Regulations Requiring Onboard Diagnostic Systems on 2010 and Later Heavy-Duty Engines Used in Highway Vehicles Over 14,000 Pounds; Revisions to Onboard Diagnostic Requirements for Diesel Highway Vehicles Under 14,000 Pounds

Summary and Analysis of Comments

EPA United States Environmental Protection Agency

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Summary and Analysis of Comments

Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

United States
Environmental Protection
Agency

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6	National Automobile Dealers Association (NADA)	2005-0047-0043
7	Volvo Powertrain	2005-0047-0044

Introduction to this Document

The outline for this document is identical to the outline used in the preamble to our proposed rule (72 FR 3200). We have summarized comments and placed those comments under the heading which most accurately characterized the nature of the comment. As such, issues can be identified by section number within which those issues have been placed. The reader should keep in mind that we have attempted to place a comment into only one issue area or section number within this document. For example, we received comments pertinent to threshold levels and/or feasibility of our proposal with respect to heavy-duty OBD on applications under 14,000 pounds (see section II.H). However, in section I.B.3 of this document, we note that we received no comments pertinent to section I.B.3 which was the preamble section that provided an overview of our proposed requirements for OBD on applications under 14,000 pounds. We make such a note since no one commented on that overview section and, instead, we have summarized the comments and made our responses under section II.H.

General statements in support of the proposed rule

The following commenters expressed general support for the HDOBD portions of the proposed rule.

Community Board #1 (2005-0047-0015)
Texas Commission on Environmental Quality (2005-0047-0020)
NESCAUM (2005-0047-0024)

General statements in opposition to the proposed rule

The following commenters expressed general opposition to the proposed rule.

None.

General statements in support of other comments

The following commenters expressed support for the comments submitted by the Engine Manufacturers Association, 2005-0047-0026:

Volvo Powertrain, 2005-0047-0021, p. 1
Cummins Inc., 2005-0047-0031, p. 3
Caterpillar Inc., 2005-0047-0030, p. 2
Truck Manufacturers Association, 2005-0047-0028, p. 1
National Automobile Dealers Association, 2005-0047-0034, p. 1

The following commenters expressed support for the comments submitted by the Engine Manufacturers Association, 2005-0047-0026, where those comments pertain to nonroad OBD:

Euromot, 2005-0047-0023, p. 3

I. Overview

We received no comments pertaining to this section that require analysis.

I.A Background

We received no comments pertaining to this section that require analysis.

I.B What is EPA Proposing?

I.B.1 OBD Requirements for Engines Used in Highway Vehicles Over 14,000 Pounds GVWR

Comments:

Engine manufacturers face many challenges in providing engines to meet the needs of customers, EPA, the California Air Resources Board ("ARB"), other government agencies, and their own businesses. During the past five years, engine manufacturers have poured huge resources into meeting stringent new federal and California emissions standards that began in 2007 and that will be fully realized by 2010. The new emission standards will reduce engine emissions by more than 90% and those reductions will come through using improved engine design, advanced aftertreatment systems and low-sulfur fuel. The 2007/2010 heavy-duty engine emission standards will result in diesel technology – long known for being the most durable and energy-efficient – having the right to also be called clean. Engine manufacturers continue to invest significant resources to develop and produce engine and aftertreatment technology meeting the stringent new emission standards. They have already devoted and will continue to devote thousands of hours of engineering time and expertise and thousands of hours of time in the emissions test cell to achieve those standards. Manufacturers have begun producing compliant engines for 2007. But, while they expect to meet the fully-realized new emission standards by 2010, future success is by no means assured.

At the same time, manufacturers are addressing the challenges of the new nationwide manufacturers' run heavy-duty in-use test program and new California engine manufacturer diagnostic ("EMD") standards which began in 2007. Those EMD standards are the first step toward comprehensive heavy-duty OBD requirements as embodied in the Proposed Rule, which would require engine manufacturers to develop and produce heavy-duty OBD technology to monitor all engine systems to stringent new requirements beginning in 2010. Engine manufacturers do not know how they will meet the new heavy-duty OBD requirements or even if they will be capable of meeting those challenging requirements. What they do know is that the Proposed Rule will require a major investment of manufacturer resources to invent the monitoring technology and develop it to a point that it can be used with confidence on 2010 and later engines. Manufacturers will undertake a workload, invent technology, and invest costs to make changes that must be implemented and engineered on significantly more engine models and ratings, and recouped on far fewer units of sale, than ever has been required in any other OBD program. This challenge is made all the more difficult by the fact that engine manufacturers are still developing the technology to meet the underlying emission standards for 2010.

