive.

We are finalizing an optional special certification procedure to address this concern. The provisions are in § 1042.655 of the finalized regulations. The emission-data engine must be tested in the specified manner to verify that the engine-out emissions comply with the Tier 2 standards. The catalyst material must be tested under conditions that accurately represent actual engine conditions for the test points. This catalyst testing may be performed on a benchscale. Manufacturers must include a detailed engineering analysis describing how the test data collected for the engine and catalyst material demonstrate that all engines in the family will meet all applicable emission standards. Manufacturers must verify their design by testing a complete production engine and catalysts in its final assembled configuration. It is important to note that this allowance does not limit in any way the manufacturers' or operators' obligations with respect to safety for catalyst systems, such as those specified by Coast Guard.

(d) Testing Production Engines

Under the current regulations, manufacturers must test a sample of their Category 1 and Category 2 engines during production. We are now finalizing similar provisions for Category 3 engines. While in the past we did not believe that such testing was necessary, circumstances have changed in two important ways. First, relatively inexpensive portable test systems have recently become available. This greatly reduces the cost of testing an engine in a ship. Second, the need to verify that production engines actually comply with the emission standards increases as standards become more stringent and emission control technologies become more complicated.

Specifically, every new Tier 2 or later Category 3 engine must be tested during the vessel's sea trial to show compliance with the applicable NO_X standard. Any engine that fails to comply with the standard will need to be repaired and retested. Since we are not finalizing PM standards for Category 3 engines, and because PM measurement is more difficult than measuring only gaseous emission, we will not require PM measurement during testing after installation, provided PM emissions were measured during certification.

One concern that manufacturers have raised in the past is that it can be difficult to achieve the exact test points in use. Therefore, we are allowing manufacturers flexibility with respect to test points when testing production engines, consistent with the equivalent allowance under the NO_X Technical Code. Where manufacturers are unable to duplicate the certification test points during production testing, we are allowing them to comply with an alternate "at-sea standard" that is 10 percent higher than the otherwise applicable standard. This is specified in § 1042.104(g).

Since we are requiring testing of every production engine, we are also excluding Category 3 engines from selective enforcement audits under 40 CFR part 1068.

(e) PM Measurement

We are requiring manufacturers to measure PM emissions along with NO_X, HC, and CO during certification testing to report these results along with the other test data. This is similar to our recently proposed requirement for manufacturers to measure and report certain greenhouse gas emissions for a variety of nonroad engine sectors.[109] Manufacturers should be able to collect these data using stand-alone partial flow PM measurement systems. In recent years, several vendors have developed such systems to be compliant with the requirements of 1065.

It is worth noting that in the past, there has been some concern regarding the use of older PM measurement procedures with high sulfur fuels. The primary issue of concern was variability of the PM measurement, which was strongly influenced by the amount of water bound to sulfur. However, we believe improvements in PM measurement procedures, such as those specified in 40 CFR 1065, have addressed these issues of measurement variability. The U.S. Government recently submitted proposed procedures for PM measurement to IMO.[110]

(2) Low Power Operation and Mode Caps

Emission control performance can vary with the power at which the engine operates. This is potentially important because Category 3 engines can operate at relatively low power levels when they are operating in port areas. Ship pilots generally operate engines at reduced power for several miles to approach a port, with even lower power levels very close to shore. The International Organization for Standardization (ISO) E3 and E2 test cycles, which are used for emission testing of propulsion marine engines, are heavily weighted towards high power. In the absence of other requirements, it would be possible for manufacturers to meet the cycle-weighted average emission standards without significantly reducing emissions at low-power modes. This could be especially problematic for Tier 3 engines relying on urea-SCR for NO_X control, since the effectiveness of the control is directly affected by the amount of urea that is injected and there would be an obvious economic incentive for manufacturers and operators to minimize the amount of urea injected.

We are addressing these concerns in two ways. First, we are applying mode caps for NO_X emissions that will ensure that manufacturers design their emission controls to be fully effective at 25 percent power. This will require that manufacturers meet the applicable NO_X standard at each individual test point, and not merely as a weighted average of the test points. The caps will only apply for NO_X emissions, and manufacturers will not be required to meet the HC and CO standards at each test point. For HC and CO, manufacturers will only be required to meet the applicable standards as a weighted average of the test points.

The other concern is related to power levels other than the test points. To address this, we will continue to rely on our prohibition of defeat devices to ensure effective control for lower powers. Most significantly, this will prohibit manufacturers from turning off the urea supply to SCR systems at these points, unless the exhaust gas temperature was too cool for the SCR catalyst to function properly. (Urea at these low temperatures does not react with NO_X molecules and can lead to high emissions of ammonia.)

(3) On-Off Technologies

Many of the technologies that are projected to be used to meet the Tier 3 NO_X standards (such as SCR, water injection, and EGR) are not integral to operation of the engine, allowing the engine to be operated without them. They will also require the operator to supply the proper reductant. Thus, these technologies are potentially "on-off" technologies. Switching to distillate fuel instead of residual fuel to reduce SO_X and PM emissions can be thought of in the same way.

The increased operating costs of such controls associated with urea (or other reductants) or with distillate usage suggest that it may be reasonable to allow these systems to be turned off while a ship is operated on the open ocean, far away from sensitive areas that are affected by ship emissions. This is the basis of the MARPOL Annex VI ECA approach, with one set of limits that would apply when ships are operated in sensitive areas and another that would apply when ships are operated outside those designated areas.

We are finalizing the proposed regulatory provision in § 1042.115(g) to address the use of on-off technologies on Category 3 engines subject to the Tier 3 standards. This provision will require the manufacturer to obtain EPA approval to design the engines to have on-off features. It will also require the engine's onboard computer to record the on-off operation (including geographic position and time) and require that the engine comply fully with the Tier 2 standards when the Tier 3 controls are turned off.

In response to comments, we are expanding this option slightly to address other possible technological solutions. In particular, we will allow a manufacturer to design the system to have a Tier 3 mode and a Tier 2 mode that correspond to "on" and "off," without regard to whether any given controls are turned on or off. For example, under this allowance, a manufacturer could design the system to have a Tier 2 (off) mode in which the SCR system continues to function, while engine-out emissions are increased. Such a design would be allowed as long as the emission downstream of the aftertreatment met the Tier 2 standards.

Our goal is to require manufacturers to comply with the Tier 3 standards in all areas where the emissions significantly affect U.S. air quality. We expect that all such areas will also ultimately be included in one or more Emission Control Areas. We describe a North American ECA in Section V.A, which is intended to include most areas where the emissions significantly affect U.S. air quality. However, we have not yet determined the extent to which Category 3 engines affect air quality in other areas—specifically, the U.S. territories, areas of Alaska west of Kodiak, the smallest Hawaiian islands, or Puerto Rico and the U.S. Virgin Islands. Therefore, we are including an interim provision to exclude those areas with respect to the Tier 3 standards at this time. We will revisit this should our review of available modeling results or

[109] 74 FR 16448, April 10, 2009.

[110] "Measurement Method For Particulate Matter Emitted From Marine Engines," Submitted by the United States to the International Maritime Organization Intersessional [sic] Meeting Of the BLG Working Group On Air Pollution, 5 October 2007.

other information indicate that compliance with the Tier 3 standards should be required for some or all of these areas.

(4) NO_X Monitoring

Category 3 engines equipped with on-off controls must be equipped to continuously monitor NO_X concentrations in the exhaust. Engine manufacturers will be required to include systems to automatically alert operators of any operation with the emission controls on where NO_X concentrations indicate malfunctioning emission controls. We are also requiring the engine to record in nonvolatile computer memory any such operation. However, we are not requiring monitoring NO_X concentrations during operation for which the emission controls are allowed to be turned off, provided the record indicated that the controls were turned off. Where the NO_X monitor system indicates a malfunction, operators will be required to investigate the cause and make any necessary adjustments or repairs.

We are defining as a malfunction of the emission controls any condition that would cause an engine to fail to comply with the applicable NO_X standard (*See* Section VI.A.1.d for a discussion of standards that will apply for installed engines at sea). Such malfunctions could include maladjustment of the engine or controls, inadequate reductant, or emission controls turned off completely. We recognize that it is not possible to perfectly correlate a measured NO_X concentration with an equivalent cycle-weighted emission result. Therefore, the requirement will allow engine manufacturers to exercise good engineering judgment in using measured NO_X concentrations to monitor the emission performance of the engine. Should manufacturers decide that it would be helpful to have a less subjective (and less flexible) requirement, we will be willing to work with them to make such improvements to this provision through a future rulemaking.

(5) Parameter Adjustment

Given the broad range of ignition properties for in-use residual fuels, we expect that our in-use adjustment allowance for Category 3 engines will result in a broad range of adjustment. We requested comment on a requirement for operators of ships equipped with NO_X monitors to perform a simple NO_X check test to confirm emissions after parameter adjustments or maintenance operations, using onboard emission measurement systems with electronic-logging equipment. While we are not adopting such a requirement at this time, we may do so in the future should we determine that these engines are being improperly adjusted in use.

(6) In-Use Liability

Under the Tier 1 program for Category 3 engines, owners and operators are required to maintain, adjust, and operate the engines in such a way as to ensure proper function of the emission controls. These requirements, which are described in 40 CFR 94.1004, are being continued in the regulations in part 1042 (*See* § 1042.660 of the finalized regulations for these requirements). Owners will also continue to be required to keep certain records onboard the vessel and report annually to EPA whether or not the vessel has complied with these and other requirements.

Specifically, these provisions require that all maintenance, repair, adjustment, and alteration of the engine be performed using good engineering judgment so that the engine continues to meet the emission standards. Each two-hour period of operation of an engine in a condition not complying with this requirement will be considered a separate violation. Some commenters expressed concern that treating each two-hour period of operation as a separate violation would be inappropriate for events that occur while the vessel is out at sea. These commenters correctly noted that where a repair cannot be made at sea, the operator has no choice but to continue operating the vessel in its noncompliant condition. Therefore, we are revising the regulations to clarify that we would not consider operating a vessel in need of repair to be a violation, if such a repair was not possible.

(7) Replacement Engines

The existing provisions of § 1042.615 provide an exemption that allows manufacturers to produce new uncertified engines when they are needed to replace equivalent existing engines that fail prematurely. For many engine sectors, this practice is common, but represents a very small faction of a manufacturer's total engine production. We do not believe this practice is either common or necessary for Category 3 engines, and therefore we proposed to not allow this exemption for Category 3 engines. However, engine manufacturers commented that there have been infrequent but real occurrences where they have needed to provide a Category 3 replacement engine in response to premature engine failure. To address this concern, we are finalizing a provision that would allow us to make an exception in very unusual circumstances and allow a manufacturer to make a new Category 3 engine that is exempt from current emission standards. Even for the rare case where manufacturers would need to supply a replacement Category 3 engine, we would expect them generally to be able to provide a certified engine. It is clear that removing a failed engine and installing a replacement will involve a very significant effort; we would expect this effort to include reasonable modifications to accommodate a certified engine even if it was somewhat different than the engine being replaced. However, if manufacturers can demonstrate under § 1042.615 that no certified engine has the physical and performance characteristics to properly power the vessel, they may produce a new engine that is exempt from emission standards. This may be most likely for vessels that have paired Category 3 engines where one of the engines fails prematurely and cannot be repaired without being removed from the vessel.

It is also important to note that the provisions of Annex VI related to replacement engines also apply. This generally limits replacement engines to those that are identical to the engines being replaced.

B. Compliance Provisions To Implement Annex VI NO_X Regulation and the NO_X Technical Code

In addition to the Clean Air Act provisions being finalized in this action, we are also establishing new regulations to implement certain provisions of the Act to Prevent Pollution from Ships. These regulations are a new part 1043 of title 40.

The Act to Prevent Pollution from Ships establishes a general requirement for vessels operating in the exclusive economic zone and navigable waters of the United States to comply with MARPOL Annex VI. It also gives EPA and the Administrator the authority to further implement MARPOL Annex VI. Many of the requirements relating to NO_X emissions and fuel sulfur limits can be implemented without the need for further elaboration because the Annex, along with the NO_X Technical Code, provides instructions on how to demonstrate compliance with those requirements. However, APPS authorizes the Administrator to prescribe any necessary or desired additional regulations to assist in carrying out the provisions of Regulations 12 through 19 of Annex VI (*see* 33 U.S.C. 1903(c)(2)). Specifically, the regulations being finalized in this FRM in part 1043 of title 40 are intended to assist in the implementation of the engine and fuel requirements contained in Regulation 13, 14, and 18 of MARPOL Annex VI. They address such issues as how to obtain an Engine International Air Pollution Prevention (EIAPP) certificate (which is equivalent in many ways to a Clean Air Act certificate of conformity), exemptions for vessels used exclusively in domestic service, and requirements for vessels not registered by a country that is a Party to Annex VI.

The requirements being finalized in part 1043 will generally begin July 1, 2010. However, the ECA NO_X requirements will not begin until the Tier 3 NO_X standards begin (or when the ECA enters into force for the U.S., whichever is later), and the ECA fuel requirements will not begin until 12 months after the ECA enters into force for the U.S., as provided by Annex VI. It is also important to clarify that Annex VI itself was effective for the United States as of January 8, 2009. The requirement of the Annex for ships to have a valid International Air Pollution Prevention (IAPP) certificate applies for U.S. vessels based on when the keel is laid and when it is dry-docking. Vessels for which keels were laid (or which were at a similar stage of construction) before January 8, 2009 must have on board a valid IAPP certificate no later than the first scheduled dry-docking, but in no case later than January 8, 2012. Vessels for which keels are laid (or which are at a similar stage of construction) after January 8, 2009 must have on board a valid IAPP certificate upon completion of its initial survey before the ship is placed into service.

The MARPOL Annex VI NO_X requirements apply to all marine diesel engines above 130 kW. Similarly, the MARPOL Annex VI fuel requirements apply to all fuel oil used onboard a vessel, defined as any fuel delivered to and intended for combustion purpose for propulsion or operation on board any ship, including distillate and residual fuels. Thus the part 1043 compliance program described here applies somewhat more broadly than the Clean Air Act compliance program described earlier for Category 3 engines.

It is worth noting that while APPS generally requires compliance with Annex VI and future amendments to Annex VI, we have incorporated by reference the existing 2008 version of the Annex for certain purposes. Specifically, we require compliance with the 2008 Annex VI NO_X and fuel requirements by non-Party vessels and require compliance with the ECA requirements by all vessels in our internal waters; both of these issues are discussed later. We fully expect to update this incorporation by reference whenever aspects of the Annex relating to these provisions are amended. However, we recognize that it is possible that there will be a brief period during which the incorporated version differs slightly from any amended provisions. To the extent that occurs, vessels in our internal waters and non-Party vessels would be subject to the requirements in the 2008 version (or the latest version that has been incorporated by reference).

In § 1043.1(d), we clarify that these regulations do not limit requirements that would otherwise apply pursuant to APPS, except for excluding domestic vessels from the Annex VI NO_X standard (consistent with the allowance in Regulation 13.1.2.2 of the Annex).

(1) EIAPP Certificates

In general, an engine can be dual-certified under EPA's Clean Air Act marine diesel engine program and the MARPOL Annex VI/APPS program. However, we require that engine manufacturers submit separate applications for the 1042 and EIAPP certificates. The regulations in part 1043 specify the process that would apply. The process for obtaining the EIAPP is very similar to the process for obtaining a certificate of conformity under part 1042, and although there are differences between the programs, manufacturers should be able to comply with both programs with very little additional work. The primary differences are that, to certify to the MARPOL Annex VI standards, the manufacturer must include a copy of the Technical File and onboard NO_X verification procedures (as specified in Section 2.4 of the NO_X Technical Code) and is not required to provide information about useful life, emission labels, deterioration factors, or PM emissions.[111] Engine manufacturers will be able to apply for both certifications using the same certification templates and test data.

Consistent with our 1042 program, our 1043 program will require that each engine installed or intended to be installed on a U.S.-flagged vessel have an EIAPP before it is introduced into U.S. commerce. The finalized regulations will create a presumption that all marine engines manufactured, sold, or distributed in U.S. commerce will be considered to be intended to be installed on a U.S.-flagged vessel, although this presumption could be rebutted by clear and convincing evidence to the contrary (evidence that the engine is intended for export, for example). We will also require that all engines that are intended only for domestic use be labeled as such. Thus, all engines not labeled for domestic use will be presumed to be intended for use on vessels subject to part 1043.

(2) Approved Methods

The 2008 amendments to MARPOL Annex VI added a new provision to the engine standards in Regulation 13 that extends the Tier I NO_X limits to certain engines installed on ships constructed on or after January 1, 1990 through December 31, 1999. Specifically, engines with power output greater than 5,000 kW and with per cylinder displacement at or above 90 liters installed on such ships would be required to meet the Tier I NO_X limits if a certified Approved Method is available. An Approved Method may be certified by the Administration of any flag state, but once one is registered with the IMO the owner of such an engine must either install the Approved Method or demonstrate compliance with the Annex VI Tier I limits through some other method. We are including a regulatory section codifying this requirement. These regulations are contained in § 1043.50.

(3) Other Annex VI Compliance Requirements

Engine manufacturers, vessel manufacturers, vessel owners, and fuel providers, fuel distributors, and other directly regulated stakeholders are required to comply with all aspects of Regulations 13, 14, and 18 of Annex VI as well as the NO_X Technical Code. These include requirements for engine operation, fuel use, fuel oil quality, and various recordkeeping requirements (*e.g.,* record book of engine parameters, engine technical file, fuel switching procedures, bunker delivery notes and associated fuel samples, and fuel sampling procedures).

Regulation 18 of both the original and the revised Annex VI sets out the requirements for bunker delivery notes and associated fuel samples. All vessels 400 gross tons and above, and each fixed and floating drilling rig and other platforms (*i.e.,* those vessels subject to Regulations 5 and 6 of both the original and the revised Annex VI) are required to keep onboard the vessel bunker delivery notes that specify the details of fuel oil brought onboard for combustion purposes. These bunker delivery notes may be inspected by the competent authority of a Party while the ship is in its port or offshore terminals. The competent authority may also verify the

[111] *See* 68 FR 9746, February 28, 2003, at 9774–5 for a discussion of these differences as they relate to Category 3 marine diesel engines.

contents of bunker delivery notes. A fuel sample is required to accompany each bunker delivery note, sealed and signed by the supplier's representative and the master or officer in charge of fuel operations. The sample should be taken pursuant to IMO guidelines and is to be retained for at least 12 months from the date of delivery. While the IMO guidelines were not in place at the time the original Annex was adopted, they were subsequently developed and Regulation 18 of amended Annex VI refers specifically to these guidelines: MEPC.96(47).

Although these are Annex VI requirements, we are not creating a regulatory requirement for the certification of bunker delivery notes or fuel samples. Such a requirement would be infeasible with respect to the time and resources that would be necessary to certify every batch of fuel sold to a vessel above 400 GT in the United States. In addition, the requirements in Annex VI clearly call for the sulfur content of gas fuels delivered to a ship for combustion purposes be documented by the fuel supplier, and that the required fuel sample be sealed and signed by the fuel provider and the representative of the ship owner.

It has been brought to the attention of EPA and the Coast Guard that some fuel providers in the United States and elsewhere have not been issuing bunker delivery notes and/or fuel samples at the time of fuel delivery. Ship owners and operators, and fuel providers, are reminded that the bunker delivery notes and fuel samples are requirements under Annex VI; a vessel can be found in noncompliance with the Annex VI fuel requirements if the vessel is inspected at a domestic or foreign port. Therefore, ship owners and operators should exercise care and diligence in obtaining the necessary bunker delivery notes and fuel samples at the time fuel is brought onboard, through the fuel contractual arrangement or through other agreement at the time of sale, and fuel providers should be certain that they have procedures and processes in place to provide the bunker delivery note and fuel sample for each batch of fuel delivered.

(4) Non-Party Vessels

The finalized regulations specify that vessels flagged by a country that is not a party to MARPOL (known as non-Party vessels) must comply with Regulations 13, 14, and 18 of Annex VI when operating in U.S. waters. This requirement fulfills the requirement of 33 U.S.C. 1902(e), which requires the adoption of regulations for non-Party vessels such that they are not treated more favorably than vessels of countries that are party to the MARPOL Protocol. However, since such vessels cannot get EIAPP certificates, this provision requires non-party vessels to obtain equivalent documentation of compliance with the NO_X standards of Annex VI.

(5) Internal Waters

APPS applies Annex VI requirements, including amendments to Annex VI that have entered into force for the United States, to ships that are in the internal waters of the U.S. Among the requirements added in the 2008 amendments to Annex VI are more stringent standards for fuel quality and NO_X emissions. Many of these standards apply in "Emission Control Areas" (ECAs) to be designated by the Parties to Annex VI. As described earlier, the U.S. and Canada submitted an application for a North American ECA, adoption of which is anticipated in March 2010.

As some commenters have noted, the ECA proposal does not include U.S. or Canadian internal waters. While the two governments did not specifically seek designation for internal waters in their ECA proposal, it is evident that emissions in internal waters are of greater concern than emissions occurring from the baseline seaward to 200 nautical miles. Vessel emissions in internal waters are often even closer to U.S. population centers than emissions in coastal waters. Emissions in internal waters affect U.S. air quality to an equal, if not greater, degree to emissions in coastal waters. Given these considerations, EPA believes that Congress' direction to apply Annex VI requirements to ships in the internal waters of the United States, as well as its grant of authority to EPA to administer the relevant regulations of Annex VI, confers the authority to apply the fuel quality and emissions requirements that apply to ECAs to ships in internal waters.

We also note the application of these standards to internal waters should not disturb reasonable expectations or impose a significant burden on industry. It has always been presumed in our analyses supporting the ECA proposal and this rule, and is the customary practice in the North Sea and Baltic Sea SECAs, that vessels will continue to comply with the emissions standards anytime they operate on the landward side of the ECA boundary, including in a country's internal waters. We are not aware of anyone ever suggesting that a vessel complying with ECA standards would increase its emissions while it remains in port or other body of water that is part of or connected to an ECA. We do not believe that vessels would generally choose to switch to higher sulfur fuels or choose to turn off Tier III control strategies in internal waters. In most cases, ocean-going vessels only operate in internal waters for short periods of time while entering and leaving ports. Switching to high sulfur fuel or turning off and on NO_X control strategies could be time consuming and may not be justified by the limited operational cost savings.

We are finalizing regulatory text to codify Annex VI global requirements and clarify application of Annex VI ECA requirements to ships in U.S. internal waters. Specifically, the regulatory text includes the APPS requirements for vessels to comply with Annex VI global requirements in our internal waters. The regulatory text also clarifies that vessels operating in U.S. internal waters, shoreward of an ECA, that can be accessed by ocean-going vessels must meet Annex VI ECA requirements. This includes ports and internal waters such as the Great Lakes. In the regulatory text we refer to the internal waters in which we are applying the ECA requirements as the "ECA associated area." The regulatory text will apply the ECA requirements for these internal waters beginning the same time the ECA takes effect under Annex VI.

Application of the ECA requirements under APPS to our internal waters does not replace but rather augments our Clean Air Act standards. The Clean Air Act exhaust emission and fuel standards apply regardless of the APPS provisions, except to the extent that any of the new CAA provisions refer to the ECA boundaries.

We received extensive comments on the economic and safety impacts of applying the ECA engine and fuel requirements to vessels that operate on the Great Lakes. The Summary and Analysis of Comments for this rule includes a discussion of the economic impacts of applying the ECA engine and fuel requirements to vessels that operate on the Great Lakes. In addition, EPA will perform a study and issue a report evaluating the economic impact of the final rule on Great Lakes carriers. We will work with Great Lakes stakeholders in conducting the study and expect to complete the report in summer 2010.

In addition to recommending the above-mentioned study, Conference Report 111–316 accompanying HR 2996, the Department of Interior, Environment, and Related Agencies Appropriations Act, 2010, suggests that EPA should include two waiver provisions for Great Lakes carriers in this final rule. Based on this statement and concerns that have been raised by the Great Lakes shipping industry, we are finalizing a new provision to address certain vessels operating exclusively on the Great Lakes (hereinafter, "Great Lakes vessels"). Specifically, we are finalizing a provision that provides for relief in the event of serious economic hardship. This economic hardship provision allows Great Lakes shippers to petition EPA for a temporary exemption from the 2015 fuel sulfur standards. The shipper must show that despite taking all reasonable business, technical, and economic steps to comply with the fuel sulfur requirements, the burden of compliance costs would create a serious economic hardship for the company. The Agency will evaluate each application on a case-by-case basis. Our experience to date shows that detailed technical and financial information from the companies seeking relief has been necessary to fully evaluate whether a hardship situation exists. As such, we may request additional information as needed. Typically, because of EPA's comprehensive evaluation of both financial and technical information, action on hardship applications can take approximately six months. Because of this, applications for an economic hardship waiver must be submitted to EPA by January 1, 2014. As is our historic practice with fuel waivers, if we approve a delay in meeting the fuel sulfur requirements, we expect to impose appropriate conditions to: (1) Ensure the shipper is making its best effort; and (2) minimize any loss of emissions benefits from the program.

In the Conference Report, Congress also indicated that EPA should provide a waiver for the requirement for the use of 1.0 percent fuel sulfur (10,000 ppm) standard if residual fuel meeting that standard is not available on the Great Lakes. In response to this statement and comments from the Lake Carriers Association, we are creating a provision that will ensure that operators on the Great Lakes will be able to buy marine residual fuels if compliant 10,000 ppm S fuel is not available. Under this provision, if marine residual fuel meeting the 10,000 ppm S standard is not available, it will not be a violation of our standards for vessel operators to bunker and use marine residual fuel with sulfur content above 10,000 ppm S provided the fuel they do purchase is the lowest sulfur marine residual fuel available at the port. We believe this market based approach will provide a significant incentive to fuel suppliers to provide 10,000 ppm S fuel, while giving Great Lakes shippers confidence that marine residual fuel will be available for their use during the 10,000 ppm S fuel program.

Finally, some commenters raised technical and safety issues associated with operating Great Lakes steamships on distillate fuel. Great Lakes steamships operate in fresh water and therefore have very long lives. Many of the boilers used on these vessels were manufactured and constructed in the 1940s and 1950s and were designed specifically to operate on heavy fuel oils. Due to these technical issues, we considered a number of options for how to address these vessels. However, Congress placed a prohibition on EPA's use of funds in this fiscal year to issue a final rule that includes fuel sulfur standards applicable to existing steamships that operate exclusively within the Great Lakes. Therefore, we are excluding Great Lakes steamships from the fuel sulfur requirements. For the purpose of this exclusion, Great Lakes steamships means vessels, operating exclusively on the Great Lakes and Saint Lawrence Seaway, whose primary propulsion is a steam turbine or steam reciprocating engine. In addition, these steamships must have been in service on the Great Lakes prior to October 30, 2009. This does not include diesel propulsion Category 3 vessels with auxiliary boilers.

Totem Ocean Trailer Express (TOTE) raised similar concerns for the small number of steamships operating along the U.S. coasts. As these vessels do not operate exclusively within U.S. internal waters, they fall under the U.S. Government's (primarily EPA and Coast Guard's) implementation of the ECA provisions of Annex VI. The requirements of the Annex VI ECA fuel sulfur limits apply to all vessels and have no exemptions for steamships. It is not within the scope of this rulemaking to amend the requirements of the MARPOL Annex VI treaty. However, through TOTE's comments and follow-up conversations with ship owners, we agree that special challenges exist for the use of lower sulfur fuel in steamships. Therefore, we will continue to work on this issue with the United States Coast Guard and other members of the U.S. Delegation to IMO as well as other interested stakeholders including the affected steamship operators. We are committed to resolving this issue before the end of 2011, well in advance of January 2015 when the 0.1 percent fuel sulfur standard will enter into force.

(6) Exemptions and Exclusions

Under MARPOL Annex VI and APPS, certain vessels are excluded from some or all of the requirements. Consistent with Annex VI and APPS, the regulations in 1043 will exclude public vessels and engines intended to be used solely for emergencies. For the purpose of this provision, the term "public vessels" includes all warships and naval auxiliary vessels, as well as any other vessels owned or operated by a sovereign country engaged in noncommercial service. Consistent with the provisions in APPS, we are not applying the Annex VI requirements to U.S.-flagged public vessels (or foreign public vessels excluded by their flag states). It should be noted, however, that not all public vessels are exempt from our Clean Air Act engine and fuel requirements. Only public vessels covered by a national security exemption under § 94.908 or § 1042.635 are exempt from the Clean Air Act program.

The category of emergency engines includes engines that power equipment such as pumps that are intended to be used solely for emergencies and engines installed in lifeboats intended to be used solely in emergencies. It should be noted that the emergency engine provisions in the Annex and part 1043 are similar but not identical to the emergency engine provisions in our Clean Air Act program or the process of obtaining our CAA exemptions. In particular, the emergency engine exemption from the CAA requirements applies only with respect to the catalyst-based Tier 4 standards.

We are exempting from the MARPOL Annex VI NO_X standards engines installed on vessels registered or flagged in the United States provided the vessel remains within the EEZ of the United States. These engines will still be required to meet stringent emission standards since they are covered by our Clean Air Act program. In addition, the fuels used by these vessels are also covered by our Clean Air Act program, which has more stringent fuel requirements than Annex VI. Therefore, as long as the operators of these domestic vessels comply with these more stringent Clean Air Act fuel requirements, they will be deemed to be in compliance with the Annex VI requirements. The combination of these proposed provisions will mean that a fishing vessel that operates out of a U.S. port and that never leaves U.S. waters will not be required to have an EIAPP for all engines above 130 kW, a record book of engine parameters and a technical file for each engines, and vessels over 400 gross tons will not be required to maintain bunker delivery notes (vessels under 400 gross tons are not required by Regulation 18 of MARPOL Annex VI to have bunker delivery notes). Instead, the engines on that vessel will be required to be in compliance with our marine diesel engine standards and be required to comply with the manufacturer's requirements with regard to the proper fueling of those engines. We are also explicitly precluding these engines from being certified to use residual fuel if they are exempt from the part 1043 requirements. Thus, these engines will be required to always use cleaner fuels than are required by Annex VI. U.S. vessels that operate or may operate in waters that are under the jurisdiction of another country are not exempt from these provisions, and the owner of any such vessel may be required by that country to show compliance with Annex VI. Therefore, the owner should be sure to maintain the appropriate paperwork for that engine and have the appropriate engine certification. It should be noted that engines that must show compliance with the Annex VI standards are not exempt from EPA's standards for Category 1 or Category 2 engines.

Finally, spark-ignition, non-reciprocating engines, and engines that do not use liquid fuel are not included in Regulation 13 of the Annex VI program and therefore they will not be covered by the proposed APPS regulations with respect to NO_X emissions. However, the MARPOL Annex VI fuel requirements do apply for these vessels. These engines are generally subject to separate Clean Air Act fuel requirements and/or emission standards that effectively require the use of low sulfur fuels, either directly or indirectly.

C. Changes to the Requirements Specific to Engines Below 30 Liters per Cylinder

The amendments to MARPOL Annex VI were adopted in October of 2008, after we finalized our Clean Air Act Tier 3 and Tier 4 standards for Category 1 and Category 2 engines (May 6, 2008, 73 FR 25097). While these two programs are very similar, there are a few differences between them with regard to their engine requirements. We are adopting some changes to our CAA program to facilitate compliance with both programs. In addition, some of the provisions described in Section VI.D may also apply to Category 1 and Category 2 marine diesel engines, regarding non-diesel engines and technical amendments to our current program.

(1) MARPOL Annex VI and EPA's Standards for Category 1 and Category 2 Engines

Our existing regulations include an exemption for Category 1 and Category 2 engines on certain migratory vessels. This allowance is limited to vessels that are operated primarily outside of the United States, and that obtain and maintain SOLAS certification and appropriate EIAPP certification demonstrating compliance with Annex VI. We are making some minor modifications to this allowance to reflect the new Annex VI standards.

We are also revising § 1042.650 to add exemption provisions for Category 1 and Category 2 auxiliary engines on vessels with Category 3 propulsion engines. These auxiliary engines would be exempt from the part 1042 standards, but would still be required to comply with the Annex VI standards. In addition, engines that would have been subject to the Tier 4 standards of part 1042 would be required to conform to the Tier III NO_X requirements, irrespective of whether they would be required to comply under Annex VI. For example, this would affect 2015 Category 2 engines with a maximum engine power of 3000 kW installed on a 2015 vessel since such an engine would be subject to the Tier 4 standards under § 1042.101, but would have only been subject to the Tier II standards under Annex VI.

Given the MARPOL Annex VI and CAA NO_X requirements are comparable, with slightly different phase-in dates and cut-offs, we believe this approach will be a less burdensome implementation approach over transitioning years, and will not have a meaningful impact on emission reductions. In the absence of this exemption, manufacturers would have been required to certify special auxiliary engines that met both Annex VI and 1042 requirements for a U.S. market that could be as small as one engine per year. By allowing manufacturers to meet only the Annex VI requirements, they would be able to produce a single international engine and spread the administrative costs over many more engines. It is important to note that we are not extending this exemption to vessels powered by smaller engines because these factors cannot be presumed for such vessels.

(2) On/Off Technology for Category 1 and 2 Engines

As described in Section VI.A.3 above, we proposed to allow the use of auxiliary emission control devices (AECDs) that would allow modulation of emission control equipment on Category 3 engines outside of specific geographic areas. These AECDs would be subject to certain restrictions: (1) The AECD would be available for the Tier 3 standards only; (2) the AECD would modulate emission controls only while operating in areas where emissions could reasonably be expected to not adversely affect U.S. air quality; and (3) an engine equipped with an AECD must also be equipped with a NO_X emission monitoring device.

We are expanding our proposed allowance for ocean-going vessels with Category 3 propulsion engines to also include Category 1 and Category 2 engines to provide auxiliary power. We are not allowing this option for U.S. vessels with Category 1 or Category 2 propulsion engines.

D. Other Regulatory Issues

In addition to the changes described in Sections VI.A and VI.C, we are also finalizing changes that apply to marine engines in general, and/or to other types of engines.

(1) Non-Diesel Engines

Most of the preceding discussions have focused on conventional diesel engines using either diesel fuel or residual fuels. It is important to highlight two other types of engines being affected by this proposal: engines using other fuels and gas turbine engines.

(a) Engines Not Using Diesel Fuel

For all categories of marine engines, our existing standards apply to all engines meeting the definition of compression-ignition, regardless of the fuel type. For example, compression-ignition Category 3 engines that burn natural gas are subject to our Tier 1 standards and will be subject to our finalized Tier 2 and Tier 3 standards. We are continuing to apply this approach for all marine engines subject to our standards.

The testing regulations in part 1065 include test fuel specifications for diesel fuel, residual fuel, and natural gas (as well as for gasoline and liquefied petroleum gas, which would not typically be used in a compression-ignition engine). To certify an engine for a different fuel type, a manufacturer will need to obtain EPA approval to use an alternate fuel which it recommends for testing. All other aspects of certification will be the same.

(b) Gas Turbine Engines

Gas turbine engines are internal combustion engines that can operate using a variety of fuels (such as diesel fuel or natural gas) but do not operate on a compression-ignition or other reciprocating engine cycle. Power is extracted from the combustion gas using a rotating turbine rather than reciprocating pistons. The primary type of U.S.-flagged vessels that use gas turbine engines are naval combat ships. While a small number have been used in commercial ships, we are not aware of any current sales for commercial applications. They can range in size from those equivalent in power to mid-size Category 1 engines to those that produce the same power as Category 3 engines. None of these engines have been subject to our current standards because they do not meet the definition of compression-ignition engines in our existing regulations.

To date, this omission has not been a concern because only a small number of turbine-powered vessels have been produced and nearly all of them would have been eligible for a national security exemption. However, we were concerned that this exclusion may become a loophole in the future for operators hoping to avoid using engines with advanced catalytic emission controls. To a lesser degree, we also had concerns about the possibility of other non-reciprocating engines being excluded. We are closing this potential loophole by revising the regulations to treat new gas turbine engines (as well as other non-reciprocating engines) the same as compression-ignition engines and to apply our standards for new Category 1 and Category 2 engines (including NO_X, HC, CO, and PM standards) to gas turbine engines.

Several commenters objected to finalizing this requirement. They argued primarily that this would not align with MARPOL. They also asserted that the proposed requirements would not pass a cost/benefit analysis and that turbines cannot be tested under the procedures of 40 CFR part 1065. However, they did not provide any information about costs, benefits, or test procedures. As described in the RIA and the Summary and Analysis of Comments Document, we continue to believe the requirements are feasible and appropriate. As described below, we are finalizing these requirements largely as proposed. The primary revision being made is to delay them until the Tier 4 timeframe to provide turbine manufacturers additional lead time.

To incorporate this approach in our marine emission control program, we are changing our definitions of Category 1 and Category 2 to include gas turbine engines. Since turbine engines have no cylinders, we are adopting a conversion convention to apply the regulatory provisions that depend on a specified value for per-cylinder displacement. This convention is intended to apply the standards based on equivalent power ratings, to the extent possible. Specifically, we are redefining “Category 1” to include gas turbines with rated power up to 2250 kW and redefining “Category 2” to include all gas turbines with higher power ratings. This means we will not consider any gas turbines as “Category 3” engines. The largest gas turbine engines will be considered to be Category 2 engines, even those that had rated power more typical of Category 3 diesel engines. We are adopting this approach primarily because our Category 3 standards vary with engine speed, and are specified based on a speed range typical of diesel engines. These formulas do not make sense for gas turbine engines since they have much higher engine speeds.

We are aware that some companies are manufacturing new high-performance recreational vessels using gas turbine engines. In at least some cases, the engines are modified from surplus military aircraft engines. We have not yet determined whether such recreational engines should be held to the same standards as conventional diesel engines. It is also important to note that under our current regulations, diesel engines meeting the definition of “recreational marine engine” in § 1042.901 are not subject to catalyst forcing standards. This approach was applied because of factors such as the usage patterns for recreational diesel engines. We believe these same factors to apply for recreational gas turbine engines. Thus, we are not as concerned about a potential gas turbine loophole for recreational engines as for commercial engines. We also do not have enough information at this time to know how feasible it would be for small gas turbine engine manufacturers to comply with the standards for recreational diesel engines, or to accurately assess the environmental impact of these vessels. Nevertheless, it is clear that the environmental impact of such small numbers of these engines cannot be large. Thus, at this time, we are not applying this regulatory change to recreational gas turbine engines (*i.e.,* that is gas turbine engines installed on recreational vessels). We will continue to investigate these engines and may subject them to standards in the future.

Our diesel engine program contains a national security exemption that automatically exempts vessels “used or owned by an agency of the Federal government responsible for national defense, where the vessel has armor, permanently attached weaponry, specialized electronic warfare systems, unique stealth performance requirements, and/or unique combat maneuverability requirements.” Since it is not our intent to prohibit naval vessels from using turbine engines, we are revising this provision to automatically exempt military vessels owned by an agency of the Federal government responsible for national defense powered by gas turbine engines.

We are confident that gas turbine engines could use the same type of aftertreatment as is projected for diesel engines. The basic reactions through which SCR reduces NO_X emissions can occur under a wide range of conditions, and exhaust from gas turbine engines is fundamentally similar to exhaust from diesel engines. Viewed another way, however, this requirement can be considered to be feasible based on the fact that the only circumstance in which a vessel would actually need a gas turbine engine would be for military purposes where our national security exemption provisions will apply. For all other vessels, it is entirely feasible for the vessel to be powered by a diesel engine. In fact, that is what is being done today.

This program for gas turbine engines will apply to freshly manufactured engines only. We are not applying our marine remanufacture program to gas turbine engines. Because there are so few engines in the fleet, it is not possible to know what common rebuilding process are or whether and how those practices would return an existing engine to as-new condition. We may review this approach in the future if there is an increase in the number of gas turbines in the fleet.

Finally, it is important to address some confusion expressed by the commenters about our definitions. We agree that it would be incorrect to actually define turbine engines as reciprocating or compression ignition, which is what the commenters thought we had proposed. However, we did not propose to define turbines to be reciprocating or compression-ignition engines. The commenters misread § 1042.1(f), which states that certain marine engines “are subject to all the requirements of this part even if they do not meet the definition of ‘compression-ignition’ in § 1042.901.” This provision subjects marine gas turbine engines to the requirements of part 1042, but it explicitly recognizes that they do not meet the definition of compression-ignition in § 1042.901. The confusion seems to arise from the statement that these engines “are deemed to be compression-ignition engines for the purposes of this subchapter.” This statement is merely a regulatory convention that means the part applies to turbines as if they did meet the definition.

(2) Technical Amendments

The finalized regulations include technical amendments to our motor vehicle and nonroad engine regulations. These changes are generally corrections and clarifications. A large number of these changes are the removal of obsolete highway engine text that applied only for past model years. Many others are changes to the text of part 1042 to make it more consistent with the language of our other recently corrected nonroad parts. The last large category of changes includes those related to the test procedures in part 1065. *See* the memorandum in the docket entitled "Technical Amendments to EPA Regulations" for a full description of these changes.[112]

E. U.S. Vessels Enrolled in the Maritime Security Program

The U.S. Department of Transportation Maritime Administration (MARAD) oversees the Maritime Security Program (MSP) established by the Maritime Security Act of 1996 and reauthorized by the Maritime Security Act of 2003 (MSA). The MSA requires that the Secretary of Transportation, in consultation with the Secretary of Defense, establish a fleet of active, commercially viable and militarily useful vessels to meet national defense and other security requirements and maintain a U.S. presence in international commercial shipping. The fleet consists of privately-owned, U.S.-flagged vessels known as the Maritime Security Fleet (MSF). 46 U.S.C. 53102 outlines that vessels complying with applicable international agreements and associated guidelines are eligible for a certificate of inspection from Coast Guard, and thus inclusion in the MSF.

The requirements of the MSP may have created confusion for owners of non-U.S.-flagged vessels regarding their obligation to also comply with EPA's domestic marine diesel engine emission standards at the time they re-flag for inclusion in the MSF. We want to remind vessel owners that the MSA does not preempt the Clean Air Act or alleviate their obligation to comply with EPA's marine diesel engine program, or any other EPA requirements that apply to marine vessels. As is clear from our past rulemakings, it has always been our intent that each U.S.-flagged vessel must comply with all of EPA's domestic standards, regardless of whether the vessel was flagged in the U.S. upon original delivery into service.

[112] *See* "Technical Amendments to EPA Regulations," EPA memorandum from Alan Stout, in the docket for this rule, Docket No.: EPA–HQ–OAR–2007–0121.

We are revising the regulations to clarify these requirements and, as noted earlier, to provide exemptions for auxiliary engines on Category 3. First, we are revising § 1042.1 to clarify that our regulations apply for all U.S.-flagged vessels. In conjunction with this, we are revising the definitions of "model year" and "new marine engine" to clarify that our marine engine program applies to all U.S.-flagged vessels regardless of where that vessels is built or operated, and how the regulations apply for vessels that are re-flagged to be U.S. vessels.

We are clarifying that engines on foreign vessels that vessels become "new marine engines" under part 1042 at the point at which they are reflagged. As new marine engines, we would expect them to be covered by valid certificates and/or exemptions prior to being placed into service. If engines on U.S.-flagged vessels are not covered by valid certificates and/or exemptions when they first enter U.S. waters, they would be subject to all of the prohibitions of part 1068.101. The operator would be in violation of the prohibition against introduction of an uncertified new engine into U.S. commerce.

Some of the revisions being finalized are intended to simplify the transition from part 94 to part 1042. Under the revised regulations, part 1042 becomes the default regulatory part for compression-ignition marine engines. Section 1043.1 specifies that such marine engines are subject to part 1042 unless they are certified under part 94. In addition, § 1042.1(c) specifies that the definition of "new marine engine" in § 1042.901 applies for engines certified under part 94. This is important because our standards and prohibitions apply for engines meeting the definition of "new marine engine". Thus, to determine whether an uncertified marine engine is subject to our standards and prohibitions, you must determine whether it meets any of the criteria of the definition of "new marine engine" in § 1042.901.

Each "new marine engine", is subject to standards based on its model year. The revised definition of "model year" specifies that engines on re-flagged vessels would generally be subject to the standards that would have applied in the year they were originally manufactured. If the engine has a model year before the years the part 94 standards first applied, it would not be subject to any standards. If the engine has a later model year but one that is before the years the part 1042 standards apply, it would be subject to the standards of part 94. According to § 1042.1(c), if the engine is certified to these part 94 standards, it is not required to comply with the requirements of part 1042.

To further smooth this transition, we are finalizing a new interim provision in § 1042.145(i). This provision is intended to apply for vessel operators that were not aware that their vessels were required to comply with our regulations. Once this amendment takes effect, it will allow them to operate in U.S. waters until July 1, 2010 without certificates or exemptions for their engines. After that, it will be a violation of 40 CFR 1068.101 to operate in U.S. waters with uncertified engines if those engines are subject to our standards. Operation of such vessels in U.S. waters on or after July 1, 2010 is deemed to be introduction into U.S. commerce of a new marine engine.

VII. Costs and Economic Impacts

In this section, we present the projected cost impacts and cost effectiveness of the coordinated emission control strategy for large marine vessels with a per cylinder displacement greater than 30 Liters per cylinder. We also present our analysis of the economic impacts of the coordinated strategy, which consists of the estimated social costs of the program and how those costs will likely be shared across stakeholders. The projected benefits and benefit-cost analysis of the coordinated strategy are presented in Section VIII.

We estimate the costs of the coordinated strategy to be about $1.85 billion in 2020, increasing to $3.11 billion in 2030.[113] Of the 2020 costs, nearly 89 percent or $1.64 billion are attributable to the fuel sulfur provisions. The total operational costs are estimated to be $1.82 billion in 2020. The costs to apply engine controls to U.S.-flagged vessels are expected to be $31.9 million in 2020, increasing to $47.4 million in 2030 as more ships are built to comply with Clean Air Act (CAA) Tier 3 NO_X limits. All costs are presented in 2006 U.S. dollars.

When attributed by pollutant, at a net present value of 3 percent from 2010 through 2040, the NO_X controls are expected to cost about $510 per ton of NO_X reduced, SO_X controls are expected to cost about $930 per ton of SO_X reduced, and the PM controls are

[113] These total estimated costs are slightly different than those reported in the ECA proposal, because the ECA proposal did not include costs associated with the Annex VI existing engine program, Tier II, or the costs associated with existing vessel modifications that may be required to accommodate the use of lower sulfur fuel. Further, the cost totals presented in the ECA package included Canadian cost estimates.

expected to cost about $7,950 per ton of PM reduced ($500, $920, and $7,850 per ton of NO_X, SO_X, and PM respectively, at a net present value of 7 percent over the same period). These costs are comparable to our other recently adopted mobile source programs, and are one of the most cost-effective programs in terms of NO_X and PM when compared to recent mobile and stationary programs. The coordinated strategy also provides very cost-effective SO_X reductions comparable to the Heavy-Duty Nonroad diesel rulemaking.

The social costs of the program are estimated to be approximately $3.1 billion in 2030. The impact of these costs on society is estimated to be minimal. For example, we estimate the cost of shipping a 20-foot container on the Pacific route, with 1,700 nm of operation in the ECA, would increase by about $18, or less than 3 percent. Similarly, the price of a seven-day Alaska cruise that operates mainly in the ECA is expected to increase by about $7 per day.

The estimated costs presented in this section are for the entire coordinated strategy, including those requirements that are the subject of this action and those that are associated with the proposed ECA designation. Table VII–1 sets out the different components of the coordinated strategy for 2020. The costs of the coordinated strategy consist of the costs associated with the MARPOL Annex VI global standards that are operational through APPS, some of which we are also adding to our CAA emission control program for U.S. vessels (Tier 2 and Tier 3 NO_X emission control hardware for U.S. vessels; operating costs for the Tier 2 NO_X requirements; controls for existing vessels; certain compliance requirements). Also included are the costs associated with complying with the engine standards and low sulfur fuel limits in U.S. internal waters (Tier 3 operating costs; fuel sulfur hardware and operating costs).

Note that, with regard to hardware costs, the coordinated strategy includes the entire cost for new U.S. vessels to comply with the Tier 3 NO_X standards and fuel limits, even though some of the benefits from using these emission control systems will occur outside the United States. Conversely, we do not include any new vessel Tier 3 or fuel hardware costs for foreign vessels that operate in U.S. waters even though a significant share of the benefits of the coordinated strategy will arise from foreign vessels that comply with the engine and fuel sulfur limits while operating within the U.S., ECA and internal waters.

The regulatory changes finalized for Category 1 and 2 engines are not included in this cost analysis as they are intended to be compliance flexibilities and not result in increased compliance costs. Similarly, the technical amendments finalized for other engines will not have significant economic impacts and are therefore not addressed here. Finally, to provide for a representative comparison between costs and benefits of the program, the cost analysis presented here assumes that all vessels currently using residual fuel will operate on distillate fuel in an ECA, including Great Lakes steamships. As noted in earlier chapters, Great Lakes steamships have been excluded from the final fuel sulfur standards. This change is not expected to have a significant impact on the estimated costs or benefits of the rule as those vessels are not a large part of the national inventory.

TABLE VII–1—COSTS ASSOCIATED WITH THE U.S. COORDINATED STRATEGY AND CANADIAN ECA

[Estimated Costs for 2020, $2006]

Program element		U.S. coordinated strategy	Canadian ECA
Hardware—T2 (variable costs; fixed costs applied in 2010).	U.S. vessels	$3,310,000	NA—not part of ECA.
	Foreign Vessels	N/A—global std	NA—not part of ECA.
Hardware—T3 (variable costs; fixed costs recovered in the year in which they occur: 2011–15).	U.S. vessels (variable costs; fixed costs recovered in the year in which they occur: 2011–15).	$28,700,000	$100,000,000.
	Foreign vessels: 30% of vessels making 75% of entrances to U.S. ports [a].	$296,700,000.	
	Foreign vessels: 70% of vessels making 25% of entrances to U.S. ports [a].	$692,200,000.	
Hardware—Fuel	U.S. vessels (new vessel costs)	$804,000	$10,000,000.
	Foreign vessels (new vessel costs)	$23,600,000.	
Operating—T2 (inside full inventory modeling domain).	U.S. vessels	$5,630,000	NA—not part of ECA.
	Foreign vessels	$32,900,000	NA—not part of ECA.
Operating—T3 (inside relevant part of affected waterways).	U.S. vessels	$15,800,000	$30,000,000.
	Foreign vessels	$127,000,000.	
Operating—Fuel (inside relevant part of affected waterways).	U.S. vessels	$210,000,000	$260,000,000.
	Foreign vessels	$1,430,000,000.	
Existing vessels—engine costs (all U.S. vessels 1990–99 retrofit during first 5 years of program, 2011–15).	U.S. vessels	$0	NA—not part of ECA.
	Foreign vessels	N/A—global std	NA—not part of ECA.
Existing vessels—vessel fuel switching costs (all U.S. vessels 1999–90 retrofit during first 5 years of program, 2011–15).	U.S. vessels	$0	Canada did not provide.
	Foreign vessels	$0	Canada did not provide.

The estimated costs presented in this section are for the Federal program as a whole. We do not estimate costs on a regional or owner-specific basis. We received several comments from owners of vessels operating on the Great Lakes contending that the impact of the proposed control program on their operations is unique, and that the economic impacts of the program on these operators should be estimated separately. As explained in Section VI of this preamble and in more detail in the Summary and Analysis of Comments prepared for this final rule, we are providing various regulatory flexibilities for operators that may have difficulty complying with the requirements of this rule. In addition, as part of EPA's appropriation bill (Pub. L. 111–88), Congress recommended that EPA perform a study to evaluate the economic impact of the final rule on Great Lakes carriers, with a final report due in the summer of 2010. We will be soliciting input from affected entities as we prepare that report.

A. Estimated Fuel Costs

The coordinated strategy includes fuel sulfur limits which are included in this cost analysis. Prior to this final rule, all distillate fuels produced at refineries in the U.S. had a sulfur limitation of 15 ppm. The coordinated strategy does not impose additional costs for refiners in the U.S. and actually allows additional flexibility. Specifically, we are allowing distillate fuel to have up to 1,000 ppm sulfur for use in Category 3 vessels. The fuel requirements will impose a cost to the ship owners. This section presents estimates of the cost of compliance with the 1,000 ppm sulfur limit in the U.S. waterways.

Distillate fuel will likely be used to meet the 1,000 ppm fuel sulfur limit, beginning in 2015. As such, the primary cost of the fuel sulfur limit for ship owners will be that associated with switching from heavy fuel oil to higher-cost distillate fuel. Some engines already operate on distillate fuel and will not be affected by fuel switching costs. However, distillate fuel costs may be affected by the need to further refine the distillate fuel to meet the 1,000 ppm sulfur limit.

To investigate these effects, studies were performed on the impact of a North American ECA on global fuel production and costs, to inform the application for such ECA.[114] These studies were performed prior to the ECA being defined; thus, we picked a maximum distance boundary to ensure the fuel volumes used for the cost analysis would be larger than required by the program. Specifically, we used the total fuel consumption in the U.S. and Canada exclusive economic zones.[115] The studies are relevant to this regulation as well, since they estimate the cost of 1,000 ppm sulfur fuel for Category 3 vessels operating in U.S. waterways.

To assess the effect on the refining industry of the imposition of a 1,000 ppm sulfur limit on fuels, we needed to first understand and characterize the fuels market. Research Triangle Institute (RTI) was contracted to conduct a fuels study using an activity-based economic approach. The study established baseline bunker fuel demand, projected a growth rate for bunker fuel demand, and established future bunker fuel demand volumes.[116] These volumes then became the input to the World Oil Refining Logistics and Demand (WORLD) model to evaluate the effect of the coordinated strategy on fuel cost.

The WORLD model was run by Ensys Energy & Systems, the owner and developer of the refinery model. The WORLD model is the only such model currently developed for this purpose and was developed by a team of international petroleum consultants. It has been widely used by industries, government agencies, and Organization of the Petroleum Exporting Countries (OPEC) over the past 13 years, including the Cross Government/Industry Scientific Group of Experts, established to evaluate the effects of the different fuel options proposed under the revision of MARPOL Annex VI. The model incorporates crude sources, global regions, refinery operations, and world economics. The results of the WORLD model have been comparable to other independent predictions of global fuel, air pollutant emissions and economic predictions.

The WORLD model was run for 2020, in which the control case included a fuel sulfur level of 1,000 ppm in the U.S. The baseline case was modeled as "business as usual" in which ships continue to use the same fuel as today. Because of the recent increases and fluctuations in oil prices, we had additional WORLD model runs conducted. For these runs, we used new reference case and high oil price estimates that were recently released by the U.S. Energy Information Administration (EIA). In addition to increased oil price estimates, the updated model accounts for increases in natural gas costs, capital costs for refinery upgrades, and product distribution costs.

Because only a small portion of global marine fuel is consumed in the ECA, the overall impact on global fuel production is small. Global fuel use in 2020 by ships is projected to be 500 million metric tonnes/yr. Of this amount, 90 million metric tonnes of fuel is used for U.S./Canadian trade, or about 18 percent of total global fuel use. In the proposed ECA, less than 20 million metric tonnes of fuel will be consumed in 2020, which is less than 4 percent of total global marine fuel use. Of the amount of fuel to be consumed in the proposed ECA in 2020, about 4 million metric tonnes of distillate will be consumed in the Business as Usual (BAU) case, which is about 20 percent of the amount of total fuel to be consumed in the proposed ECA.

There are two main components to projected increased marine fuel cost associated with the ECA. The first component results from shifting from operation on residual fuel to operation on higher cost distillate fuel. This is the dominant cost component. However, there is also a small cost associated with desulfurizing the distillate to meet the 1,000 ppm sulfur standard. Based on the WORLD modeling, the average increase in costs associated with switching from marine residual to distillate will be $145 per metric tonne of fuel consumed. Due to the differences in energy density between the two fuels, this translates to a cost increase of $123 for each metric tonne of residual fuel replaced by distillate fuel.[117] This is the cost increase that will be borne by the shipping companies purchasing the fuel. Of this amount, $6 per metric tonne is the increase in costs associated with distillate desulfurization.

Table VII–2 summarizes the fuel cost estimates with and without an ECA. In the baseline case, fuel volumes for operation are 18% marine gas oil (MGO), 7% marine diesel oil (MDO), and 75% IFO. Weighted average baseline distillate fuel cost is $462/tonne. In the ECA, all fuel volumes are modeled as MGO, at $468/tonne.

[114] Research Triangle Institute, 2009. "Global Trade and Fuels Assessment—Future Trends and Effects of Designating Requiring Clean Fuels in the Marine Sector". Prepared for U.S. Environmental Protection Agency. Research Triangle Park, NC.

[115] In this analysis, the U.S. included the lower 48 contiguous States and southeastern Alaska.

[116] Research Triangle Institute, 2009. "Global Trade and Fuels Assessment—Future Trends and Effects of Designating Requiring Clean Fuels in the Marine Sector". Prepared for U.S. Environmental Protection Agency. Research Triangle Park, NC.

[117] Note that distillate fuel has a higher energy content, on a per ton basis, than residual fuel. As such, there is an offsetting cost savings, on a per metric ton basis, for switching to distillate fuel. Based on a 5 percent higher energy content for distillate, the net equivalent cost increase is estimated as $123 for each metric ton of residual fuel that is being replaced by distillate fuel.

TABLE VII–2—ESTIMATE MARINE FUEL COSTS

Fuel	Units	Baseline	ECA
MGO ...	$/bbl	$ 61.75	$ 62.23
	$/tonne	464	468
MDO	$/bbl	61.89	62.95
	$/tonne	458	466
IFO	$/bbl	49.87	49.63
	$/tonne	322	321

The increased cost of distillate desulfurization is due both to additional coking and hydrotreating capacities at refineries. Cokers crack residual blends in IFO bunker fuel into distillates, using heat and residence time to make the conversion. The process also produces useful byproducts such as petroleum coke and off gas. The WORLD model did not use hydrocracking technology to convert residual fuels into distillates for either the reference or high price crude cases. Because of the higher capital and operating costs of hydrocrackers, the WORLD model favored the use of coking units. As such, the WORLD model assumed that cokers would convert the residual blendstocks in Intermediate Fuel Oil grades to distillates. The model added coking processes to refineries located in the U.S. and, to a lesser extent, to refiner regions outside of the U.S. Specifically, the model added one additional coking unit with a capacity of 30 thousand barrels per stream day (KBPSD), and one to two hydrocracking units representing 50 and 80 KBPSD additional capacity.

The WORLD model also added new conventional distillate hydrotreating capacity to lower the sulfur levels for the marine distillate fuel, in addition to the existing slack distillate hydrotreating capacity that existed in refiner regions for these fuels. In addition, the model used lighter crudes and adjusted operating parameters in refineries. This had the effect of increasing the projected production of lower sulfur distillate fuels in lieu of adding distillate hydrotreating capacity. The model elected to use lower sulfur crudes and used operational adjustments. Higher capital and operating costs of new units under the high-priced crude scenario favored use of existing refinery capacity made available from lower global refiner utilizations.

B. Estimated Engine Costs

To quantify the cost impacts associated with the coordinated strategy, we estimated the hardware and operational costs to U.S.-flagged ships, as well as affected foreign-flagged ships. The hardware costs included in the total cost of the coordinated strategy are only applied to U.S.-flagged vessels, and include those associated with the CAA Tier 2 and Tier 3 NO_X standards, the Annex VI existing engine program, and the use of lower sulfur fuel. Tier 2 hardware costs consist of changes to the engine block and the migration from mechanical fuel injection to common rail fuel injection systems. Tier 3 hardware costs include engine modifications, the migration from mechanical fuel injection to common rail fuel injection systems, and the installation of Selective Catalytic Reduction (SCR). Hardware costs associated with the use of lower sulfur fuel are from applying additional tanks and equipment to enable a vessel to switch from residual fuel to lower sulfur fuel. These equipment costs were applied to those new vessels that may need additional hardware, and also include the estimated cost of retrofitting the portion of the fleet that may require additional hardware to accommodate the use of lower sulfur fuel in 2015. The hardware costs also include a per engine cost of $10,000 associated with the requirement to test each production engine (§ 1042.302). These are the sole engine hardware costs specifically attributable to our CAA rule.

The operational costs were applied to both U.S.- and foreign-flagged vessels and include additional operational costs associated with the applicable NO_X limits and the use of lower sulfur fuel. The operational costs for NO_X controls consist of the additional fuel required due to an estimated two percent fuel penalty associated with the use of technologies to meet CAA Tier 2 and global Tier II NO_X standards, and the use of urea for ships equipped with an SCR unit to meet CAA Tier 3 and global Tier III NO_X standards. The operational costs associated with the use of lower sulfur fuel include both the differential cost of using lower sulfur fuel that meets ECA standards instead of using marine distillate fuel, and the differential cost of using lower sulfur fuel that meets ECA standards instead of using residual fuel.

To assess the potential cost impacts, we must understand (1) the makeup of the fleet of ships expected to visit the U.S. when these requirements go into effect, (2) the emission reduction technologies expected to be used, and (3) the cost of these technologies. Chapter 5 of the RIA presents this analysis in greater detail. The total engine and vessel costs associated with the coordinated strategy are based on a cost per unit value applied to the number of affected vessels. Operational costs are based on fuel consumption values determined in the inventory analysis (Section 5.2). This section discusses a brief overview of the methodology used to develop the hardware and operational costs, and the methodology used to develop a fleet of future vessels to which these hardware and engineering costs were applied.

(1) Methodology

To estimate the hardware costs to ships that may be affected by the coordinated strategy, we used an approach similar to that used to estimate the emissions inventory. Specifically, the same inputs were used to develop a fleet of ships by ship type and engine type that may be expected to visit U.S. ports through the year 2040. In order to determine the cost of applying emission reduction technology on a per vessel basis, ICF International was contracted by the U.S. EPA to conduct a cost study of the various compliance strategies expected to be used to meet the new NO_X standards and fuel sulfur requirements.[118] ICF was instructed to develop cost estimates covering a range of vessel types and sizes, which could be scaled according to engine speed and power to arrive at an estimated cost per vessel. The costs developed for these engine configurations were used to develop a $/kW value that could be applied to any slow or medium speed engine. Using the average propulsion power by ship type presented in the inventory analysis, the per-vessel hardware costs were then applied to the estimated number of applicable vessels built after the standards take effect.

(a) Hardware Costs

The hardware cost estimates include variable costs (components, assembly, and the associated markup) and fixed costs (tooling, research and development, redesign efforts, and certification). Hardware costs associated with the Annex VI existing engine standards were applied to the portion of existing U.S.-flagged vessels built between 1990 and 1999 expected to be subject to these standards in 2011 when the standards go into effect (engines with a per-cylinder displacement of at least 90 liters and a power output of over 5,000 kW. These costs were applied over a five-year period beginning in 2011 where 20 percent of the total subject fleet was estimated to undergo service each year. The existing engine program fixed costs were phased

[118] ICF International, "Costs of Emission Reduction Technologies for Category 3 Marine Engines," prepared for the U.S. Environmental Protection Agency, December 2008. EPA Report Number: EPA–420–R–09–008.

in over a five-year period beginning in 2010 and applied on a per-vessel basis.

Hardware costs associated with the CAA Tier 2 program were applied to all new U.S.-flagged vessels beginning in the year 2011 when the standards take effect. The fixed costs associated with Tier 2 standards are expected to be incurred over a five-year period; however, as the Tier 2 standards take effect in 2011, it was assumed that manufacturers are nearing the end of their research and development. In order to capture all of these costs, all fixed costs that would have been incurred during that five-year phase-in period were applied in the year 2010. Hardware costs associated with Tier 3 were estimated for U.S. vessels and were applied as of 2016. The fixed costs associated with Tier 3 were phased in over a five-year period beginning in 2011.

Hardware costs associated with the use of lower sulfur fuel are estimated separately for both new and existing vessels that may require additional hardware to accommodate the use of lower sulfur fuel. The fuel sulfur control related hardware costs for new vessels begin to apply in 2015, while all retrofit costs are expected to be incurred by 2015 and as such are applied in this year. The fixed costs for both new and existing vessels that may require additional hardware to accommodate the use of lower sulfur fuel are applied on a per-vessel basis and are phased in over a five year period beginning as of 2010.

(b) Operational Costs

The operational costs estimated here are composed of three parts: (1) The estimated increase in fuel consumption expected to occur with the use of Tier II technologies on U.S.- and foreign-flagged vessels, (2) the differential cost of using lower sulfur fuel applicable for both U.S.- and foreign-flagged vessels, and (3) the use of urea with SCR as a Tier III NO_X emission reduction technology on both U.S.- and foreign-flagged vessels. The fuel consumption values associated with Tier II and Tier III standards were determined in the inventory analysis (*see* Chapter 3 of the RIA), with an estimated Tier II fuel consumption penalty of 2 percent (*see* Chapter 4 of the RIA). The two percent fuel penalty estimate is based on the use of modifications to the fuel delivery system to achieve Tier II NO_X reductions, and does not reflect the possibility that there may be other technologies available to manufacturers that could offset this fuel penalty. Additionally, Tier III will provide the opportunity to re-optimize engines for fuel economy when using aftertreatment, such as SCR, to provide NO_X reductions similar to the compliance strategy for some heavy-duty truck manufacturers using urea SCR to meet our 2010 truck standard. The differential cost of using lower sulfur fuel is discussed above in Section VII.A of this preamble. The estimated urea cost associated with the use of Tier III SCR is derived from a urea dosage rate that is 7.5 percent of the fuel consumption rate.

Operating costs per vessel vary depending on what year the vessel was built, *e.g.,* vessels built as of 2016 will incur operating costs associated with the use of urea necessary when using SCR as a Tier III NO_X emission control technology, while vessels built prior to 2016 do not use urea but will incur operating costs associated with the differential cost of using lower sulfur fuel. Further, we have assumed vessels built as of 2011 that meet Tier II standards will incur a 2 percent fuel consumption penalty; *see* Table 5–31 of the RIA for further details on fuel costs and fuel volumes. In addition, vessels built as of 2016 that meet Tier III NO_X standards while traveling in the regulated U.S. waterways are still required to at least meet Tier II NO_X standards outside of an ECA and will continue to incur the associated fuel penalty. Therefore, an estimated fleet had to be developed over a range of years, and provide a breakout of ships by age in each year.

(2) Fleet Development

There are currently no available estimates of the number of ships that may visit U.S. ports in the future or comprehensive engine sales predictions. Therefore, to develop the costs associated with the coordinated strategy, an approximation of the number of ships by age and engine type that may visit U.S. ports in the future was constructed. To characterize the fleet of ships visiting U.S. ports, we used U.S. port call data collected in 2002 for the inventory port analysis (*see* Chapter 3 of the RIA) which included only vessels with C3 engines where the engine size and type was identified.[119] We used this data with the growth rates developed in the inventory analysis to estimate how many ships, by ship type and engine type, would visit U.S. ports in future years. Due to the long life of these vessels, and the fact that there has been no significant event that would have changed the composition of the world fleet since this baseline data was taken, it is reasonable to use 2002 data as the basis for modeling the future fleet upon which to base hardware cost estimates. An analysis is presented in Section 5.1.2.2 of Chapter 5 of the RIA which confirms the reasonableness of this assumption using 2007 MARAD data.

The ship type information gathered from this baseline data, for the purposes of both this analysis and the inventory, was categorized into one of the following ship types: Auto Carrier, Bulk Carrier, Container, General Cargo, Miscellaneous, Passenger, Refrigerated Cargo (Reefer), Roll-On Roll-Off (RoRo), and Tankers. Average engine and vessel characteristics were developed from the baseline data, and these values were used to represent the characteristics of new vessels used in this cost analysis (*see* Chapter 3 of the RIA). Estimated future fleets were developed by ship type and engine type through the year 2040 for both new and existing vessels and both U.S.- and foreign-flagged vessels. Hardware costs were applied on a per-vessel basis.

Although most ships primarily operate on residual fuel, they typically carry some amount of distillate fuel as well. Switching to the use of lower sulfur distillate fuel is the compliance strategy assumed here to be used by both new and existing ships in 2015 when the new lower sulfur fuel standards go into effect. To estimate the potential cost of this compliance strategy, we evaluated the distillate storage capacity of the current existing fleet to estimate how many ships may require additional hardware to accommodate the use of lower sulfur fuel. We performed this analysis on the entire global fleet listed in Lloyd's database as of 2008.[120] Of the nearly 43,000 vessels listed, approximately 20,000 vessels had provided Lloyds with fuel tankage information, cruise speed, and propulsion engine power data. Using this information, we were able to estimate how far each vessel could travel on its existing distillate carrying capacity.

In order to determine if the current distillate capacity of a particular ship was sufficient to call on a U.S. coordinated strategy without requiring additional hardware, we evaluated whether or not each ship could travel 1,140 nm, or the distance between the Port of Los Angeles and the Port of Tacoma. This distance was selected because it represents one of the longer trips a ship could travel without

[119] In order to separate slow speed engines from medium speed engines where that information was not explicitly available, 2-stroke engines were assumed to be slow speed, where 4-stroke engines were assumed to be medium speed.

[120] *http://www.sea-web.com.*

stopping at another port, and should overestimate the number of vessels that would require such a modification. The resulting percentages of ships estimated to require a retrofit were then applied to the number of existing ships in the 2015 fleet to estimate the total cost of this compliance strategy for existing ships built prior to 2015. The same percentages were also applied to all new ships built as of 2015 to determine the number of ships that may require additional hardware and estimate the cost of this compliance strategy for new vessels.

(3) NO_X Reduction Technologies

(a) Tier 2

Most engine manufacturers are expected to be able to meet Tier 2 NO_X standards using engine modifications. This cost estimate includes the hardware costs associated with the use of retarded fuel injection timing, higher compression ratios, and better fuel distribution. There are no variable costs associated with the engine modifications as the changes are not expected to require any additional hardware. Some engines may also be equipped with common-rail fuel systems instead of mechanical fuel injection to meet Tier 2 NO_X standards. It is expected that approximately 75 percent of SSD and 30 percent of MSD engines will get this modification for Tier 2. The Tier 2 hardware costs developed here include the costs of the migration of some engines to common-rail fuel systems. It was also estimated that these technologies may increase fuel consumption by up to 2 percent; this fuel penalty is included in the Tier 2 operational costs. Tier 2 hardware costs included in the total estimated cost of the coordinated strategy are only associated with U.S.-flagged vessels; operational costs are applied to both U.S.- and foreign-flagged vessels.

(b) Tier 3

Tier 3 NO_X standards are approximately 80 percent below Tier 1 NO_X standards, and are likely to require exhaust aftertreatment such as SCR. ICF performed a detailed cost analysis for the U.S. EPA that included surveying engine and emission control technology manufacturers regarding these advanced technology strategies and their potential costs. Tier 3 NO_X standards are projected to be met through the use of SCR systems. While other technologies such as EGR or those that include introduction of water into the combustion chamber either through fumigation, fuel emulsions, or direct water injection may also enable Tier 3 compliance, we assume they will only be selected if they are less costly than SCR. Therefore, we have based this analysis on the exclusive use of SCR.

(c) Engine Modifications

In addition to SCR, it is expected that manufacturers will also use compound or two-stage turbocharging as well as electronic valving to enhance performance and emission reductions to meet Tier 3 NO_X standards. Engine modifications to meet Tier 3 emission levels will include a higher percentage of common-rail fuel injection coupled with two-stage turbocharging and electronic valving. Engine manufacturers estimate that nearly all SSD and 80 percent of MSD engines will use common-rail fuel injection. Two stage turbocharging will most likely be used on least 70 percent of all engines required to meet Tier 3 emission levels. Electronically (hydraulically) actuated intake and exhaust valves for MSD and electronically actuated exhaust valves for SSD are necessary to accommodate two-stage turbocharging. Additionally, the remaining SSD engines still using mechanical injection (approximately 25 percent mechanically controlled, and 75 percent electronically controlled) are expected to migrate to common rail for Tier 3, while an additional 40 percent of MSD engines are expected to receive common rail totaling approximately 80 percent of all MSD engines. The engine modification variable costs were applied to all new U.S.-flagged vessels equipped with either SSD or MSD engines. Costs to foreign-flagged vessel expected to visit U.S. ports are presented as a separate analysis in Chapter 5 of the RIA, and are not included in the total estimated cost of the coordinated strategy.

(4) SO_X/PM Emission Reduction Technology

In addition to Tier 3 NO_X standards, the IMO ECA requirements also include lower fuel sulfur limits that will result in reductions in SO_X and PM. Category 3 marine engines typically operate on heavy fuel oil with a sulfur content of 2.7 percent, therefore significant SO_X and PM reductions will be achieved using distillate fuels with a sulfur content of 0.1 percent. This cost analysis is based on the assumption that vessel operators will operate their engines using lower sulfur fuel in the U.S. coordinated strategy waterways. We believe fuel switching will be the primary compliance approach; fuel scrubbers would be used in the event that the operator expected to realize a cost savings and are not considered in this analysis. In some cases, additional capacity and equipment to accommodate the use of lower sulfur fuel may need to be installed on a vessel. The potential costs due to these additional modifications applied to new ships as well as retrofits to any existing ships are discussed here, and these hardware costs are included as part of the total cost of this coordinated program.

Although most ships operate on heavy fuel oil, they typically carry small amounts of distillate fuel. Some vessel modifications and new operating practices may be necessary to use lower sulfur distillate fuels on vessels designed to operate primarily on residual fuel. Installation and use of a fuel cooler, associated piping, and viscosity meters to the fuel treatment system may be required to ensure viscosity matches between the fuel and injection system design. While there are many existing ships that already have the capacity to operate on both heavy fuel oil and distillate fuel and have separate fuel tank systems to support each type of fuel, some ships may not have sufficient onboard storage capacity. If a new or segregated tank is desired, additional equipment for fuel delivery and control of these systems may be required.

(5) NO_X and SO_X Emission Reduction Technology Costs

(a) NO_X Emission Reduction Technology

The costs associated with SCR include variable and fixed costs. SCR hardware costs include the reactor, dosage pump, urea injectors, piping, bypass valve, an acoustic horn or a cleaning probe, the control unit and wiring, and the urea tank (the size of the tank is based on 250 hours of normal operation when the ship is operating in the regulated U.S. waterways and the SCR system is activated.) The size of the tank is dependent on the frequency with which the individual ship owner prefers to fill the urea tank. The methodology used here to estimate the capacity of the SCR systems is based on the power rating of the propulsion engines only. Auxiliary engine power represents about 20 percent of total installed power on a vessel; however, it would be unusual to operate both propulsion and auxiliary engines at 100 percent load. Typically, ships operate under full propulsion power only while at sea when the SCR is not operating; when nearing ports, the auxiliary engine is operating at high loads while the propulsion engine is operating at very low loads.

In this analysis, we determined the average number of hours a ship would spend calling on a U.S. port: If the call was straight in and straight out at 200 nm, the average time spent was slightly over 35 hours. If the distance travelled was substantial, such as from the Port of Los Angeles to the Port of Tacoma, or 1140 nm, the average time spent travelling was approximately 75 hours. Therefore, the size of the tanks and corresponding $/kW values estimated here to carry enough urea for 250 hours of continuous operation may be an overestimate. Based on 250 hours of operation, a range of urea tank sizes from 20 m^3 to approximately 256 m^3 was determined for the six different engine configurations used in this analysis.

To understand what impacts this may have on the cargo hauling capacity of the ship, we looked at the ISO standard containers used today. Currently, over two-thirds of the containers in use today are 40 feet long, total slightly over 77 m^3 and are the equivalent of two TEU.[121] The urea tank sizes estimated here reflect a cargo equivalence of 0.5–2 TEUs, based on a capacity sufficient for 250 hours of operation. The TEU capacity of container ships, for example, continues to increase and can be as high as 13,000 TEUs.[122] Based on a rate of approximately $1,300 per TEU to ship a container from Asia to the U.S., a net profit margin of 10%, and an average of 16 trips per year, the estimated cost due to displaced cargo to call on a U.S./Canada ECA may be $2,100.[123] [124] [125] The cost analysis presented here does not include displaced cargo due to the variability of tank sizes owners choose to install.

To estimate the SCR hardware costs associated with newly built ships, we needed to generate an equation in terms of $/kW that could be applied to other engine sizes. Therefore, the $/kW values representing the hardware costs estimated for the six different engine types and sizes used in this analysis was developed using a curve fit for both SSD and MSD engines. The resulting $/kW values range from $40–$80 per kW for MSD, and $40–$70 for SSD. These costs were then applied based on the characteristics of the average ship types described in the inventory section of the RIA (*see* Chapter 3) to the representative portion of the future fleet in order to estimate the total costs associated with this program. Table VII–3 presents the estimated costs of this technology as applied to different ship and engine types representing the average ship characteristics discussed in Section VII.A.2.

(b) Lower Sulfur Fuel Hardware Costs

This cost analysis is based on the use of switching to lower sulfur fuel to meet the fuel sulfur standards. The costs presented here may be incurred by some existing and some newly built ships if additional fuel tank equipment is required to facilitate the use of lower sulfur fuel. Based on existing vessel fleet data, we estimate that approximately one-third of existing vessels may need additional equipment installed to accommodate additional lower sulfur fuel storage capacity beyond that installed on comparable new ships. In order to include any costs that may be incurred on new vessels that choose to add additional lower sulfur fuel capacity, we also estimated that one-third of new vessels may require additional hardware. Separate $/kW values were developed for new and existing vessels as the existing vessel retrofit would likely require more labor to complete installation.

The size of the tank is dependent on the frequency with which the individual ship owner prefers to fill the lower sulfur fuel tank. The size of the tanks and corresponding $/kW value estimated here will carry capacity sufficient for 250 hours of propulsion and auxiliary engine operation. This is most likely an overestimate of the amount of lower sulfur fuel a ship owner would need to carry, resulting in an overestimate of the total cost to existing and new vessels. The tank sizes based on 250 hours of operation and based on the six different engine configuration used in this analysis range from 240 m^3 to nearly 2,000 m^3. This would be the equivalent of 6–50 TEUs. This cost analysis does not reflect other design options such as partitioning of a residual fuel tank to allow for lower sulfur fuel capacity which would reduce the amount of additional space required, nor does this analysis reflect the possibility that some ships may have already been designed to carry smaller amounts of distillate fuel in separate tanks for purposes other than continuous propulsion. The $/kW value hardware cost values for the six data points corresponding to the six different engine types and sizes used in this analysis are $2–7 for SSD and $3–8 for MSD. A curve fit was determined for the slow-speed engine as well as for the medium speed engines to determine a $/kW value for each engine type. Table VII–3 presents the estimated costs of the technologies used to meet the different standards as applied to different ship and engine types representing the average ship characteristics discussed in Section VII.A.2. The estimated hardware costs of retrofitting existing U.S.-flagged vessels that may require additional hardware to accommodate the use of lower sulfur fuel is estimated to be $10.4 million in 2015.

TABLE VII–3—ESTIMATED VARIABLE COSTS OF EMISSION CONTROL TECHNOLOGY ON A PER-SHIP BASIS—BY SHIP TYPE AND ENGINE TYPE [a]

Ship type	Engine speed	Average propulsion power (kW)	MFI to common rail	EFI to common rail	Tier 3 (SCR and engine modifications)	Lower sulfur fuel hardware—new vessels	Lower sulfur fuel hardware—existing vessels
Auto Carrier	MSD	9640	$80,500	$30,400	$566,000	$42,300	$56,400
Bulk Carrier	MSD	6360	67,200	24,600	479,000	36,900	48,500
Container	MSD	13878	92,300	35,400	678,000	49,200	66,600
General Cargo	MSD	5159	60,400	21,700	448,000	34,900	45,600
Passenger	MSD	23762	109,600	42,800	939,000	65,400	90,400
Reefer	MSD	7360	71,900	26,600	506,000	38,500	50,900
RoRo	MSD	8561	76,700	28,700	538,000	40,500	53,800
Tanker	MSD	6697	68,800	25,300	488,000	37,400	49,300

[121] *http://www.iicl.org,* Institute of International Container Lessors.

[122] Kristensen, Hans Otto Holmegaard, "Preliminary Ship Design of Container Ships, Bulk Carriers, Tankers, and Ro-Ro Ships. Assessment of Environmental Impact from Sea-Borne Transport Compared with Landbased Transport," March, 2008.

[123] *http://people.hofstra.edu/geotrans/eng/ch2en/conc2en/maritimefreightrates.html.*

[124] *http://moneycentral.msn.com/investor/invsub/results/hilite.asp?Symbol=SSW.*

[125] Based on a container ship carrying nearly 9,000 TEUs traveling from Hong Kong to the Port of Los Angeles (approximately 6,400 nm) with a cruise speed of 25 nm/hr, the round trip time is nearly 21 days and this trip could be made roughly 16 times per year.

TABLE VII–3—ESTIMATED VARIABLE COSTS OF EMISSION CONTROL TECHNOLOGY ON A PER-SHIP BASIS—BY SHIP TYPE AND ENGINE TYPE [a]—Continued

Ship type	Engine speed	Average propulsion power (kW)	MFI to common rail	EFI to common rail	Tier 3 (SCR and engine modifications)	Lower sulfur fuel hardware—new vessels	Lower sulfur fuel hardware—existing vessels
Misc.	MSD	9405	79,800	30,000	560,000	41,900	55,800
Auto Carrier	SSD	11298	152,400	55,500	819,000	48,000	64,800
Bulk Carrier	SSD	8434	132,900	48,400	669,000	42,700	57,700
Container	SSD	27454	211,600	77,200	1,521,000	63,900	86,700
General Cargo	SSD	7718	127,000	46,200	630,000	41,100	55,500
Passenger	SSD	23595	201,500	73,500	1,374,000	61,200	83,000
Reefer	SSD	10449	147,200	53,600	776,000	46,500	62,900
RoRo	SSD	15702	174,300	63,500	1,034,000	53,900	72,900
Tanker	SSD	9755	142,600	51,900	739,000	45,300	61,200
Misc.	SSD	4659	93,300	33,900	50,000	32,000	43,100

[a] The values presented in Table VII–3 are provided only to show what the estimated costs would be for a range of vessel types given average characteristics (such as DWT, total main, and total auxiliary power) for both SSD and MSD engine types. Not all vessels will require all of these technologies; for example, it is estimated that only 30 percent of MSD will get common-rail fuel injection systems for Tier II.

(6) Total Costs Associated With the Coordinated Strategy

The total hardware costs associated with the coordinated strategy were estimated using the number of new ships by ship type and engine type entering the fleet each year. Table VII–4 presents the total hardware costs to U.S.-flagged vessels associated with the coordinated strategy. These costs consist of the variable and fixed hardware costs associated with the Annex VI existing engine program, Tier 2 and Tier 3 standards, and additional components that may be required to accommodate the use of lower sulfur fuel on both new and existing vessels. This table also presents the total estimated operational costs associated with the coordinated strategy. These costs consist of the 2 percent fuel consumption penalty associated with Tier 2 (Annex VI Tier II), the use of urea on vessels equipped with SCR systems, and the differential cost of using lower sulfur fuel; these costs are incurred by both U.S.- and foreign-flagged vessels. The total estimated cost of the coordinated strategy is $3.41 billion in 2030. The total costs from 2010 through 2040 are estimated to be $42.9 billion at a 3 percent discount rate or $22.1 at a 7 percent discount rate.

