§ 31.3402(t)–1 [Corrected]

On Page 26679, column 2, under the paragraph heading **§ 31.3402(t)–1 Withholding requirement on certain payments made by government entities**, line 7 from the bottom of the paragraph, the language "a mere renewal of a contract. A material" is corrected to read "a mere renewal of a contract that does not otherwise materially affect the property or services to be provided under the contract, the terms of payment for the property or services under the contract, or the amount payable for the property or services under the contract. A material".

LaNita VanDyke,

Chief, Publications and Regulations Branch, Legal Processing Division, Associate Chief Counsel (Procedure and Administration).

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 86

[FRL–9315–2]

Control of Emissions From New Highway Vehicles and Engines; Guidance on EPA's Certification Requirements for Heavy-Duty Diesel Engines Using Selective Catalytic Reduction Technology

AGENCY: Environmental Protection Agency (EPA).

ACTION: Request for comments.

SUMMARY: EPA is requesting comment on draft guidance and related interpretations concerning the application of certain emission certification regulations to those on-highway heavy-duty diesel engines that are using selective catalytic reduction systems to meet Federal emission standards. EPA will review the comments and provide final guidance and interpretations in a future **Federal Register** document.

DATES: Any party may submit written comments by July 7, 2011.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2010–0444, by one of the following methods:

- *On-line at http://www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *E-mail: a-and-r-docket@epa.gov.*
- *Fax:* (202) 566–1741.
- *Mail:* Air and Radiation Docket, Docket ID No. EPA–HQ–OAR–2010–0444, Environmental Protection Agency, Mailcode: 6102T, 1200 Pennsylvania Avenue, NW., Washington, DC 20460. Please include a total of two copies.
- *Hand Delivery:* EPA Docket Center, Public Reading Room, EPA West Building, Room 3334, 1301 Constitution Avenue, NW., Washington, DC 20460. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2010–0444. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *http://www.regulations.gov,* including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *http://www.regulations.gov* or e-mail. The *http://www.regulations.gov* Web site is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through *http://www.regulations.gov* your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket, visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.* For additional instructions on submitting comments, go to "What Should I Consider as I Prepare My Comments for EPA?"

Docket: All documents in the docket are listed in the *http://www.regulations.gov* index. 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, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *http://www.regulations.gov* or in hard copy at the Air and Radiation 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 Air Docket is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: Greg Orehowsky, Heavy-Duty and Nonroad Engine Group, Compliance and Innovative Strategies Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency; 1200 Pennsylvania Avenue, (6405J), NW., Washington, DC 20460. Telephone number: 202–343–9292; Fax number: 202–343–2804; E-mail address: *Orehowsky.Gregory@epa.gov.*

SUPPLEMENTARY INFORMATION:

I. Purpose

This **Federal Register** document describes and seeks public comment on draft guidance for complying with adjustable parameter regulations at 40 CFR 86.094–22 as they apply to certification of on-highway heavy-duty diesel engines using selective catalytic reduction (SCR) technology to meet emission standards for oxides of nitrogen (NO_X). This draft guidance includes EPA's interpretation of relevant regulatory provisions in light of available information on current and developing approaches for effective SCR controls. After considering any public comments received, EPA will issue the guidance and interpretations in the **Federal Register**, and will use them in reviewing any application for certification application involving SCR received on or after the effective date of the guidance. The draft guidance contained in this document reflects the fact that manufacturers of heavy-duty engines and operators of trucks have gained significant experience in the design and use of SCR systems for these engines, and this experience should be reflected in the certification process. We invite public comment on the draft guidance and interpretations set forth below.

Until the effective date of the final guidance and interpretations, manufacturers should continue to refer to the regulations and the existing guidance documents noted below and to work with their certification representatives. We recognize that SCR technology will continue to mature, and we anticipate that appropriate designs for heavy-duty diesel vehicles and heavy-duty diesel engines using SCR systems may continue to evolve as additional experience with the technology is gained.

This draft document provides specific examples of how we interpret existing certification regulations and how we intend to apply these regulations to heavy-duty diesel engines using SCR systems, based on the information available to us. These examples are not exclusive and are to be considered examples. Manufacturers remain able to present their own unique strategies that are not the same as the examples we are providing, and such strategies will remain subject to our review and approval under the certification regulations. Manufacturers must still show EPA that they meet all statutory and regulatory requirements when they apply for certification.

II. Overview

In promulgating the 0.20 gram per brake horsepower-hour NO_X standard for 2010 model year heavy-duty diesel engines, based on a specified regulatory test procedure, EPA recognized SCR technology as one potential approach for achieving the required emission reductions. EPA identified several issues for manufacturers to address in developing and applying SCR technology. Those issues related largely to the technology's use of a chemical reducing agent to reduce NO_X emissions. The reductant is generally in liquid form, which is referred to in this document as DEF ("diesel exhaust fluid"). DEF is stored in a tank located on the vehicle and is injected into the exhaust downstream of the engine. SCR technologies require drivers to refill DEF on a regular basis and are dependent on appropriately broad availability of DEF.[1] EPA regulations governing certification of engines generally require manufacturers to show that emission control technologies are adequately designed to limit adjustments that may increase emissions ("adjustable parameters," discussed in detail below). SCR is unique among emission controls in that it requires on-going driver interaction to ensure proper operation of the system.

To comply with the NO_X standard, most heavy-duty engine manufacturers developed SCR systems because of their high efficiency in reducing NO_X emissions. A relatively unsophisticated SCR system can achieve 60 percent reduction and a robust system can achieve greater than 80 percent reduction. This enables engine calibrations that increase fuel economy. Additionally, SCR technology has a relatively lower cost compared to NO_X adsorber technology.

In developing SCR systems, manufacturers consulted with EPA about how SCR systems could be designed and what other steps would be needed (*e.g.,* concerning DEF availability) to allow SCR to be used consistent with EPA regulations. Over a period of years, EPA has developed and refined guidance to address how manufacturers could effectively address issues related to compliance with the regulations for adjustable parameters. Manufacturers have addressed the adjustable parameter regulations by designing engines that employ warning systems for the driver and engine operation-related inducements for drivers to refill DEF tanks with proper DEF.

Manufacturers have also worked to increase DEF availability through infrastructure development. DEF infrastructure and sales volume have continued to grow since introduction of 2010 model year trucks equipped with SCR systems. Initially, DEF availability was concentrated around major truck routes, but has since increased in areas away from these locations. DEF is now available for sale in every state at truck stops and service facilities, and is available for delivery to fleet locations, as well. To assist drivers in finding DEF, multiple Internet-based DEF locator services have also been developed. Sales volumes of DEF are increasing significantly and are believed to correlate with the increased delivery and use of SCR equipped trucks. Increasing demand supported by sales volume should continue to drive the expanding infrastructure.

III. Relevant Regulatory Provisions

Under Section 203(a)(1) of the Clean Air Act, engines and/or vehicles must be certified as conforming with all applicable regulations before they may be introduced into commerce. Of particular relevance for on-highway heavy-duty diesel engines using SCR technology are the provisions that govern adjustable parameters at 40 CFR 86.094–22.[2] In particular, 40 CFR 86.094–22(e) authorizes EPA to determine those vehicle or engine parameters that will be subject to adjustment for emission testing purposes, and 40 CFR 86.094–22(e)(1) discusses how the Agency determines which parameters are subject to adjustment.

It is important for manufacturers to control the emissions performance of an engine or vehicle over the full range of any adjustable parameter in order to ensure that in-use operation is as good as projected at the time of certification. When emission-related parameters can be adjusted, there is a concern that the engine or vehicle can be operated at settings other than the manufacturer's recommended setting, possibly increasing emission levels.