OBD is technically complex, and means sophisticated new systems placed on engines and vehicles. Regulating how manufacturers use OBD and monitor their engine emission control adds more complexities and new challenges to produce engines that are compliant with 2010 and later standards. But heavy-duty engine manufacturers have very little experience with regulated OBD systems. Although some companies have experience with engines and vehicles under 14,000 lbs. (light- and medium-duty), most have none. All engine manufacturers will need to devote substantial time and effort to meeting the new rule, but those without experience will have special challenges to

overcome – from something as basic as understanding OBD terminology to something as complex as creating the algorithms and writing the software code used for monitoring.

Moreover, many of the monitoring strategies that would be required to meet EPA's proposed OBD standards depend on the development and use of accurate and durable sensor technology. Engine manufacturers do not produce sensors and do not control their development or availability in the market. Nor do engine manufacturers control the accuracy and reliability of those sensors. Technology-forcing standards are appropriate if the entities held responsible for meeting those standards have control of the development of the technology. In this case, engine manufacturers are required to meet the technology-forcing standards, but have no such control.

Finally, what has worked for light- and medium-duty OBD will not necessarily work for heavy-duty engines. The two industries are very different. The heavy-duty industry is generally a non-integrated industry, meaning that engine manufacturers sell their products – engines – to customers who take those engines and incorporate them into many different types of vehicles, with many different types of transmissions, customer specifications and performance requirements. Engine manufacturers simply cannot predict all the possible variations in which their engines will be used and they do not have control over vehicles. EPA has recognized that fact, in part, in the Proposed Rule, and has proposed to limit the requirements as much as possible to engines. But in the non-integrated heavy-duty engine and vehicle industry, there is an extreme burden associated with calibrating OBD monitors for use in a myriad of different vehicle configurations. Further changes must be made to the Proposed Rule to limit engine manufacturers' responsibility for vehicle matters outside their control.

EMA, 2005-0047-0026, p. 1-3
National Automobile Dealers Association, 2005-0047-0034, p. 3

Agency Response:

We have carefully considered the points made by commenters in developing our final rule. While sensor technology has progressed rapidly, there remain some limitations in accuracy and durability. As such, we have relaxed some 2010-2012 NOx thresholds to levels at which current technology can detect, and we have provided some PM-related monitoring requirements that our testing and industry testing show can be met. We have also addressed industry comments as regards the myriad of different vehicle configurations by providing greater flexibility in some monitoring requirements (e.g., cooling system monitoring) without compromising the expected effectiveness of the OBD systems. Most importantly, the sensors needed to comply with the final requirements do indeed exist, and they exist today, at least for the 2010-2012 requirements. Some of the 2013 requirements—notably the DPF monitoring requirements—would require, we believe, a soot sensor with greater sensitivity and durability than what exists today. In that case, we cannot state that the necessary sensors exist today. However, we believe that they will exist in time for 2013 compliance, and we will keep abreast of technological advances in the coming years in case our requirements have to be modified. We address these issues in more detail in the following sections.

I.B.2 Requirements that Service Information be Made Available

Please refer to Section IV of this document for a summary and analysis of all service information availability comments and issues.

I.B.3 OBD Requirements for Diesel Heavy-duty Vehicles and Engines Used in Vehicles Under 14,000 Pounds

We received no comments pertaining to this section that require analysis.

I.C Why is EPA Making this Proposal?

I.C.1 Highway Engines and Vehicles Contribute to Serious Air Pollution Problems

We received no comments pertaining to this section that require analysis.

I.C.2 Emissions Control of Highway Engines and Vehicles Depends on Properly Operating Emissions Control Systems

We received no comments pertaining to this section that require analysis.

I.C.3 Basis For Action Under the Clean Air Act

Comments:

EPA is obligated under CAA Section 202(a)(3)(A) to propose standards that are technologically feasible and cost effective. EPA has failed to meet it s obligations with respect to the proposed HDOBD program. EPA has failed fully to analyze and consider the technological feasibility of the proposed OBD thresholds and requirements, the practically of meeting many of the requirements, and the workload and cost burden proposed to be placed on manufacturers. EPA has not provided an adequate analysis of technological feasibility and the cost effectiveness of its proposal.