TABLE VII–4—TOTAL HARDWARE AND OPERATIONAL COSTS ASSOCIATED WITH THE COORDINATED STRATEGY

[Thousands of $]

Year	Total hardware costs for existing engines	Total new engine hardware costs	Total vessel hardware costs	Total operating costs		Total costs associated with the coordinated strategy
				U.S. flag	Foreign flag	
2010	$9,400	$319	$166	$0	$0	$485
2011	161,000	3,580	173	173	1,130	5,060
2012	153,000	3,700	179	841	5,590	10,300
2013	145,000	3,830	186	32,400	213,000	249,000
2014	137,000	3,960	192	34,400	226,000	265,000
2015	131,000	4,100	11,100	180,000	1,190,000	1,390,000
2016	0	27,300	691	189,000	1,250,000	1,470,000
2017	0	28,500	717	199,000	1,330,000	1,560,000
2018	0	29,600	745	210,000	1,410,000	1,650,000
2019	0	30,700	773	221,000	1,500,000	1,750,000
2020	0	31,900	803	233,000	1,590,000	1,860,000
2021	0	33,200	834	246,000	1,680,000	1,960,000
2022	0	34,600	866	258,000	1,770,000	2,060,000
2023	0	35,900	899	272,000	1,880,000	2,190,000
2024	0	37,400	934	286,000	1,980,000	2,300,000
2025	0	38,800	970	300,000	2,090,000	2,430,000
2026	0	40,400	1,010	315,000	2,200,000	2,560,000
2027	0	42,100	1,050	330,000	2,310,000	2,680,000
2028	0	43,700	1,090	345,000	2,430,000	2,820,000
2029	0	45,500	1,130	362,000	2,550,000	2,960,000
2030	0	47,400	1,180	378,000	2,680,000	3,110,000
2031	0	49,300	1,220	395,000	2,810,000	3,260,000
2032	0	51,300	1,270	413,000	2,950,000	3,420,000
2033	0	53,400	1,320	431,000	3,080,000	3,570,000
2034	0	55,500	1,370	451,000	3,240,000	3,750,000
2035	0	57,900	1,430	471,000	3,390,000	3,920,000
2036	0	60,200	1,490	494,000	3,560,000	4,120,000
2037	0	62,800	1,540	517,000	3,740,000	4,320,000
2038	0	65,300	1,610	541,000	3,930,000	4,540,000
2039	0	68,000	1,670	566,000	4,110,000	4,750,000
2040	0	70,800	1,740	591,000	4,310,000	4,970,000
NPV @ 3%	677,000	663,000	26,500	5,260,000	36,900,000	42,900,000

TABLE VII–4—TOTAL HARDWARE AND OPERATIONAL COSTS ASSOCIATED WITH THE COORDINATED STRATEGY—Continued

[Thousands of $]

Year	Total hardware costs for existing engines	Total new engine hardware costs	Total vessel hardware costs	Total operating costs		Total costs associated with the coordinated strategy
				U.S. flag	Foreign flag	
NPV @ 7%	610,000	346,000	16,900	2,730,000	19,000,000	22,100,000

C. Cost Effectiveness

One tool that can be used to assess the value of the coordinated strategy is the engineering costs incurred per ton of emissions reduced. This analysis involves a comparison of our program to other measures that have been or could be implemented. As summarized in this section, the coordinated strategy represents a highly cost effective mobile source control program for reducing NO_X, PM and SO_X emissions.

We have estimated the cost per ton based on the net present value of 3 percent and 7 percent of all hardware costs incurred by U.S.-flagged vessels, all operational costs incurred by both U.S. and foreign-flagged vessels, and all emission reductions generated from the year 2010 through the year 2040. The baseline case for these estimated reductions is the existing set of engine standards for C3 marine diesel engines and fuel sulfur limits. Table VII–5 shows the annual emissions reductions associated with the coordinated strategy; these annual tons are undiscounted. A description of the methodology used to estimate these annual reductions can be found in Section II of this preamble and Chapter 3 of the RIA.

TABLE VII–5—ESTIMATED EMISSIONS REDUCTIONS ASSOCIATED WITH THE COORDINATED STRATEGY

[Short tons]

Calendar year	Reductions (tons)		
	NO_X	SO_X	PM
2010	47,000	0	0
2011	54,000	0	0
2012	70,000	0	0
2013	88,000	390,000	48,400
2014	105,000	406,000	50,400
2015	123,000	641,000	68,000
2016	150,000	668,000	70,800
2017	209,000	695,000	73,700
2018	279,000	724,000	76,800
2019	349,000	755,000	80,000
2020	409,000	877,000	94,100
2021	488,000	916,000	98,200
2022	547,000	954,000	102,000
2023	634,000	995,000	107,000
2024	714,000	1,040,000	111,000
2025	790,000	1,080,000	116,000
2026	866,000	1,130,000	121,000
2027	938,000	1,170,000	126,000
2028	1,020,000	1,220,000	131,000
2029	1,100,000	1,280,000	137,000
2030	1,180,000	1,330,000	143,000
2031	1,260,000	1,390,000	149,000
2032	1,330,000	1,450,000	155,000
2033	1,410,000	1,510,000	162,000
2034	1,500,000	1,580,000	169,000
2035	1,590,000	1,650,000	177,000
2036	1,690,000	1,720,000	184,000
2037	1,810,000	1,800,000	193,000
2038	1,920,000	1,880,000	201,000
2039	2,020,000	1,970,000	210,000
2040	2,130,000	2,050,000	220,000
NPV at 3%	14,400,000	19,100,000	2,100,000
NPV at 7%	6,920,000	10,100,000	1,090,000

The net estimated reductions by pollutant, using a net present value of 3 percent from 2010 through 2040 are 14.4 million tons of NO_X, 19.1 million tons of SO_X, and 2.1 million tons of PM (6.9 million, 10.1 million, and 1.1 million tons of NO_X, SO_X, and PM, respectively, at a net present value of 7 percent over the same period.)

Using the above cost and emission reduction estimates, we estimated the lifetime (2010 through 2040) cost per ton of pollutant reduced. For this analysis, all of the hardware costs associated with the Annex VI existing engine program and Tier 2 and Tier 3 NO_X standards as well as the operational costs associated with the global Tier II and Tier III standards were attributed to NO_X reductions. The costs associated with lower sulfur fuel operational costs as applied to all vessels visiting U.S. ports and the hardware costs associated with accommodating the use of lower sulfur fuel on U.S.-flagged vessels were associated with SO_X and PM reductions. In this analysis, half of the costs associated with the use of lower sulfur fuel were allocated to PM reductions and half to SO_X, reductions, because the costs incurred to reduce SO_X emissions directly reduce emissions of PM as well. Using this allocation of costs and the emission reductions shown in Table VII–5 we can estimate the lifetime cost per ton reduced associated with each pollutant. These results are shown in Table VII–6. Using a net present value of 3 percent, the discounted lifetime cost per ton of pollutant reduced is $510 for NO_X, $930 for SO_X, and $7,950 for PM ($500, $920, and $7,850 per ton of NO_X, SO_X, and PM, respectively, at a net present value of 7 percent.) As shown in Table VII–6, these estimated discounted lifetime costs are similar to the annual long-term (2030) cost per ton of pollutant reduced.

TABLE VII–6—COORDINATED STRATEGY ESTIMATED AGGREGATE DISCOUNTED LIFETIME COST PER TON (2010–2040) AND LONG-TERM ANNUAL COST PER TON (2030) [a]

Pollutant	2010 thru 2040 discounted lifetime cost per ton at 3%	2010 thru 2040 discounted lifetime cost per ton at 7%	Long-term cost per ton (for 2030)
NO_X	$510	$500	$520
SO_X	930	920	940
PM	7,950	7,850	8,760

[a] The $/ton numbers presented here vary from those presented in the ECA proposal due to the net present value of the annualized reductions being applied from 2015–2020, and the use of metric tonnes rather than of short tons. Note that these costs are in 2006 U.S. dollars.

These results for the coordinated strategy compare favorably to other air emissions control programs. Table VII–7 compares the coordinated strategy to other air programs. This comparison shows that the coordinated strategy will provide a cost-effective strategy for generating substantial NO_X, SO_X, and PM reductions from Category 3 vessels. The results presented in Table VII–7 are lifetime costs per ton discounted at a net present value of 3 percent, with the exception of the stationary source program and locomotive/marine retrofits, for which annualized costs are presented. While results at a net present value of 7 percent are not presented, the results would be similar. Specifically, the coordinated strategy falls within the range of values for other recent programs.

TABLE VII–7—ESTIMATED $/TON FOR THE COORDINATED STRATEGY COMPARED TO PREVIOUS MOBILE SOURCE PROGRAMS FOR NO_X, SO_X, AND PM_{10}

Source category [a],	Implementation date	NO_X cost/ton	SO_X cost/ton	PM_{10} cost/ton
Category 3 Marine Compression Ignition Engine Coordinated Strategy FRM, 2009.	2011	510	930	7,950.
Nonroad Small Spark-Ignition Engines 73 FR 59034, October 8, 2008	2010	[b,c] 330–1,200		
Stationary Diesel (CI) Engines 71 FR 39154, July 11, 2006	2006	580–20,000		3,500–42,000.
Locomotives and C1/C2 Marine (Both New and Retrofits) 73 FR 25097, May 6, 2008	2015	[b] 730		8,400 (New). 45,000 (Retrofit).
Heavy Duty Nonroad Diesel Engines 69 FR 38957, June 29, 2004	2015	[b] 1,100	780	13,000.
Heavy Duty Onroad Diesel Engines 66 FR 5001, January 18, 2001	2010	[b] 2,200	5,800	14,000.

Notes:

[a] Table presents aggregate program-wide cost/ton over 30 years, discounted at a 3 percent NPV, except for Stationary CI Engines and Locomotive/Marine retrofits, for which annualized costs of control for individual sources are presented. All figures are in 2006 U.S. dollars per short ton.

[b] Includes NO_X plus non-methane hydrocarbons (NMHC). NMHC are also ozone precursors, thus some rules set combined NO_X+NMHC emissions standards. NMHC are a small fraction of NO_X so aggregate cost/ton comparisons are still reasonable.

[c] Low end of range represents costs for marine engines with credit for fuel savings, high end of range represents costs for other nonroad SI engines without credit for fuel savings.

D. Economic Impact Analysis

This section contains our analysis of the expected economic impacts of our coordinated strategy on the markets for Category 3 marine diesel engines, vessels using these engines, and the U.S. marine transportation service sector. We briefly describe our methodology and present our estimated expected economic impacts.

The total estimated social costs of the coordinated strategy in 2030 are equivalent to the estimated engineering compliance costs of the program, at approximately $3.1 billion.[126] As explained below, these costs are expected to accrue initially to the owners and operators of affected vessels when they purchase engines, vessels, and fuel. These owners and operators are expected to pass their increased

[126] The costs totals reported in this FRM are slightly different than those reported in the ECA proposal. This is because the ECA proposal did not include costs associated with the Annex VI existing engine program, Tier II, or the costs associated with existing vessel modifications that may be required to accommodate the use of lower sulfur fuel. Further, the cost totals presented in the ECA package included Canadian cost estimates.

costs on to the entities that purchase international marine transportation services, in the form of higher freight rates. Ultimately, these social costs are expected to be borne by the final consumers of goods transported by affected vessels in the form of slightly higher prices for those goods.

We estimate that compliance with the coordinated strategy would increase the price of a new vessel by 0.5 to 2 percent, depending on the vessel type. The price impact of the coordinated strategy on the marine transportation services sector would vary, depending on the route and the amount of time spent in waterways covered by the engine and fuel controls (the U.S. ECA and U.S. internal waters covered by the coordinated strategy). For example, we estimate that the cost of operating a ship in liner service between Singapore, Seattle, and Los Angeles/Long Beach, which includes about 1,700 nm of operation in waterways covered by the coordinated strategy, would increase by about 3 percent. For a container ship, this represents a price increase of about $18 per container (3 percent price increase), assuming the total increase in operating costs is passed on to the purchaser of the marine transportation services. The per passenger price of a seven-day Alaska cruise on a vessel operating entirely within waterways covered by the coordinated strategy is expected to increase by about $7 per day, again assuming that the total increase in operating costs is passed on to the passengers of the vessel. Ships that spend less time in covered areas would experience relatively smaller increases in their operating costs, and the impacts on their freight prices is expected to be smaller.

It should be noted that this economic analysis holds all other aspects of the market constant except for the elements of the coordinated strategy. It does not attempt to predict future market equilibrium conditions, particularly with respect to how excess capacity in today's market due to the current economic downturn will be absorbed. This approach is appropriate because the goal of an economic impact analysis is to explore the impacts of a specific program; allowing changes in other market conditions would confuse the impacts due to the regulatory program.

The remainder of this section provides information on the methodology we used to estimate these economic impacts and the results of our analysis. A more detailed discussion can be found in Chapter 7 of the RIA prepared for this rule.

(1) What Is the Purpose of an Economic Impact Analysis?

In general, the purpose of an Economic Impact Analysis (EIA) is to provide information about the potential economic consequences of a regulatory action, such as the coordinated strategy to reduce emissions from Category 3 vessels. Such an analysis consists of estimating the social costs of a regulatory program and the distribution of these costs across stakeholders. The estimated social costs can then be compared with the estimated social benefits as presented elsewhere in this preamble.

In an economic impact analysis, social costs are the value of the goods and services lost by society resulting from (a) the use of resources to comply with and implement a regulation and (b) reductions in output. There are two parts to the analysis. In the market analysis, we estimate how prices and quantities of goods directly affected by the emission control program can be expected to change once the program goes into effect. In the economic welfare analysis, we look at the total social costs associated with the program and their distribution across key stakeholders.

(2) How Did We Estimate the Economic Impacts of the Coordinated Strategy?

Our analysis of the economic impacts of the coordinated strategy is based on the application of basic microeconomic theory. In this analysis, we use a competitive market model approach in which the interaction between supply and demand determines equilibrium market prices and quantities. The competitive model approach is appropriate for the vessel building and transportation service markets because in each of those markets there are many producers and consumers are not constrained to use one producer over the others.[127]

We also use a competitive market structure for the Category 3 engine market. This market is characterized by a small number of manufacturers (2 companies comprising about 60 percent of the market, with two others having a notable share), which suggests that this limited number of manufacturers may have certain market power. However, an important characteristic of the market suggests this market may nevertheless be competitive. Specifically while the primary engine companies design and patent Category 3 marine diesel engines, they manufacture only key components and not the actual engine itself. Engines are manufactured through licensing agreements with shipyards or other companies. Licensees pay a fixed cost to the primary engine manufacturers for using their designs and brands. Engine prices are then set by the licensees, sometimes as part of the price of a completed vessel, and there is competition among these firms to manufacturer engines and vessels.

Nevertheless, to estimate the maximum economic impact of the program, we can examine how the results of this economic impact analysis would change if we assumed an imperfectly competitive market structure. In markets with a small number of producers, it is not uncommon for manufacturers to exercise market power to obtain prices above their costs, thereby securing greater profits. In this case, market prices would be expected to increase by more than the compliance costs of the regulatory program, although the magnitude of the increase would be limited by the existing dynamics of the market (*i.e.,* the current difference between the actual market price and the competitive market price). This impact is discussed in more detail in Section VII.D.5, below. The higher price impact from imperfect competition would be transmitted to the vessel and marine transportation markets. However, even in this case, the price impacts of this rule on the Category 3 engine market are not expected to be large given the price increases estimated for the competitive case, described below. This is because the compliance costs for engine program are relatively small compared to the price of a vessel.

Finally, the existence of only a small number of firms in a market does not mean that the market necessarily behaves noncompetitively. In the Bertrand competition model, firms compete with each other by choosing a lower price.[128] When they compete repeatedly, the market price is expected to approximate the price that would occur in a perfectly competitive market. In this case, the two primarily engine producers compete against each other and against the smaller producers in the market. They also compete to sell the same or similar engines in the land-based electrical power generating market, where they face many more competitors.

In a competitive structure model, we use the relationships between supply and demand to simulate how markets can be expected to respond to increases

[127] Stopford describes these markets as competitive. *See* Stopford, Martin. Maritime Economics, 3rd Edition (Routledge, 2009), Chapter 4.

[128] Tirole, Jean. The Theory of Industrial Organization (1989). MIT Press. *See* pages 223–224.

in production costs that occur as a result of the new emission control program. We use the laws of supply and demand to construct a model to estimate the social costs of the program and identify how those costs will be shared across the markets and, thus, across stakeholders. The relevant concepts are summarized below and are presented in greater detail in Chapter 7 of the RIA.

Before the implementation of a control program, a competitive market is assumed to be in equilibrium, with producers producing the amount of a good that consumers desire to purchase at the market price. The implementation of a control program results in an increase in production costs by the amount of the compliance costs. This generates a "shock" to the initial equilibrium market conditions (a change in supply). Producers of affected products will try to pass some or all of the increased production costs on to the consumers of these goods through price increases, without changing the quantity produced. In response to the price increases, consumers will decrease the quantity they buy of the affected good (a change in the quantity demanded). This creates surplus production at the new price. Producers will react to the decrease in quantity demanded by reducing the quantity they produce, and they will be willing to sell the remaining production at a lower price that does not cover the full amount of the compliance costs. Consumers will then react to this new price. These interactions continue until the surplus production is removed and a new market equilibrium price and quantity combination is achieved.

The amount of the compliance costs that will be borne by stakeholders is ultimately limited by the price sensitivity of consumers and producers in the relevant markets, represented by the price elasticities of demand and supply for each market. An "inelastic" price elasticity (less than one) means that supply or demand is not very responsive to price changes (a one percent change in price leads to less than one percent change in quantity). An "elastic" price elasticity (more than one) means that supply or demand is sensitive to price changes (a one percent change in price leads to more than one percent change in quantity). A price elasticity of one is unit elastic, meaning there is a one-to-one correspondence between a percent change in price and percent change in quantity.

On the production side, price elasticity of supply depends on the time available to adjust production in response to a change in price, how easy it is to store goods, and the cost of increasing (or decreasing) output. In this analysis, we assume the supply for engines, vessels, and marine transportation services is elastic: an increase in the market price of an engine, vessel or freight rates will lead producers to want to produce more, while a decrease will lead them to produce less (this is the classic upward-sloping supply curve). It would be difficult to estimate the slope of the supply curve for each of these markets given the global nature of the sector and, as explained in Chapter 7 of the RIA it is not necessary to have estimated supply elasticities for this analysis due to the assumption of nearly perfectly inelastic demand for the marine transportation sector. However, we can make some observations about the supply elasticities based on the nature of each sector. For the marine transportation sector, it is reasonable to assume a supply elasticity equal to or greater than one because the amount of transportation services provided can easily be adjusted due to a change in price in most cases (*e.g.,* move more or fewer containers or passengers) especially if the market can carry a certain amount of excess capacity. For the new Category 3 engine market the supply elasticity is also likely to be greater than one. These engines are often used in other land-based industries, notably in power plants, which provide a market to accommodate production fluctuations as manufacturers adjust their output for the marine market. The supply elasticity for the vessel construction market, on the other hand, is upward sloping but the slope (supply elasticity) may be less than or equal to one depending on the vessel type. This would be expected since it may be harder to adjust production and/or store output if the price drops, or rapidly increase production if the price increases. Because of the nature of this industry, it may not be possible to easily switch production to other goods, or to stop or start production of new vessels.

On the consumption side, we assume that the demand for engines is a function of the demand for vessels, which is a function of the demand for international shipping (demand for engines and vessels is derived from the demand for marine transportation services). This makes intuitive sense: Category 3 engine and vessel manufacturers would not be expected to build an engine or vessel unless there is a purchaser, and purchasers will want a new vessel/engine only if there is a need for one to supply marine transportation services. Deriving the price elasticity of demand for the vessel and engine markets from the international shipping market is an important feature of this analysis because it provides a link between the product markets.

In this analysis, the price elasticity of demand for marine transportation services, and therefore for vessels and Category 3 engines, is assumed to be nearly perfectly inelastic (the demand for marine transportation services will remain the same for all price changes). This stems from the fact that for most goods, there are no reasonable alternative shipping modes. In most cases, transportation by rail or truck is not feasible, and transportation by aircraft is too expensive. Approximately 90 percent of world trade by tonnage is moved by ship, and ships provide the most efficient method to transport these goods on a tonne-mile basis.[129] Stopford notes that "shippers need the cargo and, until they have time to make alternative arrangements, must ship it regardless of cost * * *. The fact that freight generally accounts for only a small portion of material costs reinforces this argument." [130] A nearly perfectly inelastic price elasticity of demand for marine transportation services means that virtually all of the compliance costs can be expected to be passed on to the consumers of marine transportation services, with no change in output for engine producers, ship builders, or owners and operators of ships engaged in international trade. Section VII.D.5, below, provides a discussion of the impact of relaxing of the nearly perfect demand elasticity for marine transportation services in general, and for the cruise industry specifically. Relaxing this assumption is not expected to change the estimated total social costs of the program, which are limited by the engineering compliance costs. However, it would change the way those costs are shared among stakeholders.

Finally, with regard to the fuel markets, the impacts of the coordinated strategy on fuel costs were assessed using the World Oil Refining Logistics and Demand (WORLD) model, as run by Ensys Energy & Systems, the owner and developer of the refinery model. As described in Chapter 5 of the RIA, the WORLD model is the only such model currently developed for this purpose, and was developed by a team of international petroleum consultants. It

[129] Harrould-Koleib, Ellycia. Shipping Impacts on Climate: A Source with Solutions. Oceana, July 2008. A copy of this report can be found at *http://www.oceana.org/fileadmin/oceana/uploads/Climate_Change/Oceana_Shipping_Report.pdf.*

[130] Stopford, Martin. *Maritime Economics, 3rd Edition.* Routledge, 2009. p. 163.

has been widely used by industries, government agencies, and OPEC over the past 13 years, including the Cross Government/Industry Scientific Group of Experts, established to evaluate the effects of the different fuel options proposed under the revision of MARPOL Annex VI. The model incorporates crude sources, global regions, refinery operations, and world economics, as well as assumptions about how these markets respond to regulatory programs. The results of the WORLD model have been shown to be comparable to other independent predictions of global fuel, air pollutant emissions and economic predictions.

WORLD is a comprehensive, bottom-up model of the global oil downstream that includes crude and noncrude supplies; refining operations and investments; crude, products, and intermediates trading and transport; and product blending/quality and demand. Its detailed simulations are capable of estimating how the global system can be expected to operate under a wide range of different circumstances, generating model outputs such as price effects and projections of refinery operations and investments.

This analysis of the economic impacts of the coordinated strategy relies on the estimated engineering compliance costs for engines and fuels described in Sections VII.A (fuels) and VII.B (engines) above. These costs include hardware costs for new U.S. vessels to comply with the Tier 2 and Tier 3 engine standards, and for existing U.S. vessels to comply with the MARPOL Annex VI requirements for existing engines. There are also hardware costs for fuel switching equipment on new and existing U.S. vessels to comply with the 1,000 ppm fuel sulfur limit; the cost analysis assumes that 32 percent of all vessels require fuel switching equipment to be added (new vessels) or retrofit (existing vessels). Also included are expected increases in operating costs for U.S. and foreign vessels operating in the inventory modeling domain (the waterways covered by the engine and fuel controls, *i.e.,* the U.S. ECA and U.S. internal waters covered by the coordinated strategy.[131] These increased operating costs include changes in fuel consumption rates, increases in fuel costs, and the use of urea for engines equipped with SCR, as well as a small increase in operating costs for operation outside the waterways affected by the coordinated strategy due to the fuel price impacts of the program.

(3) What Are the Estimated Market Impacts of the Coordinated Strategy?

(a) What Are the Estimated Engine and Vessel Market Impacts of the Coordinated Strategy?

The estimated market impacts for engines and vessels are based on the variable costs associated with the engine and vessel compliance programs; fixed costs are not included in the market analysis. This is appropriate because in a competitive market the industry supply curve is generally based on the market's marginal cost curve; fixed costs do not influence production decisions at the margin. Therefore, the market analysis for a competitive market is based on variable costs only.

The assumption of nearly perfectly inelastic demand for marine transportation services means that the quantity of these services purchased is not expected to change as a result of costs of complying with the requirements of the coordinated strategy. As a result, the demand for vessels and engines would also not change compared to the no-control scenario, and the quantities produced would remain the same.

The assumption of nearly perfectly inelastic demand for marine transportation services also means the price impacts of the coordinated strategy on new engines and vessels would be equivalent to the variable engineering compliance costs. Estimated price impacts for a sample of engine-vessel combinations are set out in Table VII–8 for medium speed engines, and Table VII–9 for slow speed engines. These are the estimated price impacts associated with the Tier 3 engine standards on a vessel that will switch fuels to comply with the fuel sulfur requirements while operating in the waterways covered by the engine and fuel controls. Because there is no phase-in for the standards, the estimated price impacts are the same for all years, beginning in 2016.

TABLE VII–8—SUMMARY OF ESTIMATED MARKET IMPACTS—MEDIUM SPEED TIER 3 ENGINES AND VESSELS

[$2006] [a]

Ship type	Average propulsion power	New vessel engine price impact (new tier 3 engine price impact) [b]	New vessel fuel switching equipment price impact [c]	New vessel total price impact
Auto Carrier	9,600	$573,200	$42,300	$615,500
Bulk Carrier	6,400	483,500	36,900	520,400
Container	13,900	687,800	49,200	736,000
General Cargo	5,200	450,300	34,900	475,200
Passenger	23,800	952,500	65,400	1,107,900
Reefer	7,400	511,000	38,500	549,500
RoRo	8,600	543,800	40,500	584,300
Tanker	6,700	492,800	37,400	530,200
Misc.	9,400	566,800	41,900	608,700

Notes:

[a] The new vessel engine price impacts listed here do not include a per engine cost of $10,000 for engines installed on U.S. vessels to comply with the proposed production testing requirement (§ 1042.302).

[b] Medium speed engine price impacts are estimated from the cost information presented in Chapter 5 of the RIA using the following formula: (10%*($/SHIP_MECH→CR)) + (30%*($/SHIP_ELEC→CR)) + (T3 ENGINE MODS) + (T3SCR)).

[c] Assumes 32 percent of new vessels would require the fuel switching equipment.

[131] The MARPOL amendments include Tier II and Tier III NO_X standards that apply to all vessels, including foreign vessels. While the analysis does not include hardware costs for the MARPOL Tier II and Tier III standards for foreign vessels because foreign vessels operate anywhere in the world, it is appropriate to include the operating costs for these foreign vessels while they are operating in our inventory modeling domain. This is because foreign vessels complying with the Tier II and Tier III standards will have a direct beneficial impact on U.S. air quality, and if we consider the benefits of these standards we should also consider their costs.

TABLE VII–9—SUMMARY OF ESTIMATED MARKET IMPACTS—SLOW SPEED TIER 3 ENGINES AND VESSELS ($2006) [a]

Ship type	Average propulsion power	New vessel engine price impact (new tier 3 engine price impact) [b]	New vessel fuel switching equipment price impact [c]	New vessel total price impact
Auto Carrier	11,300	$825,000	$48,000	$873,000
Bulk Carrier	8,400	672,600	42,700	715,300
Container	27,500	1,533,100	63,900	1,597,000
General Cargo	7,700	632,900	41,000	673,900
Passenger	23,600	1,385,300	61,200	1,446,500
Reefer	10,400	781,000	46,500	827,500
RoRo	15,700	1,042,100	53,900	1,096,000
Tanker	9,800	744,200	45,300	789,500
Misc.	4,700	453,600	32,000	485,600

Notes:

[a] The new vessel engine price impacts listed here do not include a per engine cost of $10,000 for engines installed on U.S. vessels to comply with the proposed production testing requirement (§ 1042.302).

[b] Slow speed engine price impacts are estimated from the cost information presented in Chapter 5 using the following formula: (5%*($/SHIP_MECH→CR)) + (15%*($/SHIP_ELEC→CR)) + (T3 ENGINE MODS) + (T3 SCR)).

[c] Assumes 32 percent of new vessels would require the fuel switching equipment.

The estimated price impacts for Tier 2 vessels would be substantially lower, given the technology that will be used to meet the Tier 2 standards is much less expensive. The cost of complying with the Tier 2 standards ranges from about $56,000 to $100,000 for a medium speed engine, and from about $130,000 to $250,000 for a slow speed engine (*see* discussion in Chapter 7 of the RIA). Again, because the standards do not phase in, the estimated price impacts are the same for all years the Tier 2 standards are required, 2011 through 2015.

These estimated price impacts for Tier 2 and Tier 3 vessels are small when compared to the price of a new vessel. A selection of new vessel prices is provided in Table VII–10; these range from about $40 million to $480 million. The program price increases range from about $600,000 to $1.5 million. A price increase of $600,000 to comply with the Tier 3 standards and fuel switching requirements would be an increase of approximately 2 percent for a $40 million vessel. The largest vessel price increase noted above for a Tier 3 passenger vessel is about $1.5 million; this is a price increase of less than 1 percent for a $478 million passenger vessel. Independent of the nearly-perfect inelasticity of demand, price increases of this magnitude would be expected to have little, if any, effect on the sales of new vessels, all other economic conditions held constant.

TABLE VII–10—NEWBUILD VESSEL PRICE BY SHIP TYPE AND SIZE, SELECTED VESSELS

[Millions, $2008]

Vessel type	Vessel size category	Size range (mean) (DWT)	Newbuild
Bulk Carrier	Handy	10,095–39,990 (27,593)	$56.00
	Handymax	40,009–54,881 (47,616)	79.00
	Panamax	55,000–78,932 (69,691)	97.00
	Capesize	80,000–364,767 (157,804)	175.00
Container	Feeder	1,000–13,966 (9,053)	38.00
	Intermediate	14,003–36,937 (24,775)	70.00
	Panamax	37,042–54,700 (45,104)	130.00
	Post Panamax	55,238–84,900 (67,216)	165.00
Gas carrier	Midsize	1,001–34,800 (7,048)	79.70
	LGC	35,760–59,421 (50,796)	37.50
	VLGC	62,510–122,079 (77,898)	207.70
General cargo	Coastal Small	1,000–9,999 (3,789)	33.00
	Coastal Large	10,000–24,912 (15,673)	43.00
	Handy	25,082–37,865 (29,869)	52.00
	Panamax	41,600–49,370 (44,511)	58.00
Passenger	All	1,000–19,189 (6,010)	478.40
Reefer	All	1,000–19,126 (6,561)	17.30
Ro-Ro	All	1,000–19,126 (7,819)	41.20
Tanker	Coastal	1,000–23,853 (7,118)	20.80
	Handymax	25,000–39,999 (34,422)	59.00
	Panamax	40,000–75,992 (52,300)	63.00
	AFRAmax	76,000–117,153 (103,112)	77.00
	Suezmax	121,109–167,294 (153,445)	95.00

TABLE VII–10—NEWBUILD VESSEL PRICE BY SHIP TYPE AND SIZE, SELECTED VESSELS—Continued

[Millions, $2008]

Vessel type	Vessel size category	Size range (mean) (DWT)	Newbuild
	VLCC	180,377–319,994 (294,475)	154.00

Sources: Lloyd's Shipping Economist (2008), Informa (2008), Lloyd's Sea-Web (2008).

(b) What Are the Estimated Fuel Market Impacts of the Coordinated Strategy?

The market impacts for the fuel markets were estimated through the modeling performed to estimate the fuel compliance costs for the coordinated strategy. In the WORLD model, the total quantity of fuel used is held constant, which is consistent with the assumption that the demand for international shipping transportation would not be expected to change due to the lack of transportation alternatives.

The expected price impacts of the coordinated strategy are set out in Table VII–11. Note that on a mass basis, less distillate than residual fuel is needed to go the same distance (5 percent less). The prices in Table VII–11 are adjusted for this impact.

Table VII–11 shows that the coordinated strategy is expected to result in a small increase in the price of marine distillate fuel, about 1.3 percent. The price of residual fuel is expected to decrease slightly, by less than one percent, due to a reduction in demand for that fuel.

TABLE VII–11—SUMMARY OF ESTIMATED MARKET IMPACTS—FUEL MARKETS

Fuel	Units	Baseline price	Control price	Adjusted for energy density	% change
Distillate	$/tonne	$462	$468	N/A	+1.3%
Residual	$/tonne	$322	$321	N/A	−0.3%
Fuel Switching	$/tonne	$322	$468	$444	+38.9%[a]

Notes:
[a] Energy adjusted value.

Because of the need to shift from residual fuel to distillate fuel for ships while operating in the waterways covered by the engine and fuel controls (the U.S. ECA and U.S. internal waters covered by the coordinated strategy), ship owners are expected to see an increase in their total cost of fuel. This increase is because distillate fuel is more expensive than residual fuel. Factoring in the higher energy content of distillate fuel relative to residual fuel, the fuel cost increase would be about 39 percent.

(c) What Are the Estimated Marine Transportation Market Impacts of the Coordinated Strategy?

We used the above information to estimate the impacts on the prices of marine transportation services. This analysis, which is presented in Chapter 7 of the RIA, is limited to the impacts of increases in operating costs due to the fuel and emission requirements of the coordinated strategy. Operating costs would increase due to the increase in the price of fuel, the need to switch to fuel with a sulfur content not to exceed 1,000 ppm while operating in the waterways covered by the engine and fuel controls, and due to the need to dose the aftertreatment system with urea to meet the Tier 3 standards. Table VII–12 summarizes these price impacts for selected transportation markets. Table VII–12 also lists the vessel and engine parameters that were used in the calculations.

TABLE VII–12—SUMMARY OF IMPACTS OF OPERATIONAL FUEL/UREA COST INCREASES

Vessel type	Vessel and engine parameters	Operational price increases
Container	36,540 kW	$17.53/TEU.
North Pacific Circle Route	50,814 DWT	
Bulk Carrier	3,825 kW	$0.56/tonne.
North Pacific Circle Route	16,600 DWT	
Cruise Liner	31,500 kW	$6.60/per passenger per day.
(Alaska)	226,000 DWT	
	1,886 passengers	

This information suggests that the increase in marine transportation service prices would be small, both absolutely and when compared to the price charged by the ship owner per unit transported and are estimated to be about $18 per TEU on the North Pacific Circle Route and $0.56 per tonne for bulk cargo on the North Pacific Circle Route. Stopford notes that the price of transporting a 20 foot container between the UK and Canada is estimated to be about $1,500; of that, $700 is the cost of the ocean freight; the rest is for port, terminal, and other charges.[132] Thus, a price increase of about $18 represents an increase of less than 3 percent of ocean freight cost, and about one percent of transportation cost. Similarly, the price of a 7-day Alaska cruise varies

[132] Stopford, Martin, *Maritime Economics,* 3rd Edition. Routledge, 2009. Page 519.

from $100 to $400 per night or more. In that case, a price increase of about $7 per night would be a 1.5 percent to about 6 percent increase.

(4) What Are the Estimated Social Costs of the Coordinated Strategy and How Are They Expected To Be Distributed Across Stakeholders?

The total social costs of the coordinated strategy are based on both fixed and variable costs. Fixed costs are a cost to society: They displace other product development activities that may improve the quality or performance of engines and vessels. In this economic impact analysis, fixed costs are accounted for in the year in which they occur, with the fixed costs associated with the Tier 2 engine standards accounted for in 2010 and the fixed costs associated with the Tier 3 engine standards and the fuel sulfur controls for vessels operating on the waterways covered by the coordinated strategy are accounted for in the five-year period beginning prior to their effective dates.

The estimated social costs of the coordinated strategy for all years are presented in Table VII–4. For 2030, the social costs are estimated to be about $3.1 billion.[133] For the reasons described above and explained more fully in the RIA, these costs are expected to be borne fully by consumers of marine transportation services.

These social costs are small when compared to the total value of U.S. waterborne foreign trade. In 2007, waterborne trade for government and non-government shipments by vessel into and out of U.S. foreign trade zones, the 50 States, the District of Columbia, and Puerto Rico was about $1.4 trillion. Of that, about $1 trillion was for imports.[134]

If only U.S. vessels are considered, the social costs of the coordinated strategy in 2030 would be about $427.5 million. Again, these social costs are small when compared to the annual revenue for this sector. In 2002, the annual revenue for this sector was about $19.8 billion.[135]

(5) Sensitivity Analyses

In this section we briefly discuss the impact of relaxing several of the assumptions used in our economic impact analysis for the coordinated strategy, including the assumption of nearly perfectly inelastic demand for marine transportation services, nearly perfectly inelastic demand for cruise services, and a competitive market structure for the Category 3 marine diesel engine market. Each of these cases is examined more fully in Chapter 7 of the RIA for this rule.

To examine the impact of the assumption of nearly perfectly inelastic demand elasticity for marine transportation services, we would determine a discrete value for that elasticity and then create a computer model to model the effects of the coordinated strategy. It would be difficult to develop such an elasticity using available industry information. Therefore, this alternative analysis relies on the price elasticities we developed for our 2008 rulemaking that set technology-forcing standards for Category 1 and Category 2 engines (73 FR 25098, May 6, 2008). Although these price elasticities of demand and supply were developed using data for United States markets only, they reflect behavioral reactions to price changes if alternative modes of transportation were available. While they are not specific to the global marine transportation market, they are useful to provide an idea of the change in results that could be expected if the demand elasticity for marine transportation is not nearly perfectly inelastic.

The values used for the behavioral parameters for the Category 1 and 2 markets are provided in Table VII–13. In this case, the demand for marine transportation services is estimated to be somewhat inelastic: A one percent increase in price will result in a 0.5 percent decrease in demand.

TABLE VII–13—BEHAVIORAL PARAMETERS USED IN LOCOMOTIVE/MARINE ECONOMIC IMPACT MODEL

Sector	Market	Demand elasticity	Source	Supply elasticity	Source
Marine	Marine Transportation Services.	−0.5 (inelastic)	Literature estimate	0.6 (inelastic)	Literature estimate.
	Commercial Vessels [a]	Derived	N/A	2.3 (elastic)	Econometric estimate.
	Engines	Derived	N/A	3.8 (elastic)	Econometric estimate.

Notes:
[a] Commercial vessels include tug/tow/pushboats, ferries, cargo vessels, crew/supply boats, and other commercial vessels.

In general, relaxing the condition of nearly perfectly inelastic demand elasticity would result in the compliance costs of the coordinated strategy being shared by consumers and suppliers. The distribution of compliance costs from our earlier rule are presented in Table VII–14. While the emission control requirements and the compliance cost structure of the coordinated strategy are somewhat different, these results give an idea of how costs would be shared if the assumption of nearly perfectly inelastic price elasticity of demand for the transportation services market in the ocean-going marine sector were relaxed.

[133] The costs totals reported in this FRM are slightly different than those reported in the ECA proposal. This is because the ECA proposal did not include costs associated with the Annex VI existing engine program, Tier II, or the costs associated with existing vessel modifications that may be required to accommodate the use of lower sulfur fuel. Further, the cost totals presented in the ECA package included Canadian cost estimates.

[134] Census Bureau's Foreign Trade Division, *U.S. Waterborne Foreign Trade by U.S. Custom Districts,* as reported by the Maritime Administration at *http://www.marad.dot.gov/library_landing_page/data_and_statistics/Data_and_Statistics.htm,* accessed April 9, 2009.

[135] U.S. Census Bureau, Industry Statistics Sampler, NAICS 48311, Deep sea, coastal, and Great Lakes transportation, at *http://www.census.gov/econ/census02/data/industry/E48311.HTM,* assessed on April 9, 2009.

TABLE VII–14—DISTRIBUTION OF SOCIAL COSTS AMONG STAKEHOLDER GROUPS—CATEGORY 1 AND CATEGORY 2 ENGINE PROGRAM

Stakeholder group	2020 (percent)	2030 (percent)
Marine engine producers	0.8	0.5
Marine vessel producers	10.7	3.8
Recreational and fishing vessel consumers	8.4	4.1
Marine transportation service providers	36.4	41.5
Marine transportation service consumers	43.8	50.0
Total	100.0	100.0

With regard to cruise transportation, commenters remarked that demand is not nearly perfectly inelastic. Cruises are a recreational good, and if the price of a cruise increases, consumers will choose to spend their recreational budgets on other activities.

The same analysis described above would also apply in this particular sector of the marine transportation market. In this case, the share of the compliance costs that will be borne by the cruise industry suppliers will depend on the magnitude of the demand elasticity. If the price elasticity of demand is larger (in absolute value) than the price elasticity of supply, ship owners will bear a larger share of the costs of the program; if the price elasticity of demand is smaller (in absolute value) than the price elasticity of supply, consumers will bear a larger share of the program.

In our 2002 recreational vehicle rule, we estimated the demand elasticity for inboard cruisers to be about −1.4 and the supply elasticity to be about 1.6.[136] Using these values as a proxy for cruise ship demand and supply, this suggests that the compliance costs will be shared among passengers and operators roughly evenly.

As described in Section 7.3 of the RIA, the compliance costs associated with the coordinated strategy are expected to be small compared to the daily costs of a cruise, at about $7 per night. Overall, total engine and vessel costs are expected to increase about one percent and operating costs increasing between 1.5 and 6 percent. These increases are within the range of historic variations in bunker fuel prices. So, although relaxing the assumption of nearly perfectly elastic demand elasticity for cruises means the burden of the coordinated strategy would be shared between cruise ship operators and cruise ship passengers, those costs, and therefore the expected price increases, are expected to be small compared to the price of a cruise.

Finally, this Economic Impact Analysis assumes that the market structure for the Category 3 marine diesel engine market is competitive. As explained above, this assumption is reasonable even though there are few producers in this market. If, in fact, this market is noncompetitive and behaves more like an oligopoly, then the results of the analysis would be somewhat different. Specifically, oligopolistic producers can set the market price at a level higher than the competitive market price, capturing larger profits than would otherwise be the case. However, this price premium would already be reflected in the prices of Category 3 marine diesel engines. What would change in the analysis is the magnitude of the compliance costs passed on to consumers of these engines (vessel builders and the transportation services market), which would be higher than the compliance costs. This effect is discussed in Chapter 7 of the RIA.

VIII. Benefits

This section presents our analysis of the health and environmental benefits that will occur as a result of EPA's coordinated strategy to address emissions from Category 3 engines and ocean-going vessels throughout the period from initial implementation through 2030. We provide estimated benefits for the entire coordinated strategy, including the Annex VI Tier 2 NO_X requirements and the ECA controls that will be mandatory for U.S. and foreign vessels through the Act to Prevent Pollution from Ships. However, unlike the cost analysis, this benefits analysis does not allocate benefits between the components of the program (the requirements in this rule and the requirements that would apply through MARPOL Annex VI and ECA implementation). This is because the benefits of the coordinated strategy will be fully realized only when the U.S. ECA is in place and both U.S. and foreign vessel are required to use lower sulfur fuel and operate their Tier 3 NO_X controls while in the designated area, and therefore it makes more sense to consider the benefits of the coordinated strategy as a whole.

The components of the coordinated strategy will apply stringent NO_X and SO_X standards to virtually all vessels that affect U.S. air quality, and impacts on human health and welfare will be substantial. As presented in Section II, the coordinated strategy is expected to provide very large reductions in direct PM, NO_X, SO_X, and toxic compounds, both in the near term and in the long term. Emissions of NO_X (a precursor to ozone formation and secondarily-formed $PM_{2.5}$), SO_X (a precursor to secondarily-formed $PM_{2.5}$) and directly-emitted $PM_{2.5}$ contribute to ambient concentrations of $PM_{2.5}$ and ozone. Exposure to ozone and $PM_{2.5}$ is linked to adverse human health impacts such as premature deaths as well as other important public health and environmental effects.

Using the most conservative premature mortality estimates (Pope *et al.,* 2002 for $PM_{2.5}$ and Bell *et al.,* 2004 for ozone),[137 138] we estimate that implementation of the coordinated strategy will reduce approximately 12,000 premature mortalities in 2030 and yield approximately $110 billion in total benefits. The upper end of the premature mortality estimates (Laden *et al.,* 2006 for $PM_{2.5}$ and Levy *et al.,* 2005 for ozone)[139 140] increases avoided

[136] EPA420–02–022, Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines, Chapter 9. A copy of this document is available at *http://www.epa.gov/otaq/regs/nonroad/2002/r02022j.pdf.*

[137] Pope, C.A., III, R.T. Burnett, M.J. Thun, E.E. Calle, D. Krewski, K. Ito, and G.D. Thurston (2002). Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution. *Journal of the American Medical Association,* 287, 1132–1141.

[138] Bell, M.L., *et al.* (2004). Ozone and short-term mortality in 95 U.S. urban communities, 1987–2000. *Journal of the American Medical Association, 292(19),* 2372–2378.

[139] Laden, F., J. Schwartz, F.E. Speizer, and D.W. Dockery (2006). Reduction in Fine Particulate Air Pollution and Mortality. *American Journal of Respiratory and Critical Care Medicine. 173,* 667–672.

[140] Levy, J.I., S.M. Chemerynski, and J.A. Sarnat (2005). Ozone exposure and mortality: an empiric

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premature mortalities to approximately 31,000 in 2030 and yields approximately $270 billion in total benefits. Thus, even taking the most conservative premature mortality assumptions, the health impacts of the coordinated strategy presented in this rule are clearly substantial.

A. Overview

We base our analysis on peer-reviewed studies of air quality and human health effects (*see* U.S. EPA, 2006 and U.S. EPA, 2008).[141] [142] These methods are described in more detail in the RIA that accompanies this action. To model the ozone and PM air quality impacts of the CAA standards and requirements and the ECA designation, we used the Community Multiscale Air Quality (CMAQ) model (*see* Section II). The modeled ambient air quality data serves as an input to the Environmental Benefits Mapping and Analysis Program (BenMAP).[143] BenMAP is a computer program developed by the U.S. EPA that integrates a number of the modeling elements used in previous analyses (*e.g.,* interpolation functions, population projections, health impact functions, valuation functions, analysis and pooling methods) to translate modeled air concentration estimates into health effects incidence estimates and monetized benefits estimates.

The range of total ozone- and PM-related benefits associated with the coordinated strategy to control ship emissions is presented in Table VIII–1. We present total benefits based on the PM- and ozone-related premature mortality function used. The benefits ranges therefore reflect the addition of each estimate of ozone-related premature mortality (each with its own row in Table VIII–1) to estimates of PM-related premature mortality. These estimates represent EPA's preferred approach to characterizing the best estimate of benefits associated with the coordinated strategy. As is the nature of Regulatory Impact Analyses (RIAs), the assumptions and methods used to estimate air quality benefits evolve to reflect the Agency's most current interpretation of the scientific and economic literature. This analysis, therefore, incorporates a number of important changes from recent RIAs released by the Office of Transportation and Air Quality (OTAQ):

• The 2030 air quality modeling of the final coordinated strategy reflects air quality impacts associated with an ECA boundary distance of 200 nm with global controls (set through IMO) beyond the ECA boundary. For the proposal, however, the air quality modeling reflected impacts associated with an ECA boundary distance of 100 nm with global controls beyond. To estimate the 2030 benefits associated with a 200 nm ECA boundary in the proposal, we transferred the relationship between modeled impacts between 100 nm and 200 nm ECA boundaries observed in 2020. For each health endpoint and associated valuation, we calculated a ratio based on the national-level estimate for the 200 nm and 100 nm scenario and applied that to the related 2030 100 nm estimate. For the final RIA, we estimated benefits based on the actual 2030 200 nm air quality modeling results. The net effect of this change results in a small decrease in 2030 benefits compared to the proposal.

• For a period of time (2004–2008), the Office of Air and Radiation (OAR) valued mortality risk reductions using a value of statistical life (VSL) estimate derived from a limited analysis of some of the available studies. OAR arrived at a VSL using a range of $1 million to $10 million (2000$) consistent with two meta-analyses of the wage-risk literature. The $1 million value represented the lower end of the interquartile range from the Mrozek and Taylor (2002) [144] meta-analysis of 33 studies and $10 million represented the upper end of the interquartile range from the Viscusi and Aldy (2003) [145] meta-analysis of 46 studies. The mean estimate of $5.5 million (2000$) [146] was also consistent with the mean VSL of $5.4 million estimated in the Kochi *et al.* (2006) [147] meta-analysis. However, the Agency neither changed its official guidance on the use of VSL in rule-makings nor subjected the interim estimate to a scientific peer-review process through the Science Advisory Board (SAB) or other peer-review group.

During this time, the Agency continued work to update its guidance on valuing mortality risk reductions, including commissioning a report from meta-analytic experts to evaluate methodological questions raised by EPA and the SAB on combining estimates from the various data sources. In addition, the Agency consulted several times with the Science Advisory Board Environmental Economics Advisory Committee (SAB–EEAC) on the issue. With input from the meta-analytic experts, the SAB–EEAC advised the Agency to update its guidance using specific, appropriate meta-analytic techniques to combine estimates from unique data sources and different studies, including those using different methodologies (*i.e.,* wage-risk and stated preference) (U.S. EPA–SAB, 2007).[148]

Until updated guidance is available, the Agency determined that a single, peer-reviewed estimate applied consistently best reflects the SAB–EEAC advice it has received. Therefore, the Agency has decided to apply the VSL that was vetted and endorsed by the SAB in the Guidelines for Preparing Economic Analyses (U.S. EPA, 2000) while the Agency continues its efforts to update its guidance on this issue.[149] This approach calculates a mean value across VSL estimates derived from 26 labor market and contingent valuation studies published between 1974 and 1991. The mean VSL across these studies is $6.3 million (2000$).[150]

The Agency is committed to using scientifically sound, appropriately

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bayes metaregression analysis. *Epidemiology. 16(4),* 458–68.

[141] U.S. Environmental Protection Agency (2006). *Final Regulatory Impact Analysis (RIA) for the Proposed National Ambient Air Quality Standards for Particulate Matter.* Prepared by: Office of Air and Radiation. Retrieved March 26, 2009 at *http://www.epa.gov/ttn/ecas/ria.html.*

[142] U.S. Environmental Protection Agency (2008). *Final Ozone NAAQS Regulatory Impact Analysis.* Prepared by: Office of Air and Radiation, Office of Air Quality Planning and Standards. Retrieved March 26, 2009 at *http://www.epa.gov/ttn/ecas/ria.html.*

[143] Information on BenMAP, including downloads of the software, can be found at *http://www.epa.gov/ttn/ecas/benmodels.html.*

[144] Mrozek, J.R., and L.O. Taylor (2002). What Determines the Value of Life? A Meta-Analysis. *Journal of Policy Analysis and Management* 21(2):253–270.

[145] Viscusi, V.K., and J.E. Aldy (2003). The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World. *Journal of Risk and Uncertainty* 27(1):5–76.

[146] In this analysis, we adjust the VSL to account for a different currency year (2006$) and to account for income growth to 2020 and 2030. After applying these adjustments to the $5.5 million value, the VSL is $7.7m in 2020 and $7.9 in 2030.

[147] Kochi, I., B. Hubbell, and R. Kramer 2006. An Empirical Bayes Approach to Combining Estimates of the Value of Statistical Life for Environmental Policy Analysis. Environmental and Resource Economics. 34: 385–406.

[148] U.S. Environmental Protection Agency (U.S. EPA). 2007. SAB Advisory on EPA's Issues in Valuing Mortality Risk Reduction. *http://yosemite.epa.gov/sab/sabproduct.nsf/4128007E7876B8F0852573760058A978/$File/sab-08-001.pdf.*

[149] In the (draft) update of the Economic Guidelines, EPA retained the VSL endorsed by the SAB with the understanding that further updates to the mortality risk valuation guidance would be forthcoming in the near future. Therefore, this report does not represent final agency policy. The 2000 guidelines can be downloaded here: *http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html,* and the draft updated version (2008) of the guidelines can be downloaded here: *http://yosemite.epa.gov/ee/epa/eerm.nsf/vwRepNumLookup/EE-0516?OpenDocument.*

[150] In this analysis, we adjust the VSL to account for a different currency year (2006$) and to account for income growth to 2020 and 2030. After applying these adjustments to the $6.3 million value, the VSL is $8.9m in 2020 and $9.1m in 2030.

reviewed evidence in valuing mortality risk reductions and has made significant progress in responding to the SAB–EEAC's specific recommendations. The Agency anticipates presenting results from this effort to the SAB–EEAC in Winter 2009/2010 and that draft guidance will be available shortly thereafter.

• In recent analyses, OTAQ has estimated $PM_{2.5}$-related benefits assuming that a threshold exists in the PM-related concentration-response functions (at 10 μg/m^3) below which there are no associations between exposure to $PM_{2.5}$ and health impacts. EPA strives to use the best available science to support our benefits analyses, and we recognize that interpretation of the science regarding air pollution and health is dynamic and evolving. Based on our review of the body of scientific literature, EPA applied the no-threshold model in this analysis. EPA's draft Integrated Science Assessment,[151] [152] which was recently reviewed by EPA's Clean Air Scientific Advisory Committee,[153] [154] concluded that the scientific literature consistently finds that a no-threshold log-linear model most adequately portrays the PM-mortality concentration-response relationship while recognizing potential uncertainty about the exact shape of the concentration-response function.[155] Although this document does not represent final agency policy that has undergone the full agency scientific review process, it provides a basis for reconsidering the application of thresholds in $PM_{2.5}$ concentration-response functions used in EPA's RIAs.[156] It is important to note that while CASAC provides advice regarding the science associated with setting the National Ambient Air Quality Standards, typically other scientific advisory bodies provide specific advice regarding benefits analysis.[157] Please *see* Section 6.4.1.3 of the RIA that accompanies this preamble for more discussion of the treatment of thresholds in this analysis.

• For the coordinated strategy, we rely on two empirical (epidemiological) studies of the relationship between ambient $PM_{2.5}$ and premature mortality (the extended analyses of the Harvard Six Cities study by Laden *et al* (2006) and the American Cancer Society (ACS) cohort by Pope *et al* (2002)) to anchor our benefits analysis, though we also present the $PM_{2.5}$-related premature mortality benefits associated with the estimates supplied by the expert elicitation as a sensitivity analysis. This approach was recently adopted in the proposed Portland Cement MACT RIA. Since 2006, EPA has calculated benefits based on these two empirical studies and derived the range of benefits, including the minimum and maximum results, from an expert elicitation of the relationship between exposure to $PM_{2.5}$ and premature mortality (Roman *et al.,* 2008).[158] Using alternate relationships between $PM_{2.5}$ and premature mortality supplied by experts, higher and lower benefits estimates are plausible, but most of the expert-based estimates have fallen between the two epidemiology-based estimates (Roman *et al.,* 2008). Assuming no threshold in the empirically-derived premature mortality concentration response functions used in the analysis of the coordinated strategy, only one expert falls below the empirically-derived range while two of the experts are above this range (*see* Tables 6–5 and 6–6 in the RIA that accompanies this preamble). Please refer to the proposed Portland Cement MACT RIA for more information about the preferred approach and the evolution of the treatment of threshold assumptions within EPA's regulatory analyses.

• The range of ozone benefits associated with the coordinated strategy is estimated based on risk reductions derived from several sources of ozone-related mortality effect estimates. This analysis presents six alternative estimates for the association based upon different functions reported in the scientific literature. We use three multi-city studies,[159] [160] [161] including the Bell, 2004 National Morbidity, Mortality, and Air Pollution Study (NMMAPS) that was used as the primary basis for the risk analysis in the ozone Staff Paper[162] and reviewed by the Clean Air Science Advisory Committee (CASAC).[163] We also use three studies that synthesize ozone mortality data across a large number of individual studies.[164] [165] [166] This approach is consistent with recommendations provided by the NRC in their ozone mortality report (NRC, 2008),[167] "The committee recommends

[151] U.S. Environmental Protection Agency (U.S. EPA). Integrated Science Assessment for Particulate Matter (External Review Draft). National Center for Environmental Assessment, Research Triangle Park, NC. EPA/600/R–08/139. December. Available on the Internet at *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=201805.*

[152] U.S. Environmental Protection Agency (U.S. EPA). Integrated Science Assessment for Particulate Matter (Second External Review Draft). National Center for Environmental Assessment, Research Triangle Park, NC. EPA/600/R–08/139B. July. Available on the Internet at *http://cfint.rtpnc.epa.gov/ncea/prod/recordisplay.cfm?deid=210586.*

[153] U.S. Environmental Protection Agency—Science Advisory Board (U.S. EPA–SAB). Review of EPA's Integrated Science Assessment for Particulate Matter (First External Review Draft, December 2008). EPA–COUNCIL–09–008. May. Available on the Internet at *http://yosemite.epa.gov/sab/SABPRODUCT.NSF/81e39f4c09954fcb85256ead006be86e/73ACCA834AB44A10852575BD0064346B/$File/EPA-CASAC-09-008-unsigned.pdf.*

[154] U.S. Environmental Protection Agency—Science Advisory Board (U.S. EPA–SAB). Consultation on EPA's Particulate Matter National Ambient Air Quality Standards: Scope and Methods Plan for Health Risk and Exposure Assessment. EPA–COUNCIL–09–009. May. Available on the Internet at *http://yosemite.epa.gov/sab/SABPRODUCT.NSF/81e39f4c09954fcb85256ead006be86e/723FE644C5D758DF852575BD00763A32/$File/EPA-CASAC-09-009-unsigned.pdf.*

[155] It is important to note that uncertainty regarding the shape of the concentration-response function is conceptually distinct from an assumed threshold. An assumed threshold (below which there are no health effects) is a discontinuity, which is a specific example of non-linearity.

[156] The final PM ISA, which will have undergone the full agency scientific review process, is scheduled to be completed in late December 2009.

[157] In the proposed Portland Cement RIA, EPA solicited comment on the use of the no-threshold model for benefits analysis within the preamble of that proposed rule. The comment period for the Portland Cement proposed NESHAP closed on September 4, 2009 (Docket ID No. EPA–HQ–OAR–2002–0051 available at *http://www.regulations.gov*). EPA is currently reviewing those comments. U.S. Environmental Protection Agency. (2009). Regulatory Impact Analysis: National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry. Office of Air and Radiation. Retrieved on May 4, 2009, from *http://www.epa.gov/ttn/ecas/regdata/RIAs/portlandcementria_4-20-09.pdf.*

[158] Roman, Henry A., Walker, Katherine D., Walsh, Tyra L., Conner, Lisa, Richmond, Harvey M., Hubbell, Bryan J., and Kinney, Patrick L.. (2008). Expert Judgment Assessment of the Mortality Impact of Changes in Ambient Fine Particulate Matter in the U.S. Environ. Sci. Technol., 42, 7, 2268–2274.

[159] Bell, M.L., *et al.* (2004). Ozone and short-term mortality in 95 U.S. urban communities, 1987–2000. Jama, 2004. 292(19): p. 2372–8.

[160] Huang, Y.; Dominici, F.; Bell, M.L. (2005). Bayesian hierarchical distributed lag models for summer ozone exposure and cardio-respiratory mortality. Environmetrics 16: 547–562.

[161] Schwartz, J. (2005). How sensitive is the association between ozone and daily deaths to control for temperature? Am. J. Respir. Crit. Care Med. 171: 627–631.

[162] U.S. EPA (2007). Review of the National Ambient Air Quality Standards for Ozone, Policy Assessment of Scientific and Technical Information. OAQPS Staff Paper. EPA–452/R–07–003. This document is available in Docket EPA–HQ–OAR–2003–0190. Retrieved on April 10, 2009, from *http:www.epa.gov/ttn/naaqs/standards/ozone/s_o3_cr_sp.html.*

[163] CASAC (2007). Clean Air Scientific Advisory Committee's (CASAC) Review of the Agency's Final Ozone Staff Paper. EPA–CASAC–07–002. March 26.

[164] Bell, M.L., F. Dominici, and J.M. Samet (2005). A meta-analysis of time-series studies of ozone and mortality with comparison to the national morbidity, mortality, and air pollution study. *Epidemiology,* 16(4): p. 436–45.

[165] Ito, K., S.F. De Leon, and M. Lippmann (2005). Associations between ozone and daily mortality: analysis and meta-analysis. *Epidemiology.* 16(4): p. 446–57.

[166] Levy, J.I., S.M. Chemerynski, and J.A. Sarnat (2005). Ozone exposure and mortality: an empiric bayes metaregression analysis. *Epidemiology.* 16(4): p. 458–68.

[167] National Research Council (NRC), 2008. Estimating Mortality Risk Reduction and Economic

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that the greatest emphasis be placed on estimates from new systematic multicity analyses that use national databases of air pollution and mortality, such as in the NMMAPS, without excluding consideration of meta-analyses of previously published studies." The NRC goes on to note that there are uncertainties within each study that are not fully captured by this range of estimates.

TABLE VIII–1—ESTIMATED 2030 MONETIZED PM- AND OZONE-RELATED HEALTH BENEFITS OF A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS [a]

2030 Total Ozone and PM Benefits—PM Mortality Derived from American Cancer Society Analysis and Six-Cities Analysis [a]			
Premature ozone mortality function	Reference	Total benefits (billions, 2006$, 3% discount rate) [c d]	Total benefits (billions, 2006$, 7% discount rate) [c d]
Multi-city analyses	Bell *et al.,* 2004	110–260	99–240
	Huang *et al.,* 2005	110–260	100–240
	Schwartz, 2005	110–260	100–240
Meta-analyses	Bell *et al.,* 2005	110–260	100–240
	Ito *et al.,* 2005	110–270	110–240
	Levy *et al.,* 2005	110–270	110–240

Notes:

[a] Total includes premature mortality-related and morbidity-related ozone and $PM_{2.5}$ benefits. Range was developed by adding the estimate from the ozone premature mortality function to the estimate of $PM_{2.5}$-related premature mortality derived from either the ACS study (Pope *et al.,* 2002) or the Six-Cities study (Laden *et al.,* 2006).

[b] Note that total benefits presented here do not include a number of unquantified benefits categories. A detailed listing of unquantified health and welfare effects is provided in Table VIII–2.

[c] Results reflect the use of both a 3 and 7 percent discount rate, as recommended by EPA's Guidelines for Preparing Economic Analyses and OMB Circular A–4. Results are rounded to two significant digits for ease of presentation and computation.

The benefits in Table VIII–1 include all of the human health impacts we are able to quantify and monetize at this time. However, the full complement of human health and welfare effects associated with PM and ozone remain unquantified because of current limitations in methods or available data. We have not quantified a number of known or suspected health effects linked with ozone and PM for which appropriate health impact functions are not available or which do not provide easily interpretable outcomes (*i.e.,* changes in heart rate variability). Additionally, we are unable to quantify a number of known welfare effects, including reduced acid and particulate deposition damage to cultural monuments and other materials, and environmental benefits due to reductions of impacts of eutrophication in coastal areas. These are listed in Table VIII–2. As a result, the health benefits quantified in this section are likely underestimates of the total benefits attributable to the implementation of the coordinated strategy to control ship emissions.

TABLE VIII–2—UNQUANTIFIED AND NON-MONETIZED POTENTIAL EFFECTS OF A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS

Pollutant/effects	Effects not included in analysis—Changes in
Ozone Health [a]	Chronic respiratory damage.[b]
	Premature aging of the lungs.[b]
	Non-asthma respiratory emergency room visits.
	Exposure to UVb (+/−).[e]
Ozone Welfare	Yields for
	—commercial forests.
	—some fruits and vegetables.
	—non-commercial crops.
	Damage to urban ornamental plants.
	Impacts on recreational demand from damaged forest aesthetics.
	Ecosystem functions.
	Exposure to UVb (+/−).[e]
PM Health [c]	Premature mortality—short term exposures.[d]
	Low birth weight.
	Pulmonary function.
	Chronic respiratory diseases other than chronic bronchitis.
	Non-asthma respiratory emergency room visits.
	Exposure to UVb (+/−).[e]
PM Welfare	Residential and recreational visibility in non-Class I areas.
	Soiling and materials damage.
	Damage to ecosystem functions.
	Exposure to UVb (+/−).[e]
Nitrogen and Sulfate Deposition Welfare	Commercial forests due to acidic sulfate and nitrate deposition.
	Commercial freshwater fishing due to acidic deposition.
	Recreation in terrestrial ecosystems due to acidic deposition.

Benefits from Controlling Ozone Air Pollution. The National Academies Press: Washington, DC.

TABLE VIII–2—UNQUANTIFIED AND NON-MONETIZED POTENTIAL EFFECTS OF A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS—Continued

Pollutant/effects	Effects not included in analysis—Changes in
	Existence values for currently healthy ecosystems.
	Commercial fishing, agriculture, and forests due to nitrogen. deposition.
	Recreation in estuarine ecosystems due to nitrogen. deposition.
	Ecosystem functions.
	Passive fertilization.
CO Health	Behavioral effects.
HC/Toxics Health [f]	Cancer (benzene, 1,3-butadiene, formaldehyde, acetaldehyde).
	Anemia (benzene).
	Disruption of production of blood components (benzene).
	Reduction in the number of blood platelets (benzene).
	Excessive bone marrow formation (benzene).
	Depression of lymphocyte counts (benzene).
	Reproductive and developmental effects (1,3-butadiene).
	Irritation of eyes and mucus membranes (formaldehyde).
	Respiratory irritation (formaldehyde).
	Asthma attacks in asthmatics (formaldehyde).
	Asthma-like symptoms in non-asthmatics (formaldehyde).
	Irritation of the eyes, skin, and respiratory tract (acetaldehyde).
	Upper respiratory tract irritation and congestion (acrolein).
HC/Toxics Welfare	Direct toxic effects to animals.
	Bioaccumulation in the food chain.
	Damage to ecosystem function.
	Odor.

Notes:

[a] The public health impact of biological responses such as increased airway responsiveness to stimuli, inflammation in the lung, acute inflammation and respiratory cell damage, and increased susceptibility to respiratory infection are likely partially represented by our quantified endpoints.

[b] The public health impact of effects such as chronic respiratory damage and premature aging of the lungs may be partially represented by quantified endpoints such as hospital admissions or premature mortality, but a number of other related health impacts, such as doctor visits and decreased athletic performance, remain unquantified.

[c] In addition to primary economic endpoints, there are a number of biological responses that have been associated with PM health effects including morphological changes and altered host defense mechanisms. The public health impact of these biological responses may be partly represented by our quantified endpoints.

[d] While some of the effects of short-term exposures are likely to be captured in the estimates, there may be premature mortality due to short-term exposure to PM not captured in the cohort studies used in this analysis. However, the PM mortality results derived from the expert elicitation do take into account premature mortality effects of short term exposures.

[e] May result in benefits or disbenefits.

[f] Many of the key hydrocarbons related to this rule are also hazardous air pollutants listed in the CAA.

B. Quantified Human Health Impacts

Tables VIII–3 and VIII–4 present the annual $PM_{2.5}$ and ozone health impacts in the 48 contiguous U.S. States associated with the coordinated strategy for both 2020 and 2030. For each endpoint presented in Tables VIII–3 and VIII–4, we provide both the mean estimate and the 90% confidence interval.

Using EPA's preferred estimates, based on the ACS and Six-Cities studies and no threshold assumption in the model of mortality, we estimate that the coordinated strategy will result in between 5,300 and 14,000 cases of avoided $PM_{2.5}$-related premature deaths annually in 2020 and between 12,000 and 30,000 avoided premature deaths annually in 2030. As a sensitivity analysis, when the range of expert opinion is used, we estimate between 1,900 and 18,000 fewer premature mortalities in 2020 and between 4,300 and 40,000 fewer premature mortalities in 2030 (*see* Tables 6–5 and 6–6 in the RIA that accompanies this rule).

For ozone-related premature mortality, we estimate a range of between 61 to 280 fewer premature mortalities as a result of the coordinated strategy in 2020 and between 210 to 920 in 2030. The increase in annual benefits from 2020 to 2030 reflects additional emission reductions from coordinated strategy, as well as increases in total population and the average age (and thus baseline mortality risk) of the population.

TABLE VIII–3—ESTIMATED $PM_{2.5}$-RELATED HEALTH IMPACTS ASSOCIATED WITH A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS [a]

Health effect	2020 Annual reduction in ship-related incidence (5th–95th percentile)	2030 Annual reduction in ship-related incidence (5th–95th percentile)
Premature Mortality—Derived from epidemiology literature [b]		
Adult, age 30+, ACS Cohort Study (Pope *et al.,* 2002)	5,300 (2,100–8,500)	12,000 (4,700–19,000)
Adult, age 25+, Six-Cities Study (Laden *et al.,* 2006)	14,000 (7,400–20,000)	30,000 (17,000–44,000)

TABLE VIII–3—ESTIMATED $PM_{2.5}$-RELATED HEALTH IMPACTS ASSOCIATED WITH A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS [a]—Continued

Health effect	2020 Annual reduction in ship-related incidence (5th–95th percentile)	2030 Annual reduction in ship-related incidence (5th–95th percentile)
Infant, age <1 year (Woodruff *et al.,* 1997)	20 (0–55)	34 (0–93)
Chronic bronchitis (adult, age 26 and over)	3,800 (700–6,900)	8,100 (1,500–14,000)
Non-fatal myocardial infarction (adult, age 18 and over)	8,800 (3,200–14,000)	20,000 (7,600–33,000)
Hospital admissions—respiratory (all ages) [c]	1,200 (590–1,800)	2,700 (1,300–4,000)
Hospital admissions—cardiovascular (adults, age >18) [d]	2,700 (2,000–3,200)	6,600 (4,700–7,700)
Emergency room visits for asthma (age 18 years and younger)	3,500 (2,000–4,900)	7,300 (4,300–10,000)
Acute bronchitis (children, age 8–12)	8,500 (0–17,000)	17,000 (0–35,000)
Lower respiratory symptoms (children, age 7–14)	100,000 (49,000–150,000)	210,000 (100,000–310,000)
Upper respiratory symptoms (asthmatic children, age 9–18)	77,000 (24,000–130,000)	160,000 (50,000–270,000)
Asthma exacerbation (asthmatic children, age 6–18)	95,000 (10,000–260,000)	200,000 (22,000–550,000)
Work loss days	720,000 (630,000–810,000)	1,400,000 (1,300,000–1,600,000)
Minor restricted activity days (adults, age 18–65)	4,300,000 (3,600,000–4,900,000)	8,500,000 (7,200,000–9,800,000)

Notes:

[a] Incidence is rounded to two significant digits. Estimates represent incidence within the 48 contiguous United States.

[b] PM-related adult mortality based upon the American Cancer Society (ACS) Cohort Study (Pope *et al.,* 2002) and the Six-Cities Study (Laden *et al.,* 2006). Note that these are two alternative estimates of adult mortality and should not be summed. PM-related infant mortality based upon a study by Woodruff, Grillo, and Schoendorf, (1997). [Woodruff, T.J., J. Grillo, and K.C. Schoendorf. 1997. "The Relationship Between Selected Causes of Postneonatal Infant Mortality and Particulate Air Pollution in the United States." *Environmental Health Perspectives* 105(6):608–612.]

[c] Respiratory hospital admissions for PM include admissions for chronic obstructive pulmonary disease (COPD), pneumonia and asthma.

[d] Cardiovascular hospital admissions for PM include total cardiovascular and subcategories for ischemic heart disease, dysrhythmias, and heart failure.

TABLE VIII–4—ESTIMATED OZONE-RELATED HEALTH IMPACTS ASSOCIATED WITH A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS [a]

Health effect	2020 Annual reduction in ship-related incidence (5th–95th percentile)	2030 Annual reduction in ship-related incidence (5th–95th percentile)
Premature Mortality, All ages [b]		
Multi-City Analyses		
Bell *et al.* (2004)—Non-accidental	61 (23–98)	210 (70–340)
Huang *et al.* (2005)—Cardiopulmonary	100 (43–160)	350 (130–570)
Schwartz (2005)—Non-accidental	93 (34–150)	320 (100–530)
Meta-analyses:		
Bell *et al.* (2005)—All cause	200 (100–290)	660 (320–1,000)
Ito *et al.* (2005)—Non-accidental	270 (170–370)	920 (560–1,300)
Levy *et al.* (2005)—All cause	280 (200–360)	920 (640–1,200)
Hospital admissions—respiratory causes (adult, 65 and older) [c]	470 (46–830)	1,900 (120–3,300)
Hospital admissions—respiratory causes (children, under 2)	380 (180–590)	1,200 (490–1,900)
Emergency room visit for asthma (all ages)	210 (0–550)	690 (0–1,800)
Minor restricted activity days (adults, age 18–65)	360,000 (160,000–570,000)	1,100,000 (430,000–1,700,000)

TABLE VIII–4—ESTIMATED OZONE-RELATED HEALTH IMPACTS ASSOCIATED WITH A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS [a]—Continued

Health effect	2020 Annual reduction in ship-related incidence (5th–95th percentile)	2030 Annual reduction in ship-related incidence (5th–95th percentile)
School absence days	130,000 (51,000–190,000)	420,000 (150,000–630,000)

Notes:

[a] Incidence is rounded to two significant digits. Estimates represent incidence within the 48 contiguous U.S.

[b] Estimates of ozone-related premature mortality are based upon incidence estimates derived from several alternative studies: Bell *et al.* (2004); Huang *et al.* (2005); Schwartz (2005); Bell *et al.* (2005); Ito *et al.* (2005); Levy *et al.* (2005). The estimates of ozone-related premature mortality should therefore not be summed.

[c] Respiratory hospital admissions for ozone include admissions for all respiratory causes and subcategories for COPD and pneumonia.

C. Monetized Benefits

Table VIII–5 presents the estimated monetary value of reductions in the incidence of ozone and $PM_{2.5}$-related health effects. All monetized estimates are stated in 2006$. These estimates account for growth in real gross domestic product (GDP) per capita between the present and the years 2020 and 2030. As the tables indicate, total benefits are driven primarily by the reduction in premature fatalities each year.

Our estimate of total monetized benefits in 2020 for the coordinated strategy, using the ACS and Six-Cities PM mortality studies and the range of ozone mortality assumptions, is between $47 billion and $110 billion, assuming a 3 percent discount rate, or between $42 billion and $100 billion, assuming a 7 percent discount rate. In 2030, we estimate the monetized benefits to be between $110 billion and $270 billion, assuming a 3 percent discount rate, or between $99 billion and $240 billion, assuming a 7 percent discount rate. The monetized benefit associated with reductions in the risk of both ozone- and $PM_{2.5}$-related premature mortality ranges between 90 to 98 percent of total monetized health benefits, in part because we are unable to quantify a number of benefits categories (*see* Table VIII–2). These unquantified benefits may be substantial, although their magnitude is highly uncertain.

TABLE VIII–5—ESTIMATED MONETARY VALUE IN REDUCTIONS IN INCIDENCE OF HEALTH AND WELFARE EFFECTS

[in millions of 2006$] [a b]

		2020	2030
$PM_{2.5}$-related health effect		Estimated mean value of reductions (5th and 95th percentile)	
Premature Mortality—Derived from Epidemiology Studies [c d].	Adult, age 30+—ACS study (Pope *et al.,* 2002).		
	3% discount rate	$43,000 ($5,000 – $110,000)	$99,000 ($12,000 – $260,000)
	7% discount rate	$38,000 ($4,500 – $100,000)	$89,000 ($11,000 – $230,000)
	Adult, age 25+—six-cities study (Laden *et al.,* 2006).		
	3% discount rate	$110,000 ($14,000 – $270,000)	$250,000 ($33,000 – $630,000)
	7% discount rate	$98,000 ($13,000 – $250,000)	$230,000 ($30,000 – $570,000)
	Infant mortality, <1 year—(Woodruff *et al.* 1997).	$180 ($0 – $670)	$310 ($0 – $1,200)
Chronic bronchitis (adults, 26 and over)		$1,900 ($140 – $6,500)	$4,100 ($320 – $14,000)
Non-fatal acute myocardial infarctions			
3% discount rate		$960 ($170 – $2,300)	$2,700 ($460 – $6,700)
7% discount rate		$930 ($160 – $2,300)	$2,600 ($430 – $6,600)
Hospital admissions for respiratory causes		$17 ($8.4 – $25)	$39 ($19 – $57)
Hospital admissions for cardiovascular causes		$76 ($48 – $110)	$180 ($120 – $250)
Emergency room visits for asthma		$1.3 ($0.70 – $1.9)	$2.7 ($1.5 – $4.1)
Acute bronchitis (children, age 8–12)		$0.63 ($0 – $1.6)	$1.3 ($0 – $3.2)
Lower respiratory symptoms (children, 7–14)		$2.0 ($0.75 – $3.7)	$4.1 ($1.6 – $7.6)
Upper respiratory symptoms (asthma, 9–11)		$2.4 ($0.65 – $5.3)	$5.0 ($1.4 – $11)
Asthma exacerbations		$5.1 ($0.51 – $15)	$11 ($1.1 – $32)
Work loss days		$110 ($94 – $120)	$220 ($190 – $250)
Minor restricted-activity days (MRADs)		$270 ($150 – $390)	$540 ($310 – $780)
Ozone-related Health Effect			
Premature mortality, all ages—derived from multi-city analyses.	Bell *et al.,* 2004	$540 ($63 – $1,400)	$1,800 ($210 – $4,900)
	Huang *et al.,* 2005	$910 ($110 – $2,300)	$3,100 ($360 – $8,200)
	Schwartz, 2005	$830 ($94 – $2,200)	$2,800 ($310 – $7,600)

TABLE VIII–5—ESTIMATED MONETARY VALUE IN REDUCTIONS IN INCIDENCE OF HEALTH AND WELFARE EFFECTS—Continued

[in millions of 2006$] [a b]

		2020	2030
Premature mortality, all ages—derived from meta-analyses.	Bell *et al.,* 2005	$1,700 ($220 – $4,400)	$5,800 ($740 – $15,000)
	Ito *et al.,* 2005	$2,400 ($330 – $5,900)	$8,200 ($1,100 – $20,000)
	Levy *et al.,* 2005	$2,400 ($340 – $5,900)	$8,200 ($1,100 – $20,000)
Hospital admissions—respiratory causes (adult, 65 and older)		$11 ($1.1 – $20)	$45 ($2.8 – $79)
Hospital admissions—respiratory causes (children, under 2)		$3.8 ($1.8 – $5.9)	$12 ($4.9 – $19)
Emergency room visit for asthma (all ages)		$0.08 ($0.03 – $0.20)	$0.25 ($0 – $0.63)
Minor restricted activity days (adults, age 18–65)		$23 ($9.8 – $41)	$69 ($25 – $120)
School absence days		$12 ($4.6 – $17)	$37 ($13 – $57)

Notes:

[a] Monetary benefits are rounded to two significant digits for ease of presentation and computation. PM and ozone benefits are nationwide.
[b] Monetary benefits adjusted to account for growth in real GDP per capita between 1990 and the analysis year (2020 or 2030).
[c] Valuation assumes discounting over the SAB recommended 20-year segmented lag structure. Results reflect the use of 3 percent and 7 percent discount rates consistent with EPA and OMB guidelines for preparing economic analyses.

D. What Are the Limitations of the Benefits Analysis?

Every benefit-cost analysis examining the potential effects of a change in environmental protection requirements is limited to some extent by data gaps, limitations in model capabilities (such as geographic coverage), and uncertainties in the underlying scientific and economic studies used to configure the benefit and cost models. Limitations of the scientific literature often result in the inability to estimate quantitative changes in health and environmental effects, such as potential increases in premature mortality associated with increased exposure to carbon monoxide. Deficiencies in the economics literature often result in the inability to assign economic values even to those health and environmental outcomes which can be quantified. These general uncertainties in the underlying scientific and economics literature, which can lead to valuations that are higher or lower, are discussed in detail in the RIA and its supporting references. Key uncertainties that have a bearing on the results of the benefit-cost analysis of the coordinated strategy include the following:

- The exclusion of potentially significant and unquantified benefit categories (such as health, odor, and ecological benefits of reduction in air toxics, ozone, and PM);
- Errors in measurement and projection for variables such as population growth;
- Uncertainties in the estimation of future year emissions inventories and air quality;
- Uncertainty in the estimated relationships of health and welfare effects to changes in pollutant concentrations including the shape of the C–R function, the size of the effect estimates, and the relative toxicity of the many components of the PM mixture;
- Uncertainties in exposure estimation; and
- Uncertainties associated with the effect of potential future actions to limit emissions.

As Table VIII–5 indicates, total benefits are driven primarily by the reduction in premature mortalities each year. Some key assumptions underlying the premature mortality estimates include the following, which may also contribute to uncertainty:

- Inhalation of fine particles is causally associated with premature death at concentrations near those experienced by most Americans on a daily basis. Although biological mechanisms for this effect have not yet been completely established, the weight of the available epidemiological, toxicological, and experimental evidence supports an assumption of causality. The impacts of including a probabilistic representation of causality were explored in the expert elicitation-based results of the PM NAAQS RIA.
- All fine particles, regardless of their chemical composition, are equally potent in causing premature mortality. This is an important assumption, because PM produced via transported precursors emitted from marine engines may differ significantly from PM precursors released from electric generating units and other industrial sources. However, no clear scientific grounds exist for supporting differential effects estimates by particle type.
- The C–R function for fine particles is approximately linear within the range of ambient concentrations under consideration. Thus, the estimates include health benefits from reducing fine particles in areas with varied concentrations of PM, including both regions that may be in attainment with $PM_{2.5}$ standards and those that are at risk of not meeting the standards.
- There is uncertainty in the magnitude of the association between ozone and premature mortality. The range of ozone benefits associated with the coordinated strategy is estimated based on the risk of several sources of ozone-related mortality effect estimates. In a recent report on the estimation of ozone-related premature mortality published by the National Research Council, a panel of experts and reviewers concluded that short-term exposure to ambient ozone is likely to contribute to premature deaths and that ozone-related mortality should be included in estimates of the health benefits of reducing ozone exposure.[168] EPA has requested advice from the National Academy of Sciences on how best to quantify uncertainty in the relationship between ozone exposure and premature mortality in the context of quantifying benefits.

Emissions and air quality modeling decisions are made early in the analytical process. For this reason, the emission control scenarios used in the air quality and benefits modeling are slightly different than the coordinated strategy. The discrepancies impact the benefits analysis in two ways:

- The air quality modeling used for the 2020 scenario is based on inventory estimates that were modeled using incorrect boundary information. We believe the impact of this difference, while modest, likely leads to a small underestimate of the benefits that are presented in this section. The correct boundary information was used for the

[168] National Research Council (NRC). 2008. Estimating Mortality Risk Reduction and Economic Benefits from Controlling Ozone Air Pollution. The National Academies Press: Washington, DC.

2030 scenario. Please refer to the Chapter 3 of the RIA for more information on the emissions excluded from the health impacts analysis.

• The 2020 air quality modeling scenarios do not include emission reductions associated with the implementation of global controls (set through IMO) beyond the assumed ECA boundary of 200 nautical miles (nm). Again, while we expect the impact of this difference is modest, the omission of these additional emission reductions likely leads to a small underestimate of the 2020 benefits presented in this section. The 2030 air quality modeling scenario did include emission reductions associated with global controls beyond the assumed ECA boundary of 200 nm.

Despite the uncertainties described above, we believe this analysis provides a conservative estimate of the estimated economic benefits of the standards in future years because of the exclusion of potentially significant benefit categories that are not quantifiable at this time. Acknowledging benefits omissions and uncertainties, we present a best estimate of the total benefits based on our interpretation of the best available scientific literature and methods supported by EPA's technical peer review panel, the Science Advisory Board's Health Effects Subcommittee (SAB–HES). The National Academies of Science (NRC, 2002) has also reviewed EPA's methodology for analyzing the health benefits of measures taken to reduce air pollution. EPA addressed many of these comments in the analysis of the final PM NAAQS.[169] [170] This analysis incorporates this most recent work to the extent possible.

E. Comparison of Costs and Benefits

This section presents the cost-benefit comparison related to the expected impacts of our coordinated strategy for ocean-going vessels. In estimating the net benefits of the coordinated strategy, the appropriate cost measure is 'social costs.' Social costs represent the welfare costs of a rule to society and do not consider transfer payments (such as taxes) that are simply redistributions of wealth. For this analysis, we estimate that the social costs of the coordinated program are equivalent to the estimated compliance costs of the program. While vessel owners and operators will see their costs increase by the amount of those compliance costs, they are expected to pass them on in their entirety to consumers of marine transportation services in the form of increased freight rates. Ultimately, these costs will be borne by the final consumers of goods transported by ocean-going vessels in the form of higher prices for those goods. The social benefits of the coordinated strategy are represented by the monetized value of health and welfare improvements experienced by the U.S. population. Table VIII–6 contains the estimated social costs and the estimated monetized benefits of the coordinated strategy.

The results in Table VIII–6 suggest that the 2020 monetized benefits of the coordinated strategy are greater than the expected costs. Specifically, the annual benefits of the total program will range between $47 to $110 billion annually in 2020 using a three percent discount rate, or between $42 to $100 billion assuming a 7 percent discount rate, compared to estimated social costs of approximately $1.9 billion in that same year. These benefits are expected to increase to between $110 and $270 billion annually in 2030 using a three percent discount rate, or between $99 and $240 billion assuming a 7 percent discount rate, while the social costs are estimated to be approximately $3.1 billion. Though there are a number of health and environmental effects associated with the coordinated strategy that we are unable to quantify or monetize (*see* Table VIII–2), the benefits of the coordinated strategy far outweigh the projected costs.

Using a conservative benefits estimate, the 2020 benefits outweigh the costs by a factor of 22. Using the upper end of the benefits range, the benefits could outweigh the costs by a factor of 58. Likewise, in 2030 benefits outweigh the costs by at least a factor of 32 and could be as much as a factor of 87. Thus, even taking the most conservative benefits assumptions, benefits of the coordinated strategy clearly outweigh the costs.

