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EPA Proposed Emissions Standards for Category 3 Marine Diesel Engines on Oceangoing Vessels

New Development

On August 28, 2009, the Environmental Protection Agency (EPA) published a Notice of Proposed Rulemaking (NPRM) that will require significant reductions in nitrogen oxide (NO_x) emissions from Category 3 compression-ignition marine diesel engines installed on U.S.-flag vessels. Category 3 engines are marine diesels with per cylinder displacements at or above 30 liters. These engines are primarily used as propulsion engines on oceangoing vessels such as bulk carriers, cruise ships, tankers, and container ships. EPA is also proposing to amend its diesel fuel regulations to prohibit the production and sale of marine fuel oil above 1,000 parts per million (ppm) sulfur for use in the waters within the proposed U.S. Emission Control Area (ECA) (see <http://www.blankrome.com/siteFiles/maritime0409-08.pdf>) and internal U.S. waters, and to allow for the production and sale of 1,000 ppm sulfur fuel for use in Category 3 marine engines only. The NPRM also sets forth new EPA regulations to implement MARPOL Annex VI (see <http://www.blankrome.com/siteFiles/maritime0508-14.pdf>). Comments are due by September 28, 2009.

Background

EPA's National Clean Diesel Campaign is aimed at reducing diesel emissions from mobile and stationary sources through in-engine controls, add-on controls,

and diesel fuel regulations. EPA has coordinated its marine engine and fuel regulations with the MARPOL Annex VI regulations. The current Category 3 engine EPA Tier 1 emission standard is the Annex VI Tier I NO_x emission standard and applied to U.S.-flag vessels beginning with engines built in 2004. MARPOL Annex VI standards are designated as Tiers I, II, and III; EPA Category 3 emission standards are designated as Tiers 1, 2, and 3.

At the Tier 1 level, emissions from oceangoing vessels remain relatively high. As EPA points out, the 2004 Category 3 engine Tier 1 emission control technology is comparable to technologies required on nonroad diesel engines since the early 1990s and the fuel used in these engines can have a sulfur content of 30,000 ppm or more. In 2009, emissions from Category 3 engines are estimated by EPA to account for 913,000 tons or around 10% of mobile source NO_x emissions, 71,000 tons or about 24% of mobile source diesel fine PM emissions (PM_{2.5}), and 597,000 tons or about 80% of mobile source sulfur oxides (SO_x) emissions. Without additional emission controls, the percent of mobile source NO_x, PM_{2.5}, and SO_x emissions attributable to oceangoing vessels is estimated to grow to 40%, 48%, and 95%, respectively, by 2030.

Annex VI was recently amended to include more stringent Tier II and III NOx emission standards and a global limit on fuel sulfur content. These requirements will be phased in through 2016. The amendments further provide that the Tier III NOx standards and a more restrictive fuel sulfur content will apply in ECAs. The United States proposed the designation of an ECA in March 2009.

The NPRM, which will implement the Annex VI Tier II and III emission standards and the reduced sulfur content in marine fuel, is estimated to reduce annual NOx emissions by 1.2 million tons and PM emissions by 143,000 tons by 2030. According to EPA, the emission reductions are estimated to annually prevent between 13,000 and 32,000 PM-related premature deaths, between 220 and 980 ozone-related premature deaths, 1,500,000 work days lost, and 10,000,000 minor restricted-activity days.

Proposed Rule

Overview

The proposed rule would include engine and fuel regulations pursuant to the Clean Air Act, which are applicable to U.S.-flag vessels, and regulations to implement the new engine emission and fuel sulfur limits in the amendments to Annex VI, which are applicable to all vessels regardless of flag and that are implemented in the United States through the Act to Prevent Pollution from Ships (APPS). The Annex VI regulations will be implemented in conjunction with the proposed ECA in which all vessels, regardless of flag, would be required to meet the most stringent engine emissions and marine fuel sulfur requirements in Annex VI. The combination of the Clean Air Act diesel regulations, MARPOL Annex VI, and the APPS will apply comparable emission standards to the vast majority of vessels entering U.S. ports or operating in U.S. waters.

The NPRM would significantly revise 40 C.F.R. Part 80, *Regulation of Fuels and Fuel Additives*, and Part 1042, *Control of Emissions from New and In-Use Marine Compression-Ignition Engines*. The NPRM would also create a new Part 1043, *Control of NOx, SOx, and PM Emissions from Marine Engines and Vessels Subject to the MARPOL Protocol*, and make technical changes to 12 more parts of Title 40 of the Code of Federal Regulations.