EPA is obligated by Section 202(a)(3)(C) of the CAA to provide four years leadtime for the promulgation of new standards and at least a three year period of stability for those new standards. However, if EPA adequately addresses the technological feasibility, practicality and cost effectiveness issues discussed throughout EMA's comments, while maintaining the proposed implementation phase-in, engine manufacturers believe they would be able to comply with such a program in 2010. Given a limited amount of time in which to address the challenges of HDOBD, manufacturers can succeed only if the changes recommended by EMA are made. If EPA makes EMA's recommended changes, engine manufacturers may not be pressed to rely on their legal rights to leadtime and stability guaranteed by the CAA.

EPA has not met its burden to show that the proposed requirements are cost effective. EPA has both underestimated costs and has not fully analyzed cost effectiveness.

EMA, 2005-0047-0026, p. 47-49

While Freightliner understands that EPA strove to align its OBD requirements to those of CARB where feasible, we ask that the EPA adhere in future rulemakings to lead time and stability limitations. The specific authority to require OBD in HD highway engines clearly stems from CAA section 202(m)(1) which allows the Administrator to promulgate OBD regulations under CAA section 202(a). In turn, regulations promulgated under CAA section 202(a) are bound by the lead time and stability requirements of that subsection at subparagraph (3)(C). EPA has already promulgated regulations applicable to the year 2010 (40 CFR §86.007.11). Following Congress' stability mandate

then, EPA must maintain its HD highway engine regulations without change until 2013. At the very least, with EPA publishing its proposal after the commencement of model year 2007, Congress' lead time mandate prohibits EPA from regulating OBD until model year 2012.

Freightliner, 2005-0047-0025, p. 1

Agency Response:

These comments can be summarized as: EPA has failed to show feasibility; and, EPA has failed to provide proper lead time. EMA and Freightliner are incorrect in claiming that EPA is bound by section 202(a)(3) of the Act for these OBD regulations. That provision applies only to standards applicable to emissions of particular pollutants from heavy duty engines, not to OBD requirements for such engines. This rule is governed by section 202(m) of the Act, which explicitly discusses promulgation of OBD regulations, including regulations for heavy duty engines. The provisions of section 202(a)(3), including the lead time and stability provisions, are therefore not applicable to this rule. In addition, we believe that this issue is moot as a practical matter. On a national level, we fully expect that manufacturers will sell the same OBD system that is being developed for use in the State of California to comply with California's analogous OBD requirements. California made final those requirements in 2005 which provided four years lead time to industry. The requirements we are finalizing for 2010 compliance are less stringent in terms of OBD thresholds than those finalized by California back in 2005. Therefore, lead time appears not to be an issue in practical terms. We believe that the changes made to the final requirements should satisfy commenters as they have themselves suggested.[1]

EMA mentions cost effectiveness and, while cost effectiveness is not mentioned in CAA Section 202(m), we believe we have properly taken costs into consideration in promulgating this rule. See the final technical support document contained in the docket where we show our estimated costs as roughly $60 to $70 per engine for engines that are placed in vehicles selling for $50,000 to more than $100,000 a piece. As for technological feasibility, we have revised some of our thresholds for the 2010-2012 model years to address feasibility concerns raised by industry during development of this final rule. We believe that these changes result in a feasible set of requirements as discussed in our responses to comments in Sections II and III and by commenters themselves.[2] As for the thresholds for model years 2013 and later, we have not made changes relative to our proposal because we still believe that monitoring and sensing technology will advance such that the thresholds will be feasible. We discuss this in more detail in our responses to comments in Sections III.A.6 through III.A.9. If, in the 2010/2011 timeframe we are made aware that such advances have not occurred, we will need to address the issue via possible changes to the 2013 and later thresholds.

I.D How has EPA Chosen the Level of the Proposed Emissions Thresholds?

Comments:

We support requiring stringent OBD thresholds (i.e., OBD detection at lower emissions levels) that will, among other things, induce manufacturers to produce more durable emission controls. Accordingly, we support using the emissions thresholds listed in Tables II.B–1 and II.C.–1 as trigger points for requiring malfunction indicator light (MIL) illumination and storing diagnostic

[1] See memorandum to Docket ID No. EPA-HQ-OAR-2005-0047 from Todd Sherwood, "Meetings with the Engine Manufacturers Association," document ID # EPA-HQ-OAR-2005-0047-0053.