TABLE VIII–6—SUMMARY OF ANNUAL BENEFITS AND COSTS ASSOCIATED WITH A COORDINATED U.S. STRATEGY TO CONTROL SHIP EMISSIONS[a]

[Millions of 2006 dollars]

Description	2020	2030
Total Estimated Costs[b]	$1,900	$3,100.
Total Estimated Health Benefits:[c d e f]		
3-percent discount rate	$47,000 to $110,000	$110,000 to $270,000.
7-percent discount rate	$42,000 to $100,000	$99,000 to $240,000.
Annual Net Benefits (Total Benefits—Total Costs):		
3-percent discount rate	$45,000 to $110,000	$110,000 to $270,000.
7-percent discount rate	$40,000 to $98,000	$96,000 to $240,000.

Notes:

[a] All estimates represent annual benefits and costs anticipated for the years 2020 and 2030. Totals are rounded to two significant digits and may not sum due to rounding.

[b] The calculation of annual costs does not require amortization of costs over time. Therefore, the estimates of annual cost do not include a discount rate or rate of return assumption (*see* Chapter 7 of the RIA). In Chapter 7, however, we use both a 3-percent and 7-percent social discount rate to calculate the net present value of total social costs consistent with EPA and OMB guidelines for preparing economic analyses.

[c] Total includes ozone and $PM_{2.5}$ benefits. Range was developed by adding the estimate from the Bell *et al.,* 2005 ozone premature mortality function to $PM_{2.5}$-related premature mortality derived from the ACS (Pope *et al.,* 2002) and Six-Cities (Laden *et al.,* 2006) studies.

[d] Annual benefits analysis results reflect the use of a 3-percent and 7-percent discount rate in the valuation of premature mortality and nonfatal myocardial infarctions, consistent with EPA and OMB guidelines for preparing economic analyses.

[e] Valuation of premature mortality based on long-term PM exposure assumes discounting over the SAB recommended 20-year segmented lag structure described in the Regulatory Impact Analysis for the Final Clean Air Interstate Rule (March 2005).

[f] Not all possible benefits or disbenefits are quantified and monetized in this analysis. Potential benefit categories that have not been quantified and monetized are listed in Table VIII–2.

[169] National Research Council (NRC). 2002. Estimating the Public Health Benefits of Proposed Air Pollution Regulations. The National Academies Press: Washington, DC.

[170] U.S. Environmental Protection Agency. October 2006. *Final Regulatory Impact Analysis (RIA) for the Proposed National Ambient Air Quality Standards for Particulate Matter.* Prepared by: Office of Air and Radiation. Available at *http://www.epa.gov/ttn/ecas/ria.html.*

IX. Public Participation

Two public hearings were held to provide interested parties the opportunity to present data, views, or arguments concerning the proposed rule; the first hearing was held in New York, NY on August 4, 2009, and the second in Long Beach, CA on August 6, 2009. The public was invited to submit written comments on the proposed rule during the formal comment period, which ended on September 28, 2009. EPA received 126 comments, and a detailed summary and response to these comments can be found in the Summary and Analysis of Comments document in the docket (Docket ID EPA–HQ–OAR–2007–0121).

EPA received a number of comments on the value that a voluntary verification program would provide as well as comments on how best to implement such a program. The proposed program is discussed in Chapter 9 of the RIA. EPA is still reviewing these comments and is not taking any action today with regard to such a program. We will continue to evaluate the potential for such a program and will work in an open process with stakeholders should we conclude that such a program is appropriate.

EPA also received a number of comments on the technical challenges of operating steamships on lower sulfur fuel. In response, we are not taking final action today to apply the ECA fuel sulfur requirements to Great Lakes steamships in service prior to January 1, 2009. We will continue to study these technical issues and address these vessels in a future action, if appropriate.

This rule includes several technical amendments unrelated to Category 3 marine diesel engines. Two of these have generated a significant degree of interest from commenters. First, we raised for discussion a variety of temporary changes to the bonding requirements for nonroad spark-ignition engines below 19 kW (Small SI engines) based on feedback received by manufacturers and surety agents. We learned over the last several months that manufacturers have been struggling to obtain a bond for 2010, as required under § 1054.690. It seemed that the bond values specified in the regulation were in some cases preventing surety agents and manufacturers from reaching agreeable terms. While we were considering these changes, we learned that one manufacturer in the United States and nine manufacturers from China were able to establish a bond policy. We expect to continue to monitor implementation experiences with respect to the bonding provision, but we believe it is no longer necessary to adopt the interim regulatory provisions we were considering. We are proceeding with one adjustment to the bonding provisions. We believe it is appropriate to set a maximum value of $10 million for any bond that is required under § 1054.690. Setting this value the same as the maximum level of fixed assets that we require to be exempted from getting a bond would allow for a logical correlation regarding the liability for manufacturers that are exempt from the bonding requirement and those that are not. Nevertheless, we believe it is appropriate to adopt this change for a three-year transition period. At that point, we would either change the regulation to adopt some permanent cap on bond values or let the regulation revert to the original provisions with no maximum value.

We communicated our intent to make these bonding-related changes to those that commented on the bonding provisions when we first adopted them, including the Outdoor Power Equipment Institute, the Engine Manufacturers Association, and the California Air Resources Board. The Outdoor Power Equipment Institute and the Engine Manufacturers Association objected to the change, arguing that the reduced bond requirement would be insufficient to recover penalties for noncompliance in most cases. Based on these comments and on the fact that several companies have established bond policies, we have decided not to make these changes in this rulemaking. We may choose to pursue these or other long-term adjustments to the bonding regulations based on our experiences over the next several months, but we would do that in the context of a new rulemaking, which would include ample opportunity for comment and collaboration. In the meantime, we anticipate that small businesses may continue to have difficulty establishing a bond. If this is the case, we would be ready to consider an application for hardship under the provisions of § 1054.635. Small businesses applying for relief under this provision would need to provide us with enough information to be able to act on their request. In any hardship approval, we would likely first consider the same kinds of relief reflected in the interim regulation changes we were considering. In particular, we could reduce the specified bond amount to preserve a measure of protection that is more carefully calibrated for very small sales volumes. We could also consider a manufacturer to be exempted from getting a bond based on a good compliance history of less than ten years.

The proposed rule also included new regulatory provisions to clarify what we would consider acceptable inventory and stockpiling practices for engine and vehicle manufacturers relative to the new emission standards for heavy-duty highway engines that take effect in 2010 and later model years. We have received extensive input in the comments, including concerns about how to define and potentially apply certain terms such as "normal inventory" and "production" practices given the dynamics of today's market and placed in the context of the timing of this final rule, and how such terms might be used by the Agency to determine whether inappropriate stockpiling has occurred. Based on this, we have decided to defer codification of the stockpiling prohibition until a later rulemaking. In the meantime, we plan to implement the 2010 standards based on the Agency's existing stockpiling guidance and to monitor engine and vehicle manufacturers in order to ensure that no circumventions of the Clean Air Act have occurred.

X. Statutory and Executive Order Reviews

As explained in Section I.A, the program we are finalizing is part of a coordinated strategy to address emissions from ocean-going vessels. That coordinated strategy includes, among other actions, the combination the global Tier 2 NO_X standards included in the amendments to Annex VI and the ECA Tier 3 NO_X limits and fuel sulfur limits that will apply when the U.S. coasts are designated as an ECA through an additional amendment to Annex VI. These engine and fuel standards will be enforceable for all vessels, U.S. and foreign, operating in the United States through the Act to Prevent Pollution from Ships. Because the coordinated strategy in its entirety is economically significant (*see* cost analysis in Section V), the components we are adopting in this rule (engine controls for Category 3 engines on U.S. vessels under our Clean Air Act program, as required by section 213 of the Act that are identical to the MARPOL Annex VI NO_X limits; limits on hydrocarbon and carbon monoxide emissions for Category 3 engines; PM measurement requirement; changes to our Clean Air Act diesel fuel program to allow production and sale of ECA-compliant fuel; changes to our emission control program for smaller marine diesel engines to harmonize with the Annex VI NO_X requirements, for U.S. vessels that operate internationally) may also be considered to be economically significant.

A. Executive Order 12866: Regulatory Planning and Review

Under Executive Order (EO) 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action" because it raises novel legal or policy issues due to the international nature of the use of Category 3 marine diesel engines. Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under EO 12866 and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, EPA prepared an analysis of the potential costs and benefits associated with our coordinated strategy for controlling emissions from ocean-going vessels. While the costs of the coordinated strategy are "significant," the largest part of these costs are related to compliance with MARPOL Annex VI, which applies independently of this final rule. The costs of the requirements we are adopting in this rule are minimal. This analysis is contained in the Regulatory Impact Analysis that was prepared, and is available in the docket for this rulemaking and at the docket Internet address listed under **ADDRESSES** above.

B. Paperwork Reduction Act

The information collection requirements in this rule will be submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* The information collection requirements are not enforceable until OMB approves them.

Section 208(a) of the Clean Air Act requires that manufacturers provide information the Administrator may reasonably require to determine compliance with the regulations; submission of the information is therefore mandatory. We will consider confidential all information meeting the requirements of section 208(c) of the Clean Air Act. Recordkeeping and reporting requirements for manufacturers would be pursuant to the authority of section 208 of the Clean Air Act.

The data we require in this action is necessary to comply with Title II of the Clean Air Act, as amended in 1990. The Act directs us to adopt regulations for nonroad engines if we determine those engines contribute significantly to air pollution in the U.S. Now that we have made this determination, the Act directs us to set emission standards for any category of nonroad engines that contribute to air quality nonattainment in two or more areas in the U.S. We can only meet the requirements of the Act by collecting data from the regulated industry. Also, we will only have an effective program if we know that these engines maintain their certified emission level throughout their operating lives.

The burden for certification testing is generally based on conducting two engine tests for each engine family, then using that test data for several years. The manufacturer's application for certification involves an extensive effort the first year, followed by relatively little effort in subsequent years. We estimate that manufacturers will conduct new certification testing every five years; the costs have been estimated on an annual average basis. In addition to testing, manufacturers must prepare the application for certification and maintain appropriate records. The burden for production-line testing is based on an industry-wide calculation. Rebuilders, including operators of marine vessels with Category 3 engines, must keep records as needed to show that rebuilt engines continue to meet emission standards, consistent with the manufacturer's original design. In addition, owners and operators of marine vessels with Category 3 engines must record information about their location when rebuilding engines or making other adjustments and send minimal annual notification to EPA to show that engine maintenance and adjustments have not caused engines to be noncompliant. In total, we estimate that 12 engine manufacturers and 200 engine rebuilders will together face an estimated compliance burden of 3,012 hours per year, which corresponds with annual costs of $191,759 per year. Burden is defined at 5 CFR 1320.3(b).

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9. EPA will amend the table in 40 CFR part 9 to add OMB control number associated with the new regulations in 40 CFR part 1043 once those are approved.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this rule on small entities, small entity is defined as: (1) A small business that is primarily engaged in manufacture of large diesel marine engines as defined by NAICS code 333618 with 1,000 or fewer employees (based on Small Business Administration size standards) or a small business primarily engaged in shipbuilding and repairing as defined by NAICS code 336611 with 1,000 or fewer employees (based on Small Business Administration size standards); (2) a small business that is primarily engaged in freight or passenger transportation, either on the Great Lakes or in coastal areas as defined by NAICS codes 483113 and 483114 with 500 or fewer employees (based on Small Business Administration size standards); (3) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (4) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. Since publication of the proposed rulemaking, we have learned that the small entities directly regulated by this final rule include shipping companies that use fuel subject to the requirements in this rulemaking. We have identified four small U.S. companies that are operating Category 3 engines that currently burn residual fuel, and have estimated the compliance burden for each of these four small companies based on available information about the companies and their vessels. Our analysis indicates that two companies will have an estimated compliance burden representing less than 1 percent of their operating revenues, one company will have an estimated compliance burden representing between 1 and 3 percent of their operating revenues, and one company will have an estimated compliance burden representing slightly over 6 percent of their operating revenues.

Although this final rule will not have a significant economic impact on a substantial number of small entities, EPA nonetheless has tried to reduce the impact of this rule by adopting provisions to reduce the regulatory burden for these companies. For example, if we would apply the fuel requirements to steamships, a total of five small businesses would have an estimated compliance burden representing over 1 percent of their operating revenues, with the values for some companies reaching 20 percent or higher. However, we have decided to adopt provisions allowing us to waive the fuel-related requirements for these companies if it can be demonstrated that a compliant residual fuel is not available, or that the compliance burden will jeopardize the solvency of the company. This analysis also does not include cost savings from increased durability and reliability or decreased maintenance that occurs when using distillate fuel instead of residual fuel. Our estimated burden for these companies therefore overestimates the costs these companies will actually face when complying with the rule.

Additionally, in some areas, we consider port areas to be internal waters even though they are directly accessed by vessels that operate in coastal and international service on the oceans (such as Puget Sound). We believe it would not be realistic to expect companies operating such vessels to use distillate fuel as they approach U.S. ports and then convert the engines to operate on residual fuel for that portion of their operation that is considered internal waters. Since it would take about an hour of operation to transition back to the residual fuel, we believe this would not be commonly practiced whether or not fuel requirements apply in internal waters. Nevertheless, we have analyzed this scenario for potential small business impacts. We found that one U.S. small business with coastal operations would be affected by this rule, but that they will have costs representing less than one percent of their revenues. As a result, we have concluded that all small businesses that own or operate these coastal vessels will see no significant economic impact in complying with this rule.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local, and Tribal governments, in the aggregate, or the private sector in any one year. While the costs of the coordinated strategy exceed the $100 million per year threshold for the private sector, the costs of the components of that strategy that are the subject of this rule are less than $100 million per year, as explained in Section VII. Therefore, this action is not subject to the requirements of Sections 202 or 205 of the UMRA. This action is also not subject to the requirements of Section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. This action will be implemented at the Federal level and impose compliance obligations only on private industry. Thus, Executive Order 13132 does not apply to this rule.

Although Section 6 of Executive Order 13132 does not apply to this rule, EPA did consult with representatives of various State and local governments in developing this rule. EPA consulted with representatives from the National Association of Clean Air Agencies (NACAA, formerly STAPPA/ALAPCO), the Northeast States for Coordinated Air Use Management (NESCAUM), and the California Air Resources Board (CARB).

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicited comment on the action from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have Tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The rule will be implemented at the Federal level and impose compliance costs only on manufacturers of marine engines and marine vessels. Tribal governments will be affected only to the extent they purchase and use the regulated engines and vehicles. Thus, Executive Order 13175 does not apply to this action.

G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

This action is not subject to EO 13045 (62 FR 19885, April 23, 1997) because it is not economically significant as defined in EO 12866, and because the Agency does not believe the environmental health or safety risks addressed by this action present a disproportionate risk to children. This action's health and risk assessments are contained in Section II.A and Section VIII in this document and in Chapter 2 of the RIA, which has been placed in the public docket under Docket ID number EPA–HQ–OAR–2007–0121.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355 (May 22, 2001)), requires EPA to prepare and submit a Statement of Energy Effects to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, for certain actions identified as "significant energy actions." Section 4(b) of Executive Order 13211 defines "significant energy actions" as "any action by an agency (normally published in the **Federal Register**) that promulgates or is expected to lead to the promulgation of a final rule or regulation, including notices of inquiry, advance notices of proposed rulemaking, and notices of proposed rulemaking: (1)(i) That is a significant regulatory action under Executive Order 12866 or any successor order, and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action." We have prepared a Statement of Energy Effects for this action as follows.

This rule's potential effects on energy supply, distribution, or use have been analyzed and are discussed in detail in Section 4.6 of the RIA. In summary, while we project that this rule would result in an energy effect that exceeds the 10,000 barrel per day change in crude oil production threshold noted in E.O. 13211, this rule does not significantly affect the energy use, production, or distribution beyond what is required by Annex VI of the International Convention for the Prevention of Pollution from Ships.

I. National Technology Transfer Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

The rulemaking involves technical standards. Therefore, the Agency conducted a search to identify potentially applicable voluntary consensus standards. The only test procedures outside of EPA that are written for Category 3 marine diesel engines are in the NO_X Technical Code as part of MARPOL Annex VI. These test procedures have been adopted by the International Maritime Organization under the auspices of the United Nations. As such, they are not technically voluntary consensus standards. We have adopted test procedure specifications for Category 3 marine diesel engines in 40 CFR part 1042, which rely on the EPA test procedures in 40 CFR part 1065. We have written the part 1065 test procedures to apply broadly to all sizes and types of engines. We have coordinated these efforts with a wide range of manufacturers from every industry over nearly the last ten years. As a result of this effort, we have reached a point that the test procedures have been very widely referenced and adopted for use in various countries and for various applications. We believe that part 1065 is the best path toward global harmonization of emission test procedures for highway, nonroad, and stationary engines. Nevertheless, we have included a provision allowing manufacturers to rely on the procedures specified in the NO_X Technical Code. We believe this appropriately maintains part 1065 as the primary path for adopting standardized and harmonized test procedures, without precluding the possibility of testing according to the other widely accepted protocol for testing Category 3 marine diesel engines.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes Federal executive policy on environmental justice. Its main provision directs Federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this final rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population.

Together, this final rule which addresses emissions from domestic-flagged vessels and the joint U.S./Canada ECA application to the IMO which addresses emissions from foreign-flagged vessels (referred to as the "coordinated strategy") will achieve significant reductions of various emissions from Category 3 marine diesel engines, including NO_X, SO_X, and direct PM. Exposure to these pollutants raises concerns regarding environmental health for the U.S. population in general including the minority populations and low-income populations that are the focus of the environmental justice executive order.

The emission reductions from the new standards in the coordinated strategy will have large beneficial effects on communities in proximity to port, harbor, and waterway locations, including low-income and minority communities. In addition to exhaust emission standards for freshly manufactured and remanufactured engines, the coordinated strategy will further reduce emissions from regulated engines that directly impact low-income and minority communities.

EPA recently updated its initial screening-level analysis of selected marine port areas to better understand the populations, including minority and low-income populations, that are exposed to diesel PM emission sources from these facilities.[171] [172] This screening-level analysis is an inexact tool and should only be considered for illustrative purposes to help understand potential impacts. The analysis included all emission sources as well as ocean-going marine diesel engines, and focused on a representative selection of national marine ports (45 ports total).[173] [174] Considering only ocean-going marine engine diesel PM emissions, the results indicate that 6.5 million people are exposed to ambient diesel PM levels that are 2.0 μg/m³ and 0.2 μg/m³ above levels found in areas further from these facilities. This population includes a disproportionate number of low-income households, African-Americans, and Hispanics. The results from all emission sources show that nearly 18 million people are exposed to higher levels of diesel PM from all sources at the marine port areas than urban background levels. Because those living in the vicinity of marine ports are more likely to be low-income households and minority residents, these populations would receive a significant benefit from the combined coordinated strategy. *See* Section VIII of this preamble and Chapter 6 of the RIA for a discussion on the benefits of this rule, including the benefits to minority and low-income communities.

K. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.,* as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A Major rule cannot take effect until 60 days after it is published in the **Federal Register**. This action is not a "major rule" as defined by 5 U.S.C. 804(2). This rule will be effective June 29, 2010.

XI. Statutory Provisions and Legal Authority

Statutory authority for the controls in this final rule can be found in sections 203–209, 211, 213 (which specifically authorizes controls on emissions from nonroad engines and vehicles), 216, and 301 of the Clean Air Act (CAA), 42 U.S.C. 7414, 7522, 7523, 7424, 7525, 7541, 7542, 7543, 7545, 7547, 7550, and 7601.

[171] ICF International. December 1, 2008. Estimation of diesel particulate matter concentration isopleths near selected harbor areas with revised emissions (revised). Memorandum to EPA under Work Assignment Number 1–9, Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[172] ICF International. December 10, 2008. Estimation of diesel particulate matter population exposure near selected harbor areas with revised harbor emissions (revised). Memorandum to EPA under Work Assignment Number 2–9, Contract Number EP–C–06–094. This memo is available in Docket EPA–HQ–OAR–2007–0121.

[173] The emissions inventories used as inputs for the analyses are not official estimates and likely underestimate overall emissions because they are not inclusive of all emission sources at the individual ports in the sample.

[174] The Agency selected a representative sample from the top 150 U.S. ports including coastal, inland and Great Lake ports.

List of Subjects

40 CFR Part 80

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Diesel fuel, Fuel additives, Imports, Labeling, Penalties, Reporting and recordkeeping requirements.

40 CFR Part 85

Confidential business information, Imports, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements, Research, Warranties.

40 CFR Part 86

Environmental protection, Administrative practice and procedure, Air pollution control, Reporting and recordkeeping requirements, Motor vehicle.

40 CFR Part 94

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Vessels, Reporting and recordkeeping requirements, Warranties.

40 CFR Part 1027

Environmental protection, Administrative practice and procedure, Air pollution control, Imports, Reporting and recordkeeping requirements.

40 CFR Part 1033

Environmental protection, Administrative practice and procedure, Confidential business information, Incorporation by reference, Labeling, Penalties, Railroads, Reporting and recordkeeping requirements.

40 CFR Part 1039

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Reporting and recordkeeping requirements, Warranties.

40 CFR Part 1042

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Vessels, Reporting and recordkeeping requirements, Warranties.

40 CFR Part 1043

Environmental protection, Administrative practice and procedure, Air pollution control, Imports, Incorporation by reference, Vessels, Reporting and recordkeeping requirements.

40 CFR Parts 1045, 1048, 1051, 1054, and 1060

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by reference, Labeling, Penalties, Reporting and recordkeeping requirements, Warranties.

40 CFR Parts 1065

Environmental protection, Administrative practice and procedure, Incorporation by reference, Reporting and recordkeeping requirements, Research.

40 CFR Part 1068

Environmental protection, Administrative practice and procedure, Confidential business information, Imports, Incorporation by reference, Motor vehicle pollution, Penalties, Reporting and recordkeeping requirements, Warranties.

Dated: December 18, 2009.

Lisa P. Jackson,

Administrator.

■ For the reasons set out in the preamble, title 40, chapter I of the Code of Federal Regulations is amended as set forth below.

PART 80—REGULATION OF FUEL AND FUEL ADDITIVES

■ 1. The authority citation for part 80 continues to read as follows:

Authority: 42 U.S.C. 7414, 7542, 7545, and 7601.

■ 2. Section 80.2 is amended as follows:
■ a. By revising paragraph (ccc).
■ b. By revising paragraph (nnn).
■ c. By adding paragraph (ttt).
■ d. By adding paragraph (uuu).

§ 80.2 Definitions.

* * * * *

(ccc) *Heating Oil* means any #1, #2, or non-petroleum diesel blend that is sold for use in furnaces, boilers, and similar applications and which is commonly or commercially known or sold as heating oil, fuel oil, and similar trade names, and that is not jet fuel, kerosene, or MVNRLM diesel fuel.

* * * * *

(nnn) *Nonroad, locomotive, or marine (NRLM) diesel fuel* means any diesel fuel or other distillate fuel that is used, intended for use, or made available for use, as a fuel in any nonroad diesel engines, including locomotive and marine diesel engines, except the following: Distillate fuel with a T90 at or above 700 °F that is used only in Category 2 and 3 marine engines is not NRLM diesel fuel, and ECA marine fuel is not NRLM diesel fuel (note that fuel that conforms to the requirements of NRLM diesel fuel is excluded from the definition of "ECA marine fuel" in this section without regard to its actual use). Use the distillation test method specified in 40 CFR 1065.1010 to determine the T90 of the fuel. NR diesel fuel and LM diesel fuel are subcategories of NRLM diesel fuel.

(1) Any diesel fuel that is sold for use in stationary engines that are required to meet the requirements of § 80.510(a) and/or (b), when such provisions are applicable to nonroad engines, shall be considered NRLM diesel fuel.

(2) [Reserved]

* * * * *

(ttt) *ECA marine fuel* is diesel, distillate, or residual fuel that meets the criteria of paragraph (ttt)(1) of this section, but not the criteria of paragraph (ttt)(2) of this section.

(1) All diesel, distillate, or residual fuel used, intended for use, or made available for use in Category 3 marine vessels while the vessels are operating within an Emission Control Area (ECA) is ECA marine fuel, unless it meets the criteria of paragraph (ttt)(2) of this section.

(2) ECA marine fuel does not include any of the following fuel:

(i) Fuel that is allowed by 40 CFR part 1043 to exceed the fuel sulfur limits for operation in an ECA (such as fuel used by excluded vessels or vessels equipped with equivalent emission controls in conformance with 40 CFR 1043.55).

(ii) Fuel that conforms fully to the requirements of this part for NRLM diesel fuel (including being designated as NRLM).

(iii) Fuel used, or made available for use, in any diesel engines not installed on a Category 3 marine vessel.

(uuu) *Category 3 marine vessels,* for the purposes of this part 80, are vessels that are propelled by engines meeting the definition of "Category 3" in 40 CFR part 1042.901.

Subpart I—Motor Vehicle Diesel Fuel; Nonroad, Locomotive, and Marine Diesel Fuel; and ECA Marine Fuel

■ 3. The heading for subpart I is revised as set forth above.

■ 4. Section 80.501 is amended as follows:

■ a. By revising paragraph (a)(5).

■ b. By revising paragraph (a)(6).
■ c. By adding paragraph (a)(7).

§ 80.501 What fuel is subject to the provisions of this subpart?

(a) * * *

(5) ECA marine fuel.

(6) Other distillate fuels.

(7) Motor oil that is used as or intended for use as fuel in diesel motor vehicles or nonroad diesel engines or is blended with diesel fuel for use in diesel motor vehicles or nonroad diesel engines, including locomotive and marine diesel engines, at any downstream location.

* * * * *

■ 5. Section 80.502 is amended as follows:
■ a. By revising paragraph (a).
■ b. By revising paragraph (b) introductory text and paragraph (b)(1) introductory text.
■ c. By revising paragraph (c).
■ d. By revising paragraph (d) introductory text.
■ e. By adding paragraph (g).
■ f. By adding paragraph (h).

§ 80.502 What definitions apply for purposes of this subpart?

* * * * *

(a) *Entity* means any refiner, importer, distributor, retailer or wholesale-purchaser consumer of any distillate fuel (or other product subject to the requirements of this subpart I).

(b) *Facility* means any place, or series of places, where an entity produces, imports, or maintains custody of any distillate fuel (or other product subject to the requirements of this subpart I) from the time it is received to the time custody is transferred to another entity, except as described in paragraphs (b)(1) through (4) of this section:

(1) Where an entity maintains custody of a batch of diesel fuel (or other product subject to the requirements of this subpart I) from one place in the distribution system to another place (*e.g.,* from a pipeline to a terminal), all owned by the same entity, both places combined are considered to be one single aggregated facility, except where an entity chooses to treat components of such an aggregated facility as separate facilities. The choice made to treat these places as separate facilities may not be changed by the entity during any applicable compliance period. Except as specified in paragraph (b)(2) of this section, where compliance requirements depend upon facility-type, the entire facility must comply with the requirements that apply to its components as follows:

* * * * *

(c) *Truck loading terminal* means any facility that dyes NRLM diesel fuel or ECA marine fuel, pays taxes on motor vehicle diesel fuel per IRS code (26 CFR part 48), or adds a fuel marker pursuant to § 80.510 to heating oil and delivers diesel fuel or heating oil into trucks for delivery to retail or ultimate consumer locations.

(d) *Batch* means a quantity of diesel fuel (or other product subject to the requirements of this subpart I) which is homogeneous with regard to those properties that are specified for MVNRLM diesel fuel or ECA marine fuel under this subpart I, has the same designation under this subpart I (if applicable), and whose custody is transferred from one facility to another facility.

* * * * *

(g) *Emission Control Area.* An Emission Control Area (ECA), for the purposes of this subpart, means the "ECA" as defined in 40 CFR 1043.20 as well as "ECA associated area" as defined in 40 CFR 1043.20.

(h) *Marine diesel engine.* For the purposes of this subpart I only, marine diesel engine means a diesel engine installed on a Category 1 (C1) or Category 2 (C2) marine vessel.

■ 6. Section 80.510 is amended as follows:
■ a. By revising the section heading.
■ b. By revising paragraph (f) introductory text and adding paragraph (f)(6).
■ c. By revising paragraph (g)(1).
■ d. By adding paragraph (k).

§ 80.510 What are the standards and marker requirements for NRLM diesel fuel and ECA marine fuel?

* * * * *

(f) *Marking provisions.* From June 1, 2012 through May 31, 2014:

* * * * *

(6) Marker solvent yellow 124 shall not be used in any MVNRLM or heating oil after May 31, 2014.

(g) * * *

(1) Northeast/Mid-Atlantic Area, which includes the following States and counties, through May 31, 2014: North Carolina, Virginia, Maryland, Delaware, New Jersey, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, Washington DC, New York (except for the counties of Chautauqua, Cattaraugus, and Allegany), Pennsylvania (except for the counties of Erie, Warren, McKean, Potter, Cameron, Elk, Jefferson, Clarion, Forest, Venango, Mercer, Crawford, Lawrence, Beaver, Washington, and Greene), and the eight eastern-most counties of West Virginia (Jefferson, Berkeley, Morgan, Hampshire, Mineral, Hardy, Grant, and Pendleton).

* * * * *

(k) *Beginning June 1, 2014.* All ECA marine fuel is subject to a maximum per-gallon sulfur content of 1,000 ppm.

■ 7. Section 80.511 is amended as follows:
■ a. By revising the section heading.
■ b. By revising paragraph (a).
■ c. By revising paragraphs (b)(4) and (b)(9).
■ d. By adding paragraph (b)(10).

§ 80.511 What are the per-gallon and marker requirements that apply to NRLM diesel fuel, ECA marine fuel, and heating oil downstream of the refiner or importer?

(a) *Applicable dates for marker requirements.* Beginning June 1, 2006, all NRLM diesel fuel and ECA marine fuel shall contain less than 0.10 milligrams per liter of the marker solvent yellow 124, except for LM diesel fuel subject to the marking requirements of § 80.510(e).

(b) * * *

(4) Except as provided in paragraphs (b)(5) through (8) of this section, the per-gallon sulfur standard of § 80.510(c) shall apply to all NRLM diesel fuel beginning August 1, 2014, for all downstream locations other than retail outlets or wholesale purchaser-consumer facilities, shall apply to all NRLM diesel fuel beginning October 1, 2014 for retail outlets and wholesale purchaser-consumer facilities, and shall apply to all NRLM diesel fuel beginning December 1, 2014, for all locations.

* * * * *

(9) The per-gallon sulfur standard of § 80.510(k) shall apply to all ECA marine fuel beginning August 1, 2014, for all downstream locations other than retail outlets or wholesale purchaser-consumer facilities, shall apply to all ECA marine fuel beginning October 1, 2014, for retail outlets and wholesale purchaser-consumer facilities, and shall apply to all ECA marine fuel beginning December 1, 2014, for all locations.

(10) For the purposes of this section, distributors that have their own fuel storage tanks and deliver only to ultimate consumers shall be treated the same as retailers and their facilities treated the same as retail outlets.

■ 8. Section 80.513 is amended by revising paragraph (e) to read as follows:

§ 80.513 What provisions apply to transmix processing facilities?

* * * * *

(e) From June 1, 2014 and beyond, NRLM diesel fuel produced by a transmix processor is subject to the standards of § 80.510(c).

■ 9. Section 80.525 is amended by revising paragraphs (b) and (d) to read as follows:

§ 80.525 What requirements apply to kerosene blenders?

* * * * *

(b) Kerosene blenders are not subject to the requirements of this subpart applicable to refiners of diesel fuel, but are subject to the requirements and prohibitions applicable to downstream parties.

* * * * *

(d) Kerosene that a kerosene blender adds or intends to add to diesel fuel subject to the 15 ppm sulfur content standard must meet the 15 ppm sulfur content standard, and either of the following requirements:

(1) The product transfer document received by the kerosene blender indicates that the kerosene is diesel fuel that complies with the 15 ppm sulfur content standard.

(2) The kerosene blender has test results indicating the kerosene complies with the 15 ppm sulfur standard.

■ 10. Section 80.551 is amended by revising paragraph (f) to read as follows:

§ 80.551 How does a refiner obtain approval as a small refiner under this subpart?

* * * * *

(f) Approval of small refiner status for refiners who apply under § 80.550(d) will be based on all information submitted under paragraph (c) of this section, except as provided in § 80.550(e).

* * * * *

■ 11. Section 80.561 is amended by revising the section heading to read as follows:

§ 80.561 How can a refiner or importer seek temporary relief from the requirements of this subpart in case of extreme unforeseen circumstances?

* * * * *

■ 12. Section 80.570 is amended by revising paragraphs (a) and (b) to read as follows:

§ 80.570 What labeling requirements apply to retailers and wholesale purchaser-consumers of diesel fuel beginning June 1, 2006?

(a) From June 1, 2006 through November 30, 2010, any retailer or wholesale purchaser-consumer who sells, dispenses, or offers for sale or dispensing, motor vehicle diesel fuel subject to the 15 ppm sulfur standard of § 80.520(a)(1), must affix the following conspicuous and legible label, in block letters of no less than 24-point bold type, and printed in a color contrasting with the background, to each pump stand:

ULTRA-LOW SULFUR HIGHWAY DIESEL FUEL (15 ppm Sulfur Maximum)

Required for use in all model year 2007 and later highway diesel vehicles and engines.

Recommended for use in all diesel vehicles and engines.

(b) From June 1, 2006, through November 30, 2010, any retailer or wholesale purchaser-consumer who sells, dispenses, or offers for sale or dispensing, motor vehicle diesel fuel subject to the 500 ppm sulfur standard of § 80.520(c), must prominently and conspicuously display in the immediate area of each pump stand from which motor vehicle fuel subject to the 500 ppm sulfur standard is offered for sale or dispensing, the following legible label, in block letters of no less than 24-point bold type, printed in a color contrasting with the background:

LOW SULFUR HIGHWAY DIESEL FUEL (500 ppm Sulfur Maximum)

WARNING

Federal law prohibits use in model year 2007 and later highway vehicles and engines.

Its use may damage these vehicles and engines.

* * * * *

■ 13. Section 80.571 is amended by revising paragraphs (b) and (d) to read as follows:

§ 80.571 What labeling requirements apply to retailers and wholesale purchaser-consumers of NRLM diesel fuel or heating oil beginning June 1, 2007?

* * * * *

(b) From June 1, 2007, through September 30, 2010, for pumps dispensing NRLM diesel fuel meeting the 500 ppm sulfur standard of § 80.510(a):

LOW SULFUR NON-HIGHWAY DIESEL FUEL (500 ppm Sulfur Maximum)

WARNING

Federal Law prohibits use in highway vehicles or engines.

* * * * *

(d) From June 1, 2007, and beyond, for pumps dispensing non-motor vehicle diesel fuel for use other than in nonroad, locomotive, or marine engines, such as for use as heating oil:

HEATING OIL (May Exceed 500 ppm Sulfur)

WARNING

Federal law prohibits use in highway vehicles or engines, or in nonroad, locomotive, or marine diesel engines.

Its use may damage these diesel engines.

* * * * *

■ 14. Section 80.572 is amended by revising paragraphs (a) and (b) to read as follows:

§ 80.572 What labeling requirements apply to retailers and wholesale purchaser-consumers of NR and NRLM diesel fuel and heating oil beginning June 1, 2010?

* * * * *

(a) From June 1, 2010, through September 31, 2014, any retailer or wholesale purchaser-consumer who sells, dispenses, or offers for sale or dispensing, motor vehicle diesel fuel subject to the 15 ppm sulfur standard of § 80.520(a)(1), must affix the following conspicuous and legible label, in block letters of no less than 24-point bold type, and printed in a color contrasting with the background, to each pump stand:

ULTRA-LOW SULFUR HIGHWAY DIESEL FUEL (15 ppm Sulfur Maximum)

Required for use in all highway diesel vehicles and engines.

Recommended for use in all diesel vehicles and engines.

(b) From June 1, 2010, through September 30, 2012, for pumps dispensing NR diesel fuel subject to the 15 ppm sulfur standard of § 80.510(b):

ULTRA-LOW SULFUR NON-HIGHWAY DIESEL FUEL (15 ppm Sulfur Maximum)

Required for use in all model year 2011 and later nonroad diesel engines.

Recommended for use in all other non-highway diesel engines.

WARNING

Federal law prohibits use in highway vehicles or engines.

* * * * *

■ 15. Section 80.573 is amended by revising paragraph (a) to read as follows:

§ 80.573 What labeling requirements apply to retailers and wholesale purchaser-consumers of NRLM diesel fuel and heating oil beginning June 1, 2012?

* * * * *

(a) From June 1, 2012, through September 30, 2014, for pumps dispensing NRLM diesel fuel subject to the 15 ppm sulfur standard of § 80.510(c):

ULTRA-LOW SULFUR NON-HIGHWAY DIESEL FUEL (15 ppm Sulfur Maximum)

Required for use in all model year 2011 and later nonroad diesel engines.

Recommended for use in all other non-highway diesel engines.

WARNING

Federal law prohibits use in highway vehicles or engines.

* * * * *

■ 16. Section 80.574 is revised to read as follows:

§ 80.574 What labeling requirements apply to retailers and wholesale purchaser-consumers of ECA marine fuel beginning June 1, 2014?

(a) Any retailer or wholesale purchaser-consumer who sells, dispenses, or offers for sale or dispensing ECA marine fuel must prominently and conspicuously display in the immediate area of each pump stand from which ECA marine fuel is offered for sale or dispensing, one of the following legible labels, as applicable, in block letters of no less than 24-point bold type, printed in a color contrasting with the background:

(1) From June 1, 2014, and beyond, for pumps dispensing ECA marine fuel subject to the 1,000 ppm sulfur standard of § 80.510(k):

1,000 ppm SULFUR ECA MARINE FUEL (1,000 ppm Sulfur Maximum)

For use in Category 3 (C3) marine vessels only.

WARNING

Federal law prohibits use in any engine that is not installed on a C3 marine vessel; use of fuel oil with a sulfur content greater than 1,000 ppm in an ECA is prohibited except as allowed by 40 CFR Part 1043.

(2) The labels required by paragraph (a)(1) of this section must be placed on the vertical surface of each pump housing and on each side that has gallon and price meters. The labels shall be on the upper two-thirds of the pump, in a location where they are clearly visible.

(b) Alternative labels to those specified in paragraph (a) of this section may be used as approved by EPA.

(1) *For U.S. Mail:* U.S. EPA, Attn: Diesel Sulfur Alternative Label Request, 6406J, 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

(2) *For overnight or courier services:* U.S. EPA, Attn: Diesel Sulfur Alternative Label Request, 6406J, 1310 L Street, NW., 6th Floor, Washington, DC 20005. (202) 343–9038.

■ 17. Section 80.580 is amended by adding paragraphs (b)(1) and (c)(1) to read as follows:

§ 80.580 What are the sampling and testing methods for sulfur?

* * * * *

(b) * * *

(1) For ECA marine fuel subject to the 1,000 ppm sulfur standard of § 80.510(k), sulfur content may be determined using ASTM D2622 (incorporated by reference, *see* paragraph (e) of this section).

* * * * *

(c) * * *

(1) *Options for testing sulfur content of 1,000 ppm diesel fuel.* (i) For ECA marine fuel subject to the 1,000 ppm sulfur standard of § 80.510(k), sulfur content may be determined using ASTM D4294, ASTM D5453, or ASTM D6920 (all incorporated by reference, *see* paragraph (e) of this section), provided that the refiner or importer test result is correlated with the appropriate method specified in paragraph (b)(1) of this section; or

(ii) For ECA marine fuel subject to the 1,000 ppm sulfur standard of § 80.510(k), sulfur content may be determined using any test method approved under § 80.585.

* * * * *

■ 18. Section 80.581 is amended by revising the section heading and paragraphs (a) and (c)(1) to read as follows:

§ 80.581 What are the batch testing and sample retention requirements for motor vehicle diesel fuel, NRLM diesel fuel, and ECA marine fuel?

(a) Beginning on June 1, 2006 (or earlier pursuant to § 80.531), for motor vehicle diesel fuel, and beginning June 1, 2010 (or earlier pursuant to § 80.535), for NRLM diesel fuel, and beginning June 1, 2014, for ECA marine fuel, each refiner and importer shall collect a representative sample from each batch of motor vehicle or NRLM diesel fuel produced or imported and subject to the 15 ppm sulfur content standard, or ECA marine fuel subject to the 1,000 ppm sulfur content standard. Batch, for the purposes of this section, means batch as defined under § 80.2 but without the reference to transfer of custody from one facility to another facility.

* * * * *

(c)(1) Any refiner who produces motor vehicle, NRLM diesel fuel, or ECA marine fuel using computer-controlled in-line blending equipment, including the use of an on-line analyzer test method that is approved under the provisions of § 80.580, and who, subsequent to the production of the diesel fuel batch tests a composited sample of the batch under the provisions of § 80.580 for purposes of designation and reporting, is exempt from the requirement of paragraph (b) of this section to obtain the test result required under this section prior to the diesel fuel leaving the refinery, provided that the refiner obtains approval from EPA. The requirement of this paragraph (c)(1) that the in-line blending equipment must include an on-line analyzer test method that is approved under the provisions of § 80.580 is effective beginning June 1, 2006.

* * * * *

■ 19. Section 80.583 is amended by revising the section heading to read as follows:

§ 80.583 What alternative sampling and testing requirements apply to importers who transport motor vehicle diesel fuel, NRLM diesel fuel, or ECA marine fuel by truck or rail car?

* * * * *

■ 20. Section 80.584 is amended by revising the section heading and adding paragraphs (a)(3) and (b)(3) to read as follows:

§ 80.584 What are the precision and accuracy criteria for approval of test methods for determining the sulfur content of motor vehicle diesel fuel, NRLM diesel fuel, and ECA marine fuel?

(a) * * *

(3) For ECA marine fuel subject to the 1,000 ppm sulfur standard of § 80.510(k), of a standard deviation less than 18.07 ppm, computed from the results of a minimum of 20 repeat tests made over 20 days on samples taken from a single homogeneous commercially available diesel fuel with a sulfur content in the range of 700–1,000 ppm. The 20 results must be a series of tests with a sequential record of the analyses and no omissions. A laboratory facility may exclude a given sample or test result only if the exclusion is for a valid reason under good laboratory practices and it maintains records regarding the sample and test results and the reason for excluding them.

(b) * * *

(3) For ECA marine fuel subject to the 1,000 ppm sulfur standard of § 80.510(k):

(i) The arithmetic average of a continuous series of at least 10 tests performed on a commercially available gravimetric sulfur standard in the range of 300–400 ppm sulfur shall not differ from the ARV of that standard by more than 13.55 ppm sulfur;

(ii) The arithmetic average of a continuous series of at least 10 tests performed on a commercially available gravimetric sulfur standard in the range of 900–1,000 ppm sulfur shall not differ from the ARV of that standard by more than 13.55 ppm sulfur; and

(iii) In applying the tests of paragraphs (b)(3)(i) and (ii) of this section, individual test results shall be compensated for any known chemical interferences.

■ 21. Section 80.585 is amended by revising the section heading and paragraphs (e)(2) and (e)(4) to read as follows:

§ 80.585 What is the process for approval of a test method for determining the sulfur content of diesel or ECA marine fuel?

* * * * *

(e) * * *

(2) Follow paragraph 7.3.1 of ASTM D 6299–02 to check standards using a reference material at least monthly or following any major change to the laboratory equipment or test procedure. Any deviation from the accepted reference value of a check standard greater than 1.44 ppm (for diesel fuel subject to the 15 ppm sulfur standard), 19.36 ppm (for diesel fuel subject to the 500 ppm sulfur standard), or 36.14 ppm (for ECA marine fuel subject to the 1,000 ppm sulfur standard must be investigated.

* * * * *

(4) Upon discovery of any quality control testing violation of paragraph A 1.5.1.3 or A 1.5.2.1 of ASTM D 6299–02, or any check standard deviation greater than 1.44 ppm (for diesel fuel subject to the 15 ppm sulfur standard), 19.36 ppm (for diesel fuel subject to the 500 ppm sulfur standard), or 36.14 ppm (for ECA marine fuel subject to the 1,000 ppm sulfur standard), conduct an investigation into the cause of such violation or deviation and, after restoring method performance to statistical control, retest retained samples from batches originally tested since the last satisfactory quality control material or check standard testing occasion.

■ 22. Section 80.590 is amended as follows:

■ a. By revising the section heading.

■ b. By revising paragraphs (a) introductory text, (a)(5), (a)(6) introductory text, and (a)(6)(ii).

■ c. By adding paragraph (a)(7)(vii).

■ d. By redesignating paragraphs (e) through (i) as paragraphs (f) through (j), respectively.

■ e. By adding a new paragraph (e).

§ 80.590 What are the product transfer document requirements for motor vehicle diesel fuel, NRLM diesel fuel, heating oil, ECA marine fuel, and other distillates?

(a) This paragraph (a) applies on each occasion that any person transfers custody or title to MVNRLM diesel fuel, heating oil, or ECA marine fuel (including distillates used or intended to be used as MVNRLM diesel fuel, heating oil, or ECA marine fuel) except when such fuel is dispensed into motor vehicles or nonroad equipment, locomotives, marine diesel engines or C3 vessels. Note that 40 CFR part 1043 specifies requirements for documenting fuel transfers to certain marine vessels. For all fuel transfers subject to this paragraph (a), the transferor must provide to the transferee documents which include the following information:

* * * * *

(5) For transfers of MVNRLM diesel fuel or ECA marine fuel (beginning June 1, 2014), the sulfur content standard the transferor represents the fuel to meet.

(6) Beginning June 1, 2006, when an entity, from a facility at any point in the distribution system, transfers custody of a distillate or residual fuel designated under § 80.598, the following information must also be included:

* * * * *

(ii) An accurate and clear statement of the applicable designation and/or classification under § 80.598(a) and (b), for example, "500 ppm sulfur NRLM diesel fuel", or "jet fuel"; and whether the fuel is dyed or undyed, and for heating oil, whether marked or unmarked where applicable.

(7) * * *

(vii) *ECA marine fuel.* For ECA marine fuel produced or imported beginning June 1, 2014, "1,000 ppm sulfur (maximum) ECA marine fuel. For use in Category 3 marine vessels only. Not for use in engines not installed on C3 marine vessels."

* * * * *

(e) Beginning June 1, 2014, for ECA marine fuel only (except for transfers to truck carriers, retailers or wholesale purchaser-consumers), product codes may be used to convey the information required under this section if such codes are clearly understood by each transferee. "1000" must appear clearly on the product transfer document, and may be contained in the product code. If the designation is included in the code, codes used to convey the statement in paragraph (a)(7)(vii) of this section must contain the number "1000". If another letter, number, or symbol is being used to convey the statement in paragraph (a)(7)(vii) of this section, it must be clearly defined and denoted on the product transfer document.

* * * * *

■ 23. Section 80.593 is amended by revising the introductory text to read as follows:

§ 80.593 What are the reporting requirements for refiners and importers of motor vehicle diesel fuel subject to temporary refiner relief standards?

Beginning with 2006, or the first compliance period during which credits are generated under § 80.531(b) or (c), whichever is earlier, any refiner or importer who produces or imports motor vehicle diesel fuel subject to the 500 ppm sulfur standard under § 80.520(c), or any refiner or importer who generates, uses, obtains, or transfers credits under §§ 80.530 through 80.532, and continuing for each year thereafter, must submit to EPA annual reports that contain the information required in this section, and such other information as EPA may require:

* * * * *

■ 24. Section 80.597 is amended by revising paragraphs (c), (d), (e), and (f) and adding paragraph (g) to read as follows:

§ 80.597 What are the registration requirements?

* * * * *

(c) *Registration for ECA marine fuel.* Refiners and importers that intend to produce or supply ECA marine fuel beginning June 1, 2014, must provide EPA the information under § 80.76 no later than December 31, 2012, if such information has not been previously provided under the provisions of this part. In addition, for each import facility, the same identifying information as required for each refinery under § 80.76(c) must be provided.

(d) *Entity registration.* (1) Except as prescribed in paragraph (d)(6) of this section, each entity as defined in § 80.502 that intends to deliver or receive custody of any of the following fuels from June 1, 2006 through May 31, 2010, must register with EPA by December 31, 2005, or six months prior to commencement of producing, importing, or distributing any distillate listed in paragraphs (d)(1)(i) through (d)(1)(iii) of this section:

(i) Fuel designated as 500 ppm sulfur MVNRLM diesel fuel under § 80.598 on which taxes have not been assessed pursuant to IRS code (26 CFR part 48).

(ii) Fuel designated as 15 ppm sulfur MVNRLM diesel fuel under § 80.598 on which taxes have not been assessed pursuant to IRS code (26 CFR part 48).

(iii) Fuel designated as NRLM diesel fuel under § 80.598 that is undyed pursuant to § 80.520.

(iv) Fuel designated as California Diesel fuel under § 80.598 on which taxes have not been assessed and red dye has not been added (if required) pursuant to IRS code (26 CFR part 48) and that is delivered by pipeline to a terminal outside of the State of California pursuant to the provisions of § 80.617(b).

(2) Except as prescribed in paragraph (d)(6) of this section, each entity as defined in § 80.502 that intends to deliver or receive custody of any of the following fuels from June 1, 2007, through May 31, 2014, must register with EPA by December 31, 2005, or six months prior to commencement of producing, importing, or distributing any distillate listed in paragraph (d)(1) of this section:

(i) Fuel designated as 500 ppm sulfur MVNRLM diesel fuel under § 80.598 on which taxes have not been assessed pursuant to IRS code (26 CFR part 48).

(ii) Fuel designated as NRLM diesel fuel under § 80.598 that is undyed pursuant to § 80.520.

(iii) Fuel designated as heating oil under § 80.598 that is unmarked pursuant to § 80.510(d) through (f).

(iv) Fuel designated as LM diesel fuel under § 80.598(a)(2)(iii) that is unmarked pursuant to § 80.510(e).

(3) Except as prescribed in paragraph (d)(6) of this section, each entity as defined in § 80.502 that intends to deliver or receive custody of any of the following fuels beginning June 1, 2014, must register with EPA by December 31, 2012, or prior to commencement of producing, importing, or distributing any distillate or residual fuel listed in this paragraph (d):

(i) Fuel designated as 1,000 ppm sulfur ECA marine fuel under § 80.598.

(ii) [Reserved]

(4) Registration shall be on forms prescribed by the Administrator, and shall include the name, business address, contact name, telephone number, e-mail address, and type of production, importation, or distribution activity or activities engaged in by the entity.

(5) Registration shall include the information required under paragraph (e) of this section for each facility owned or operated by the entity that delivers or receives custody of a fuel described in paragraphs (d)(1) through (3) of this section.

(6) *Exceptions for Excluded Liquids.* An entity that would otherwise be required to register pursuant to the requirements of paragraphs (d)(1) through (3) of this section is exempted from the registration requirements under this section provided that:

(i) The only diesel fuel or heating oil that the entity delivers or receives on which taxes have not been assessed or which is not received dyed pursuant to IRS code 26 CFR part 48 is an excluded liquid as defined pursuant to IRS code 26 CFR 48.4081–1(b).

(ii) The entity does not transfer the excluded liquid to a facility which delivers or receives diesel fuel other than an excluded liquid on which taxes have not been assessed pursuant to IRS code (26 CFR part 48).

(e) *Facility registration.* (1) List for each separate facility of an entity required to register under paragraph (d) of this section, the facility name, physical location, contact name, telephone number, e-mail address and type of facility. For facilities that are aggregated under § 80.502, provide information regarding the nature and location of each of the components. If aggregation is changed for any subsequent compliance period, the entity must provide notice to EPA prior to the beginning of such compliance period.

(2) If facility records are kept off-site, list the off-site storage facility name, physical location, contact name, and telephone number.

(3) *Mobile facilities:* (i) A description shall be provided in the registration detailing the types of mobile vessels that will likely be included and the nature of the operations.

(ii) Entities may combine all mobile operations into one facility; or may split the operations by vessel, region, route, waterway, *etc.* and register separate mobile facilities for each.

(iii) The specific vessels need not be identified in the registration, however information regarding specific vessel contracts shall be maintained by each registered entity for its mobile facilities, pursuant to § 80.602(d).

(f) *Changes to registration information.* Any company or entity shall submit updated registration information to the Administrator within 30 days of any occasion when the registration information previously supplied for an entity, or any of its registered facilities, becomes incomplete or inaccurate.

(g) *Issuance of registration numbers.* EPA will supply a registration number to each entity and a facility registration number to each of an entity's facilities that is identified, which shall be used in all reports to the Administrator.

■ 25. Section 80.598 is amended as follows:

■ a. By revising paragraphs (a)(2)(i)(A) through (F).

■ b. By adding paragraph (a)(2)(i)(H).

■ c. By revising paragraph (a)(2)(v) introductory text.

■ d. By adding paragraph (a)(3)(xv).

■ e. By revising paragraphs (b)(4)(i), (b)(4)(ii), (b)(7)(i), (b)(7)(ii), (b)(8), (b)(9)(ii), (b)(9)(viii), and (b)(9)(x) introductory text.

§ 80.598 What are the designation requirements for refiners, importers, and distributors?

(a) * * *

(2) * * *

(i) * * *

(A) Motor vehicle, nonroad, locomotive or marine (MVNRLM) diesel fuel.

(B) Heating oil.

(C) Jet fuel.

(D) Kerosene.

(E) No. 4 fuel.

(F) Distillate fuel for export only.

* * * * *

(H) ECA marine fuel. This designation may be used beginning June 1, 2014, and fuel designated as such is subject to the restrictions in paragraph (a)(3)(xv) of this section.

* * * * *

(v) From June 1, 2006, through May 31, 2010, any batch designated as motor vehicle diesel fuel must also be designated according to one of the following distillation classifications that most accurately represents the fuel:

* * * * *

(3) * * *

(xv) Beginning June 1, 2014, any fuel designated as ECA marine fuel will be subject to all the following restrictions:

(A) Such fuel may not exceed a sulfur level of 1,000 ppm.

(B) Such fuel may only be produced, distributed, sold, and purchased for use in C3 marine vessels.

(b) * * *

(4) * * *

(i) #1D 500 ppm sulfur motor vehicle diesel fuel.

(ii) #2D 500 ppm sulfur motor vehicle diesel fuel.

* * * * *

(7) * * *

(i) 500 ppm sulfur NRLM diesel fuel.

(ii) Heating oil.

* * * * *

(8) Beginning June 1, 2014, whenever custody of a batch of distillate or residual fuel (other than jet fuel, kerosene, No. 4 fuel, fuel for export, fuel intended for use outside an ECA, or fuel otherwise allowed to be used under 40 CFR part 1043) having a sulfur content greater than 15 ppm is transferred to another facility, the entity transferring custody must accurately and clearly designate the batch as one of the following and specify its volume:

(i) ECA marine fuel.

(ii) Heating oil.

(iii) Exempt distillate fuels such as fuels that are covered by a national security exemption under § 80.606, fuels that are used for purposes of research and development pursuant to § 80.607, and fuels used in the U.S. Territories pursuant to § 80.608 (including additional identifying information).

(9) * * *

(ii) Until June 1, 2014, any distillate fuel containing greater than or equal to 0.10 milligrams per liter of marker solvent yellow 124 required under § 80.510(d), (e), or (f) must be designated as heating oil except that from June 1, 2010, through September 30, 2012, it may also be designated as LM diesel fuel as specified under § 80.510(e).

* * * * *

(viii) For facilities in areas other than those specified in § 80.510(g)(1) and (2), batches or portions of batches of unmarked distillate received designated as heating oil may be re-designated as NRLM or LM diesel fuel only if all the following restrictions are met:

(A) From June 1, 2007, through May 31, 2010, for any compliance period, the volume of high sulfur NRLM diesel fuel delivered from a facility cannot be greater than the volume received, unless the volume of heating oil delivered from the facility is also greater than the volume it received by an equal or greater proportion, as calculated in § 80.599(c)(2).

(B) From June 1, 2010, through May 31, 2014, for any compliance period, the volume of fuel designated as heating oil delivered from a facility cannot be less than the volume of fuel designated as heating oil received, as calculated in § 80.599(c)(4).

* * * * *

(x) Notwithstanding the provisions of paragraphs (b)(5) and (8) of this section, beginning October 1, 2007:

* * * * *

■ 26. Section 80.599 is amended as follows:

■ a. By revising paragraph (a)(1).

■ b. By removing and reserving paragraph (a)(2).

■ c. By revising paragraph (e)(4).

§ 80.599 How do I calculate volume balances for designation purposes?

(a) * * *

(1) The annual compliance periods are shown in the following table:

Beginning date of annual compliance period	Ending date of annual compliance period
June 1, 2006	May 31, 2007.
June 1, 2007	June 30, 2008.
July 1, 2008	June 30, 2009.
July 1, 2009	May 31, 2010.
June 1, 2010	June 30, 2011.
July 1, 2011	May 31, 2012.
June 1, 2012	June 30, 2013.
July 1, 2013	May 31, 2014.

(2) [Reserved]

* * * * *

(e) * * *

(4) The following calculation may be used to account for wintertime blending of kerosene and the blending of non-petroleum diesel:

$$\#2MV500_O \leq \#2MV500_I + \#2MV500_P - \#2MV500_{INVCHG} + 0.2 * (\#1MV15_I + \#2MV15_I + NPMV15_I)$$

Where:

$\#1MV15_I$ = the total volume of fuel received during the compliance period that is designated as #1D 15 ppm sulfur motor vehicle diesel fuel. Any motor vehicle diesel fuel produced by or imported into the facility shall not be included in this volume.

$NPMV15_I$ = the total volume of fuel received during the compliance period that is designated as NP15 ppm sulfur motor vehicle diesel fuel. Any motor vehicle diesel fuel produced by or imported into the facility shall not be included in this volume.

$\#1MV15_P$ = the total volume of fuel produced by or imported into the facility during the compliance period that was designated as #1D 15 ppm sulfur motor vehicle diesel fuel when it was delivered.

* * * * *

■ 27. Section 80.600 is amended as follows:

■ a. By revising paragraphs (a)(5) and (a)(12).

■ b. By revising paragraphs (b)(1)(v)(A) and (B).

■ c. By revising paragraph (b)(3).

■ d. By revising paragraph (i).

■ e. By revising paragraphs (o)(1) and (o)(2).

§ 80.600 What records must be kept for purposes of the designate and track provisions?

(a) * * *

(5) Any refiner or importer shall maintain the records specified in paragraphs (a)(6) through (10) of this section for each batch of distillate or residual fuel that it transfers custody of and designates from June 1, 2014, and later as any of the following categories:

(i) Heating oil.

(ii) ECA marine fuel.

* * * * *

(12) Records must be maintained that demonstrate compliance with a refiner's compliance plan required under § 80.554, for distillate fuel designated as high sulfur NRLM diesel fuel and delivered from June 1, 2007 through May 31, 2010, for distillate fuel designated as 500 ppm sulfur NR diesel fuel and delivered from June 1, 2010, through May 31, 2012, and for distillate fuel designated as 500 ppm sulfur NRLM diesel fuel and delivered from June 1, 2012, through May 31, 2014, in the areas specified in § 80.510(g)(2).

* * * * *

(b) * * *

(1) * * *

(v) For each facility that receives fuel designated as heating oil, records for each batch of distillate or residual fuel with any of the following designations for which custody is received or delivered as well as any batches produced from June 1, 2014, and beyond:

(A) 1,000 ppm sulfur ECA marine fuel.

(B) Heating oil.

* * * * *

(3) Records that clearly and accurately identify the total volume in gallons of each designated fuel identified under paragraph (b)(1) of this section transferred over each of the compliance periods, and over the periods from June 1, 2006 to the end of each compliance period. The records shall be maintained separately for each fuel designated under paragraph (b)(1) of this section, and for each EPA entity and facility registration number from whom the fuel was received or to whom it was delivered. For batches of fuel received from facilities without an EPA facility registration number:

(i) Any batches of fuel received marked pursuant to § 80.510(d) or (f) shall be deemed to be designated as heating oil.

(ii) Any batches of fuel received marked pursuant to § 80.510(e) shall be deemed to be designated as heating oil or LM diesel fuel.

(iii) Any batches of fuel received on which taxes have been paid pursuant to Section 4082 of the Internal Revenue Code (26 CFR 48.4082) shall be deemed to be designated as motor vehicle diesel fuel.

(iv) Any 500 ppm sulfur diesel fuel dyed pursuant to § 80.520(b) and not marked pursuant to § 80.510(d) or (f) shall be deemed to be designated as NRLM diesel fuel.

(v) Any diesel fuel with less than or equal to 500 ppm sulfur which is dyed pursuant to § 80.520(b) and not marked pursuant to § 80.510(e) shall be deemed to be NR diesel fuel.

(vi) Beginning June 1, 2014, any batches of fuel with greater than 15 ppm sulfur, but less than or equal to 1,000 ppm sulfur, and not designated as heating oil shall be deemed to be 1,000 ppm ECA marine fuel.

* * * * *

(i) Additional records that must be kept by mobile facilities. Any registered mobile facility must keep records of all contracts from any contracted components (*e.g.,* tank truck, barge, marine tanker, rail car, *etc.*) in each of its registered mobile facilities.

* * * * *

(o) * * *

(1) Any aggregated facility consisting of a refinery and truck loading terminal shall maintain records of all the following information for each batch of distillate fuel (and/or residual fuel with a sulfur level of 1,000 ppm or less that is intended for use in an ECA) produced by the refinery and sent over the aggregated facility's truck loading terminal rack:

(i) The batch volume.

(ii) The batch number, assigned under the batch numbering procedures under §§ 80.65(d)(3) and 80.502(d)(1).

(iii) The date of production.

(iv) A record designating the batch as distillate or residual fuel meeting the 500 ppm, 15 ppm, or 1,000 ppm ECA marine sulfur standard.

(v) A record indicating the volumes that were either taxed, dyed, or dyed and marked.

(2) Volume reports for all distillate fuel (and/or residual fuel with a sulfur level of 1,000 ppm or less that is intended for use in an ECA) from external sources (*i.e.,* from another refiner or importer), as described in § 80.601(f)(2), sent over the aggregated facility's truck rack.

■ 28. Section 80.601 is amended by revising paragraph (b)(3)(x) to read as follows:

§ 80.601 What are the reporting requirements for purposes of the designate and track provisions?

* * * * *

(b) * * *

(3) * * *

(x) Beginning with the report due August 31, 2011, and ending with the report due August 31, 2012, the volume balance under §§ 80.598(b)(9)(ix) and 80.599(d)(2).

* * * * *

■ 29. Section 80.602 is amended as follows:

■ a. By revising the section heading.

■ b. By revising paragraphs (a) introductory text, (a)(2) introductory text, and (a)(3).

■ c. By revising paragraphs (b) introductory text, (b)(4)(i), and (b)(4)(ii).

■ d. By revising paragraphs (g)(1) and (g)(2).

§ 80.602 What records must be kept by entities in the NRLM diesel fuel, ECA marine fuel, and diesel fuel additive production, importation, and distribution systems?

(a) *Records that must be kept by parties in the NRLM diesel fuel, ECA marine fuel and diesel fuel additive production, importation, and distribution systems.* Beginning June 1, 2007, or June 1, 2006, if that is the first period credits are generated under § 80.535, any person who produces, imports, sells, offers for sale, dispenses, distributes, supplies, offers for supply, stores, or transports nonroad, locomotive or marine diesel fuel, or ECA marine fuel (beginning June 1, 2014) subject to the provisions of this subpart, must keep all the following records:

* * * * *

(2) For any sampling and testing for sulfur content for a batch of NRLM diesel fuel produced or imported and subject to the 15 ppm sulfur standard or any sampling and testing for sulfur content as part of a quality assurance testing program, and any sampling and testing for cetane index, aromatics content, marker solvent yellow 124 content or dye solvent red 164 content of NRLM diesel fuel, ECA marine fuel, NRLM diesel fuel additives or heating oil:

* * * * *

(3) The actions the party has taken, if any, to stop the sale or distribution of any NRLM diesel fuel or ECA marine fuel found not to be in compliance with the sulfur standards specified in this subpart, and the actions the party has taken, if any, to identify the cause of any noncompliance and prevent future instances of noncompliance.

(b) *Additional records to be kept by refiners and importers of NRLM diesel fuel and ECA marine fuel.* Beginning June 1, 2007, or June 1, 2006, pursuant to the provisions of §§ 80.535 or 80.554(d) (or June 1, 2014, pursuant to the provisions of § 80.510(k)), any refiner producing distillate or residual fuel subject to a sulfur standard under §§ 80.510, 80.513, 80.536, 80.554, 80.560, or 80.561, for each of its refineries, and any importer importing such fuel separately for each facility, shall keep records that include the following information for each batch of NRLM diesel fuel, ECA marine fuel, or heating oil produced or imported:

* * * * *

(4) * * *

(i) NRLM diesel fuel, NR diesel fuel, LM diesel fuel, ECA marine fuel, or heating oil, as applicable.

(ii) Meeting the 500 ppm sulfur standard of § 80.510(a), the 15 ppm sulfur standard of § 80.510(b) and (c), the 1,000 ppm sulfur standard of § 80.510(k), or other applicable standard.

* * * * *

(g) * * *

(1) All the following information for each batch of distillate fuel (or residual fuel with a sulfur level of 1,000 ppm or less if such fuel is intended for use in an ECA) produced by the refinery and sent over the aggregated facility's truck rack:

(i) The batch volume.

(ii) The batch number, assigned under the batch numbering procedures under §§ 80.65(d)(3) and 80.502(d)(1).

(iii) The date of production.

(iv) A record designating the batch as one of the following:

(A) NRLM diesel fuel, NR diesel fuel, LM diesel fuel, ECA marine fuel, or heating oil, as applicable.

(B) Meeting the 500 ppm sulfur standard of § 80.510(a), the 15 ppm sulfur standard of § 80.510(b) and (c), the 1,000 ppm sulfur standard of § 80.510(k), or other applicable standard.

(C) Dyed or undyed with visible evidence of solvent red 164.

(D) Marked or unmarked with solvent yellow 124.

(2) Hand-off reports for all distillate fuel (or residual fuel with a sulfur level of 1,000 ppm or less if such fuel is intended for use in an ECA) from external sources (*i.e.,* from another refiner or importer), as described in § 80.601(f)(2).

■ 30. Section 80.606 is amended as follows:

■ a. By revising the section heading.

■ b. By revising paragraph (a) introductory text and paragraph (a)(1).

■ c. By revising paragraph (b).

■ d. By adding paragraph (c).

§ 80.606 What national security exemption applies to fuels covered under this subpart?

(a) The standards of all the fuels listed in paragraph (b) of this section do not apply to fuel that is produced, imported, sold, offered for sale, supplied, offered for supply, stored, dispensed, or transported for use in any of the following:

(1) Tactical military motor vehicles or tactical military nonroad engines, vehicles or equipment, including locomotive and marine, having an EPA national security exemption from the motor vehicle emission standards under 40 CFR 85.1708, or from the nonroad engine emission standards under 40 CFR part 89, 92, 94, 1042, or 1068.

* * * * *

(b) The exempt fuel must meet any of the following:

(1) The motor vehicle diesel fuel standards of § 80.520(a)(1), (a)(2), and (c).

(2) The nonroad, locomotive, and marine diesel fuel standards of § 80.510(a), (b), and (c).

(3) The 1,000 ppm ECA marine fuel standards of § 80.510(k).

(c) The exempt fuel must meet all the following conditions:

(1) It must be accompanied by product transfer documents as required under § 80.590.

(2) It must be segregated from non-exempt MVNRLM diesel fuel and ECA marine fuel at all points in the distribution system.

(3) It must be dispensed from a fuel pump stand, fueling truck or tank that is labeled with the appropriate designation of the fuel, such as "JP–5" or "JP–8".

(4) It may not be used in any motor vehicles or nonroad engines, equipment or vehicles, including locomotive and marine, other than the vehicles, engines, and equipment referred to in paragraph (a) of this section.

■ 31. Section 80.607 is amended as follows:

■ a. By revising the section heading.

■ b. By revising paragraph (a).

■ c. By revising paragraphs (c)(3)(iv) and (c)(4).

■ d. By revising paragraphs (d)(2), (d)(3), and (d)(4).

■ e. By revising paragraph (e)(1).

■ f. By revising paragraph (f).

§ 80.607 What are the requirements for obtaining an exemption for diesel fuel or ECA marine fuel used for research, development or testing purposes?

(a) *Written request for a research and development exemption.* Any person may receive an exemption from the provisions of this subpart for diesel fuel or ECA marine fuel used for research, development, or testing purposes by submitting the information listed in paragraph (c) of this section to: Director, Transportation and Regional Programs Division (6406J), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460 (postal mail); or Director, Transportation and Regional Programs Division, U.S. Environmental Protection Agency, 1310 L Street, NW., 6th floor, Washington, DC 20005 (express mail/courier); and Director, Air Enforcement Division (2242A), U.S. Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

* * * * *

(c) * * *

(3) * * *

(iv) The quantity of fuel which does not comply with the requirements of §§ 80.520 and 80.521 for motor vehicle diesel fuel, or § 80.510 for NRLM diesel fuel or ECA marine fuel.

(4) With regard to control, a demonstration that the program affords EPA a monitoring capability, including all the following:

(i) The site(s) of the program (including facility name, street address, city, county, State, and zip code).

(ii) The manner in which information on vehicles and engines used in the program will be recorded and made available to the Administrator upon request.

(iii) The manner in which information on the fuel used in the program (including quantity, fuel properties, name, address, telephone number and contact person of the supplier, and the date received from the supplier), will be recorded and made available to the Administrator upon request.

(iv) The manner in which the party will ensure that the research and development fuel will be segregated from motor vehicle diesel fuel, NRLM diesel fuel, or ECA marine fuel, as applicable, and how fuel pumps will be labeled to ensure proper use of the research and development fuel.

(v) The name, address, telephone number and title of the person(s) in the organization requesting an exemption from whom further information on the application may be obtained.

(vi) The name, address, telephone number and title of the person(s) in the organization requesting an exemption who is responsible for recording and making available the information specified in this paragraph (c), and the location where such information will be maintained.

(d) * * *

(2) The research and development fuel must be designated by the refiner or supplier, as applicable, as research and development fuel.

(3) The research and development fuel must be kept segregated from non-exempt MVNRLM diesel fuel and ECA marine fuel at all points in the distribution system.

(4) The research and development fuel must not be sold, distributed, offered for sale or distribution, dispensed, supplied, offered for supply, transported to or from, or stored by a fuel retail outlet, or by a wholesale purchaser-consumer facility, unless the wholesale purchaser-consumer facility is associated with the research and development program that uses the fuel.

* * * * *

(e) * * *

(1) The volume of fuel subject to the approval shall not exceed the estimated amount under paragraph (c)(3)(iv) of this section, unless EPA grants a greater amount in writing.

* * * * *

(f) *Effects of exemption.* Motor vehicle diesel fuel, NRLM diesel fuel, or ECA marine fuel that is subject to a research and development exemption under this section is exempt from other provisions of this subpart provided that the fuel is used in a manner that complies with the purpose of the program under paragraph (c) of this section and the requirements of this section.

* * * * *

■ 32. Section 80.608 is revised to read as follows:

§ 80.608 What requirements apply to diesel fuel and ECA marine fuel for use in the Territories?

The sulfur standards of § 80.520(a)(1) and (c) related to motor vehicle diesel fuel, of § 80.510(a), (b), and (c) related to NRLM diesel fuel, and of § 80.510(k) related to ECA marine fuel, do not apply to fuel that is produced, imported, sold, offered for sale, supplied, offered for supply, stored, dispensed, or transported for use in the Territories of Guam, American Samoa or the Commonwealth of the Northern Mariana Islands, provided that such diesel fuel is all the following:

(a) Designated by the refiner or importer as high sulfur diesel fuel only for use in Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands.

(b) Used only in Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands.

(c) Accompanied by documentation that complies with the product transfer document requirements of § 80.590(b)(1).

(d) Segregated from non-exempt MVNRLM diesel fuel and/or non-exempt ECA marine fuel at all points in the distribution system from the point the fuel is designated as exempt fuel only for use in Guam, American Samoa, or the Commonwealth of the Northern Mariana Islands, while the exempt fuel is in the United States (or the United States Emission Control Area) but outside these Territories.

■ 33. Section 80.610 is amended as follows:

■ a. By revising paragraph (a)(1).

■ b. By revising paragraph (b).

■ c. By revising paragraph (c).

■ d. By revising paragraphs (e)(3)(iii) and (e)(4)(iii) and adding paragraph (e)(6).

■ e. By revising paragraph (g).

§ 80.610 What acts are prohibited under the diesel fuel sulfur program?

* * * * *

(a) * * *

(1) Produce, import, sell, offer for sale, dispense, supply, offer for supply, store or transport motor vehicle diesel fuel,

NRLM diesel fuel, ECA marine fuel or heating oil that does not comply with the applicable standards, dye, marking or any other product requirements under this subpart I and 40 CFR part 69, except as allowed by 40 CFR part 1043 for ECA marine fuel.

* * * * *

(b) *Designation and volume balance violation.* Produce, import, sell, offer for sale, dispense, supply, offer for supply, store or transport motor vehicle diesel, NRLM diesel fuel, ECA marine fuel, heating oil or other fuel that does not comply with the applicable designation or volume balance requirements under §§ 80.598 and 80.599.

(c) *Additive violation.* (1) Produce, import, sell, offer for sale, dispense, supply, offer for supply, store or transport any fuel additive for use at a downstream location that does not comply with the applicable requirements of § 80.521.

(2) Blend or permit the blending into motor vehicle diesel fuel, NRLM diesel fuel, or ECA marine fuel at a downstream location, or use, or permit the use, in motor vehicle diesel fuel, NRLM diesel fuel, or ECA marine fuel, of any additive that does not comply with the applicable requirements of § 80.521.

* * * * *

(e) * * *

(3) * * *

(iii) This prohibition begins December 1, 2014, in all other areas.

(4) * * *

(iii) This prohibition begins December 1, 2014, in all other areas.

* * * * *

(6) Beginning January 1, 2015, introduce (or permit the introduction of) any fuel with a sulfur content greater than 1,000 ppm for use in a Category 3 marine vessel within an ECA, except as allowed by 40 CFR part 1043. This prohibition is in addition to other prohibitions in this section.

* * * * *

(g) *Cause violating fuel or additive to be in the distribution system.* Cause motor vehicle diesel fuel, NRLM diesel fuel, or ECA marine fuel to be in the diesel fuel distribution system which does not comply with the applicable standard, dye or marker requirements or the product segregation requirements of this subpart I, or cause any fuel additive to be in the fuel additive distribution system which does not comply with the applicable sulfur standards under § 80.521.

■ 34. Section 80.612 is amended by revising paragraph (b) introductory text to read as follows:

§ 80.612 Who is liable for violations of this subpart?

* * * * *

(b) *Persons liable for failure to comply with other provisions of this subpart.* Any person who:

* * * * *

■ 35. Section 80.613 is amended by revising paragraph (a)(1)(iv) introductory text to read as follows:

§ 80.613 What defenses apply to persons deemed liable for a violation of a prohibited act under this subpart?

(a) * * *

(1) * * *

(iv) For refiners and importers of diesel fuel subject to the 15 ppm sulfur standard under § 80.510(b) or (c) or § 80.520(a)(1), the 500 ppm sulfur standard under § 80.510(a) or § 80.520(c), and/or the 1,000 ppm sulfur standard under § 80.510(k), test results that—

* * * * *

■ 36. Section 80.615 is amended by revising paragraphs (b)(2) and (b)(4) to read as follows:

§ 80.615 What penalties apply under this subpart?

* * * * *

(b) * * *

(2) Any person liable under § 80.612(a)(2) for causing motor vehicle diesel fuel, NRLM diesel fuel, ECA marine fuel, heating oil, or other distillate fuel to be in the distribution system which does not comply with an applicable standard or requirement of this subpart I, except as allowed under 40 CFR part 1043, is subject to a separate day of violation for each and every day that the noncomplying fuel remains any place in the diesel fuel distribution system.

* * * * *

(4) For purposes of this paragraph (b):

(i) The length of time the motor vehicle diesel fuel, NRLM diesel fuel, ECA marine fuel, heating oil, or other distillate fuel in question remained in the diesel fuel distribution system is deemed to be 25 days, except as further specified in paragraph (b)(4)(ii) of this section.

(ii) The length of time is deemed not to be 25 days if a person subject to liability demonstrates by reasonably specific showings, by direct or circumstantial evidence, that the non-complying motor vehicle, NR diesel fuel, NRLM diesel fuel, ECA marine fuel, heating oil, or distillate fuel remained in the distribution system for fewer than or more than 25 days.

* * * * *

PART 85—CONTROL OF AIR POLLUTION FROM MOBILE SOURCES

■ 37. The authority citation for part 85 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart R—[Amended]

■ 38. Section 85.1703 is amended by revising the section heading and paragraph (a) introductory text to read as follows:

§ 85.1703 Definition of motor vehicle.

(a) For the purpose of determining the applicability of section 216(2), a vehicle which is self-propelled and capable of transporting a person or persons or any material or any permanently or temporarily affixed apparatus shall be deemed a motor vehicle, unless any one or more of the criteria set forth below are met, in which case the vehicle shall be deemed not a motor vehicle:

* * * * *

■ 39. A new § 85.1715 is added to subpart R to read as follows:

§ 85.1715 Aircraft meeting the definition of motor vehicle.

This section applies for aircraft meeting the definition of motor vehicle in § 85.1703.

(a) For the purpose of this section, aircraft means any vehicle capable of sustained air travel above treetop heights.

(b) The standards, requirements, and prohibitions of 40 CFR part 86 do not apply for aircraft or aircraft engines. Standards apply separately to certain aircraft engines, as described in 40 CFR part 87.

PART 86—CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

■ 40. The authority citation for part 86 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

§§ 86.000–15, 86.000–21, 86000–23, 86.000–25, 86.001–1, 86.087–38, 86.090–8, 86.091–10, 86.094–1. 86.094–15, 86.094–17, 86.094–23, 86.094–9, 86.096–9, 86.096–10, 86.096–11, 86.096–14, 86.096–23, 86.098–7, 86.098–8, 86.098–11, 86.098–15, 86.098–17, 86.098–21, 86.098–22, 86.099–1, and 86.099–30 [Removed]

■ 41. Subpart A is amended by removing the following sections: 86.000–15, 86.000–21, 86.000–23, 86.000–25, 86.001–1, 86.087–38, 86.090–8, 86.091–10, 86.094–1, 86.094–15, 86.094–17, 86.094–23, 86.094–9, 86.096–9, 86.096–10, 86.096–11, 86.096–14, 86.096–23, 86.098–7, 86.098–8, 86.098–11, 86.098–15, 86.098–17, 86.098–21, 86.098–22, 86.099–1, 86.099–30.

§ 86.000–28—[Amended]

■ 42. Section 86.000–28 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraph (a)(3).
■ c. By removing paragraph (a)(4)(i) introductory text.
■ d. By removing and reserving paragraphs (a)(4)(i)(A) through (a)(4)(i)(B)(*2*)(*i*).
■ e. By removing paragraphs (a)(4)(i)(B)(*2*)(*iii*) through (a)(4)(i)(D)(*2*).
■ f. By removing and reserving paragraph (a)(4)(ii)(B).
■ g. By removing paragraphs (a)(4)(ii)(C) and (a)(4)(iv) and (v).
■ h. By removing and reserving paragraphs (a)(5) and (a)(6).
■ i. By removing paragraph (a)(7)(i) introductory text.
■ j. By removing and reserving paragraphs (a)(7)(ii) through (b)(4)(i).
■ k. By removing paragraphs (b)(7) through (h).
■ 43. Section 86.008–10 is amended by revising paragraph (a)(2) to read as follows:

§ 86.008–10 Emission standards for 2008 and later model year Otto-cycle heavy-duty engines and vehicles.

* * * * *

(a) * * *

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in subpart N or P of this part:

(i) Perform the test interval set forth in paragraph (f)(1) of Appendix I of this part with a cold-start according to 40 CFR part 1065, subpart F. This is the cold-start test interval.

(ii) Shut down the engine after completing the test interval and allow 20 minutes to elapse. This is the hot soak.

(iii) Repeat the test interval. This is the hot-start test interval.

(iv) Calculate the total emission mass of each constituent, m, and the total work, W, over each test interval according to 40 CFR 1065.650.

(v) Determine your engine's brake-specific emissions using the following calculation, which weights the emissions from the cold-start and hot-start test intervals:

$$\text{brake-specific emissions} = \frac{m_{\text{cold-start}} + 6 \cdot m_{\text{hot-start}}}{W_{\text{cold-start}} + 6 \cdot W_{\text{hot-start}}}$$

* * * * *

■ 44. Section 86.010–38 is amended by revising paragraphs (j) introductory text and (j)(15)(i) introductory text to read as follows:

§ 86.010–38 Maintenance instructions.

* * * * *

(j) The following provisions describe requirements related to emission control diagnostic service information for heavy-duty engines used in vehicles over 14,000 pounds gross vehicle weight (GVW):

* * * * *

(15) * * *

(i) By July 1, 2013, manufacturers shall make available for sale to the persons specified in paragraph (j)(3)(i) of this section their own manufacturer-specific diagnostic tools at a fair and reasonable cost. These tools shall also be made available in a timely fashion either through the manufacturer Web site or through a manufacturer-designated intermediary. Upon Administrator approval, manufacturers will not be required to make available manufacturer-specific tools with reconfiguration capabilities if they can demonstrate to the satisfaction of the Administrator that these tools are not essential to the completion of an emissions-related repair, such as recalibration. As a condition of purchase, manufacturers may request that the purchaser take all necessary training offered by the engine manufacturer. Any required training materials and classes must comply with the following:

* * * * *

§ 86.091–7 [Amended]

■ 45. Section 86.091–7 is amended by removing paragraph (a)(3) and removing and reserving paragraphs (c)(3) and (d)(2).

§ 86.094–7 [Amended]

■ 46. Section 86.094–7 is amended as follows:

■ a. By removing the introductory text.

■ b. By removing and reserving paragraphs (a) introductory text through (a)(2).

■ c. By removing and reserving paragraphs (b) through (c)(2), (c)(4) through (d)(1)(v), (d)(3) through (g), and (h)(1).

■ d. By removing paragraphs (h)(6) and (i).

§ 86.094–14 [Amended]

■ 47. Section 86.094–14 is amended as follows:

■ a. By removing paragraph (c)(7)(i)(C)(*4*).

■ b. By removing and reserving paragraph (c)(11)(ii)(B)(*1*).

■ c. By removing paragraphs (c)(11)(ii)(B)(*16*) through (*18*).

■ d. By removing and reserving paragraphs (c)(11)(ii)(C) and (c)(11)(ii)(D)(*1*) through (*6*)

§ 86.094–21 [Amended]

■ 48. Section 86.094–21 is amended by removing and reserving paragraph (b)(6).

§ 86.094–22 [Amended]

■ 49. Section 86.094–22 is amended by removing and reserving paragraph (d)(1).

§ 86.094–26 [Amended]

■ 50. Section 86.094–26 is amended as follows:
■ a. By removing and reserving paragraph (a)(2).
■ b. By removing the text of paragraph (a)(3) introductory text and the (a)(3)(i) paragraph heading.
■ c. By removing and reserving paragraphs (a)(3)(i)(A), (a)(3)(i)(C), (a)(3)(ii)(C), and (a)(4)(i)(C).
■ d. By removing paragraph (a)(6)(iii).
■ e. By removing and reserving paragraphs (a)(9)(ii) and (b)(2)(i) and (ii).
■ f. By removing paragraphs (b)(2)(iv) and (b)(4)(i)(C), and (D).
■ g. By removing and reserving paragraphs (b)(4)(ii), (c), and (d)(2)(ii).

§ 86.094–28 [Amended]

■ 51. Section 86.094–28 is amended as follows:
■ a. By removing and reserving paragraphs (a)(1) and (2).
■ b. By removing the text of paragraphs (a)(4) introductory text and (a)(4)(i) introductory text.
■ c. By removing and reserving paragraph (a)(4)(i)(B)(*2*)(*ii*).

■ d. By removing paragraph (a)(4)(i)(C).
■ e. By removing and reserving paragraph (a)(4)(ii) and(iii).
■ f. By removing paragraph (a)(4)(v).
■ g. By removing paragraph and reserving (a)(7) introductory text.
■ h. By removing and reserving paragraphs (a)(7)(i), (b)(1) and (2), and (b)(4)(ii).
■ i. By removing paragraphs (b)(4)(iii) and (iv), (b)(5) through (8), and (c) and (d).