Category 3 Engine Standards

EPA is proposing 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 EPA to set standards regulating emissions of NOx, volatile organic compounds (VOCs), and carbon monoxide (CO) for categories of engines.

The proposed near-term Tier 2 NOx standards would apply beginning with new engines manufactured in 2011 and would require use of more effective in-engine technologies. The proposed long-term Tier 3 NOx standards would apply beginning in 2016 and would require the use of aftertreatment technology such as selective catalytic reduction (SCR). The NOx standards vary with engine RPMs.

	Less than 130 RPM NOx g/kWh	130-200 RPM NOx g/kWh	Over 200 RPM NOx g/kWh
Tier 2	14.4	44.0 x RPM ^(-0.23)	7.7
Tier 3	3.4	9.0 x RPM ^(-0.20)	2.0

The NPRM also includes standards for emissions of hydrocarbons (HC) and CO from new Category 3 engines. The CO standard will be 5.0 g/kWh and the HC standard will be 2.0 g/kWh. These emission standards will prevent increases in CO and HC that might otherwise occur from the application of certain technologies to reduce NOx. Because U.S.-flag vessels routinely operate outside the proposed ECA, EPA is proposing to allow the use of so-called Alternative Emission Control Devices (AECDs) that would permit a ship to meet less stringent requirements (*i.e.*, turn off Tier 3 aftertreatment) on the high seas. Engines would still be required to meet the Tier 2 NOx limits when the AECD is implemented and an AECD would not be allowed on any Tier 2 or earlier engine.

EPA did not propose to set a standard for PM emissions for Category 3 engines; however, significant PM emissions benefits will result from the ECA fuel sulfur requirements. EPA is proposing to require Category 3 marine diesel engine manufacturers to conduct PM emissions measurements on engines in order to gather additional information regarding PM emissions.

Fuel Sulfur Limits

EPA is proposing to revise its fuel regulations, which allow EPA to regulate fuels that contribute to air pollution that endangers public health or welfare. The revised fuel sulfur limit will match the limits that will apply under Annex VI in ECAs. Most vessels with Category 3 propulsion engines currently operate on high-sulfur heavy fuel oil (HFO), also known as residual or bunker fuel. Because of the high sulfur content of HFO, these engines have high PM and SO₂ emissions. There is currently no sulfur limit on HFO. The ECA fuel sulfur limit will be 1,000 ppm.

EPA's current diesel fuel program sets a sulfur limit of 15 ppm, which will be fully phased-in by December 1, 2014, for nonroad, locomotive, and marine (NRLM) diesel fuel produced for distribution and use in the United States. The NPRM proposed two changes to the diesel fuel program. First, EPA is proposing to prohibit the production and sale of fuel oil with sulfur content greater than 1,000 ppm for use in the waters within the proposed ECA, as well as internal U.S. waters. Second, EPA is proposing to revise the existing diesel fuel program to allow for the production and sale of 1,000 ppm sulfur fuel for use in Category 3 marine vessels only. The change will allow production and distribution of fuel consistent with the sulfur limits that will become applicable in ECA beginning in 2015. The 1,000 ppm sulfur fuel will be called "ECA marine fuel."

Once the change is implemented, the EPA diesel fuel program will consist of the following fuel standards: 15 ppm motor vehicle, nonroad, locomotive, and marine (MVNRLM) diesel fuel; heating oil; and 1,000 ppm ECA marine fuel. Category 1 and 2 marine diesel engines will operate on MVNRLM diesel fuel and Category 3 engines will operate on ECA marine fuel.

As part of EPA's overall diesel sulfur fuel regulatory program, refiners and diesel importers are required to designate the type of diesel and the sulfur level for each batch of fuel produced or imported. As the diesel fuel is transferred throughout the distribution system, product transfer documents (PTDs) must be exchanged each time the fuel batch changes custody. These Designate and Track (D&T) provisions are the principle compliance mechanism in the diesel sulfur fuel program and are intended to prevent cross-contamination and assure

delivery of adequate supplies of low sulfur diesel to the end user. The D&T program also requires quarterly and annual reporting, fuel pump labeling, and record-keeping. As part of the NPRM, EPA will eliminate the current 500 ppm locomotive and marine diesel fuel standard. Elimination of this fuel will simplify the diesel sulfur program.