If a parameter is subject to adjustment, the engine may be tested over any point in the range of adjustment and must meet the emissions standard through the range of adjustment. The Administrator determines the range of adjustment for emissions testing based on whether the means used to inhibit improper adjustment (*e.g.,* limits, stops, seals) are adequate. 40 CFR 86.094–22(e)(2) sets forth how EPA determines the adequacy of the limits, stops, seals or other means used to inhibit improper adjustment. For any parameter that is not adequately limited, 40 CFR 86.094–22(e) authorizes EPA to adjust the setting within the physical limits or stops during certification and other compliance testing. If a parameter is determined to be adequately inaccessible, sealed, or otherwise inhibited from adjustment, the vehicle will only be emission tested at the actual settings to which the parameter is adjusted during production. 40 CFR 86.094–22(e)(2)(i) and (ii) identifies certain types of parameters subject to adjustment, and identifies criteria related to technology, time, or expense for determining whether adjustment of the parameter is adequately limited. These provisions indicate that the technology used to limit adjustment, or the burden on the operator to make an adjustment (*e.g.,* more than one-half hour in time or more

[1] A Class 8 truck equipped with standard dual 150-gallon fuel tanks can travel approximately 3,600 miles between DEF tank refills, assuming a 20-gallon DEF tank and representative DEF dosing rate of 3 percent of fuel usage. DEF price varies depending on whether it is supplied via bulk container (commonly used by fleets and growing numbers of truck stops) or a 1 to 2.5-gallon jug. Current prices for bulk DEF at a truck stop are generally less than $3.00 per gallon and jug prices can be $4.00 or more per gallon.

[2] The regulatory provisions governing allowable maintenance at 40 CFR 86.004–25 and 40 CFR 86.094–25, and auxiliary emission control devices, or AECDs at 40 CFR 86.004–2, 40 CFR 86.082–2 and 40 CFR 86.004–16 are also relevant to certification of engines using SCR technology, but are outside the scope of this document. Manufacturers should continue to refer to existing guidance noted below covering these regulatory provisions.

than $20.00 in cost),[3] can be adequate to determine that the parameter is adequately limited and would not be treated as adjustable outside of the specified range for purposes of emissions testing for compliance with the standard. 40 CFR 86.094–22(e)(2)(iv) states that in determining the adequacy of a physical limit, stop, seal, or other means used to inhibit adjustment of an adjustable parameter, EPA will consider the likelihood that settings other than the manufacturer's recommended setting will occur during in-use operation of the vehicle or engine, considering such factors as, but not limited to: (1) The difficulty and cost of getting access to make an adjustment, (2) the damage to the engine/vehicle if an attempt is made, (3) the effect of settings beyond the limits, stops, seals, or other means on engine performance characteristics other than emission characteristics, and (4) surveillance information from similar in-use vehicles or engines.

The emission control efficiency of an SCR system is highly dependent on the presence and quality of the reducing agent. Consequently, it is critical that a SCR-equipped vehicle be designed so that it is highly unlikely that the vehicle will be used without proper reducing agent. Given that most SCR system designs store the required DEF in a tank located on the vehicle and depend on the vehicle operator to refill the tank with DEF, EPA has indicated in previous guidance that manufacturers relying on SCR systems for emission control must incorporate engine design elements that make it highly unlikely the vehicle will operate for any substantial period without the appropriate DEF. In practice, this has meant designing engines or vehicles to alert operators of when the engine will run out of DEF, when the DEF is inadequate, or if the SCR system is not properly operating due to tampering or some malfunction. This has also meant designing engines or vehicles with features that motivate operators to ensure proper use of the SCR system, such as engine derates and vehicle speed inhibitors. Engine derates and vehicle speed inhibitors alter important vehicle performance characteristics, such as acceleration, maximum vehicle speed attainable, and ability to maintain speed under various loads, that are clearly noticeable to a driver.

[3] This cost is represented in terms of 1978 dollars. Adjusting for inflation, this would equate to roughly $70.00 in 2011 dollars.

IV. Prior Guidance

On March 27, 2007, EPA issued guidance regarding the certification of light-duty and heavy-duty motor vehicles and heavy-duty motor vehicle engines using SCR systems (CISD–07–07).[4] The purpose of the guidance was to discuss EPA's intended approach to certification of engines using SCR technologies and to facilitate manufacturer planning in advance of certification. EPA noted that several regulatory requirements are uniquely relevant to the certification and implementation of engines using SCR, specifically the regulatory provisions dealing with allowable maintenance and adjustable parameters. EPA suggested that an SCR system that requires the vehicle operator to replenish DEF periodically is potentially an adjustable parameter, and that unless operation of the vehicle without DEF was sufficiently inhibited through built-in performance deterioration or some similar system, vehicles using SCR could be treated as having an adjustable parameter range including no DEF in the tank and could not be certified if the vehicle would exceed emission standards without DEF in the tank. EPA provided guidance regarding how engines using SCR could be designed consistent with these regulatory provisions to allow for certification of such engines. EPA provided examples of possible sufficient inducements, including prohibiting operation if DEF is not present and having vehicle performance degraded in a manner that would be safe but onerous enough to discourage the user from operating the vehicle until the DEF tank was refilled. EPA also highlighted the need to assure that DEF would be available and accessible to operators and suggested places where DEF could be made available, such as dealerships and truck stops. We recognized that SCR technology was evolving and that our guidance also might need to evolve.

On February 18, 2009, EPA issued additional guidance (CISD–09–04) to supplement CISD–07–07.[5] This guidance provided additional details regarding certification of heavy-duty engines with SCR systems. Particularly, it outlined design elements that would make it highly likely operators would replenish DEF prior to the tank being empty and operators would not tamper with SCR systems. The guidance provided specific examples of robust driver warnings and inducements to help ensure operators addressed conditions such as low reductant level, improper reductant quality, and tampered system components. EPA continued to note the potential need for additional guidance or changes in our approach for SCR certification.

On December 30, 2009, EPA revised CISD–09–04.[6] The intent of this revision was to clarify that CISD–09–04 was guidance and did not set forth binding requirements. EPA revised the guidance and made clear that manufacturers wishing to certify engines using SCR technology should consult the revised guidance document as well as the guidance provided in CISD–07–07. EPA also reminded manufacturers that they should work with their certification representatives to provide EPA adequate descriptions of the strategies that are incorporated in their SCR systems in order to demonstrate compliance with EPA's certification requirements as set forth in 40 CFR Part 86.

EPA has continued to monitor the development of SCR technology and its effectiveness in achieving emission control in use. On July 20, 2010, in conjunction with the California Air Resources Board (CARB), we conducted a public workshop to review existing guidance and policies regarding design and operation of SCR-equipped heavy-duty diesel engines.[7] In particular, EPA reviewed approaches to designing SCR-equipped engines to monitor and induce appropriate responses to insufficient or improper DEF, as well as strategies regarding SCR systems that are tampered with or defective. EPA developed a strawman proposal regarding future certification of heavy-duty diesel engines equipped with SCR technology,[8] and opened a docket to allow public comment regarding these issues.[9] As part of the strawman, EPA included approaches for engines

[4] U.S. Environmental Protection Agency, Dear Manufacturer Letter regarding "Certification Procedure for Light-Duty and Heavy-Duty Diesel Vehicles and Heavy-Duty Diesel Engines Using Selective Catalytic Reduction (SCR) Technologies," March 27, 2007, reference number CISD–07–07 (LDV/LDT/MDT/HDV/HDE), *available at http://iaspub.epa.gov/otaqpub/display_file.jsp?docid=16677&flag=1.*

[5] *See* docket number EPA–HQ–OAR–2010–0444–0018.