§ 86.094–30 [Amended]

■ 52. Section 86.094–30 is amended as follows:
■ a. By removing and reserving paragraphs (a)(3) and (a)(4)(i) and (ii).
■ b. By removing and reserving paragraph (a)(4)(iv) introductory text.
■ c. By removing and reserving paragraphs (a)(10), (11), (13), (b)(1)(ii)(B), (b)(1)(ii)(D), and (b)(2).
■ d. By removing and reserving paragraph (b)(4)(ii) introductory text.
■ e. By removing and reserving paragraph (b)(4)(ii)(B).
■ f. By removing paragraphs (b)(4)(iii) and (iv) and (f).

§ 86.095–14 [Amended]

■ 53. Section 86.095–14 is amended by removing the introductory text and removing and reserving paragraphs (a) through (c)(11)(ii)(B)(*15*) and (c)(11)(ii)(D)(*7*) through (c)(15).

§ 86.095–23 [Amended]

■ 54. Section 86.095–23 is amended as follows:
■ a. By removing and reserving paragraphs (a) and (b).
■ b. By removing and reserving paragraph (c)(2).
■ c. By removing and reserving paragraphs (d) and (e).
■ d. By removing and reserving paragraphs (h) through (k).

§ 86.095–26 [Amended]

■ 55. Section 86.095–26 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a) through (b)(4)(i)(C) and (b)(4)(ii)(C).
■ c. By removing paragraphs (b)(4)(iii) through (d).

§ 86.095–30 [Amended]

■ 56. Section 86.095–30 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a)(1) through (a)(3) and (a)(4)(i) through (iii).
■ c. By removing paragraphs (a)(4)(iv)(A) through (C).
■ d. By removing and reserving paragraphs (a)(5) through (12).
■ e. By removing paragraph (a)(14).
■ f. By removing and reserving paragraph (b).
■ g. By removing paragraphs (c) through (f).

§ 86.095–35 [Amended]

■ 57. Section 86.095–35 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a)(2) introductory text through (a)(2)(iii)(C).
■ c. By removing and reserving paragraph (c).

§ 86.096–7 [Amended]

■ 58. Section 86.096–7 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a) through (h)(5).
■ c. By removing the heading for paragraph (h)(6) introductory text and removing and reserving paragraph (h)(6)(i).
■ d. By removing paragraph (h)(7)(vii).

§ 86.096–8 [Amended]

■ 59. Section 86.096–8 is amended as follows:
■ a. By removing paragraph (a)(1)(iii).
■ b. By removing and reserving paragraph (a)(2).
■ c. By removing paragraph (a)(3).
■ d. By removing and reserving paragraphs (b) introductory text through (b)(4).

§ 86.096–21 [Amended]

■ 60. Section 86.096–21 is amended by removing the introductory text and removing and reserving paragraphs (a) through (j).

§ 86.096–24 [Amended]

■ 61. Section 86.096–24 is amended as follows:
■ a. By removing and reserving paragraphs (a)(5) through (7), (b)(1)(i) and (ii), and (b)(1)(vii).
■ b. By removing and reserving paragraphs (b)(1)(viii) introductory text and (b)(1)(viii)(A).
■ c. By removing and reserving paragraph (f).
■ d. By removing paragraph (g)(3).

§ 86.096–26 [Amended]

■ 62. Section 86.096–26 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a) and (b).
■ c. By removing and reserving paragraphs (c)(1) through (c)(3).
■ d. By removing paragraph (d).

§ 86.096–30 [Amended]

■ 63. Section 86.096–30 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a)(1) through (14).
■ c. By removing paragraphs (a)(19) through (24).
■ d. By removing and reserving paragraph (b).
■ e. By removing paragraphs (c) through (f).

§ 86.097–9 [Amended]

■ 64. Section 86.097–9 is amended as follows:
■ a. By removing paragraph (a)(1)(iv).
■ b. By removing and reserving paragraph (a)(2).
■ c. By removing paragraph (a)(3).
■ d. By removing and reserving paragraphs (b) and (d) through (f).

§ 86.098–10 [Amended]

■ 65. Section 86.098–10 is amended by removing and reserving paragraph (b).

§ 86.098–23 [Amended]

■ 66. Section 86.098–23 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (b)(2), (c), and (d)(2).
■ c. By removing paragraph (d)(3).
■ d. By removing and reserving paragraphs (f) through (g) and (l).

§ 86.098–24 [Amended]

■ 67. Section 86.098–24 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing paragraph (a) introductory text.
■ c. By removing and reserving paragraphs (a)(1) through (4).
■ d. By removing paragraph (a)(8) through (15).
■ e. By removing and reserving paragraphs (b) introductory text and(b)(1) introductory text.
■ f. By removing and reserving paragraphs (b)(1)(i) through (vi) and (b)(1)(viii)(B).
■ g. By removing paragraphs (b)(1)(ix) through (xii).
■ h. By removing and reserving paragraph (b)(2).
■ i. By removing paragraphs (b)(3) and (c) through (h).

§ 86.098–25 [Amended]

■ 68. Section 86.098–25 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraph (a).
■ c. By removing and reserving paragraph (b) introductory text.

■ d. By removing and reserving paragraphs (b)(1) through (2).
■ e. By removing and reserving paragraph (b)(3) introductory text through (b)(3)(vi)(D).
■ f. By removing paragraphs (b)(3)(vii), (b)(4) through (7), and (c) through (h).

§ 86.098–26 [Amended]

■ 69. Section 86.098–26 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a)(1) and (2).
■ c. By removing and reserving paragraphs (a)(3) introductory text and (a)(3)(i)(A) and (B).
■ d. By removing paragraph (a)(3)(i)(D).
■ e. By removing and reserving paragraph (a)(3)(ii)(A) and (B).
■ h. By removing paragraphs (a)(3)(ii)(D) and (a)(4) through (11).
■ i. By removing and reserving paragraph (b).
■ j. By removing paragraphs (c) through (d).

§ 86.098–28 [Amended]

■ 70. Section 86.098–28 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a)(1) through (a)(3).
■ c. By removing and reserving paragraphs (a)(4)(i) introductory text, (a)(4)(i)(A) and (B), and (a)(4)(ii)(A) .
■ d. By removing and reserving paragraphs (a)(4)(iii) and (iv).
■ f. By removing and reserving paragraphs (a)(5) and (6), (a)(7)(i) and (ii), and (b).
■ g. By removing paragraphs (c) through (h).

§ 86.098–30 [Amended]

■ 71. Section 86.098–30 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraphs (a)(1) through (18), (b)(1), and (b)(3).
■ c. By removing and reserving paragraphs (b)(4) introductory text, (b)(4)(i), and (b)(4)(ii)(A).
■ d. By removing paragraphs (b)(5) through (f).

§ 86.099–8 [Amended]

■ 72. Section 86.099–8 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraph (a)(1) introductory text.
■ c. By removing and reserving paragraphs (a)(1)(i) and (ii), (b)(5), and (c).
■ d. By removing paragraphs (e) through (k).

§ 86.099–9 [Amended]

■ 73. Section 86.099–9 is amended as follows:
■ a. By removing the introductory text.
■ b. By removing and reserving paragraph (a)(1) introductory text.
■ c. By removing and reserving paragraphs (a)(1)(i) through (iii).
■ d. By removing paragraph (c) through (k).

Subpart B—[Amended]

■ 74. Section 86.138–96 is amended by revising paragraph (k) to read as follows:

§ 86.138–96 Hot soak test.

* * * * *

(k) For the supplemental two-diurnal test sequence (*see* § 86.130–96), perform a hot soak test as described in this section, except that the test shall be conducted within seven minutes after completion of the hot start exhaust test and temperatures throughout the hot soak measurement period must be between 68 ° and 86 °F. This hot soak test is followed by two consecutive diurnal heat builds, described in § 86.133–96(p).

* * * * *

■ 75. Section 86.144–94 is amended by revising paragraph (c)(7)(ii) to read as follows:

§ 86.144–94 Calculations; exhaust emissions.

* * * * *

(c) * * *

(7) * * *

(ii) For methanol-fueled vehicles, where fuel composition is $C_xH_yO_z$ as measured, or calculated, for the fuel used:

$$DF = \frac{100 \cdot \left(\frac{X}{x + y/2 + 3.76 \cdot \left(x + y/4 - z/2 \right)} \right)}{CO_{2e} + \left(HC_e + CO_e + C_{CH_3OH_e} + C_{HCHO_e} \right) \cdot 10^{-4}}$$

* * * * *

Subpart E—[Amended]

■ 76. Section 86.415–78 is amended by revising paragraph (b) to read as follows:

§ 86.415–78 Production vehicles.

* * * * *

(b) Any manufacturer obtaining certification shall notify the Administrator of the number of vehicles of each engine family-engine displacement-emission control system-fuel system-transmission type-inertial mass category combination produced for sale in the United States during the preceding year. This report must be submitted every year within 45 days after the end of the model year.

* * * * *

Subpart G—Selective Enforcement Auditing of New Light-Duty Vehicles, Light-Duty Trucks, and Heavy-Duty Vehicles

■ 77. The heading for subpart G is revised as set forth above.

■ 78. Section 86.601–84 is amended by revising the introductory text to read as follows:

§ 86.601–84 Applicability.

The provisions of this subpart apply to light-duty vehicles, light-duty trucks, and heavy-duty vehicles. However, manufacturers that optionally certify heavy-duty vehicles based on chassis testing under § 86.1863–07 may choose instead to perform selective enforcement audits using the procedures specified in 40 CFR part 1068, subpart E. References to "light-duty vehicle" or "LDT" in this subpart G shall be deemed to include light-duty trucks and heavy-duty vehicles as appropriate.

* * * * *

■ 79. Subpart K, consisting of § 86.1001, is revised to read as follows:

Subpart K—Selective Enforcement Auditing of New Heavy-Duty Engines

§ 86.1001 Applicability.

(a) The selective enforcement auditing program described in 40 CFR part 1068, subpart E, applies for all heavy-duty engines as described in this section. In addition, the provisions of 40 CFR 1068.10 and 1068.20 apply for any selective enforcement audits of these engines.

(b) For heavy-duty engines, the prescribed test procedure is the Federal Test Procedure as described in subparts I, N, and P of this part (including provisions of 40 CFR part 1065 as specified in this part), except that they shall not be subject to the test procedures specified in §§ 86.1360(b)(2) and (f), 86.1370, 86.1372, and 86.1380. The Administrator may, on the basis of a written application by a manufacturer, approve optional test procedures other than those in subparts I, N, and P of this part for any heavy-duty vehicle which is not susceptible to satisfactory testing using the procedures in subparts I, N, and P of this part.

Subpart N—[Amended]

■ 80. Section 86.1305–2010 is amended by revising paragraph (h)(2) to read as follows:

§ 86.1305–2010 Introduction; structure of subpart.

* * * * *

(h) * * *

(2) Follow the provisions of 40 CFR 1065.342 to verify the performance of any sample dryers in your system. Correct your measurements according to 40 CFR 1065.659, except use the value of K_w in § 86.1342–90(i) as the value of $(1 - x_{H2Oexh})$ in Equation 1065.659–1.

* * * * *

Subpart T—[Amended]

■ 81. Section 86.1910 is amended by revising paragraph (d) to read as follows:

§ 86.1910 How must I prepare and test my in-use engines?

* * * * *

(d) You must test the selected engines while they remain installed in the vehicle. Use portable emission sampling equipment and field-testing procedures referenced in § 86.1375. Measure emissions of THC, NMHC (by any method specified in 40 CFR part 1065, subpart J), CO, NO_X, PM (as appropriate), and CO_2. Measure or determine O_2 emissions using good engineering judgment.

* * * * *

PART 94—CONTROL OF EMISSIONS FROM MARINE COMPRESSION–IGNITION ENGINES

■ 82. The authority citation for part 94 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 83. Section 94.1 is amended by revising paragraph (b)(3) to read as follows:

§ 94.1 Applicability.

* * * * *

(b) * * *

(3) Marine engines subject to the standards of 40 CFR part 1042, and marine engines that optionally certify (to the Tier 1 or Tier 2 standards) under the provisions of 40 CFR part 1042. Note that 40 CFR 1042.1 specifies that marine compression-ignition engines that are not certified under this part are subject to 40 CFR part 1042. Such engines may also be subject to the standards of this part 94.

* * * * *

■ 84. Section 94.12 is amended by adding paragraph (j) to read as follows:

§ 94.12 Interim provisions.

* * * * *

(j) *Transition to new category thresholds.* Beginning model year 2012, engines with maximum engine power at or below 3700 kW with per-cylinder displacement at or above 5.0 liters and below 7.0 liters are Category 1 engines subject to 40 CFR part 1042. Similarly, beginning model year 2014, engines with maximum engine power above 3700 kW with per-cylinder displacement at or above 5.0 liters and below 7.0 liters are Category 1 engines subject to 40 CFR part 1042. For purposes of this paragraph (j), maximum engine power has the meaning given in 40 CFR 1042.901.

Subpart J—[Amended]

■ 85. Section 94.904 is amended by revising paragraph (a) to read as follows:

§ 94.904 Exemptions.

(a) Except as specified otherwise in this subpart, the provisions of §§ 94.904 through 94.913 exempt certain new engines from the standards, other requirements, and prohibitions of this part, except for the requirements of this subpart and the requirements of § 94.1104. Additional requirements may apply for imported engines; these are described in subpart I of this part. Engines may also be exempted from the standards of this part under the provisions of 40 CFR part 1042 or part 1068.

* * * * *

PART 1027—FEES FOR ENGINE, VEHICLE, AND EQUIPMENT COMPLIANCE PROGRAMS

■ 86. The authority citation for part 1027 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

■ 87. Section 1027.101 is amended as follows:

■ a. By revising paragraph (a)(2)(iii).

■ b. By adding paragraph (a)(4).

■ c. By revising paragraph (d).

§ 1027.101 To whom do these requirements apply?

(a) * * *

(2) * * *

(iii) Marine compression-ignition engines we regulate under 40 CFR part 94, 1042, or 1043.

* * * * *

(4) Portable fuel containers we regulate under 40 CFR part 59, subpart F.

* * * * *

(d) Paragraph (a) of this section identifies the parts of the CFR that define emission standards and other requirements for particular types of engines, vehicles, and fuel-system components. This part 1027 refers to each of these other parts generically as the "standard-setting part." For example, 40 CFR part 1051 is always the standard-setting part for recreational vehicles. For some nonroad engines, we allow for certification related to evaporative emissions separate from exhaust emissions. In this case, 40 CFR part 1060 is the standard-setting part for the equipment or fuel system components you produce.

■ 88. Section 1027.105 is amended by revising paragraph (b)(3) to read as follows:

§ 1027.105 How much are the fees?

* * * * *

(b) * * *

(3) The following fees apply for nonroad and stationary engines, vehicles, equipment, and components:

Category	Certificate type	Fee
(i) Locomotives and locomotive engines	All	$826
(ii) Marine compression-ignition engines and stationary compression-ignition engines with per-cylinder displacement at or above 10 liters.	All, including EIAPP	826

Category	Certificate type	Fee
(iii) Other nonroad compression-ignition engines and stationary compression-ignition engines with per-cylinder displacement below 10 liters.	All	1,822
(iv) Large SI engines	All	826
(v) Stationary spark-ignition engines above 19 kW	All	826
(vi) Marine SI engines and Small SI engines	Exhaust only	826
(vii) Stationary spark-ignition engines at or below 19 kW	Exhaust only	826
(viii) Recreational vehicles	Exhaust (or combined exhaust and evap)	826
(ix) Equipment and fuel-system components associated with nonroad and stationary spark-ignition engines, including portable fuel containers.	Evap (where separate certification is required).	241

* * * * *

■ 89. Section 1027.115 is amended by revising paragraph (g) to read as follows:

§ 1027.115 What special provisions apply for certification related to nonroad and stationary engines?

* * * * *

(g) For marine compression-ignition engines, if you apply for a Federal certificate and an EIAPP certificate for the same engine family, a single fee applies for the engine family (*see* 40 CFR parts 94, 1042, and 1043).

* * * * *

■ 89b. Section 1027.150 is amended by revising the section heading to read as follows and removing the definition of "Annex VI."

§ 1027.150 What definitions apply to this part?

* * * * *

PART 1033—CONTROL OF EMISSIONS FROM LOCOMOTIVES

■ 90. The authority citation for part 1033 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 91. Section 1033.15 is amended by revising paragraph (a) to read as follows:

§ 1033.15 Other regulation parts that apply for locomotives.

(a) Part 1065 of this chapter describes procedures and equipment specifications for testing engines to measure exhaust emissions. Subpart F of this part 1033 describes how to apply the provisions of part 1065 of this chapter to test locomotives to determine whether they meet the exhaust emission standards in this part.

* * * * *

■ 92. A new § 1033.30 is added to subpart A to read as follows:

§ 1033.30 Submission of information.

(a) This part includes various requirements to record data or other information. Refer to § 1033.925 and 40 CFR 1068.25 regarding recordkeeping requirements. Unless we specify otherwise, store these records in any format and on any media and keep them readily available for one year after you send an associated application for certification, or one year after you generate the data if they do not support an application for certification. You must promptly send us organized, written records in English if we ask for them. We may review them at any time.

(b) The regulations in § 1033.255 and 40 CFR 1068.101 describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. This includes information not related to certification.

(c) Send all reports and requests for approval to the Designated Compliance Officer (*see* § 1033.901).

(d) Any written information we require you to send to or receive from another company is deemed to be a required record under this section. Such records are also deemed to be submissions to EPA. We may require you to send us these records whether or not you are a certificate holder.

Subpart B—[Amended]

■ 93. Section 1033.101 is amended by revising paragraph (d) to read as follows:

§ 1033.101 Exhaust emission standards.

* * * * *

(d) *Averaging, banking, and trading.* You may generate or use emission credits under the averaging, banking, and trading (ABT) program as described in subpart H of this part to comply with the NO_X and/or PM standards of this part. You may also use ABT to comply with the Tier 4 HC standards of this part as described in paragraph (j) of this section. Generating or using emission credits requires that you specify a family emission limit (FEL) for each pollutant you include in the ABT program for each engine family. These FELs serve as the emission standards for the engine family with respect to all required testing instead of the standards specified in paragraphs (a) and (b) of this section. FELs may not be higher than the following limits:

(1) FELs for Tier 0 and Tier 1 locomotives originally manufactured before 2002 may have any value.

(2) FELs for Tier 1 locomotives originally manufactured 2002 through 2004 may not exceed 9.5 g/bhp-hr for NO_X emissions or 0.60 g/bhp-hr for PM emissions measured over the line-haul duty cycle. FELs for these locomotives may not exceed 14.4 g/bhp-hr for NO_X emissions or 0.72 g/bhp-hr for PM emissions measured over the switch duty cycle.

(3) FELs for Tier 2 and Tier 3 locomotives may not exceed the Tier 1 standards of this section.

(4) FELs for Tier 4 locomotives may not exceed the Tier 3 standards of this section.

* * * * *

■ 94. Section 1033.115 is amended by revising paragraph (f) to read as follows:

§ 1033.115 Other requirements.

* * * * *

(f) *Defeat devices.* You may not equip your locomotives with a defeat device. A defeat device is an auxiliary emission control device (AECD) that reduces the effectiveness of emission controls under conditions that the locomotive may reasonably be expected to encounter during normal operation and use.

(1) This does not apply to AECDs you identify in your application for certification if any of the following is true:

(i) The conditions of concern were substantially included in the applicable duty cycle test procedures described in subpart F of this part.

(ii) You show your design is necessary to prevent locomotive damage or accidents.

(iii) The reduced effectiveness applies only to starting the locomotive.

(iv) The locomotive emissions when the AECD is functioning are at or below the notch caps of § 1033.101.

(2) This does not apply to AECDs related to hotel mode that conform to the specifications of this paragraph (f)(2). This provision is intended for AECDs that have the primary function of operating the engine at a different speed than would be done to generate

the same propulsive power when not operating in hotel mode. Identify and describe these AECDs in your application for certification. We may allow the AECDs to modify engine calibrations where we determine that such modifications are environmentally beneficial or needed for proper engine function. You must obtain preliminary approval under § 1033.210 before incorporating such modifications. Otherwise, you must apply the same injection timing and intake air cooling strategies in hotel mode and non-hotel mode.

* * * * *

■ 95. Section 1033.120 is amended by revising paragraph (c) to read as follows:

§ 1033.120 Emission-related warranty requirements.

* * * * *

(c) *Components covered.* The emission-related warranty covers all components whose failure would increase a locomotive's emissions of any regulated pollutant. This includes components listed in 40 CFR part 1068, Appendix I, and components from any other system you develop to control emissions. The emission-related warranty covers the components you sell even if another company produces the component. Your emission-related warranty does not need to cover components whose failure would not increase a locomotive's emissions of any regulated pollutant. For remanufactured locomotives, your emission-related warranty is required to cover only those parts that you supply or those parts for which you specify allowable part manufacturers. It does not need to cover used parts that are not replaced during the remanufacture.

* * * * *

■ 95b. Section 1033.150 amended by revising paragraph (a)(4) and redesignating paragraph (k)(1) as paragraph (l) to read as follows:

§ 1033.150 Interim provisions.

* * * * *

(a) * * *

(4) Estimate costs as follows:

(i) The cost limits described in paragraph (a)(1) of this section are specified in terms of 2007 dollars. Adjust these values for future years according to the following equation:

$$\text{Actual Limit} = (\text{2007 Limit}) \times [(0.6000) \times (\text{Commodity Index}) + (0.4000) \times (\text{Earnings Index})]$$

Where:

2007 Limit = The value specified in paragraph (a)(1) of this section ($250,000 or $125,000).

Commodity Index = The U.S. Bureau of Labor Statistics Producer Price Index for Industrial Commodities Less Fuel (Series WPU03T15M05) for the month prior to the date you submit your application divided by 173.1.

Earnings Index = The U.S. Bureau of Labor Statistics Estimated Average Hourly Earnings of Production Workers for Durable Manufacturing (Series CES3100000008) for the month prior to the date you submit your application divided by 18.26.

(ii) Calculate all costs in current dollars (for the month prior to the date you submit your application). Calculate fuel costs based on a fuel price adjusted by the Association of American Railroads' monthly railroad fuel price index (P), which is available at *https://www.aar.org//media/AAR/RailCostIndexes/Index_MonthlyFuelPrices.ashx.* (Use the value for the column in which P equals 539.8 for November 2007.) Calculate a new fuel price using the following equation:

$$\text{Fuel Price} = (\$2.76 \text{ per gallon}) \times (P/539.8)$$

* * * * *

Subpart C—[Amended]

■ 96. Section 1033.220 is amended by revising the introductory text and paragraph (a) to read as follows:

§ 1033.220 Amending maintenance instructions.

You may amend your emission-related maintenance instructions after you submit your application for certification, as long as the amended instructions remain consistent with the provisions of § 1033.125. You must send the Designated Compliance Officer a request to amend your application for certification for an engine family if you want to change the emission-related maintenance instructions in a way that could affect emissions. In your request, describe the proposed changes to the maintenance instructions. If owners/operators follow the original maintenance instructions rather than the newly specified maintenance, this does not allow you to disqualify those locomotives from in-use testing or deny a warranty claim.

(a) If you are decreasing or eliminating any of the specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

* * * * *

■ 97. Section 1033.225 is amended as follows:

■ a. By revising the introductory text.

■ b. By revising paragraphs (b) introductory text and (b)(2).

■ c. By revising paragraphs (e) and (f).

§ 1033.225 Amending applications for certification.

Before we issue you a certificate of conformity, you may amend your application to include new or modified locomotive configurations, subject to the provisions of this section. After we have issued your certificate of conformity, you may send us an amended application requesting that we include new or modified locomotive configurations within the scope of the certificate, subject to the provisions of this section. You must also amend your application if any changes occur with respect to any information that is included or should be included in your application. For example, you must amend your application if you determine that your actual production variation for an adjustable parameter exceeds the tolerances specified in your application.

* * * * *

(b) To amend your application for certification, send the relevant information to the Designated Compliance Officer.

* * * * *

(2) Include engineering evaluations or data showing that the amended engine family complies with all applicable requirements. You may do this by showing that the original emission-data locomotive is still appropriate for showing that the amended family complies with all applicable requirements.

* * * * *

(e) For engine families already covered by a certificate of conformity, you may start producing the new or modified locomotive anytime after you send us your amended application, before we make a decision under paragraph (d) of this section. However, if we determine that the affected locomotives do not meet applicable requirements, we will notify you to cease production of the locomotives and may require you to recall the locomotives at no expense to the owner. Choosing to produce locomotives under this paragraph (e) is deemed to be consent to recall all locomotives that we determine do not meet applicable emission standards or other requirements and to remedy the nonconformity at no expense to the owner. If you do not provide information required under paragraph

(c) of this section within 30 days after we request it, you must stop producing the new or modified locomotives.

(f) You may ask us to approve a change to your FEL in certain cases after the start of production. The changed FEL may not apply to locomotives you have already introduced into U.S. commerce, except as described in this paragraph (f). If we approve a changed FEL after the start of production, you must include the new FEL on the emission control information label for all locomotives produced after the change. You may ask us to approve a change to your FEL in the following cases:

(1) You may ask to raise your FEL for your engine family at any time. In your request, you must show that you will still be able to meet the emission standards as specified in subparts B and H of this part. If you amend your application by submitting new test data to include a newly added or modified locomotive, as described in paragraph (b)(3) of this section, use the appropriate FELs with corresponding production volumes to calculate emission credits for the model year, as described in subpart H of this part. In all other circumstances, you must use the higher FEL for the entire family to calculate emission credits under subpart H of this part.

(2) You may ask to lower the FEL for your emission family only if you have test data from production locomotives showing that emissions are below the proposed lower FEL. The lower FEL applies only to engines or fuel-system components you produce after we approve the new FEL. Use the appropriate FELs with corresponding production volumes to calculate emission credits for the model year, as described in subpart H of this part.

■ 98. Section 1033.235 is amended by revising paragraphs (c) and (d) introductory text to read as follows:

§ 1033.235 Emission testing required for certification.

* * * * *

(c) We may measure emissions from any of your emission-data locomotives or other locomotives from the engine family.

(1) We may decide to do the testing at your plant or any other facility. If we do this, you must deliver the locomotive to a test facility we designate. If we do the testing at your plant, you must schedule it as soon as possible and make available the instruments, personnel, and equipment we need.

(2) If we measure emissions from one of your locomotives, the results of that testing become the official emission results for the locomotive. Unless we later invalidate these data, we may decide not to consider your data in determining if your engine family meets applicable requirements.

(3) Before we test one of your locomotives, we may set its adjustable parameters to any point within the adjustable ranges (*see* § 1033.115(b)).

(4) Before we test one of your locomotives, we may calibrate it within normal production tolerances for anything we do not consider an adjustable parameter. For example, this would apply where we determine that an engine parameter is not an adjustable parameter (as defined in § 1033.901) but that it is subject to production variability.

(d) You may ask to use carryover emission data from a previous model year instead of doing new tests if all the following are true:

* * * * *

■ 99. Section 1033.240 is amended by revising paragraph (a) introductory text and paragraph (b) introductory text to read as follows:

§ 1033.240 Demonstrating compliance with exhaust emission standards.

(a) For purposes of certification, your engine family is considered in compliance with the applicable numerical emission standards in § 1033.101 if all emission-data locomotives representing that family have test results showing official emission results and deteriorated emission levels at or below these standards.

* * * * *

(b) Your engine family is deemed not to comply if any emission-data locomotive representing that family has test results showing an official emission result or a deteriorated emission level for any pollutant that is above an applicable emission standard. Use the following steps to determine the deteriorated emission level for the test locomotive:

* * * * *

■ 100. Section 1033.255 is amended by revising paragraph (b) to read as follows:

§ 1033.255 EPA decisions.

* * * * *

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Clean Air Act. We will base our decision on all available information. If we deny your application, we will explain why in writing.

* * * * *

Subpart D—[Amended]

■ 101. Section 1033.325 is amended by revising paragraph (d) to read as follows:

§ 1033.325 Maintenance of records; submittal of information.

* * * * *

(d) Nothing in this section limits our authority to require you to establish, maintain, keep or submit to us information not specified by this section. We may also ask you to send less information.

* * * * *

Subpart F—[Amended]

■ 102. Section 1033.501 is amended by revising paragraph (i) to read as follows:

§ 1033.501 General provisions.

* * * * *

(i) For passenger locomotives that can generate hotel power from the main propulsion engine, the locomotive must comply with the emission standards when in non-hotel setting. For hotel mode, the locomotive is subject to the notch cap provisions of § 1033.101 and the defeat device prohibition of § 1033.115.

■ 103. Section 1033.505 is amended by revising paragraph (a) to read as follows:

§ 1033.505 Ambient conditions.

* * * * *

(a) *Temperature.* (1) Testing may be performed with ambient temperatures from 15.5 °C (60 °F) to 40.5 °C (105 °F). Do not correct emissions for temperature effects within this range.

(2) It is presumed that combustion air will be drawn from the ambient air. Thus, the ambient temperature limits of this paragraph (a) apply for intake air upstream of the engine. If you do not draw combustion air from the ambient air, use good engineering judgment to ensure that any temperature difference (between the ambient air and combustion air) does not cause the emission measurement to be unrepresentative of in-use emissions.

(3) If we allow you to perform testing at ambient temperatures below 15.5 °C, you must correct NO_X emissions for temperature effects, consistent with good engineering judgment. For example, if the intake air temperature (at the manifold) is lower at the test temperature than it would be for equivalent operation at an ambient temperature of 15.5 °C, you generally will need to adjust your measured NO_X emissions to account for the effect of the lower intake air temperature. However, if you maintain a constant manifold air

temperature, you will generally not need to correct emissions.

* * * * *

■ 104. Section 1033.515 is amended by revising the section heading and paragraphs (d) and (e) to read as follows:

§ 1033.515 Discrete-mode steady-state emission tests of locomotives and locomotive engines.

* * * * *

(d) Use one of the following approaches for sampling PM emissions during discrete-mode steady-state testing:

(1) *Engines certified to a PM standard/FEL at or above 0.05 g/bhp-hr.* Use a separate PM filter sample for each test mode of the locomotive test cycle according to the procedures specified in paragraph (a) through (c) of this section. You may ask to use a shorter sampling period if the total mass expected to be collected would cause unacceptably high pressure drop across the filter before reaching the end of the required sampling time. We will not allow sampling times shorter than 60 seconds. When we conduct locomotive emission tests, we will adhere to the time limits for each of the numbered modes in Table 1 to this section.

(2) *Engines certified to a PM standard/FEL below 0.05 g/bhp-hr.* (i) You may use separate PM filter samples for each test mode as described in paragraph (d)(1) of this section; however, we recommend that you do not. The low rate of sample filter loading will result in very long sampling times and the large number of filter samples may induce uncertainty stack-up that will lead to unacceptable PM measurement accuracy. Instead, we recommend that you measure PM emissions as specified in paragraph (d)(2)(ii) of this section.

(ii) You may use a single PM filter for sampling PM over all of the test modes of the locomotive test cycle as specified in this paragraph (d)(2). Vary the sample time to be proportional to the applicable line-haul or switch weighting factors specified in § 1033.530 for each mode. The minimum sampling time for each mode is 400 seconds multiplied by the weighting factor. For example, for a mode with a weighting factor of 0.030, the minimum sampling time is 12.0 seconds. PM sampling in each mode must be proportional to engine exhaust flow as specified in 40 CFR part 1065. Begin proportional sampling of PM emissions at the beginning of each test mode as is specified in paragraph (c) of this section. End the sampling period for each test mode so that sampling times are proportional to the weighting factors for the applicable duty cycles. If necessary, you may extend the time limit for each of the test modes beyond the sampling times in Table 1 to this section to increase the sampled mass of PM emissions or to account for proper weighting of the PM emission sample over the entire cycle, using good engineering judgment.

(e) This paragraph (e) describes how to test locomotive engines when not installed in a locomotive. Note that the test procedures for dynamometer engine testing of locomotive engines are intended to produce emission measurements that are the same as emission measurements produced during testing of complete locomotives using the same engine configuration. The following requirements apply for all engine tests:

(1) Specify a second-by-second set of engine speed and load points that are representative of in-use locomotive operation for each of the set-points of the locomotive test cycle described in Table 1 to this section, including transitions from one notch to the next. This is your reference cycle for validating your cycle. You may ignore points between the end of the sampling period for one mode and the point at which you change the notch setting to begin the next mode.

(2) Keep the temperature of the air entering the engine after any charge air cooling to within 5 °C of the typical intake manifold air temperature when the engine is operated in the locomotive under similar ambient conditions.

(3) Proceed as specified in paragraphs (a) through (d) of this section for testing complete locomotives.

■ 105. Section 1033.530 is amended by revising paragraphs (e) and (h) to read as follows:

§ 1033.530 Duty cycles and calculations.

* * * * *

(e) *Automated Start-Stop.* For a locomotive equipped with features that shut the engine off after prolonged periods of idle, multiply the measured idle mass emission rate over the idle portion of the applicable test cycles by a factor equal to one minus the estimated fraction reduction in idling time that will result in use from the shutdown feature. Do not apply this factor to the weighted idle power. Application of this adjustment is subject to our approval if the fraction reduction in idling time that is estimated to result from the shutdown feature is greater than 25 percent. This paragraph (e) does not apply if the locomotive is (or will be) covered by a separate certificate for idle control.

* * * * *

(h) *Calculation adjustments for energy-saving design features.* The provisions of this paragraph (h) apply for locomotives equipped with new energy-saving locomotive design features. They do not apply for features that only improve the engine's brake-specific fuel consumption. They also do not apply for features that were commonly incorporated in locomotives before 2008. *See* paragraph (h)(6) of this section for provisions related to determining whether certain features are considered to have been commonly incorporated in locomotives before 2008.

(1) Manufacturers/remanufacturers choosing to adjust emissions under this paragraph (h) must do all of the following for certification:

(i) Describe the energy-saving features in your application for certification.

(ii) Describe in your installation instruction and/or maintenance instructions all steps necessary to utilize the energy-saving features.

(2) If your design feature will also affect the locomotives' duty cycle, you must comply with the requirements of paragraph (g) of this section.

(3) Calculate the energy savings as follows:

(i) Estimate the expected mean in-use fuel consumption rate (on a BTU per ton-mile basis) with and without the energy saving design feature, consistent with the specifications of paragraph (h)(4) of this section. The energy savings is the ratio of fuel consumed from a locomotive operating with the new feature to fuel consumed from a locomotive operating without the feature under identical conditions. Include an estimate of the 80 percent confidence interval for your estimate of the mean and other statistical parameters we specify.

(ii) Your estimate must be based on in-use operating data, consistent with good engineering judgment. Where we have previously certified your design feature under this paragraph (h), we may require you to update your analysis based on all new data that are available. You must obtain approval before you begin collecting operational data for this purpose.

(iii) We may allow you to consider the effects of your design feature separately for different route types, regions, or railroads. We may require that you certify these different locomotives in different engine families and may restrict their use to the specified applications.

(iv) Design your test plan so that the operation of the locomotives with and without is as similar as possible in all material aspects (other than the design feature being evaluated). Correct all data for any relevant differences, consistent with good engineering judgment.

(v) Do not include any brake-specific energy savings in your calculated values. If it is not possible to exclude such effects from your data gathering, you must correct for these effects, consistent with good engineering judgment.

(4) Calculate adjustment factors as described in this paragraph (h)(4). If the energy savings will apply broadly, calculate and apply the adjustment on a cycle-weighted basis. Otherwise, calculate and apply the adjustment separately for each notch. To apply the adjustment, multiply the emissions (either cycle-weighted or notch-specific, as applicable) by the adjustment. Use the lower bound of the 80 percent confidence interval of the estimate of the mean as your estimated energy savings rate. We may cap your energy savings rate for this paragraph (h)(4) at 80 percent of the estimate of the mean. Calculate the emission adjustment factors as:

$$AF = 1.000 - (\text{energy savings rate})$$

(5) We may require you to collect and report data from locomotives we allow you to certify under this paragraph (h) and to recalculate the adjustment factor for future model years based on such data.

(6) Features that are considered to have not been commonly incorporated in locomotives before 2008 include but are not limited to those identified in this paragraph (h)(6).

(i) Electronically controlled pneumatic (ECP) brakes, computerized throttle management control, and advanced hybrid technology were not commonly incorporated in locomotives before 2008. Manufacturers may claim full credit for energy savings that result from applying these features to freshly manufactured and/or remanufactured locomotives.

(ii) Distributed power systems that use radio controls to optimize operation of locomotives in the middle and rear of a train were commonly incorporated in some but not all locomotives in 2008. Manufacturers may claim credit for incorporating these features into locomotives as follows:

(A) Manufacturers may claim prorated credit for incorporating distributed power systems in freshly manufactured locomotives. Multiply the energy saving rate by 0.50 when calculating the adjustment factor:

$$AF = 1.000 - (\text{energy savings rate}) \times (0.50)$$

(B) Manufacturers may claim full credit for retrofitting distributed power systems in remanufactured locomotives.

Subpart G—[Amended]

■ 106. Section 1033.601 is amended by revising paragraph (a) to read as follows:

§ 1033.601 General compliance provisions.

* * * * *

(a) *Meaning of terms.* When used in 40 CFR part 1068, apply meanings for specific terms as follows:

(1) “Manufacturer” means manufacturer and/or remanufacturer.

(2) “Date of manufacture” means date of original manufacture for freshly manufactured locomotives and the date on which a remanufacture is completed for remanufactured engines.

* * * * *

■ 107. Section 1033.625 is amended by revising paragraphs (a)(1), (b), and (c) to read as follows:

§ 1033.625 Special certification provisions for non-locomotive-specific engines.

* * * * *

(a) * * *

(1) Before being installed in the locomotive, the engines were covered by a certificate of conformity issued under 40 CFR Part 1039 (or part 89) that is effective for the calendar year in which the manufacture or remanufacture occurs. You may use engines certified during the previous years if they were subject to the same standards. You may not make any modifications to the engines unless we approve them.

* * * * *

(b) To certify your locomotives by design under this section, submit your application as specified in § 1033.205, with the following exceptions:

(1) Include the following instead of the locomotive test data otherwise required by § 1033.205:

(i) A description of the engines to be used, including the name of the engine manufacturer and engine family identifier for the engines.

(ii) A brief engineering analysis describing how the engine's emission controls will function when installed in the locomotive throughout the locomotive's useful life.

(iii) The emission data submitted under 40 CFR part 1039 (or part 89).

(2) You may separately submit some of the information required by § 1033.205, consistent with the provisions of § 1033.1(d). For example, this may be an appropriate way to submit detailed information about proprietary engine software. Note that this allowance to separately submit some of the information required by § 1033.205 is also available for applications not submitted under this section.

(c) Locomotives certified under this section are subject to all the requirements of this part except as specified in paragraph (b) of this section. The engines used in such locomotives are not considered to be included in the otherwise applicable engines family of 40 CFR part 1039 (or part 89).

* * * * *

■ 108. A new § 1033.652 is added to subpart G to read as follows:

§ 1033.652 Special provisions for exported locomotives.

(a) *Uncertified locomotives.* Locomotives covered by an export exemption under 40 CFR 1068.230 may be introduced into U.S. commerce prior to being exported, but may not be used in any revenue generating service in the United States. Locomotives covered by this paragraph (a) may not include any EPA emission control information label. Such locomotives may include emission control information labels for the country to which they are being exported.

(b) *Locomotives covered by export-only certificates.* Locomotives may be certified for export under 40 CFR 1068.230. Such locomotives may be introduced into U.S. commerce prior to being exported, but may not be used in any revenue generating service in the United States.

(c) *Locomotives included in a certified engine family.* Except as specified in paragraph (d) of this section, locomotives included in a certified engine family may be exported without restriction. Note that § 1033.705 requires that exported locomotives be excluded from emission credit calculations in certain circumstances.

(d) *Locomotives certified to FELs above the standards.* The provisions of this paragraph (d) apply for locomotive configurations included in engine families certified to one or more FELs above any otherwise applicable standard. Individual locomotives that will be exported may be excluded from an engine family if they are unlabeled. For locomotives that were labeled during production, you may remove the emission control information labels prior to export. All unlabeled locomotives that will be exported are subject to the provisions of paragraph (a) of this section. Locomotives that are of a configuration included in an engine family certified to one of more FELs above any otherwise applicable standard that include an EPA emission control information label when exported are considered to be part of the engine family and must be included in credit calculations under § 1033.705. Note that this requirement does not apply for locomotives that do not have an EPA emission control information label, even if they have other labels (such as an export-only label).

Subpart H—[Amended]

■ 109. Section 1033.705 is amended by revising paragraph (b) introductory text to read as follows:

§ 1033.705 Calculating emission credits.

* * * * *

(b) For each participating engine family, calculate positive or negative emission credits relative to the otherwise applicable emission standard. For the end of year report, round the sum of emission credits to the nearest one hundredth of a megagram (0.01 Mg). Round your end of year emission credit balance to the nearest megagram (Mg). Use consistent units throughout the calculation. When useful life is expressed in terms of megawatt-hrs, calculate credits for each engine family from the following equation:

* * * * *

■ 110. Section 1033.715 is revised to read as follows:

§ 1033.715 Banking emission credits.

(a) Banking is the retention of emission credits by the manufacturer/remanufacturer generating the emission credits (or owner/operator, in the case of transferred credits) for use in future model years for averaging, trading, or transferring. You may use banked emission credits only as allowed by § 1033.740.

(b) You may designate any emission credits you plan to bank in the reports you submit under § 1033.730 as reserved credits. During the model year and before the due date for the final report, you may designate your reserved emission credits for averaging, trading, or transferring.

(c) Reserved credits become actual emission credits when you submit your final report. However, we may revoke these emission credits if we are unable to verify them after reviewing your reports or auditing your records.

■ 111. Section 1033.725 is amended by revising paragraph (b)(2) to read as follows:

§ 1033.725 Requirements for your application for certification.

* * * * *

(b) * * *

(2) Detailed calculations of projected emission credits (positive or negative) based on projected production volumes. We may require you to include similar calculations from your other engine families to demonstrate that you will be able to avoid a negative credit balance for the model year. If you project negative emission credits for a family, state the source of positive emission credits you expect to use to offset the negative emission credits.

■ 112. Section 1033.730 is amended by revising paragraphs (b)(3) and (b)(5) to read as follows:

§ 1033.730 ABT reports.

* * * * *

(b) * * *

(3) The FEL for each pollutant. If you change the FEL after the start of production, identify the date that you started using the new FEL and/or give the engine identification number for the first engine covered by the new FEL. In this case, identify each applicable FEL and calculate the positive or negative emission credits as specified in § 1033.225.

* * * * *

(5) Rated power for each locomotive configuration, and the average locomotive power weighted by U.S.-directed production volumes for the engine family.

* * * * *

■ 113. Section 1033.735 is amended by revising paragraphs (b), (d), and (e) to read as follows:

§ 1033.735 Required records.

* * * * *

(b) Keep the records required by this section for at least eight years after the due date for the end-of-year report. You may not use emission credits for any engines if you do not keep all the records required under this section. You must therefore keep these records to continue to bank valid credits. Store these records in any format and on any media, as long as you can promptly send us organized, written records in English if we ask for them. You must keep these records readily available. We may review them at any time.

* * * * *

(d) Keep records of the engine identification number for each locomotive you produce that generates or uses emission credits under the ABT program. If you change the FEL after the start of production, identify the date you started using each FEL and the range of engine identification numbers associated with each FEL. You must also be able to identify the purchaser and destination for each engine you produce.

(e) We may require you to keep additional records or to send us relevant information not required by this section in accordance with the Clean Air Act.

Subpart J—[Amended]

■ 114. Section 1033.901 is amended by revising the definitions for "Carryover", "Total hydrocarbon equivalent", and "Useful life" and adding a new definition for "Alcohol-fueled locomotive" in alphabetical order to read as follows:

§ 1033.901 Definitions.

* * * * *

Alcohol-fueled locomotive means a locomotive with an engine that is designed to run using an alcohol fuel. For purposes of this definition, alcohol fuels do not include fuels with a nominal alcohol content below 25 percent by volume.

* * * * *

Carryover means relating to certification based on emission data generated from an earlier model year as described in § 1033.235(d).

* * * * *

Total hydrocarbon equivalent has the meaning given in 40 CFR 1065.1001. This generally means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as exhaust hydrocarbon from petroleum-fueled locomotives. The atomic hydrogen-to-carbon mass ratio of the equivalent hydrocarbon is 1.85:1.

* * * * *

Useful life means the period during which the locomotive engine is designed to properly function in terms of reliability and fuel consumption, without being remanufactured, specified as work output or miles. It is the period during which a locomotive is required to comply with all applicable emission standards. *See* § 1033.101(g).

* * * * *

■ 115. Section 1033.905 is amended by adding "ABT", "AF", and U.S." in alphabetical order to read as follows:

§ 1033.925 Symbols, acronyms, and abbreviations.

* * * * *

ABT averaging, banking, and trading.

* * * * *

AF adjustment factor (*see* § 1033.530).

* * * * *

U.S. United States.

* * * * *

■ 116. A new § 1033.925 is added to subpart J to read as follows:

§ 1033.925 Reporting and recordkeeping requirements.

Under the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*), the Office of Management and Budget approves the reporting and recordkeeping specified in the applicable regulations. Failing to properly report information and keep the records we specify violates 40 CFR 1068.101(a)(2), which may involve civil or criminal penalties. The following items illustrate the kind of reporting and recordkeeping we require for engines regulated under this part:

(a) We specify the following requirements related to engine certification in this part 1033:

(1) In § 1033.150 we state the requirements for interim provisions.

(2) In subpart C of this part we identify a wide range of information required to certify engines.

(3) In § 1033.325 we specify certain records related to production-line testing.

(4) In subpart G of this part we identify several reporting and recordkeeping items for making demonstrations and getting approval related to various special compliance provisions.

(5) In §§ 1033.725, 1033.730, and 1033.735 we specify certain records related to averaging, banking, and trading.

(6) In subpart I of this part we specify certain records related to meeting requirements for remanufactured engines.

(b) We specify the following requirements related to testing in 40 CFR part 1065:

(1) In 40 CFR 1065.2 we give an overview of principles for reporting information.

(2) In 40 CFR 1065.10 and 1065.12 we specify information needs for establishing various changes to published test procedures.

(3) In 40 CFR 1065.25 we establish basic guidelines for storing test information.

(4) In 40 CFR 1065.695 we identify the specific information and data items to record when measuring emissions.

(c) We specify the following requirements related to the general compliance provisions in 40 CFR part 1068:

(1) In 40 CFR 1068.5 we establish a process for evaluating good engineering judgment related to testing and certification.

(2) In 40 CFR 1068.25 we describe general provisions related to sending and keeping information.

(3) In 40 CFR 1068.27 we require manufacturers to make engines available for our testing or inspection if we make such a request.

(4) In 40 CFR 1068.105 we require vessel manufacturers to keep certain records related to duplicate labels from engine manufacturers.

(5) In 40 CFR 1068.120 we specify recordkeeping related to rebuilding engines.

(6) In 40 CFR part 1068, subpart C, we identify several reporting and recordkeeping items for making demonstrations and getting approval related to various exemptions.

(7) In 40 CFR part 1068, subpart D, we identify several reporting and recordkeeping items for making demonstrations and getting approval related to importing engines.

(8) In 40 CFR 1068.450 and 1068.455 we specify certain records related to testing production-line engines in a selective enforcement audit.

(9) In 40 CFR 1068.501 we specify certain records related to investigating and reporting emission-related defects.

(10) In 40 CFR 1068.525 and 1068.530 we specify certain records related to recalling nonconforming engines.

PART 1039—CONTROL OF EMISSIONS FROM NEW AND IN-USE NONROAD COMPRESSION-IGNITION ENGINES

■ 117. The authority citation for part 1039 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 118. Section 1039.2 is revised to read as follows:

§ 1039.2 Who is responsible for compliance?

The regulations in this part 1039 contain provisions that affect both engine manufacturers and others. However, the requirements of this part are generally addressed to the engine manufacturer. The term "you" generally means the engine manufacturer, as defined in § 1039.801, especially for issues related to certification.

■ 119. Section 1039.5 is amended by revising paragraph (a) to read as follows:

§ 1039.5 Which engines are excluded from this part's requirements?

* * * * *

(a) *Locomotive engines.* (1) The following locomotive engines are not subject to the provisions of this part 1039:

(i) Engines in locomotives certified under 40 CFR part 1033.

(ii) Engines in locomotives that are exempt from the standards of 40 CFR part 92 or 1033 pursuant to the provisions of 40 CFR part 1033 or 1068 (except for the provisions of 40 CFR 1033.150(e)).

(2) The following locomotive engines are subject to the provisions of this part 1039:

(i) Engines in locomotives exempt from 40 CFR part 1033 pursuant to the provisions of 40 CFR 1033.150(e).

(ii) Locomotive engines excluded from the definition of locomotive in 40 CFR 1033.901.

* * * * *

■ 120. Section 1039.15 is amended by revising paragraph (a) to read as follows:

§ 1039.15 Do any other regulation parts apply to me?

(a) Part 1065 of this chapter describes procedures and equipment specifications for testing engines to measure exhaust emissions. Subpart F of this part 1039 describes how to apply the provisions of part 1065 of this chapter to determine whether engines meet the exhaust emission standards in this part.

* * * * *

■ 121. A new § 1039.30 is added to subpart A to read as follows:

§ 1039.30 Submission of information.

(a) This part includes various requirements to record data or other information. Refer to § 1039.825 and 40 CFR 1068.25 regarding recordkeeping requirements. Unless we specify otherwise, store these records in any format and on any media and keep them readily available for one year after you send an associated application for certification, or one year after you generate the data if they do not support an application for certification. You must promptly send us organized, written records in English if we ask for them. We may review them at any time.

(b) The regulations in § 1039.255 and 40 CFR 1068.101 describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. This includes information not related to certification.

(c) Send all reports and requests for approval to the Designated Compliance Officer (*see* § 1039.801).

(d) Any written information we require you to send to or receive from another company is deemed to be a required record under this section. Such records are also deemed to be submissions to EPA. We may require you to send us these records whether or not you are a certificate holder.

Subpart B—[Amended]

■ 122. Section 1039.104 is amended by adding paragraph (h) to read as follows:

§ 1039.104 Are there interim provisions that apply only for a limited time?

* * * * *

(h) *Delayed compliance with labeling requirements.* Before the 2011 model year, you may omit the dates of manufacture from the emission control information label as specified in § 1039.135(c)(6) if you keep those records and provide them to us upon request.

■ 123. Section 1039.120 is amended by revising paragraph (c) to read as follows:

§ 1039.120 What emission-related warranty requirements apply to me?

* * * * *

(c) *Components covered.* The emission-related warranty covers all components whose failure would increase an engine's emissions of any regulated pollutant, including components listed in 40 CFR part 1068, Appendix I, and components from any other system you develop to control emissions. The emission-related warranty covers these components even if another company produces the component. Your emission-related warranty does not need to cover components whose failure would not increase an engine's emissions of any regulated pollutant.

* * * * *

■ 124. Section 1039.125 is amended as follows:

■ a. By revising paragraphs (a)(1)(iii), (a)(2)(ii), and (a)(3)(ii).

■ b. By redesignating paragraph (a)(4) as paragraph (a)(6).

■ c. By adding a new paragraph (a)(4).

■ d. By adding paragraph (a)(5).

■ e. By revising paragraphs (c), (d), and (g) introductory text to read as follows:

§ 1039.125 What maintenance instructions must I give to buyers?

* * * * *

(a) * * *

(1) * * *

(iii) You provide the maintenance free of charge and clearly say so in your maintenance instructions.

* * * * *

(2) * * *

(ii) For the following components, including associated sensors and actuators, the minimum interval is 3,000 hours: Fuel injectors, turbochargers, catalytic converters, electronic control units, EGR systems (including related components, but excluding filters and coolers), and other add-on components.

(3) * * *

(ii) For the following components, including associated sensors and actuators, the minimum interval is 4,500 hours: Fuel injectors, turbochargers, catalytic converters, electronic control units, EGR systems (including related components, but excluding filters and coolers), and other add-on components.

(4) For particulate traps, trap oxidizers, and components related to either of these, scheduled maintenance may include cleaning or repair at the intervals specified in paragraph (a)(2) or (3) of this section, as applicable. Scheduled maintenance may include a shorter interval for cleaning or repair and may also include adjustment or replacement, but only if we approve it. We will approve your request if you provide the maintenance free of charge and clearly state this in your maintenance instructions, and you provide us additional information as needed to convince us that the maintenance will occur.

(5) You may ask us to approve a maintenance interval shorter than that specified in paragraphs (a)(2) and (3) of this section under § 1039.210, including emission-related components that were not in widespread use with nonroad compression-ignition engines before 2011. In your request you must describe the proposed maintenance step, recommend the maximum feasible interval for this maintenance, include your rationale with supporting evidence to support the need for the maintenance at the recommended interval, and demonstrate that the maintenance will be done at the recommended interval on in-use engines. In considering your request, we will evaluate the information you provide and any other available information to establish alternate specifications for maintenance intervals, if appropriate. We will announce any decision we make under this paragraph (a)(5) in the **Federal Register.** Anyone may request a hearing regarding such a decision (*see* § 1039.820).

* * * * *

(c) *Special maintenance.* You may specify more frequent maintenance to address problems related to special situations, such as atypical engine operation. You must clearly state that this additional maintenance is associated with the special situation you are addressing. We may disapprove your maintenance instructions if we determine that you have specified special maintenance steps to address engine operation that is not atypical, or that the maintenance is unlikely to occur in use. If we determine that certain maintenance items do not qualify as special maintenance under this paragraph (c), you may identify this as recommended additional maintenance under paragraph (b) of this section.

(d) *Noncritical emission-related maintenance.* Subject to the provisions of this paragraph (d), you may schedule any amount of emission-related inspection or maintenance that is not covered by paragraph (a) of this section (that is, maintenance that is neither explicitly identified as critical emission-related maintenance, nor that we approve as critical emission-related maintenance). Noncritical emission-related maintenance generally includes maintenance on the components we specify in 40 CFR part 1068, Appendix I, that is not covered in paragraph (a) of this section. You must state in the owners manual that these steps are not necessary to keep the emission-related warranty valid. If operators fail to do this maintenance, this does not allow you to disqualify those engines from in-use testing or deny a warranty claim. Do not take these inspection or maintenance steps during service accumulation on your emission-data engines.

* * * * *

(g) *Payment for scheduled maintenance.* Owners are responsible for properly maintaining their engines. This generally includes paying for scheduled maintenance. However, manufacturers must pay for scheduled maintenance during the useful life if the regulations require it or if it meets all the following criteria:

* * * * *

■ 125. Section 1039.135 is amended by revising paragraphs (c)(6) and (c)(8) to read as follows:

§ 1039.135 How must I label and identify the engines I produce?

* * * * *

(c) * * *

(6) State the date of manufacture [DAY (optional), MONTH, and YEAR]; however, you may omit this from the label if you stamp, engrave, or otherwise permanently identify it elsewhere on the engine, in which case you must also describe in your application for certification where you will identify the date on the engine.

* * * * *

(8) Identify the emission-control system. Use terms and abbreviations as described in 40 CFR 1068.45. You may omit this information from the label if there is not enough room for it and you put it in the owners manual instead.

* * * * *

Subpart C—[Amended]

■ 126. Section 1039.201 is amended by adding paragraph (h) to read as follows:

§ 1039.201 What are the general requirements for obtaining a certificate of conformity?

* * * * *

(h) For engines that become new after being placed into service, such as engines converted to nonroad use after being used in motor vehicles, we may specify alternate certification provisions consistent with the intent of this part. *See* the definition of "new nonroad engine" in § 1039.801.

■ 127. Section 1039.220 is revised to read as follows:

§ 1039.220 How do I amend the maintenance instructions in my application?

You may amend your emission-related maintenance instructions after you submit your application for certification as long as the amended instructions remain consistent with the provisions of § 1039.125. You must send the Designated Compliance Officer a written request to amend your application for certification for an engine family if you want to change the emission-related maintenance instructions in a way that could affect emissions. In your request, describe the proposed changes to the maintenance instructions. If operators follow the original maintenance instructions rather than the newly specified maintenance, this does not allow you to disqualify those engines from in-use testing or deny a warranty claim.

(a) If you are decreasing or eliminating any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

(b) If your requested change would not decrease the specified maintenance, you may distribute the new maintenance instructions anytime after you send your request. For example, this paragraph (b) would cover adding instructions to increase the frequency of filter changes for engines in severe-duty applications.

(c) You need not request approval if you are making only minor corrections (such as correcting typographical mistakes), clarifying your maintenance instructions, or changing instructions for maintenance unrelated to emission control. We may ask you to send us copies of maintenance instructions revised under this paragraph (c).

■ 128. Section 1039.225 is amended by revising the section heading, the introductory text, and paragraphs (b) introductory text, (b)(2), (e), and (f) to read as follows:

§ 1039.225 How do I amend my application for certification?

Before we issue you a certificate of conformity, you may amend your application to include new or modified engine configurations, subject to the provisions of this section. After we have issued your certificate of conformity, you may send us an amended application requesting that we include new or modified engine configurations within the scope of the certificate, subject to the provisions of this section. You must amend your application if any changes occur with respect to any information that is included or should be included in your application.

* * * * *

(b) To amend your application for certification, send the relevant information to the Designated Compliance Officer.

* * * * *

(2) Include engineering evaluations or data showing that the amended engine family complies with all applicable requirements. You may do this by showing that the original emission-data engine is still appropriate for showing that the amended family complies with all applicable requirements.

* * * * *

(e) For engine families already covered by a certificate of conformity, you may start producing the new or modified engine configuration anytime after you send us your amended application and before we make a decision under paragraph (d) of this section. However, if we determine that the affected engines do not meet applicable requirements, we will notify you to cease production of the engines and may require you to recall the engines at no expense to the owner. Choosing to produce engines under this paragraph (e) is deemed to be consent to recall all engines that we determine do not meet applicable emission standards or other requirements and to remedy the nonconformity at no expense to the owner. If you do not provide information required under paragraph (c) of this section within 30 days after we request it, you must stop producing the new or modified engines.

(f) You may ask us to approve a change to your FEL in certain cases after the start of production. The changed FEL may not apply to engines you have already introduced into U.S. commerce, except as described in this paragraph (f). If we approve a changed FEL after the start of production, you must include the new FEL on the emission control information label for all engines produced after the change. You may ask us to approve a change to your FEL in the following cases:

(1) You may ask to raise your FEL for your engine family at any time. In your request, you must show that you will still be able to meet the emission standards as specified in subparts B and H of this part. If you amend your application by submitting new test data to include a newly added or modified engine, as described in paragraph (b)(3) of this section, use the appropriate FELs with corresponding production volumes to calculate emission credits for the model year, as described in subpart H of this part. In all other circumstances, you must use the higher FEL for the entire engine family to calculate emission credits under subpart H of this part.

(2) You may ask to lower the FEL for your engine family only if you have test data from production engines showing that emissions are below the proposed lower FEL. The lower FEL applies only to engines you produce after we approve the new FEL. Use the appropriate FELs with corresponding production volumes to calculate emission credits for the model year, as described in subpart H of this part.

■ 129. Section 1039.230 is amended by revising paragraphs (b) and (d) to read as follows:

§ 1039.230 How do I select engine families?

* * * * *

(b) Group engines in the same engine family if they are the same in all the following aspects:

(1) The combustion cycle and fuel.

(2) The cooling system (water-cooled vs. air-cooled).

(3) Method of air aspiration.

(4) Method of exhaust aftertreatment (for example, catalytic converter or particulate trap).

(5) Combustion chamber design.

(6) Bore and stroke.

(7) Cylinder arrangement (such as in-line vs. vee configurations). This applies for engines with aftertreatment devices only.

(8) Method of control for engine operation other than governing (*i.e.,* mechanical or electronic).

(9) Power category.

(10) Numerical level of the emission standards that apply to the engine.

* * * * *

(d) In unusual circumstances, you may group engines that are not identical with respect to the things listed in paragraph (b) of this section in the same engine family if you show that their emission characteristics during the useful life will be similar.

* * * * *

■ 130. Section 1039.235 is amended by revising the section heading and paragraphs (c) and (d) introductory text to read as follows:

§ 1039.235 What testing requirements apply for certification?

* * * * *

(c) We may measure emissions from any of your emission-data engines or other engines from the engine family, as follows:

(1) We may decide to do the testing at your plant or any other facility. If we do this, you must deliver the engine to a test facility we designate. The engine you provide must include appropriate manifolds, aftertreatment devices, electronic control units, and other emission-related components not normally attached directly to the engine block. If we do the testing at your plant, you must schedule it as soon as possible and make available the instruments, personnel, and equipment we need.

(2) If we measure emissions on one of your engines, the results of that testing become the official emission results for the engine. Unless we later invalidate these data, we may decide not to consider your data in determining if your engine family meets applicable requirements.

(3) Before we test one of your engines, we may set its adjustable parameters to any point within the physically adjustable ranges (*see* § 1039.115(e)).

(4) Before we test one of your engines, we may calibrate it within normal production tolerances for anything we do not consider an adjustable parameter. For example, this would apply for an engine parameter that is subject to production variability because it is adjustable during production, but is not considered an adjustable parameter (as defined in § 1039.801) because it is permanently sealed.

(d) You may ask to use carryover emission data from a previous model year instead of doing new tests, but only if all the following are true:

* * * * *

■ 131. Section 1039.240 is amended by revising paragraphs (a), (b), and (c)(1) to read as follows:

§ 1039.240 How do I demonstrate that my engine family complies with exhaust emission standards?

(a) For purposes of certification, your engine family is considered in compliance with the emission standards in § 1039.101(a) and (b), § 1039.102(a) and (b), § 1039.104, and § 1039.105 if all emission-data engines representing that family have test results showing official emission results and deteriorated emission levels at or below these standards. This also applies for all test points for emission-data engines within the family used to establish deterioration factors. Note that your FELs are considered to be the applicable emission standards with which you must comply if you participate in the ABT program in subpart H of this part.

(b) Your engine family is deemed not to comply if any emission-data engine representing that family has test results showing an official emission result or a deteriorated emission level for any pollutant that is above an applicable emission standard. Similarly, your engine family is deemed not to comply if any emission-data engine representing that family has test results showing any emission level above the applicable not-to-exceed emission standard for any pollutant. This also applies for all test points for emission-data engines within the family used to establish deterioration factors.

(c) * * *

(1) *Additive deterioration factor for exhaust emissions.* Except as specified in paragraph (c)(2) of this section, use an additive deterioration factor for exhaust emissions. An additive deterioration factor is the difference between exhaust emissions at the end of the useful life and exhaust emissions at the low-hour test point. In these cases, adjust the official emission results for each tested engine at the selected test point by adding the factor to the measured emissions. If the factor is less than zero, use zero. Additive deterioration factors must be specified to one more decimal place than the applicable standard.

* * * * *

■ 132. Section 1039.245 is amended by revising the introductory text to read as follows:

§ 1039.245 How do I determine deterioration factors from exhaust durability testing?

This section describes how to determine deterioration factors, either with an engineering analysis, with pre-existing test data, or with new emission measurements. Apply these deterioration factors to determine whether your engines will meet the duty-cycle emission standards throughout the useful life as described in § 1039.240.

* * * * *

■ 133. Section 1039.250 is amended by revising paragraphs (a) introductory text and (c) and removing paragraph (e) to read as follows:

§ 1039.250 What records must I keep and what reports must I send to EPA?

(a) Within 45 days after the end of the model year, send the Designated Compliance Officer a report describing the following information about engines you produced during the model year:

* * * * *

(c) Keep data from routine emission tests (such as test cell temperatures and relative humidity readings) for one year after we issue the associated certificate of conformity. Keep all other information specified in this section for eight years after we issue your certificate.

* * * * *

■ 134. Section 1039.255 is amended by revising paragraph (b) to read as follows:

§ 1039.255 What decisions may EPA make regarding my certificate of conformity?

* * * * *

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Clean Air Act. We will base our decision on all available information. If we deny your application, we will explain why in writing.

* * * * *

■ 135. Section 1039.510 is amended by revising paragraph (b) and adding paragraph (c) to read as follows:

§ 1039.510 Which duty cycles do I use for transient testing?

* * * * *

(b) The transient test sequence consists of an initial run through the transient duty cycle from a cold start, 20 minutes with no engine operation, then a final run through the same transient duty cycle. Start sampling emissions immediately after you start the engine. Calculate the official transient emission result from the following equation:

$$\text{Official transient emission result} = \frac{0.05 \cdot \text{cold-start emissions (g)} + 0.95 \cdot \text{hot-start emissions (g)}}{0.05 \cdot \text{cold-start work (kW} \cdot \text{hr)} + 0.95 \cdot \text{hot-start work (kW} \cdot \text{hr)}}$$

(c) Calculate cycle statistics and compare with the established criteria as specified in 40 CFR 1065.514 to confirm that the test is valid.

Subpart G—[Amended]

■ 136. Section 1039.605 is amended by revising paragraph (d)(3) introductory text to read as follows:

§ 1039.605 What provisions apply to engines certified under the motor-vehicle program?

* * * * *

(d) * * *

(3) You must show that fewer than 50 percent of the engine family's total sales in the United States are used in nonroad applications. This includes engines used in any application without regard to which company manufactures the vehicle or equipment. Show this as follows:

* * * * *

■ 137. Section 1039.610 is amended by revising paragraph (d)(3) introductory text to read as follows:

§ 1039.610 What provisions apply to vehicles certified under the motor-vehicle program?

* * * * *

(d) * * *

(3) You must show that fewer than 50 percent of the engine family's total sales in the United States are used in nonroad applications. This includes any type of vehicle, without regard to which company completes the manufacturing of the nonroad equipment. Show this as follows:

* * * * *

■ 138. Section 1039.627 is amended by revising paragraphs (a)(3)(ii) and (a)(3)(iii) to read as follows:

§ 1039.627 What are the incentives for equipment manufacturers to use cleaner engines?

* * * * *

(a) * * *

(3) * * *

*	*	*	*	* * *
(ii) 56 ≤ kW < 130	Two engines	NO_X standards in § 1039.102(e)(1), and NMHC standard of 0.19 g/kW-hr, a PM standard of 0.02 g/kW-hr, and a CO standard of 5.0 g/kW-hr.	Standards in Tables 2 through 7 of § 1039.102 or in § 1039.101.	One engine.
(iii) 130 ≤ kW < 560	Two engines	NO_X standards in § 1039.102(e)(2), an NMHC standard of 0.19 g/kW-hr, a PM standard of 0.02 g/kW-hr, and a CO standard of 3.5 g/kW-hr.	Standards in Tables 2 through 7 of § 1039.102 or in § 1039.101.	One engine.

* * * * *

Subpart H—[Amended]

■ 139. Section 1039.705 is amended by revising paragraph (b) introductory text (before the equation) to read as follows:

§ 1039.705 How do I generate and calculate emission credits?

* * * * *

(b) For each participating family, calculate positive or negative emission credits relative to the otherwise applicable emission standard. Calculate positive emission credits for a family that has an FEL below the standard. Calculate negative emission credits for a family that has an FEL above the standard. Sum your positive and negative credits for the model year before rounding. Round the sum of emission credits to the nearest kilogram (kg), using consistent units throughout the following equation:

* * * * *

■ 140. Section 1039.715 is revised to read as follows:

§ 1039.715 How do I bank emission credits?

(a) Banking is the retention of emission credits by the manufacturer generating the emission credits for use in future model years for averaging or trading.

(b) You may designate any emission credits you plan to bank in the reports you submit under § 1039.730 as reserved credits. During the model year and before the due date for the final report, you may designate your reserved emission credits for averaging or trading.

(c) Reserved credits become actual emission credits when you submit your final report. However, we may revoke these emission credits if we are unable to verify them after reviewing your reports or auditing your records.

■ 141. Section 1039.720 is amended by revising paragraph (b) to read as follows:

§ 1039.720 How do I trade emission credits?

* * * * *

(b) You may trade actual emission credits as described in this subpart. You may also trade reserved emission credits, but we may revoke these emission credits based on our review of your records or reports or those of the company with which you traded emission credits. You may trade banked credits within an averaging set to any certifying manufacturer.

* * * * *

■ 142. Section 1039.725 is amended by revising paragraph (b)(2) to read as follows:

§ 1039.725 What must I include in my application for certification?

* * * * *

(b) * * *

(2) Detailed calculations of projected emission credits (positive or negative) based on projected production volumes. We may require you to include similar calculations from your other engine families to demonstrate that you will be able to avoid a negative credit balance for the model year. If you project negative emission credits for a family, state the source of positive emission credits you expect to use to offset the negative emission credits.

■ 143. Section 1039.730 is amended by revising paragraphs (b)(3), (b)(4), (b)(5), and (f) to read as follows:

§ 1039.730 What ABT reports must I send to EPA?

* * * * *

(b) * * *

(3) The FEL for each pollutant. If you change the FEL after the start of production, identify the date that you started using the new FEL and/or give the engine identification number for the first engine covered by the new FEL. In this case, identify each applicable FEL and calculate the positive or negative emission credits as specified in § 1039.225.

(4) The projected and actual U.S.-directed production volumes for the model year. If you changed an FEL during the model year, identify the actual production volume associated with each FEL.

(5) Maximum engine power for each engine configuration, and the average engine power weighted by U.S.-directed production volumes for the engine family.

* * * * *

(f) Correct errors in your end-of-year report or final report as follows:

(1) You may correct any errors in your end-of-year report when you prepare the final report, as long as you send us the final report by the time it is due.

(2) If you or we determine within 270 days after the end of the model year that errors mistakenly decreased your balance of emission credits, you may correct the errors and recalculate the balance of emission credits. You may not make these corrections for errors that are determined more than 270 days after the end of the model year. If you report a negative balance of emission credits, we may disallow corrections under this paragraph (f)(2).

(3) If you or we determine anytime that errors mistakenly increased your balance of emission credits, you must correct the errors and recalculate the balance of emission credits.

■ 144. Section 1039.735 is amended by revising paragraphs (b), (d), and (e) to read as follows:

§ 1039.735 What records must I keep?

* * * * *

(b) Keep the records required by this section for at least eight years after the due date for the end-of-year report. You may not use emission credits for any engines if you do not keep all the records required under this section. You must therefore keep these records to continue to bank valid credits. Store these records in any format and on any media, as long as you can promptly send us organized, written records in English if we ask for them. You must keep these records readily available. We may review them at any time.

* * * * *

(d) Keep records of the engine identification number for each engine you produce that generates or uses emission credits under the ABT program. You may identify these numbers as a range. If you change the FEL after the start of production, identify the date you started using each FEL and the range of engine identification numbers associated with each FEL. You must also identify the purchaser and destination for each engine you produce to the extent this information is available.

(e) We may require you to keep additional records or to send us relevant information not required by this section in accordance with the Clean Air Act.

Subpart I—[Amended]

■ 145. Section 1039.801 is amended as follows:

■ a. By adding definitions for "Alcohol-fueled engine", "Carryover", and "Date of manufacture" in alphabetical order.

■ b. By revising the definitions for "Engine configuration", "Model year", "New nonroad engine", "Total hydrocarbon", "Total hydrocarbon equivalent", and "Useful life.

§ 1039.801 What definitions apply to this part?

* * * * *

Alcohol-fueled engine means an engine that is designed to run using an alcohol fuel. For purposes of this definition, alcohol fuels do not include fuels with a nominal alcohol content below 25 percent by volume.

* * * * *

Carryover means relating to certification based on emission data generated from an earlier model year as described in § 1039.235(d).

* * * * *

Date of manufacture has the meaning given in 40 CFR 1068.30.

* * * * *

Engine configuration means a unique combination of engine hardware and calibration within an engine family. Engines within a single engine configuration differ only with respect to normal production variability or factors unrelated to emissions.

* * * * *

Model year means one of the following things:

(1) For freshly manufactured equipment and engines (*see* definition of "new nonroad engine," paragraph (1)), model year means one of the following:

(i) Calendar year.

(ii) Your annual new model production period if it is different than the calendar year. This must include January 1 of the calendar year for which the model year is named. It may not begin before January 2 of the previous calendar year and it must end by December 31 of the named calendar year.

(2) For an engine that is converted to a nonroad engine after being placed into service as a stationary engine, or being certified and placed into service as a motor vehicle engine, model year means the calendar year in which the engine was originally produced. For a motor vehicle engine that is converted to be a nonroad engine without having been certified, model year means the calendar year in which the engine becomes a new nonroad engine. (*See* definition of "new nonroad engine," paragraph (2).)

(3) For a nonroad engine excluded under § 1039.5 that is later converted to operate in an application that is not excluded, model year means the calendar year in which the engine was originally produced (*see* definition of "new nonroad engine," paragraph (3)).

(4) For engines that are not freshly manufactured but are installed in new nonroad equipment, model year means the calendar year in which the engine is installed in the new nonroad equipment (*see* definition of "new nonroad engine," paragraph (4)).

(5) For imported engines:

(i) For imported engines described in paragraph (5)(i) of the definition of "new nonroad engine," *model year* has the meaning given in paragraphs (1) through (4) of this definition.

(ii) For imported engines described in paragraph (5)(ii) of the definition of "new nonroad engine," *model year* has the meaning given in 40 CFR 89.602 for independent commercial importers.

(iii) For imported engines described in paragraph (5)(iii) of the definition of "new nonroad engine," *model year* means the calendar year in which the engine is first assembled in its imported configuration, unless specified otherwise in this part or in 40 CFR part 1068.

* * * * *

New nonroad engine means any of the following things:

(1) A freshly manufactured nonroad engine for which the ultimate purchaser has never received the equitable or legal title. This kind of engine might commonly be thought of as "brand new." In the case of this paragraph (1), the engine is new from the time it is produced until the ultimate purchaser receives the title or the product is placed into service, whichever comes first.

(2) An engine originally manufactured as a motor vehicle engine or a stationary engine that is later used or intended to be used in a piece of nonroad equipment. In this case, the engine is no longer a motor vehicle or stationary engine and becomes a "new nonroad engine." The engine is no longer new when it is placed into nonroad service. This paragraph (2) applies if a motor vehicle engine or a stationary engine is installed in nonroad equipment, or if a motor vehicle or a piece of stationary equipment is modified (or moved) to become nonroad equipment.

(3) A nonroad engine that has been previously placed into service in an application we exclude under § 1039.5, when that engine is installed in a piece of equipment that is covered by this part 1039. The engine is no longer new when it is placed into nonroad service covered by this part 1039. For example, this would apply to marine diesel engine that is no longer used in a marine vessel but is instead installed in a piece of nonroad equipment subject to the provisions of this part.

(4) An engine not covered by paragraphs (1) through (3) of this definition that is intended to be installed in new nonroad equipment. This generally includes installation of used engines in new equipment. The engine is no longer new when the ultimate purchaser receives a title for the equipment or the product is placed into service, whichever comes first.

(5) An imported nonroad engine, subject to the following provisions:

(i) An imported nonroad engine covered by a certificate of conformity issued under this part that meets the criteria of one or more of paragraphs (1) through (4) of this definition, where the original engine manufacturer holds the certificate, is new as defined by those applicable paragraphs.

(ii) An imported engine covered by a certificate of conformity issued under this part, where someone other than the original engine manufacturer holds the certificate (such as when the engine is modified after its initial assembly), is a new nonroad engine when it is imported. It is no longer new when the ultimate purchaser receives a title for the engine or it is placed into service, whichever comes first.

(iii) An imported nonroad engine that is not covered by a certificate of conformity issued under this part at the time of importation is new, but only if it was produced on or after the dates shown in the following table. This addresses uncertified engines and equipment initially placed into service that someone seeks to import into the United States. Importation of this kind of engine (or equipment containing such an engine) is generally prohibited by 40 CFR part 1068. However, the importation of such an engine is not prohibited if the engine has an earlier model year than that identified in the following table:

APPLICABILITY OF EMISSION STANDARDS FOR NONROAD DIESEL ENGINES

Maximum engine power	Initial date of emission standards
kW < 19	January 1, 2000.
19 ≤ kW < 37	January 1, 1999.
37 ≤ kW < 75	January 1, 1998.
75 ≤ kW < 130	January 1, 1997.
130 ≤ kW ≤ 560	January 1, 1996.
kW > 560	January 1, 2000.

* * * * *

Total hydrocarbon has the meaning given in 40 CFR 1065.1001. This generally means the combined mass of organic compounds measured by the specified procedure for measuring total hydrocarbon, expressed as a hydrocarbon with an atomic hydrogen-to-carbon ratio of 1.85:1.

Total hydrocarbon equivalent has the meaning given in 40 CFR 1065.1001. This generally means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as exhaust hydrocarbon from petroleum-fueled engines. The atomic hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1.

* * * * *

Useful life means the period during which the engine is designed to properly function in terms of reliability and fuel consumption, without being remanufactured, specified as a number of hours of operation or calendar years, whichever comes first. It is the period during which a nonroad engine is required to comply with all applicable emission standards. *See* § 1039.101(g).

* * * * *

§ 1039.810 [Removed]

■ 146. Section 1039.810 is removed.

PART 1042—CONTROL OF EMISSIONS FROM NEW AND IN-USE MARINE COMPRESSION-IGNITION ENGINES AND VESSELS

■ 147. The authority citation for part 1042 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 148. Section 1042.1 is revised to read as follows:

§ 1042.1 Applicability.

Except as provided in this section and § 1042.5, the regulations in this part 1042 apply for all new compression-ignition marine engines (including new engines deemed to be compression-ignition engines under this section) and vessels containing such engines. *See* § 1042.901 for the definitions of engines and vessels considered to be new.

(a) The emission standards of this part 1042 for freshly manufactured engines apply for new marine engines starting with the model years noted in the following tables:

TABLE 1 TO § 1042.1—PART 1042 APPLICABILITY BY MODEL YEAR

Engine category	Maximum engine power [a]	Displacement (L/cyl) or application	Model year
Category 1	kW < 75	disp. < 0.9	[b] 2009
	75 ≤ kW ≤ 3700	disp. < 0.9	2012
		0.9 ≤ disp. < 1.2	2013
		1.2 ≤ disp. < 2.5	2014
		2.5 ≤ disp. < 3.5	2013
		3.5 ≤ disp. < 7.0	2012

TABLE 1 TO § 1042.1—PART 1042 APPLICABILITY BY MODEL YEAR—Continued

Engine category	Maximum engine power [a]	Displacement (L/cyl) or application	Model year
	kW > 3700	disp. < 7.0	2014
Category 2	kW ≤ 3700	7.0 < disp. < 15.0	2013
	kW > 3700	7.0 ≤ disp. < 15.0	2014
	All	15 ≤ disp. < 30	2014
Category 3	All	disp. ≥ *30*	*2011*

[a] *See* § 1042.140, which describes how to determine maximum engine power.
[b] *See* Table 1 of § 1042.101 for the first model year in which this part 1042 applies for engines with maximum engine power below 75 kW and displacement at or above 0.9 L/cyl.

(b) New engines with maximum engine power below 37 kW and originally manufactured and certified before the model years identified in Table 1 to this section are subject to emission standards and requirements of 40 CFR part 89. The provisions of this part 1042 do not apply for such engines certified under 40 CFR part 89, except as follows beginning June 29, 2010:

(1) The allowances of this part apply.

(2) The definitions of "new marine engine" and "model year" apply.

(c) Freshly manufactured engines with maximum engine power at or above 37 kW and originally manufactured and certified before the model years identified in Table 1 to this section are subject to emission standards and requirements of 40 CFR part 94. The provisions of this part 1042 do not apply for such engines certified under 40 CFR part 89, except as follows beginning June 29, 2010:

(1) The allowances of this part apply.

(2) The definitions of "new marine engine" and "model year" apply.

(3) The remanufacturing provisions in subpart I of this part may apply for remanufactured engines originally manufactured in model years before the model years identified in Table 1 to this section.

(4) 40 CFR part 94 specifies other provisions from this part 1042 that apply.

(d) Engines with model years before those specified in Table 1 to this section are generally subject to the Tier 1 or Tier 2 standards of 40 CFR part 94. Such engines may be certified to those standards under this part 1042. All the provisions of this part except the emission standards apply to such engines if they are certified under this part. Note that engines subject to, but not certified to, the standards of 40 CFR part 94 are subject to the requirements and prohibitions of this part and 40 CFR part 1068.

(e) The requirements of subpart I of this part apply to remanufactured Category 1 and Category 2 engines beginning July 7, 2008.

(f) The marine engines listed in this paragraph (f) are subject to all the requirements of this part even if they do not meet the definition of "compression-ignition" in § 1042.901. The following engines are deemed to be compression-ignition engines for purposes of this part:

(1) Marine engines powered by natural gas or other gaseous fuels with maximum engine power at or above 250 kW. Note that gaseous-fueled engines with maximum engine power below 250 kW may or may not meet the definition of "compression-ignition" in § 1042.901.

(2) Marine gas turbine engines.

(3) Other marine internal combustion engines that do not meet the definition of "spark-ignition" in § 1042.901.

(g) Some of the provisions of this part may apply for other engines as specified in 40 CFR part 1043.

■ 149. Section 1042.2 is revised to read as follows:

§ 1042.2 Who is responsible for compliance?

The regulations in this part 1042 contain provisions that affect both engine manufacturers and others. However, the requirements of this part, other than those of subpart I of this part, are generally addressed to the engine manufacturer for freshly manufactured marine engines or other certificate holders. The term "you" generally means the engine manufacturer, as defined in § 1042.901, especially for issues related to certification (including production-line testing, reporting, *etc.*).

■ 150. Section 1042.5 is amended by revising paragraph (a) and adding paragraph (c) to read as follows:

§ 1042.5 Exclusions.

* * * * *

(a) *Foreign vessels.* The requirements and prohibitions of this part do not apply to engines installed on foreign vessels, as defined in § 1042.901. Note however, that the requirements and prohibitions of this part do apply to engines installed on any formerly foreign vessels that are reflagged as U.S.-flagged vessels.

* * * * *

(c) *Recreational gas turbine engines.* The requirements and prohibitions of this part do not apply to gas turbine engines installed on recreational vessels, as defined in § 1042.901.

■ 151. Section 1042.15 is revised to read as follows:

§ 1042.15 Do any other regulation parts apply to me?

(a) Part 1043 of this chapter describes requirements related to international pollution prevention that apply for some of the engines subject to this part.

(b) The evaporative emission requirements of part 1060 of this chapter apply to vessels that include installed engines fueled with a volatile liquid fuel as specified in § 1042.107. (Note: Conventional diesel fuel is not considered to be a volatile liquid fuel.)

(c) Part 1065 of this chapter describes procedures and equipment specifications for testing engines to measure exhaust emissions. Subpart F of this part 1042 describes how to apply the provisions of part 1065 of this chapter to determine whether engines meet the exhaust emission standards in this part.

(d) The requirements and prohibitions of part 1068 of this chapter apply to everyone, including anyone who manufactures, imports, installs, owns, operates, or rebuilds any of the engines subject to this part 1042, or vessels containing these engines. Part 1068 of this chapter describes general provisions, including these seven areas:

(1) Prohibited acts and penalties for engine manufacturers, vessel manufacturers, and others.

(2) Rebuilding and other aftermarket changes.

(3) Exclusions and exemptions for certain engines.

(4) Importing engines.

(5) Selective enforcement audits of your production.

(6) Defect reporting and recall.

(7) Procedures for hearings.

(e) Other parts of this chapter apply if referenced in this part.

■ 152. A new § 1042.30 is added to subpart A to read as follows:

§ 1042.30 Submission of information.

(a) This part includes various requirements to record data or other information. Refer to § 1042.925 and 40 CFR 1068.25 regarding recordkeeping requirements. Unless we specify otherwise, store these records in any format and on any media and keep them readily available for one year after you send an associated application for certification, or one year after you generate the data if they do not support an application for certification. You must promptly send us organized, written records in English if we ask for them. We may review them at any time.

(b) The regulations in § 1042.255 and 40 CFR 1068.101 describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. This includes information not related to certification.

(c) Send all reports and requests for approval to the Designated Compliance Officer (*see* § 1042.901).

(d) Any written information we require you to send to or receive from another company is deemed to be a required record under this section. Such records are also deemed to be submissions to EPA. We may require you to send us these records whether or not you are a certificate holder.

Subpart B—[Amended]

■ 153. Section 1042.101 is amended by revising the section heading, Table 1 in paragraph (a)(3), and paragraph (d)(1)(iii) to read as follows:

§ 1042.101 Exhaust emission standards for Category 1 engines and Category 2 engines.