[2] See memorandum to Docket ID No. EPA-HQ-OAR-2005-0047 from Todd Sherwood, "Meetings with the Engine Manufacturers Association," document ID # EPA-HQ-OAR-2005-0047-0053.

trouble codes (DTC). These thresholds are likely to achieve the balance sought by EPA between environmental protection, system capabilities, and avoidance of repairs where costs are high compared to emissions benefits.

NESCAUM, 2005-0047-0024, p. 4
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 7-8

EPA's proposal does not include the step-down in increased stringency for malfunctions of aftertreatment devices as ARB's regulation does for 2013 and 2016 model years. While EPA has indicated that it will continue to monitor industry's progress towards meeting the ARB thresholds and could potentially revisit the appropriateness of more stringent thresholds in the future, ARB believes it is appropriate for EPA to adopt the more stringent thresholds now to provide a clear goal for industry to design for. EPA could still monitor industry's progress, as ARB does, and as noted above, could potentially revisit the appropriateness at a later date if changes need to be made. But, adoption now of thresholds that align with those developed jointly with EPA and adopted by ARB would provide a consistent target to industry to design to for a single system that meets both requirements. To date, engine manufacturers have not provided any new technical data indicating that these thresholds may not be feasible or adjustments may need to be made. In fact, as the first 2007 model year applications are now being certified with various elements of aftertreatment, ARB and manufacturers are starting to see actual data indicating what thresholds can be achieved now and in the immediate future and ARB believes the data shows promising results that the manufacturers are on track.

California Air Resources Board, 2005-0047-0035, p. 3

Agency Response:

As we stated in the preamble to the proposed rule (see 72 FR 3205), we believed that the proposed thresholds would strike the proper balance between environmental protection, OBD and various sensor capabilities, and avoidance of repairs whose costs could be high compared to their emission control results. Since that time, we have learned that certain sensor capabilities have not advanced as we expected and have, therefore, revised upward some OBD thresholds for the 2010-2012 model years. One must keep in mind that increasingly stringent OBD thresholds (i.e., OBD detection at lower emissions levels) may lead to more durable emission controls due to a manufacturer’s desire to avoid the negative impression given their product upon OBD detection. Such an outcome would result in lower fleetwide emissions while increasing costs to manufacturers. However, increasingly stringent OBD thresholds may also lead to more OBD detections and more OBD induced repairs and, perhaps, many OBD induced repairs for malfunctions having little impact on emissions. Such an outcome would result in lower fleetwide emissions while increasing costs to both manufacturers and truck owners. Furthermore, increasingly stringent OBD thresholds may increase the likelihood of false malfunction detections (false positives) which has no impact on emissions while adversely impacting the perception of OBD. All of these factors must be carefully balanced and we believe we have done that properly with our final requirements. The California Air Resources Board is willing to go forward with some uncertainty as regards the ability of manufacturers to meet the complete set of “stepped down” thresholds in 2013 and 2016. EPA is not so comfortable moving forward with that level of uncertainty.

I.E World Wide Harmonized OBD (WWH-OBD)

Comments:

Ultimately, EMA's goal is alignment of the EPA and WWH-OBD requirements such that engine manufacturers could certify one engine for sale that could meet OBD requirements internationally. Given the existence of the national and international processes which have not yet led to a fully aligned approach, EMA recommends that EPA complete this rulemaking and, in a later rulemaking, evaluate and propose an approach to allow EPA to specify WWH-OBD as an alternative OBD solution.

EMA, 2005-0047-0026, p. 45-47
Cummins Inc., 2005-0047-0031, p. 5-6

The allowance of WWH-OBD would be beneficial provided it did not result in a second or third type of OBD for highway HD engines. A second or third type of OBD would add unnecessary burdens on engine manufacturers and serve to confuse the service industry for little if any added value. The commenter also provides a list of OBD elements that EPA should change in the final rule to align fully with WWH-OBD requirements, listed below, to help support manufacturers' ability to compete in the international marketplace.