[6] U.S. Environmental Protection Agency, Dear Manufacturer Letter regarding "Revised Guidance for Certification of Heavy-Duty Diesel Engines Using Selective Catalyst Reduction (SCR) Technologies," December 30, 2009, reference number CISD–09–04 (HDDE), *available at http://iaspub.epa.gov/otaqpub/display_file.jsp?docid=20532&flag=1.*

[7] *See* 75 FR 39251 (July 8, 2010).

[8] *See* docket number EPA–HQ–OAR–2010–0444–0016. The strawman proposal was not final guidance.

[9] *See* 75 FR 39251 (July 8, 2010). Public comments received in response to the public workshop are available in EPA's docket EPA–HQ–OAR–2010–0444, *available at http://www.regulations.gov.*

equipped with SCR, including designs that monitor on-board DEF supply and induce action to avoid low DEF supply and operation with no DEF (or an insufficient amount to allow proper dosing). EPA also discussed detection of poor quality DEF, as well as warnings and inducements if poor quality DEF is detected. In addition, EPA discussed designs for engines equipped with SCR systems to sufficiently reduce the likelihood that SCR system operation would be circumvented. EPA cautioned manufacturers to review any element of design that could be tampered with and prevent proper operation of the SCR system. Lastly, EPA noted DEF freeze protection and infrastructure requirements, and requirements regarding unregulated pollutants.

V. Experience to Date

A. EPA's Certification Program

For the 2010 and 2011 model years, EPA has certified a total of 71 on-highway heavy-duty diesel engine families with SCR systems produced by 11 engine manufacturers. As part of the certification process, engine manufacturers are required to disclose various aspects of the SCR system designs, including elements of their system that may be adjustable parameters. To date, manufacturers' designs have employed driver warnings and inducements for low reductant level, poor reductant quality, and tampered or malfunctioning SCR systems.

In order to ensure adequate availability of DEF for use with manufacturers' engines, at the time of certification EPA reviews manufacturers' plans for DEF availability and accessibility. EPA expects manufacturers to have DEF available at their dealerships, to encourage DEF availability at third-party locations, and to have an emergency backup plan in case DEF is not readily available.

When manufacturers implement new emission controls, the engine technology generally evolves and the manufacturers make improvements over the course of initial model years as they develop and certify engines and vehicles for each new model year. The process of certification involves interaction between manufacturers and EPA technical staff about the nature and effectiveness of emission controls and often results in manufacturers modifying emission control strategies based on feedback from EPA. In the case of SCR technology, manufacturers have certified only a few model years of engines that incorporate SCR technology, and EPA has seen maturing approaches to implementing the technology. For example, from the 2010 to 2011 model years manufacturers improved or developed new engine/vehicle diagnostic software that provides more or better driver warnings and inducements related to the SCR system. Similarly, manufacturers are also evaluating various sensors that are expected to reduce the amount of time necessary to detect poor quality DEF in future model years. As with other new engine technologies, defects in the operation of SCR system strategies (*e.g.,* driver inducements) are sometimes discovered in the field, and manufacturers initiate campaigns to fix the issues and incorporate these fixes in current and new model year production engines.

B. California Air Resources Board SCR Field Evaluation

The California Air Resources Board (CARB) recently conducted field investigations within the State of California to evaluate implementation of SCR technology for 2010 model year vehicles.[10] The investigations included: (1) A survey of DEF availability, (2) a survey to determine whether drivers are using DEF or have tampered with SCR components, (3) an evaluation of SCR driver inducements, and (4) an evaluation of the potential emissions impact of improper SCR operation.

CARB conducted surveys of DEF availability in March 2010 and August 2010. Both surveys indicated that DEF is readily available at major diesel truck stop refueling stations along major interstate highways in California. In the first survey DEF was determined to be available at 85 percent of refueling stations, and in the second survey DEF was determined to be available at 92 percent of refueling stations. In addition, both surveys indicated that 30 percent of retailers that normally supply parts for heavy-duty vehicles have DEF available. CARB noted that as older engines are retired and an increasing number of SCR-equipped engines enter into operation, the availability of DEF should increase with demand. It concluded that DEF is currently being offered in adequate supply for the relatively limited number of vehicles using SCR.

In September 2010, CARB conducted random inspections of 69 trucks equipped with 2010 model year engines to determine whether DEF was being used, whether the DEF was of appropriate quality, and whether driver warning indicators (*i.e.,* warning lights, messages, or audible alarms) were present. CARB found that all trucks were using DEF and that the DEF was of appropriate quality. No DEF-related warning indicators were active and there was no evidence of tampering with SCR system components. Additionally, CARB solicited information from drivers about their experience with locating DEF. Sixty drivers indicated that they encountered no problem locating DEF, while nine indicated they had minor problems locating DEF in California or in other states. For those encountering problems, the issue was limited to not being able to purchase DEF at a particular refueling station and instead having to purchase it at a different refueling station. Sixty-eight drivers stated that they never ran out of DEF while operating their vehicles and only one driver indicated that he drove for only 10 miles with an empty DEF tank as indicated by the driver's gauge.

In the second half of 2010, CARB conducted an evaluation of SCR inducements on three trucks equipped with 2010 model year engines and SCR systems. The trucks evaluated were a Freightliner Cascadia equipped with a 12.8-liter Detroit Diesel DD13 engine (Test Vehicle 1), a Kenworth T800 equipped with a 14.9-liter Cummins ISX engine (Test Vehicle 2), and a Dodge 5500 equipped with a 6.7-liter Cummins ISB engine (Test Vehicle 3). Each truck was operated under various test conditions to observe the operation of driver inducements and their effectiveness in compelling the driver to take a particular course of action. The conditions under which the trucks were operated included: (1) Operation until the DEF tank was depleted, (2) operation with water in the reductant tank instead of DEF, and (3) operation with a disabled DEF system. CARB staff referenced the vehicle owner's manuals and the February 2009 EPA guidance to ascertain the expected driver warning indicators and inducement strategies that were expected in each condition.

On Test Vehicle 1, the warnings and inducements were implemented as expected. CARB deemed the warnings effective in drawing the driver's attention to the need for SCR-related service. The initial inducement incorporated in Test Vehicle 1 was a 25 percent engine torque derate and a 55 mph speed limitation. CARB concluded that driving the truck with these inducements was neither acceptable nor tolerable, especially when trying to accelerate or driving up-hill, and would

[10] California Air Resources Board, Report regarding "Heavy-Duty Vehicle Selective Catalytic Reduction Technology Field Evaluation," May 2011, *available at http://www.arb.ca.gov/msprog/cihd/cihd.htm.*

likely cause a driver to refill with DEF or correct the SCR problem as needed. If the initial inducement were ignored, the severe inducement incorporated in Test Vehicle 1 was a 5 mph speed limitation, which worked as designed. The only way to resume normal operation after the severe inducement was to have the vehicle serviced by draining the water out of the system, filling the reductant tank with DEF, and having the system reset by an authorized service technician. CARB determined that the inducements were effective for this vehicle because the constant inducement strategies and risk of costly repairs would not be worth the downtime and financial loss to the business when DEF could simply have been added to ensure proper vehicle operation.

On Test Vehicles 2 and 3, the warnings and some inducements were implemented as expected, but certain inducements were not. Test Vehicle 2 implemented the initial inducement (25 percent engine torque derate) in response to DEF depletion, DEF contamination, and DEF tampering conditions, but failed to implement the severe inducement (5 mph speed limitation) in response to any of these conditions. Test Vehicle 3 incorporates an engine no-restart severe inducement after a 500-mile to no-restart countdown. After the 500-mile countdown reaches zero and a safe harbor event (key-off) is experienced, the truck should not restart. The inducement worked as expected in response to DEF contamination and DEF tampering conditions. In response to the DEF depletion condition, Test Vehicle 3 started the 500-mile to no-restart countdown as expected. However, after the countdown reached zero and the truck was shut off, the truck successfully started the next day and reset the countdown. On a subsequent restart attempt after the countdown reached zero, the truck successfully implemented the no-restart condition.