(a) * * *

(3) * * *

BILLING CODE 6560–50–P

Table 1 to §1042.101— Tier 3 Standards for Category 1 Engines Below 3700 kW [a]

Power Density and Application	Displacement (L/cyl)	Maximum Engine Power	Model Year	PM (g/kW-hr)	NOx+HC (g/kW-hr) [b]
All	disp.< 0.9	kW <19	2009+	0.40	7.5
		19 ≤ kW < 75	2009-2013	0.30	7.5
			2014+	0.30	4.7
Commercial engines with kW/L ≤ 35[b]	disp.< 0.9	kW ≥ 75	2012+	0.14	5.4
	0.9 ≤ disp. < 1.2	all	2013+	0.12	5.4
	1.2 ≤ disp. < 2.5	kW < 600	2014-2017	0.11	5.6
			2018+	0.10	5.6
		kW ≥ 600	2014+	0.11	5.6
	2.5 ≤ disp. < 3.5	kW < 600	2013-2017	0.11	5.6
			2018+	0.10	5.6
		kW ≥ 600	2013+	0.11	5.6
	3.5 ≤ disp.< 7.0	kW < 600	2012-2017	0.11	5.8
			2018+	0.10	5.8
		kW ≥ 600	2012+	0.11	5.8
Commercial engines with kW/L > 35 and all recreational engines[b]	disp. < 0.9	kW ≥ 75	2012+	0.15	5.8
	0.9 ≤ disp. < 1.2	all	2013+	0.14	5.8
	1.2 ≤ disp. < 2.5		2014+	0.12	5.8
	2.5 ≤ disp. < 3.5		2013+	0.12	5.8
	3.5 ≤ disp. < 7.0		2012+	0.11	5.8

[a] No Tier 3 standards apply for commercial Category 1 engines at or above 3700 kW. See §1042.1(c) and paragraph (a)(7) of this section for the standards that apply for these engines.
[b] The applicable NOx+HC standards specified for Tier 2 engines in Appendix I of this part continue to apply instead of the values noted in the table for commercial engines at or above 2000 kW. FELs for these engines may not be higher than the Tier 1 NOx standard specified in Appendix I of this part.

BILLING CODE 6560–50–C

* * * * *

(d) * * *

(1) * * *

(iii) Diesel-fueled and all other engines not described in paragraph (d)(1)(i) or (ii) of this section must comply with Tier 3 HC standards based on THC emissions and with Tier 4 standards based on NMHC emissions.

* * * * *

■ 154. A new § 1042.104 is added to subpart B to read as follows:

§ 1042.104 Exhaust emission standards for Category 3 engines.

(a) *Duty-cycle standards.* Exhaust emissions from your engines may not exceed emission standards, as follows:

(1) Measure emissions using the test procedures described in subpart F of this part. Note that while no PM standards apply for Category 3 engines, PM emissions must be measured for certification testing and reported under § 1042.205. Note also that you are not required to measure PM emissions for other testing.

(2) NO_X standards apply based on the engine's model year and maximum in-use engine speed as shown in the following table:

TABLE 1 TO § 1042.104—NO_X EMISSION STANDARDS FOR CATEGORY 3 ENGINES (G/KW-HR)

Emission standards	Model year	Maximum in-use engine speed		
		Less than 130 RPM	130–2000 RPM [a]	Over 2000 RPM
Tier 1	2004–2010 [b]	17.0	$45.0 \cdot n^{(-0.20)}$	9.8
Tier 2	2011–2015	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier 3	2016 and later	3.4	$9.0 \cdot n^{(-0.20)}$	2.0

[a] Applicable standards are calculated from n (maximum in-use engine speed, in RPM, as specified in § 1042.140). Round the standards to one decimal place.
[b] Tier 1 NO_X standards apply as specified in 40 CFR part 94 for engines originally manufactured in model years 2004 through 2010. They are shown here only for reference.

(3) The HC standard for Tier 2 and later engines is 2.0 g/kW-hr. This standard applies as follows:

(i) Alcohol-fueled engines must comply with HC standards based on THCE emissions.

(ii) Natural gas-fueled engines must comply with HC standards based on NMHC emissions.

(iii) Diesel-fueled and all other engines not described in paragraph (a)(3)(i) or (ii) of this section must comply with HC standards based on THC emissions.

(4) The CO standard for Tier 2 and later engines is 5.0 g/kW-hr.

(b) *Averaging, banking, and trading.* Category 3 engines are not eligible for participation in the averaging, banking, and trading (ABT) program as described in subpart H of this part.

(c) *Mode caps.* Measured NO_X emissions may not exceed the cap specified in this paragraph (c) for any applicable duty-cycle test modes with power greater than 10 percent maximum engine power. Calculate the mode cap by multiplying the applicable NO_X standard by 1.5 and rounding to the nearest 0.1 g/kW-hr. Note that mode caps do not apply for pollutants other than NO_X and do not apply for any modes of operation outside of the applicable duty cycles in § 1042.505. Category 3 engines are not subject to not-to-exceed standards.

(d) *Useful life.* Your engines must meet the exhaust emission standards of this section over their full useful life, expressed as a period in years or hours of engine operation, whichever comes first.

(1) The minimum useful life value is 3 years or 10,000 hours of operation.

(2) Specify a longer useful life in hours for an engine family under either of two conditions:

(i) If you design, advertise, or market your engine to operate longer than the minimum useful life (your recommended hours until rebuild indicates a longer design life).

(ii) If your basic mechanical warranty is longer than the minimum useful life.

(e) *Applicability for testing.* The duty-cycle emission standards in this section apply to all testing performed according to the procedures in § 1042.505, including certification, production-line, and in-use testing. *See* paragraph (g) of this section for standards that apply for certain other test procedures, such as some production-line testing.

(f) *Domestic engines.* Engines installed on vessels excluded from 40 CFR part 1043 because they operate only domestically may not be certified for use with residual fuels.

(g) *Alternate installed-engine standards.* NO_X emissions may not exceed the standard specified in this paragraph (g) for test of engines installed on vessels when you are unable to operate the engine at the test points for the specified duty cycle, and you approximate these points consistent with the specifications of section 6 of Appendix 8 to the NO_X Technical Code (incorporated by reference in § 1042.910). Calculate the alternate installed-engine standard by multiplying the applicable NO_X standard by 1.1 and rounding to the nearest 0.1 g/kW-hr.

■ 155. Section 1042.110 is amended by revising paragraph (a)(2) and adding paragraphs (a)(3) and (d) to read as follows:

§ 1042.110 Recording reductant use and other diagnostic functions.

(a) * * *

(2) The onboard computer log must record in nonvolatile computer memory all incidents of engine operation with inadequate reductant injection or reductant quality. Use good engineering judgment to ensure that the operator can readily access the information to submit the report required by § 1042.660. For example, you may meet this requirement by documenting the incident in a text file that can be downloaded or printed by the operator.

(3) SCR systems must also conform to the provisions of paragraph (d) of this section if they are equipped with on-off controls as allowed under § 1042.115(g).

* * * * *

(d) For Category 3 engines equipped with on-off NO_X controls (as allowed by § 1042.115(g)), you must also equip your engine to continuously monitor NO_X concentrations in the exhaust. *See* § 1042.650 to determine if this requirement applies for a given Category 1 or Category 2 engine. Use good engineering judgment to alert operators if measured NO_X concentrations indicate malfunctioning emission controls. Record any such operation in nonvolatile computer memory. You are not required to monitor NO_X concentrations during operation for which the emission controls may be disabled under § 1042.115(g). For the purpose of this paragraph (d), "malfunctioning emission controls" means any condition in which the measured NO_X concentration exceeds the highest value expected when the engine is in compliance with the installed engine standard of § 1042.104(g). Use good engineering judgment to determine these expected values during production-line testing of the engine using linear interpolation between test points and accounting for the degree to which the cycle-weighted emissions of the engine are below the standard. You may also use additional intermediate test points measured during the production-line test. Note that the provisions of paragraph (a) of this section also apply for SCR systems covered by this paragraph (d). For engines subject to both the provisions of paragraph (a) of this section and this paragraph (d), use good engineering judgment to integrate diagnostic features to comply with both paragraphs.

■ 156. Section 1042.115 is amended by revising paragraphs (d)(2) introductory text, (f) introductory text, and adding paragraphs (f)(4) and (g) to read as follows:

§ 1042.115 Other requirements.

* * * * *

(d) * * *

(2) Category 2 and Category 3 engines that have adjustable parameters must meet all the requirements of this part for any adjustment in the specified adjustable range. You must specify in your application for certification the adjustable range of each adjustable parameter on a new engine to—

* * * * *

(f) *Defeat devices.* You may not equip your engines with a defeat device. A defeat device is an auxiliary emission control device that reduces the effectiveness of emission controls under conditions that the engine may reasonably be expected to encounter during normal operation and use. (Note that this means emission control for operation outside of and between the official test modes is generally expected to be similar to emission control demonstrated at the test modes.) This does not apply to auxiliary emission control devices you identify in your application for certification if any of the following is true:

* * * * *

(4) The engine is a Category 3 engine and the AECD conforms to the requirements of paragraph (g) of this section. *See* § 1042.650 to determine if this allowance applies for a given Category 1 or Category 2 engine.

(g) *On-off controls for Category 3 engines.* Manufacturers may equip Category 3 engines with features that disable Tier 3 NO_X emission controls subject to the provisions of this paragraph (g). *See* § 1042.650 to determine if this allowance applies for a given Category 1 or Category 2 engine. Where this paragraph (g) applies for a Category 1 or Category 2 engine, read "Tier 2" to mean "Tier 3" and read "Tier 3" to mean "Tier 4".

(1) Features that disable Tier 3 emission controls are considered to be AECDs whether or not they meet the definition of an AECD. For example, manually operated on-off features are AECDs under this paragraph (g). The features must be identified in your application for certification as AECDs. For purposes of this paragraph (g), the term "features that disable Tier 3 emission controls" includes (but is not limited to) any combination of the following that cause the engine's emissions to exceed any Tier 3 emission standard:

(i) Bypassing of exhaust aftertreatment.

(ii) Reducing or eliminating flow of reductant to an SCR system.

(iii) Modulating engine calibration in a manner that increases engine-out emissions of a regulated pollutant.

(2) You must demonstrate that the AECD will not disable emission controls while operating in areas where emissions could reasonably be expected to adversely affect U.S. air quality. If an ECA has been established for U.S. waters, this means you must demonstrate that the AECD will not disable emission control while operating in waters within the ECA or any ECA associated area. (Note: *See* the regulations in 40 CFR part 1043 for requirements related to operation in ECAs, including foreign ECAs.) Compliance with this paragraph will generally require that the AECD operation be based on Global Positioning System (GPS) inputs. We may consider any relevant information to determine whether your AECD conforms to this paragraph (g).

(3) The onboard computer log must record in nonvolatile computer memory all incidents of engine operation with the Tier 3 emission controls disabled.

(4) The engine must comply fully with the Tier 2 standards when the Tier 3 emission controls are disabled.

■ 157. Section 1042.120 is amended by adding paragraph (b)(2) and revising paragraph (c) to read as follows:

§ 1042.120 Emission-related warranty requirements.

* * * * *

(b) * * *

(2) For Category 3 engines, your emission-related warranty must be valid throughout the engine's full useful life as specified in § 1042.104(d).

* * * * *

(c) *Components covered.* The emission-related warranty covers all components whose failure would increase an engine's emissions of any regulated pollutant, including components listed in 40 CFR part 1068, Appendix I, and components from any other system you develop to control emissions. The emission-related warranty for freshly manufactured marine engines covers these components even if another company produces the component. Your emission-related warranty does not need to cover components whose failure would not increase an engine's emissions of any regulated pollutant. For remanufactured engines, your emission-related warranty is required to cover only those parts that you supply or those parts for which you specify allowable part manufacturers. It does not need to cover used parts that are not replaced during the remanufacture.

* * * * *

■ 158. Section 1042.125 is amended by revising the section heading, introductory text, and paragraphs (a)(1)(iii) and (d) to read as follows:

§ 1042.125 Maintenance instructions.

Give the ultimate purchaser of each new engine written instructions for properly maintaining and using the engine, including the emission control system, as described in this section. The maintenance instructions also apply to service accumulation on your emission-data engines as described in § 1042.245 and in 40 CFR part 1065. The restrictions specified in paragraphs (a) through (e) of this section related to allowable maintenance apply only to Category 1 and Category 2 engines. Manufacturers may specify any maintenance for Category 3 engines.

(a) * * *

(1) * * *

(iii) You provide the maintenance free of charge and clearly say so in your maintenance instructions.

* * * * *

(d) *Noncritical emission-related maintenance.* Subject to the provisions of this paragraph (d), you may schedule any amount of emission-related inspection or maintenance that is not covered by paragraph (a) of this section (that is, maintenance that is neither explicitly identified as critical emission-related maintenance, nor that we approve as critical emission-related maintenance). Noncritical emission-related maintenance generally includes maintenance on the components we specify in 40 CFR part 1068, Appendix I that is not covered in paragraph (a) of this section. You must state in the owners manual that these steps are not necessary to keep the emission-related warranty valid. If operators fail to do this maintenance, this does not allow you to disqualify those engines from in-use testing or deny a warranty claim. Do not take these inspection or maintenance steps during service accumulation on your emission-data engines.

* * * * *

■ 159. Section 1042.135 is amended by revising paragraphs (c)(5), (c)(8), (c)(9), and (c)(11) and adding paragraphs (c)(12) and (c)(13) to read as follows:

§ 1042.135 Labeling.

* * * * *

(c) * * *

(5) State the date of manufacture [DAY (optional), MONTH, and YEAR]; however, you may omit this from the label if you stamp, engrave, or otherwise permanently identify it elsewhere on the engine, in which case you must also describe in your application for certification where you will identify the date on the engine.

* * * * *

(8) State the useful life for your engine family if the applicable useful life is based on the provisions of § 1042.101(e)(2) or (3), or § 1042.104(d)(2).

(9) Identify the emission control system. Use terms and abbreviations as described in 40 CFR 1068.45. You may omit this information from the label if there is not enough room for it and you put it in the owners manual instead.

* * * * *

(11) For a Category 1 or Category 2 engine that can be modified to operate on residual fuel, but has not been certified to meet the standards on such a fuel, include the statement: "THIS ENGINE IS CERTIFIED FOR OPERATION ONLY WITH DIESEL FUEL. MODIFYING THE ENGINE TO OPERATE ON RESIDUAL OR INTERMEDIATE FUEL MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTIES."

(12) For an engine equipped with on-off emissions controls as allowed by § 1042.115, include the statement: "THIS ENGINE IS CERTIFIED WITH ON-OFF EMISSION CONTROLS. OPERATION OF THE ENGINE CONTRARY TO 40 CFR 1042.115(g) IS A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTIES."

(13) For engines intended for installation on domestic or public vessels, include the following statement: "THIS ENGINE DOES NOT COMPLY WITH INTERNATIONAL MARINE REGULATIONS FOR COMMERCIAL VESSELS UNLESS IT IS ALSO COVERED BY AN EIAPP CERTIFICATE."

* * * * *

■ 160. Section 1042.140 is amended by revising the section heading and introductory text and adding paragraph (g) to read as follows:

§ 1042.140 Maximum engine power, displacement, power density, and maximum in-use engine speed.

This section describes how to determine the maximum engine power, displacement, and power density of an engine for the purposes of this part. Note that maximum engine power may differ from the definition of "maximum test power" in § 1042.901. This section also specifies how to determine maximum in-use engine speed for Category 3 engines.

* * * * *

(g) Calculate a maximum test speed for the nominal power curve as specified in 40 CFR 1065.610. This is the maximum in-use engine speed used for calculating the NO_X standard in § 1042.104 for Category 3 engines. Alternatively, you may use a lower value if engine speed will be limited in actual use to that lower value.

■ 161. Section 1042.145 is amended by revising paragraph (a) and the heading of paragraph (c) introductory text and adding paragraphs (h) and (i) to read as follows:

§ 1042.145 Interim provisions.

(a) *General.* The provisions in this section apply instead of other provisions in this part. This section describes when these interim provisions expire. Only the provisions of paragraph (h) of this section apply for Category 3 engines.

* * * * *

(c) *Part 1065 test procedures for Category 1 and Category 2 engines.* * * *

* * * * *

(h) The following interim provisions apply for Category 3 engines:

(1) *Applicability of Tier 3 standards to Category 3 engines operating in Alaska, Hawaii, and U.S. territories.* (i) Category 3 engines are not required to comply with the Tier 3 NO_X standard when operating in areas of Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, Puerto Rico, or U.S. Virgin Islands. Category 3 engines are also not required to comply with the Tier 3 NO_X standards when operating in the waters of the smallest Hawaiian islands or in the waters of Alaska west of Kodiak. For the purpose of this paragraph (h)(1), "the smallest Hawaiian islands" includes all Hawaiian islands other than Hawaii, Kahoolawe, Kauai, Lanai, Maui, Molokai, Niihau, and Oahu. Engines must comply fully with the appropriate Tier 2 NO_X standard and all other applicable requirements when operating in the areas identified in this paragraph (h)(1).

(ii) The provisions of paragraph (h)(1)(i) of this section do not apply to ships operating in an ECA or an ECA associated area. The Tier 3 standards apply in full for any area included in an ECA or an ECA associated area.

(2) *Part 1065 test procedures.* You must generally use the test procedures specified in subpart F of this part for Category 3 engines, including the applicable test procedures in 40 CFR part 1065. You may use a combination of the test procedures specified in this part and the test procedures specified in 40 CFR part 94 before January 1, 2016 without request. After this date, you must use test procedures only as specified in subpart F of this part.

(i) *Limitation of 40 CFR 1068.101 before July 1, 2010.* Notwithstanding other provisions of this part or 40 CFR part 94, for the period June 29, 2010 through July 1, 2010, it is not a violation of 40 CFR 1068.101 to operate in U.S. waters uncertified engines installed on vessels manufactured outside of the United States before June 29, 2010. Operation of such vessels in U.S. waters on or after July 1, 2010 is deemed to be introduction into U.S. commerce of a new marine engine.

Subpart C—[Amended]

■ 162. Section 1042.201 is amended by revising paragraph (h) to read as follows:

§ 1042.201 General requirements for obtaining a certificate of conformity.

* * * * *

(h) For engines that become new after being placed into service, such as engines installed on imported vessels, we may specify alternate certification provisions consistent with the intent of this part. *See* the definition of "new marine engine" in § 1042.901.

■ 163. Section 1042.205 is amended by adding paragraph (b)(12) and revising paragraphs (i), (o), and (s)(5) to read as follows:

§ 1042.205 Application requirements.

* * * * *

(b) * * *

(12) Include any other information required by this part with respect to AECDs. For example, *see* § 1042.115 for requirements related to on-off technologies.

* * * * *

(i) Include the maintenance and warranty instructions you will give to the ultimate purchaser of each new engine (*see* §§ 1042.120 and 1042.125). Describe your plan for meeting warranty obligations under § 1042.120.

* * * * *

(o) Present emission data for HC, NO_X, PM, and CO on an emission-data engine to show your engines meet emission standards as specified in §§ 1042.101 or 1042.104. Note that you must submit PM data for all engines, whether or not a PM standard applies. Show emission figures before and after applying adjustment factors for regeneration and deterioration factors for each pollutant and for each engine. If we specify more than one grade of any fuel type (for example, high-sulfur and low-sulfur diesel fuel), you need to submit test data only for one grade, unless the regulations of this part specify otherwise for your engine. Include emission results for each mode for Category 3 engines or for other engines if you do discrete-mode testing under § 1042.505. Note that §§ 1042.235

and 1042.245 allows you to submit an application in certain cases without new emission data.

* * * * *

(s) * * *

(5) For Category 2 and Category 3 engines, propose a range of adjustment for each adjustable parameter, as described in § 1042.115(d). Include information showing why the limits, stops, or other means of inhibiting adjustment are effective in preventing adjustment of parameters on in-use engines to settings outside your proposed adjustable ranges.

* * * * *

■ 164. Section 1042.220 is revised to read as follows:

§ 1042.220 Amending maintenance instructions.

You may amend your emission-related maintenance instructions after you submit your application for certification as long as the amended instructions remain consistent with the provisions of § 1042.125. You must send the Designated Compliance Officer a written request to amend your application for certification for an engine family if you want to change the emission-related maintenance instructions in a way that could affect emissions. In your request, describe the proposed changes to the maintenance instructions. If operators follow the original maintenance instructions rather than the newly specified maintenance, this does not allow you to disqualify those engines from in-use testing or deny a warranty claim.

(a) If you are decreasing or eliminating any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

(b) If your requested change would not decrease the specified maintenance, you may distribute the new maintenance instructions anytime after you send your request. For example, this paragraph (b) would cover adding instructions to increase the frequency of filter changes for engines in severe-duty applications.

(c) You need not request approval if you are making only minor corrections (such as correcting typographical mistakes), clarifying your maintenance instructions, or changing instructions for maintenance unrelated to emission control. We may ask you to send us copies of maintenance instructions revised under this paragraph (c).

■ 165. Section 1042.225 is amended by revising the introductory text, paragraphs (b) introductory text, (b)(2), (e), and (f) to read as follows:

§ 1042.225 Amending applications for certification.

Before we issue you a certificate of conformity, you may amend your application to include new or modified engine configurations, subject to the provisions of this section. After we have issued your certificate of conformity, you may send us an amended application requesting that we include new or modified engine configurations within the scope of the certificate, subject to the provisions of this section. You must amend your application if any changes occur with respect to any information that is included or should be included in your application.

* * * * *

(b) To amend your application for certification as specified in paragraph (a) of this section, send the relevant information to the Designated Compliance Officer.

* * * * *

(2) Include engineering evaluations or data showing that the amended engine family complies with all applicable requirements. You may do this by showing that the original emission-data engine is still appropriate for showing that the amended family complies with all applicable requirements.

* * * * *

(e) For engine families already covered by a certificate of conformity, you may start producing the new or modified engine configuration anytime after you send us your amended application and before we make a decision under paragraph (d) of this section. However, if we determine that the affected engines do not meet applicable requirements, we will notify you to cease production of the engines and may require you to recall the engines at no expense to the owner. Choosing to produce engines under this paragraph (e) is deemed to be consent to recall all engines that we determine do not meet applicable emission standards or other requirements and to remedy the nonconformity at no expense to the owner. If you do not provide information required under paragraph (c) of this section within 30 days after we request it, you must stop producing the new or modified engines.

(f) You may ask us to approve a change to your FEL in certain cases after the start of production. The changed FEL may not apply to engines you have already introduced into U.S. commerce, except as described in this paragraph (f). If we approve a changed FEL after the start of production, you must include the new FEL on the emission control information label for all engines produced after the change. You may ask us to approve a change to your FEL in the following cases:

(1) You may ask to raise your FEL for your engine family at any time. In your request, you must show that you will still be able to meet the emission standards as specified in subparts B and H of this part. If you amend your application by submitting new test data to include a newly added or modified engine, as described in paragraph (b)(3) of this section, use the appropriate FELs with corresponding production volumes to calculate emission credits for the model year, as described in subpart H of this part. In all other circumstances, you must use the higher FEL for the entire family to calculate emission credits under subpart H of this part.

(2) You may ask to lower the FEL for your engine family only if you have test data from production engines showing that emissions are below the proposed lower FEL. The lower FEL applies only to engines you produce after we approve the new FEL. Use the appropriate FELs with corresponding production volumes to calculate emission credits for the model year, as described in subpart H of this part.

■ 166. Section 1042.230 is amended by revising paragraphs (a), (b), (f) introductory text, and (g) and adding paragraph (d) to read as follows:

§ 1042.230 Engine families.

(a) For purposes of certification, divide your product line into families of engines that are expected to have similar emission characteristics throughout the useful life as described in this section. You may not group engines in different engine categories in the same family. Your engine family is limited to a single model year.

(b) For Category 1 engines, group engines in the same engine family if they are the same in all the following aspects:

(1) The combustion cycle and the fuel with which the engine is intended or designed to be operated.

(2) The cooling system (for example, raw-water vs. separate-circuit cooling).

(3) Method of air aspiration.

(4) Method of exhaust aftertreatment (for example, catalytic converter or particulate trap).

(5) Combustion chamber design.

(6) Nominal bore and stroke.

(7) Cylinder arrangement (such as in-line vs. vee configurations). This applies for engines with aftertreatment devices only.

(8) Method of control for engine operation other than governing (*i.e.,* mechanical or electronic).

(9) Application (commercial or recreational).

(10) Numerical level of the emission standards that apply to the engine, except as allowed under paragraphs (f) and (g) of this section.

* * * * *

(d) For Category 3 engines, group engines into engine families based on the criteria specified in Section 4.3 of the NO_X Technical Code (incorporated by reference in § 1042.910), except as allowed in paragraphs (e) and (f) of this section.

* * * * *

(f) You may group engines that are not identical with respect to the things listed in paragraph (b), (c), or (d) of this section in the same engine family, as follows:

* * * * *

(g) If you combine engines that are subject to different emission standards into a single engine family under paragraph (f) of this section, you must certify the engine family to the more stringent set of standards for that model year. For Category 3 engine families that include a range of maximum in-use engine speeds, use the highest value of maximum in-use engine speed to establish the applicable NO_X emission standard.

■ 167. Section 1042.235 is amended by revising the section heading, the introductory text, and paragraphs (a), (c), and (d) introductory text to read as follows:

§ 1042.235 Emission testing related to certification.

This section describes the emission testing you must perform to show compliance with the emission standards in § 1042.101(a) or § 1042.104. *See* § 1042.205(p) regarding emission testing related to the NTE standards. *See* §§ 1042.240 and 1042.245 and 40 CFR part 1065, subpart E, regarding service accumulation before emission testing. *See* § 1042.655 for special testing provisions available for Category 3 engines subject to Tier 3 standards.

(a) Select an emission-data engine from each engine family for testing. For engines at or above 560 kW, you may use a development engine that is equivalent in design to the engine being certified. For Category 3 engines, you may use a single-cylinder version of the engine. Using good engineering judgment, select the engine configuration most likely to exceed an applicable emission standard over the useful life, considering all exhaust emission constituents and the range of installation options available to vessel manufacturers.

* * * * *

(c) We may measure emissions from any of your emission-data engines or other engines from the engine family, as follows:

(1) We may decide to do the testing at your plant or any other facility. If we do this, you must deliver the engine to a test facility we designate. The engine you provide must include appropriate manifolds, aftertreatment devices, electronic control units, and other emission-related components not normally attached directly to the engine block. If we do the testing at your plant, you must schedule it as soon as possible and make available the instruments, personnel, and equipment we need.

(2) If we measure emissions from one of your engines, the results of that testing become the official emission results for the engine. Unless we later invalidate these data, we may decide not to consider your data in determining if your engine family meets applicable requirements.

(3) Before we test one of your engines, we may set its adjustable parameters to any point within the specified adjustable ranges (*see* § 1042.115(d)).

(4) Before we test one of your engines, we may calibrate it within normal production tolerances for anything we do not consider an adjustable parameter. For example, this would apply for an engine parameter that is subject to production variability because it is adjustable during production, but is not considered an adjustable parameter (as defined in § 1042.901) because it is permanently sealed.

(d) You may ask to use carryover emission data from a previous model year instead of doing new tests, but only if all the following are true:

* * * * *

■ 168. Section 1042.240 is amended by revising paragraphs (a), (b), and (c) introductory text and adding paragraphs (e) and (f) to read as follows:

§ 1042.240 Demonstrating compliance with exhaust emission standards.

(a) For purposes of certification, your engine family is considered in compliance with the emission standards in § 1042.101(a) or § 1042.104 if all emission-data engines representing that family have test results showing official emission results and deteriorated emission levels at or below these standards. This also applies for all test points for emission-data engines within the family used to establish deterioration factors. *See* paragraph (f) of this section for provisions related to demonstrating compliance with non-duty-cycle standards, such as NTE standards. Note that your FELs are considered to be the applicable emission standards with which you must comply if you participate in the ABT program in subpart H of this part.

(b) Your engine family is deemed not to comply if any emission-data engine representing that family has test results showing an official emission result or a deteriorated emission level for any pollutant that is above an applicable emission standard. Similarly, your engine family is deemed not to comply if any emission-data engine representing that family has test results showing any emission level above the applicable not-to-exceed emission standard for any pollutant. This also applies for all test points for emission-data engines within the family used to establish deterioration factors.

(c) To compare emission levels from the emission-data engine with the applicable emission standards, apply deterioration factors to the measured emission levels for each pollutant. Section 1042.245 specifies how to test your Category 1 or Category 2 engine to develop deterioration factors that represent the deterioration expected in emissions over your engines' full useful life. *See* paragraph (e) of this section for determining deterioration factors for Category 3 engines. Your deterioration factors must take into account any available data from in-use testing with similar engines. Small-volume engine manufacturers and post-manufacture marinizers may use assigned deterioration factors that we establish. Apply deterioration factors as follows:

* * * * *

(e) For Category 3 engines, determine a deterioration factor based on an engineering analysis. The engineering analysis must describe how the measured emission levels from the emission-data engine show that engines comply with applicable emission standards throughout the useful life. Include this analysis in your application for certification and add a statement that all data, analyses, evaluations, and other information you used are available for our review upon request.

(f) For NTE standards and mode caps, use good engineering judgment to demonstrate compliance throughout the useful life. You may, but are not required to, apply the same deterioration factors used to show compliance with the applicable duty-cycle standards. We will deny your application for certification if we determine that your test data show that your engines would exceed one or more NTE standard or mode cap during their useful lives.

■ 169. Section 1042.245 is amended by revising the introductory text and paragraph (a) to read as follows:

§ 1042.245 Deterioration factors.

This section describes how to determine deterioration factors for Category 1 and Category 2 engines, either with an engineering analysis, with pre-existing test data, or with new emission measurements. Apply these deterioration factors to determine whether your engines will meet the duty-cycle emission standards throughout the useful life as described in § 1042.240. This section does not apply for Category 3 engines.

(a) You may ask us to approve deterioration factors for an engine family with established technology based on engineering analysis instead of testing. Engines certified to a NO_X+HC standard or FEL greater than the Tier 3 NO_X+HC standard are considered to rely on established technology for control of gaseous emissions, except that this does not include any engines that use exhaust-gas recirculation or aftertreatment. In most cases, technologies used to meet the Tier 1 and Tier 2 emission standards would qualify as established technology. We must approve your plan to establish a deterioration factor under this paragraph (a) before you submit your application for certification.

* * * * *

■ 170. Section 1042.250 is amended by revising paragraphs (a) and (c) and removing paragraph (e) to read as follows:

§ 1042.250 Recordkeeping and reporting.

(a) Send the Designated Compliance Officer information related to your U.S.-directed production volumes as described in § 1042.345. In addition, within 45 days after the end of the model year, you must send us a report describing information about engines you produced during the model year as follows:

(1) State the total production volume for each engine family that is not subject to reporting under § 1042.345.

(2) State the total production volume for any engine family for which you produce engines after completing the reports required in § 1042.345.

* * * * *

(c) Keep data from routine emission tests (such as test cell temperatures and relative humidity readings) for one year after we issue the associated certificate of conformity. Keep all other information specified in this section for eight years after we issue your certificate.

* * * * *

■ 171. Section 1042.255 is amended by revising paragraph (b) to read as follows:

§ 1042.255 EPA decisions.

* * * * *

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Clean Air Act. We will base our decision on all available information. If we deny your application, we will explain why in writing.

* * * * *

Subpart D—[Amended]

■ 172. Section 1042.301 is amended by revising paragraphs (a)(2), (c), (e), and (f) to read as follows:

§ 1042.301 General provisions.

(a) * * *

(2) We may exempt Category 1 engine families with a projected U.S.-directed production volume below 100 engines from routine testing under this subpart. Request this exemption in your application for certification and include your basis for projecting a production volume below 100 units. We will approve your request if we agree that you have made good-faith estimates of your production volumes. Your exemption is approved when we grant your certificate. You must promptly notify us if your actual production exceeds 100 units during the model year. If you exceed the production limit or if there is evidence of a nonconformity, we may require you to test production-line engines under this subpart, or under 40 CFR part 1068, subpart E, even if we have approved an exemption under this paragraph (a)(2).

* * * * *

(c) Other regulatory provisions authorize us to suspend, revoke, or void your certificate of conformity, or order recalls for engine families, without regard to whether they have passed these production-line testing requirements. The requirements of this subpart do not affect our ability to do selective enforcement audits, as described in 40 CFR part 1068. Individual engines in families that pass these production-line testing requirements must also conform to all applicable regulations of this part and 40 CFR part 1068.

* * * * *

(e) If you certify a Category 1 or Category 2 engine family with carryover emission data, as described in § 1042.235(d), and these equivalent engine families consistently pass the production-line testing requirements over the preceding two-year period, you may ask for a reduced testing rate for further production-line testing for that family. The minimum testing rate is one engine per engine family. If we reduce your testing rate, we may limit our approval to any number of model years. In determining whether to approve your request, we may consider the number of engines that have failed the emission tests.

(f) We may ask you to make a reasonable number of production-line engines available for a reasonable time so we can test or inspect them for compliance with the requirements of this part. For Category 3 engines, you are not required to deliver engines to us, but we may inspect and test your engines at any facility at which they are assembled or installed in vessels.

■ 173. A new § 1042.302 is added to subpart D to read as follows:

§ 1042.302 Applicability of this subpart for Category 3 engines.

If you produce Tier 3 or later Category 3 engines that are certified under this part, you must test them as described in this subpart, except as specified in this section.

(a) You must test each engine at the sea trial of the vessel in which it is installed or within the first 300 hours of operation, whichever occurs first. Since you must test each engine, the provisions of §§ 1042.310 and 1042.315(b) do not apply for Category 3 engines. If we determine that an engine failure under this subpart is caused by defective components or design deficiencies, we may revoke or suspend your certificate for the engine family as described in § 1042.340. If we determine that an engine failure under this subpart is caused only by incorrect assembly, we may suspend your certificate for the engine family as described in § 1042.325. If the engine fails, you may continue operating only to complete the sea trial and return to port. It is a violation of 40 CFR 1068.101(b)(1) to operate the vessel further until you remedy the cause of failure. Each two-hour period of such operation constitutes a separate offense. A violation lasting less than two hours constitutes a single offense.

(b) You are only required to measure NO_X emissions. You do not need to measure HC, CO or PM emissions under this subpart.

(c) If you are unable to operate the engine at the test points for the specified duty cycle, you may approximate these points consistent with the specifications of section 6 of Appendix 8 to the NO_X Technical Code (incorporated by reference in § 1042.910) and show compliance with the alternate installed-engine standard of § 1042.104(g). You must obtain EPA approval of your test procedure prior to testing the engine. Include in your request a description of your basis for concluding that the engine cannot be tested at the actual test points of the specified duty cycle.

(d) You may measure NO_X emissions at additional test points for the purposes of the continuous NO_X monitoring requirements of § 1042.110(d). If you do, you must report these values along with your other test results. Describe in your application for certification how you plan to use these values for continuous NO_X monitoring.

(e) You may ask to measure emissions according to the Direct Measurement and Monitoring method specified in section 6.4 of the NO_X Technical Code (incorporated by reference in § 1042.910).

■ 174. Section 1042.305 is amended by revising paragraphs (a), (d) introductory text, (d)(2), (e)(2), and (g) to read as follows:

§ 1042.305 Preparing and testing production-line engines.

* * * * *

(a) *Test procedures.* Test your production-line engines using the applicable testing procedures in subpart F of this part to show you meet the duty-cycle emission standards in subpart B of this part. For Category 1 and Category 2 engines, the not-to-exceed standards apply for this testing of Category 1 and Category 2 engines, but you need not do additional testing to show that production-line engines meet the not-to-exceed standards. The mode cap standards apply for the testing of Category 3 engines.

* * * * *

(d) *Setting adjustable parameters.* Before any test, we may require you to adjust any adjustable parameter on a Category 1 engine to any setting within its physically adjustable range. We may adjust or require you to adjust any adjustable parameter on a Category 2 or Category 3 engine to any setting within its specified adjustable range.

* * * * *

(2) We may specify adjustments within the physically adjustable range or the specified adjustable range by considering their effect on emission levels. We may also consider how likely it is that someone will make such an adjustment with in-use engines.

(e) * * *

(2) For Category 2 or Category 3 engines, you may ask us to approve a Green Engine Factor for each regulated pollutant for each engine family. Use the Green Engine Factor to adjust measured emission levels to establish a stabilized low-hour emission level.

* * * * *

(g) *Retesting after invalid tests.* You may retest an engine if you determine an emission test is invalid under subpart F of this part. Explain in your written report reasons for invalidating any test and the emission results from all tests. If we determine that you improperly invalidated a test, we may require you to ask for our approval for future testing before substituting results of the new tests for invalid ones.

■ 175. Section 1042.310 is amended by revising the section heading to read as follows:

§ 1042.310 Engine selection for Category 1 and Category 2 engines.

* * * * *

■ 176. Section 1042.315 is amended by revising paragraphs (a) and (b) to read as follows:

§ 1042.315 Determining compliance.

* * * * *

(a) Calculate your test results as follows:

(1) *Initial and final test results.* Calculate and round the test results for each engine. If you do several tests on an engine, calculate the initial results for each test, then add all the test results together and divide by the number of tests. Round this final calculated value for the final test results on that engine. Include the Green Engine Factor to determine low-hour emission results, if applicable.

(2) *Final deteriorated test results.* Apply the deterioration factor for the engine family to the final test results (*see* § 1042.240(c)).

(3) *Round deteriorated test results.* Round the results to the number of decimal places in the emission standard expressed to one more decimal place.

(b) For Category 1 and Category 2 engines, if a production-line engine fails to meet emission standards and you test two additional engines as described in § 1042.310, calculate the average emission level for each pollutant for the three engines. If the calculated average emission level for any pollutant exceeds the applicable emission standard, the engine family fails the production-line testing requirements of this subpart. Tell us within ten working days if this happens. You may request to amend the application for certification to raise the FEL of the engine family as described in § 1042.225(f).

■ 177. Section 1042.320 is amended by revising paragraph (a)(2) to read as follows:

§ 1042.320 What happens if one of my production-line engines fails to meet emission standards?

(a) * * *

(2) Include the test results and describe the remedy for each engine in the written report required under § 1042.345.

* * * * *

■ 178. Section 1042.325 is amended by revising paragraph (e) to read as follows:

§ 1042.325 What happens if an engine family fails the production-line testing requirements?

* * * * *

(e) You may request to amend the application for certification to raise the FEL of the entire engine family before or after we suspend your certificate as described in § 1042.225(f). We will approve your request if the failure is not caused by a defect and it is clear that you used good engineering judgment in establishing the original FEL.

■ 179. Section 1042.345 is amended by revising paragraphs (a)(6) and (b) to read as follows:

§ 1042.345 Reporting.

(a) * * *

(6) Provide the test number; the date, time and duration of testing; test procedure; all initial test results; final test results; and final deteriorated test results for all tests. Provide the emission results for all measured pollutants. Include information for both valid and invalid tests and the reason for any invalidation.

* * * * *

(b) We may ask you to add information to your written report so we can determine whether your new engines conform with the requirements of this subpart. We may also ask you to send less information.

* * * * *

■ 180. Section 1042.350 is amended by revising paragraphs (b), (e), and (f) to read as follows:

§ 1042.350 Recordkeeping.

* * * * *

(b) Keep paper or electronic records of your production-line testing for eight years after you complete all the testing required for an engine family in a model year.

* * * * *

(e) If we ask, you must give us a more detailed description of projected or actual production figures for an engine family. We may ask you to divide your production figures by maximum engine power, displacement, fuel type, or assembly plant (if you produce engines at more than one plant).

(f) Keep records of the engine identification number for each engine you produce under each certificate of conformity. You may identify these numbers as a range. Give us these records within 30 days if we ask for them.

* * * * *

Subpart F—[Amended]

■ 181. Section 1042.501 is amended by revising paragraphs (a) and (c) and adding paragraph (g) to read as follows:

§ 1042.501 How do I run a valid emission test?

(a) Use the equipment and procedures for compression-ignition engines in 40 CFR part 1065 to determine whether engines meet the duty-cycle emission standards in §§ 1042.101 or 1042.104. Measure the emissions of all regulated pollutants as specified in 40 CFR part 1065. Use the applicable duty cycles specified in § 1042.505.

* * * * *

(c) Use the fuels and lubricants specified in 40 CFR part 1065, subpart H, for all the testing we require in this part, except as specified in this section and § 1042.515.

(1) For service accumulation, use the test fuel or any commercially available fuel that is representative of the fuel that in-use engines will use.

(2) For diesel-fueled engines, use the appropriate diesel fuel specified in 40 CFR part 1065, subpart H, for emission testing. Unless we specify otherwise, the appropriate diesel test fuel for Category 1 and Category 2 engines is the ultra low-sulfur diesel fuel. If we allow you to use a test fuel with higher sulfur levels, identify the test fuel in your application for certification. Unless we specify otherwise, the appropriate diesel test fuel for Category 3 engines is the high-sulfur diesel fuel. For Category 2 and Category 3 engines, you may ask to use commercially available diesel fuel similar but not necessarily identical to the applicable fuel specified in 40 CFR part 1065, subpart H; we will approve your request if you show us that it does not affect your ability to demonstrate compliance with the applicable emission standards.

(3) For Category 1 and Category 2 engines that are expected to use a type of fuel (or mixed fuel) other than diesel fuel (such as natural gas, methanol, or residual fuel), use a commercially available fuel of that type for emission testing. If a given engine is designed to operate on different fuels, we may (at our discretion) require testing on each fuel. Propose test fuel specifications that take into account the engine design and the properties of commercially available fuels. Describe these test fuel specifications in the application for certification.

* * * * *

(g) For Category 3 engines, instead of test data collected as specified in 40 CFR part 1065, you may submit test data for NO_X, HC, and CO emissions that were collected as specified in the NO_X Technical Code (incorporated by reference in § 1042.910). For example, this allowance includes the allowance to perform the testing using test fuels allowed under the NO_X Technical Code that do not meet the sulfur specifications of this section. We may require you to include a brief engineering analysis showing how these data demonstrate that your engines would meet the applicable emission standards if you had used the test procedures specified in 40 CFR part 1065.

■ 182. Section 1042.505 is amended by revising paragraph (b) introductory text to read as follows:

§ 1042.505 Testing engines using discrete-mode or ramped-modal duty cycles.

* * * * *

(b) Measure emissions by testing the engine on a dynamometer with one of the following duty cycles (as specified) to determine whether it meets the emission standards in §§ 1042.101 or 1042.104:

* * * * *

■ 183. Section 1042.525 is amended by revising paragraph (b) and adding paragraph (g) to read as follows:

§ 1042.525 How do I adjust emission levels to account for infrequently regenerating aftertreatment devices?

* * * * *

(b) *Calculating average adjustment factors.* Calculate the average adjustment factor (EF_A) based on the following equation:

$$EF_A = (F)(EF_H) + (1 - F)(EF_L)$$

Where:

F = The frequency of the regeneration event during normal in-use operation, expressed in terms of the fraction of equivalent tests during which the regeneration occurs. You may determine F from in-use operating data or running replicate tests. For example, if you observe that the regeneration occurs 125 times during 1,000 MW-hrs of operation, and your engine typically accumulates 1 MW-hr per test, F would be (125) ÷ (1,000) ÷ (1) = 0.125. No further adjustments, including weighting factors, may be applied to F.

EF_H = Measured emissions from a test segment in which the regeneration occurs.

EF_L = Measured emissions from a test segment in which the regeneration does not occur.

* * * * *

(g) *Category 3 engines.* We may specify an alternate methodology to account for regeneration events from Category 3 engines. If we do not, the provisions of this section apply as specified.

Subpart G—[Amended]

■ 184. Section 1042.601 is amended by revising paragraph (b) and adding paragraphs (g), (h), and (i) to read as follows:

§ 1042.601 General compliance provisions for marine engines and vessels.

* * * * *

(b) Subpart I of this part describes how the prohibitions of 40 CFR 1068.101(a)(1) apply for certain remanufactured engines. The provisions of 40 CFR 1068.105 do not allow the installation of a new remanufactured engine in a vessel that is defined as a new vessel unless the remanufactured engine is subject to the same standards as the standards applicable to freshly manufactured engines of the required model year.

* * * * *

(g) The selective enforcement audit provisions of 40 CFR part 1068 do not apply for Category 3 engines.

(h) The defect reporting requirements of 40 CFR 1068.501 apply for Category 3 engines, except the threshold for filing a defect report is two engines.

(i) You may not circumvent the requirements of this part or the Clean Air Act by manufacturing a vessel outside the United States or initially flagging a vessel in another country. The definition of "new marine engine" in § 1042.901 includes provisions for U.S.-flagged vessels that are manufactured or reflagged outside of U.S. waters. These provisions have the effect of applying the prohibitions of 40 CFR 1068.101(a)(1) to such vessels no later than when they first enter U.S. waters. The inclusion of these provisions does not affect requirements or prohibitions of the Clean Air Act or other statutes that may apply to the vessel before it first enters U.S. waters.

■ 185. Section 1042.605 is amended by revising paragraph (a) to read as follows:

§ 1042.605 Dressing engines already certified to other standards for nonroad or heavy-duty highway engines for marine use.

(a) *General provisions.* If you are an engine manufacturer (including someone who marinizes a land-based engine), this section allows you to introduce new marine engines into U.S. commerce if they are already certified to the requirements that apply to compression-ignition engines under 40 CFR parts 85 and 86 or 40 CFR part 89, 92, 1033, or 1039 for the appropriate model year. If you comply with all the provisions of this section, we consider the certificate issued under 40 CFR part 86, 89, 92, 1033, or 1039 for each engine to also be a valid certificate of conformity under this part 1042 for its model year, without a separate application for certification under the requirements of this part 1042. This section does not apply for Category 3 engines.

* * * * *

■ 186. Section 1042.610 is amended by revising the introductory text to read as follows:

§ 1042.610 Certifying auxiliary marine engines to land-based standards.

This section applies to auxiliary marine engines that are identical to certified land-based engines. *See* § 1042.605 for provisions that apply to propulsion marine engines or auxiliary marine engines that are modified for marine applications. This section does not apply for Category 3 engines.

* * * * *

■ 187. Section 1042.615 is amended by revising the introductory text and paragraph (a)(4) and adding paragraph (d) to read as follows:

§ 1042.615 Replacement engine exemption.

For Category 1 and Category 2 replacement engines, apply the provisions of 40 CFR 1068.240 as described in this section. In unusual circumstances, you may ask us to allow you to apply these provisions for a new Category 3 engine.

(a) * * *

(4) The replacement engine must conform to the applicable requirements of 40 CFR part 1043. Note that 40 CFR 1043.10 specifies allowances for vessels that operate only domestically.

* * * * *

(d) We may reduce the reporting and recordkeeping requirements in this section.

■ 188. Section 1042.620 is revised to read as follows:

§ 1042.620 Engines used solely for competition.

The provisions of this section apply for new Category 1 engines and vessels built on or after January 1, 2009.

(a) We may grant you an exemption from the standards and requirements of this part for a new engine on the grounds that it is to be used solely for competition. The requirements of this part, other than those in this section, do not apply to engines that we exempt for use solely for competition.

(b) We will exempt engines that we determine will be used solely for competition. The basis of our determination is described in paragraphs (c) and (d) of this section. Exemptions granted under this section are good for only one model year and you must request renewal for each subsequent model year. We will not approve your renewal request if we determine the engine will not be used solely for competition.

(c) Engines meeting all the following criteria are considered to be used solely for competition:

(1) Neither the engine nor any vessels containing the engine may be displayed for sale in any public dealership or otherwise offered for sale to the general public. Note that this does not preclude display of these engines as long as they are not available for sale to the general public.

(2) Sale of the vessel in which the engine is installed must be limited to professional racing teams, professional racers, or other qualified racers. For replacement engines, the sale of the engine itself must be limited to professional racing teams, professional racers, other qualified racers, or to the original vessel manufacturer.

(3) The engine and the vessel in which it is installed must have performance characteristics that are substantially superior to noncompetitive models.

(4) The engines are intended for use only as specified in paragraph (e) of this section.

(d) You may ask us to approve an exemption for engines not meeting the criteria listed in paragraph (c) of this section as long as you have clear and convincing evidence that the engines will be used solely for competition.

(e) Engines are considered to be used solely for competition only if their use is limited to competition events sanctioned by the U.S. Coast Guard or another public organization with authorizing permits for participating competitors. Operation of such engines may include only racing events, trials to qualify for racing events, and practice associated with racing events. Authorized attempts to set speed records are also considered racing events. Engines will not be considered to be used solely for competition if they are ever used for any recreational or other noncompetitive purpose. Use of exempt engines in any recreational events, such as poker runs and lobsterboat races, is a violation of 40 CFR 1068.101(b)(4).

(f) You must permanently label engines exempted under this section to clearly indicate that they are to be used only for competition. Failure to properly label an engine will void the exemption for that engine.

(g) If we request it, you must provide us any information we need to determine whether the engines are used solely for competition. This would include documentation regarding the number of engines and the ultimate purchaser of each engine as well as any documentation showing a vessel manufacturer's request for an exempted engine. Keep these records for five years.

■ 189. Section 1042.625 is amended by adding introductory text to read as follows:

§ 1042.625 Special provisions for engines used in emergency applications.

This section describes an exemption that is available for certain Category 1 and Category 2 engines. This exemption is not available for Category 3 engines.

* * * * *

■ 190. Section 1042.630 is amended by revising the introductory text to read as follows:

§ 1042.630 Personal-use exemption.

This section applies to individuals who manufacture vessels for personal use with used Category 1 engines. If you and your vessel meet all the conditions of this section, the vessel and its engine are considered to be exempt from the standards and requirements of this part that apply to new engines and new vessels. The prohibitions in § 1068.101(a)(1) do not apply to engines exempted under this section. For example, you may install an engine that was not certified as a marine engine.

* * * * *

■ 191. Section 1042.635 is amended by revising paragraph (a) to read as follows:

§ 1042.635 National security exemption.

* * * * *

(a) An engine is exempt without a request if it will be used or owned by an agency of the Federal government responsible for national defense, where the vessel in which it is installed has armor, permanently attached weaponry, specialized electronic warfare systems, unique stealth performance requirements, and/or unique combat maneuverability requirements. This applies to both remanufactured and freshly manufactured marine engines. Gas turbine engines are also exempt without a request if they will be owned by an agency of the Federal government responsible for national defense.

* * * * *

■ 192. Section 1042.650 is amended by revising the section heading and the introductory text and adding a new paragraph (d) to read as follows:

§ 1042.650 Exemptions for migratory vessels and auxiliary engines on Category 3 vessels.

The provisions of this section apply for Category 1 and Category 2 engines, including auxiliary engines installed on vessels with Category 3 propulsion engines. These provisions do not apply for any Category 3 engines. All engines exempted under this section must comply with the applicable requirements of 40 CFR part 1043.

* * * * *

(d) *Auxiliary engines on Category 3 vessels.* As specified in this paragraph (d), auxiliary engines on vessels with Category 3 propulsion engines are exempt from the standards of this part.

(1) To be eligible for this exemption, the engine must meet all of the following criteria.

(i) The engine must conform fully to the applicable NO_X standards of Annex VI and meet all other applicable requirements of 40 CFR part 1043. Engines installed on vessels constructed on or after January 1, 2016 must conform fully to the Annex VI Tier III NO_X standards under 40 CFR part 1043 and meet all other applicable requirements in 40 CFR part 1043. Engines that would otherwise be subject to the Tier 4 standards of this part must also conform fully to the Annex VI Tier III NO_X standards under 40 CFR part 1043.

(ii) The engine may not be used for propulsion (except for emergency engines).

(iii) The engine may be equipped with on-off NO_X controls, provided it conforms to the requirements of § 1042.115(g).

(2) You must notify the Designated Compliance Officer of your intent to use this exemption when applying for the EIAPP certificate for the engine under 40 CFR part 1043.

(3) The remanufactured engine requirements of subpart I of this part do not apply.

(4) If you introduce an engine into U.S. commerce under this paragraph (d), you must meet the labeling requirements in § 1042.135, but add the following statement instead of the compliance statement in § 1042.135(c)(10):

THIS ENGINE DOES NOT COMPLY WITH CURRENT U.S. EPA EMISSION STANDARDS UNDER 40 CFR 1042.650 AND IS FOR USE SOLELY IN VESSELS WITH CATEGORY 3 PROPULSION ENGINES. INSTALLATION OR USE OF THIS ENGINE IN ANY OTHER APPLICATION MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY.

■ 193. A new § 1042.655 is added to subpart G to read as follows:

§ 1042.655 Special certification provisions for—Category 3 engines with aftertreatment.

This section describes an optional approach for demonstrating for certification that catalyst-equipped engines (or engines equipped with other aftertreatment devices) comply with applicable emission standards. You must use good engineering judgment for all aspects of this allowance.

(a) *Eligibility.* You may use the provisions of this section without our prior approval to demonstrate that aftertreatment-equipped Category 3 engines meet the Tier 3 standards. In unusual circumstances, we may also allow you to use this approach to demonstrate that aftertreatment-equipped Category 2 engines meet the Tier 4 standards. We will generally approve this for Category 2 engines only if the engines are too large to be practically tested in a laboratory with a fully assembled aftertreatment system. If we approve this approach for a Category 2 engine, interpret references to Tier 3 in this section to mean Tier 4, and interpret references to Tier 2 in this section to mean Tier 3.

(b) *Required testing.* The emission-data engine must be tested as specified in Subpart F to verify that the engine-out emissions comply with the Tier 2 standards. The catalyst material or other aftertreatment device must be tested under conditions that accurately represent actual engine conditions for the test points. This catalyst or aftertreatment testing may be performed on a benchscale.

(c) *Engineering analysis.* Include with your application a detailed engineering analysis describing how the test data collected for the engine and aftertreatment demonstrate that all engines in the family will meet all applicable emission standards. We may require that you submit this analysis separately from your application, or that you obtain preliminary approval under § 1042.210.

(d) *Verification.* You must verify your design by testing a complete production engine with installed aftertreatment in the final assembled configuration. Unless we specify otherwise, do this by complying with production-line testing requirements of subpart D of this part.

(e) *Other requirements.* All other requirements of this part, including the non-testing requirements for certification, apply for these engines. Nothing in this section affects requirements in other regulatory parts, such as Coast Guard safety requirements.

■ 194. Section 1042.660 is revised to read as follows:

§ 1042.660 Requirements for vessel manufacturers, owners, and operators.

(a) For vessels equipped with emission controls requiring the use of specific fuels, lubricants, or other fluids, owners and operators must comply with the manufacturer/remanufacturer's specifications for such fluids when operating the vessels. Failure to comply with the requirements of this paragraph is a violation of 40 CFR 1068.101(b)(1). For marine vessels that are excluded from the requirements of 40 CFR part 1043 because they operate only domestically, it is also a violation of 40 CFR 1068.101(b)(1) to operate the vessel using residual fuel on or after January 1, 2015. Note that 40 CFR part 80 also includes provisions that restrict the use of certain fuels by certain marine engines.

(b) For vessels equipped with SCR systems requiring the use of urea or other reductants, owners and operators must report to us within 30 days any operation of such vessels without the appropriate reductant. Failure to comply with the requirements of this paragraph is a violation of 40 CFR 1068.101(a)(2). Note that such operation is a violation of 40 CFR 1068.101(b)(1).

(c) The provisions of this paragraph (c) apply for marine vessels containing Category 3 engines.

(1) The requirements of this paragraph (c)(1) apply only for Category 3 engines. All maintenance, repair, adjustment, and alteration of Category 3 engines subject to the provisions of this part performed by any owner, operator or other maintenance provider must be perform using good engineering judgment, in such a manner that the engine continues (after the maintenance, repair, adjustment or alteration) to meet the emission standards it was certified as meeting prior to the need for service. This includes but is not limited to complying with the maintenance

instructions described in § 1042.125. Adjustments are limited to the range specified by the engine manufacturer in the approved application for certification. Note that where a repair (or other maintenance) cannot be completed while at sea, it is not a violation to continue operating the engine to reach your destination.

(2) It is a violation of 40 CFR 1068.101(b)(1) to operate the vessel with the engine adjusted outside of the specified adjustable range. Each two-hour period of such operation constitutes a separate offense. A violation lasting less than two hours constitutes a single offense.

(3) The owner and operator of the engine must maintain on board the vessel records of all maintenance, repair, and adjustment that could reasonably affect the emission performance of any engine subject to the provision of this part. Owners and operators must also maintain, on board the vessel, records regarding certification, parameter adjustment, and fuels used. For engines that are automatically adjusted electronically, all adjustments must be logged automatically. Owners and operators must make these records available to EPA upon request. These records must include the following:

(i) The Technical File, Record Book of Engine Parameters, and bunker delivery notes as specified in 40 CFR 1043.70. The Technical File must be transferred to subsequent purchasers in the event of a sale of the engine or vessel. (ii) Specific descriptions of engine maintenance, repair, adjustment, and alteration (including rebuilding). The descriptions must include at least the date, time, and nature of the maintenance, repair, adjustment, or alteration and the position of the vessel when the maintenance, repair, adjustment, or alteration was made.

(iii) Emission-related maintenance instructions provided by the manufacturer. These instructions must be transferred to subsequent purchasers in the event of a sale of the engine or vessel.

(4) Owners and operators of engines equipped with on-off emission controls must comply with the requirements of this paragraph (c)(4) whenever a malfunction of the emission controls is indicated as specified in § 1042.110(d). You must determine the cause of the malfunction and remedy it consistent with paragraph (c)(1) of this section. *See* paragraph (b) of this section if the malfunction is due to either a lack of reductant or inadequate reductant quality. If the malfunction occurs during the useful life, report the malfunction to the certificate holder for investigation and compliance with defect reporting requirements of 40 CFR 1068.501 (unless the malfunction is due to operation without adequate urea or other malmaintenance).

(d) For each marine vessel containing a Category 3 engine, the owner must annually review the vessel's records and submit to EPA a signed statement certifying compliance during the preceding year with the requirements of this part that are applicable to owners and operators of such vessels. Alternately, if review of the vessel's records indicates that there has been one or more violations of the requirements of this part, the owner must submit to EPA a signed statement specifying the noncompliance, including the nature of the noncompliance, the time of the noncompliance, and any efforts made to remedy the noncompliance. The statement of compliance (or noncompliance) required by this paragraph must be signed by the executive with responsibility for marine activities of the owner. If the vessel is operated by a different business entity than the vessel owner, the reporting requirements of this paragraph (e) apply to both the owner and the operator. Compliance with these review and certification requirements by either the vessel owner or the vessel operator with respect to a compliance statement will be considered compliance with these requirements by both of these parties for that compliance statement. The executive(s) may authorize a captain or other primary operator to conduct this review and submit the certification, provided that the certification statement is accompanied by written authorization for that individual to submit such statements. The Administrator may waive the requirements of this paragraph when equivalent assurance of compliance is otherwise available.

(e) Manufacturers, owners and operators must allow emission tests and inspections required by this part to be conducted and must provide reasonable assistance to perform such tests or inspections.

■ 195. A new § 1042.670 is added to subpart G to read as follows:

§ 1042.670 Special provisions for gas turbine engines.

The provisions of this section apply for gas turbine engines.

(a) *Implementation schedule.* The requirements of this part do not apply for gas turbine engines below 600 kW before the 2014 model year. The requirements of this part do not apply for Tier 3 or earlier gas turbine engines at or above 600 kW. The provisions of 40 CFR part 1068 also do not apply for gas turbine engines produced in these earlier model years.

(b) *Special test procedures.* Manufacturers seeking certification of gas turbine engines must obtain preliminary approval of the test procedures to be used, consistent with § 1042.210 and 40 CFR 1065.10.

(c) *Remanufacturing.* The requirements of subpart I of this part do not apply for gas turbine engines.

(d) *Equivalent displacement.* Apply displacement-based provisions of this part by calculating an equivalent displacement from the maximum engine power. The equivalent per-cylinder displacement (in liters) equals the maximum engine power in kW multiplied by 0.00311, except that all gas turbines with maximum engine power above 9,300 kW are considered to have an equivalent per-cylinder displacement of 29.0 liters.

(e) *Emission-related components.* All components meeting the criteria of 40 CFR 1068.501(a)(1) are considered to be emission-related components with respect to maintenance, warranty, and defect reporting for gas turbine engines.

(f) *Engines used for national defense. See* § 1042.635 for provisions related to exempting gas turbine engines used for national defense.

Subpart H—[Amended]

■ 196. Section 1042.701 is amended by adding introductory text to read as follows:

§ 1042.701 General provisions.

This subpart describes how you may use emission credits to demonstrate that Category 1 and Category 2 engines comply with emission standards under this part. The provisions of this subpart do not apply for Category 3 engines.

* * * * *

■ 197. Section 1042.705 is amended by revising paragraph (a) introductory text, before the equation, to read as follows:

§ 1042.705 Generating and calculating emission credits.

* * * * *

(a) For each participating family, calculate positive or negative emission credits relative to the otherwise applicable emission standard. Calculate positive emission credits for a family that has an FEL below the standard. Calculate negative emission credits for a family that has an FEL above the standard. Sum your positive and negative credits for the model year before rounding. Round the sum of emission credits to the nearest kilogram (kg) using consistent units throughout the following equation:

* * * * *

■ 198. Section 1042.715 is revised to read as follows:

§ 1042.715 Banking emission credits.

(a) Banking is the retention of emission credits by the manufacturer generating the emission credits for use in future model years for averaging or trading.

(b) You may designate any emission credits you plan to bank in the reports you submit under § 1042.730 as reserved credits. During the model year and before the due date for the final report, you may designate your reserved emission credits for averaging or trading.

(c) Reserved credits become actual emission credits when you submit your final report. However, we may revoke these emission credits if we are unable to verify them after reviewing your reports or auditing your records.

■ 199. Section 1042.720 is amended by revising paragraph (b) to read as follows:

§ 1042.720 Trading emission credits.

* * * * *

(b) You may trade actual emission credits as described in this subpart. You may also trade reserved emission credits, but we may revoke these emission credits based on our review of your records or reports or those of the company with which you traded emission credits. You may trade banked credits within an averaging set to any certifying manufacturer.

* * * * *

■ 200. Section 1042.725 is amended by revising paragraph (b)(2) to read as follows:

§ 1042.725 Information required for the application for certification.

* * * * *

(b) * * *

(2) Detailed calculations of projected emission credits (positive or negative) based on projected production volumes. We may require you to include similar calculations from your other engine families to demonstrate that you will be able to avoid a negative credit balance for the model year. If you project negative emission credits for a family, state the source of positive emission credits you expect to use to offset the negative emission credits.

■ 201. Section 1042.730 is amended by revising paragraphs (b)(3), (b)(4), and (b)(5) to read as follows:

§ 1042.730 ABT reports.

* * * * *

(b) * * *

(3) The FEL for each pollutant. If you change the FEL after the start of production, identify the date that you started using the new FEL and/or give the engine identification number for the first engine covered by the new FEL. In this case, identify each applicable FEL and calculate the positive or negative emission credits under each FEL.

(4) The projected and actual U.S.-directed production volumes for the model year, as described in § 1042.705(c). If you changed an FEL during the model year, identify the actual production volume associated with each FEL.

(5) Maximum engine power for each engine configuration, and the average engine power weighted by U.S.-directed production volumes for the engine family.

* * * * *

■ 202. Section 1042.735 is amended by revising paragraphs (b), (d), and (e) to read as follows:

§ 1042.735 Recordkeeping.

* * * * *

(b) Keep the records required by this section for at least eight years after the due date for the end-of-year report. You may not use emission credits for any engines if you do not keep all the records required under this section. You must therefore keep these records to continue to bank valid credits. Store these records in any format and on any media as long as you can promptly send us organized, written records in English if we ask for them. You must keep these records readily available. We may review them at any time.

* * * * *

(d) Keep records of the engine identification number for each engine you produce that generates or uses emission credits under the ABT program. You may identify these numbers as a range. If you change the FEL after the start of production, identify the date you started using each FEL and the range of engine identification numbers associated with each FEL. You must also identify the purchaser and destination for each engine you produce to the extent this information is available.

(e) We may require you to keep additional records or to send us relevant information not required by this section in accordance with the Clean Air Act.

Subpart I—[Amended]

■ 203. Section 1042.801 is amended by revising the introductory text and paragraph (a) to read as follows:

§ 1042.801 General provisions.

This subpart describes how the provisions of this part 1042 apply for certain remanufactured marine engines.

(a) The requirements of this subpart apply for remanufactured Tier 2 and earlier commercial Category 1 and Category 2 marine engines at or above 600 kW, excluding those engines originally manufactured before 1973. Note that the requirements of this subpart do not apply for engines below 600 kW, Category 3 engines, engines installed on recreational vessels, or Tier 3 and later engines.

* * * * *

■ 204. Section 1042.836 is amended by revising the introductory text and paragraphs (a) introductory text and (c) to read as follows:

§ 1042.836 Marine certification of locomotive remanufacturing systems.

If you certify a Tier 0, Tier 1, or Tier 2 remanufacturing system for locomotives under 40 CFR part 1033, you may also certify the system under this part 1042, according to the provisions of this section. Note that in certain cases before 2013, locomotives may be certified under 40 CFR part 1033 to the standards of 40 CFR part 92.

(a) Include the following with your application for certification under 40 CFR part 1033 (or as an amendment to your application):

* * * * *

(c) Systems certified to the standards of 40 CFR part 92 are subject to the following restrictions:

(1) Tier 0 locomotives systems may not be used for any Category 1 engines or Tier 1 or later Category 2 engines.

(2) Where systems certified to the standards of 40 CFR part 1033 are also available for an engine, you may not use a system certified to the standards of 40 CFR part 92.

■ 205. Section 1042.850 is amended by revising paragraph (c) to read as follows:

§ 1042.850 Exemptions and hardship relief.

* * * * *

(c) If you believe that a remanufacturing system that we identified as being available cannot be installed without significant modification of your vessel, you may ask us to determine that a remanufacturing system is not considered available for your vessel because the cost would exceed the total marginal cost threshold in § 1042.815(a)(2).

* * * * *

Subpart J—[Amended]

■ 206. Section 1042.901 is amended as follows:

■ a. By revising the definitions for "Carryover", "Category 1", "Category 2", "Category 3", "Compression-ignition", "Deterioration factor", "Engine configuration", "Freshly manufactured marine engine", "Hydrocarbon (HC)", "Manufacture", "Manufacturer", "Model year", "New marine engine", "Residual fuel", "Small-volume boat builder", "Small-volume engine manufacturer", "Tier 2", "Tier 3", "Total hydrocarbon equivalent", and "Useful life".

■ b. Adding new definitions for "2008 Annex VI", "Alcohol-fueled engine", "Date of manufacture", "ECA associated area", "Emission control area (ECA)", "Gas turbine engine", "Maximum in-use engine speed", "Reflag", "NO_X Technical Code", and "U.S. waters" in alphanumeric order.

■ c. By removing the definition for "Annex VI Technical Code".

§ 1042.901 Definitions.

* * * * *

2008 Annex VI means MARPOL Annex VI, which is an annex to the International Convention on the Prevention of Pollution from Ships, 1973, as modified by the protocol of 1978 relating thereto (incorporated by reference in § 1042.910).

* * * * *

Alcohol-fueled engine means an engine that is designed to run using an alcohol fuel. For purposes of this definition, alcohol fuels do not include fuels with a nominal alcohol content below 25 percent by volume.

* * * * *

Carryover means relating to certification based on emission data generated from an earlier model year as described in § 1042.235(d).

Category 1 means relating to a marine engine with specific engine displacement below 7.0 liters per cylinder. *See* § 1042.670 to determine equivalent per-cylinder displacement for nonreciprocating marine engines (such as gas turbine engines).

Category 2 means relating to a marine engine with a specific engine displacement at or above 7.0 liters per cylinder but less than 30.0 liters per cylinder. *See* § 1042.670 to determine equivalent per-cylinder displacement for nonreciprocating marine engines (such as gas turbine engines).

Category 3 means relating to a reciprocating marine engine with a specific engine displacement at or above 30.0 liters per cylinder.

* * * * *

Compression-ignition means relating to a type of reciprocating, internal-combustion engine that is not a spark-ignition engine. Note that certain other marine engines (such as those powered by natural gas with maximum engine power at or above 250 kW) are deemed to be compression-ignition engines in § 1042.1.

* * * * *

Date of manufacture has the meaning given in 40 CFR 1068.30.

* * * * *

Deterioration factor means the relationship between emissions at the end of useful life and emissions at the low-hour test point (*see* §§ 1042.240 and 1042.245), expressed in one of the following ways:

(1) For multiplicative deterioration factors, the ratio of emissions at the end of useful life to emissions at the low-hour test point.

(2) For additive deterioration factors, the difference between emissions at the end of useful life and emissions at the low-hour test point.

* * * * *

ECA associated area has the meaning given in 40 CFR 1043.20.

Emission control area (ECA) has the meaning given in 40 CFR 1043.20.

* * * * *

Engine configuration means a unique combination of engine hardware and calibration within an engine family. Engines within a single engine configuration differ only with respect to normal production variability or factors unrelated to emissions.

* * * * *

Freshly manufactured marine engine means a marine engine that has not been placed into service. An engine becomes freshly manufactured when it is originally manufactured. *See* the definition of "New marine engine" for provisions that specify that certain other types of new engines are treated as freshly manufactured engines.

* * * * *

Gas turbine engine has the meaning given in 40 CFR 1068.30. In general, this means anything commercially known as a gas turbine engine. It does not include external combustion steam engines.

* * * * *

Hydrocarbon (HC) means the hydrocarbon group on which the emission standards are based for each fuel type, as described in § 1042.101(d) and § 1042.104(a).

* * * * *

Manufacture means the physical and engineering process of designing, constructing, and assembling an engine or a vessel, or modifying or operating an engine or vessel in a way that makes it a new marine engine or new marine vessel.

Manufacturer means any person who manufactures (*see* definition of "manufacture" in this section) a new engine or vessel or imports such engines or vessels for resale. All manufacturing entities under the control of the same person are considered to be a single manufacturer.

(1) This term includes, but is not limited to:

(i) Any person who manufactures an engine or vessel for sale in the United States or otherwise introduces a new marine engine into U.S. commerce.

(ii) Importers who import engines or vessels for resale.

(iii) Post-manufacture marinizers.

(iv) Vessel owners/operators that reflag a formerly foreign vessel as a U.S.-flagged vessel.

(v) Any person who modifies or operates an engine or vessel in a way that makes it a new marine engine or new marine vessel.

(2) Dealers that do not cause an engine or vessel to become new are not manufacturers.

* * * * *

Maximum in-use engine speed has the meaning given in § 1042.140.

* * * * *

Model year means any of the following:

(1) For freshly manufactured marine engines (*see* definition of "new marine engine," paragraph (1)), model year means one of the following:

(i) Calendar year.

(ii) Your annual new model production period if it is different than the calendar year. This must include January 1 of the calendar year for which the model year is named. It may not begin before January 2 of the previous calendar year and it must end by December 31 of the named calendar year. For seasonal production periods not including January 1, model year means the calendar year in which the production occurs, unless you choose to certify the applicable engine family with the following model year. For example, if your production period is June 1, 2010 through November 30, 2010, your model year would be 2010 unless you choose to certify the engine family for model year 2011.

(2) For an engine that is converted to a marine engine after being certified and placed into service as a motor vehicle engine, a nonroad engine that is not a marine engine, or a stationary engine, model year means the calendar year in which the engine was originally produced. For an engine that is

converted to a marine engine after being placed into service as a motor vehicle engine, a nonroad engine that is not a marine engine, or a stationary engine without having been certified, model year means the calendar year in which the engine becomes a new marine engine. (*See* definition of "new marine engine," paragraph (2)).

(3) For an uncertified marine engine excluded under § 1042.5 that is later subject to this part 1042 as a result of being installed in a different vessel, model year means the calendar year in which the engine was installed in the non-excluded vessel. For a marine engine excluded under § 1042.5 that is later subject to this part 1042 as a result of reflagging the vessel, model year means the calendar year in which the engine was originally manufactured. For a marine engine that become new under paragraph (7) of the definition of "new marine engine," model year means the calendar year in which the engine was originally manufactured. (*See* definition of "new marine engine," paragraphs (3) and (7)).

(4) For engines that do not meet the definition of "freshly manufactured" but are installed in new vessels, model year means the calendar year in which the engine is installed in the new vessel. (*See* definition of "new marine engine," paragraph (4)).

(5) For remanufactured engines, model year means the calendar year in which the remanufacture takes place.

(6) For imported engines:

(i) For imported engines described in paragraph (5)(i) of the definition of "new marine engine," *model year* has the meaning given in paragraphs (1) through (4) of this definition.

(ii) For imported engines described in paragraph (5)(ii) of the definition of "new marine engine," *model year* means the calendar year in which the engine is remanufactured.

(iii) For imported engines described in paragraph (5)(iii) of the definition of "new marine engine," *model year* means the calendar year in which the engine is first assembled in its imported configuration, unless specified otherwise in this part or in 40 CFR part 1068.

(iv) For imported engines described in paragraph (5)(iv) of the definition of "new marine engine," *model year* means the calendar year in which the engine is imported.

(7) [Reserved].

(8) For freshly manufactured vessels, model year means the calendar year in which the keel is laid or the vessel is at a similar stage of construction. For vessels that become new under paragraph (2) of the definition of "new vessel" (as a result of modifications), model year means the calendar year in which the modifications physically begin.

* * * * *

New marine engine means any of the following:

(1) A freshly manufactured marine engine for which the ultimate purchaser has never received the equitable or legal title. This kind of engine might commonly be thought of as "brand new." In the case of this paragraph (1), the engine is new from the time it is produced until the ultimate purchaser receives the title or the product is placed into service, whichever comes first.

(2) An engine originally manufactured as a motor vehicle engine, a nonroad engine that is not a marine engine, or a stationary engine that is later used or intended to be used as a marine engine. In this case, the engine is no longer a motor vehicle, nonmarine, or stationary engine and becomes a "new marine engine." The engine is no longer new when it is placed into marine service as a marine engine. This paragraph (2) applies for engines we exclude under § 1042.5, where that engine is later installed as a marine engine in a vessel that is covered by this part 1042. For example, this would apply to an engine that is no longer used in a foreign vessel. An engine converted to a marine engine without having been certified is treated as a freshly manufactured engine under this part 1042.

(3) A marine engine that has been previously placed into service in an application we exclude under § 1042.5, where that engine is installed in a vessel that is covered by this part 1042. The engine is new when it first enters U.S. waters on a vessel covered by this part 1042. For example, this would apply to an engine that is no longer used in a foreign vessel and for engines on a vessel that is reflagged as a U.S. vessel. Note paragraph (7) of this definition may also apply.

(4) An engine not covered by paragraphs (1) through (3) of this definition that is intended to be installed in a new vessel. This generally includes installation of used engines in new vessels. The engine is no longer new when the ultimate purchaser receives a title for the vessel or it is placed into service, whichever comes first. Such an engine is treated as a freshly manufactured engine under this part 1042, whether or not it meets the definition of "freshly manufactured marine engine."

(5) A remanufactured marine engine. An engine becomes new when it is remanufactured (as defined in this section) and ceases to be new when placed back into service.

(6) An imported marine engine, subject to the following provisions:

(i) An imported marine engine covered by a certificate of conformity issued under this part that meets the criteria of one or more of paragraphs (1) through (4) of this definition, where the original engine manufacturer holds the certificate, is new as defined by those applicable paragraphs.

(ii) An imported remanufactured engine that would have been required to be certified if it had been remanufactured in the United States.

(iii) An imported engine that will be covered by a certificate of conformity issued under this part, where someone other than the original engine manufacturer holds the certificate (such as when the engine is modified after its initial assembly), is a new marine engine when it is imported. It is no longer new when the ultimate purchaser receives a title for the engine or it is placed into service, whichever comes first.

(iv) An imported marine engine that is not covered by a certificate of conformity issued under this part at the time of importation is new, but only if it was produced on or after the dates shown in the following table. This addresses uncertified engines and vessels initially placed into service that someone seeks to import into the United States. Importation of this kind of engine (or vessel containing such an engine) is generally prohibited by 40 CFR part 1068.

APPLICABILITY OF EMISSION STANDARDS FOR COMPRESSION-IGNITION MARINE ENGINES

Engine category and type	Power (kW)	Per-cylinder displacement (L/cyl)	Initial model year of emission standards
Category 1	P < 19	All	2000

APPLICABILITY OF EMISSION STANDARDS FOR COMPRESSION-IGNITION MARINE ENGINES—Continued

Engine category and type	Power (kW)	Per-cylinder displacement (L/cyl)	Initial model year of emission standards
Category 1	19 ≤ P < 37	All	1999
Category 1, Recreational	P ≥ 37	disp. < 0.9	2007
Category 1, Recreational	All	0.9 ≤ disp. < 2.5	2006
Category 1, Recreational	All	disp. ≥ 2.5	2004
Category 1, Commercial	P ≥ 37	disp. < 0.9	2005
Category 1, Commercial	All	disp. ≥ 0.9	2004
Category 2 and Category 3	All	disp. ≥ 5.0	2004

(7) A marine engine that is not covered by a certificate of conformity issued under this part on a U.S.-flag vessel entering U.S. waters is new, but only if it was produced on or after the dates identified in paragraph (6)(iv) of this definition. Such entrance is deemed to be introduction into U.S. commerce.

* * * * *

NO_X Technical Code means the "Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines" adopted by the International Maritime Organization (incorporated by reference in § 1042.910). The Technical Code is part of 2008 Annex VI.

* * * * *

Reflag means to register as a U.S. vessel any vessel that previously had a foreign registry or had been placed into service without registration.

* * * * *

Residual fuel means any fuel with a T_{90} greater than 700 °F as measured with the distillation test method specified in 40 CFR 1065.1010. This generally includes all RM grades of marine fuel without regard to whether they are known commercially as residual fuel. For example, fuel marketed as intermediate fuel may be residual fuel.

* * * * *

Small-volume boat builder means a boat manufacturer with fewer than 500 employees and with annual worldwide production of fewer than 100 boats. For manufacturers owned by a parent company, these limits apply to the combined production and number of employees of the parent company and all its subsidiaries. Manufacturers that produce vessels with Category 3 engines are not small-volume boat builders.

Small-volume engine manufacturer means a manufacturer of Category 1 and/or Category 2 engines with annual worldwide production of fewer than 1,000 internal combustion engines (marine and nonmarine). For manufacturers owned by a parent company, the limit applies to the production of the parent company and all its subsidiaries. Manufacturers that certify or produce any Category 3 engines are not small-volume engine manufacturers.

* * * * *

Tier 2 means relating to the Tier 2 emission standards, as shown in § 1042.104 and Appendix I.

Tier 3 means relating to the Tier 3 emission standards, as shown in § 1042.101 and § 1042.104.

* * * * *

Total hydrocarbon equivalent has the meaning given in 40 CFR 1065.1001. This generally means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as exhaust hydrocarbon from petroleum-fueled engines. The atomic hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1.

* * * * *

U.S. waters includes U.S. navigable waters and the U.S. EEZ.

Useful life means the period during which the engine is designed to properly function in terms of reliability and fuel consumption, without being remanufactured, specified as a number of hours of operation or calendar years, whichever comes first. It is the period during which an engine is required to comply with all applicable emission standards. *See* §§ 1042.101(e) and 1042.104(d).

■ 207. Section 1042.905 is amended by adding the acronyms "ECA", "EEZ", and "IMO" in alphabetical order to read as follows:

§ 1042.905 Symbols, acronyms, and abbreviations.

* * * * *

ECA Emission Control Area.
EEZ Exclusive Economic Zone.

* * * * *

IMO International Maritime Organization.

* * * * *

■ 208. Section 1042.910 is revised to read as follows:

§ 1042.910 Reference materials.

Documents listed in this section have been incorporated by reference into this part. The Director of the Federal Register approved the incorporation by reference as prescribed in 5 U.S.C. 552(a) and 1 CFR part 51. Anyone may inspect copies at the U.S. EPA, Air and Radiation Docket and Information Center, 1301 Constitution Ave., NW., Room B102, EPA West Building, Washington, DC 20460, (202) 566–1744, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(a) *IMO material.* This paragraph (a) lists material from the International Maritime Organization that we have incorporated by reference. Anyone may purchase copies of these materials from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, United Kingdom, or *http://www.imo.org,* or 44–(0)20–7735–7611.

(1) Revised MARPOL Annex VI, Regulations for the Prevention of Air Pollution from Ships, and NO_X Technical Code 2008, 2009 edition.

(i) Revised MARPOL Annex VI, Regulations for the Prevention of Pollution from Ships ("2008 Annex VI"); IBR approved for § 1042.901.

(ii) NO_X Technical Code 2008 ("NO_X Technical Code"); IBR approved for §§ 1042.104(g), 1042.230(d), 1042.302(c) and (e), 1042.501(g), and 1042.901.

(2) [Reserved]

(b) [Reserved]

■ 209. Appendix I to part 1042 is amended by revising paragraphs (b)(2) introductory text and (b)(3) to read as follows:

Appendix I to Part 1042—Summary of Previous Emission Standards

* * * * *

(b) * * *

(2) *Tier 2 primary standards.* Exhaust emissions from Category 1 engines at or

above 37 kW and all Category 2 engines may not exceed the values shown in the following table:

* * * * *

(3) *Tier 2 supplemental standards.* The not-to-exceed emission standards specified in 40 CFR 94.8(e) apply for all engines subject to the Tier 2 standards described in paragraph (b)(2) of this appendix.

■ 210. A new part 1043 is added to subchapter U to read as follows:

PART 1043—CONTROL OF NO_X, SO_X, AND PM EMISSIONS FROM MARINE ENGINES AND VESSELS SUBJECT TO THE MARPOL PROTOCOL

Sec.

Authority: 33 U.S.C. 1901–1915.

§ 1043.1 Overview.

The Act to Prevent Pollution from Ships (APPS) requires engine manufacturers, owners and operators of vessels, and other persons to comply with Annex VI of the MARPOL Protocol. This part implements portions of APPS as it relates to Regulations 13, 14 and 18 of Annex VI. These regulations clarify the application of some Annex VI provisions; provide procedures and criteria for the issuance of EIAPP certificates; and specify requirements applicable to ships that are not registered by Parties to Annex VI. This part includes provisions to apply the equivalency provisions of Regulation 4 of Annex VI with respect to Regulations 14 and 18 of Annex VI. Additional regulations may also apply with respect to the Annex VI, such as those issued separately by the U.S. Coast Guard. Note that references in this part to a specific subsection of an Annex VI regulation (such as Regulation 13.5.1) reflect the regulation numbering of the 2008 Annex VI (incorporated by reference in § 1043.100).

(a) The general requirements for non-public U.S.-flagged and other Party vessels are specified in Annex VI, as implemented by 33 U.S.C. 1901–1915. These requirements apply to engine manufacturers, owners and operators of vessels, and other persons.

(b) The provisions of this part specify how Regulations 13, 14 and 18 of Annex VI, as implemented by APPS, will be applied to U.S.-flagged vessels that operate only domestically.

(c) This part implements section 33 U.S.C. 1902(e) by specifying that non-public vessels flagged by a country that is not a party to Annex VI are subject to certain provisions under this part that are equivalent to the substantive requirements of Regulations 13, 14 and 18 of Annex VI as implemented by APPS.

(d) This part also describes where the requirements of Regulation 13.5.1 of Annex VI and Regulation 14.4 of Annex VI will apply.

(e) This part 1043 does not limit the requirements specified in Annex VI, as implemented by APPS, except as specified in § 1043.10(a)(2) and (b)(3).

(f) Nothing in this part limits the operating requirements and restrictions applicable for engines and vessels subject to 40 CFR part 1042 or the requirements and restrictions applicable for fuels subject to 40 CFR part 80.

(g) The provisions of this part specify how to obtain EIAPP certificates and certificates for Approved Methods.

§ 1043.5 Effective dates.

(a) The requirement of APPS for marine vessels to comply with Annex VI of the MARPOL Protocol is in effect.

(b) The amendments to Annex VI adopted on October 8, 2008 enter into force July 1, 2010. The requirement of APPS for marine vessels to comply with the amended Annex VI is effective July 1, 2010, although some requirements do not become applicable until later dates.