EPA is requesting comments on reducing some of the D&T reporting requirements. This portion of the NPRM should be reviewed by refiners, importers, pipeline operators, fuel terminal operators and barge, rail, and truck diesel transportation companies.

MARPOL Annex VI and APPS

As part of the NPRM, EPA is proposing regulations to implement MARPOL Annex VI. The proposed rule will establish a new Part 1043, *Control of NO_x, SO_x, and PM Emissions from Marine Engines and Vessels Subject to the MARPOL Protocol*. Part 1043 will establish procedures for EPA to issue Engine International Air Pollution Prevention (EIAPP) Certificates under Annex VI and to implement the ECA, once it becomes effective. An engine can be dual-certified under EPA's Clean Air Act marine diesel engine program and the MARPOL Annex VI/APPS program. However, EPA is proposing to require that engine manufacturers submit separate applications for the Part 1042 and EIAPP certificates.

Foreign-Flag Vessels

In prior marine diesel engine rulemakings, EPA has not applied Clean Air Act emissions standards to engines on foreign-flag vessels. In the advance NPRM for Category 3 engine standards (see <http://www.blankrome.com/siteFiles/maritime0108-01.pdf>), EPA requested comments on whether the standards should apply to foreign-flag vessels. With regard to diesel engines on foreign-flag vessels that enter U.S. ports, EPA has decided not to regulate foreign-flag vessels under the Clean Air Act diesel regulations. EPA's rationale is that engines on foreign-flag vessels will be subject to the same NO_x limits through MARPOL Annex VI and that the United States can enforce compliance pursuant to Annex VI and the recent amendments to the APPS. Because the effectiveness of this approach is contingent on the designation of areas off U.S. coasts as an ECA, EPA will revisit this approach if the ECA is not adopted.

Non-Party Vessels

The proposed regulations in the new Part 1043 require that vessels flagged by a country that is not a party to MARPOL (non-Party vessels) must comply with Regulations 13, 14, and 18 of Annex VI when operating in U.S. waters. The recent amendments to APPS require the EPA to adopt regulations for non-Party vessels such that they are not treated more favorably than vessels of countries that are parties to the MARPOL Protocol. Because such vessels cannot get EIAPP certificates, the proposed regulations require non-Party vessels to obtain equivalent documentation of compliance with the NOx standards of Annex VI. Non-Party vessels will also have to meet the ECA requirements.

Gas Turbines

Gas turbines are not subject to EPA marine combustion-ignition diesel engine standards because they do not meet the definition of combustion-ignition engines. While there are currently only a small number of turbine-powered marine engines, EPA is concerned that the exclusion may become a “loophole” for avoiding the use of combustion-ignition marine diesels with SCR emission controls. EPA is proposing to close the potential loophole by revising the regulations to treat new gas turbine engines (as well as other non-reciprocating engines) as compression-ignition engines and applying the standards for new Category 1 and Category 2 engines to gas turbine engines. However, EPA would not consider any gas turbine as a Category 3 engine and the largest gas turbine engines would be considered to

be Category 2 engines, even those that had rated power more typical of Category 3 diesel engines.

Existing Vessels and Engines

EPA is also considering a programmatic alternative to encourage additional NOx reductions from Category 3 engines. In combination with state or local incentives, this program would provide incentives for owners to achieve, on a voluntary basis, greater emission reductions earlier than required for new Category 3 engines, and to retrofit existing Category 3 engines with more advanced NOx emission control technologies. EPA would establish a “Voluntary Marine Verification Program” (VMVP) as an extension of its current diesel retrofit program. Under the VMVP program, EPA would set up a verification protocol, based on simplified emission testing, for any vessel owner who provides data to show that its Category 3 propulsion engines achieve a more stringent tier of NOx limits (Tier 2 or Tier 3) than otherwise applies to those engines. EPA is requesting comments on the VMVP.

Conclusion and Recommendation

This NPRM will result in more stringent regulation of large marine diesel engines on oceangoing vessels once implemented. All Category 3 engine manufacturers and other parties involved in the construction, repair, or operation of U.S.-flag and foreign-flag vessels operating within the proposed ECA should review the NPRM and submit comments as appropriate before the comment period ends on September 28, 2009. ■

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