CARB contacted Cummins, the engine manufacturer for Test Vehicles 2 and 3, about the failures. Cummins was aware of and addressing the issues underlying the failures. In the case of Test Vehicle 2, Cummins in the second quarter of 2010 had implemented a correction on their engine production line and in the third quarter of 2010 had begun a voluntary recall of the engine family to correct the problem.[11] Similarly, in the case of Test Vehicle 3, Cummins was aware of a DEF heater malfunction that contributed to the final inducement not initiating as expected and was already addressing the issue. CARB concluded that for both Test Vehicles 2 and 3, the warnings were deemed effective in drawing the driver's attention to the need for SCR-related service. CARB also concluded that the inducements on Test Vehicle 2 were difficult to objectively assess due to a malfunctioning throttle position sensor that was encountered during the testing. CARB concluded that the inducements on Test Vehicle 3 were effective once the DEF heater malfunction was corrected.

C. American Trucking Associations Survey

In 2010, the American Trucking Associations (ATA) through its technical advisory group conducted a survey of 12 trucking fleets operating across the United States regarding their experience operating trucks with SCR-equipped engines.[12] The surveyed fleets are some of the largest in the country and operate an approximate total of 2,000 SCR-equipped trucks. The fleet owners indicated that they would probably purchase approximately 5,900 SCR-equipped trucks in 2011.

None of the surveyed fleets reported any problems locating DEF and none reported an engine derate, vehicle speed limitation, or no-restart event caused by operation with an empty DEF tank. Similarly, no fleet reported issues with the quality of DEF. There were six reported instances of an engine derate resulting from circumstances other than an empty DEF tank. Two of these instances were caused by malfunctioning sensors and four were caused by melted DEF supply hoses. None of these instances were associated with the behavior of the operator. Survey respondents also reported a total of five instances of NO_X sensor malfunctions, none of which were related to driver tampering.[13] ATA's fleet survey indicates that drivers do not favor inducements involving an engine power derate, especially if it occurs while a truck under heavy load is driving up-hill.

D. Cummins Survey

In 2010, Cummins collected information from 47 different customer-owned vehicles that were equipped with Cummins 11.9-liter and 15-liter engines using SCR.[14] The vehicles were equipped with data-loggers that wirelessly transmit data to Cummins periodically on the operation of those vehicles. At the time the data was gathered, the vehicles had accumulated a total of more than 2.4 million miles of operation across the United States. For approximately 99.7 percent of the operating miles of the surveyed vehicles, the DEF level was above 10 percent of tank capacity. For the remainder of vehicle operation:

- DEF level was between 5 and 10 percent of tank capacity for less than 0.13 percent of the operating miles (*i.e.,* approximately 3,000 miles).
- DEF level was between 2.5 and 5 percent of tank capacity for less than 0.03 percent of the operating miles (*i.e.,* approximately 740 miles).
- DEF level was between zero and 2.5 percent of tank capacity (a condition at which engines experienced derated performance) for less than 0.04 percent of the operating miles (*i.e.,* approximately 920 miles).
- DEF level was at zero percent of tank capacity (a condition at which engines experienced derated performance) for less than 0.02 percent of the operating miles (*i.e.,* approximately 520 miles).

In addition, DEF quality was unacceptable (*i.e.,* a faulted condition existed) for less than 0.18 percent of the operating miles (*i.e.,* approximately 4,400 miles).

E. Navistar EnSIGHT Report

In 2010, Navistar retained EnSIGHT, Inc. to test three 2010 model year SCR-equipped trucks to analyze inducements provided for in EPA certification guidance.[15] The following three trucks were tested: (1) One Freightliner Cascadia with a 15-liter Detroit Diesel engine, (2) one Kenworth T–660 with a 15-liter Cummins ISX 15 435B engine, and (3) one Dodge Ram 5500 crew cab flatbed with a 6.7-liter Cummins ISB 6.7 305 engine. As part of testing, the three trucks were operated with the intent of circumventing the manufacturer-designed inducements, which is in contravention to EPA tampering regulations.[16]

[11] Voluntary recalls are a typical method for manufacturers to remedy emission-related problems they discover. Manufacturers are required to report voluntary emission recalls to EPA and ARB, and Cummins did so in this case.

[12] *See* docket number EPA–HQ–OAR–2010–0444–0019.

[13] When a manufacturer determines that an emission-related defect exists in 25 or more engines of the same class or category and model year, they are required to file an Emission Defect Information Report in accordance with 40 CFR 85.1901 *et seq.*

[14] *See* docket number EPA–HQ–OAR–2010–0444–0020.

[15] *See* docket number EPA–HQ–OAR–2010–0444–0015 for the August 2010 report. Navistar provided EPA with supplemental details on the August 2010 report in a follow-up October 2010 report. See docket number EPA–HQ–OAR–2010–0444–0022 for the October 2010 report.

[16] Section 203(a)(3) prohibits tampering with emission controls. Such actions are illegal, unless conducted as part of a testing program covered by an Agency-issued testing exemption.

Based on their testing program, EnSIGHT reported the following:

• All trucks physically could be operated for extended periods under an initial inducement. Provided the driver took particular actions, final inducements could be avoided indefinitely. For example, the Freightliner Cascadia was driven over 1,000 miles on an empty DEF tank at a limited speed of 55 mph, which is the initial inducement. As long as no more than 30 percent of the fuel tank capacity (approximately 100 gallons) was added at any single refueling event, the final inducement, a 5 mph vehicle speed limitation was not triggered. The Kenworth T–660 was driven with an empty DEF tank and a 25 percent engine torque derate, which is the initial inducement. As long as the engine was not shut off for more than a few minutes at a time, the 5 mph vehicle speed limitation final inducement was not triggered.

• When DEF tanks were empty and water was added instead of DEF, two trucks were able to run indefinitely. When the Dodge 5500 was low on DEF and began its 500-mile to final inducement (*i.e.,* no-restart condition) countdown, the driver was able to fill the DEF tank with water, start the truck, and drive normally. This action cleared the 500-mile countdown and the driver display indicated a full DEF tank. On one test run, the truck displayed visual and audible warning signals after 73 miles of driving with water in the DEF tank and eventually displayed the 500-mile to no-restart countdown after 694 miles of driving. Upon shutting off the truck after a total of 1,278 miles of driving, a no-restart condition was encountered. On a subsequent test run with water in the DEF tank, the truck was driven over 4,000 miles and encountered no warning signals or inducements. The Freightliner Cascadia was driven over 15,000 miles with only water in its DEF tank and triggered no initial or final inducement.

• SCR system components could be repeatedly disconnected and reconnected to avoid particular inducements. On the Dodge 5500, the driver was able to disconnect the injector electrical connector, which would initiate a 500-mile to final inducement (*i.e.,* no-restart condition) countdown. As the mileage countdown continued, the driver could reconnect the component and reset the 500-mile countdown. On the Freightliner Cascadia, when electrical connections to the DEF injector, gauge, or tank pump were unplugged, the truck was driven for over 1,000 miles prior to triggering an inducement.

• Although the testing program was designed to intentionally operate the trucks until final inducements were encountered, EnSIGHT also provided an assessment of the impact of initial inducements on driver behavior. They concluded that a 25 percent engine torque derate would not induce a corrective response by the drivers, including when the truck was fully loaded. With this level of derate, EnSIGHT's drivers were able to operate the Freightliner Cascadia and the Kenworth T–660 at speeds up to 55 mph and 65 mph, respectively. Of the Kenworth T–660, EnSIGHT's drivers indicated that the truck could easily be operated and was acceptable for typical driving for long periods of time under derate.