(c) Compliance with the applicable regulations of this part is required for all persons as of July 1, 2010. (Note that certain requirements begin later, as described in paragraph (d) of this section.) Note also that compliance with §§ 1043.40 and 1043.41 is required to obtain EIAPP certificates under this part whether the application is submitted before July 1, 2010 or later.

(d) Compliance with the requirements related to ECAs are effective as follows:

(1) Compliance with the ECA NO_X requirements (*see* § 1043.60(a)) is required beginning on the date on which the ECA enters into force for the United States under Annex VI.

(2) Compliance with the fuel content requirements applicable within ECAs and ECA associated areas (*see* § 1043.60(b)) is required beginning 12 months after date on which the ECA enters into force for the United States under Annex VI.

§ 1043.10 Applicability.

(a) *U.S.-flagged vessels.* The provisions of this part apply for all U.S.-flagged vessels wherever they are located (including engines installed or intended to be installed on such vessels), except as specified in this paragraph (a) or in § 1043.95.

(1) Public vessels are excluded from this part.

(2) Vessels that operate only domestically and conform to the requirements of this paragraph (a)(2) are excluded from Regulation 13 of Annex VI (including the requirement to obtain an EIAPP certificate) and the NO_X-related requirements of this part. For the purpose of this exclusion, the phrase "operate only domestically" means the vessels do not enter waters subject to the jurisdiction or control of any foreign country, except for Canadian portions of the Great Lakes. (*See* §§ 1043.60 and 1043.70 for provisions related to fuel use by such vessels). To be excluded, the vessel must conform to each of the following provisions:

(i) All compression-ignition engines on the vessel must conform fully to all applicable provisions of 40 CFR parts 94 and 1042.

(ii) The vessel may not contain any engines with a specific engine displacement at or above 30.0 liters per cylinder.

(iii) Any engine installed in the vessel that is not covered by an EIAPP must be labeled as specified in 40 CFR 1042.135 with respect to whether it meets the requirements of Regulation 13 of Annex VI.

(b) *Foreign-flagged vessels.* The provisions of this part apply for all non-public foreign-flagged vessels (including engines installed on such vessels) as follows:

(1) The requirements of this part apply for foreign-flagged vessels operating in U.S. navigable waters or the U.S. EEZ.

(2) For non-public vessels flagged by a country that is not a party to Annex VI, the requirements of this part apply in the same manner as apply for Party vessels, except as otherwise provided in this part. For example, *see* § 1043.30(b)(3) for provisions related to showing compliance with this requirement without an EIAPP certificate. *See* § 1043.60 for specific operating requirements.

(3) Canadian vessels that operate only within the Great Lakes and are subject to an alternative NO_X control measure established by the Canadian government

are excluded from the NO_X-related requirements of this part.

(c) *Fuel suppliers.* The provisions of § 1043.80 apply for all persons supplying fuel to any vessel subject to this part.

(d) *Sea bed mineral exploration.* This part does not apply to emissions directly arising from the exploration, exploitation, and associated offshore processing of sea-bed mineral resources. Note that other regulations apply with respect to these emissions in certain circumstances, and that engines that are not solely dedicated to such activities are otherwise subject to all requirements of this part.

§ 1043.20 Definitions.

The following definitions apply to this part:

2008 Annex VI means Annex VI to the MARPOL Protocol, including amendments adopted in October 2008. The 2008 Annex VI is incorporated by reference in § 1043.100. Note that this version of Annex VI does not include any amendments that may be adopted in the future. This 2008 version applies for certain provisions of this part such as those applicable for internal waters and for non-Party vessels.

*Administrato*r means the Administrator of the Environmental Protection Agency.

Annex VI means Annex VI of the MARPOL Protocol.

APPS means the Act to Prevent Pollution from Ships (33 U.S.C. 1901–1915).

Designated Certification Officer means the EPA official to whom the Administrator has delegated authority to issue EIAPP certificates. Note that the Designated Certification Officer is also delegated certain authorities under this part in addition to the authority to issue EIAPP certificates.

ECA associated area means the U.S. internal waters that are navigable from the ECA. This term does not include internal waters that are shoreward of ocean waters that are not part of an emission control area.

EIAPP certificate means a certificate issued to certify initial compliance with Regulation 13 of Annex VI. (Note that EIAPP stands for Engine International Air Pollution Prevention under Annex VI.)

Emission control area (ECA) means an area designated pursuant to Annex VI as an Emission Control Area that:

(1) Is in force; and

(2) Includes waters of the U.S. territorial sea and/or EEZ.

Engine has the meaning given in 40 CFR 1068.30.

EPA means the United States Environmental Protection Agency.

Foreign-flagged vessel means a vessel of foreign registry or a vessel operated under the authority of a country other than the United States.

Good engineering judgment has the meaning given in 40 CFR 1068.30. We will evaluate engineering judgments as described in 40 CFR 1068.5.

Great Lakes means all the streams, rivers, lakes, and other bodies of water that are within the drainage basin of the St. Lawrence River, west of Anticosti Island.

IMO means the International Maritime Organization.

Major conversion has the meaning given in 2008 Annex VI (incorporated by reference in § 1043.100).

MARPOL Protocol has the meaning given in 33 U.S.C. 1901.

Navigable waters has the meaning given in 33 U.S.C. 1901.

Non-Party vessel means a vessel flagged by a country that is not a party to Annex VI.

NO_X Technical Code means the "Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines" adopted by IMO (incorporated by reference in § 1043.100). The Technical Code is part of 2008 Annex VI.

Operator has the meaning given in 33 U.S.C. 1901.

Owner has the meaning given in 33 U.S.C. 1901.

Party vessel means a vessel flying the flag of, registered in, or operating under the authority of a country that is a party to Annex VI.

Person has the meaning given in 33 U.S.C. 1901.

Public vessels means warships, naval auxiliary vessels, and other vessels owned or operated by a sovereign country when engaged in noncommercial service.

Secretary has the meaning given in 33 U.S.C. 1901.

U.S. EEZ means the Exclusive Economic Zone of the United States, as defined in Presidential Proclamation 5030 of March 10, 1983.

U.S.-flagged vessel means a vessel of U.S. registry or a vessel operated under the authority of the United States.

Vessel has the meaning given to "ship" in APPS.

We means EPA.

§ 1043.30 General obligations.

(a) 33 U.S.C. 1907 prohibits any person from violating any provisions of the MARPOL Protocol, whether or not they are a manufacturer, owner or operator. For manufacturers, owners and operators of vessels subject to this part, it is the responsibility of such manufacturers, owners and operators to ensure that all employees and other agents operating on their behalf comply with these requirements.

(b) Manufacturers of engines to be installed on U.S. vessels subject to this part must obtain an EIAPP certificate for an engine prior to it being installed in a vessel.

(c) Engines with power output of more than 130 kW that are listed in this paragraph (c) must be covered by a valid EIAPP certificate, certifying the engine meets the applicable emission standards of Annex VI, unless the engine is excluded under § 1043.10 or paragraph (d) of this section. An EIAPP certificate is valid for a given engine only if it certifies compliance with the tier of standards applicable to that engine and the vessel into which it is being installed (or a later tier). Note that none of the requirements of this paragraph (c) are limited to new engines.

(1) Engines meeting any of the following criteria must be covered by a valid EIAPP certificate:

(i) Engines installed (or intended to be installed) on vessels that were constructed on or after January 1, 2000. This includes engines that met the definition of "new marine engine" in 40 CFR 1042.901 at any time on or after January 1, 2000, unless such engines are installed on vessels that were constructed before January 1, 2000.

(ii) Engines that undergo a major conversion on or after January 1, 2000, unless the engines have been exempt from this requirement under paragraph (e) of this section.

(2) For such engines intended to be installed on U.S.-flagged vessels, the engine may not be introduced into U.S. commerce before it is covered by a valid EIAPP certificate, except as allowed by this paragraph (c)(2).

(i) This paragraph (c)(2) does not apply for engines installed on vessels excluded under this part 1043.

(ii) Engines without a valid EIAPP certificate (because they are intended for domestic use only) may be introduced into U.S. commerce, but may not be installed on vessels that do not meet the requirements of § 1043.10(a)(2).

(iii) Engines that have been temporarily exempted by EPA under 40 CFR part 1042 or part 1068 may be introduced into U.S. commerce without a valid EIAPP certificate to the same extent they are allowed to be introduced into U.S. commerce without a valid part 1042 certificate of conformity, however, this allowance does not affect whether the engine must ultimately be covered by an EIAPP certificate. Unless otherwise excluded or exempted under this part 1043, the engine must be covered by an EIAPP certificate before being placed into service. For example, engines allowed to be temporarily distributed in an uncertified configuration under 40 CFR 1068.260 would not be required to be covered by an EIAPP certificate while it is covered by the temporary exemption under 40 CFR 1068.260; however, it would be required to be covered by an EIAPP certificate before being placed into service.

(iv) All uninstalled marine engines within the United States are presumed to be intended to be installed on a U.S.-flagged vessel, unless there is clear and convincing evidence to the contrary.

(3) For engines installed on Party vessels, the engine may not operate in the U.S. navigable waters or the U.S. exclusive economic zone, or other areas designated under 33 U.S.C. 1902(a)(5)(B)(iii), (C)(iii), or (D)(iv) unless it is covered by a valid EIAPP certificate.

(4) Engines installed on non-Party vessels are not required to have EIAPP certificates, but the operator must have evidence of conformity with Regulation 13 of Annex VI issued by either the government of a country that is party to Annex VI or a recognized classification society. For the purposes of this paragraph, "recognized classification society" means a classification society that is a participating member of the International Association of Classification Societies (IACS).

(d) In addition to the engines excluded under § 1043.10, the following engines are excluded from the requirement to have an EIAPP certificate (or equivalent demonstration of compliance in the case of non-Party vessels) or otherwise meet the requirements of Regulation 13 of Annex VI.

(1) Spark-ignition engines.

(2) Non-reciprocating engines.

(3) Engines that do not use liquid fuel.

(4) Engines intended to be used solely for emergencies. This includes engines that power equipment such as pumps that are intended to be used solely for emergencies and engines installed in lifeboats intended to be used solely for emergencies. It does not include engines to be used for both emergency and non-emergency purposes.

(e) The following requirements apply to Party vessels, including U.S.-flagged vessels:

(1) The requirements specified in Annex VI apply for vessels subject to this part for operation in U.S. navigable waters or the U.S. EEZ. (*See* § 1043.60 for a summary of the standards included in these requirements.)

(2) Vessels operating in an ECA must also comply with the requirements of Annex VI applicable to operation in an ECA.

(3) Vessels operating in waters of an ECA associated area must also comply with the requirements in § 1043.60.

(f) The following requirements apply to non-Party vessels:

(1) Non-Party vessels operating in U.S. navigable waters or the U.S. EEZ must comply with the operating and recordkeeping requirements of the 2008 Annex VI (incorporated by reference in § 1043.100) related to Regulations 13, 14 and 18 of the 2008 Annex VI. This paragraph (f)(1) does not address requirements of other portions of Annex VI.

(2) Non-Party vessels operating in an ECA or ECA associated area must also comply with the requirements in § 1043.60.

(g) A replacement engine may be exempted by EPA from Regulation 13 of Annex VI and the NO_X-related requirements of this part if it is identical to the engine being replaced and the old engine was not subject to Regulation 13 of Annex VI. Send requests for such exemptions to the Designated Certification Officer.

(h) Compliance with the provisions of this part 1043 does not affect your responsibilities under 40 CFR part 1042 for engines subject to that part 1042.

§ 1043.40 EIAPP certificates.

(a) Engine manufacturers seeking EIAPP certificates for new engines to be used in U.S.-flagged vessels must apply to EPA for an EIAPP certificate in compliance with the requirements of this section (which references 40 CFR part 1042). Note that under APPS engine manufacturers must comply with the applicable requirements of Regulation 13 of Annex VI to obtain a certificate. Note also that only the Administrator or the EPA official designated by the Administrator may issue EIAPP certificates on behalf of the U.S. Government.

(b) Persons other than engine manufacturers may apply for and obtain EIAPP certificates for new engines to be used in U.S.-flagged vessels by complying with the requirements of this section (which references 40 CFR part 1042) and the applicable requirements of Regulation 13 of Annex VI.

(c) In appropriate circumstances, EPA may issue an EIAPP certificate under this section for non-new engines or engines for vessels that will not initially be flagged in the U.S.

(d) The process for obtaining an EIAPP certificate is described in § 1043.41. That section references regulations in 40 CFR part 1042, which apply under the Clean Air Act. References in that part to certificates of conformity are deemed to mean EIAPP certificates. References in that part to the Clean Air Act as the applicable statute are deemed to mean 33 U.S.C. 1901–1915.

(e) For engines that undergo a major conversion or for engines installed on imported vessels that become subject to the requirements of this part, we may specify alternate certification provisions consistent with the intent of this part.

(f) This paragraph (f) applies for engines that were originally excluded from this part because they were intended for domestic use and were introduced into U.S. commerce without an EIAPP certificate. Note that such engines must be labeled as specified under 40 CFR 1042.135 to indicate that they are intended for domestic use. Such engines may be installed on vessels not intended only for domestic operation provided the engine manufacturer, vessel manufacturer, or vessel owner obtains an EIAPP certificate. Similarly, vessels originally intended only for domestic operation may be used internationally provided the engine manufacturer, vessel manufacturer, or vessel owner obtains an EIAPP certificate. In either case, the Technical File must specify that the engine was originally certified for domestic use only, prior to being covered by an EIAPP certificate. Engine manufacturers may provide a supplemental label to clarify that the engine is no longer limited to domestic service. An engine manufacturer, vessel manufacturer, or vessel owner may also ask to apply the provisions of this paragraph to engines originally certified for public vessels.

§ 1043.41 EIAPP certification process.

This section describes the process for obtaining the EIAPP certificate required by § 1043.40.

(a) You must send the Designated Certification Officer a separate application for an EIAPP certificate for each engine family. An EIAPP certificate is valid starting with the indicated effective date and is valid for any production until such time as the design of the engine family changes or more stringent emission standards become applicable, whichever comes first. You may obtain preliminary approval of portions of the application under 40 CFR 1042.210.

(b) The application must contain all the information required by this part. It must not include false or incomplete statements or information (*see* 40 CFR 1042.255). Include the information specified in 40 CFR 1042.205 except as follows:

(1) You must include the dates on which the test engines were built and the locations where the test engines were built.

(2) Include a copy of documentation required by this part related to maintenance and in-use compliance for operators, such as the Technical File and onboard NO_X verification procedures as specified by the NO_X Technical Code (incorporated by reference in § 1043.100).

(3) You are not required to provide information specified in 40 CFR 1042.205 regarding useful life, emission labels, deterioration factors, PM emissions, or not-to-exceed standards.

(4) You must include a copy of your warranty instructions, but are not required to describe how you will meet warranty obligations.

(c) We may ask you to include less information than we specify in this section as long as you maintain all the information required by paragraph (b) of this section.

(d) You must use good engineering judgment for all decisions related to your application (*see* 40 CFR 1068.5).

(e) An authorized representative of your company must approve and sign the application.

(f) *See* 40 CFR 1042.255 for provisions describing how we will process your application.

(g) Your application, including the Technical File and onboard NO_X verification procedures, is subject to amendment as described in 40 CFR 1042.225.

(h) Perform emission tests as follows:

(1) Select an emission-data engine from each engine family for testing. For engines at or above 560 kW, you may use a development engine that is equivalent in design to the engine being certified. For Category 3 engines, you may use a single-cylinder version of the engine. Using good engineering judgment, select the engine configuration most likely to exceed an applicable emission standard, considering all exhaust emission constituents and the range of installation options available to vessel manufacturers.

(2) Test your emission-data engines using the procedures and equipment specified in 40 CFR part 1042, subpart F, or in the NO_X Technical Code (incorporated by reference in § 1043.100). We may require that your test be witnessed by an EPA official.

(3) We may measure emissions from any of your test engines or other engines from the engine family, as follows:

(i) We may decide to do the testing at your plant or any other facility. You must deliver the test engine to any test facility we designate. The test engine you provide must include appropriate manifolds, aftertreatment devices, electronic control units, and other emission-related components not normally attached directly to the engine block. If we do the testing at your plant, you must schedule it as soon as possible and make available the instruments, personnel, and equipment we need.

(ii) If we measure emissions from one of your test engines, the results of that testing become the official emission results for the engine. Unless we later invalidate these data, we may decide not to consider your data in determining if your engine family meets applicable requirements.

(iii) Before we test one of your engines, we may set its adjustable parameters to any point within the specified adjustable ranges (*see* 40 CFR 1042.115(d)).

(iv) Before we test one of your engines, we may calibrate it within normal production tolerances for anything we do not consider an adjustable parameter.

(4) We may require you to test a second engine of the same or different configuration in addition to the engine tested under paragraph (b) of this section.

(5) If you use an alternate test procedure under 40 CFR 1065.10 and later testing shows that such testing does not produce results that are equivalent to the procedures otherwise required by this part, we may reject data you generated using the alternate procedure.

(i) Collect emission data using measurements to one more decimal place than the applicable standard, then round the value to the same number of decimal places as the emission standard. Compare the rounded emission levels to the emission standard for each emission-data engine.

(j) Your engine family is considered in compliance with the emission standards in Regulation 13 of Annex VI if all emission-data engines representing that family have test results showing emission levels at or below these standards. Your engine family is deemed not to comply if any emission-data engine representing that family has test results showing an emission level above an applicable emission standard for any pollutant.

(k) If we determine your application is complete and shows that the engines meet all the requirements of this part, we will issue an EIAPP certificate for your engines. We may make the approval subject to additional conditions.

§ 1043.50 Approval of methods to meet Tier 1 retrofit NO_X standards.

Regulation 13 of Annex VI provides for certification of Approved Methods, which are retrofit procedures that enable Pre-Tier 1 engines to meet the Tier 1 NO_X standard of regulation 13 of Annex VI. Any person may request approval of such a method by submitting an application for certification of an Approve Method to the Designated Certification Officer. If we determine that your application conforms to the requirements of Regulation 13 of Annex VI, we will issue a certificate and notify IMO that your Approved Method has been certified.

§ 1043.55 Applying equivalent controls instead of complying with fuel requirements.

Regulation 4 of Annex VI allows Administrations to approve the use of fuels not meeting the requirements of Regulation 14 of the Annex, provided the vessel applies a method that results in equivalent emission reductions. This section describes provisions related to applying this allowance.

(a) Any person may request approval of such equivalent methods for controlling emissions on U.S.-flagged vessels by submitting an application for certification of an equivalent control method to the Designated Certification Officer. If we determine that your control method achieves emission levels equivalent to those achieved by the use of fuels meeting the requirements of Regulation 14 of Annex VI, we will issue a certificate and notify IMO that your method has been certified.

(b) The provisions of this paragraph (b) apply for vessels equipped with controls certified by the Administration of a foreign flag vessel to achieve emission levels equivalent to those achieved by the use of fuels meeting the applicable fuel sulfur limits of Regulation 14 of Annex VI. Fuels not meeting the applicable fuel sulfur limits of Regulation 14 of Annex VI may be used on such vessels consistent with the provisions of the IAPP certificate, APPS and Annex VI.

(c) Compliance with the requirements of this section does not affect the applicability of requirements or prohibitions specified by other statutes or regulations with respect to water pollution.

§ 1043.60 Operating requirements for engines and vessels subject to this part.

This section specifies the operating requirements of this part. Note that it does not limit the operating requirements of APPS or Annex VI that are applicable to U.S.-flagged vessels outside of U.S. domestic waters.

(a) Except as specified otherwise in this part, NO_X emission limits apply to all vessels subject to this part as specified in the following table:

TABLE 1 TO § 1043.60 ANNEX VI NO_X EMISSION STANDARDS (G/KW-HR)

Tier	Area of applicability	Model year	Maximum in-use engine speed		
			Less than 130 RPM	130–2000 RPM[a]	Over 2000 RPM
Tier 1	All U.S. navigable waters and EEZ	2004–2010	17.0	$45.0 \cdot n^{(-0.20)}$	9.8
Tier 2	All U.S. navigable waters and EEZ	2011–2015	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier 2	All U.S. navigable waters and EEZ, exluding ECA and ECA associated areas.	2016 and later	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier 3	ECA and ECA associated areas	2016 and later	3.4	$9.0 \cdot n^{(-0.20)}$	2.0

[a] Applicable standards are calculated from n (maximum in-use engine speed, in RPM, as specified in § 1042.140). Round the standards to one decimal place.

(b) Except as specified otherwise in this part, fuel sulfur limits apply to all vessels subject to this part as specified in the following table:

TABLE 2 TO § 1043.60 ANNEX VI FUEL SULFUR LIMITS

[wt %]

Calendar years	Sulfur limit in all U.S. navigable waters and EEZ (percent)	Sulfur limit in ECA and ECA associated areas (percent)
2010–2011	4.50	1.00
2012–2015	3.50	1.00
2016–2019	3.50	0.10
2020 and later	0.50	0.10

(c) Operators of non-Party vessels must comply with the requirements of paragraphs (a) and (b) of this section as well as other operating requirements and restrictions specified in 2008 Annex VI (incorporated by reference in § 1043.100) related to Regulations 13, 14, and 18.

(d) This paragraph (d) applies for vessels that are excluded from Regulation 13 of Annex VI and the NO_X-related requirements of this part under § 1043.10(a)(2) or (b)(3) because they operate only domestically. Where the vessels operate using only fuels meeting the specifications of 40 CFR part 80 for distillate fuel, they are deemed to be in full compliance with the fuel use requirements and prohibitions of this part and of Regulations 14 and 18 of Annex VI.

(e) Except as noted in paragraph (d) of this section, nothing in this section limits the operating requirements and restrictions of Annex VI, as implemented by APPS, for Party vessels, including U.S.-flagged vessels. Note also that nothing in this part limits the operating requirements and restrictions applicable for engines and vessels subject to 40 CFR part 1042 or the requirements and restrictions applicable for fuels subject to 40 CFR part 80.

(f) We may exempt historic steamships from the fuel requirements of this part for operation in U.S. internal waters. Send requests for exemptions to the Designated Certification Officer.

§ 1043.70 General recordkeeping and reporting requirements.

(a) Under APPS, owners and operators of Party vessels must keep records related to NO_X standards and in-use fuel specifications such as the Technical File, the Engine Book of Record Parameters, and bunker delivery notes. Owners and operators of non-Party vessels must keep these records as specified in the NO_X Technical Code and Regulations 13, 14, and 18 of Annex VI (incorporated by reference in § 1043.100). We may inspect these records as allowed by APPS. As part of our inspection, we may require that the owner submit copies of these records to us.

(b) Nothing in this part limits recordkeeping and reporting the Secretary may require, nor does it preclude the Secretary from providing copies of any records to EPA.

(c) Nothing in this part limits the recordkeeping and reporting requirements applicable with respect to engines and vessels subject to 40 CFR part 1042 or with respect to fuels subject to 40 CFR part 80.

(d) This paragraph (d) applies for vessels that are excluded from Regulation 13 of Annex VI and the NO_X-related requirements of this part under § 1043.10(a)(2) or (b)(3) because they operate only domestically. Where the vessel operator has fuel receipts (or equivalent records) for the preceding three years showing it operated using only fuels meeting the specifications of 40 CFR part 80 for distillate fuel, they are deemed to be in full compliance with the fuel recordkeeping requirements and prohibitions of this part and Annex VI.

§ 1043.80 Recordkeeping and reporting requirements for fuel suppliers.

Under APPS, fuel suppliers must provide bunker delivery notes to vessel operators for any fuel for an engine on any vessel identified in paragraph (a) of this section. Fuel suppliers must also keep copies of these records.

(a) The requirements of this section apply for fuel delivered to any of the following vessels:

(1) Vessels of 400 gross tonnage and above engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties.

(2) Platforms and drilling rigs engaged in voyages to waters under the sovereignty or jurisdiction of other Parties.

(b) Except as allowed by paragraph (c) of this section, the bunker delivery note must contain the following:

(1) The name and IMO number of the receiving vessel.

(2) Port (or other description of the location, if the delivery does not take place at a port).

(3) Date the fuel is delivered to the vessel (or date on which the delivery begins where the delivery begins on one day and ends on a later day).

(4) Name, address, and telephone number of fuel supplier.

(5) Fuel type and designation under 40 CFR part 80.

(6) Quantity in metric tons.

(7) Density at 15 °C, in kg/m^3.

(8) Sulfur content in weight percent.

(9) A signed statement by an authorized representative of fuel supplier certifying that the fuel supplied conforms to Regulations 14 and 18 of Annex VI consistent with it designation, intended use, and the date on which it is to be used. For example, with respect to conformity to Regulation 14 of Annex VI, a fuel designated and intended for use in an ECA any time between July 1, 2010 and January 1, 2015 may not have a sulfur content above 1.00 weight percent. This statement is not required where the vessel conforms to the requirements of § 1043.55.

(c) You may measure density and sulfur content according to the specifications of Annex VI, or according to other equivalent methods that we approve. Where the density and/or sulfur content of the delivered fuel cannot be measured, we may allow the use of alternate methods to specify the density and/or sulfur content of the fuel. For example, where fuel is supplied from multiple tanks on a supply vessel, we may allow the density and sulfur content of the fuel to be calculated as a weighted average of the measured densities and sulfur contents of the fuel that is supplied from each tank.

§ 1043.90 [Reserved]

§ 1043.95 Interim provisions.

The interim provisions of this section apply for vessels operating exclusively in the Great Lakes.

(a) Notwithstanding other provisions of this part, the requirements of this part do not apply for vessels propelled by steam turbine engines or reciprocating steam engines (also known as steamships), provided they were propelled by steam engines and operated within the Great Lakes before October 30, 2009 and continue to operate exclusively within the Great Lakes.

(b) In cases of serious economic hardship, we may exempt Great Lakes vessels from the otherwise applicable fuel use requirements under this part.

(1) To be eligible, you must demonstrate that all of the following are true:

(i) Unusual circumstances exist that impose serious economic hardship and significantly affect your ability to comply.

(ii) You have taken all reasonable steps to minimize the extent of the nonconformity.

(iii) No other allowances are available under the regulations in this chapter to avoid the impending violation.

(2) Send the Designated Certification Officer a written request for an exemption no later than January 1, 2014.

(3) Applicants must provide, at a minimum, the following information:

(i) Detailed description of existing contract freight rates, the additional operating costs attributed to complying with the regulations, any loan covenants or other requirements regarding vessel financial instruments or agreements.

(ii) Bond rating of entity that owns the vessels in question (in the case of joint ventures, include the bond rating of the joint venture entity and the bond ratings of all partners; in the case of corporations, include the bond ratings of any parent or subsidiary corporations).

(iii) Estimated capital investment needed to comply with the requirements of this part by the applicable date.

(4) In determining whether to grant the exemptions, we will consider all relevant factors, including the following:

(i) The number of vessels to be exempted.

(ii) The size of your company and your ability to endure the hardship.

(iii) The length of time a vessel is expected to remain out of compliance with this part.

(iv) The ability of an individual vessel to recover capital investments incurred to repower or otherwise modify a vessel to reduce air emissions.

(5) In addition to the application requirements of paragraphs (b)(1) through (4) of this section, your application for temporary relief under this paragraph (b) must also include a compliance plan that shows the period over which the waiver is needed.

(6) We may impose conditions on the waiver, including conditions to limit or recover any environmental loss.

(c) Prior to January 1, 2015, it is not a violation of this part for vessels operating exclusively in the Great Lakes to use a residual fuel not meeting the sulfur limits of Regulation 14.4.2 of Annex VI, where the operator bunkers with the lowest sulfur marine residual fuel that was available within the port area where the vessel bunkered the fuel. For purposes of this paragraph (c), port area means the geographic limits of the port as specified by the Army Corps of Engineers. The reporting and recordkeeping requirements of this part continue to apply for such operation. In addition, if you operate using a residual fuel not meeting the sulfur limits of Regulation 14.4.2 under this paragraph (c), you must send a report to the Designated Certification Officer that identifies the fuel that was used and documents how you determined that no compliant fuel was available. You must send this report within three months after the fueling event.

§ 1043.100 Reference materials.

Documents listed in this section have been incorporated by reference into this part. The Director of the Federal Register approved the incorporation by reference as prescribed in 5 U.S.C. 552(a) and 1 CFR part 51. Anyone may inspect copies at the U.S. EPA, Air and Radiation Docket and Information Center, 1301 Constitution Ave., NW., Room B102, EPA West Building, Washington, DC 20460, (202) 566–1744, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(a) *IMO material.* This paragraph (a) lists material from the International Maritime Organization that we have incorporated by reference. Anyone may purchase copies of these materials from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, United Kingdom, or *http://www.imo.org,* or 44–(0)20–7735–7611.

(1) Revised MARPOL Annex VI, Regulations for the Prevention of Air Pollution from Ships, and NO_X Technical Code 2008, 2009 edition.

(i) Revised MARPOL Annex VI, Regulations for the Prevention of Pollution from Ships ("2008 Annex VI"); IBR approved for § 1043.1, 1043.20, 1043.30(f), and 1043.60(c), and 1043.70(a).

(ii) NO_X Technical Code 2008 ("NO_X Technical Code"); IBR approved for §§ 1043.20, 1043.41(b) and (h), and 1043.70(a).

(2) [Reserved]

(b) [Reserved]

PART 1045—CONTROL OF EMISSIONS FROM SPARK-IGNITION PROPULSION MARINE ENGINES AND VESSELS

■ 211. The authority citation for part 1045 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart B—[Amended]

■ 212. Section 1045.103 is amended by revising paragraph (b) introductory text to read as follows:

§ 1045.103 What exhaust emission standards must my outboard and personal watercraft engines meet?

* * * * *

(b) *Averaging, banking, and trading.* You may generate or use emission credits under the averaging, banking, and trading (ABT) program described in subpart H of this part for demonstrating compliance with $HC+NO_X$ emission standards. For CO emissions, you may generate or use emission credits for averaging as described in subpart H of this part, but such credits may not be banked or traded. To generate or use emission credits, you must specify a family emission limit for each pollutant you include in the ABT program for each engine family. These family emission limits serve as the emission standards for the engine family with respect to all required testing instead of the standards specified in this section. An engine family meets emission standards even if its family emission limit is higher than the standard, as long as you show that the whole averaging set of applicable engine families meets the emission standards using emission credits and the engines within the family meet the family emission limit. The following FEL caps apply:

* * * * *

■ 213. Section 1045.125 is amended as follows:

■ a. By revising paragraphs (a)(2).

■ b. By adding paragraph (a)(3).

■ c. By revising paragraph (c).

§ 1045.125 What maintenance instructions must I give to buyers?

* * * * *

(a) * * *

(2) You may not schedule critical emission-related maintenance within the useful life period for aftertreatment devices, pulse-air valves, fuel injectors, oxygen sensors, electronic control units, superchargers, or turbochargers, except as specified in paragraph (a)(3), (b), or (c) of this section.

(3) You may ask us to approve a maintenance interval shorter than that specified in paragraph (a)(2) of this section. In your request you must describe the proposed maintenance step, recommend the maximum feasible interval for this maintenance, include your rationale with supporting evidence to support the need for the maintenance at the recommended interval, and demonstrate that the maintenance will be done at the recommended interval on in-use engines. In considering your request, we will evaluate the information you provide and any other available information to establish alternate specifications for maintenance intervals, if appropriate.

* * * * *

(c) *Special maintenance.* You may specify more frequent maintenance to address problems related to special situations, such as atypical engine operation. You must clearly state that this additional maintenance is associated with the special situation you are addressing. We may disapprove your maintenance instructions if we determine that you have specified special maintenance steps to address engine operation that is not atypical, or that the maintenance is unlikely to occur in use. If we determine that certain maintenance items do not qualify as special maintenance under this paragraph (c), you may identify this as recommended additional maintenance under paragraph (b) of this section.

* * * * *

■ 214. Section 1045.140 is amended by revising paragraph (a) to read as follows:

§ 1045.140 What is my engine's maximum engine power?

(a) An engine configuration's maximum engine power is the maximum brake power point on the nominal power curve for the engine configuration, as defined in this section. Round the power value to the nearest whole kilowatt for engines above 30 kW and to the nearest 0.1 kilowatt for engines at or below 30 kW.

* * * * *

■ 215. Section 1045.145 is amended by adding paragraph (o) to read as follows:

§ 1045.145 Are there interim provisions that apply only for a limited time?

* * * * *

(o) *Banking early credits for jet boat engines.* Banked emission credits that were originally generated from outboard and personal watercraft engines under 40 CFR part 91 may be used to certify jet boat engines under the provisions § 1045.660.

Subpart C—[Amended]

■ 216. Section 1045.201 is amended by adding paragraph (h) to read as follows:

§ 1045.201 What are the general requirements for obtaining a certificate of conformity?

* * * * *

(h) For engines that become new after being placed into service, such as engines installed on imported vessels or engines converted to run on a different fuel, we may specify alternate certification provisions consistent with the intent of this part. *See* § 1045.645 and the definition of "new propulsion marine engine" in § 1045.801.

■ 217. Section 1045.220 is amended by revising paragraph (a) to read as follows:

§ 1045.220 How do I amend the maintenance instructions in my application?

* * * * *

(a) If you are decreasing or eliminating any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

* * * * *

■ 218. Section 1045.230 is amended by revising paragraph (b)(4) to read as follows:

§ 1045.230 How do I select engine families?

* * * * *

(b) * * *

(4) The number, arrangement (such as in-line or vee configuration), and approximate bore diameter of cylinders.

* * * * *

■ 219. Section 1045.240 is amended by revising paragraphs (a) and (b) and adding paragraph (e) to read as follows:

§ 1045.240 How do I demonstrate that my engine family complies with exhaust emission standards?

(a) For purposes of certification, your engine family is considered in compliance with the duty-cycle emission standards in § 1045.103 or § 1045.105 if all emission-data engines representing that family have test results showing official emission results and deteriorated emission levels at or below these standards. This also applies for all test points for emission-data engines within the family used to establish deterioration factors. Note that your FELs are considered to be the applicable emission standards with which you must comply if you participate in the ABT program in subpart H of this part. *See* paragraph (e) of this section for provisions related to demonstrating compliance with NTE standards.

(b) Your engine family is deemed not to comply with the duty-cycle emission standards in § 1045.103 or § 1045.105 if any emission-data engine representing that family has test results showing an official emission result or a deteriorated emission level for any pollutant that is above an applicable emission standard. Similarly, your engine family is deemed not to comply if any emission-data engine representing that family has test results showing any emission level above the applicable not-to-exceed emission standard for any pollutant. This also applies for all test points for emission-data engines within the family used to establish deterioration factors.

* * * * *

(e) Use good engineering judgment to demonstrate compliance with NTE standards throughout the useful life. You may, but are not required to, apply the same deterioration factors used to show compliance with the applicable duty-cycle standards.

Subpart E—[Amended]

■ 220. Section 1045.405 is amended by revising paragraphs (c) and (e) to read as follows:

§ 1045.405 How does this program work?

* * * * *

(c) Send us an in-use testing plan for engine families selected for testing as described in this paragraph (c). Complete the testing within 36 months after we direct you to test a particular engine family. Send us a complete in-use testing plan according to the following deadlines:

(1) Within six months after we direct you to test a particular engine family.

(2) By February 28 of the following year if you select engine families for testing under paragraph (b)(1) of this section.

(3) Within six months after we approve certification for engine families subject to the requirements of paragraph (b)(2) of this section.

(4) If we request additional information or require you to modify your plan to meet the requirements of this subpart, you must provide the information or the modified plan within 30 days of our request.

* * * * *

(e) In appropriate extreme and unusual circumstances that are clearly outside your control and could not have been avoided by the exercise of prudence, diligence, and due care, we may allow more time to complete testing or we may waive the in-use testing requirement for an engine family. For example, if your test fleet is destroyed by severe weather during service accumulation and we agree that completion of testing is not possible, we would generally waive testing requirements for that engine family.

Subpart F—[Amended]

■ 221. Section 1045.515 is amended by revising paragraph (c)(5) introductory text to read as follows:

§ 1045.515 What are the test procedures related to not-to-exceed standards?

* * * * *

(c) * * *

(5) For two-stroke engines not equipped with a catalyst, the NTE zone described in paragraph (c)(3) of this section is divided into subzones for testing to determine compliance with the applicable NTE standards. Measure emissions to get an NTE result by collecting emissions at five points as described in this paragraph (c)(5). Calculate a weighted test result for these emission measurements using the weighting factors from Appendix II of this part for the corresponding modal result (similar to discrete-mode testing for certification). Test engines over the following modes corresponding to the certification duty cycle:

* * * * *

Subpart H—[Amended]

■ 222. Section 1045.701 is amended by revising paragraphs (d), (g), (j)(4) and (j)(5) to read as follows:

§ 1045.701 General provisions.

* * * * *

(d) Sterndrive/inboard engines certified under § 1045.660 for jet boats may use $HC+NO_x$ and CO exhaust credits generated from outboard and personal watercraft engines, as long as the credit-using engine is the same model as an engine model from an outboard or personal watercraft family. Such emission credits that you generate under this part 1045 may be used for averaging, but not for banking or trading. The FEL caps for such jet boat families are the $HC+NO_x$ and CO standard for outboard and personal watercraft engines. U.S.-directed sales from jet boat engines using the provisions of this paragraph (d) may not be greater than the U.S.-directed sales of the same engine model for outboard or personal watercraft engines.

* * * * *

(g) Emission credits may be used for averaging in the model year they are generated or banked for averaging in future model years, except that CO emission credits for outboard and personal watercraft engines may not be banked or traded.

* * * * *

(j) * * *

(4) Engines or vessels not subject to the requirements of this part, such as those excluded under § 1045.5.

(5) Any other engines or vessels where we indicate elsewhere in this part 1045 that they are not to be included in the calculations of this subpart.

■ 223. Section 1045.705 is amended by revising paragraph (a) to read as follows:

§ 1045.705 How do I generate and calculate exhaust emission credits?

* * * * *

(a) For each participating family, calculate positive or negative emission credits relative to the otherwise applicable emission standard. Calculate positive emission credits for a family that has an FEL below the standard. Calculate negative emission credits for a family that has an FEL above the standard. Sum your positive and negative credits for the model year before rounding. Round the sum of emission credits to the nearest kilogram (kg) using consistent units throughout the following equation:

$$\text{Emission credits (kg)} = (\text{STD} - \text{FEL}) \times (\text{Volume}) \times (\text{Power}) \times (\text{UL}) \times (\text{LF}) \times (10^{-3})$$

Where:

STD = the emission standard, in g/kW-hr.

FEL = the family emission limit for the family, in g/kW-hr.

Volume = the number of engines eligible to participate in the averaging, banking, and trading program within the given family during the model year, as described in § 1045.701(j).

Power = maximum engine power for the family, in kilowatts (*see* § 1045.140).

UL = The useful life for the given family.

LF = load factor. Use 0.207. We may specify a different load factor if we approve the use of special test procedures for an engine family under 40 CFR 1065.10(c)(2), consistent with good engineering judgment.

* * * * *

Subpart I—[Amended]

■ 224. Section 1045.801 is amended by revising the definition of “Fuel system” and paragraphs (2) and (5)(iii) of the definition of “Model year” to read as follows:

§ 1045.801 What definitions apply to this part?

* * * * *

Fuel system means all components involved in transporting, metering, and mixing the fuel from the fuel tank to the combustion chamber(s), including the fuel tank, fuel tank cap, fuel pump, fuel filters, fuel lines, carburetor or fuel-injection components, and all fuel-system vents. In the case where the fuel tank cap or other components (excluding fuel lines) are directly mounted on the fuel tank, they are considered to be a part of the fuel tank.

* * * * *

Model year * * *

(2) For an engine that is converted to a propulsion marine engine after being certified and placed into service as a motor vehicle engine, a nonroad engine that is not a propulsion marine engine, or a stationary engine, model year means the calendar year in which the engine was originally produced. For an engine that is converted to a propulsion marine engine after being placed into service as a motor vehicle engine, a nonroad engine that is not a propulsion marine engine, or a stationary engine without having been certified, model year means the calendar year in which the engine becomes a new propulsion marine engine. (*See* definition of "new propulsion marine engine," paragraph (2).)

* * * * *

(5) * * *

(iii) For imported engines described in paragraph (5)(iii) of the definition of "new propulsion marine nonroad engine," *model year* means the calendar year in which the engine is first assembled in its imported configuration, unless specified otherwise in this part or in 40 CFR part 1068.

* * * * *

PART 1048—CONTROL OF EMISSIONS FROM NEW, LARGE NONROAD SPARK-IGNITION ENGINES

■ 225. The authority citation for part 1048 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 226. Section 1048.15 is amended by revising paragraph (b) to read as follows:

§ 1048.15 Do any other regulation parts apply to me?

* * * * *

(b) Part 1065 of this chapter describes procedures and equipment specifications for testing engines to measure exhaust emissions. Subpart F of this part 1048 describes how to apply the provisions of part 1065 of this chapter to determine whether engines meet the exhaust emission standards in this part.

* * * * *

■ 227. A new § 1048.30 is added to subpart A to read as follows:

§ 1048.30 Submission of information.

(a) This part includes various requirements to record data or other information. Refer to § 1048.825 and 40 CFR 1068.25 regarding recordkeeping requirements. Unless we specify otherwise, store these records in any format and on any media and keep them readily available for one year after you send an associated application for certification, or one year after you generate the data if they do not support an application for certification. You must promptly send us organized, written records in English if we ask for them. We may review them at any time.

(b) The regulations in § 1048.255 and 40 CFR 1068.101 describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. This includes information not related to certification.

(c) Send all reports and requests for approval to the Designated Compliance Officer (*see* § 1048.801).

(d) Any written information we require you to send to or receive from another company is deemed to be a required record under this section. Such records are also deemed to be submissions to EPA. We may require you to send us these records whether or not you are a certificate holder.

Subpart B—[Amended]

■ 228. Section 1048.120 is amended by revising paragraph (b) to read as follows:

§ 1048.120 What emission-related warranty requirements apply to me?

* * * * *

(b) *Warranty period.* Your emission-related warranty for evaporative emission controls must be valid for at least two years. Your emission-related warranty for exhaust emission controls must be valid for at least 50 percent of the engine's useful life in hours of operation or at least three years, whichever comes first. In the case of a high-cost warranted part, the warranty must be valid for at least 70 percent of the engine's useful life in hours of operation or at least five years, whichever comes first. You may offer an emission-related warranty more generous than we require. The emission-related warranty for the engine may not be shorter than any published warranty you offer without charge for the engine. Similarly, the emission-related warranty for any component may not be shorter than any published warranty you offer without charge for that component. If an engine has no hour meter, we base the warranty periods in this paragraph (b) only on the engine's age (in years). The warranty period begins when the engine is placed into service.

* * * * *

■ 229. Section 1048.125 is amended by adding paragraph (a)(4) and revising paragraph (c) to read as follows:

§ 1048.125 What maintenance instructions must I give to buyers?

* * * * *

(a) * * *

(4) You may ask us to approve a maintenance interval shorter than that specified in paragraphs (a)(2) of this section. In your request you must describe the proposed maintenance step, recommend the maximum feasible interval for this maintenance, include your rationale with supporting evidence to support the need for the maintenance at the recommended interval, and demonstrate that the maintenance will be done at the recommended interval on in-use engines. In considering your request, we will evaluate the information you provide and any other available information to establish alternate specifications for maintenance intervals, if appropriate.

* * * * *

(c) *Special maintenance.* You may specify more frequent maintenance to address problems related to special situations, such as substandard fuel or atypical engine operation. For example, you may specify more frequent cleaning of fuel system components for engines you have reason to believe will be using fuel that causes substantially more engine performance problems than commercial fuels of the same type that are generally available across the United States. You must clearly state that this additional maintenance is associated with the special situation you are addressing. We may disapprove your maintenance instructions if we determine that you have specified special maintenance steps to address engine operation that is not atypical, or that the maintenance is unlikely to occur in use. If we determine that certain maintenance items do not qualify as special maintenance under this paragraph (c), you may identify this as recommended additional maintenance under paragraph (b) of this section.

* * * * *

Subpart C—[Amended]

■ 230. Section 1048.201 is amended by adding paragraph (h) to read as follows:

§ 1048.201 What are the general requirements for obtaining a certificate of conformity?

* * * * *

(h) For engines that become new after being placed into service, such as engines converted to nonroad use after being used in motor vehicles, we may specify alternate certification provisions consistent with the intent of this part. *See* the definition of "new nonroad engine" in § 1048.801.

■ 231. Section 1048.220 is amended by revising paragraphs (a) and (c) to read as follows:

§ 1048.220 How do I amend the maintenance instructions in my application?

* * * * *

(a) If you are decreasing or eliminating any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

* * * * *

(c) You need not request approval if you are making only minor corrections (such as correcting typographical mistakes), clarifying your maintenance instructions, or changing instructions for maintenance unrelated to emission control. We may ask you to send us copies of maintenance instructions revised under this paragraph (c).

■ 232. Section 1048.230 is amended by revising paragraph (b)(6) to read as follows:

§ 1048.230 How do I select engine families?

* * * * *

(b) * * *

(6) The number, arrangement (such as in-line or vee configuration), and approximate bore diameter of cylinders.

* * * * *

■ 233. Section 1048.240 is amended by revising paragraphs (a) and (b) and adding paragraph (e) to read as follows:

§ 1048.240 How do I demonstrate that my engine family complies with exhaust emission standards?

(a) For purposes of certification, your engine family is considered in compliance with the applicable numerical emission standards in § 1048.101(a) and (b) if all emission-data engines representing that family have test results showing official emission results and deteriorated emission levels at or below these standards. This includes all test points over the course of the durability demonstration. This also applies for all test points for emission-data engines within the family used to establish deterioration factors. *See* paragraph (e) of this section for provisions related to demonstrating compliance with field-testing standards.

(b) Your engine family is deemed not to comply if any emission-data engine representing that family has test results showing an official emission result or a deteriorated emission level for any pollutant that is above an applicable emission standard from § 1048.101(a) and (b). Similarly, your engine family is deemed not to comply if any emission-data engine representing that family has test results showing any emission level above the applicable field-testing standard for any pollutant. This also applies for all test points for emission-data engines within the family used to establish deterioration factors.

* * * * *

(e) Use good engineering judgment to demonstrate compliance with field-testing standards throughout the useful life. You may, but are not required to, apply the same deterioration factors used to show compliance with the applicable duty-cycle standards.

■ 234. Section 1048.245 is amended by revising paragraph (e) to read as follows:

§ 1048.245 How do I demonstrate that my engine family complies with evaporative emission standards?

* * * * *

(e) You may demonstrate that your engine family complies with the evaporative emission standards by demonstrating that you use the following control technologies:

(1) For certification to the standards specified in § 1048.105(c), with the following technologies:

(i) Use a tethered or self-closing gas cap on a fuel tank that stays sealed up to a positive pressure of 24.5 kPa (3.5 psig); however, they may contain air inlets that open when there is a vacuum pressure inside the tank. Nonmetal fuel tanks must also use one of the qualifying designs for controlling permeation emissions specified in 40 CFR 1060.240.

(ii) [Reserved]

(2) For certification to the standards specified in § 1048.105(d), demonstrating that you use design features to prevent fuel boiling under all normal operation. If you install engines in equipment, you may do this using fuel temperature data measured during normal operation. Otherwise, you may do this by including appropriate information in your emission-related installation instructions.

(3) We may establish additional options for design-based certification where we find that new test data demonstrate that a technology will ensure compliance with the emission standards in this section.

■ 235. Section 1048.255 is amended by revising paragraph (b) to read as follows:

§ 1048.255 What decisions may EPA make regarding my certificate of conformity?

* * * * *

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Clean Air Act. We will base our decision on all available information. If we deny your application, we will explain why in writing.

* * * * *

Subpart E—[Amended]

■ 236. Section 1048.405 is amended by revising paragraphs (b) and (d) to read as follows:

§ 1048.405 How does this program work?

* * * * *

(b) Send us an in-use testing plan within six months after we direct you to test a particular engine family. If we request additional information or require you to modify your plan to meet the requirements of this subpart, you must provide the information or the modified plan within 30 days of our request. Complete the testing within 36 months after we direct you to test a particular engine family.

* * * * *

(d) In appropriate extreme and unusual circumstances that are clearly outside your control and could not have been avoided by the exercise of prudence, diligence, and due care, we may allow more time to complete testing or we may waive the in-use testing requirement for an engine family. For example, if your test fleet is destroyed by severe weather during service accumulation and we agree that completion of testing is not possible, we would generally waive testing requirements for that engine family.

Subpart F—[Amended]

■ 237. Section 1048.505 is amended by revising the section heading and paragraph (b)(5)(i) and Table 3 to read as follows:

§ 1048.505 How do I test engines using steady-state duty cycles, including ramped-modal testing?

* * * * *

(b) * * *

(5) * * *

(i) The following duty cycle applies for discrete-mode testing:

TABLE 3 OF § 1048.505

Mode No.	Engine speed	Torque (percent) [1]	Minimum time in mode (minutes)	Weighting factors
1	Maximum test speed	100	3.0	0.50
2	Maximum test speed	75	3.0	0.50

[1] The percent torque is relative to the maximum torque at maximum test speed.

* * * * *

■ 238. Section 1048.510 is amended by adding paragraph (b) to read as follows:

§ 1048.510 What transient duty cycles apply for laboratory testing?

* * * * *

(b) Calculate cycle statistics and compare with the established criteria as specified in 40 CFR 1065.514 to confirm that the test is valid.

* * * * *

Subpart I—[Amended]

■ 239. Section 1048.801 is amended by adding definitions for "Carryover" and "Date of manufacture" in alphabetical order to read as follows:

§ 1048.801 What definitions apply to this part?

* * * * *

Carryover means relating to certification based on emission data generated from an earlier model year as described in § 1048.235(d).

* * * * *

Date of manufacture has the meaning given in 40 CFR 1068.30.

* * * * *

PART 1051—CONTROL OF EMISSIONS FROM RECREATIONAL ENGINES AND VEHICLES

■ 240. The authority citation for part 1051 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 241. Section 1051.15 is amended by revising paragraph (a) to read as follows:

§ 1051.15 Do any other regulation parts apply to me?

(a) Parts 86 and 1065 of this chapter describe procedures and equipment specifications for testing vehicles and engines to measure exhaust emissions. Subpart F of this part 1051 describes how to apply the provisions of parts 86 and 1065 of this chapter to determine whether vehicles meet the exhaust emission standards in this part.

* * * * *

■ 242. Section 1051.20 is amended by adding paragraph (g) to read as follows:

§ 1051.20 May I certify a recreational engine instead of the vehicle?

* * * * *

(g) Apply the provisions of 40 CFR part 1068 for engines certified under this section as if they were subject to engine-based standards. For example, you may rely on the provisions of 40 CFR 1068.261 to have vehicle manufacturers install catalysts that you describe in your application for certification.

■ 243. A new § 1051.30 is added to subpart A to read as follows:

§ 1051.30 Submission of information.

(a) This part includes various requirements to record data or other information. Refer to § 1051.825 and 40 CFR 1068.25 regarding recordkeeping requirements. Unless we specify otherwise, store these records in any format and on any media and keep them readily available for one year after you send an associated application for certification, or one year after you generate the data if they do not support an application for certification. You must promptly send us organized, written records in English if we ask for them. We may review them at any time.

(b) The regulations in § 1051.255 and 40 CFR 1068.101 describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. This includes information not related to certification.

(c) Send all reports and requests for approval to the Designated Compliance Officer (*see* § 1051.801).

(d) Any written information we require you to send to or receive from another company is deemed to be a required record under this section. Such records are also deemed to be submissions to EPA. We may require you to send us these records whether or not you are a certificate holder.

Subpart B—[Amended]

■ 244. Section 1051.125 is amended by adding paragraph (a)(3) and revising paragraph (c) to read as follows:

§ 1051.125 What maintenance instructions must I give to buyers?

* * * * *

(a) * * *

(3) You may ask us to approve a maintenance interval shorter than that specified in paragraph (a)(2) of this section. In your request you must describe the proposed maintenance step, recommend the maximum feasible interval for this maintenance, include your rationale with supporting evidence to support the need for the maintenance at the recommended interval, and demonstrate that the maintenance will be done at the recommended interval on in-use engines. In considering your request, we will evaluate the information you provide and any other available information to establish alternate specifications for maintenance intervals, if appropriate.

* * * * *

(c) *Special maintenance.* You may specify more frequent maintenance to address problems related to special situations, such as atypical engine operation. You must clearly state that this additional maintenance is associated with the special situation you are addressing. We may disapprove your maintenance instructions if we determine that you have specified special maintenance steps to address engine operation that is not atypical, or that the maintenance is unlikely to occur in use. If we determine that certain maintenance items do not qualify as special maintenance under this paragraph (c), you may identify this as recommended additional maintenance under paragraph (b) of this section.

* * * * *

■ 245. Section 1051.135 is amended by revising paragraph (c)(12) to read as follows:

§ 1051.135 How must I label and identify the vehicles I produce?

* * * * *

(c) * * *

(12) State: "THIS VEHICLE MEETS U.S. EPA REGULATIONS FOR [MODEL YEAR] [SNOWMOBILES or OFF–ROAD MOTORCYCLES or ATVs or OFFROAD UTILITY VEHICLES]."

* * * * *

Subpart C—[Amended]

■ 246. Section 1051.201 is amended by adding paragraph (h) to read as follows:

§ 1051.201 What are the general requirements for obtaining a certificate of conformity?

* * * * *

(h) For vehicles that become new after being placed into service, such as vehicles converted to run on a different fuel, we may specify alternate certification provisions consistent with the intent of this part. *See* § 1051.650 and the definition of "new" in § 1051.801.

■ 247. Section 1051.220 is amended by revising paragraphs (a) and (c) to read as follows:

§ 1051.220 How do I amend the maintenance instructions in my application?

* * * * *

(a) If you are decreasing or eliminating any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

* * * * *

(c) You need not request approval if you are making only minor corrections (such as correcting typographical mistakes), clarifying your maintenance instructions, or changing instructions for maintenance unrelated to emission control. We may ask you to send us copies of maintenance instructions revised under this paragraph (c).

■ 248. Section 1051.230 is amended by revising paragraph (b)(7) to read as follows:

§ 1051.230 How do I select engine families?

* * * * *

(b) * * *

(7) The number, arrangement (such as in-line or vee configuration), and approximate bore diameter of cylinders.

* * * * *

■ 249. Section 1051.255 is amended by revising paragraph (b) to read as follows:

§ 1051.255 What decisions may EPA make regarding my certificate of conformity?

* * * * *

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Clean Air Act. We will base our decision on all available information. If we deny your application, we will explain why in writing.

* * * * *

Subpart I—[Amended]

■ 250. Section 1051.801 is amended by revising paragraph (2) of the definition for "All-terrain vehicle" and the definition for "Offroad utility vehicle" to read as follows:

§ 1051.801 What definitions apply to this part?

* * * * *

All-terrain vehicle means * * *

(2) Other all-terrain vehicles have three or more wheels and one or more seats, are designed for operation over rough terrain, are intended primarily for transportation, and have a maximum vehicle speed higher than 25 miles per hour. Golf carts generally do not meet these criteria since they are generally not designed for operation over rough terrain.

* * * * *

Offroad utility vehicle means a nonroad vehicle that has four or more wheels, seating for two or more persons, is designed for operation over rough terrain, and has either a rear payload capacity of 350 pounds or more or seating for six or more passengers. Vehicles intended primarily for recreational purposes that are not capable of transporting six passengers (such as dune buggies) are not offroad utility vehicles. (**Note:** § 1051.1(a) specifies that some offroad utility vehicles are required to meet the requirements that apply for all-terrain vehicles.) Unless there is significant information to the contrary, we consider vehicles to be intended primarily for recreational purposes if they are marketed for recreational use, have a rear payload capacity no greater than 1,000 pounds, and meet at least five of the following criteria:

(1) Front and rear suspension travel is greater than 18 cm.

(2) The vehicle has no tilt bed.

(3) The vehicle has no mechanical power take-off (PTO) and no permanently installed hydraulic system for operating utility-oriented accessory devices.

(4) The engine has in-use operating speeds at or above 4,000 rpm.

(5) Maximum vehicle speed is greater than 35 miles per hour.

(6) The speed at which the engine produces peak power is above 4,500 rpm and the engine is equivalent to engines in ATVs certified by the same manufacturer. For the purpose of this paragraph (6), the engine is considered equivalent if it could be included in the same emission family based on the characteristics specified in § 1051.230(b).

(7) Gross Vehicle Weight Rating is no greater than 3,750 pounds. This is the maximum design loaded weight of the vehicle as defined in 40 CFR 86.1803–01, including passengers and cargo.

* * * * *

PART 1054—CONTROL OF EMISSIONS FROM NEW, SMALL NONROAD SPARK-IGNITION ENGINES AND EQUIPMENT

■ 251. The authority citation for part 1054 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 252. Section 1054.1 is amended by revising paragraph (a)(4) to read as follows:

§ 1054.1 Does this part apply for my engines and equipment?

(a) * * *

(4) This part 1054 applies for other spark-ignition engines as follows:

(i) The provisions of §§ 1054.620 and 1054.801 apply for new engines used solely for competition beginning January 1, 2010.

(ii) The provisions of §§ 1054.660 and 1054.801 apply for new engines used in emergency rescue equipment beginning January 1, 2010.

* * * * *

Subpart B—[Amended]

■ 253. Section 1054.125 is amended by adding paragraph (a)(4) and revising paragraph (c) to read as follows:

§ 1054.125 What maintenance instructions must I give to buyers?

* * * * *

(a) * * *

(4) You may ask us to approve a maintenance interval shorter than that specified in paragraph (a)(3) of this

section. In your request you must describe the proposed maintenance step, recommend the maximum feasible interval for this maintenance, include your rationale with supporting evidence to support the need for the maintenance at the recommended interval, and demonstrate that the maintenance will be done at the recommended interval on in-use engines. In considering your request, we will evaluate the information you provide and any other available information to establish alternate specifications for maintenance intervals, if appropriate.

* * * * *

(c) *Special maintenance.* You may specify more frequent maintenance to address problems related to special situations, such as atypical engine operation. You must clearly state that this additional maintenance is associated with the special situation you are addressing. We may disapprove your maintenance instructions if we determine that you have specified special maintenance steps to address engine operation that is not atypical, or that the maintenance is unlikely to occur in use. If we determine that certain maintenance items do not qualify as special maintenance under this paragraph (c), you may identify this as recommended additional maintenance under paragraph (b) of this section.

* * * * *

■ 254. Section 1054.145 is amended by adding paragraph (o) to read as follows:

§ 1054.145 Are there interim provisions that apply only for a limited time?

* * * * *

(o) *Interim bonding provisions.* Through 2012, the maximum value of the bond under § 1054.690 is $10 million. This maximum value applies without adjustment for inflation.

Subpart C—[Amended]

■ 255. Section 1054.201 is amended by adding paragraph (h) to read as follows:

§ 1054.201 What are the general requirements for obtaining a certificate of conformity?

* * * * *

(h) For engines that become new after being placed into service, such as engines converted to run on a different fuel, we may specify alternate certification provisions consistent with the intent of this part. *See* § 1054.645 and the definition of "new nonroad engine" in § 1054.801.

■ 256. Section 1054.205 is amended by revising paragraph (b) to read as follows:

§ 1054.205 What must I include in my application?

* * * * *

(b) Explain how the emission control systems operate. Describe the evaporative emission controls and show how your design will prevent running loss emissions, if applicable. Also describe in detail all system components for controlling exhaust emissions, including all auxiliary emission control devices (AECDs) and all fuel-system components you will install on any production or test engine. Identify the part number of each component you describe. For this paragraph (b), treat as separate AECDs any devices that modulate or activate differently from each other. Include sufficient detail to allow us to evaluate whether the AECDs are consistent with the defeat device prohibition of § 1054.115. For example, if your engines will routinely experience in-use operation that differs from the specified duty cycle for certification, describe how the fuel-metering system responds to varying speeds and loads not represented by the duty cycle. If you test an emission-data engine by disabling the governor for full-load operation such that the engine operates at an air-fuel ratio significantly different than under full-load operation with an installed governor, explain why these differences are necessary or appropriate. For conventional carbureted engines without electronic fuel controls, it is sufficient to state that there is no significant difference in air-fuel ratios.

* * * * *

■ 257. Section 1054.220 is amended by revising paragraph (a) to read as follows:

§ 1054.220 How do I amend the maintenance instructions in my application?

* * * * *

(a) If you are decreasing or eliminating any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. This would generally include replacing one maintenance step with another. We may approve a shorter time or waive this requirement.

* * * * *

■ 258. Section 1054.230 is amended by revising paragraph (b)(6) to read as follows:

§ 1054.230 How do I select emission families?

* * * * *

(b) * * *

(6) The number and arrangement of cylinders (such as in-line or vee configuration) and approximate total displacement.

* * * * *

Subpart G—[Amended]

■ 259. Section 1054.601 is amended by revising the section heading and adding paragraph (c) to read as follows:

§ 1054.601 What compliance provisions apply?

* * * * *

(c) The provisions of 40 CFR 1068.215 apply for cases in which the manufacturer takes possession of engines for purposes of recovering components as described in this paragraph (c). Note that this paragraph (c) does not apply for certified engines that still have the emission control information label since such engines do not need an exemption.

(1) You must label the engine as specified in 40 CFR 1068.215(c)(3), except that the label may be removable as specified in 40 CFR 1068.45(b).

(2) You may not resell the engine. For components other than the engine block, you may generate revenue from the sale of the components that you recover, or from the sale of new engines containing these components. You may also use components other than the engine block for engine rebuilds as otherwise allowed under the regulations. You may use the engine block from an engine that is exempted under this paragraph (c) only to make a new engine, and then only where such an engine has a separate identity from the original engine.

(3) Once the engine has reached its final destination, you may stop collecting records describing the engine's final disposition and how you use the engine. This does not affect the requirement to maintain the records you have already collected under 40 CFR 1068.215. This also does not affect the requirement to maintain records for new engines.

■ 260. Section 1054.690 is amended by revising paragraphs (d), (f), and (j) to read as follows:

§ 1054.690 What bond requirements apply for certified engines?

* * * * *

(d) The minimum value of the bond is $500,000. A higher bond value may apply based on the per-engine bond values shown in Table 1 to this section and on the U.S.-directed production volume from each displacement grouping for the calendar model year. For example, if you have projected U.S.-directed production volumes of 10,000 engines with 180 cc displacement and

10,000 engines with 400 cc displacement in 2013, the appropriate bond amount is $750,000. Adjust the value of the bond as follows:

(1) If your estimated or actual U.S.-directed production volume in any later year increases beyond the level appropriate for your current bond payment, you must post additional bond to reflect the increased volume within 90 days after you change your estimate or determine the actual production volume. You may not decrease your bond.

(2) If you sell engines without aftertreatment components under the provisions of § 1054.610, you must increase the per-engine bond values for the current year by 20 percent.

TABLE 1 TO § 1054.690—PER-ENGINE BOND VALUES

For engines with displacement falling in the following ranges . . .	The per-engine bond value is . . .
Disp. < 225 cc	$25
225 ≤ Disp. < 740 cc	50
740 ≤ Disp. ≤ 1,000 cc	100
Disp. > 1,000 cc	200

* * * * *

(f) You may meet the bond requirements of this section by obtaining a bond from a third-party surety that is cited in the U.S. Department of Treasury Circular 570, "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" (*http://www.fms.treas.gov/c570/c570.html#certified*). You must maintain this bond for every year in which you sell certified engines. The surety agent remains responsible for obligations under the bond for two years after the bond is cancelled or expires without being replaced.

* * * * *

(j) The following provisions apply if you import engines for resale when those engines have been certified by someone else (or equipment containing such engines):

(1) You and the certificate holder are each responsible for compliance with the requirements of this part and the Clean Air Act. For example, we may require you to comply with the warranty requirements in § 1054.120.

(2) You do not need to post bond if you or the certificate holder complies with the bond requirements of this section. You also do not need to post bond if the certificate holder complies with the asset requirements of this section and the repair-network provisions of § 1054.120(f)(4).

Subpart H—[Amended]

■ 261. Section 1054.730 is amended by revising paragraph (b)(4) to read as follows:

§ 1054.730 What ABT reports must I send to EPA?

* * * * *

(b) * * *

(4) The projected and actual U.S.-directed production volumes for the model year, as described in § 1054.701(i). For fuel tanks, state the production volume in terms of surface area and production volume for each fuel tank configuration and state the total surface area for the emission family. If you changed an FEL during the model year, identify the actual production volume associated with each FEL.

* * * * *

Subpart I—[Amended]

■ 262. Section 1054.801 is amended by revising the definitions for "Oxides of nitrogen", "Total hydrocarbon", and "Total hydrocarbon equivalent" to read as follows:

§ 1054.801 What definitions apply to this part?

* * * * *

Oxides of nitrogen has the meaning given in 40 CFR 1065.1001.

* * * * *

* * * * *

Total hydrocarbon has the meaning given in 40 CFR 1065.1001. This generally means the combined mass of organic compounds measured by the specified procedure for measuring total hydrocarbon, expressed as an atomic hydrocarbon with a hydrogen-to-carbon ratio of 1.85:1.

Total hydrocarbon equivalent has the meaning given in 40 CFR 1065.1001. This generally means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as exhaust hydrocarbon from petroleum-fueled engines. The atomic hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1.

* * * * *

PART 1060—CONTROL OF EVAPORATIVE EMISSIONS FROM NEW AND IN-USE NONROAD AND STATIONARY EQUIPMENT

■ 263. The authority citation for part 1060 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart B—[Amended]

■ 264. Section 1060.103 is amended by revising paragraph (e) to read as follows:

§ 1060.103 What permeation emission control requirements apply for fuel tanks?

* * * * *

(e) Fuel caps may be certified separately relative to the permeation emission standard in paragraph (b) of this section using the test procedures specified in § 1060.521. Fuel caps certified alone do not need to meet the emission standard. Rather, fuel caps would be certified with a Family Emission Limit, which is used for demonstrating that fuel tanks meet the emission standard as described in § 1060.520(b)(5). For the purposes of this paragraph (e), gaskets or O-rings that are produced as part of an assembly with the fuel cap are considered part of the fuel cap.

* * * * *

■ 265. Section 1060.135 is amended by revising paragraph (a)(5) to read as follows:

§ 1060.135 How must I label and identify the engines and equipment I produce?

* * * * *

(a) * * *

(5) Readily visible in the final installation. It may be under a hinged door or other readily opened cover. It may not be hidden by any cover attached with screws or any similar designs. Labels on marine vessels (except personal watercraft) must be visible from the helm.

* * * * *

■ 266. Section 1060.137 is amended by revising paragraphs (a) introductory text and (a)(4) to read as follows:

§ 1060.137 How must I label and identify the fuel-system components I produce?

* * * * *

(a) Label the components identified in this paragraph (a), unless the components are too small to be properly labeled. Unless we approve otherwise, we consider parts large enough to be properly labeled if they have space for 12 characters in six-point font (approximately 2 mm × 12 mm). For these small parts, you may omit the label as long as you identify those part numbers in your maintenance and installation instructions.

* * * * *

(4) Fuel caps, as described in this paragraph (a)(4). Fuel caps must be labeled if they are separately certified under § 1060.103 or if the diurnal control system requires that the fuel tank hold pressure. Fuel caps must also be labeled if they are mounted directly

on the fuel tank, unless the fuel tank is certified based on a worst-case fuel cap.

* * * * *

Subpart F—[Amended]

■ 267. Section 1060.515 is amended by revising paragraph (c) to read as follows:

§ 1060.515 How do I test EPA Nonroad Fuel Lines and EPA Cold-Weather Fuel Lines for permeation emissions?

* * * * *

(c) Measure fuel line permeation emissions using the equipment and procedures for weight-loss testing specified in SAE J30 or SAE J1527 (incorporated by reference in § 1060.810). Start the measurement procedure within 8 hours after draining and refilling the fuel line. Perform the emission test over a sampling period of 14 days. Determine your final emission result based on the highest measured valued over the 14-day period.

* * * * *

■ 268. Section 1060.520 is amended as follows:

■ a. By adding paragraph (a)(4).

■ b. By removing and reserving paragraph (b)(3).

■ c. By revising paragraphs (b)(5)(ii)(B), (d)(8), (d)(9), and (d)(10).

§ 1060.520 How do I test fuel tanks for permeation emissions?

* * * * *

(a) * * *

(4) *Cap testing.* Perform durability cycles on fuel caps intended for use with handheld equipment by putting the fuel cap on and taking it off 300 times. Tighten the fuel cap each time in a way that represents the typical in-use experience.

(b) * * *

(5) * * *

(ii) * * *

(B) You may seal the fuel inlet with a nonpermeable covering if you separately account for permeation emissions from the fuel cap. This may involve a separate measurement of permeation emissions from a worst-case fuel cap as described in § 1060.521. This may also involve specifying a worst-case Family Emission Limit based on separately certified fuel caps as described in § 1060.103(e).

* * * * *

(d) * * *

(8) Measure weight loss daily by retaring the balance using the reference tank and weighing the sealed test tank. Calculate the cumulative weight loss in grams for each measurement. Calculate the coefficient of determination, r^2, based on a linear plot of cumulative weight loss vs. test days. Use the equation in 40 CFR 1065.602(k), with cumulative weight loss represented by y_i and cumulative time represented by y_{ref}. The daily measurements must be at approximately the same time each day. You may omit up to two daily measurements in any seven-day period. Test for ten full days, then determine when to stop testing as follows:

(i) You may stop testing after the measurement on the tenth day if r^2 is at or above 0.95 or if the measured value is less than 50 percent of the applicable standard. (Note that if a Family Emission Limit applies for the family, it is considered to be the applicable standard for that family.) This means that if you stop testing with an r^2 below 0.95, you may not use the data to show compliance with a Family Emission Limit less than twice the measured value.

(ii) If after ten days of testing your r^2 value is below 0.95 and your measured value is more than 50 percent of the applicable standard, continue testing for a total of 20 days or until r^2 is at or above 0.95. If r^2 is not at or above 0.95 within 20 days of testing, discontinue the test and precondition the fuel tank further until it has stabilized emission levels, then repeat the testing.

(9) Record the difference in mass between the reference tank and the test tank for each measurement. This value is M_i, where *i* is a counter representing the number of days elapsed. Subtract M_i from M_o and divide the difference by the internal surface area of the fuel tank. Divide this g/m^2 value by the number of test days (using at least two decimal places) to calculate the emission rate in $g/m^2/day$. Example: If a tank with an internal surface area of 0.720 m^2 weighed 1.31 grams less than the reference tank at the beginning of the test and weighed 9.86 grams less than the reference tank after soaking for 10.03 days, the emission rate would be—

$$((-1.31\text{ g}) - (-9.82\text{ g}))/0.720\text{ m}^2/10.03\text{ days} = 1.1784\text{ g/m}^2\text{/day}$$

(10) Determine your final emission result based on the cumulative weight loss measured on the final day of testing. Round this result to the same number of decimal places as the emission standard.

* * * * *

Subpart G—[Amended]

■ 269. Section 1060.601 is amended by adding paragraph (h) to read as follows:

§ 1060.601 How do the prohibitions of 40 CFR 1068.101 apply with respect to the requirements of this part?

* * * * *

(h) If equipment manufacturers hold certificates of conformity for their equipment but they use only fuel-system components that have been certified by other companies, they may satisfy their defect-reporting obligations by tracking the information described in 40 CFR 1068.501(b)(1) related to possible defects, reporting this information to the appropriate component manufacturers, and keeping these records for eight years. Such equipment manufacturers will not be considered in violation of 40 CFR 1068.101(b)(6) for failing to perform investigations, make calculations, or submit reports to EPA as specified in 40 CFR 1068.501. *See* § 1060.5(a).

Subpart I—[Amended]

■ 270. Section 1060.801 is amended by revising the definitions for "Detachable fuel line", "Installed marine fuel tank", and "Sealed" and adding definitions for "Installed marine fuel line" and "Portable marine fuel line" to read as follows:

§ 1060.801 What definitions apply to this part?

* * * * *

Detachable fuel line means a fuel line or fuel line assembly intended to be used with a portable nonroad fuel tank and which is connected by special fittings to the fuel tank and/or engine for easy disassembly. Fuel lines that require a wrench or other tools to disconnect are not considered detachable fuel lines. Fuel lines that are labeled or marketed as USCG Type B1 fuel line as specified in 33 CFR 183.540 are not considered detachable fuel lines if they are sold to the ultimate purchaser without quick-connect fittings or similar hardware.

* * * * *

Installed marine fuel line means a fuel line designed for delivering fuel to a Marine SI engine that does not meet the definition of *portable marine fuel line.*

Installed marine fuel tank means a fuel tank designed for delivering fuel to a Marine SI engine that does not meet the definition of *portable marine fuel tanks.*

* * * * *

Portable marine fuel line means a detachable fuel line that is used or intended to be used to supply fuel to a marine engine during operation. This also includes any fuel line labeled or marketed at USCG Type B1 fuel line as specified in 33 CFR 183.540, whether or not it includes detachable connecting hardware; this is often called universal fuel line.

* * * * *

Sealed means lacking openings to the atmosphere that would allow a measurable amount of liquid or vapor to leak out under normal operating pressures or other pressures specified in this part. For example, you may generally establish a maximum value for operating pressures based on the highest pressure you would observe from an installed fuel tank during continuous equipment operation on a sunny day with ambient temperatures of 35 °C. A fuel system may be considered to have no measurable leak if it does not release bubbles when held underwater at the identified tank pressure for 60 seconds. This determination presumes the use of good engineering judgment; for example, it would not be appropriate to test the fuel tank such that small leaks would avoid detection by collecting in a cavity created by holding the tank with a certain orientation. Sealed fuel systems may have openings for emission controls or for fuel lines needed to route fuel to the engine.

* * * * *

PART 1065—ENGINE-TESTING PROCEDURES

■ 271. The authority citation for part 1065 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

■ 272. Section 1065.1 is amended by revising paragraphs (d) and (g) to read as follows:

§ 1065.1 Applicability.

* * * * *

(d) Paragraph (a) of this section identifies the parts of the CFR that define emission standards and other requirements for particular types of engines. In this part, we refer to each of these other parts generically as the "standard-setting part." For example, 40 CFR part 1051 is always the standard-setting part for snowmobiles. Note that while 40 CFR part 86 is the standard-setting part for heavy-duty highway engines, this refers specifically to 40 CFR part 86, subpart A, and to certain portions of 40 CFR part 86, subpart N, as described in 40 CFR 86.1301.

* * * * *

(g) For additional information regarding these test procedures, visit our Web site at *http://www.epa.gov,* and in particular *http://www.epa.gov/nvfel/testing/regulations.htm.*

■ 273. Section 1065.2 is amended by revising paragraphs (a) and (b) to read as follows:

§ 1065.2 Submitting information to EPA under this part.

(a) You are responsible for statements and information in your applications for certification, requests for approved procedures, selective enforcement audits, laboratory audits, production-line test reports, field test reports, or any other statements you make to us related to this part 1065. If you provide statements or information to someone for submission to EPA, you are responsible for these statements and information as if you had submitted them to EPA yourself.

(b) In the standard-setting part and in 40 CFR 1068.101, we describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. *See* also 18 U.S.C. 1001 and 42 U.S.C. 7413(c)(2). This obligation applies whether you submit this information directly to EPA or through someone else.

* * * * *

■ 274. Section 1065.10 is amended by revising paragraphs (c)(2) and (c)(7) introductory text to read as follows:

§ 1065.10 Other procedures.

* * * * *

(c) * * *

(2) You may request to use special procedures if your engine cannot be tested using the specified procedures. For example, this may apply if your engine cannot operate on the specified duty cycle. In this case, tell us in writing why you cannot satisfactorily test your engine using this part's procedures and ask to use a different approach. We will approve your request if we determine that it would produce emission measurements that represent in-use operation and we determine that it can be used to show compliance with the requirements of the standard-setting part. Where we approve special procedures that differ substantially from the specified procedures, we may preclude you from participating in averaging, banking, and trading with the affected engine families.

* * * * *

(7) You may request to use alternate procedures that are equivalent to the allowed procedures, or procedures that are more accurate or more precise than the allowed procedures. The following provisions apply to requests for alternate procedures:

* * * * *

■ 275. Section 1065.15 is amended by revising paragraph (c) to read as follows:

§ 1065.15 Overview of procedures for laboratory and field testing.

* * * * *

(c) We generally set brake-specific emission standards over test intervals and/or duty cycles, as follows:

(1) *Engine operation.* Testing may involve measuring emissions and work in a laboratory-type environment or in the field, as described in paragraph (f) of this section. For most laboratory testing, the engine is operated over one or more duty cycles specified in the standard-setting part. However, laboratory testing may also include non-duty cycle testing (such as simulation of field testing in a laboratory). For field testing, the engine is operated under normal in-use operation. The standard-setting part specifies how test intervals are defined for field testing. Refer to the definitions of "duty cycle" and "test interval" in § 1065.1001. Note that a single duty cycle may have multiple test intervals and require weighting of results from multiple test intervals to calculate a composite brake-specific emissions value to compare to the standard.

(2) *Constituent determination.* Determine the total mass of each constituent over a test interval by selecting from the following methods:

(i) *Continuous sampling.* In continuous sampling, measure the constituent's concentration continuously from raw or dilute exhaust. Multiply this concentration by the continuous (raw or dilute) flow rate at the emission sampling location to determine the constituent's flow rate. Sum the constituent's flow rate continuously over the test interval. This sum is the total mass of the emitted constituent.

(ii) *Batch sampling.* In batch sampling, continuously extract and store a sample of raw or dilute exhaust for later measurement. Extract a sample proportional to the raw or dilute exhaust flow rate. You may extract and store a proportional sample of exhaust in an appropriate container, such as a bag, and then measure HC, CO, and NO_X concentrations in the container after the test interval. You may deposit PM from proportionally extracted exhaust onto an appropriate substrate, such as a filter. In this case, divide the PM by the amount of filtered exhaust to calculate the PM concentration. Multiply batch sampled concentrations by the total (raw or dilute) flow from which it was extracted during the test interval. This product is the total mass of the emitted constituent.

(iii) *Combined sampling.* You may use continuous and batch sampling simultaneously during a test interval, as follows:

(A) You may use continuous sampling for some constituents and batch sampling for others.

(B) You may use continuous and batch sampling for a single constituent, with one being a redundant measurement. *See* § 1065.201 for more information on redundant measurements.

(3) *Work determination.* Determine work over a test interval by one of the following methods:

(i) *Speed and torque.* Synchronously multiply speed and brake torque to calculate instantaneous values for engine brake power. Sum engine brake power over a test interval to determine total work.

(ii) *Fuel consumed and brake-specific fuel consumption.* Directly measure fuel consumed or calculate it with chemical balances of the fuel, intake air, and exhaust. To calculate fuel consumed by a chemical balance, you must also measure either intake-air flow rate or exhaust flow rate. Divide the fuel consumed during a test interval by the brake-specific fuel consumption to determine work over the test interval. For laboratory testing, calculate the brake-specific fuel consumption using fuel consumed and speed and torque over a test interval. For field testing, refer to the standard-setting part and § 1065.915 for selecting an appropriate value for brake-specific fuel consumption.

* * * * *

Subpart B—[Amended]

■ 276. Section 1065.125 is amended by revising paragraphs (c) and (e) to read as follows:

§ 1065.125 Engine intake air.

* * * * *

(c) Maintain the temperature of intake air to (25 ± 5) °C, except as follows:

(1) Follow the standard-setting part if it specifies different temperatures.

(2) For engines above 560 kW, you may use 35 °C as the upper bound of the tolerance. However, your system must be capable of controlling the temperature to the 25 °C setpoint for any steady-state operation at > 30% of maximum engine power.

(3) You may ask us to allow you to apply a different setpoint for intake air temperature if it is necessary to remain consistent with the provisions of § 1065.10(c)(1) for testing during which ambient temperature will be outside this range.

* * * * *

(e) This paragraph (e) includes provisions for simulating charge-air cooling in the laboratory. This approach is described in paragraph (e)(1) of this section. Limits on using this approach are described in paragraphs (e)(2) and (3) of this section.

(1) Use a charge-air cooling system with a total intake-air capacity that represents production engines' in-use installation. Design any laboratory charge-air cooling system to minimize accumulation of condensate. Drain any accumulated condensate and completely close all drains before starting a duty cycle. Keep the drains closed during the emission test. Maintain coolant conditions as follows:

(i) Maintain a coolant temperature of at least 20 °C at the inlet to the charge-air cooler throughout testing. We recommend maintaining a coolant temperature of 25 ±5 °C at the inlet of the charge-air cooler.

(ii) At the engine conditions specified by the manufacturer, set the coolant flow rate to achieve an air temperature within ±5 °C of the value specified by the manufacturer after the charge-air cooler's outlet. Measure the air-outlet temperature at the location specified by the manufacturer. Use this coolant flow rate set point throughout testing. If the engine manufacturer does not specify engine conditions or the corresponding charge-air cooler air outlet temperature, set the coolant flow rate at maximum engine power to achieve a charge-air cooler air outlet temperature that represents in-use operation.

(iii) If the engine manufacturer specifies pressure-drop limits across the charge-air cooling system, ensure that the pressure drop across the charge-air cooling system at engine conditions specified by the manufacturer is within the manufacturer's specified limit(s). Measure the pressure drop at the manufacturer's specified locations.

(2) Using a constant flow rate as described in paragraph (e)(1) of this section may result in unrepresentative overcooling of the intake air. The provisions of this paragraph (e)(2) apply instead of the provisions of § 1065.10(c)(1) for this simulation. Our allowance to cool intake air as specified in this paragraph (e) does not affect your liability for field testing or for laboratory testing that is done in a way that better represents in-use operation. Where we determine that this allowance adversely affects your ability to demonstrate that your engines would comply with emission standards under in-use conditions, we may require you to use more sophisticated setpoints and controls of charge-air pressure drop, coolant temperature, and flow rate to achieve more representative results.

(3) This approach does not apply for field testing. You may not correct measured emission levels from field testing to account for any differences caused by the simulated cooling in the laboratory.

■ 277. Section 1065.140 is revised amended by revising paragraphs (c)(6), (e) introductory text, and (e)(4) to read as follows:

§ 1065.140 Dilution for gaseous and PM constituents.

* * * * *

(c) * * *

(6) *Aqueous condensation.* This paragraph (c)(6) describes how you must address aqueous condensation in the CVS. As described below, you may meet these requirements by preventing or limiting aqueous condensation in the CVS from the exhaust inlet to the last emission sample probe. *See* that paragraph for provisions related to the CVS between the last emission sample probe and the CVS flow meter. You may heat and/or insulate the dilution tunnel walls, as well as the bulk stream tubing downstream of the tunnel to prevent or limit aqueous condensation. Where we allow aqueous condensation to occur, use good engineering judgment to ensure that the condensation does not affect your ability to demonstrate that your engines comply with the applicable standards (*see* § 1065.10(a)).

(i) *Preventing aqueous condensation.* To prevent condensation, you must keep the temperature of internal surfaces, excluding any sample probes, above the dew point of the dilute exhaust passing through the CVS tunnel. Use good engineering judgment to monitor temperatures in the CVS. For the purposes of this paragraph (c)(6), assume that aqueous condensation is pure water condensate only, even though the definition of "aqueous condensation" in § 1065.1001 includes condensation of any constituents that contain water. No specific verification check is required under this paragraph (c)(6)(i), but we may ask you to show how you comply with this requirement. You may use engineering analysis, CVS tunnel design, alarm systems, measurements of wall temperatures, and calculation of water dew point to demonstrate compliance with this requirement. For optional CVS heat exchangers, you may use the lowest water temperature at the inlet(s) and outlet(s) to determine the minimum internal surface temperature.

(ii) *Limiting aqueous condensation.* This paragraph (c)(6)(ii) specifies limits of allowable condensation and requires you to verify that the amount of condensation that occurs during each test interval does not exceed the specified limits.

(A) Use chemical balance equations in § 1065.655 to calculate the mole fraction of water in the dilute exhaust continuously during testing. Alternatively, you may continuously measure the mole fraction of water in the dilute exhaust prior to any condensation during testing. Use good engineering judgment to select, calibrate and verify water analyzers/detectors. The linearity verification requirements of § 1065.307 do not apply to water analyzers/detectors used to correct for the water content in exhaust samples.

(B) Use good engineering judgment to select and monitor locations on the CVS tunnel walls prior to the last emission sample probe. If you are also verifying limited condensation from the last emission sample probe to the CVS flow meter, use good engineering judgment to select and monitor locations on the CVS tunnel walls, optional CVS heat exchanger, and CVS flow meter. For optional CVS heat exchangers, you may use the lowest water temperature at the inlet(s) and outlet(s) to determine the minimum internal surface temperature. Identify the minimum surface temperature on a continuous basis.

(C) Identify the maximum potential mole fraction of dilute exhaust lost on a continuous basis during the entire test interval. This value must be less than or equal to 0.02 (*i.e.* 2%). Calculate on a continuous basis the mole fraction of water that would be in equilibrium with liquid water at the measured minimum surface temperature. Subtract this mole fraction from the mole fraction of water that would be in the exhaust without condensation (either measured or from the chemical balance), and set any negative values to zero. This difference is the potential mole fraction of the dilute exhaust that would be lost due to water condensation on a continuous basis.

(D) Integrate the product of the molar flow rate of the dilute exhaust and the potential mole fraction of dilute exhaust lost, and divide by the totalized dilute exhaust molar flow over the test interval. This is the potential mole fraction of the dilute exhaust that would be lost due to water condensation over the entire test interval. Note that this assumes no re-evaporation. This value must be less than or equal to 0.005 (*i.e.* 0.5%).

* * * * *

(e) *Dilution air temperature, dilution ratio, residence time, and temperature control of PM samples.* Dilute PM samples at least once upstream of transfer lines. You may dilute PM samples upstream of a transfer line using full-flow dilution, or partial-flow dilution immediately downstream of a PM probe. In the case of partial-flow dilution, you may have up to 26 cm of insulated length between the end of the probe and the dilution stage, but we recommend that the length be as short as practical. The intent of these specifications is to minimize heat transfer to or from the emission sample before the final stage of dilution, other than the heat you may need to add to prevent aqueous condensation. This is accomplished by initially cooling the sample through dilution. Configure dilution systems as follows:

* * * * *

(4) Control sample temperature to a (47 ±5) °C tolerance, as measured anywhere within 20 cm upstream or downstream of the PM storage media (such as a filter). Measure this temperature with a bare-wire junction thermocouple with wires that are (0.500 ±0.025) mm diameter, or with another suitable instrument that has equivalent performance.

■ 278. Section 1065.145 is revised to read as follows:

§ 1065.145 Gaseous and PM probes, transfer lines, and sampling system components.

(a) *Continuous and batch sampling.* Determine the total mass of each constituent with continuous or batch sampling, as described in § 1065.15(c)(2). Both types of sampling systems have probes, transfer lines, and other sampling system components that are described in this section.

(b) Options for engines with multiple exhaust stacks. Measure emissions from a test engine as described in this paragraph (b) if it has multiple exhaust stacks. You may choose to use different measurement procedures for different pollutants under this paragraph (b) for a given test. For purposes of this part 1065, the test engine includes all the devices related to converting the chemical energy in the fuel to the engine's mechanical output energy. This may or may not involve vehicle- or equipment-based devices. For example, all of an engine's cylinders are considered to be part of the test engine even if the exhaust is divided into separate exhaust stacks. As another example, all the cylinders of a diesel-electric locomotive are considered to be part of the test engine even if they transmit power through separate output shafts, such as might occur with multiple engine-generator sets working in tandem. Use one of the following procedures to measure emissions with multiple exhaust stacks:

(1) Route the exhaust flow from the multiple stacks into a single flow as described in § 1065.130(c)(6). Sample and measure emissions after the exhaust streams are mixed. Calculate the emissions as a single sample from the entire engine. We recommend this as the preferred option, since it requires only a single measurement and calculation of the exhaust molar flow for the entire engine.

(2) Sample and measure emissions from each stack and calculate emissions separately for each stack. Add the mass (or mass rate) emissions from each stack to calculate the emissions from the entire engine. Testing under this paragraph (b)(2) requires measuring or calculating the exhaust molar flow for each stack separately. If the exhaust molar flow in each stack cannot be calculated from combustion air flow(s), fuel flow(s), and measured gaseous emissions, and it is impractical to measure the exhaust molar flows directly, you may alternatively proportion the engine's calculated total exhaust molar flow rate (where the flow is calculated using combustion air mass flow(s), fuel mass flow(s), and emissions concentrations) based on exhaust molar flow measurements in each stack using a less accurate, non-traceable method. For example, you may use a total pressure probe and static pressure measurement in each stack.

(3) Sample and measure emissions from one stack and repeat the duty cycle as needed to collect emissions from each stack separately. Calculate the emissions from each stack and add the separate measurements to calculate the mass (or mass rate) emissions from the entire engine. Testing under this paragraph (b)(3) requires measuring or calculating the exhaust molar flow for each stack separately. You may alternatively proportion the engine's calculated total exhaust molar flow rate based on calculation and measurement limitations as described in paragraph (b)(2) of this section. Use the average of the engine's total power or work values from the multiple test runs to calculate brake-specific emissions. Divide the total mass (or mass rate) of each emission by the average power (or work). You may alternatively use the engine power or work associated with the corresponding stack during each test run if these values can be determined for each stack separately.

(4) Sample and measure emissions from each stack separately and calculate emissions for the entire engine based on the stack with the highest concentration. Testing under this paragraph (b)(4)

requires only a single exhaust flow measurement or calculation for the entire engine. You may determine which stack has the highest concentration by performing multiple test runs, reviewing the results of earlier tests, or using good engineering judgment. Note that the highest concentration of different pollutants may occur in different stacks. Note also that the stack with the highest concentration of a pollutant during a test interval for field testing may be a different stack than the one you identified based on average concentrations over a duty cycle.

(5) Sample emissions from each stack separately and combine the wet sample streams from each stack proportionally to the exhaust molar flows in each stack. Measure the emission concentrations and calculate the emissions for the entire engine based on these weighted concentrations. Testing under this paragraph (b)(5) requires measuring or calculating the exhaust molar flow for each stack separately during the test run to proportion the sample streams from each stack. If it is impractical to measure the exhaust molar flows directly, you may alternatively proportion the wet sample streams based on less accurate, non-traceable flow methods. For example, you may use a total pressure probe and static pressure measurement in each stack. The following restrictions apply for testing under this paragraph (b)(5):

(i) You must use an accurate, traceable measurement or calculation of the engine's total exhaust molar flow rate for calculating the mass of emissions from the entire engine.

(ii) You may dry the single, combined, proportional sample stream; you may not dry the sample streams from each stack separately.

(iii) You must measure and proportion the sample flows from each stack with active flow controls. For PM sampling, you must measure and proportion the diluted sample flows from each stack with active flow controls that use only smooth walls with no sudden change in cross-sectional area. For example, you may control the dilute exhaust PM sample flows using electrically conductive vinyl tubing and a control device that pinches the tube over a long enough transition length so no flow separation occurs.

(iv) For PM sampling, the transfer lines from each stack must be joined so the angle of the joining flows is 12.5° or less. Note that the exhaust manifold must meet the same specifications as the transfer line according to paragraph (d) of this section.

(6) Sample emissions from each stack separately and combine the wet sample streams from each stack equally. Measure the emission concentrations and calculate the emissions for the entire engine based on these measured concentrations. Testing under this paragraph (b)(6) assumes that the raw-exhaust and sample flows are the same for each stack. The following restrictions apply for testing under this paragraph (b)(6):

(i) You must measure and demonstrate that the sample flow from each stack is within 5% of the value from the stack with the highest sample flow. You may alternatively ensure that the stacks have equal flow rates without measuring sample flows by designing a passive sampling system that meets the following requirements:

(A) The probes and transfer line branches must be symmetrical, have equal lengths and diameters, have the same number of bends, and have no filters.

(B) If probes are designed such that they are sensitive to stack velocity, the stack velocity must be similar at each probe. For example, a static pressure probe used for gaseous sampling is not sensitive to stack velocity.

(C) The stack static pressure must be the same at each probe. You can meet this requirement by placing probes at the end of stacks that are vented to atmosphere.

(D) For PM sampling, the transfer lines from each stack must be joined so the angle of the joining flows is 12.5° or less. Note that the exhaust manifold must meet the same specifications as the transfer line according to paragraph (d) of this section.

(ii) You may use the procedure in this paragraph (b)(6) only if you perform an analysis showing that the resulting error due to imbalanced stack flows and concentrations is either at or below 2%. You may alternatively show that the resulting error does not impact your ability to demonstrate compliance with applicable standards. For example, you may use less accurate, non-traceable measurements of emission concentrations and molar flow in each stack and demonstrate that the imbalances in flows and concentrations cause 2% or less error.

(iii) For a two-stack engine, you may use the procedure in this paragraph (b)(6) only if you can show that the stack with the higher flow has the lower average concentration for each pollutant over the duty cycle.

(iv) You must use an accurate, traceable measurement or calculation of the engine's total exhaust molar flow rate for calculating the mass of emissions from the entire engine.

(v) You may dry the single, equally combined, sample stream; you may not dry the sample streams from each stack separately.

(vi) You may determine your exhaust flow rates with a chemical balance of exhaust gas concentrations and either intake air flow or fuel flow.

(c) *Gaseous and PM sample probes.* A probe is the first fitting in a sampling system. It protrudes into a raw or diluted exhaust stream to extract a sample, such that its inside and outside surfaces are in contact with the exhaust. A sample is transported out of a probe into a transfer line, as described in paragraph (d) of this section. The following provisions apply to sample probes:

(1) *Probe design and construction.* Use sample probes with inside surfaces of 300 series stainless steel or, for raw exhaust sampling, use any nonreactive material capable of withstanding raw exhaust temperatures. Locate sample probes where constituents are mixed to their mean sample concentration. Take into account the mixing of any crankcase emissions that may be routed into the raw exhaust. Locate each probe to minimize interference with the flow to other probes. We recommend that all probes remain free from influences of boundary layers, wakes, and eddies—especially near the outlet of a raw-exhaust tailpipe where unintended dilution might occur. Make sure that purging or back-flushing of a probe does not influence another probe during testing. You may use a single probe to extract a sample of more than one constituent as long as the probe meets all the specifications for each constituent.

(2) *Gaseous sample probes.* Use either single-port or multi-port probes for sampling gaseous emissions. You may orient these probes in any direction relative to the raw or diluted exhaust flow. For some probes, you must control sample temperatures, as follows:

(i) For probes that extract NO_X from diluted exhaust, control the probe's wall temperature to prevent aqueous condensation.

(ii) For probes that extract hydrocarbons for THC or NMHC analysis from the diluted exhaust of compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW, we recommend heating the probe to minimize hydrocarbon contamination consistent with good engineering judgment. If you routinely fail the contamination check in the 1065.520 pretest check, we recommend heating the probe section to approximately 190 °C to minimize contamination.

(3) *PM sample probes.* Use PM probes with a single opening at the end. Orient PM probes to face directly upstream. If you shield a PM probe's opening with a PM pre-classifier such as a hat, you may not use the preclassifier we specify in paragraph (f)(1) of this section. We recommend sizing the inside diameter of PM probes to approximate isokinetic sampling at the expected mean flow rate.

(d) *Transfer lines.* You may use transfer lines to transport an extracted sample from a probe to an analyzer, storage medium, or dilution system, noting certain restrictions for PM sampling in § 1065.140(e). Minimize the length of all transfer lines by locating analyzers, storage media, and dilution systems as close to probes as practical. We recommend that you minimize the number of bends in transfer lines and that you maximize the radius of any unavoidable bend. Avoid using 90° elbows, tees, and cross-fittings in transfer lines. Where such connections and fittings are necessary, take steps, using good engineering judgment, to ensure that you meet the temperature tolerances in this paragraph (d). This may involve measuring temperature at various locations within transfer lines and fittings. You may use a single transfer line to transport a sample of more than one constituent, as long as the transfer line meets all the specifications for each constituent. The following construction and temperature tolerances apply to transfer lines:

(1) *Gaseous samples.* Use transfer lines with inside surfaces of 300 series stainless steel, PTFE, Viton™, or any other material that you demonstrate has better properties for emission sampling. For raw exhaust sampling, use a non-reactive material capable of withstanding raw exhaust temperatures. You may use in-line filters if they do not react with exhaust constituents and if the filter and its housing meet the same temperature requirements as the transfer lines, as follows:

(i) For NO_X transfer lines upstream of either an NO_2-to-NO converter that meets the specifications of § 1065.378 or a chiller that meets the specifications of § 1065.376, maintain a sample temperature that prevents aqueous condensation.

(ii) For THC transfer lines for testing compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW, maintain a wall temperature tolerance throughout the entire line of (191 ±11) °C. If you sample from raw exhaust, you may connect an unheated, insulated transfer line directly to a probe. Design the length and insulation of the transfer line to cool the highest expected raw exhaust temperature to no lower than 191 °C, as measured at the transfer line's outlet. For dilute sampling, you may use a transition zone between the probe and transfer line of up to 92 cm to allow your wall temperature to transition to (191 ±11) °C.

(2) *PM samples.* We recommend heated transfer lines or a heated enclosure to minimize temperature differences between transfer lines and exhaust constituents. Use transfer lines that are inert with respect to PM and are electrically conductive on the inside surfaces. We recommend using PM transfer lines made of 300 series stainless steel. Electrically ground the inside surface of PM transfer lines.

(e) *Optional sample-conditioning components for gaseous sampling.* You may use the following sample-conditioning components to prepare gaseous samples for analysis, as long as you do not install or use them in a way that adversely affects your ability to show that your engines comply with all applicable gaseous emission standards.

(1) *NO_2-to-NO converter.* You may use an NO_2-to-NO converter that meets the converter conversion verification specified in § 1065.378 at any point upstream of a NO_X analyzer, sample bag, or other storage medium.

(2) *Sample dryer.* You may use either type of sample dryer described in this paragraph (e)(2) to decrease the effects of water on gaseous emission measurements. You may not use a chemical dryer, or use dryers upstream of PM sample filters.

(i) *Osmotic-membrane.* You may use an osmotic-membrane dryer upstream of any gaseous analyzer or storage medium, as long as it meets the temperature specifications in paragraph (d)(1) of this section. Because osmotic-membrane dryers may deteriorate after prolonged exposure to certain exhaust constituents, consult with the membrane manufacturer regarding your application before incorporating an osmotic-membrane dryer. Monitor the dewpoint, T_{dew}, and absolute pressure, p_{total}, downstream of an osmotic-membrane dryer. You may use continuously recorded values of T_{dew} and p_{total} in the amount of water calculations specified in § 1065.645. For our testing we may use average temperature and pressure values over the test interval or a nominal pressure value that we estimate as the dryer's average pressure expected during testing as constant values in the amount of water calculations specified in § 1065.645. For your testing, you may use the maximum temperature or minimum pressure values observed during a test interval or duty cycle or the high alarm temperature setpoint or low alarm pressure setpoint as constant values in the calculations specified in § 1065.645. For your testing, you may also use a nominal p_{total}, which you may estimate as the dryer's lowest absolute pressure expected during testing.

(ii) *Thermal chiller.* You may use a thermal chiller upstream of some gas analyzers and storage media. You may not use a thermal chiller upstream of a THC measurement system for compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW. If you use a thermal chiller upstream of an NO_2-to-NO converter or in a sampling system without an NO_2-to-NO converter, the chiller must meet the NO_2 loss-performance check specified in § 1065.376. Monitor the dewpoint, T_{dew}, and absolute pressure, p_{total}, downstream of a thermal chiller. You may use continuously recorded values of T_{dew} and p_{total} in the amount of water calculations specified in § 1065.645. If it is valid to assume the degree of saturation in the thermal chiller, you may calculate T_{dew} based on the known chiller performance and continuous monitoring of chiller temperature, $T_{chiller}$. If it is valid to assume a constant temperature offset between $T_{chiller}$ and T_{dew}, due to a known and fixed amount of sample reheat between the chiller outlet and the temperature measurement location, you may factor in this assumed temperature offset value into emission calculations. If we ask for it, you must show by engineering analysis or by data the validity of any assumptions allowed by this paragraph (e)(2)(ii). For our testing we may use average temperature and pressure values over the test interval or a nominal pressure value that we estimate as the dryer's average pressure expected during testing as constant values in the calculations specified in § 1065.645. For your testing you may use the maximum temperature and minimum pressure values observed during a test interval or duty cycle or the high alarm temperature setpoint and the low alarm pressure setpoint as constant values in the amount of water calculations specified in § 1065.645. For your testing you may also use a nominal p_{total}, which you may estimate as the dryer's lowest absolute pressure expected during testing.

(3) *Sample pumps.* You may use sample pumps upstream of an analyzer or storage medium for any gas. Use sample pumps with inside surfaces of 300 series stainless steel, PTFE, or any other material that you demonstrate has

better properties for emission sampling. For some sample pumps, you must control temperatures, as follows:

(i) If you use a NO_X sample pump upstream of either an NO_2-to-NO converter that meets § 1065.378 or a chiller that meets § 1065.376, it must be heated to prevent aqueous condensation.

(ii) For testing compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW, if you use a THC sample pump upstream of a THC analyzer or storage medium, its inner surfaces must be heated to a tolerance of (191 ±11) °C.

(4) *Ammonia Scrubber.* You may use ammonia scrubbers for any or all gaseous sampling systems to prevent interference with NH_3, poisoning of the NO_2-to-NO converter, and deposits in the sampling system or analyzers. Follow the ammonia scrubber manufacturer's recommendations or use good engineering judgment in applying ammonia scrubbers.

(f) *Optional sample-conditioning components for PM sampling.* You may use the following sample-conditioning components to prepare PM samples for analysis, as long as you do not install or use them in a way that adversely affects your ability to show that your engines comply with the applicable PM emission standards. You may condition PM samples to minimize positive and negative biases to PM results, as follows:

(1) *PM preclassifier.* You may use a PM preclassifier to remove large-diameter particles. The PM preclassifier may be either an inertial impactor or a cyclonic separator. It must be constructed of 300 series stainless steel. The preclassifier must be rated to remove at least 50% of PM at an aerodynamic diameter of 10 µm and no more than 1% of PM at an aerodynamic diameter of 1 µm over the range of flow rates for which you use it. Follow the preclassifier manufacturer's instructions for any periodic servicing that may be necessary to prevent a buildup of PM. Install the preclassifier in the dilution system downstream of the last dilution stage. Configure the preclassifier outlet with a means of bypassing any PM sample media so the preclassifier flow may be stabilized before starting a test. Locate PM sample media within 75 cm downstream of the preclassifier's exit. You may not use this preclassifier if you use a PM probe that already has a preclassifier. For example, if you use a hat-shaped preclassifier that is located immediately upstream of the probe in such a way that it forces the sample flow to change direction before entering the probe, you may not use any other preclassifier in your PM sampling system.

(2) *Other components.* You may request to use other PM conditioning components upstream of a PM preclassifier, such as components that condition humidity or remove gaseous-phase hydrocarbons from the diluted exhaust stream. You may use such components only if we approve them under § 1065.10.

Subpart C—[Amended]

■ 279. Section 1065.201 is amended by revising paragraph (h) to read as follows:

§ 1065.201 Overview and general provisions.

* * * * *

(h) *Recommended practices.* This subpart identifies a variety of recommended but not required practices for proper measurements. We believe in most cases it is necessary to follow these recommended practices for accurate and repeatable measurements. However, we do not specifically require you to follow these recommended practices to perform a valid test, as long as you meet the required calibrations and verifications of measurement systems specified in subpart D of this part. Similarly, we are not required to follow all recommended practices, as long as we meet the required calibrations and verifications. Our decision to follow or not follow a given recommendation when testing your engine is not dependent on whether or not you followed it during your testing.

■ 280. Section 1065.205 is revised to read as follows:

§ 1065.205 Performance specifications for measurement instruments.

Your test system as a whole must meet all the applicable calibrations, verifications, and test-validation criteria specified in subparts D and F of this part or subpart J of this part for using PEMS and for performing field testing. We recommend that your instruments meet the specifications in Table 1 of this section for all ranges you use for testing. We also recommend that you keep any documentation you receive from instrument manufacturers showing that your instruments meet the specifications in Table 1 of this section.

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Table 1 of §1065.205–Recommended performance specifications for measurement instruments

Measurement Instrument	Measured quantity symbol	Complete System Rise time ($t_{10\text{-}90}$) and Fall time ($t_{90\text{-}10}$)[a]	Recording update frequency	Accuracy[b]	Repeatability[b]	Noise[b]
Engine speed transducer	f_n	1 s	1 Hz means	2.0 % of pt. or 0.5 % of max.	1.0 % of pt. or 0.25 % of max.	0.05 % of max
Engine torque transducer	T	1 s	1 Hz means	2.0 % of pt. or 1.0 % of max.	1.0 % of pt. or 0.5 % of max	0.05 % of max.
Electrical work (active-power meter)	W	1 s	1 Hz means	2.0 % of pt. or 0.5 % of max.	1.0 % of pt. or 0.25 % of max.	0.05 % of max
General pressure transducer (not a part of another instrument)	p	5 s	1 Hz	2.0 % of pt. or 1.0 % of max.	1.0 % of pt. or 0.50 % of max.	0.1 % of max
Atmospheric pressure meter used for PM-stabilization and balance environments	p_{atmos}	50 s	5 times per hour	50 Pa	25 Pa	5 Pa
General purpose atmospheric pressure meter	p_{atmos}	50 s	5 times per hour	250 Pa	100Pa	50 Pa
Temperature sensor for PM-stabilization and balance environments	T	50 s	0.1 Hz	0.25 K	0.1 K	0.1 K
Other temperature sensor (not a part of another instrument)	T	10 s	0.5 Hz	0.4 % of pt. K or 0.2 % of max. K	0.2 % of pt. K or 0.1 % of max. K	0.1 % of max
Dewpoint sensor for intake air, PM-stabilization and balance environments	T_{dew}	50 s	0.1 Hz	0.25 K	0.1 K	0.02 K
Other dewpoint sensor	T_{dew}	50 s	0.1 Hz	1 K	0.5 K	0.1 K
Fuel flow meter (Fuel totalizer)	$\dot{m}$	5 s (N/A)	1 Hz (N/A)	2.0 % of pt. or 1.5 % of max.	1.0 % of pt. or 0.75 % of max.	0.5 % of max.
Total diluted exhaust meter (CVS) (With heat exchanger before meter)	$\dot{n}$	1 s (5 s)	1 Hz means (1 Hz)	2.0 % of pt. or 1.5 % of max.	1.0 % of pt. or 0.75 % of max.	1.0 % of max.

Dilution air, inlet air, exhaust, and sample flow meters	$\dot{n}$	1 s	1 Hz means of 5 Hz samples	2.5 % of pt. or 1.5 % of max.	1.25 % of pt. or 0.75 % of max.	1.0 % of max.
Continuous gas analyzer	x	5 s	1 Hz	2.0 % of pt. or 2.0 % of meas.	1.0 % of pt. or 1.0 % of meas.	1.0 % of max.
Batch gas analyzer	x	N/A	N/A	2.0 % of pt. or 2.0 % of meas.	1.0 % of pt. or 1.0 % of meas.	1.0 % of max.
Gravimetric PM balance	m_{PM}	N/A	N/A	See §1065.790	0.5 µg	N/A
Inertial PM balance	m_{PM}	5 s	1 Hz	2.0 % of pt. or 2.0 % of meas.	1.0 % of pt. or 1.0 % of meas.	0.2 % of max.

[a] The performance specifications identified in the table apply separately for rise time and fall time.

[b] Accuracy, repeatability, and noise are all determined with the same collected data, as described in §1065.305, and based on absolute values. "pt." refers to the overall flow-weighted mean value expected at the standard; "max." refers to the peak value expected at the standard over any test interval, not the maximum of the instrument's range; "meas" refers to the actual flow-weighted mean measured over any test interval.

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■ 281. Section 1065.240 is amended by revising paragraph (d) introductory text to read as follows:

§ 1065.240 Dilution air and diluted exhaust flow meters.

* * * * *

(d) *Exhaust cooling.* You may cool diluted exhaust upstream of a dilute-exhaust flow meter, as long as you observe all the following provisions:

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■ 282. Section 1065.260 is amended by revising paragraph (c) to read as follows:

§ 1065.260 Flame-ionization detector.

* * * * *

(c) *Heated FID analyzers.* For compression-ignition engines, two-stroke spark-ignition engines, and four-stroke spark-ignition engines below 19 kW, you must use heated FID analyzers that maintain all surfaces that are exposed to emissions at a temperature of (191 ± 11) °C.

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Subpart D—[Amended]

■ 283. Section 1065.303 is revised to read as follows:

§ 1065.303 Summary of required calibration and verifications

The following table summarizes the required and recommended calibrations and verifications described in this subpart and indicates when these have to be performed:

TABLE 1 OF § 1065.303—SUMMARY OF REQUIRED CALIBRATION AND VERIFICATIONS

Type of calibration or verification	Minimum frequency [a]
§ 1065.305: Accuracy, repeatability and noise	Accuracy: Not required, but recommended for initial installation. Repeatability: Not required, but recommended for initial installation. Noise: Not required, but recommended for initial installation.
§ 1065.307: Linearity verification	Speed: Upon initial installation, within 370 days before testing and after major maintenance. Torque: Upon initial installation, within 370 days before testing and after major maintenance. Electrical power: Upon initial installation, within 370 days before testing and after major maintenance. Fuel flow: Upon initial installation, within 370 days before testing, and after major maintenance. Clean gas and diluted exhaust flows: Upon initial installation, within 370 days before testing and after major maintenance, unless flow is verified by propane check or by carbon or oxygen balance. Raw exhaust flow: Upon initial installation, within 185 days before testing and after major maintenance, unless flow is verified by propane check or by carbon or oxygen balance.

TABLE 1 OF § 1065.303—SUMMARY OF REQUIRED CALIBRATION AND VERIFICATIONS—Continued

Type of calibration or verification	Minimum frequency [a]
	Gas dividers: Upon initial installation, within 370 days before testing, and after major maintenance. Gas analyzers: Upon initial installation, within 35 days before testing and after major maintenance. FTIR and photoacoustic analyzers: Upon initial installation, within 370 days before testing and after major maintenance. GC–ECD: Upon initial installation and after major maintenance. PM balance: Upon initial installation, within 370 days before testing and after major maintenance. Pressure, temperature, and dewpoint: Upon initial installation, within 370 days before testing and after major maintenance.
§ 1065.308: Continuous gas analyzer system response and updating-recording verification—for gas analyzers not continuously compensated for other gas species.	Upon initial installation or after system modification that would affect response.
§ 1065.309: Continuous gas analyzer system-response and updating-recording verification—for gas analyzers continuously compensated for other gas species.	Upon initial installation or after system modification that would affect response.
§ 1065.310: Torque	Upon initial installation and after major maintenance.
§ 1065.315: Pressure, temperature, dewpoint	Upon initial installation and after major maintenance.
§ 1065.320: Fuel flow	Upon initial installation and after major maintenance.
§ 1065.325: Intake flow	Upon initial installation and after major maintenance.
§ 1065.330: Exhaust flow	Upon initial installation and after major maintenance.
§ 1065.340: Diluted exhaust flow (CVS)	Upon initial installation and after major maintenance.
§ 1065.341: CVS and batch sampler verification [b]	Upon initial installation, within 35 days before testing, and after major maintenance.
§ 1065.342 Sample dryer verification	For thermal chillers: Upon installation and after major maintenance. For osmotic membranes; upon installation, within 35 days of testing, and after major maintenance.
§ 1065.345: Vacuum leak	For laboratory testing: Upon initial installation of the sampling system, within 8 hours before the start of the first test interval of each duty-cycle sequence, and after maintenance such as pre-filter changes. For field testing: After each installation of the sampling system on the vehicle, prior to the start of the field test, and after maintenance such as pre-filter changes.
§ 1065.350: CO_2 NDIR H_2O interference	Upon initial installation and after major maintenance.
§ 1065.355: CO NDIR CO_2 and H_2O interference	Upon initial installation and after major maintenance.
§ 1065.360: FID calibration	Calibrate all FID analyzers: Upon initial installation and after major maintenance.
THC FID optimization, and THC FID verification	Optimize and determine CH_4 response for THC FID analyzers: Upon initial installation and after major maintenance. Verify CH_4 response for THC FID analyzers: Upon initial installation, within 185 days before testing, and after major maintenance.
§ 1065.362: Raw exhaust FID O_2 interference	For all FID analyzers: Upon initial installation, and after major maintenance. For THC FID analyzers: Upon initial installation, after major maintenance, and after FID optimization according to § 1065.360.
§ 1065.365: Nonmethane cutter penetration	Upon initial installation, within 185 days before testing, and after major maintenance.
§ 1065.370: CLD CO_2 and H_2O quench	Upon initial installation and after major maintenance.
§ 1065.372: NDUV HC and H_2O interference	Upon initial installation and after major maintenance.
§ 1065.375: N_2O analyzer interference	Upon initial installation and after major maintenance.
§ 1065.376: Chiller NO_2 penetration	Upon initial installation and after major maintenance.
§ 1065.378: NO_2-to-NO converter conversion	Upon initial installation, within 35 days before testing, and after major maintenance.
§ 1065.390: PM balance and weighing	Independent verification: Upon initial installation, within 370 days before testing, and after major maintenance. Zero, span, and reference sample verifications: Within 12 hours of weighing, and after major maintenance.
§ 1065.395: Inertial PM balance and weighing	Independent verification: Upon initial installation, within 370 days before testing, and after major maintenance. Other verifications: Upon initial installation and after major maintenance.

[a] Perform calibrations and verifications more frequently, according to measurement system manufacturer instructions and good engineering judgment.

[b] The CVS verification described in § 1065.341 is not required for systems that agree within ±2% based on a chemical balance of carbon or oxygen of the intake air, fuel, and diluted exhaust.

■ 284. Section 1065.305 is amended by revising paragraphs (d)(4), (d)(5), and (d)(7) to read as follows:

§ 1065.305 Verifications for accuracy, repeatability, and noise.

* * * * *

(d) * * *

(4) Use the instrument to quantify a NIST-traceable reference quantity, $y_{ref.}$ For gas analyzers the reference gas must meet the specifications of § 1065.750. Select a reference quantity near the mean value expected during testing. For all gas analyzers, use a quantity near the flow-weighted mean concentration expected at the standard or expected during testing, whichever is greater. For noise verification, use the same zero gas from paragraph (d)(2) of this section as the reference quantity. In all cases, allow time for the instrument to stabilize while it measures the reference quantity. Stabilization time may include time to purge an instrument and time to account for its response.

(5) Sample and record values for 30 seconds (you may select a longer sampling period if the recording update frequency is less than 0.5 Hz), record the arithmetic mean, $\bar{y}_i$ and record the standard deviation, σ_i of the recorded values. Refer to § 1065.602 for an example of calculating arithmetic mean and standard deviation.

* * * * *

(7) Subtract the reference value, y_{ref} (or $\bar{y}_{refi}$), from the arithmetic mean, $\bar{y}_i$. Record this value as the error, $\varepsilon_{i.}$

* * * * *

■ 285. Section 1065.307 is amended by revising paragraphs (c)(6), (c)(11), (d), (e), and Table 1 of § 1065.307 to read as follows:

§ 1065.307 Linearity verification.

* * * * *

(c) * * *

(6) For all measured quantities, use instrument manufacturer recommendations and good engineering judgment to select reference values, $y_{refi,}$ that cover a range of values that you expect would prevent extrapolation beyond these values during emission testing. We recommend selecting a zero reference signal as one of the reference values of the linearity verification. For pressure, temperature, dewpoint, and GC–ECD linearity verifications, we recommend at least three reference values. For all other linearity verifications select at least ten reference values.

* * * * *

(11) At a recording frequency of at least *f* Hz, specified in Table 1 of § 1065.205, measure the reference value for 30 seconds (you may select a longer sampling period if the recording update frequency is less than 0.5 Hz) and record the arithmetic mean of the recorded values, $\bar{y}_i$. Refer to § 1065.602 for an example of calculating an arithmetic mean.

* * * * *

(d) *Reference signals.* This paragraph (d) describes recommended methods for generating reference values for the linearity-verification protocol in paragraph (c) of this section. Use reference values that simulate actual values, or introduce an actual value and measure it with a reference-measurement system. In the latter case, the reference value is the value reported by the reference-measurement system. Reference values and reference-measurement systems must be NIST-traceable. We recommend using calibration reference quantities that are NIST-traceable within 0.5% uncertainty, if not specified otherwise in other sections of this part 1065. Use the following recommended methods to generate reference values or use good engineering judgment to select a different reference:

(1) *Speed.* Run the engine or dynamometer at a series of steady-state speeds and use a strobe, a photo tachometer, or a laser tachometer to record reference speeds.

(2) *Torque.* Use a series of calibration weights and a calibration lever arm to simulate engine torque. You may instead use the engine or dynamometer itself to generate a nominal torque that is measured by a reference load cell or proving ring in series with the torque-measurement system. In this case use the reference load cell measurement as the reference value. Refer to § 1065.310 for a torque-calibration procedure similar to the linearity verification in this section.

(3) *Electrical power.* Use a controlled source of current and a watt-hour standard reference meter. Complete calibration systems that contain a current source and a reference watt-hour meter are commonly used in the electrical power distribution industry and are therefore commercially available.

(4) *Fuel rate.* Operate the engine at a series of constant fuel-flow rates or re-circulate fuel back to a tank through the fuel flow meter at different flow rates. Use a gravimetric reference measurement (such as a scale, balance, or mass comparator) at the inlet to the fuel-measurement system. Use a stopwatch or timer to measure the time intervals over which reference masses of fuel are introduced to the fuel measurement system. The reference fuel mass divided by the time interval is the reference fuel flow rate.

(5) *Flow rates—inlet air, dilution air, diluted exhaust, raw exhaust, or sample flow.* Use a reference flow meter with a blower or pump to simulate flow rates. Use a restrictor, diverter valve, a variable-speed blower or a variable-speed pump to control the range of flow rates. Use the reference meter's response as the reference values.

(i) *Reference flow meters.* Because the flow range requirements for these various flows are large, we allow a variety of reference meters. For example, for diluted exhaust flow for a full-flow dilution system, we recommend a reference subsonic venturi flow meter with a restrictor valve and a blower to simulate flow rates. For inlet air, dilution air, diluted exhaust for partial-flow dilution, raw exhaust, or sample flow, we allow reference meters such as critical flow orifices, critical flow venturis, laminar flow elements, master mass flow standards, or Roots meters. Make sure the reference meter is calibrated by the flow-meter manufacturer and its calibration is NIST-traceable. If you use the difference of two flow measurements to determine a net flow rate, you may use one of the measurements as a reference for the other.

(ii) *Reference flow values.* Because the reference flow is not absolutely constant, sample and record values of $\dot{n}_{refi}$ for 30 seconds and use the arithmetic mean of the values, $\overline{\dot{n}}_{ref}$, as the reference value. Refer to § 1065.602 for an example of calculating arithmetic mean.

(6) *Gas division.* Use one of the two reference signals:

(i) At the outlet of the gas-division system, connect a gas analyzer that meets the linearity verification described in this section and has not been linearized with the gas divider being verified. For example, verify the linearity of an analyzer using a series of reference analytical gases directly from compressed gas cylinders that meet the specifications of § 1065.750. We recommend using a FID analyzer or a PMD or MPD O_2 analyzer because of their inherent linearity. Operate this analyzer consistent with how you would operate it during an emission test. Connect a span gas to the gas-divider inlet. Use the gas-division system to divide the span gas with purified air or nitrogen. Select gas divisions that you typically use. Use a selected gas division as the measured value. Use the analyzer response divided by the span gas concentration as the reference gas-division value.

Because the instrument response is not absolutely constant, sample and record values of x_{refi} for 30 seconds and use the arithmetic mean of the values, $\bar{x}_{ref}$, as the reference value. Refer to § 1065.602 for an example of calculating arithmetic mean.

(ii) Using good engineering judgment and gas divider manufacturer recommendations, use one or more reference flow meters to measure the flow rates of the gas divider and verify the gas-division value.

(7) *Continuous constituent concentration.* For reference values, use a series of gas cylinders of known gas concentration or use a gas-division system that is known to be linear with a span gas. Gas cylinders, gas-division systems, and span gases that you use for reference values must meet the specifications of § 1065.750.

(8) *Temperature.* You may perform the linearity verification for temperature measurement systems with thermocouples, RTDs, and thermistors by removing the sensor from the system and using a simulator in its place. Use a NIST-traceable simulator that is independently calibrated and, as appropriate, cold-junction compensated. The simulator uncertainty scaled to temperature must be less than 0.5% of T_{max}. If you use this option, you must use sensors that the supplier states are accurate to better than 0.5% of T_{max} compared with their standard calibration curve.

(e) *Measurement systems that require linearity verification.* Table 1 of this section indicates measurement systems that require linearity verifications, subject to the following provisions:

(1) Perform a linearity verification more frequently based on the instrument manufacturer's recommendation or good engineering judgment.

(2) The expression "x_{min}" refers to the reference value used during the linearity verification that is closest to zero. This is the value used to calculate the first tolerance in Table 1 of this section using the intercept, a_0. Note that this value may be zero, positive, or negative depending on the reference values. For example, if the reference values chosen to validate a pressure transducer vary from −10 to −1 kPa, x_{min} is −1 kPa. If the reference values used to validate a temperature device vary from 290 to 390 K, x_{min} is 290 K.

(3) The expression "max" generally refers to the absolute value of the reference value used during the linearity verification that is furthest from zero. This is the value used to scale the first and third tolerances in Table 1 of this section using a_0 and *SEE.* For example, if the reference values chosen to validate a pressure transducer vary from −10 to −1 kPa, then p_{max} is +10 kPa. If the reference values used to validate a temperature device vary from 290 to 390 K, then T_{max} is 390 K. For gas dividers where "max" is expressed as, x_{max}/x_{span}; x_{max} is the maximum gas concentration used during the verification, x_{span} is the undivided, undiluted, span gas concentration, and the resulting ratio is the maximum divider point reference value used during the verification (typically 1). The following are special cases where "max" refers to a different value:

(i) For linearity verification with a PM balance, m_{max} refers to the typical mass of a PM filter.

(ii) For linearity verification of torque on the engine's primary output shaft, T_{max} refers to the manufacturer's specified engine torque peak value of the lowest torque engine to be tested.

(4) The specified ranges are inclusive. For example, a specified range of 0.98–1.02 for a_1 means $0.98 \leq a_1 \leq 1.02$.

(5) These linearity verifications are optional for systems that pass the flow-rate verification for diluted exhaust as described in § 1065.341 (the propane check) or for systems that agree within ±2% based on a chemical balance of carbon or oxygen of the intake air, fuel, and exhaust.

(6) You must meet the a_1 criteria for these quantities only if the absolute value of the quantity is required, as opposed to a signal that is only linearly proportional to the actual value.

(7) Linearity checks are required for the following temperature measurements:

(i) The following temperature measurements always require linearity checks:

(A) Air intake.

(B) Aftertreatment bed(s), for engines tested with aftertreatment devices subject to cold-start testing.

(C) Dilution air for PM sampling, including CVS, double-dilution, and partial-flow systems.

(D) PM sample, if applicable.

(E) Chiller sample, for gaseous sampling systems that use thermal chillers to dry samples and use chiller temperature to calculate the dewpoint at the outlet of the chiller. For your testing, if you choose to use a high alarm temperature setpoint for the chiller temperature as a constant value in the amount of water calculations in § 1065.645, you may use good engineering judgment to verify the accuracy of the high alarm temperature setpoint in lieu of the linearity verification on the chiller temperature. We recommend that you input a reference simulated temperature signal below the alarm trip point, increase this signal until the high alarm trips, and verify that the alarm trip point value is no less than 2.0 °C below the reference value at the trip point.

(ii) Linearity checks are required for the following temperature measurements if these temperature measurements are specified by the engine manufacturer:

(A) Fuel inlet.

(B) Air outlet to the test cell's charge air cooler air outlet, for engines tested with a laboratory heat exchanger that simulates an installed charge air cooler.

(C) Coolant inlet to the test cell's charge air cooler, for engines tested with a laboratory heat exchanger that simulates an installed charge air cooler.

(D) Oil in the sump/pan.

(E) Coolant before the thermostat, for liquid-cooled engines.

(8) Linearity checks are required for the following pressure measurements:

(i) The following pressure measurements always require linearity checks:

(A) Air intake restriction.

(B) Exhaust back pressure.

(C) Barometer.

(D) CVS inlet gage pressure.

(E) Sample dryer, for gaseous sampling systems that use either osmotic-membrane or thermal chillers to dry samples. For your testing, if you choose to use a low alarm pressure setpoint for the sample dryer pressure as a constant value in the amount of water calculations in § 1065.645, you may use good engineering judgment to verify the accuracy of the low alarm pressure setpoint in lieu of the linearity verification on the sample dryer pressure. We recommend that you input a reference pressure signal above the alarm trip point, decrease this signal until the low alarm trips, and verify that the trip point value is no more than 4.0 kPa above the reference value at the trip point.

(ii) Linearity checks are required for the following pressure measurements if these pressure measurements are specified by the engine manufacturer:

(A) The test cell's charge air cooler and interconnecting pipe pressure drop, for turbo-charged engines tested with a laboratory heat exchanger that simulates an installed charge air cooler.

(B) Fuel outlet.

TABLE 1 OF § 1065.307—MEASUREMENT SYSTEMS THAT REQUIRE LINEARITY VERIFICATIONS—CONTINUED

Measurement system	Quantity	Minimum verification frequency	Linearity criteria			
			$\lvert x_{min}(a_1 - 1) + a_0 \rvert$	a_1	*SEE*	r^2
Speed	f_n	Within 370 days before testing.	$\le 0.05\% \cdot f_{nmax}$	0.98–1.02	$\le 2\% \cdot f_{nmax}$	≥0.990
Torque	T	Within 370 days before testing.	$\le 1\% \cdot T_{max}$	0.98–1.02	$\le 2\% \cdot T_{max}$	≥0.990
Electrical power	P	Within 370 days before testing.	$\le 1\% \cdot P_{max}$	0.98–1.02	$\le 2\% \cdot P_{max}$	≥0.990
Fuel flow rate	$\dot{m}$	Within 370 days before testing.	$\le 1\% \cdot \dot{m}_{max}$	0.98–1.02	$\le 2\% \cdot \dot{m}_{max}$	>0.990
Intake-air flow rate	$\dot{n}$	Within 370 days before testing.	$\le 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\le 2\% \cdot \dot{n}_{max}$	≥0.990
Dilution air flow rate	$\dot{n}$	Within 370 days before testing.	$\le 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\le 2\% \cdot \dot{n}_{max}$	≥0.990
Diluted exhaust flow rate.	$\dot{n}$	Within 370 days before testing.	$\le 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\le 2\% \cdot \dot{n}_{max}$	≥0.990
Raw exhaust flow rate.	$\dot{n}$	Within 185 days before testing.	$\le 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\le 2\% \cdot \dot{n}_{max}$	≥0.990
Batch sampler flow rates.	$\dot{n}$	Within 370 days before testing.	$\le 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\le 2\% \cdot \dot{n}_{max}$	≥0.990
Gas dividers	x/x_{span}	Within 370 days before testing.	$\le 0.5\% \cdot x_{max}/x_{span}$	0.98–1.02	$\le 2\% \cdot x_{max}/x_{span}$	>0.990
Gas analyzers for laboratory testing.	x	Within 35 days before testing.	$\le 0.5\% \cdot x_{max}$	0.99–1.01	$\le 1\% \cdot x_{max}$	≥0.998
Gas analyzers for field testing.	x	Within 35 days before testing.	$\le 1\% \cdot x_{max}$	0.99–1.01	$\le 1\% \cdot x_{max}$	≥0.998
PM balance	m	Within 370 days before testing.	$\le 1\% \cdot m_{max}$	0.99–1.01	$\le 1\% \cdot m_{max}$	≥0.998
Pressures	p	Within 370 days before testing.	$\le 1\% \cdot p_{max}$	0.99–1.01	$\le 1\% \cdot p_{max}$	≥0.998
Dewpoint for intake air, PM-stabilization and balance environments.	T_{dew}	Within 370 days before testing.	$\le 0.5\% \cdot T_{dewmax}$	0.99–1.01	$\le 0.5\% \cdot T_{dewmax}$	≥0.998
Other dewpoint measurements.	T_{dew}	Within 370 days before testing.	$\le 1\% \cdot T_{dewmax}$	0.99–1.01	$\le 1\% \cdot T_{dewmax}$	≥0.998
Analog-to-digital conversion of temperature signals.	T	Within 370 days before testing.	$\le 1\% \cdot T_{max}$	0.99–1.01	$\le 1\% \cdot T_{max}$	≥0.998

■ 286. Section 1065.309 is amended by revising paragraph (d)(2) to read as follows:

§ 1065.309 Continuous gas analyzer system-response and updating-recording verification—for gas analyzers continuously compensated for other gas species.

* * * * *

(d) * * *

(2) *Equipment setup.* We recommend using minimal lengths of gas transfer lines between all connections and fast-acting three-way valves (2 inlets, 1 outlet) to control the flow of zero and blended span gases to the sample system's probe inlet or a tee near the outlet of the probe. Normally the gas flow rate is higher than the probe sample flow rate and the excess is overflowed out the inlet of the probe. If the gas flow rate is lower than the probe flow rate, the gas concentrations must be adjusted to account for the dilution from ambient air drawn into the probe. Select span gases for the species being continuously combined, other than H_2O. Select concentrations of compensating species that will yield concentrations of these species at the analyzer inlet that covers the range of concentrations expected during testing. You may use binary or multi-gas span gases. You may use a gas blending or mixing device to blend span gases. A gas blending or mixing device is recommended when blending span gases diluted in N_2 with span gases diluted in air. You may use a multi-gas span gas, such as NO-CO-CO_2-C_3H_8-CH_4, to verify multiple analyzers at the same time. In designing your experimental setup, avoid pressure pulsations due to stopping the flow through the gas blending device. If H_2O correction is applicable, then span gases must be humidified before entering the analyzer; however, you may not humidify NO_2 span gas by passing it through a sealed humidification vessel that contains water. You must humidify NO_2 span gas with another moist gas stream. We recommend humidifying your NO-CO-CO_2-C_3H_8-CH_4, balance N_2 blended gas by flowing the gas mixture through a sealed vessel that humidifies the gas by bubbling it through distilled water and then mixing the gas with dry NO_2 gas, balance purified synthetic air. If your system does not use a sample dryer to remove water from the sample gas, you must humidify your span gas to the highest sample H_2O content that you estimate during emission sampling. If your system uses a sample dryer during testing, it must pass the sample dryer verification check in § 1065.342, and you must humidify your span gas to an H_2O content greater than or equal to the level determined in § 1065.145(e)(2). If you are humidifying span gases without NO_2, use good engineering judgment to ensure that the wall temperatures in the transfer lines, fittings, and valves from the humidifying system to the probe are above the dewpoint required for the target H_2O content. If you are humidifying span gases with NO_2, use good engineering judgment to ensure that there is no condensation in the transfer lines, fittings, or valves from the point where humidified gas is mixed

with NO_2 span gas to the probe. We recommend that you design your setup so that the wall temperatures in the transfer lines, fittings, and valves from the humidifying system to the probe are at least 5 °C above the local sample gas dewpoint. Operate the measurement and sample handling system as you do for emission testing. Make no modifications to the sample handling system to reduce the risk of condensation. Flow humidified gas through the sampling system before this check to allow stabilization of the measurement system's sampling handling system to occur, as it would for an emission test.

* * * * *

■ 287. Section 1065.315 is amended by revising paragraph (a)(2) to read as follows:

§ 1065.315 Pressure, temperature, and dewpoint calibration.

(a) * * *

(2) *Temperature.* We recommend digital dry-block or stirred-liquid temperature calibrators, with data logging capabilities to minimize transcription errors. We recommend using calibration reference quantities that are NIST-traceable within 0.5% uncertainty. You may perform the linearity verification for temperature measurement systems with thermocouples, RTDs, and thermistors by removing the sensor from the system and using a simulator in its place. Use a NIST-traceable simulator that is independently calibrated and, as appropriate, cold-junction compensated. The simulator uncertainty scaled to temperature must be less than 0.5% of T_{max}. If you use this option, you must use sensors that the supplier states are accurate to better than 0.5% of T_{max} compared with their standard calibration curve.

* * * * *

■ 288. Section 1065.342 is amended by revising paragraphs (a), (c), (d)(4), and (d)(7) to read as follows:

§ 1065.342 Sample dryer verification.

(a) *Scope and frequency.* If you use a sample dryer as allowed in § 1065.145(e)(2) to remove water from the sample gas, verify the performance upon installation, after major maintenance, for thermal chiller. For osmotic membrane dryers, verify the performance upon installation, after major maintenance, and within 35 days of testing.

* * * * *

(c) *System requirements.* The sample dryer must meet the specifications as determined in § 1065.145(e)(2) for dewpoint, T_{dew}, and absolute pressure, p_{total}, downstream of the osmotic-membrane dryer or thermal chiller.

(d) * * *

(4) Maintain the sample lines, fittings, and valves from the location where the humidified gas water content is measured to the inlet of the sampling system at a temperature at least 5 °C above the local humidified gas dewpoint. For dryers used in NO_X sample systems, verify the sample system components used in this verification prevent aqueous condensation as required in § 1065.145(d)(1)(i). We recommend that the sample system components be maintained at least 5 °C above the local humidified gas dewpoint to prevent aqueous condensation.

* * * * *

(7) The sample dryer meets the verification if the dewpoint at the sample dryer pressure as measured in paragraph (d)(6) of this section is less than the dewpoint corresponding to the sample dryer specifications as determined in § 1065.145(e)(2) plus 2 °C or if the mole fraction of water as measured in (d)(6) is less than the corresponding sample dryer specifications plus 0.002 mol/mol.

* * * * *

■ 289. Section 1065.345 is amended by revising paragraphs (a) and (e)(1)(iii) to read as follows:

§ 1065.345 Vacuum-side leak verification.

(a) *Scope and frequency.* Verify that there are no significant vacuum-side leaks using one of the leak tests described in this section. For laboratory testing, perform the vacuum-side leak verification upon initial sampling system installation, within 8 hours before the start of the first test interval of each duty-cycle sequence, and after maintenance such as pre-filter changes. For field testing, perform the vacuum-side leak verification after each installation of the sampling system on the vehicle, prior to the start of the field test, and after maintenance such as pre-filter changes. This verification does not apply to any full-flow portion of a CVS dilution system.

* * * * *

(e) * * *

(1) * * *

(iii) Close a leak-tight valve located in the sample transfer line within 92 cm of the probe.

* * * * *

■ 290. Section 1065.350 is amended by revising paragraph (d) to read as follows:

§ 1065.350 H_2O interference verification for CO_2 NDIR analyzers.

* * * * *

(d) *Procedure.* Perform the interference verification as follows:

(1) Start, operate, zero, and span the CO_2 NDIR analyzer as you would before an emission test. If the sample is passed through a dryer during emission testing, you may run this verification test with the dryer if it meets the requirements of § 1065.342. Operate the dryer at the same conditions as you will for an emission test. You may also run this verification test without the sample dryer.

(2) Create a humidified test gas by bubbling zero gas that meets the specifications in § 1065.750 through distilled water in a sealed vessel. If the sample is not passed through a dryer during emission testing, control the vessel temperature to generate an H_2O level at least as high as the maximum expected during emission testing. If the sample is passed through a dryer during emission testing, control the vessel temperature to generate an H_2O level at least as high as the level determined in § 1065.145(e)(2) for that dryer.

(3) Introduce the humidified test gas into the sample system. You may introduce it downstream of any sample dryer, if one is used during testing.

(4) If the sample is not passed through a dryer during this verification test, measure the water mole fraction, x_{H2O}, of the humidified test gas, as close as possible to the inlet of the analyzer. For example, measure dewpoint, T_{dew}, and absolute pressure, p_{total}, to calculate x_{H2O}. Verify that the water content meets the requirement in paragraph (d)(2) of this section. If the sample is passed through a dryer during this verification test, you must verify that the water content of the humidified test gas downstream of the vessel meets the requirement in paragraph (d)(2) of this section based on either direct measurement of the water content (*e.g.,* dewpoint and pressure) or an estimate based on the vessel pressure and temperature. Use good engineering judgment to estimate the water content. For example, you may use previous direct measurements of water content to verify the vessel's level of saturation.

(5) If a sample dryer is not used in this verification test, use good engineering judgment to prevent condensation in the transfer lines, fittings, or valves from the point where x_{H2O} is measured to the analyzer. We recommend that you design your system so the wall temperatures in the transfer lines, fittings, and valves from the point where x_{H2O} is measured to the analyzer are at

least 5 °C above the local sample gas dewpoint.

(6) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the transfer line and to account for analyzer response.

(7) While the analyzer measures the sample's concentration, record 30 seconds of sampled data. Calculate the arithmetic mean of this data. The analyzer meets the interference verification if this value is within (0 ±0.4) mmol/mol.

■ 291. Section 1065.355 is amended by revising paragraphs (d) and (e)(1) to read as follows:

§ 1065.355 H_2O and CO_2 interference verification for CO NDIR analyzers.

* * * * *

(d) *Procedure.* Perform the interference verification as follows:

(1) Start, operate, zero, and span the CO NDIR analyzer as you would before an emission test. If the sample is passed through a dryer during emission testing, you may run this verification test with the dryer if it meets the requirements of § 1065.342. Operate the dryer at the same conditions as you will for an emission test. You may also run this verification test without the sample dryer.

(2) Create a humidified CO_2 test gas by bubbling a CO_2 span gas that meets the specifications in § 1065.750 through distilled water in a sealed vessel. If the sample is not passed through a dryer during emission testing, control the vessel temperature to generate an H_2O level at least as high as the maximum expected during emission testing. If the sample is passed through a dryer during emission testing, control the vessel temperature to generate an H_2O level at least as high as the level determined in § 1065.145(e)(2) for that dryer. Use a CO_2 span gas concentration at least as high as the maximum expected during testing.

(3) Introduce the humidified CO_2 test gas into the sample system. You may introduce it downstream of any sample dryer, if one is used during testing.

(4) If the sample is not passed through a dryer during this verification test, measure the water mole fraction, x_{H2O}, of the humidified CO_2 test gas as close as possible to the inlet of the analyzer. For example, measure dewpoint, T_{dew}, and absolute pressure, p_{total}, to calculate x_{H2O}. Verify that the water content meets the requirement in paragraph (d)(2) of this section. If the sample is passed through a dryer during this verification test, you must verify that the water content of the humidified test gas downstream of the vessel meets the requirement in paragraph (d)(2) of this section based on either direct measurement of the water content (*e.g.,* dewpoint and pressure) or an estimate based on the vessel pressure and temperature. Use good engineering judgment to estimate the water content. For example, you may use previous direct measurements of water content to verify the vessel's level of saturation.

(5) If a sample dryer is not used in this verification test, use good engineering judgment to prevent condensation in the transfer lines, fittings, or valves from the point where x_{H2O} is measured to the analyzer. We recommend that you design your system so that the wall temperatures in the transfer lines, fittings, and valves from the point where x_{H2O} is measured to the analyzer are at least 5 °C above the local sample gas dewpoint.

(6) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the transfer line and to account for analyzer response.

(7) While the analyzer measures the sample's concentration, record its output for 30 seconds. Calculate the arithmetic mean of this data.

(8) The analyzer meets the interference verification if the result of paragraph (d)(7) of this section meets the tolerance in paragraph (c) of this section.

(9) You may also run interference procedures for CO_2 and H_2O separately. If the CO_2 and H_2O levels used are higher than the maximum levels expected during testing, you may scale down each observed interference value by multiplying the observed interference by the ratio of the maximum expected concentration value to the actual value used during this procedure. You may run separate interference concentrations of H_2O (down to 0.025 mol/mol H_2O content) that are lower than the maximum levels expected during testing, but you must scale up the observed H_2O interference by multiplying the observed interference by the ratio of the maximum expected H_2O concentration value to the actual value used during this procedure. The sum of the two scaled interference values must meet the tolerance in paragraph (c) of this section.

(e) * * *

(1) You may omit this verification if you can show by engineering analysis that for your CO sampling system and your emission-calculation procedures, the combined CO_2 and H_2O interference for your CO NDIR analyzer always affects your brake-specific CO emission results within ±0.5% of the applicable CO standard.

* * * * *

■ 292. Section 1065.360 is amended by revising paragraph (e)(2) to read as follows:

§ 1065.360 FID optimization and verification.

* * * * *

(e) * * *

(2) If $RF_{CH4[THC\text{-}FID]}$ is not within the tolerance specified in this paragraph (e), re-optimize the FID response as described in paragraph (c) of this section.

* * * * *

■ 293. Section 1065.370 is amended by revising paragraphs (e)(5) and (g)(1) to read as follows:

§ 1065.370 CLD CO_2 and H_2O quench verification.

* * * * *

(e) * * *

(5) Humidify the NO span gas by bubbling it through distilled water in a sealed vessel. If the humidified NO span gas sample does not pass through a sample dryer for this verification test, control the vessel temperature to generate an H_2O level approximately equal to the maximum mole fraction of H_2O expected during emission testing. If the humidified NO span gas sample does not pass through a sample dryer, the quench verification calculations in § 1065.675 scale the measured H_2O quench to the highest mole fraction of H_2O expected during emission testing. If the humidified NO span gas sample passes through a dryer for this verification test, control the vessel temperature to generate an H_2O level at least as high as the level determined in § 1065.145(e)(2). For this case, the quench verification calculations in § 1065.675 do not scale the measured H_2O quench.

* * * * *

(g) * * *

(1) You may omit this verification if you can show by engineering analysis that for your NO_X sampling system and your emission calculation procedures, the combined CO_2 and H_2O interference for your NO_X CLD analyzer always affects your brake-specific NO_X emission results within no more than ±1.0% of the applicable NO_X standard. If you certify to a combined emission standard (such as a NO_X + NMHC standard), scale your NO_X results to the combined standard based on the measured results (after incorporating deterioration factors, if applicable). For example, if your final NO_X + NMHC value is half of the emission standard,

double the NO_X result to estimate the level of NO_X emissions corresponding to the applicable standard.

* * * * *

■ 294. Section 1065.390 is amended by revising paragraph (d)(9) to read as follows:

§ 1065.390 PM balance verifications and weighing process verification.

* * * * *

(d) * * *

(9) If any of the reference filters' observed mass changes by more than that allowed under this paragraph, you must invalidate all PM mass determinations made since the last successful reference media (*e.g.* filter) mass validation. You may discard reference PM media (*e.g.* filters) if only one of the filter's mass changes by more than the allowable amount and you can positively identify a special cause for that filter's mass change that would not have affected other in-process filters. Thus, the validation can be considered a success. In this case, you do not have to include the contaminated reference media when determining compliance with paragraph (d)(10) of this section, but the affected reference filter must be immediately discarded and replaced prior to the next weighing session.

* * * * *

Subpart F—[Amended]

■ 295. Section 1065.501 is amended by revising paragraph (b)(2) to read as follows:

§ 1065.501 Overview.

* * * * *

(b) * * *

(2) *Steady-state cycles.* Steady-state duty cycles are typically specified in the standard-setting part as a list of discrete operating points (modes or notches), where each operating point has one value of a normalized speed command and one value of a normalized torque (or power) command. Ramped-modal cycles for steady-state testing also list test times for each mode and transition times between modes where speed and torque are linearly ramped between modes, even for cycles with % power. Start a steady-state cycle as a hot running test, where you start to measure emissions after an engine is started, warmed up and running. You may run a steady-state duty cycle as a discrete-mode cycle or a ramped-modal cycle, as follows:

(i) *Discrete-mode cycles.* Before emission sampling, stabilize an engine at the first discrete mode. Sample emissions and other parameters for that mode in the same manner as a transient cycle, with the exception that reference speed and torque values are constant. Record mean values for that mode, and then stabilize the engine at the next mode. Continue to sample each mode discretely as separate test intervals and calculate weighted emission results according to the standard-setting part.

(ii) *Ramped-modal cycles.* Perform ramped-modal cycles similar to the way you would perform transient cycles, except that ramped-modal cycles involve mostly steady-state engine operation. Generate a ramped-modal duty cycle as a sequence of second-by-second (1 Hz) reference speed and torque points. Run the ramped-modal duty cycle in the same manner as a transient cycle and use the 1 Hz reference speed and torque values to validate the cycle, even for cycles with % power. Proportionally sample emissions and other parameters during the cycle and use the calculations in subpart G of this part to calculate emissions.

* * * * *

■ 296. Section 1065.510 is amended by revising paragraphs (b)(5) and (d)(5) to read as follows:

§ 1065.510 Engine mapping.

* * * * *

(b) * * *

(5) Perform one of the following:

(i) For any engine subject only to steady-state duty cycles (*i.e.,* discrete-mode or ramped-modal), you may perform an engine map by using discrete speeds. Select at least 20 evenly spaced setpoints from 95% of warm idle speed to the highest speed above maximum power at which 50% of maximum power occurs. We refer to this 50% speed as the check point speed as described in paragraph (b)(5)(iii) of this section. At each setpoint, stabilize speed and allow torque to stabilize. Record the mean speed and torque at each setpoint. We recommend that you stabilize an engine for at least 15 seconds at each setpoint and record the mean feedback speed and torque of the last (4 to 6) seconds. Use linear interpolation to determine intermediate speeds and torques. Use this series of speeds and torques to generate the power map as described in paragraph (e) of this section.

(ii) For any variable-speed engine, you may perform an engine map by using a continuous sweep of speed by continuing to record the mean feedback speed and torque at 1 Hz or more frequently and increasing speed at a constant rate such that it takes (4 to 6) min to sweep from 95% of warm idle speed to the check point speed as described in paragraph (b)(5)(iii) of this section. Use good engineering judgment to determine when to stop recording data to ensure that the sweep is complete. In most cases, this means that you can stop the sweep at any point after the power falls to 50% of the maximum value. From the series of mean speed and maximum torque values, use linear interpolation to determine intermediate values. Use this series of speeds and torques to generate the power map as described in paragraph (e) of this section.

(iii) The check point speed of the map is the highest speed above maximum power at which 50% of maximum power occurs. If this speed is unsafe or unachievable (*e.g.,* for ungoverned engines or engines that do not operate at that point), use good engineering judgment to map up to the maximum safe speed or maximum achievable speed. For discrete mapping, if the engine cannot be mapped to the check point speed, make sure the map includes at least 20 points from 95% of warm idle to the maximum mapped speed. For continuous mapping, if the engine cannot be mapped to the check point speed, verify that the sweep time from 95% of warm idle to the maximum mapped speed is (4 to 6) min.

(iv) Note that under § 1065.10(c)(1) we may allow you to disregard portions of the map when selecting maximum test speed if the specified procedure would result in a duty cycle that does not represent in-use operation.

* * * * *

(d) * * *

(5) Record at 1 Hz the mean of feedback speed and torque. Use the dynamometer to increase torque at a constant rate. Unless the standard-setting part specifies otherwise, complete the map such that it takes (2 to 4) min to sweep from no-load governed speed to the speed below maximum mapped power at which the engine develops 90% of maximum mapped power. You may map your engine to lower speeds. Stop recording after you complete the sweep. Use this series of speeds and torques to generate the power map as described in paragraph (e) of this section.

* * * * *

■ 297. Section 1065.514 is amended by revising paragraph (d) and Table 1 of § 1065.514 to read as follows:

§ 1065.514 Cycle-validation criteria for operation over specified duty cycles.

* * * * *

(d) *Omitting additional points.* Besides engine cranking, you may omit additional points from cycle-validation statistics as described in the following table:

TABLE 1 OF § 1065.514—PERMISSIBLE CRITERIA FOR OMITTING POINTS FROM DUTY-CYCLE REGRESSION STATISTICS

When operator demand is at its . . .	you may omit . . .	if . . .
For reference duty cycles that are specified in terms of speed and torque (f_{nref}, T_{ref})		
minimum	power and torque	T_{ref} < 0% (motoring).
minimum	power and speed	f_{nref} = 0% (idle speed) and T_{ref} = 0% (idle torque) and $T_{ref} - (2\% \cdot T_{max\ mapped}) < T < T_{ref} + (2\% \cdot T_{max\ mapped})$.
minimum	power and either torque or speed.	$f_n > f_{nref}$ or $T > T_{ref}$ but not if $f_n > (f_{nref} \cdot 102\%)$ and $T > T_{ref} \pm (2\% \cdot T_{max\ mapped})$.
maximum	power and either torque or speed.	$f_n < f_{nref}$ or $T < T_{ref}$ but not if $f_n < (f_{nref} \cdot 98\%)$ and $T < T_{ref} - (2\% \cdot T_{max\ mapped})$.
For reference duty cycles that are specified in terms of speed and power (f_{nref}, P_{ref})		
minimum	power and torque	P_{ref} < 0% (motoring).
minimum	power and speed	f_{nref} = 0% (idle speed) and P_{ref} = 0% (idle power) and $P_{ref} - (2\% \cdot P_{max\ mapped}) < P < P_{ref} + (2\% \cdot P_{max\ mapped})$.
minimum	power and either torque or speed.	$f_n > f_{nref}$ or $P > P_{ref}$ but not if $f_n > (f_{nref} \cdot 102\%)$ and $P > P_{ref} + (2\% \cdot P_{max\ mapped})$.
maximum	power and either torque or speed.	$f_n < f_{nref}$ or $P < P_{ref}$ but not if $f_n < (f_{nref} \cdot 98\%)$ and $P < P_{ref} - (2\% \cdot P_{max\ mapped})$.

* * * * *

■ 298. Section 1065.520 is amended by revising paragraphs (b) and (g) introductory text to read as follows:

§ 1065.520 Pre-test verification procedures and pre-test data collection.

* * * * *

(b) Unless the standard-setting part specifies different tolerances, verify at some point before the test that ambient conditions are within the tolerances specified in this paragraph (b). For purposes of this paragraph (b), "before the test" means any time from a point just prior to engine starting (excluding engine restarts) to the point at which emission sampling begins.

(1) Ambient temperature of (20 to 30) °C. *See* § 1065.530(j) for circumstances under which ambient temperatures must remain within this range during the test.

(2) Atmospheric pressure of (80.000 to 103.325) kPa and within ±5 kPa of the value recorded at the time of the last engine map. You are not required to verify atmospheric pressure prior to a hot start test interval for testing that also includes a cold start.

(3) Dilution air conditions as specified in § 1065.140, except in cases where you preheat your CVS before a cold start test. We recommend verifying dilution air conditions just prior to the start of each test interval.

* * * * *

(g) Verify the amount of nonmethane contamination in the exhaust and background HC sampling systems within 8 hours before the start of the first test interval of each duty-cycle sequence for laboratory tests. You may verify the contamination of a background HC sampling system by reading the last bag fill and purge using zero gas. For any NMHC measurement system that involves separately measuring methane and subtracting it from a THC measurement, verify the amount of THC contamination using only the THC analyzer response. There is no need to operate any separate methane analyzer for this verification, however you may measure and correct for THC contamination in the CH_4 sample train for the cases where NMHC is determined by subtracting CH_4 from THC, using an NMC as configured in § 1065.365(d), (e), and (f); and the calculations in § 1065.660(b)(2). Perform this verification as follows:

* * * * *

■ 299. Section 1065.530 is amended by revising paragraphs (g)(3)(iv), (g)(4)(i), and (j) to read as follows:

§ 1065.530 Emission test sequence.

* * * * *

(g) * * *

(3) * * *

(iv) Analyze non-conventional gaseous batch samples, such as ethanol (NMHCE) as soon as practical using good engineering judgment.

(4) * * *

(i) For batch and continuous gas analyzers, record the mean analyzer value after stabilizing a zero gas to the analyzer. Stabilization may include time to purge the analyzer of any sample gas, plus any additional time to account for analyzer response.

* * * * *

(j) Measure and record ambient temperature, pressure, and humidity, as appropriate. For testing the following engines, you must record ambient temperature continuously to verify that it remains within the pre-test temperature range as specified in § 1065.520(b):

(1) Air-cooled engines.

(2) Engines equipped with auxiliary emission control devices that sense and respond to ambient temperature.

(3) Any other engine for which good engineering judgment indicates this is necessary to remain consistent with § 1065.10(c)(1).

■ 300. Section 1065.545 is amended by revising the section heading and removing paragraph (d) to read as follows:

§ 1065.545 Validation of proportional flow control for batch sampling.

* * * * *

■ 301. A new § 1065.546 is added to subpart F to read as follows:

§ 1065.546 Validation of minimum dilution ratio for PM batch sampling.

Use continuous flows and/or tracer gas concentrations for transient and ramped modal cycles to validate the minimum dilution ratios for PM batch sampling as specified in § 1065.140(e)(2) over the test interval. You may use mode-average values instead of continuous measurements for discrete mode steady-state duty cycles. Determine the minimum primary and minimum overall dilution ratios using one of the following methods (you may use a different method for each stage of dilution):

(a) Determine minimum dilution ratio based on molar flow data. This involves determination of at least two of the following three quantities: Raw exhaust flow (or previously diluted flow), dilution air flow, and dilute exhaust flow. You may determine the raw exhaust flow rate based on the measured intake air molar flow rate and the chemical balance terms in § 1065.655. You may alternatively estimate the molar raw exhaust flow rate based on intake air, fuel rate measurements, and fuel properties, consistent with good engineering judgment.

(b) Determine minimum dilution ratio based on tracer gas (*e.g.,* CO_2) concentrations in the raw (or previously diluted) and dilute exhaust corrected for any removed water.

(c) Use good engineering judgment to develop your own method of determining dilution ratios.

■ 302. Section 1065.550 is amended by revising paragraph (b)(2) and adding paragraph (b)(3) to read as follows:

§ 1065.550 Gas analyzer range validation, drift validation, and drift correction.

* * * * *

(b) * * *

(2) For standards consisting of multiple emission mass measurements (such as NMHC + NO_X or separate NO and NO_2 measurements to comply with a NO_X standard), the duty cycle shall be validated for drift if you satisfy one of the following:

(i) For each test interval of the duty cycle and for each individual mass, the difference between the uncorrected and the corrected brake-specific emission values over the test interval is within ±4% of the uncorrected value; or

(ii) For the entire duty cycle the difference between the combined (*e.g.* NMHC + NO_X) uncorrected and combined (*e.g.* NMHC + NO_X) corrected composite brake-specific emissions values over the entire duty cycle is within ±4% of the uncorrected value or the applicable emissions standard, whichever is greater.

(3) If the test is not validated for drift, you may consider the test results for the duty cycle to be valid only if, using good engineering judgment, the observed drift does not affect your ability to demonstrate compliance with the applicable emission standards. For example, if the drift-corrected value is less than the standard by at least two times the absolute difference between the uncorrected and corrected values, you may consider the data to be valid for demonstrating compliance with the applicable standard.

* * * * *

Subpart G—[Amended]

■ 303. Section 1065.601 is amended by revising paragraph (b) to read as follows:

§ 1065.601 Overview.

* * * * *

(b) You may use data from multiple systems to calculate test results for a single emission test, consistent with good engineering judgment. You may also make multiple measurements from a single batch sample, such as multiple weighings of a PM filter or multiple readings from a bag sample. You may not use test results from multiple emission tests to report emissions. We allow weighted means where appropriate. You may discard statistical outliers, but you must report all results.

* * * * *

■ 304. Section 1065.602 is amended by revising paragraphs (b), (e), and (l)(1)(iii) to read as follows:

§ 1065.602 Statistics.

* * * * *

(b) *Arithmetic mean.* Calculate an arithmetic mean, $\bar{y}$, as follows:

$$\bar{y} = \frac{\sum_{i=1}^{N} y_i}{N} \qquad \text{Eq. 1065.602-1}$$

Example:

$N = 3$

$y_1 = 10.60$

$y_2 = 11.91$

$y_N = y_3 = 11.09$

$$\bar{y} = \frac{10.60 + 11.91 + 11.09}{3}$$

$\bar{y} = 11.20$

* * * * *

(e) *Accuracy.* Determine accuracy as described in this paragraph (e). Make multiple measurements of a standard quantity to create a set of observed values, y_i, and compare each observed value to the known value of the standard quantity. The standard quantity may have a single known value, such as a gas standard, or a set of known values of negligible range, such as a known applied pressure produced by a calibration device during repeated applications. The known value of the standard quantity is represented by y_{ref_i}. If you use a standard quantity with a single value, y_{ref_i} would be constant. Calculate an accuracy value as follows:

$$accuracy = \left| \frac{1}{N} \sum_{i=1}^{N} \left(y_i - y_{ref_i} \right) \right| \qquad \text{Eq. 1065.602-4}$$

Example:

$y_{ref} = 1800.0$

$N = 3$

$y_1 = 1806.4$

$y_2 = 1803.1$

$y_3 = 1798.9$

$$accuracy = \left| \frac{1}{3} \left((1806.4 - 1800.0) + (1803.1 - 1800.0) + (1798.9 - 1800.0) \right) \right|$$

$$accuracy = \left| \frac{1}{3} \left((6.4) + (3.1) + (-1.1) \right) \right|$$

$accuracy = 2.8$

* * * * *

(l) * * *

(1) * * *

(iii) Use your estimated values as described in the following example calculation:

$$\bar{x}_{exp} = \frac{e_{std} \cdot W_{ref}}{M \cdot \dot{n}_{exhmax} \cdot \Delta t_{duty\,cycle} \cdot \left(\frac{\bar{P}_{ref} + \left(\bar{P}_{frict} \cdot P_{max}\right)}{P_{max}}\right)} \quad \text{Eq. 1065.602-13}$$

$$\dot{n}_{exhmax} = \frac{p_{max} \cdot V_{disp} \cdot f_{nmax} \cdot \frac{2}{N_{stroke}} \cdot \eta_V}{R \cdot T_{max}} \quad \text{Eq. 1065.602-14}$$

Example:

e_{NOx} = 2.5 g/(kW·hr)
W_{ref} = 11.883 kW·hr
M_{NOx} = 46.0055 g/mol = $46.0055 \cdot 10^{-6}$ g/µmol
$\Delta t_{dutycycle}$ = 20 min = 1200 s
$\bar{P}_{ref}$ = 35.65 kW
$\bar{P}_{frict}$ = 15%
P_{max} = 125 kW
p_{max} = 300 kPa = 300000 Pa
V_{disp} = 3.0 l = 0.0030 m^3
f_{nmax} = 2800 rev/min = 46.67 rev/s
N_{stroke} = 4 1/rev
η_V = 0.9
R = 8.314472 J/(mol·K)
T_{max} = 348.15 K

$$\dot{n}_{exhmax} = \frac{300000 \cdot 0.0030 \cdot 46.67 \cdot \frac{2}{4} \cdot 0.9}{8.314472 \cdot 348.15}$$

$\dot{n}_{exhmax}$ = 6.53 mol/s

$$\bar{x}_{exp} = \frac{2.5 \cdot 11.883}{46.0055 \cdot 10^{-6} \cdot 6.53 \cdot 1200 \cdot \left(\frac{35.65 + (0.15 \cdot 125)}{125}\right)}$$

$\bar{x}_{exp}$ = 189.4 µmol/mol

* * * * *

■ 305. Section 1065.610 is amended by revising paragraph (c)(3) introductory text to read as follows:

§ 1065.610 Duty cycle generation.

* * * * *

(c) * * *

(3) *Intermediate speed.* If your normalized duty cycle specifies a speed as "intermediate speed," use your torque-versus-speed curve to determine the speed at which maximum torque occurs. This is peak torque speed. If maximum torque occurs in a flat region of the torque-versus-speed curve, your peak torque speed is the midpoint between the lowest and highest speeds at which the trace reaches the flat region. For purposes of this paragraph (c)(3), a flat region is one in which measured torque values are within 2.0% of the maximum recorded value. Identify your reference intermediate speed as one of the following values:

* * * * *

■ 306. Section 1065.640 is amended as follows:

■ a. By revising paragraphs (b)(1), (b)(5), and Table 1 of § 1065.640.

■ b. By revising paragraphs (c)(3), (c)(4) introductory text, and (c)(4)(i).

■ c. By revising paragraph (c)(5), (d)(1) (including Table 4 of § 1065.640), and (e)(3).

§ 1065.640 Flow meter calibration calculations.

* * * * *

(b) * * *

(1) PDP volume pumped per revolution, V_{rev} (m^3/rev):

$$V_{rev} = \frac{\bar{\dot{n}}_{ref} \cdot R \cdot \bar{T}_{in}}{\bar{P}_{in} \cdot \bar{f}_{nPDP}} \quad \text{Eq. 1065.640-2}$$

Example:

$\bar{\dot{n}}_{ref}$ = 25.096 mol/s
R = 8.314472 J/(mol·K)
$\bar{T}_{in}$ = 299.5 K
$\bar{P}_{in}$ = 98290 Pa
$\bar{f}_{nPDP}$ = 1205.1 rev/min = 20.085 rev/s

$$V_{rev} = \frac{25.096 \cdot 8.314472 \cdot 299.5}{98290 \cdot 20.085}$$

V_{rev} = 0.03166 m^3/rev

* * * * *

(5) The following example illustrates these calculations:

TABLE 1 OF § 1065.640—EXAMPLE OF PDP CALIBRATION DATA

$\bar{f}_{nPDP}$ (rev/min)	a_1 (m^3/min)	a_0 (m^3/rev)
755.0	50.43	0.056
987.6	49.86	−0.013
1254.5	48.54	0.028
1401.3	47.30	−0.061

* * * * *

(c) * * *

(3) Calculate r as follows:

(i) For SSV systems only, calculate r_{SSV} using the following equation:

$$r_{SSV} = 1 - \frac{\Delta p_{SSV}}{p_{in}} \quad \text{Eq. 1065.640-7}$$

Where:

Δp_{SSV} = Differential static pressure; venturi inlet minus venturi throat.

(ii) For CFV systems only, calculate r_{CFV} iteratively using the following equation:

$$r_{CFV}^{\frac{1-\gamma}{\gamma}} + \left(\frac{\gamma-1}{2}\right) \cdot \beta^4 \cdot r_{CFV}^{\frac{2}{\gamma}} = \frac{\gamma+1}{2} \quad \text{Eq. 1065.640-8}$$

(4) You may make any of the following simplifying assumptions of the governing equations, or you may use good engineering judgment to develop more appropriate values for your testing:

(i) For emission testing over the full ranges of raw exhaust, diluted exhaust and dilution air, you may assume that the gas mixture behaves as an ideal gas: $Z = 1$.

* * * * *

(5) The following example illustrates the use of the governing equations to calculate the discharge coefficient, C_d of an SSV flow meter at one reference flow meter value. Note that calculating C_d for a CFV flow meter would be similar, except that C_f would be determined from Table 2 of this section or calculated iteratively using values of β and γ as described in paragraph (c)(2) of this section.

Example:

$\bar{n}_{ref}$ = 57.625 mol/s

$Z = 1$

M_{mix} = 28.7805 g/mol = 0.0287805 kg/mol

R = 8.314472 J/(mol·K)

T_{in} = 298.15 K

A_t = 0.01824 m²

p_{in} = 99132.0 Pa

γ = 1.399

β = 0.8

Δp = 2.312 kPa

$$r_{SSV} = 1 - \frac{2.312}{99.132} = 0.977$$

$$C_f = \left[\frac{2 \cdot 1.399 \cdot \left(0.977^{\frac{1.399-1}{1.399}} - 1\right)}{(1.399-1) \cdot \left(0.8^4 - 0.977^{\frac{-2}{1.399}}\right)}\right]^{\frac{1}{2}}$$

C_f = 0.274

$$C_d = 57.625 \cdot \frac{\sqrt{1 \cdot 0.0287805 \cdot 8.314472 \cdot 298.15}}{0.274 \cdot 0.01824 \cdot 99132.0}$$

C_d = 0.981

(d) * * *

(1) Calculate the Reynolds number, $Re^{\#}$, for each reference molar flow rate, using the throat diameter of the venturi, d_t. Because the dynamic viscosity, μ, is needed to compute $Re^{\#}$, you may use your own fluid viscosity model to determine μ for your calibration gas (usually air), using good engineering judgment. Alternatively, you may use the Sutherland three-coefficient viscosity model to approximate μ, as shown in the following sample calculation for $Re^{\#}$:

$$Re^{\#} = \frac{4 \cdot M_{mix} \cdot \dot{n}_{ref}}{\pi \cdot d_t \cdot \mu} \qquad \text{Eq. 1065.640-10}$$

Where, using the Sutherland three-coefficient viscosity model:

$$\mu = \mu_0 \cdot \left(\frac{T_{in}}{T_0}\right)^{\frac{3}{2}} \cdot \left(\frac{T_0 + S}{T_{in} + S}\right) \qquad \text{Eq. 1065.640-11}$$

Where:

μ = Dynamic viscosity of calibration gas.

μ_0 = Sutherland reference viscosity.

T_0 = Sutherland reference temperature.

S = Sutherland constant.

TABLE 4 OF § 1065.640—SUTHERLAND THREE-COEFFICIENT VISCOSITY MODEL PARAMETERS

Gas [a]	μ_0	T_0	S	Temp range within ± 2% error	Pressure limit
	kg/(m·s)	K	K	K	kPa
Air	$1.716 \cdot 10^{-5}$	273	111	170 to 1,900	≤ 1,800
CO_2	$1.370 \cdot 10^{-5}$	273	222	190 to 1,700	≤ 3,600
H_2O	$1.12 \cdot 10^{-5}$	350	1,064	360 to 1,500	≤ 10,000
O_2	$1.919 \cdot 10^{-5}$	273	139	190 to 2,000	≤ 2,500
N_2	$1.663 \cdot 10^{-5}$	273	107	100 to 1,500	≤ 1,600

[a] Use tabulated parameters only for the pure gases, as listed. Do not combine parameters in calculations to calculate viscosities of gas mixtures.

Example:

μ_0 = 1.716 · 10⁻⁵ kg/(m·s)

T_0 = 273.11 K

S = 110.56 K

$$\mu = 1.716 \cdot 10^{-5} \cdot \left(\frac{298.15}{273.11}\right)^{\frac{3}{2}} \cdot \left(\frac{273.11+110.56}{298.15+110.56}\right)$$

$\mu = 1.837 \cdot 10^{-5}$ kg/(m·s)
M_{mix} = 28.7805 g/mol
$\dot{n}_{ref}$ = 57.625 mol/s
d_t = 152.4 mm
T_{in} = 298.15 K

$$Re^{\#} = \frac{4 \cdot 28.7805 \cdot 57.625}{3.14159 \cdot 152.4 \cdot 1.837 \cdot 10^{-5}}$$

$Re^{\#} = 7.541 \cdot 10^5$

* * * * *

(e) * * *

(3) If the standard deviation of all the C_d values is less than or equal to 0.3% of the mean C_d, use the mean C_d in Eq 1065.642–6, and use the CFV only down to the lowest r measured during calibration using the following equation:

$$r = 1 - \frac{\Delta p_{CFV}}{p_{in}} \qquad \text{Eq. 1065.640-13}$$

Where:

Δp_{CFV} = Differential static pressure; venturi inlet minus venturi outlet.

* * * * *

■ 307. Section 1065.642 is revised to read as follows:

§ 1065.642 SSV, CFV, and PDP molar flow rate calculations.

This section describes the equations for calculating molar flow rates from various flow meters. After you calibrate a flow meter according to § 1065.640, use the calculations described in this section to calculate flow during an emission test.