F. DEF Infrastructure and DEF Quality

The DEF infrastructure and sales volume have continued to grow since introduction of 2010 model year trucks equipped with SCR systems. Initially, DEF availability was concentrated around major truck stops and truck routes and 2.5-gallon jugs represented the common mode of supply. Although very limited, bulk DEF dispensing typically utilized small storage tanks located apart from the fuel islands at truck stops. The refilling of fuel and DEF tanks at truck stops was also more likely to require two separate purchase transactions.

The continually increasing DEF infrastructure and sales volume have resulted in improved DEF availability along major truck routes as well as other locations. "AdBlue and DEF Monitor," a publication of Integer Research, reports that DEF is available for sale in jug form in every state.[17] Integer Research also reports that DEF is available for delivery to fleet locations in every state, as well. To assist drivers in finding DEF, multiple Internet-based DEF locator services have been developed. One of these services, DiscoverDEF.com, run by Integer Research, recently announced that DEF consumption in the U.S. reached 2.3 million gallons per month in December 2010 and that in August of the same year consumption volumes increased 43% compared to the previous month. Also, a number of suppliers reported sales volumes doubling in September 2010 alone. These increases in DEF consumption are believed to correlate with the increased delivery and use of SCR-equipped trucks.

Increasing demand supported by sales volume helps drive the continuing expansion of DEF infrastructure. The same locator service recently reported that more than 100 truck stops in the U.S. and Canada now have DEF available at the pump. Additionally, this service maintains a list of over 3,000 locations that have packaged DEF, and a majority of the locations are in the U.S. As truck stops such as Travel Centers of America roll out on-island DEF dispensers, they usually incorporate technology which allows for single transaction fuel and DEF filling, which makes buying DEF quicker, more efficient, and customer-friendly. On-island DEF dispensing typically requires truck stops to utilize a mini-bulk system with at least 800-gallon above ground storage tanks or even larger underground storage tanks. The transition to larger tanks supports bulk purchases as well as cheaper end-user prices for DEF. This information is consistent with the survey information discussed above.

Regarding DEF quality, ISO 22241–1 sets forth generally accepted industry-wide quality specifications for DEF that were developed by vehicle manufacturers and other affected stakeholders. The American Petroleum Institute (API) Diesel Exhaust Fluid Certification Program (*http://www.apidef.org*) is a DEF quality licensing program intended to ensure that DEF of known specifications and quality is available. We understand that more than 20 of the largest producers of DEF are participating in the Certification Program and that the associated DEF Aftermarket Audit Program has also begun. In 2010, API tested all licensed products and the vast majority of those products met the ISO 22241–1 specifications. Where deficiencies were found, API and DEF manufacturers are working to identify the cause and helping to ensure that future batches conform to the ISO specifications. Because of API's Audit Program and its responsiveness to failed test results, we believe good quality DEF is broadly and generally available. API's Certification and Audit Programs were developed under the SCR Stakeholder Group, an informal consortium of vehicle/engine manufacturers, urea manufacturers, DEF blenders and distributors, and associated technology companies. EPA has been an active participant in the Stakeholder Group for several years. We also understand that the Petroleum Equipment Institute, its members, and associated stakeholders have developed Recommended Practices for the Storage and Dispensing of Diesel Exhaust Fluid (DEF), which will provide useful advice to any party

[17] *See* docket number EPA–HQ–OAR–2010–0444–0021.

who stores and dispenses DEF. Given that the vast majority of DEF production is accounted for in API's certification program and that the follow-up audit program is showing high rates of conformance to the ISO specifications, we believe these programs will be adequate to ensure DEF quality.

VI. Reasons for Revised Guidance

Considering the developments in SCR-related technologies, DEF infrastructure, and the other available information described above, we believe it is appropriate to further refine our guidance to manufacturers regarding certification of SCR-equipped engines to be compliant with applicable regulations. As discussed in this section of the document, on-highway heavy-duty diesel SCR systems introduced into commerce to date have been highly successful in inducing operators to refill DEF tanks on a timely basis and to avoid interfering with SCR operation, with a few specific exceptions.[18] At the same time, the Agency believes it is appropriate to refine its guidance, particularly as experience is gained with SCR in-use and as technology advances. We seek comment on the draft guidance and interpretations presented here and plan to incorporate what more we learn in the next version of the guidance to be issued later this year.

A. Current SCR Systems Are Highly Effective in Use

As trucks equipped with SCR systems have been introduced into U.S. commerce, drivers have become familiar with this technology. Current information concerning in use operation of SCR-equipped trucks, including all of the studies and other information discussed above, indicates that warning signals work correctly and that drivers do not wait for SCR-related inducements to be triggered to ensure appropriate and continuing operation of the systems. Specifically, the overwhelming majority of drivers surveyed by CARB, ATA, and Cummins did not wait for activation of warning indicators prior to refilling their DEF tanks and, where warnings did occur, generally did not drive distances long enough to lead to activation of inducements. Further, as the infrastructure for making DEF available becomes even more widespread, drivers will have increased and more convenient access to DEF when they need it. As documented in part by CARB's survey, there are currently few availability issues and those appear to stem primarily from limited situations where DEF was not found at the first location at which it was sought. As DEF infrastructure and supply continue to expand, EPA also expects the price of DEF to decrease, in part because of the move to bulk dispensing that is already underway. In addition, EPA expects that the DEF quality assurance programs described above will make it increasingly easy for drivers to find DEF which meets the specifications necessary for proper operation of the SCR systems. The strong indication from all of this evidence is that DEF warning systems are working correctly, and that when warned, drivers have not continued to drive distances long enough to lead to inducements. Inducements appear to be triggered in very few cases.

Navistar's study and CARB's field evaluation provide some evidence indicating that in some cases there have been issues related to SCR-equipped engines and assurance of their proper operation. Navistar's study identifies specific problems associated with the design or manufacture of certain SCR-equipped engines, and outlines the intentional actions taken by drivers employed by Navistar's contractor in conducting the study. The study's findings are properly considered in the context of all the available information on SCR operation. In light of the investigations and surveys conducted by CARB, ATA, and Cummins, EPA does not believe Navistar's findings reflect the overall efficacy of SCR systems on heavy-duty diesel engines currently in operation or the way they are actually used.

Most of Navistar's findings resulted from actions by the contractor's drivers to intentionally circumvent the manufacturer-designed inducements of the three test vehicles. For example, drivers avoided triggering inducements associated with an empty DEF tank by limiting refueling quantities or keeping the truck running when it normally would be turned off. Both ways of circumventing the inducements exact their own costs on drivers in terms of time, convenience, and expense. To illustrate, never refilling above about 30% of the tank leads to approximately three times as many refueling events, and the time and expense associated with this kind of disruption detract from the efficient operation of truck operators, who work in a competitive business. Navistar's contract drivers also disconnected and reconnected various SCR system components as a means of avoiding DEF inducements. Such intentional actions would be considered tampering and are illegal.[19] While it is possible that drivers could intentionally take such actions to circumvent inducements, manner of truck operation conducted in the Navistar study is clearly not representative of the vast majority of truck operation, as indicated by the CARB and ATA surveys. We do not think that the marginal cost and effort involved in purchasing DEF provide sufficient motivation for a driver to follow such inconvenient and risky courses of action.