(a) *PDP molar flow rate.* Based upon the speed at which you operate the PDP for a test interval, select the corresponding slope, a_1, and intercept, a_0, as calculated in § 1065.640, to calculate molar flow rate, $\dot{n}$ as follows:

$$\dot{n} = f_{nPDP} \cdot \frac{p_{in} \cdot V_{rev}}{R \cdot T_{in}} \qquad \text{Eq. 1065.642-1}$$

Where:

$$V_{rev} = \frac{a_1}{\bar{f}_{nPDP}} \cdot \sqrt{\frac{p_{out} - p_{in}}{p_{out}}} + a_0 \qquad \text{Eq. 1065.642-2}$$

Example:

a_1 = 50.43 (m³/min) = 0.8405 (m³/s)
$\bar{f}_{nPDP}$ = 755.0 rev/min = 12.58 rev/s
p_{out} = 99950 Pa
p_{in} = 98575 Pa
a_0 = 0.056 (m³/rev)
R = 8.314472 J/(mol·K)
T_{in} = 323.5 K
C_p = 1000 (J/m³)/kPa
C_t = 60 s/min

$$V_{rev} = \frac{0.8405}{12.58} \cdot \sqrt{\frac{99950 - 98575}{99950}} + 0.056$$

V_{rev} = 0.06383 m³/rev

$$\dot{n} = 12.58 \cdot \frac{98575 \cdot 0.06383}{8.314472 \cdot 323.5}$$

$\dot{n}$ = 29.428 mol/s

(b) *SSV molar flow rate.* Based on the C_d versus $Re^{\#}$ equation you determined according to § 1065.640, calculate SSV molar flow rate, $\dot{n}$ during an emission test as follows:

$$\dot{n} = C_d \cdot C_f \cdot \frac{A_t \cdot p_{in}}{\sqrt{Z \cdot M_{mix} \cdot R \cdot T_{in}}} \qquad \text{Eq. 1065.642-3}$$

Example:

A_t = 0.01824 m²
p_{in} = 99132 Pa
Z = 1
M_{mix} = 28.7805 g/mol = 0.0287805 kg/mol
R = 8.314472 J/(mol·K)
T_{in} = 298.15 K
$Re^{\#} = 7.232 \cdot 10^5$
γ = 1.399
β = 0.8
Δp = 2.312 kPa
Using Eq. 1065.640–7,
r_{ssv} = 0.997
Using Eq. 1065.640–6,
C_f = 0.274
Using Eq. 1065.640–5,
C_d = 0.990

$$\dot{n} = 0.990 \cdot 0.274 \cdot \frac{0.01824 \cdot 99132}{\sqrt{1 \cdot 0.0287805 \cdot 8.314472 \cdot 298.15}}$$

$\dot{n}$ = 58.173 mol/s

(c) *CFV molar flow rate.* Some CFV flow meters consist of a single venturi and some consist of multiple venturis, where different combinations of venturis are used to meter different flow rates. If you use multiple venturis and you calibrated each venturi independently to determine a separate discharge coefficient, C_d, for each venturi, calculate the individual molar flow rates through each venturi and sum all their flow rates to determine $\dot{n}$. If you use multiple venturis and you calibrated each combination of venturis, calculate $\dot{n}$ using the sum of the active venturi throat areas as A_t, the sum of the active venturi throat diameters as d_t, and the ratio of venturi throat to inlet diameters as the ratio of the sum of the active venturi throat diameters to the diameter of the common entrance to all of the venturis. To calculate the molar flow rate through one venturi or one combination of venturis, use its respective mean C_d and other constants you determined according to § 1065.640 and calculate its molar flow rate $\dot{n}$ during an emission test, as follows:

$$\dot{n} = C_d \cdot C_f \cdot \frac{A_t \cdot p_{in}}{\sqrt{Z \cdot M_{mix} \cdot R \cdot T_{in}}} \qquad \text{Eq. 1065.642-4}$$

Example:
$C_d = 0.985$
$C_f = 0.7219$
$A_t = 0.00456\ m^2$
$p_{in} = 98836$ Pa
$Z = 1$
$M_{mix} = 28.7805$ g/mol = 0.0287805 kg/mol
$R = 8.314472$ J/(mol·K)
$T_{in} = 378.15$ K

$$\dot{n} = 0.985 \cdot 0.7219 \cdot \frac{0.00456 \cdot 98836}{\sqrt{1 \cdot 0.0287805 \cdot 8.314472 \cdot 378.15}}$$

$\dot{n} = 33.690$ mol/s

■ 308. Section 1065.645 is amended by revising paragraphs (a)(2), (b), and (c) to read as follows:

§ 1065.645 Amount of water in an ideal gas.

* * * * *

(a) * * *

(2) For humidity measurements over ice at ambient temperatures from (−100 to 0) °C, use the following equation:

$$\log_{10}(p_{sat}) = -9.096853 \cdot \left(\frac{273.16}{T_{sat}} - 1\right) - 3.566506 \cdot \log_{10}\left(\frac{273.16}{T_{sat}}\right) + 0.876812 \cdot \left(1 - \frac{T_{sat}}{273.16}\right) - 0.2138602 \qquad \text{Eq. 1065.645-2}$$

Example:
$T_{ice} = -15.4$ °C
$T_{ice} = -15.4 + 273.15 = 257.75$ K

$$\log_{10}(p_{sat}) = -9.096853 \cdot \left(\frac{273.16}{257.75} - 1\right) - 3.566506 \cdot \log_{10}\left(\frac{273.16}{257.75}\right) + 0.876812 \cdot \left(1 - \frac{257.75}{273.16}\right) - 0.2138602$$

$\log_{10}(p_{H20}) = -0.798207$
$p_{H20} = 10^{\,0.79821} = 0.159145$ kPa

(b) *Dewpoint.* If you measure humidity as a dewpoint, determine the amount of water in an ideal gas, x_{H20}, as follows:

$$x_{H2O} = \frac{p_{H2O}}{p_{abs}} \qquad \text{Eq. 1065.645-3}$$

Where:
x_{H20} = amount of water in an ideal gas.
p_{H20} = water vapor pressure at the measured dewpoint, $T_{sat} = T_{dew}$.
p_{abs} = wet static absolute pressure at the location of your dewpoint measurement.

Example::
$p_{abs} = 99.980$ kPa
$T_{sat} = T_{dew} = 9.5$ °C
Using Eq. 1065.645–1,
$p_{H20} = 1.186581$ kPa
$x_{H2O} = 1.186581/99.980$
$x_{H2O} = 0.011868$ mol/mol

(c) *Relative humidity.* If you measure humidity as a relative humidity, *RH*%, determine the amount of water in an ideal gas, x_{H2O}, as follows:

$$x_{H2O} = \frac{RH\% \cdot p_{H2O}}{p_{abs}} \qquad \text{Eq. 1065.645-4}$$

Where:
x_{H20} = amount of water in an ideal gas.
RH% = relative humidity.
p_{H20} = water vapor pressure at 100% relative humidity at the location of your relative humidity measurement, $T_{sat} = T_{amb}$.
p_{abs} = wet static absolute pressure at the location of your relative humidity measurement.

Example:
RH% = 50.77%
$p_{abs} = 99.980$ kPa
$T_{sat} = T_{amb} = 20$ °C
Using Eq. 1065.645–1,
$p_{H20} = 2.3371$ kPa
$x_{H2O} = (50.77\% \cdot 2.3371)/99.980$
$x_{H2O} = 0.011868$ mol/mol

■ 309. Section 1065.650 is amended by revising paragraphs (a), (b), (c) introductory text, (d) introductory text, (d)(7), (e)(2), (f)(4), (g), and (h) to read as follows:

§ 1065.650 Emission calculations.

(a) *General.* Calculate brake-specific emissions over each applicable duty cycle or test interval. For test intervals with zero work (or power), calculate the emission mass (or mass rate), but do not calculate brake-specific emissions. For duty cycles with multiple test intervals, refer to the standard-setting part for calculations you need to determine a composite result, such as a calculation that weights and sums the results of individual test intervals in a duty cycle. If the standard-setting part does not include those calculations, use the equations in paragraph (g) of this section. This section is written based on rectangular integration, where each indexed value (*i.e.,* "$_i$") represents (or approximates) the mean value of the parameter for its respective time interval, delta-t. You may also integrate continuous signals using trapezoidal integration consistent with good engineering judgment.

(b) *Brake-specific emissions over a test interval.* We specify three alternative ways to calculate brake-specific emissions over a test interval, as follows:

(1) For any testing, you may calculate the total mass of emissions, as described in paragraph (c) of this section, and divide it by the total work generated over the test interval, as described in paragraph (d) of this section, using the following equation:

$$e = \frac{m}{W} \qquad \text{Eq. 1065.650-1}$$

Example:
$m_{NOx} = 64.975$ g
$W = 25.783$ kW·hr
$e_{NOx} = 64.975/25.783$
$e_{NOx} = 2.520$ g/(kW·hr)

(2) For discrete-mode steady-state testing, you may calculate the brake-specific emissions over a test interval

using the ratio of emission mass rate to power, as described in paragraph (e) of this section, using the following equation:

$$e = \frac{\bar{\dot{m}}}{\bar{P}} \qquad \text{Eq. 1065.650-2}$$

(3) For field testing, you may calculate the ratio of total mass to total work, where these individual values are determined as described in paragraph (f) of this section. You may also use this approach for laboratory testing, consistent with good engineering judgment. Good engineering judgment dictates that this method not be used if there are any work flow paths described in § 1065.210 that cross the system boundary, other than the primary output shaft (crankshaft). This is a special case in which you use a signal linearly proportional to raw exhaust molar flow rate to determine a value proportional to total emissions. You then use the same linearly proportional signal to determine total work using a chemical balance of fuel, intake air, and exhaust as described in § 1065.655, plus information about your engine's brake-specific fuel consumption. Under this method, flow meters need not meet accuracy specifications, but they must meet the applicable linearity and repeatability specifications in subpart D or subpart J of this part. The result is a brake-specific emission value calculated as follows:

$$e = \frac{\tilde{m}}{\tilde{W}} \qquad \text{Eq. 1065.650-3}$$

Example:

$\tilde{m} = 805.5$ g
$\tilde{W} = 52.102$ kW·hr
$e_{CO} = 805.5/52.102$
$e_{CO} = 2.520$ g/(kW·hr)

(c) *Total mass of emissions over a test interval.* To calculate the total mass of an emission, multiply a concentration by its respective flow. For all systems, make preliminary calculations as described in paragraph (c)(1) of this section, then use the method in paragraphs (c)(2) through (4) of this section that is appropriate for your system. Calculate the total mass of emissions as follows:

* * * * *

(d) *Total work over a test interval.* To calculate the total work from the engine over a test interval, add the total work from all the work paths described in § 1065.210 that cross the system boundary including electrical energy/work, mechanical shaft work, and fluid pumping work. For all work paths, except the engine's primary output shaft (crankshaft), the total work for the path over the test interval is the integration of the net work flow rate (power) out of the system boundary. When energy/work flows into the system boundary, this work flow rate signal becomes negative; in this case, include these negative work rate values in the integration to calculate total work from that work path. Some work paths may result in a negative total work. Include negative total work values from any work path in the calculated total work from the engine rather than setting the values to zero. The rest of this paragraph (d) describes how to calculate total work from the engine's primary output shaft over a test interval. Before integrating power on the engine's primary output shaft, adjust the speed and torque data for the time alignment used in § 1065.514(c). Any advance or delay used on the feedback signals for cycle validation must also be used for calculating work. Account for work of accessories according to § 1065.110. Exclude any work during cranking and starting. Exclude work during actual motoring operation (negative feedback torques), unless the engine was connected to one or more energy storage devices. Examples of such energy storage devices include hybrid powertrain batteries and hydraulic accumulators, like the ones illustrated in Figure 1 of § 1065.210. Exclude any work during reference zero-load idle periods (0% speed or idle speed with 0 N·m reference torque). Note, that there must be two consecutive reference zero load idle points to establish a period where this applies. Include work during idle points with simulated minimum torque such as Curb Idle Transmissions Torque (CITT) for automatic transmissions in "drive". The work calculation method described in paragraphs (b)(1) through (7) of this section meets these requirements using rectangular integration. You may use other logic that gives equivalent results. For example, you may use a trapezoidal integration method as described in paragraph (b)(8) of this section.

* * * * *

(7) Integrate the resulting values for power over the test interval. Calculate total work as follows:

$$W = \sum_{i=1}^{N} P_i \cdot \Delta t \qquad \text{Eq. 1065.650-10}$$

Where:

W = total work from the primary output shaft
P_i = instantaneous power from the primary output shaft over an interval *i*.

$$P_i = f_{ni} \cdot T_i \qquad \text{Eq. 1065.650-11}$$

Example:

$N = 9000$
$f_{n1} = 1800.2$ rev/min
$f_{n2} = 1805.8$ rev/min
$T_1 = 177.23$ N·m
$T_2 = 175.00$ N·m
$C_{rev} = 2 \cdot \pi$ rad/rev
$C_{t1} = 60$ s/min
$C_p = 1000$ (N·m·rad/s)/kW
$f_{record} = 5$ Hz
$C_{t2} = 3600$ s/hr

$$P_1 = \frac{1800.2 \cdot 177.23 \cdot 2 \cdot 3.14159}{60 \cdot 1000}$$

$P_1 = 33.41$ kW
$P_2 = 33.09$ kW
Using Eq. 1065.650–5,
$\Delta t = 1/5 = 0.2$ s

$$W = \frac{(33.41 + 33.09 + ... + P_{9000}) \cdot 0.2}{3600}$$

$W = 16.875$ kW·hr

* * * * *

(e) * * *

(2) To calculate an engine's mean steady-state total power, $\bar{P}$, add the mean steady-state power from all the work paths described in § 1065.210 that cross the system boundary including electrical power, mechanical shaft power, and fluid pumping power. For all work paths, except the engine's primary output shaft (crankshaft), the mean steady-state power over the test interval is the integration of the net work flow rate (power) out of the system boundary divided by the period of the test interval. When power flows into the system boundary, the power/work flow rate signal becomes negative; in this case, include these negative power/work rate values in the integration to calculate the mean power from that work path. Some work paths may result in a negative mean power. Include negative mean power values from any work path in the mean total power from the engine rather than setting these values to zero. The rest of this paragraph (e)(2) describes how to calculate the mean power from the engine's primary output shaft. Calculate $\bar{P}$ using Equation 1065.650–13, noting that $\bar{P}$, $\bar{f}_n$ and $\bar{T}$ refer to mean power, mean rotational shaft frequency, and mean torque from the primary output shaft. Account for the power of simulated accessories according to § 1065.110 (reducing the mean primary output shaft power or torque by the accessory power or torque). Set the power to zero during actual motoring operation (negative feedback torques), unless the engine was connected to one or more energy storage devices. Examples of such energy

storage devices include hybrid powertrain batteries and hydraulic accumulators, like the ones illustrated in Figure 1 of § 1065.210. Set the power to zero for modes with a zero reference load (0 N·m reference torque or 0 kW reference power). Include power during idle modes with simulated minimum torque or power.

$$\bar{P} = \bar{f}_n \cdot \bar{T} \qquad \text{Eq. 1065.650-13}$$

* * * * *

(f) * * *

(4) *Example.* The following example shows how to calculate mass of emissions using proportional values:

N= 3000

f_{record} = 5 Hz

e_{fuel} = 285 g/(kW·hr)

w_{fuel} = 0.869 g/g

M_c = 12.0107 g/mol

$\dot{n}_1$= 3.922 ~mol/s = 14119.2 mol/hr

$x_{Ccombdry1}$ = 91.634 mmol/mol = 0.091634 mol/mol

$x_{H2Oexh1}$ = 27.21 mmol/mol = 0.02721 mol/mol

Using Eq. 1065.650–5,

Δt = 0.2 s

$$\tilde{W} = \frac{12.0107\left[\frac{3.922 \cdot 0.091634}{1+0.02721} + \frac{\tilde{\dot{n}}_2 \cdot x_{Ccombdry2}}{1+x_{H2Oexh2}} + ... + \frac{\tilde{\dot{n}}_{3000} \cdot x_{Ccombdry3000}}{1+x_{H2Oexh3000}}\right] \cdot 0.2}{285 \cdot 0.869}$$

W= 5.09 (kW·hr)

(g) *Brake-specific emissions over a duty cycle with multiple test intervals.* The standard-setting part may specify a duty cycle with multiple test intervals, such as with discrete-mode steady-state testing. Unless we specify otherwise, calculate composite brake-specific emissions over the duty cycle as described in this paragraph (g). If a measured mass (or mass rate) is negative, set it to zero for calculating composite brake-specific emissions, but leave it unchanged for drift validation. In the case of calculating composite brake-specific emissions relative to a combined emission standard (such as a NO_X + NMHC standard), change any negative mass (or mass rate) values to zero for a particular pollutant before combining the values for the different pollutants.

(1) Use the following equation to calculate composite brake-specific emissions for duty cycles with multiple test intervals all with prescribed durations, such as cold-start and hot-start transient cycles:

$$e_{composite} = \frac{\sum_{i=1}^{N} WF_i \cdot m_i}{\sum_{i=1}^{N} WF_i \cdot W_i} \qquad \text{Eq. 1065.650-17}$$

Where:

i = test interval number.

N = number of test intervals.

WF = weighting factor for the test interval as defined in the standard-setting part.

m = mass of emissions over the test interval as determined in paragraph (c) of this section.

W = total work from the engine over the test interval as determined in paragraph (d) of this section.

Example:

N = 2

WF_1 = 0.1428

WF_2 = 0.8572

m_1 = 70.125 g

m_2 = 64.975 g

W_1 = 25.783 kW·hr

W_2 = 25.783 kW·hr

$$e_{NO_x composite} = \frac{(0.1428 \cdot 70.125) + (0.8572 \cdot 64.975)}{(0.1428 \cdot 25.783) + (0.8572 \cdot 25.783)}$$

$e_{NOxcomposite}$ = 2.548 g/kW·hr

(2) Calculate composite brake-specific emissions for duty cycles with multiple test intervals that allow use of varying duration, such as discrete-mode steady-state duty cycles, as follows:

(i) Use the following equation if you calculate brake-specific emissions over test intervals based on total mass and total work as described in paragraph (b)(1) of this section:

$$e_{composite} = \frac{\sum_{i=1}^{N} WF_i \cdot \frac{m_i}{t_i}}{\sum_{i=1}^{N} WF_i \cdot \frac{W_i}{t_i}} \qquad \text{Eq. 1065.650-18}$$

Where:

i = test interval number.

N = number of test intervals.

WF = weighting factor for the test interval as defined in the standard-setting part.

m = mass of emissions over the test interval as determined in paragraph (c) of this section.

W = total work from the engine over the test interval as determined in paragraph (d) of this section.
t = duration of the test interval.
Example:

$N = 2$
$WF_1 = 0.85$
$WF_2 = 0.15$
$m_1 = 1.3753$ g
$m_2 = 0.4135$ g
$t_1 = 120$ s
$t_2 = 200$ s
$W_1 = 2.8375$ kW·hr
$W_2 = 0.0$ kW·hr

$$e_{\mathrm{NO}_x\mathrm{composite}} = \frac{\left(0.85 \cdot \frac{1.3753}{120}\right) + \left(0.15 \cdot \frac{0.4135}{200}\right)}{\left(0.85 \cdot \frac{2.8375}{120}\right) + \left(0.15 \cdot \frac{0.0}{200}\right)}$$

$e_{\mathrm{NOxcomposite}} = 0.5001$ g/kW·hr

(ii) Use the following equation if you calculate brake-specific emissions over test intervals based on the ratio of mass rate to power as described in paragraph (b)(2) of this section:

$$e_{\mathrm{composite}} = \frac{\sum_{i=1}^{N} WF_i \cdot \bar{m}_i}{\sum_{i=1}^{N} WF_i \cdot \bar{P}_i} \qquad \text{Eq. 1065.650-19}$$

Where:

i = test interval number.
N = number of test intervals.
WF = weighting factor for the test interval as defined in the standard-setting part.
$\bar{m}$= mean steady-state mass rate of emissions over the test interval as determined in paragraph (e) of this section.
$\bar{P}$ is the mean steady-state power over the test interval as described in paragraph (e) of this section.
Example:

$N = 2$
$WF_1 = 0.85$
$WF_2 = 0.15$
$\bar{m}_1 = 2.25842$ g/hr
$\bar{m}_2 = 0.063443$ g/hr
$\bar{P}_1= 4.5383$ kW
$\bar{P}_2= 0.0$ kW

$$e_{\mathrm{NO}_x\mathrm{composite}} = \frac{(0.85 \cdot 2.25842) + (0.15 \cdot 0.063443)}{(0.85 \cdot 4.5383) + (0.15 \cdot 0.0)}$$

$e_{\mathrm{NOxcomposite}} = 0.5001$ g/kW·hr

(h) *Rounding.* Round the final brake-specific emission values to be compared to the applicable standard only after all calculations are complete (including any drift correction, applicable deterioration factors, adjustment factors, and allowances) and the result is in g/(kW·hr) or units equivalent to the units of the standard, such as g/(hp·hr). *See* the definition of "Round" in § 1065.1001.

■ 310. Section 1065.655 is amended by revising paragraphs (c), (d), Table 1 of § 1065.655, and paragraph (e)(3) to read as follows:

§ 1065.655 Chemical balances of fuel, intake air, and exhaust.

* * * * *

(c) *Chemical balance procedure.* The calculations for a chemical balance involve a system of equations that require iteration. We recommend using a computer to solve this system of equations. You must guess the initial values of up to three quantities: The amount of water in the measured flow, x_{H2Oexh}, fraction of dilution air in diluted exhaust, $x_{\mathrm{dil/exh}}$, and the amount of products on a C_1 basis per dry mole of dry measured flow, x_{Ccombdry}. You may use time-weighted mean values of combustion air humidity and dilution air humidity in the chemical balance; as long as your combustion air and dilution air humidities remain within tolerances of ±0.0025 mol/mol of their respective mean values over the test interval. For each emission concentration, x, and amount of water, x_{H2Oexh}, you must determine their completely dry concentrations, x_{dry} and $x_{\mathrm{H2Oexhdry}}$. You must also use your fuel's atomic hydrogen-to-carbon ratio, α, oxygen-to-carbon ratio, β, sulfur-to-carbon ratio, γ, and nitrogen-to-carbon ratio, δ. You may measure α, β, γ, and δ or you may use default values for a given fuel as described in § 1065.655(d). Use the following steps to complete a chemical balance:

(1) Convert your measured concentrations such as, $x_{\mathrm{CO2meas,\ xNOmeas}}$, and x_{H2Oint}, to dry concentrations by dividing them by one minus the amount of water present during their respective measurements; for example: $x_{\mathrm{H2OxCO2meas\ x}}$, $_{\mathrm{H2OxNOmeas}}$, and x_{H2Oint}. If the amount of water present during a "wet" measurement is the same as the unknown amount of water in the exhaust flow, x_{H2Oexh}, iteratively solve for that value in the system of equations. If you measure only total NO_X and not NO and NO_2 separately, use good engineering judgment to estimate a split in your total NO_X concentration between NO and NO_2 for the chemical balances. For example, if you measure emissions from a stoichiometric spark-ignition engine, you may assume all NO_X is NO. For a compression-ignition engine, you may assume that your molar concentration of NO_X, x_{NOx}, is 75% NO and 25% NO_2. For NO_2 storage aftertreatment systems, you may assume x_{NOx} is 25% NO and 75% NO_2. Note that for calculating the mass of NO_X emissions, you must use the molar mass of NO_2 for the effective molar mass of all NO_X species, regardless of the actual NO_2 fraction of NO_X.

(2) Enter the equations in paragraph (c)(4) of this section into a computer program to iteratively solve for x_{H2Oexh},

$x_{Ccombdry}$, and $x_{dil/exh}$. Use good engineering judgment to guess initial values for x_{H2Oexh}, $x_{Ccombdry}$, and $x_{dil/exh}$. We recommend guessing an initial amount of water that is about twice the amount of water in your intake or dilution air. We recommend guessing an initial value of $x_{Ccombdry}$ as the sum of your measured CO_2, CO, and THC values. We also recommend guessing an initial $x_{dil/exh}$ between 0.75 and 0.95, such as 0.8. Iterate values in the system of equations until the most recently updated guesses are all within ± 1% of their respective most recently calculated values.

(3) Use the following symbols and subscripts in the equations for this paragraph (c):

$x_{dil/exh}$ = amount of dilution gas or excess air per mole of exhaust.

x_{H2Oexh} = amount of water in exhaust per mole of exhaust.

$x_{Ccombdry}$ = amount of carbon from fuel in the exhaust per mole of dry exhaust.

x_{H2dry} = amount of H_2 in exhaust per amount of dry exhaust.

K_{H2Ogas} = water-gas reaction equilibrium coefficient. You may use 3.5 or calculate your own value using good engineering judgment.

$x_{H2Oexhdry}$ = amount of water in exhaust per dry mole of dry exhaust.

$x_{prod/intdry}$ = amount of dry stoichiometric products per dry mole of intake air.

$x_{dil/exhdry}$ = amount of dilution gas and/or excess air per mole of dry exhaust.

$x_{int/exhdry}$ = amount of intake air required to produce actual combustion products per mole of dry (raw or diluted) exhaust.

$x_{raw/exhdry}$ = amount of undiluted exhaust, without excess air, per mole of dry (raw or diluted) exhaust.

x_{O2int} = amount of intake air O_2 per mole of intake air.

$x_{CO2intdry}$ = amount of intake air CO_2 per mole of dry intake air. You may use $x_{CO2intdry}$ = 375 µmol/mol, but we recommend measuring the actual concentration in the intake air.

$x_{H2Ointdry}$ = amount of intake air H_2O per mole of dry intake air.

x_{CO2int} = amount of intake air CO_2 per mole of intake air.

x_{CO2dil} = amount of dilution gas CO_2 per mole of dilution gas.

$x_{CO2dildry}$ = amount of dilution gas CO_2 per mole of dry dilution gas. If you use air as diluent, you may use $x_{CO2dildry}$ = 375 µmol/mol, but we recommend measuring the actual concentration in the intake air.

$x_{H2Odildry}$ = amount of dilution gas H_2O per mole of dry dilution gas.

x_{H2Odil} = amount of dilution gas H_2O per mole of dilution gas.

$x_{[emission]meas}$ = amount of measured emission in the sample at the respective gas analyzer.

$x_{[emission]dry}$ = amount of emission per dry mole of dry sample.

$x_{H2O[emission]meas}$ = amount of water in sample at emission-detection location. Measure or estimate these values according to § 1065.145(e)(2).

x_{H2Oint} = amount of water in the intake air, based on a humidity measurement of intake air.nb

α = atomic hydrogen-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.

β = atomic oxygen-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.

γ = atomic sulfur-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.

δ = atomic nitrogen-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.

(4) Use the following equations to iteratively solve for $x_{dil/exh}$, x_{H2Oexh}, and $x_{Ccombdry}$:

$$x_{dil/exh} = 1 - \frac{x_{raw/exhdry}}{1 + x_{H2Oexhdry}} \quad \text{Eq. 1065.655-1}$$

$$x_{H2Oexh} = \frac{x_{H2Oexhdry}}{1 + x_{H2Oexhdry}} \quad \text{Eq. 1065.655-2}$$

$$x_{Ccombdry} = x_{CO2dry} + x_{COdry} + x_{THCdry} - x_{CO2dil} \cdot x_{dil/exhdry} - x_{CO2int} \cdot x_{int/exhdry} \quad \text{Eq. 1065.655-3}$$

$$x_{H2dry} = \frac{x_{COdry} \cdot \left(x_{H2Oexhdry} - x_{H2Odil} \cdot x_{dil/exhdry}\right)}{K_{H2O\text{-}gas} \cdot \left(x_{CO2dry} - x_{CO2dil} \cdot x_{dil/exhdry}\right)} \quad \text{Eq. 1065.655-4}$$

$$x_{H2Oexhdry} = \frac{\alpha}{2}\left(x_{Ccombdry} - x_{THCdry}\right) + x_{H2Odil} \cdot x_{dil/exhdry} + x_{H2Oint} \cdot x_{int/exhdry} - x_{H2dry} \quad \text{Eq. 1065.655-5}$$

$$x_{dil/exhdry} = \frac{x_{dil/exh}}{1 - x_{H2Oexh}} \quad \text{Eq. 1065.655-6}$$

$$x_{int/exhdry} = \frac{1}{2 \cdot x_{O2int}}\left(\left(\frac{\alpha}{2} - \beta + 2 + 2\gamma\right)\left(x_{Ccombdry} - x_{THCdry}\right) - \left(x_{COdry} - x_{NOdry} - 2x_{NO2dry} + x_{H2dry}\right)\right) \quad \text{Eq. 1065.655-7}$$

$$x_{raw/exhdry} = \frac{1}{2}\left(\left(\frac{\alpha}{2} + \beta + \delta\right)\left(x_{Ccombdry} - x_{THCdry}\right) + \left(2x_{THCdry} + x_{COdry} - x_{NO2dry} + x_{H2dry}\right)\right) + x_{int/exhdry} \quad \text{Eq. 1065.655-8}$$

$$x_{O2int} = \frac{0.209820 - x_{CO2intdry}}{1 + x_{H2Ointdry}} \quad \text{Eq. 1065.655-9}$$

$$x_{CO2int} = \frac{x_{CO2intdry}}{1 + x_{H2Ointdry}} \quad \text{Eq. 1065.655-10}$$

$$x_{H2Ointdry} = \frac{x_{H2Oint}}{1 - x_{H2Oint}} \quad \text{Eq. 1065.655-11}$$

$$x_{CO2dil} = \frac{x_{CO2dildry}}{1 + x_{H2Odildry}} \quad \text{Eq. 1065.655-12}$$

$$x_{H2Odildry} = \frac{x_{H2Odil}}{1 - x_{H2Odil}} \quad \text{Eq. 1065.655-13}$$

$$x_{COdry} = \frac{x_{COmeas}}{1 - x_{H2OCOmeas}} \quad \text{Eq. 1065.655-14}$$

$$x_{CO2dry} = \frac{x_{CO2meas}}{1 - x_{H2OCO2meas}} \quad \text{Eq. 1065.655-15}$$

$$x_{NOdry} = \frac{x_{NOmeas}}{1 - x_{H2ONOmeas}} \quad \text{Eq. 1065.655-16}$$

$$x_{NO2dry} = \frac{x_{NO2meas}}{1 - x_{H2ONO2meas}} \quad \text{Eq. 1065.655-17}$$

$$x_{THCdry} = \frac{x_{THCmeas}}{1 - x_{H2OTHCmeas}} \quad \text{Eq. 1065.655-18}$$

(5) The following example is a solution for $x_{dil/exh}$, x_{H2Oexh}, and $x_{Ccombdry}$ using the equations in paragraph (c)(4) of this section:

$$x_{dil/exh} = 1 - \frac{0.184}{1 + \frac{35.38}{1000}} = 0.822 \ mol/mol$$

$$x_{H2Oexh} = \frac{35.38}{1 + \frac{35.38}{1000}} = 34.18 \ mmol/mol$$

$$x_{Ccombdry} = 0.025 + \frac{29.3}{1000000} + \frac{47.6}{1000000} - \frac{0.371}{1000} \cdot 0.851 - \frac{0.369}{1000} \cdot 0.172 = 0.0249 \ mol/mol$$

$$x_{H2dry} = \frac{29.3 \cdot (0.034 - 0.012 \cdot 0.851)}{3.5 \cdot \left(\frac{25.2}{1000} - \frac{0.371}{1000} \cdot 0.851\right)} = 8.5 \mu mol/mol$$

$$x_{H2Oexhdry} = \frac{1.8}{2}\left(0.0249 - \frac{47.6}{1000000}\right) + 0.018 \cdot 0.851 + 0.017 \cdot 0.172 - \frac{8.5}{1000000} = 0.0353\ mol/mol$$

$$x_{dil/exhdry} = \frac{0.822}{1-0.034} = 0.851\ mol/mol$$

$$x_{int/exhdry} = \frac{1}{2 \cdot 0.206}\left(\begin{array}{l}\left(\frac{1.8}{2} - 0.050 + 2 + 2 \cdot 0.0003\right)\left(0.0249 - \frac{47.6}{1000000}\right) - \\ \left(\frac{29.3}{1000000} - \frac{50.4}{1000000} - 2 \cdot \frac{12.1}{1000000} + \frac{8.5}{1000000}\right)\end{array}\right) = 0.172\ mol/mol$$

$$x_{raw/exhdry} = \frac{1}{2}\left(\begin{array}{l}\left(\frac{1.8}{2} + 0.050 + 0.0001\right)\left(0.0249 - \frac{47.6}{1000000}\right) + \\ \left(2 \cdot \frac{47.6}{1000000} + \frac{29.3}{1000000} - \frac{12.1}{1000000} + \frac{8.5}{1000000}\right)\end{array}\right) + 0.172 = 0.184\ mol/mol$$

$$x_{O2int} = \frac{0.209820 - 0.000375}{1 + \frac{17.22}{1000}} = 0.206\ mol/mol$$

$$x_{CO2int} = \frac{0.000375 \cdot 1000}{1 + \frac{17.22}{1000}} = 0.369\ mmol/mol$$

$$x_{H2Ointdry} = \frac{16.93}{1 - \frac{16.93}{1000}} = 17.22\ mmol/mol$$

$$x_{CO2dil} = \frac{0.375}{1 + \frac{12.01}{1000}} = 0.371\ mmol/mol$$

$$x_{H2Odildry} = \frac{11.87}{1 - \frac{11.87}{1000}} = 12.01\ mmol/mol$$

$$x_{COdry} = \frac{29.0}{1 - \frac{8.601}{1000}} = 29.3\ mmol/mol$$

$$x_{CO2dry} = \frac{24.98}{1 - \frac{8.601}{1000}} = 25.2\ mmol/mol$$

$$x_{NOdry} = \frac{50.0}{1 - \frac{8.601}{1000}} = 50.4\ mmol/mol$$

$$x_{NO2dry} = \frac{12.0}{1 - \frac{8.601}{1000}} = 12.1\ mmol/mol$$

$$x_{THCdry} = \frac{46}{1 - \frac{34.18}{1000}} = 47.6\ mmol/mol$$

$\alpha = 1.8$
$\beta = 0.05$
$\gamma = 0.0003$
$\delta = 0.0001$

(d) *Carbon mass fraction.* Determine carbon mass fraction of fuel, w_c, using one of the following methods:

(1) You may calculate w_c as described in this paragraph (d)(1) based on measured fuel properties. To do so, you must determine values for α and β in all cases, but you may set γ and δ to zero if the default value listed in Table 1 of this section is zero. Calculate w_c using the following equation:

$$w_C = \frac{1 \cdot M_C}{1 \cdot M_C + \alpha \cdot M_H + \beta \cdot M_O + \gamma \cdot M_S + \delta \cdot M_N} \qquad \text{Eq. 1065.655-19}$$

Where:
w_C, = carbon mass fraction of fuel.
M_C = molar mass of carbon.
α = atomic hydrogen-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.
M_H = molar mass of hydrogen.
β = atomic oxygen-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.
M_O = molar mass of oxygen.
γ = atomic sulfur-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.
M_S = molar mass of sulfur.
δ = atomic nitrogen-to-carbon ratio of the mixture of fuel(s) being combusted, weighted by molar consumption.
M_N = molar mass of nitrogen.
Example:
α = 1.8
β = 0.05
γ = 0.0003
δ = 0.0001
M_C = 12.0107
M_H = 1.01
M_O = 15.9994
M_S = 32.065
M_N = 14.0067

$$w_C = \frac{1 \cdot 12.0107}{1 \cdot 12.0107 + 1.8 \cdot 1.01 + 0.05 \cdot 15.9994 + 0.0003 \cdot 32.065 + 0.0001 \cdot 14.0067}$$

w_C, = 0.8205

(2) You may use the default values in the following table to determine w_c for a given fuel:

TABLE 1 OF § 1065.655—DEFAULT VALUES OF α, β, γ, δ, AND w_c, FOR VARIOUS FUELS

Fuel	Atomic hydrogen, oxygen, sulfur, and nitrogen-to-carbon ratios $CH\alpha O\beta S\gamma N\delta$	Carbon mass fraction, w_c g/g.
Gasoline	$CH_{1.85}O_0S_0N_0$	0.866
#2 Diesel	$CH_{1.80}O_0S_0N_0$	0.869
#1 Diesel	$CH_{1.93}O_0S_0N_0$	0.861
Liquefied Petroleum Gas	$CH_{2.64}O_0S_0N_0$	0.819
Natural gas	$CH_{3.78}O_{0.016}S_0N_0$	0.747
Ethanol	$CH_3O_{0.5}S_0N_0$	0.521
Methanol	$CH_4O_1S_0N_0$	0.375
Residual fuel blends	Must be determined by measured fuel properties as described in paragraph (d)(1) of this section.	

(e) * * *

(3) *Fuel mass flow rate calculation.* Based on $\dot{m}_{fuel}$, calculate $\dot{n}_{exh}$ as follows:

$$\dot{n}_{exh} = \frac{\dot{m}_{fuel} \cdot w_c \cdot \left(1 + x_{H2Oexhdry}\right)}{M_c \cdot x_{Ccombdry}} \qquad \text{Eq. 1065.655-21}$$

Where:
$\dot{n}_{exh}$ = raw exhaust molar flow rate from which you measured emissions.
$\dot{m}_{fuel}$ = fuel flow rate including humidity in intake air.
Example:
$\dot{m}_{fuel}$ = 7.559 g/s
w_C = 0.869 g/g
M_C = 12.0107 g/mol
$x_{Ccombdry}$ = 99.87 mmol/mol = 0.09987 mol/mol
$x_{H20exhdry}$ = 107.64 mmol/mol = 0.10764 mol/mol

$$\dot{n}_{exh} = \frac{7.559 \cdot 0.869 \cdot (1 + 0.10764)}{12.0107 \cdot 0.09987}$$

$\dot{n}_{exh}$= 6.066 mol/s

■ 311. Section 1065.667 is amended by revising paragraphs (d) and (e) to read as follows:

§ 1065.667 Dilution air background emission correction.

* * * * *

(d) The following is an example of using the flow-weighted mean fraction of dilution air in diluted exhaust, $\bar{x}_{dil/exh}$, and the total mass of background emissions calculated using the total flow of diluted exhaust, n_{dexh}, as described in § 1065.650(c):

$$m_{bkgnd} = \bar{x}_{dil/exh} \cdot m_{bkgnddexh} \qquad \text{Eq. 1065.667-1}$$

$$m_{bkgnddexh} = M \cdot \bar{x}_{bkgnd} \cdot n_{dexh} \qquad \text{Eq. 1065.667-2}$$

Example:
M_{NOx} = 46.0055 g/mol
$\bar{x}_{bkgnd}$ = 0.05 μmol/mol = $0.05 \cdot 10^{-6}$ mol/mol
n_{dexh} = 23280.5 mol
$\bar{x}_{dil/exh}$ = 0.843 mol/mol
$m_{bkgndNOxdexh}$ = $46.0055 \cdot 0.05 \cdot 10^{-6} \cdot 23280.5$
$m_{bkgndNOxdexh}$ = 0.0536 g
$m_{bkgndNOx}$ = 0.843 · 0.0536
$m_{bkgndNOx}$ = 0.0452 g

(e) The following is an example of using the fraction of dilution air in diluted exhaust, $x_{dil/exh}$, and the mass rate of background emissions calculated using the flow rate of diluted exhaust, $\dot{n}_{dexh}$, as described in § 1065.650(c):

$$\dot{m}_{bkgnd} = x_{dil/exh} \cdot \dot{m}_{bkgnddexh} \qquad \text{Eq. 1065.667-3}$$

$$\dot{m}_{bkgnddexh} = M \cdot x_{bkgnd} \cdot \dot{n}_{dexh} \qquad \text{Eq. 1065.667-4}$$

Example:

M_{NOx} = 46.0055 g/mol
x_{bkgnd} = 0.05 μmol/mol = 0.05·10^{-6} mol/mol
$\dot{n}_{dexh}$ = 23280.5 mol/s
$x_{dil/exh}$ = 0.843 mol/mol
$\dot{m}_{bkgndNOxdexh}$ = 36.0055·0.05·10^{-6} · 23280.5
$\dot{m}_{bkgndNOXdexh}$ = 0.0536 g/hr
$\dot{m}_{bkgndNOx}$ = 0.843 · 0.0536
$\dot{m}_{bkgndNOx}$ = 0.0452 g/hr

■ 312. Section 1065.670 is revised to read as follows:

§ 1065.670 NO_X intake-air humidity and temperature corrections.

See the standard-setting part to determine if you may correct NO_X emissions for the effects of intake-air humidity or temperature. Use the NO_X intake-air humidity and temperature corrections specified in the standard-setting part instead of the NO_X intake-air humidity correction specified in this part 1065. If the standard-setting part does not prohibit correcting NO_X emissions for intake-air humidity according to this part 1065, first apply any NO_X corrections for background emissions and water removal from the exhaust sample, then correct NO_X concentrations for intake-air humidity. You may use a time-weighted mean combustion air humidity to calculate this correction if your combustion air humidity remains within a tolerance of ±0.0025 mol/mol of the mean value over the test interval. For intake-air humidity correction, use one of the following approaches:

(a) For compression-ignition engines, correct for intake-air humidity using the following equation:

$$x_{NOxcor} = x_{NOxuncor} \cdot (9.953 \cdot x_{H20} + 0.832) \qquad \text{Eq. 1065.670-1}$$

Example:

$x_{NOxuncor}$ = 700.5 μmol/mol
x_{H2O} = 0.022 mol/mol
x_{NOxcor} = 700.5 · (9.953 · 0.022 + 0.832)
x_{NOxcor} = 736.2 μmol/mol

(b) For spark-ignition engines, correct for intake-air humidity using the following equation:

$$x_{NOxcor} = x_{NOxuncor} \cdot (18.840 \cdot x_{H20} + 0.68094) \qquad \text{Eq. 1065.670-2}$$

Example:

$x_{NOxuncor}$ = 154.7 μmol/mol
x_{H2O} = 0.022 mol/mol
x_{NOxcor} = 154.7 · (18.840 · 0.022 + 0.68094)
x_{NOxcor} = 169.5 μmol/mol

(c) Develop your own correction, based on good engineering judgment.

■ 313. Section 1065.672 is amended by revising paragraph (d)(7) to read as follows:

§ 1065.672 Drift correction.

* * * * *

(d) * * *

(7) Usually the reference concentration of the zero gas, $x_{refzero}$, is zero: $x_{refzero}$ = 0 μmol/mol. However, in some cases you might know that $x_{refzero}$ has a non-zero concentration. For example, if you zero a CO_2 analyzer using ambient air, you may use the default ambient air concentration of CO_2, which is 375 μmol/mol. In this case, $x_{refzero}$ = 375 μmol/mol. Note that when you zero an analyzer using a non-zero $x_{refzero}$, you must set the analyzer to output the actual $x_{refzero}$ concentration. For example, if $x_{refzero}$ = 375 μmol/mol, set the analyzer to output a value of 375 μmol/mol when the zero gas is flowing to the analyzer.

■ 314. Section 1065.690 is amended by revising paragraphs (c) and (e) to read as follows:

§ 1065.690 Buoyancy correction for PM sample media.

* * * * *

(c) *Air density.* Because a PM balance environment must be tightly controlled to an ambient temperature of (22 ±1) °C and humidity has an insignificant effect on buoyancy correction, air density is primarily a function of atmospheric pressure. Therefore you may use nominal constant values for temperature and humidity in the buoyancy correction equation in Eq. 1065.690–2.

* * * * *

(e) *Correction calculation.* Correct the PM sample media for buoyancy using the following equations:

$$m_{cor} = m_{uncor} \cdot \left[\frac{1 - \dfrac{\rho_{air}}{\rho_{weight}}}{1 - \dfrac{\rho_{air}}{\rho_{media}}} \right] \qquad \text{Eq. 1065.690-1}$$

Where:

m_{cor} = PM mass corrected for buoyancy.
m_{uncor} = PM mass uncorrected for buoyancy.
ρ_{air} = density of air in balance environment.

ρ_{weight} = density of calibration weight used to span balance.
ρ_{media} = density of PM sample media, such as a filter.

$$\rho_{air} = \frac{p_{abs} \cdot M_{mix}}{R \cdot T_{amb}} \qquad \text{Eq.1065.690-2}$$

Where:
p_{abs} = absolute pressure in balance environment.
M_{mix} = molar mass of air in balance environment.
R = molar gas constant.
T_{amb} = absolute ambient temperature of balance environment.

Example:

p_{abs} = 99.980 kPa
T_{sat} = T_{dew} = 9.5 °C
Using Eq. 1065.645–1,
p_{H20} = 1.1866 kPa
Using Eq. 1065.645–3,
x_{H2O} = 0.011868 mol/mol
Using Eq. 1065.640–9,
M_{mix} = 28.83563 g/mol
R = 8.314472 J/(mol·K)
T_{amb} = 20 °C

$$\rho_{air} = \frac{99.980 \cdot 28.83563}{8.314472 \cdot 293.15}$$

ρ_{air} = 1.18282 kg/m³
m_{uncorr} = 100.0000 mg
ρ_{weight} = 8000 kg/m³
ρ_{media} = 920 kg/m³

$$m_{cor} = 100.0000 \cdot \left[\frac{1 - \frac{1.18282}{8000}}{1 - \frac{1.18282}{920}} \right]$$

m_{cor} = 100.1139 mg

Subpart H— [Amended]

■ 315. Section 1065.701 is amended by revising paragraph (f) and Table 1 of § 1065.701 to read as follows:

§ 1065.701 General requirements for test fuels.

* * * * *

(f) *Service accumulation and field testing fuels.* If we do not specify a service-accumulation or field-testing fuel in the standard-setting part, use an appropriate commercially available fuel such as those meeting minimum specifications from the following table:

TABLE 1 OF § 1065.701—EXAMPLES OF SERVICE-ACCUMULATION AND FIELD-TESTING FUELS

Fuel category	Subcategory	Reference procedure [1]
Diesel	Light distillate and light blends with residual	ASTM D975–07b.
	Middle distillate	ASTM D6985–04a.
	Biodiesel (B100)	ASTM D6751–07b.
Intermediate and residual fuel	All	*See* § 1065.705.
Gasoline	Motor vehicle gasoline	ASTM D4814–07a.
	Minor oxygenated gasoline blends	ASTM D4814–07a.
Alcohol	Ethanol (Ed75–85)	ASTM D5798–07.
	Methanol (M70–M85)	ASTM D5797–07.
Aviation fuel	Aviation gasoline	ASTM D910–07.
	Gas turbine	ASTM D1655–07e01.
	Jet B wide cut	ASTM D6615–06.
Gas turbine fuel	General	ASTM D2880–03l.

[1] ASTM specifications are incorporated by reference in § 1065.1010.

■ 316. Section 1065.703 is amended by revising Table 1 of § 1065.703 to read as follows:

§ 1065.703 Distillate diesel fuel.

* * * * *

TABLE 1 OF § 1065.703—TEST FUEL SPECIFICATIONS FOR DISTILLATE DIESEL FUEL

Item	Units	Ultra low sulfur	Low sulfur	High sulfur	Reference procedure [1]
Cetane Number		40–50	40–50	40–50	ASTM D613–05.
Distillation range:					
Initial boiling point	°C	171–204	171–204	171–204	ASTM D86–07a.
10 pct. point		204–238	204–238	204–238	
50 pct. point		243–282	243–282	243–282	
90 pct. point		293–332	293–332	293–332	
Endpoint		321–366	321–366	321–366	
Gravity	°API	32–37	32–37	32–37	ASTM D4052–96e01.
Total sulfur, ultra low sulfur	mg/kg	7–15			*See* 40 CFR 80.580.
Total sulfur, low and high sulfur	mg/kg		300–500	800–2500	ASTM D2622–07 or alternates as allowed under 40 CFR 80.580.
Aromatics, min. (Remainder shall be paraffins, naphthalenes, and olefins)	g/kg	100	100	100	ASTM D5186–03.
Flashpoint, min	°C	54	54	54	ASTM D93–07.

TABLE 1 OF § 1065.703—TEST FUEL SPECIFICATIONS FOR DISTILLATE DIESEL FUEL—Continued

Item	Units	Ultra low sulfur	Low sulfur	High sulfur	Reference procedure [1]
Kinematic Viscosity	cSt	2.0–3.2	2.0–3.2	2.0–3.2	ASTM D445–06.

[1]ASTM procedures are incorporated by reference in § 1065.1010. *See* § 1065.701(d) for other allowed procedures.

Subpart I—[Amended]

■ 317. Section 1065.845 is amended by revising paragraph (b) to read as follows:

§ 1065.845 Response factor determination.

* * * * *

(b) Alcohol/carbonyl calibration gases must remain within ±2% of the labeled concentration. You must demonstrate the stability based on a quarterly measurement procedure with a precision of ±2% percent or another method that we approve. Your measurement procedure may incorporate multiple measurements. If the true concentration of the gas changes deviates by more than ±2%, but less than ±10%, the gas may be relabeled with the new concentration.

Subpart J— [Amended]

■ 318. Section 1065.910 is amended by revising paragraphs (a)(3) and (c) to read as follows:

§ 1065.910 PEMS auxiliary equipment for field testing.

* * * * *

(a) * * *

(3) *Flow restriction.* Use flow meters, connectors, and tubing that do not increase flow restriction so much that it exceeds the manufacturer's maximum specified value. You may verify this at the maximum exhaust flow rate by measuring pressure at the manufacturer-specified location with your system connected. You may also perform an engineering analysis to verify an acceptable configuration, taking into account the maximum exhaust flow rate expected, the field test system's flexible connectors, and the tubing's characteristics for pressure drops versus flow.

* * * * *

(c) Use mounting hardware as required for securing flexible connectors, ambient sensors, and other equipment. Use structurally sound mounting points such as vehicle frames, trailer hitch receivers, walk spaces, and payload tie-down fittings. We recommend mounting hardware such as clamps, suction cups, and magnets that are specifically designed for your application. We also recommend considering mounting hardware such as commercially available bicycle racks, trailer hitches, and luggage racks where applicable.

* * * * *

Subpart K—[Amended]

■ 319. Section 1065.1001 is amended by revising the definitions for "Duty cycle" and "Percent" to read as follows:

§ 1065.1001 Definitions.

* * * * *

Duty cycle means one of the following:

(1) A series of speed and torque values (or power values) that an engine must follow during a laboratory test. Duty cycles are specified in the standard-setting part. A single duty cycle may consist of one or more test intervals. A series of speed and torque values meeting the definition of this paragraph (1) may also be considered a test cycle. For example, a duty cycle may be a ramped-modal cycle, which has one test interval; a cold-start plus hot-start transient cycle, which has two test intervals; or a discrete-mode cycle, which has one test interval for each mode.

(2) A set of weighting factors and the corresponding speed and torque values, where the weighting factors are used to combine the results of multiple test intervals into a composite result.

* * * * *

Percent (%) means a representation of exactly 0.01 (with infinite precision). Significant digits for the product of % and another value, or the expression of any other value as a percentage, are defined as follows:

(1) Where we specify some percentage of a total value, the calculated value has the same number of significant digits as the total value. The specified percentage by which the total value is multiplied has infinite precision. Note that not all displayed or recorded digits are significant. For example, 2% of a span value where the span value is 101.3302 is 2.026604. However, where the span value has limited precision such that only one digit to the right of the decimal is significant (*i.e.,* the actual value is 101.3), 2% of the span value is 2.026.

(2) In other cases, determine the number of significant digits using the same method as you would use for determining the number of significant digits of any calculated value. For example, a calculated value of 0.321, where all three digits are significant, is equivalent to 32.1%.

* * * * *

PART 1068—GENERAL COMPLIANCE PROVISIONS FOR ENGINE PROGRAMS

■ 320. The authority citation for part 1068 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

■ 321. The heading for part 1068 is revised as set forth above.

Subpart A—[Amended]

■ 322. Section 1068.1 is amended by revising paragraphs (a)(4), (b)(4), (b)(8), and (d)(1) to read as follows:

§ 1068.1 Does this part apply to me?

(a) * * *

(4) Marine compression-ignition engines we regulate under 40 CFR part 1042.

* * * * *

(b) * * *

(4) Land-based nonroad compression-ignition engines we regulate under 40 CFR part 89.

* * * * *

(8) Marine compression-ignition engines we regulate under 40 CFR parts 89 or 94.

* * * * *

(d) * * *

(1) The provisions of §§ 1068.30 and 1068.310 apply for stationary spark-ignition engines built on or after January 1, 2004, and for stationary compression-ignition engines built on or after January 1, 2006.

* * * * *

■ 323. Section 1068.25 is amended by adding paragraph (c) to read as follows:

§ 1068.25 What information must I give to EPA?

* * * * *

(c) You are responsible for statements and information in your applications for certification or any other requests or reports. If you provide statements or information to someone for submission to EPA, you are responsible for these statements and information as if you had submitted them to EPA yourself. For example, knowingly submitting false information to someone else for inclusion in an application for certification would be deemed to be a submission of false information to the U.S. government in violation of 18 U.S.C. 1001.

■ 324. Section 1068.30 is amended as follows:

■ a. By revising the introductory text of the definition for "Engine".

■ b. By adding a definition for "Engine configuration" in alphabetical order.

■ c. By adding a definition for "Gas turbine engine" in alphabetical order.

■ d. By revising the definition for "Ultimate purchaser".

§ 1068.30 What definitions apply to this part?

* * * * *

Engine means an engine block with an installed crankshaft, or a gas turbine engine. The term engine does not include engine blocks without an installed crankshaft, nor does it include any assembly of reciprocating engine components that does not include the engine block. (**Note:** For purposes of this definition, any component that is the primary means of converting an engine's energy into usable work is considered a crankshaft, whether or not it is known commercially as a crankshaft.) This includes complete and partially complete engines as follows:

* * * * *

Engine configuration means a unique combination of engine hardware and calibration within an engine family. Engines within a single engine configuration differ only with respect to normal production variability or factors unrelated to emissions.

* * * * *

Gas turbine engine means anything commercially known as a gas turbine engine or any collection of assembled engine components that is substantially similar to engines commercially known as gas turbine engines. For example, a jet engine is a gas turbine engine. Gas turbine engines may be complete or partially complete. Turbines that rely on external combustion such as steam engines are not gas turbine engines.

* * * * *

Ultimate purchaser means the first person who in good faith purchases a new engine or new piece of equipment for purposes other than resale.

* * * * *

■ 325. Section 1068.31 is amended by revising paragraph (d) to read as follows:

§ 1068.31 What provisions apply to nonroad or stationary engines that change their status?

* * * * *

(d) Changing the status of a nonroad engine to be a new stationary engine as described in paragraph (e) of this section is a violation of § 1068.101(a)(1) unless the engine complies with all the requirements of this chapter for new stationary engines of the same type (for example, a compression-ignition engine rated at 40 kW) and model year. For a new stationary engine that is required to be certified under 40 CFR part 60, the engine must have been certified to be compliant with all the requirements that apply to new stationary engines of the same type and model year, and must be in its certified configuration. Note that the definitions of "model year" in the standard-setting parts generally identify the engine's original date of manufacture as the basis for determining which standards apply if it becomes a stationary engine after it is no longer new. For example, *see* 40 CFR 60.4219 and 60.4248.

* * * * *

■ 326. Section 1068.40 is revised to read as follows:

§ 1068.40 What special provisions apply for implementing changes in the regulations?

(a) During the 12 months following the effective date of any change in the provisions of this part, you may ask to apply the previously applicable provisions. We will generally approve your request if you can demonstrate that it would be impractical to comply with the new requirements. We may consider the potential for adverse environmental impacts in our decision. Similarly, in unusual circumstances, you may ask for relief under this paragraph (a) from new requirements that apply under the standard-setting part.

(b) During the 60 days following the effective date of any change in the provisions of this part, you may use the previously applicable provisions without request if they meet either of the following criteria:

(1) The new provisions require you to redesign your engines/equipment, modify your engine/equipment labels, or change your production procedures.

(2) The new provisions change what you must include in an application for certification that you submit before the end of this 60-day period. You are not required to amend such applications to comply with the new provisions for that model year; however, this allowance does not apply for later model years, even if you certify an engine family using carryover emission data. This allowance does not affect your obligation to provide information that we request separate from an application for certification.

(c) Prior to the dates listed you may comply with earlier versions of applicable regulations as follows:

(1) Prior to June 1, 2010, you may comply with the provisions of § 1068.240 that were in effect on April 30, 2010.

(2) [Reserved]

■ 327. Section 1068.45 is amended by revising paragraph (c) introductory text to read as follows:

§ 1068.45 General labeling provisions.

* * * * *

(c) *Labels on packaging.* Unless we specify otherwise, where we require engine/equipment labels that may be removable, you may instead label the packaging if the engines/equipment are packaged together as described in this paragraph (c). For example, this may involve packaging engines together by attaching them to a rack, binding them together on a pallet, or enclosing them in a box. The provisions of this paragraph (c) also apply for engines/equipment boxed individually where you do not apply labels directly to the engines/equipment. The following provisions apply if you label the packaging instead of labeling engines/equipment individually:

* * * * *

■ 328. Section 1068.101 is revised to read as follows:

§ 1068.101 What general actions does this regulation prohibit?

This section specifies actions that are prohibited and the maximum civil penalties that we can assess for each violation in accordance with 42 U.S.C. 7522 and 7524. The maximum penalty values listed in paragraphs (a) and (b) of this section apply as of January 12, 2009. As described in paragraph (h) of this section, these maximum penalty limits are different for earlier violations and they may be adjusted as set forth in 40 CFR part 19.

(a) The following prohibitions and requirements apply to manufacturers of new engines, manufacturers of equipment containing these engines, and manufacturers of new equipment, except as described in subparts C and D of this part:

(1) *Introduction into commerce.* You may not sell, offer for sale, or introduce or deliver into commerce in the United States or import into the United States any new engine/equipment after emission standards take effect for the engine/equipment, unless it is covered by a valid certificate of conformity for its model year and has the required label or tag. You also may not take any of the actions listed in the previous sentence with respect to any equipment

containing an engine subject to this part's provisions unless the engine is covered by a valid certificate of conformity for its model year and has the required engine label or tag. We may assess a civil penalty up to $37,500 for each engine or piece of equipment in violation.

(i) For purposes of this paragraph (a)(1), a valid certificate of conformity is one that applies for the same model year as the model year of the equipment (except as allowed by § 1068.105(a)), covers the appropriate category of engines/equipment (such as locomotive or Marine SI), and conforms to all requirements specified for equipment in the standard-setting part. Engines/equipment are considered not covered by a certificate unless they are in a configuration described in the application for certification.

(ii) The requirements of this paragraph (a)(1) also cover new engines you produce to replace an older engine in a piece of equipment, unless the engine qualifies for the replacement-engine exemption in § 1068.240.

(iii) For engines used in equipment subject to equipment-based standards, you may not sell, offer for sale, or introduce or deliver into commerce in the United States or import into the United States any new engine unless it is covered by a valid certificate of conformity for its model year and has the required label or tag. *See* the standard-setting part for more information about how this prohibition applies.

(2) *Reporting and recordkeeping.* This chapter requires you to record certain types of information to show that you meet our standards. You must comply with these requirements to make and maintain required records (including those described in § 1068.501). You may not deny us access to your records or the ability to copy your records if we have the authority to see or copy them. Also, you must give us complete and accurate reports and information without delay as required under this chapter. Failure to comply with the requirements of this paragraph is prohibited. We may assess a civil penalty up to $37,500 for each day you are in violation. In addition, knowingly submitting false information is a violation of 18 U.S.C. 1001, which may involve criminal penalties and up to five years imprisonment.

(3) *Testing and access to facilities.* You may not keep us from entering your facility to test engines/equipment or inspect if we are authorized to do so. Also, you must perform the tests we require (or have the tests done for you). Failure to perform this testing is prohibited. We may assess a civil penalty up to $37,500 for each day you are in violation.

(b) The following prohibitions apply to everyone with respect to the engines and equipment to which this part applies:

(1) *Tampering.* You may not remove or render inoperative any device or element of design installed on or in engines/equipment in compliance with the regulations prior to its sale and delivery to the ultimate purchaser. You also may not knowingly remove or render inoperative any such device or element of design after such sale and delivery to the ultimate purchaser. This includes, for example, operating an engine without a supply of appropriate quality urea if the emissions control system relies on urea to reduce NOx emissions or the use of incorrect fuel or engine oil that renders the emissions control system inoperative. Section 1068.120 describes how this applies to rebuilding engines. *See* the standard-setting part, which may include additional provisions regarding actions prohibited by this requirement. For a manufacturer or dealer, we may assess a civil penalty up to $37,500 for each engine or piece of equipment in violation. For anyone else, we may assess a civil penalty up to $3,750 for each day an engine or piece of equipment is operated in violation. This prohibition does not apply in any of the following situations:

(i) You need to repair the engine/equipment and you restore it to proper functioning when the repair is complete.

(ii) You need to modify the engine/equipment to respond to a temporary emergency and you restore it to proper functioning as soon as possible.

(iii) You modify new engines/equipment that another manufacturer has already certified to meet emission standards and recertify them under your own family. In this case you must tell the original manufacturer not to include the modified engines/equipment in the original family.

(2) *Defeat devices.* You may not knowingly manufacture, sell, offer to sell, or install, any part that bypasses, impairs, defeats, or disables the control of emissions of any regulated pollutant, except as explicitly allowed by the standard-setting part. We may assess a civil penalty up to $3,750 for each part in violation.

(3) *Stationary engines.* For an engine that is excluded from any requirements of this chapter because it is a stationary engine, you may not move it or install it in any mobile equipment except as allowed by the provisions of this chapter. You may not circumvent or attempt to circumvent the residence-time requirements of paragraph (2)(iii) of the nonroad engine definition in § 1068.30. Anyone violating this paragraph (b)(3) is deemed to be a manufacturer in violation of paragraph (a)(1) of this section. We may assess a civil penalty up to $37,500 for each engine or piece of equipment in violation.

(4) *Competition engines/equipment.* For uncertified engines/equipment that are excluded or exempted from any requirements of this chapter because they are to be used solely for competition, you may not use any of them in a manner that is inconsistent with use solely for competition. Anyone violating this paragraph (b)(4) is deemed to be a manufacturer in violation of paragraph (a)(1) of this section. We may assess a civil penalty up to $37,500 for each engine or piece of equipment in violation.

(5) *Importation.* You may not import an uncertified engine or piece of equipment if it is defined to be new in the standard-setting part with a model year for which emission standards applied. Anyone violating this paragraph (b)(5) is deemed to be a manufacturer in violation of paragraph (a)(1) of this section. We may assess a civil penalty up to $37,500 for each engine or piece of equipment in violation. Note the following:

(i) The definition of new is broad for imported engines/equipment; uncertified engines and equipment (including used engines and equipment) are generally considered to be new when imported.

(ii) Used engines/equipment that were originally manufactured before applicable EPA standards were in effect are generally not subject to emission standards.

(6) *Warranty, recall, and maintenance instructions.* You must meet your obligation to honor your emission-related warranty under § 1068.115, including any commitments you identify in your application for certification. You must also fulfill all applicable requirements under subpart F of this part related to emission-related defects and recalls. You must also provide emission-related installation and maintenance instructions as described in the standard-setting part. Failure to meet these obligations is prohibited. Also, except as specifically provided by regulation, you are prohibited from directly or indirectly communicating to the ultimate purchaser or a later purchaser that the emission-related warranty is valid only if the owner has service performed at

authorized facilities or only if the owner uses authorized parts, components, or systems. We may assess a civil penalty up to $37,500 for each engine or piece of equipment in violation.

(7) *Labeling.* (i) You may not remove or alter an emission control information label or other required permanent label except as specified in this paragraph (b)(7) or otherwise allowed by this chapter. Removing or altering an emission control information label is a violation of paragraph (b)(1) of this section. However, it is not a violation to remove a label in the following circumstances:

(A) The engine is destroyed, is permanently disassembled, or otherwise loses its identity such that the original title to the engine is no longer valid.

(B) The regulations specifically direct you to remove the label. For example, *see* § 1068.235.

(C) The part on which the label is mounted needs to be replaced. In this case, you must have a replacement part with a duplicate of the original label installed by the certifying manufacturer or an authorized agent, except that the replacement label may omit the date of manufacture if applicable. We generally require labels to be permanently attached to parts that will not normally be replaced, but this provision allows for replacements in unusual circumstances, such as damage in a collision or other accident.

(D) The original label is incorrect, provided that it is replaced with the correct label from the certifying manufacturer or an authorized agent. This allowance to replace incorrect labels does not affect whether the application of an incorrect original label is a violation.

(ii) Removing or altering a temporary or removable label contrary to the provisions of this paragraph (b)(7)(ii) is a violation of paragraph (b)(1) of this section.

(A) For labels identifying temporary exemptions, you may not remove or alter the label while the engine/equipment is in an exempt status. The exemption is automatically revoked for each engine/equipment for which the label has been removed.

(B) For temporary or removable consumer information labels, only the ultimate purchaser may remove the label.

(iii) You may not apply a false emission control information label. You also may not manufacture, sell, or offer to sell false labels. The application, manufacture, sale, or offer for sale of false labels is a violation of this section (such as paragraph (a)(1) or (b)(2) of this section). Note that applying an otherwise valid emission control information label to the wrong engine is considered to be applying a false label.

(c) If you cause someone to commit a prohibited act in paragraph (a) or (b) of this section, you are in violation of that prohibition.

(d) Exemptions from these prohibitions are described in subparts C and D of this part and in the standard-setting part.

(e) The standard-setting parts describe more requirements and prohibitions that apply to manufacturers (including importers) and others under this chapter.

(f) The specification of prohibitions and penalties in this part does not limit the prohibitions and penalties described in the Clean Air Act. Additionally, a single act may trigger multiple violations under this section and the Act. We may pursue all available administrative, civil, or criminal remedies for those violations even if the regulation references only a single prohibited act in this section.

(g) [Reserved]

(h) The maximum penalty values listed in paragraphs (a) and (b) of this section apply as of January 12, 2009. Maximum penalty values for earlier violations are published in 40 CFR part 19. Maximum penalty limits may be adjusted after January 12, 2009 based on the Consumer Price Index. The specific regulatory provisions for changing the maximum penalties, published in 40 CFR part 19, reference the applicable U.S. Code citation on which the prohibited action is based. The following table is shown here for informational purposes:

TABLE 1 OF § 1068.101—LEGAL CITATION FOR SPECIFIC PROHIBITIONS FOR DETERMINING MAXIMUM PENALTY AMOUNTS

Part 1068 regulatory citation of prohibited action	General description of prohibition	U.S. Code citation for Clean Air Act authority
§ 1068.101(a)(1)	Introduction into U.S. commerce of an uncertified source.	42 U.S.C. 7522(a)(1) and (a)(4).
§ 1068.101(a)(2)	Failure to provide information	42 U.S.C. 7522(a)(2).
§ 1068.101(a)(3)	Denying access to facilities	42 U.S.C. 7522(a)(2).
§ 1068.101(b)(1)	Tampering with emission controls by a manufacturer or dealer.	42 U.S.C. 7522(a)(3).
	Tampering with emission controls by someone other than a manufacturer or dealer.	
§ 1068.101(b)(2)	Sale or use of a defeat device	42 U.S.C. 7522(a)(3).
§ 1068.101(b)(3)	Mobile use of a stationary engine	42 U.S.C. 7522(a)(1) and (a)(4).
§ 1068.101(b)(4)	Noncompetitive use of uncertified engines/equipment that is exempted for competition.	42 U.S.C. 7522(a)(1) and (a)(4).
§ 1068.101(b)(5)	Importation of an uncertified source	42 U.S.C. 7522(a)(1) and (a)(4).
§ 1068.101(b)(6)	Recall and warranty	42 U.S.C. 7522(a)(4).
§ 1068.101(b)(7)	Removing labels	42 U.S.C. 7522(a)(3).

■ 329. Section 1068.103 is amended by revising paragraph (a) to read as follows:

§ 1068.103 What are the provisions related to the duration and applicability of certificates of conformity?

(a) Engines/equipment covered by a certificate of conformity are limited to those that are produced during the period specified in the certificate and conform to the specifications described in the certificate and the associated application for certification. For the purposes of this paragraph (a), "specifications" includes any conditions or limitations identified by the manufacturer or EPA. For example, if the application for certification specifies certain engine configurations, the certificate does not cover any configurations that are not specified. We may ignore any information provided in the application that we determine is not relevant to a demonstration of compliance with applicable regulations, such as your projected production volumes in many cases.

* * * * *

■ 330. Section 1068.105 is amended by revising paragraph (a) to read as follows:

§ 1068.105 What other provisions apply to me specifically if I manufacture equipment needing certified engines?

* * * * *

(a) *Transitioning to new engine-based standards.* If new engine-based emission standards apply in a given model year, your equipment in that calendar year must have engines that are certified to the new standards, except that you may continue to use up normal inventories of earlier engines that were built before the date of the new or changed standards. For purposes of this paragraph (a), normal inventory applies for engines you possess and engines from your engine supplier's inventory. (**Note:** this paragraph (a) does not apply in the case of new remanufacturing standards.) For example, if your normal inventory practice is to keep on hand a one-month supply of engines based on your upcoming production schedules, and a new tier of standards starts to apply for the 2015 model year, you may order engines consistent with your normal inventory requirements late in the engine manufacturer's 2014 model year and install those engines in your equipment, regardless of the date of installation. Also, if your model year starts before the end of the calendar year preceding new standards, you may use engines from the previous model year for those units you produce before January 1 of the year that new standards apply. If emission standards for the engine do not change in a given model year, you may continue to install engines from the previous model year without restriction (or any earlier model year for which the same standards apply). You may not circumvent the provisions of § 1068.101(a)(1) by stockpiling engines that were built before new or changed standards take effect. Similarly, you may not circumvent the provisions of § 1068.101(a)(1) by knowingly installing engines that were stockpiled by engine suppliers in violation of § 1068.103(f). Note that this allowance does not apply for equipment subject to equipment-based standards. *See* 40 CFR 1060.601 for similar provisions that apply for equipment subject to evaporative emission standards.

* * * * *

■ 331. Section 1068.120 is amended by revising paragraph (e) to read as follows:

§ 1068.120 What requirements must I follow to rebuild engines?

* * * * *

(e) If the rebuilt engine remains installed or is reinstalled in the same piece of equipment, you must rebuild it to the original configuration, except as allowed by this paragraph (e). You may rebuild it to a different certified configuration of the same or later model year. You may also rebuild it to a certified configuration from an earlier model year as long as the earlier configuration is as clean or cleaner than the original configuration. For purposes of this paragraph (e), "as clean or cleaner" means one of the following:

(1) For engines not certified with a Family Emission Limit for calculating credits for a particular pollutant, this means that the same emission standard applied for both model years. This includes supplemental standards such as Not-to-Exceed standards.

(2) For engines certified with a Family Emission Limit for a particular pollutant, this means that the configuration to which the engine is being rebuilt has a Family Emission Limit for that pollutant that is at or below the standard that applied to the engine originally, and is at or below the original Family Emission Limit.

* * * * *

■ 332. Section 1068.125 is amended by revising paragraph (b) introductory text to read as follows:

§ 1068.125 What happens if I violate the regulations?

* * * * *

(b) *Administrative penalties.* Instead of bringing a civil action, we may assess administrative penalties if the total is less than $295,000 against you individually. This maximum penalty may be greater if the Administrator and the Attorney General jointly determine that a greater administrative penalty assessment is appropriate, or if the limit is adjusted under 40 CFR part 19. No court may review this determination. Before we assess an administrative penalty, you may ask for a hearing (subject to 40 CFR part 22). The Administrator may compromise or remit, with or without conditions, any administrative penalty that may be imposed under this section.

* * * * *

Subpart C—[Amended]

■ 333. Section 1068.215 is amended by revising paragraphs (a) and (b) to read as follows:

§ 1068.215 What are the provisions for exempting manufacturer-owned engines/equipment?

(a) You are eligible for the exemption for manufacturer-owned engines/equipment only if you are a certificate holder. Any engine for which you meet all applicable requirements under this section is exempt without request.

(b) Engines/equipment may be exempt without a request if they are nonconforming engines/equipment under your ownership, possession, and control and you do not operate them for purposes other than to develop products, assess production methods, or promote your engines/equipment in the marketplace, or other purposes we approve. You may not loan, lease, sell, or use the engine/equipment to generate revenue, either by itself or for an engine installed in a piece of equipment, except as allowed by § 1068.201(i). Note that this paragraph (b) does not prevent the sale or shipment of a partially complete engine to a secondary engine manufacturer that will meet the requirements of this paragraph (b). *See* § 1068.262 for provisions related to shipping partially complete engines to secondary engine manufacturers.

* * * * *

■ 334. Section 1068.225 is amended by revising paragraph (b) to read as follows:

§ 1068.225 What are the provisions for exempting engines/equipment for national security?

* * * * *

(b) Manufacturers may request a national security exemption for engines/equipment not meeting the conditions of paragraph (a) of this section as long as the request is endorsed by an agency of the Federal government responsible for national defense. In your request, explain why you need the exemption.

* * * * *

■ 335. Section 1068.240 is amended as follows:

■ a. By revising paragraphs (a) and (b)(6).

■ b. By adding paragraph (b)(7).

■ c. By revising paragraphs (c) introductory text, (c)(2)(ii), and (c)(4).

■ d. By revising paragraphs (d), (e), and (g)(2).

§ 1068.240 What are the provisions for exempting new replacement engines?

* * * * *

(a) *General provisions.* You are eligible for the exemption for new replacement engines only if you are a certificate holder. Note that this exemption does not apply for locomotives (40 CFR 1033.601) and that unique provisions apply to marine compression-ignition engines (40 CFR

1042.615). Paragraphs (b), (c), and (d) of this section describe different approaches for exempting new replacement engines where the engines are specially built to correspond to an earlier model year that was subject to less stringent standards than those that apply for current production (or is no longer covered by a certificate of conformity). Paragraph (e) of this section describes a simpler approach for exempting partially complete new replacement engines that are built under a certificate of conformity that is valid for producing engines for the current model year.

(b) * * *

(6) You add a permanent label, consistent with § 1068.45, with your corporate name and trademark and the following additional information:

(i) Add the following statement if the engine being replaced was not subject to any emission standards under this chapter:

THIS ENGINE DOES NOT COMPLY WITH U.S. EPA EMISSION REQUIREMENTS. SELLING OR INSTALLING THIS ENGINE FOR ANY PURPOSE OTHER THAN TO REPLACE AN ENGINE BUILT BEFORE JANUARY 1, [Insert appropriate year reflecting when the earliest tier of standards began to apply to engines of that size and type] MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY.

(ii) Add the following statement if the engine being replaced was subject to emission standards:

THIS ENGINE COMPLIES WITH U.S. EPA EMISSION REQUIREMENTS FOR [Identify the appropriate emission standards (by model year, tier, or emission levels) for the replaced engine] ENGINES UNDER 40 CFR 1068.240. SELLING OR INSTALLING THIS ENGINE FOR ANY PURPOSE OTHER THAN TO REPLACE A [Identify the appropriate emission standards for the replaced engine, by model year(s), tier(s), or emission levels)] ENGINE MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY.

(7) Engines exempt under this paragraph (b) may not be introduced into commerce before you make the determination under paragraph (b)(3), except as specified in this paragraph (b)(7). We may waive this restriction for engines excluded under paragraph (c)(5) of this section that you ship to a distributor. Where we waive this restriction, you must take steps to ensure that the engine is installed consistent with the requirements of this paragraph (b). For example, at a minimum you must report to us annually whether engines we allowed you to ship to a distributor under this paragraph (b)(7) have been placed into service or remain in inventory. After an engine is placed into service, your report must describe how the engine was installed consistent with the requirements of this paragraph (b). Send these reports to the Designated Compliance Officer by the deadlines we specify.

(c) *Previous-tier replacement engines without tracking.* You may produce a limited number of new replacement engines that are not from a currently certified engine family under the provisions of this paragraph (c). If you produce new engines under this paragraph (c) to replace engines subject to emission standards, the new replacement engine must be in a configuration identical in all material respects to the old engine and meet the requirements of § 1068.265. This would apply, for example, for engine configurations that were certified in an earlier model year but are no longer covered by a certificate of conformity. You must comply with the requirements of paragraph (b) of this section for any number of replacement engines you produce in excess of what we allow under this paragraph (c). Engines produced under this paragraph (c) may be redesignated as engines subject to paragraph (b) of this section, as long as you meet all the requirements and conditions of paragraph (b) of this section before the end of the calendar year in which the engine was produced. The following provisions apply to engines exempted under this paragraph (c):

(2) * * *

(ii) Partially complete engines exempted under paragraph (e) of this section.

* * * * *

(4) Add a permanent label as specified in paragraph (b)(6) of this section. For partially complete engines, you may alternatively add a permanent or removable label as specified in paragraph (d) of this section.

* * * * *

(d) *Partially complete engines.* The following requirements apply if you ship a partially complete replacement engine under paragraph (b) or (c) of this section:

(1) Provide instructions specifying how to complete the engine assembly such that the resulting engine conforms to the applicable certificate of conformity or the specifications of § 1068.265. Where a partially complete engine can be built into multiple different configurations, you must be able to identify all the engine models and model years for which the partially complete engine may properly be used for replacement purposes. Your instructions must make clear how the final assembler can determine which configurations are appropriate for the engine they receive.

(2) You must label the engine as follows:

(i) If you have a reasonable basis to believe that the fully assembled engine will include the original emission control information label, you may add a removable label to the engine with your corporate name and trademark and the statement: "This replacement engine is exempt under 40 CFR 1068.240." This would generally apply if all the engine models that are compatible with the replacement engine were covered by a certificate of conformity and they were labeled in a position on the engine or equipment that is not included as part of the partially complete engine being shipped for replacement purposes. Removable labels must meet the requirements specified in § 1068.45.

(ii) If you do not qualify for using a removable label in paragraph (d)(1) of this section, you must add a permanent label in a readily visible location, though it may be obscured after installation in a piece of equipment. Include on the permanent label your corporate name and trademark, the engine's part number (or other identifying information), and the statement: "This replacement engine is exempt under 40 CFR 1068.240." If there is not enough space for this statement, you may alternatively add: "REPLACEMENT" or "SERVICE ENGINE". For purposes of this paragraph (d)(2), engine part numbers permanently stamped or engraved on the engine are considered to be included on the label.

(e) *Partially complete current-tier replacement engines.* The provisions of paragraph (d) of this section apply for partially complete engines you produce from a current line of certified engines or vehicles. This applies for engine-based and equipment-based standards as follows:

(1) Where engine-based standards apply, you may introduce into U.S. commerce short blocks or other partially complete engines from a currently certified engine family as replacement components for in-use equipment powered by engines you originally produced. You must be able to identify all the engine models and model years for which the partially complete engine may properly be used for replacement purposes.

(2) Where equipment-based standards apply, you may introduce into U.S. commerce engines that are identical to engines covered by a current certificate of conformity by demonstrating compliance with currently applicable standards where the engines will be installed as replacement engines. These engines might be fully assembled, but we would consider them to be partially complete engines because they are not yet installed in the equipment.

* * * * *

(g)* * *

(2) Anyone installing or completing assembly of an exempted new replacement engine is deemed to be a manufacturer of a new engine with respect to the prohibitions of § 1068.101(a)(1). This applies to all engines exempted under this section.

* * * * *

■ 336. Section 1068.260 is amended by revising paragraphs (a), (b), (c), and (e) to read as follows:

§ 1068.260 What general provisions apply for selling or shipping engines that are not yet in their certified configuration?

* * * * *

(a) The provisions of this paragraph (a) apply for emission-related components that cannot practically be assembled before shipment because they depend on equipment design parameters.

(1) You do not need an exemption to ship an engine that does not include installation or assembly of certain emission-related components, if those components are shipped along with the engine. For example, you may generally ship aftertreatment devices along with engines rather than installing them on the engine before shipment. We may require you to describe how you plan to use this provision.

(2) You may ask us at the time of certification for an exemption to allow you to ship your engines without emission-related components. If we allow this, we may specify conditions that we determine are needed to ensure that shipping the engine without such components will not result in the engine being operated outside of its certified configuration. *See* paragraph (d) of this section for additional provisions that apply in certain circumstances.

(b) You do not need an exemption to ship engines without specific components if they are not emission-related components identified in Appendix I of this part. For example, you may generally ship engines without radiators needed to cool the engine.

(c) If you are a certificate holder, partially complete engines shipped between two of your facilities are exempt, subject to the provisions of this paragraph (c), as long as you maintain ownership and control of the engines until they reach their destination. We may also allow this where you do not maintain actual ownership and control of the engines (such as hiring a shipping company to transport the engines) but only if you demonstrate that the engines will be transported only according to your specifications. *See* § 1068.261(b) for the provisions that apply instead of this paragraph (c) for the special case of integrated manufacturers using the delegated-assembly exemption. Notify us of your intent to use this exemption in your application for certification, if applicable. Your exemption is effective when we grant your certificate. You may alternatively request an exemption in a separate submission; for example, this would be necessary if you will not be the certificate holder for the engines in question. We may require you to take specific steps to ensure that such engines are in a certified configuration before reaching the ultimate purchaser. Note that since this is a temporary exemption, it does not allow you to sell or otherwise distribute to ultimate purchasers an engine in an uncertified configuration. Note also that the exempted engine remains new and subject to emission standards (*see* definition of "exempted" in § 1068.30) until its title is transferred to the ultimate purchaser or it otherwise ceases to be new.

* * * * *

(e) Engines used in hobby vehicles are not presumed to be engines subject to the prohibitions of § 1068.101. Hobby vehicles are reduced-scale models of vehicles that are not capable of transporting a person. Some gas turbine engines are subject to the prohibitions of § 1068.101, but we do not presume that all gas turbine engines are subject to these prohibitions. Other engines that do not have a valid certificate of conformity or exemption when introduced into U.S. commerce are presumed to be engines subject to the prohibitions of § 1068.101 unless we determine that such engines are excluded from the prohibitions of § 1068.101.

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§ 1068.261 [Amended]

■ 337. Section 1068.261 is amended by removing and reserving paragraph (c)(5).

Subpart D—[Amended]

■ 338. Section 1068.325 is amended by revising paragraph (g) to read as follows:

§ 1068.325 What are the temporary exemptions for imported engines/equipment?

* * * * *

(g) *Exemption for partially complete engines.* You may import an engine if another company already has a certificate of conformity and will be modifying the engine to be in its final certified configuration or a final exempt configuration under the provisions of § 1068.262. You may also import a partially complete engine by shipping it from one of your facilities to another under the provisions of § 1068.260(c). If you are importing a used engine that becomes new as a result of importation, you must meet all the requirements that apply to original engine manufacturers under § 1068.262.

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Subpart E—[Amended]

§ 1068.410 [Amended]

■ 339. Section 1068.410 is amended by removing and reserving paragraph (e)(1).

■ 340. Section 1068.440 is amended by revising paragraph (b) to read as follows:

§ 1068.440 How do I ask EPA to reinstate my suspended certificate?

* * * * *

(b) Give us test data from production engines/equipment showing that engines/equipment in the remedied family comply with all the emission standards that apply.

Subpart F—[Amended]

■ 341. Section 1068.501 is amended by revising paragraphs (a)(5), (e), and (f) to read as follows:

§ 1068.501 How do I report emission-related defects?

* * * * *

(a)* * *

(5) You must track the information specified in paragraph (b)(1) of this section. You must assess this data at least every three months to evaluate whether you exceed the thresholds specified in paragraphs (e) and (f) of this section. Where thresholds are based on a percentage of engines/equipment in the family, use actual U.S.-directed production volumes for the whole model year when they become available. Use projected production figures until the actual production figures become available. You are not required to collect additional information other than that specified in paragraph (b)(1) of this section before reaching a threshold for an investigation specified in paragraph (e) of this section.

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(e) *Thresholds for conducting a defect investigation.* You must begin a defect investigation based on the following number of engines/equipment that may have the defect:

(1) For engines/equipment with maximum engine power at or below 560 kW:

(i) For families with annual production below 500 units: 50 or more engines/equipment.

(ii) For families with annual production from 500 to 50,000 units: more than 10.0 percent of the total number of engines/equipment in the family.

(iii) For families with annual production from 50,000 to 550,000 units: more than the total number of engines/equipment represented by the following equation:

Investigation threshold = 5,000 + (Production units—50,000) × 0.04

(iv) For families with annual production above 550,000 units: 25,000 or more engines/equipment.

(2) For engines/equipment with maximum engine power greater than 560 kW:

(i) For families with annual production below 250 units: 25 or more engines/equipment.

(ii) For families with annual production at or above 250 units: more than 10.0 percent of the total number of engines/equipment in the family.

(f) *Thresholds for filing a defect report.* You must send a defect report based on the following number of engines/equipment that have the defect:

(1) For engines/equipment with maximum engine power at or below 560 kW:

(i) For families with annual production below 1,000 units: 20 or more engines/equipment.

(ii) For families with annual production from 1,000 to 50,000 units: more than 2.0 percent of the total number of engines/equipment in the family.

(iii) For families with annual production from 50,000 to 550,000 units: more than the total number of engines/equipment represented by the following equation:

Reporting threshold = 1,000 + (Production units—50,000) × 0.01

(iv) For families with annual production above 550,000 units: 6,000 or more engines/equipment.

(2) For engines/equipment with maximum engine power greater than 560 kW:

(i) For families with annual production below 150 units: 10 or more engines/equipment.

(ii) For families with annual production from 150 to 750 units: 15 or more engines/equipment.

(iii) For families with annual production above 750 units: more than 2.0 percent of the total number of engines/equipment in the family.

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