We also do not agree with Navistar's view that initial inducements are ineffective to produce corrective responses by drivers. ATA's fleet survey indicates that drivers do not favor inducements involving an engine power derate, especially if it occurs while a truck under heavy load is driving up-hill. Thus, drivers are likely to maintain proper SCR operation to avoid encountering these inducements. CARB's investigation shows that most inducements functioned properly during expected truck operating conditions and their assessment of the effectiveness of initial inducements was contrary to Navistar's findings. CARB determined that the inducements were effective because operating in a way that avoids the inducement strategies and raise the risk of costly repairs would not be worth the downtime and potential financial loss to business. In fact, Cummins' survey, which included some of the same 15-liter engines in Navistar's study, found that surveyed trucks operated with DEF in their tanks for greater than 99.9 percent of their total operation. Cummins' survey also found that trucks operated with unacceptable DEF quality for less than 0.18 percent of their total operation. This strongly indicates that the inducements have the intended effect of motivating appropriate driver behavior.

The report of Navistar's study found that some manufacturers' designs did not adequately detect water in the urea tank and thus did not prevent the driver from refilling the tank with something other than DEF. Navistar and CARB findings on DEF quality detection were not consistent in all cases. For example, Navistar found that initial and final inducements for the Freightliner Cascadia equipped with the 12.8-liter Detroit Diesel DD13 engine were not triggered when the DEF tank was filled with water. During CARB's field investigation, both the initial and final inducements were implemented for Test

[18] It is worth noting again in this context that under Section 203(a)(3) of the Clean Air Act, tampering with SCR systems or other emission controls is prohibited.

[19] Such actions are illegal, unless conducted as part of a testing program covered by an Agency-issued testing exemption.

Vehicle 1 as expected when the DEF tank was filled with water. CARB's investigation discovered various production defects for Test Vehicles 2 and 3 that prevented the systems from working fully (as designed, the systems appeared to have sufficient capabilities to detect and respond to DEF quality problems). CARB followed up with Cummins and learned that the manufacturer was aware of the performance problems and addressing them in a manner consistent with regulatory provisions governing defect reporting and repair.[20] The defect reports submitted by Cummins corroborated that the manufacturer was appropriately responding to the problems. Additionally, Detroit Diesel informed EPA that they knew of problems with their system and had developed an updated software calibration to fix them as early as June 2010, prior to Navistar reporting the results of their study. Detroit Diesel has since begun addressing the problems on in use trucks consistent with regulatory provisions governing defect reporting and repair. As noted above, the problems with detecting water in the urea tank appear to be related to defects in production of these engines, as opposed to deficient designs. These production defects are being addressed in the same manner that problems with new technology are addressed under EPA's regulations.

B. Regulations Should Be Applied in Light of Continuing Information and Process Improvements

EPA's regulatory provisions for adjustable parameters are intended to ensure that manufacturers design their emissions control system in a way that makes it unlikely that they will be operated inappropriately. It appears that manufacturer's past SCR designs and EPA's guidance have resulted in highly effective controls to protect the operation of SCR systems, as evidenced by the surveys and other data which show that drivers are properly operating their SCR-equipped trucks. There have been indications of specific problems with some engines in-use, and the manufactures involved have been addressing them through production and other improvements as the problems are identified. We believe it is appropriate to evaluate the experience gained to date and to make continuing, appropriate adjustments to our certification process for SCR-equipped engines as technology evolves and in-use experience is gained. EPA recognizes that development of even more robust sensors and inducements does not negate past approaches implemented pursuant to existing regulations. Rather, continual improvement is expected given the mounting experience with, and the maturing of, SCR technology, and the greater availability of DEF. As improved strategies and capabilities for proper SCR operation become feasible, EPA may guide their application to provide even further assurance that the technology is operating as intended on SCR-equipped engines.

C. As SCR Technology Matures, Further Guidance Is Appropriate

Several developments in SCR technology allow continuing refinement in SCR design. One area of potential improvement in design involves sensors that can detect poor quality DEF. Current SCR system designs incorporate NO_X sensors to determine catalyst efficiency and detect catalyst malfunction. Since the sensors are part of the system design, they have also been used to detect poor quality DEF through correlation of NO_X emission rates with various concentrations of urea. Urea quality sensors have been identified as a means to help improve detection capabilities for poor quality urea. They directly measure quality and appear likely to represent a quick detection method for addressing quality concerns. Manufacturers are currently evaluating the performance and durability of various sensor designs.

Since the 2010 model year, manufacturers have also been refining their engine/vehicle system diagnostics software to incorporate additional capabilities for implementing SCR-related inducements. For example, many manufacturers today have developed multiple triggers for triggering inducements, including detection of refueling, extended idling, and engine shutdown events. Incorporation of additional inducement triggers into designs further decreases the likelihood of improper operation of the SCR system. Manufacturers are also improving their diagnostics software to ensure that SCR-related inducements cannot be reset or erased by diagnostic scan tools available to the general public or by disconnecting components in the field.

Many manufacturers are implementing improved designs in their 2011 model year engines/trucks that may be sold in the State of California. After the July 2010 public workshop, CARB and EPA began encouraging manufacturers to adopt the elements of design that were discussed. In order to avoid the need for multiple engine/vehicle production designs, manufacturers have often incorporated the design elements of vehicles sold in California into their 49-state vehicles.

Improving sensor capabilities and inducement strategies should present low risk and little burden for both manufacturers and drivers. Manufacturers are already in the process of improving their SCR designs, and overwhelmingly drivers are not waiting for SCR-related warnings or inducements to be triggered before they refill DEF tanks and otherwise maintain proper operation of SCR systems. Given the importance of reducing NO_X emissions from heavy-duty diesel engines for attaining and maintaining national air quality standards, we have developed the following draft revised guidance to reflect improving capabilities for designing SCR systems to ensure proper operation.

VII. SCR Adjustable Parameter Design Criteria

This section discusses design criteria for on-highway heavy-duty diesel vehicles or engines using SCR technology. EPA believes that vehicles and engines that meet these design criteria would meet the requirements of the regulations regarding adjustable parameters. EPA will still review each certification application to ensure that the regulatory provisions are met. Likewise, in the case of design criteria that are not fully specified in this guidance, EPA will review the application to ensure that the engine design meets the regulatory requirements. EPA may review and revise this guidance as the technology continues to mature and as EPA receives more information regarding the use of SCR systems. In addition, manufacturers may present other designs for EPA consideration. All designs will remain subject to EPA approval under the existing certification regulations.

As noted above, in determining the adequacy of an engine's means of inhibiting adjustment of a parameter, EPA considers the likelihood that settings other than the manufacturer's recommended setting will occur in use. With this in mind, EPA is providing these draft SCR adjustable parameter design criteria based on our view that an SCR-equipped vehicle that complies with these criteria will be adequately inhibited from use when the SCR system is not operating properly.

EPA is asking for comments on the draft guidance discussed below. The design criteria are divided into four categories. The categories are:

A. Reductant tank level driver warning system.

[20] *See* 40 CFR Part 85, Subpart T.

B. Reductant tank level driver inducement.

C. Identification and correction of incorrect reducing agent.

D. Tamper resistant design.

A. Reductant Tank Level Warning System

The emissions performance of SCR-equipped vehicles depends on having an adequate supply of appropriate quality reducing agent in the system. SCR systems require regular user interaction to ensure that the system is operating properly. Therefore, it is critical that the operator both know when reducing agent is needed and have enough time to replace it before it runs out. A properly designed driver warning system should address these concerns.

To achieve this design goal, under our criteria, the manufacturers would use a warning system including the following features:

1. The warning system should incorporate visual and possibly audible alarms informing the vehicle operator that reductant level is low and must soon be replenished. The manufacturer should design the warning system to activate well in advance of the reducing agent running out so that the operator is expected to have one or more refueling opportunities to refill the reductant tank before it is empty.

2. The warning alarm(s) should escalate in intensity as the reducing agent level approaches empty, culminating in driver notification that is difficult to ignore, and cannot be turned off without replenishment of the reducing agent.

3. To provide adequate notice, the visual alarm should, at a minimum, consist of a DEF level indicator, a unique light, reducing agent indicator symbol or message indicating low reducing agent level. The warning light, symbol or message should be different from the "check engine" or "service engine soon" lights used by the On Board Diagnostic (OBD) system or other indicators that maintenance is required. The symbol or message used as the warning indicator should unmistakably indicate to the vehicle operator that the reducing agent level is low. The reducing agent indicator symbol shown below has been generally accepted in the industry and EPA considers it acceptable as an indicator of low reducing agent level.

4. The light, indicator symbol or message should be located on the dashboard or in a vehicle message center. The warning light or message does not initially have to be continuously activated, but as the reducing agent level approaches empty the illumination of the light or message would escalate, culminating with the light being continuously illuminated or the message continuously broadcast in the message center. Many current designs have been found acceptable and EPA does not anticipate requiring changes in the foreseeable future. Unique SCR system warning lights and message designs that deviate from previously approved designs or the design criteria outlined above would need to be approved by EPA.

Manufacturers may also incorporate an audible component of the low DEF warning system. As the reducing agent level approaches empty the audible warning system should escalate.

B. Low Reductant Level Inducement

The warning systems discussed above can play a critical role in achieving vehicle compliance. As noted, a well designed warning system should deter drivers from operating SCR-equipped vehicles without reducing agent. However, we believe an additional, stronger deterrent is necessary and appropriate. Therefore, at some point after the operator receives the initial signal warning that reductant level is low, it is important that the engine design incorporates measures to induce users to replenish the reducing agent.

Under these design criteria, manufacturers would design their engines with a final inducement system that accomplishes the following when the reductant tank is empty or the SCR system is incapable of proper dosing:

1. Maximum vehicle speed is decreased at the quickest safe rate to 5 miles per hour while the vehicle is operating; or

2. The maximum engine fueling and engine speed are decreased at the quickest safe rate while the vehicle is operating, resulting in engine shutdown or limiting operation capability to idle only.

Some manufacturers prefer to trigger the above final inducement only when the vehicle has stopped at a safe location. Under this approach, a vehicle may be assumed to be in a safe location if the engine is purposefully shut off (key turned to the off position), has experienced an extended idle of 60 minutes (as indicated by zero vehicle speed for 60 minutes), or a refueling event has occurred (meaning a volume of fuel has been added equal to or greater than 15 percent of vehicle operating fuel capacity).

If a manufacturer chooses to implement final inducement only when the vehicle is stopped, we believe the engine will need to be designed with the following additional characteristics:

a. Be able to trigger final inducement when the vehicle is stopped at a safe location. The final inducement will consist of limiting the vehicle speed to 5 mph, shutting the engine down, or limiting engine operation to idle only.

b. Prior to triggering final inducement, be able to impose a severe inducement which makes prolonged operation of the vehicle unacceptable to the driver and compels the driver to replenish the reducing agent prior to the SCR system becoming incapable of proper dosing. The severe inducement will consist of an engine derate, a vehicle speed limitation, or a limitation on the number of engine restarts. For example, an engine torque derate of 40 percent may be utilized as a severe inducement for the operator of a Class 8 line-haul truck to replenish the reducing agent. The severe inducement should occur while there is enough reductant in the tank to continue to provide proper SCR dosing for approximately one full day of vehicle operation. For example, it may be appropriate to initiate severe inducement with a 10 percent reserve of reducing agent in the reductant tank.

c. Be able to determine when the vehicle has arrived at a safe location for the purpose of imposing a final inducement. Such a determination will be based upon the vehicle experiencing the next key-off, refueling, or 60-minute idling event after imposing severe inducement. During the course of one day of vehicle operation, EPA believes it sufficiently likely an operator will encounter one of the three events triggering final inducement. In the unlikely scenario that one of the three events is not encountered, the severe inducement should still provide sufficient incentive for the operator to refill the reductant tank.

The above final and severe inducements are not meant to limit the use of other inducements prior to severe or final inducement. EPA encourages the use of additional inducements which would serve to minimize the amount of time either severe or final inducements are encountered.

When developing inducement strategies for review by EPA at the time of certification, manufacturers should be prepared to detail the type and level of inducements chosen and demonstrate how they will sufficiently compel drivers to maintain appropriate reductant levels and ensure vehicle operation is limited only to periods when proper SCR dosing is occurring.

EPA believes that an engine that is designed with warning and inducement strategies consistent with those above will be highly unlikely to be driven with an empty reductant tank, and therefore that such an engine would be adequately protected from operation with an empty tank.

C. Identification and Correction of Incorrect Reducing Agent

Assuring that an SCR-equipped engine is unlikely to be operated without proper reducing agent calls for an SCR system design that is able to detect incorrect or poor quality reducing agent. As noted above in the context of maintaining an adequate level of reducing agent, the emissions performance of SCR-equipped vehicles is dependent on having reducing agent in the system and the reducing agent must be of the proper quality. Therefore, the system must be able to identify and appropriately respond to poor reductant quality such as filling the reductant storage tank with a fluid other than the manufacturer-specified reducing agent, or with excessively diluted reducing agent. An example would be filling the tank with water rather than DEF, when DEF is the specified reducing agent.

Current urea-based SCR technology uses a robust NO_X sensor system to detect poor quality reductant. High NO_X emissions can be correlated to poor reductant quality and NO_X sensors are already part of the SCR system. Urea quality sensors directly measure DEF quality and appear likely to represent a quick detection method for addressing quality concerns in the future. Manufacturers are currently evaluating the performance and durability of various sensor designs.

NO_X sensor systems will take somewhat longer to detect poor quality reducing agent compared to urea quality sensors. Under ideal conditions, NO_X sensors can detect poor quality in 20 minutes, but may take as long as one hour to detect poor quality reductant. An advantage of urea quality sensors is that, once fully developed, they will provide operator notification of poor quality while the vehicle is still at a filling location.

Because NO_X sensors do not directly measure DEF quality, they do not detect variations in DEF quality as small as those detected by urea quality sensors. However, NO_X sensors adequately detect water which is the most likely substitute for DEF. Therefore, NO_X sensors are likely able to detect and prevent the majority of serious quality problems. Because of the ability of urea quality sensors to detect smaller concentration deviations in urea quality, we believe urea quality sensors will soon be the best reasonable technology to help manufacturers meet the adjustable parameter requirement. Urea quality sensors will also permit the emission control system to adjust DEF dosing based on the detected quality of the DEF and, in conjunction with the inducement strategies, help ensure that only compliant DEF is used. We expect urea quality sensors to be available for use in 2013 model year vehicles.

Under these design criteria, the engine design would have the following features to identify and respond appropriately to poor quality reducing agent or incorrect fluid:

1. Given the current technology, we believe manufacturers should be capable of detecting poor reductant quality within one hour. As improved technology becomes available, such as urea quality sensors, manufactures should decrease the likelihood, and increase the performance consequences of operation with poor quality reductant by incorporating the technology which best and most promptly detects poor reductant quality.

2. Immediately upon detection, the operator should be notified of the problem with warnings similar to those discussed above for inadequate reductant level. EPA expects the warning light or message addressing incorrect reducing agent would quickly increase in intensity to be continuously activated.

3. Given the current state of technology, the engine design should implement final inducement while the vehicle is operating and within 4 hours of detection. Alternately, if a manufacturer chooses to implement final inducement when the vehicle is stopped at a safe location, the engine design should implement severe inducement and search for final inducement triggers within 4 hours of detection. For this alternate approach, some lesser inducement should precede severe inducement at 2 hours after detection. While we believe it is appropriate that the vehicle respond in a similar manner when poor quality reducing agent is detected as when the vehicle runs low on reducing agent, we believe the inducement should not begin immediately. It is currently possible for a driver to receive poor quality reductant unknowingly and for a driver to need a certain amount of time after being alerted to the problem to have it remedied. Therefore, we think it currently appropriate to allow no more than 4 hours of operation following detection before imposing severe or final inducement. The 4 hours until severe or final inducement will allow the operator sufficient time to reach a service facility to remedy the problem.

4. If poor quality reductant is detected again within 40 hours after putting proper reducing agent in the tank, then the operator should be immediately notified and the poor quality final inducement or the alternate severe inducement approach should begin immediately. We believe continuing to monitor for repeat instances of poor quality reductant for 40 hours is likely to capture the vast majority of operators intentionally trying to circumvent SCR controls.

EPA believes design requirements that alert the operator to inadequate reducing agent and that institute inducements to assure correction of reducing agent quality are needed in order to ensure that the “adjustable parameter” of reductant quality is sufficiently limited. EPA believes that the warnings and inducements associated with poor quality reducing agent discussed above are burdensome enough that they ensure that introduction of poor quality reductant would not occur often or purposely and that in the unlikely event it occurs, proper actions will be taken within reasonable time limits to adequately minimize the operation of the vehicle/engine with poor quality reductant and associated excess emissions. We also believe the 4 hours until severe or final inducement is currently needed to allow the operator to locate and drive to a service facility capable of draining and refilling the tank.

EPA believes that an engine that is designed with the warning and inducement strategies discussed above will be highly unlikely to be driven with inadequate reductant for any significant period, and therefore that such an engine would be adequately protected from operation with inadequate reductant.

D. Tamper Resistant Design

SCR systems should be designed to be tamper resistant to reduce the likelihood that the SCR system will be circumvented or that the operating parameters of the system will be purposefully or inadvertently altered. Manufacturers should be careful to review any element of design that would prevent the proper operation of the SCR system to make tampering with that element of design impossible or highly unlikely. Manufacturers will have to demonstrate to EPA that their SCR system design is tamper resistant. 40 CFR 86.094–22(e) contains provisions regarding actions and criteria to ensure that elements of design related to the adjustable parameters of DEF level and quality are adequately inaccessible, sealed, physically limited or stopped, or otherwise inhibited from adjustment.

1. At a minimum, the following actions, if done intentionally, would be considered tampering and manufacturers should design their SCR systems to ensure that restraints on such actions, whether purposeful or not, are adequate and such results are unlikely:

a. Disconnected reductant level sensor
b. Blocked reductant line or dosing valve
c. Disconnected reductant dosing valve
d. Disconnected reductant pump
e. Disconnected SCR wiring harness
f. Disconnected NO_X sensor (that is incorporated with the SCR system)
g. Disconnected reductant quality sensor
h. Disconnected exhaust temperature sensor
i. Disconnected reductant temperature sensor

2. EPA believes that the warnings and inducements described above for incorrect reducing agent would also be adequate under 40 CFR § 86.094–22(e) to prevent tampering or accidental actions causing the above results. The engine should be able to detect tampering as soon as possible, but no longer than one hour after a tampering event.

3. Immediately upon detection, the operator should be notified of the problem.

4. We believe the inducement should not begin immediately. It is possible that a part failure that occurs in the course of normal operation will be recognized as a result of these diagnostics. An operator should not immediately receive inducement for an event which may not have been caused by tampering. Therefore, we think it appropriate to allow 4 hours of operation following detection before implementing final inducement while the vehicle is in operation. Alternately, if a manufacturer chooses to implement final inducement when the vehicle is stopped at a safe location, the engine design should implement severe inducement and search for final inducement triggers within 4 hours of detection. For this alternate approach, some lesser inducement should precede severe inducement at 2 hours after detection. The 4 hours until severe or final inducement will allow the operator sufficient time to reach a service facility to remedy the problem.

5. If tampering of the same component is detected again within 40 hours after repair, then the operator should be immediately notified and the tampering final inducement, or the alternate severe inducement approach, should begin immediately. We believe continuing to monitor for repeat instances of tampering for 40 hours is likely to capture the vast majority of operators intentionally trying to circumvent SCR controls.

EPA believes that an engine that is designed with the warning and inducement strategies discussed above will be highly unlikely to be driven for any significant period under the aforementioned conditions, and that such an engine would be adequately protected from operation under such circumstances.

VIII. Conclusion

EPA is releasing this draft document for comments. We will continue to work with manufacturers, other stakeholders, and the public regarding issues related to its existing regulatory requirements and SCR technology.

Dated: May 27, 2011.

Margo Tsirigotis Oge,

Director, Office of Transportation and Air Quality, Office of Air and Radiation.

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DEPARTMENT OF HOMELAND SECURITY

Federal Emergency Management Agency

44 CFR Part 67

[Docket ID FEMA–2011–0002; Internal Agency Docket No. FEMA–B–1194]

Proposed Flood Elevation Determinations

AGENCY: Federal Emergency Management Agency, DHS.

ACTION: Proposed rule.

SUMMARY: Comments are requested on the proposed Base (1% annual-chance) Flood Elevations (BFEs) and proposed BFE modifications for the communities listed in the table below. The purpose of this proposed rule is to seek general information and comment regarding the proposed regulatory flood elevations for the reach described by the downstream and upstream locations in the table below. The BFEs and modified BFEs are a part of the floodplain management measures that the community is required either to adopt or to show evidence of having in effect in order to qualify or remain qualified for participation in the National Flood Insurance Program (NFIP). In addition, these elevations, once finalized, will be used by insurance agents and others to calculate appropriate flood insurance premium rates for new buildings and the contents in those buildings.

DATES: Comments are to be submitted on or before September 6, 2011.

ADDRESSES: The corresponding preliminary Flood Insurance Rate Map (FIRM) for the proposed BFEs for each community is available for inspection at the community's map repository. The respective addresses are listed in the table below.

You may submit comments, identified by Docket No. FEMA–B–1194, to Luis Rodriguez, Chief, Engineering Management Branch, Federal Insurance and Mitigation Administration, Federal Emergency Management Agency, 500 C Street, SW., Washington, DC 20472, (202) 646–4064, or (e-mail) *luis.rodriguez1@dhs.gov.*

FOR FURTHER INFORMATION CONTACT: Luis Rodriguez, Chief, Engineering Management Branch, Federal Insurance and Mitigation Administration, Federal Emergency Management Agency, 500 C Street, SW., Washington, DC 20472, (202) 646–4064, or (e-mail) *luis.rodriguez1@dhs.gov.*

SUPPLEMENTARY INFORMATION: The Federal Emergency Management Agency (FEMA) proposes to make determinations of BFEs and modified BFEs for each community listed below, in accordance with section 110 of the Flood Disaster Protection Act of 1973, 42 U.S.C. 4104, and 44 CFR 67.4(a).

These proposed BFEs and modified BFEs, together with the floodplain management criteria required by 44 CFR 60.3, are the minimum that are required. They should not be construed to mean that the community must change any existing ordinances that are more stringent in their floodplain management requirements. The community may at any time enact stricter requirements of its own or pursuant to policies established by other Federal, State, or regional entities. These proposed elevations are used to meet the floodplain management requirements of the NFIP and also are used to calculate the appropriate flood insurance premium rates for new buildings built after these elevations are made final, and for the contents in those buildings.

Comments on any aspect of the Flood Insurance Study and FIRM, other than the proposed BFEs, will be considered. A letter acknowledging receipt of any comments will not be sent.

National Environmental Policy Act. This proposed rule is categorically