- Fewer emission threshold monitors and fewer system monitors (e.g., cooling system, cold start aids
- Less rigidity regarding emission threshold monitor calibrations/lower fidelity emission threshold monitoring
- Fewer malfunctions requiring continuous MIL illumination (i.e., align with the WWH-OBD "discriminatory" MIL display logic)
- Fewer certification steps and certification requirements
- No permanent diagnostic trouble codes
- No performance monitor ratios
- No per-trip readiness reporting
- No commanded tests and results
- Fewer data stream and freeze frame parameters required
- No enforcement provisions
- No production evaluation requirements
- Fewer emission demonstration tests

EMA, 2005-0047-0026, p. 45-47

WWH OBD as a solution could be beneficial to commercial vehicle market by not having as many continuous MIL malfunctions. It also could be beneficial to vehicle maintenance industry because WWH OBD provides a malfunction classification system that could direct them to the malfunction with the worst emission impact so that they could be fixed first. Additionally it could be beneficial to manufacturers and maintenance industry if, in addition to the US 50 states, other regions around the world were following one type of HD OBD.

Cummins Inc., 2005-0047-0026, p. 5-6

Agency Response:

We appreciate the comments received on this topic. As made clear in our proposal, we were not able to propose the WWH-OBD regulation since it was not yet a final document. It is important to note that California already had HD OBD requirements in place and we must be cognizant of harmonization both with California and at the international level. The California OBD requirements were analogous to the WWH-OBD requirements, but were not identical. At industry's request, we patterned our proposal after the California regulation and, in the 2010-2012 timeframe, our requirements were identical to California's. We continue to like certain aspects of the WWH-OBD regulation (e.g., the malfunction classification system mentioned by Cummins) but we do have

concerns with the lack of specificity regarding some of the WWH-OBD requirements relative to the specificity we have in our final requirements. We have not changed anything in our final rule with respect to this issue but, should this topic come up for further consideration in a future rule, we will consider the comments summarized here in making any possible future proposal.

I.F Onboard Diagnostics for Diesel Engines used in Nonroad Land-based Equipment

Comments:

TCEQ also supports the consideration of future rulemaking that would require OBD systems on non-road heavy-duty diesel engines. Non-road heavy-duty vehicles are a source of NOx and PM and, similar to heavy-duty vehicles, have an extended useful life lasting many years. The implementation of OBD on non-road heavy-duty engines would assist in the maintenance and repair of these vehicles and provide a means to ensure these engines continue to emit at low emissions levels.

Texas Commission on Environmental Quality, 2005-0047-0020, p. 1
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 2
NY State DEC, 2005-0047-0033, p. 1

Considering OBD for nonroad must take into account nonroad market characteristics, such as:

- Low volume applications in highly diversified markets
- Broad power ranges with a variety of different test cycles
- Severe space, weight and handling constraints, especially in lower power categories
- Technically challenging and complex transfers of on-highway technology to nonroad applications

Consequently, adopting HDOBD requirements for nonroad applications is not regarded as appropriate and any such considerations by EPA must consider making available flexibility provisions.

Euromot, 2005-0047-0023, p. 3

EMA appreciates EPA's recognition of the extreme diversity of the nonroad land-based market. MEA has previously enumerated the issues associated with technology transfer from on-highway to nonroad applications (see EMA comments on the NRT4 proposal, dated August 20, 2003, contained in docket # A-2001-28). Moreover, technology transfer to nonroad engines outside the typical highway HD horsepower range of 200-600 horsepower compounds the level of complexity which affects manufacturers' ability to transfer OBD from highway to nonroad engines. EMA believes that proposing the same OBD requirements for nonroad as for highway HD is not appropriate; the "natural progression" from highway to nonroad, as suggested by EPA, is not appropriate.

EMA, 2005-0047-0026, p. 43
Caterpillar Inc., 2005-0047-0030, p. 4

Agency Response:

We appreciate the time, effort, and thought put into preparing these comments and will consider them when we begin development of any possible future nonroad OBD proposals.

I.F.1 What is the baseline nonroad OBD system?

Comments:

Monitoring and diagnostic systems are commonly used today on electronically-controlled engine platforms. These are typically the higher horsepower engines that currently meet more stringent emissions standards. These diagnostic systems are used to ensure customer satisfaction, product performance, and in-use emission compliance. By contrast, lower horsepower engines can meet emission standards using mechanically-controlled engine platforms and, as such, have few diagnostic systems today. The first step for EPA is to engage in dialogue and review with industry over the use case(s) for OBD. Industry and regulators should have a common understanding of goals and expected environmental results of implementing OBD prior to moving forward.

EMA, 2005-0047-0026, p. 44
Caterpillar Inc., 2005-0047-0030, p. 6
Cummins Inc., 2005-0047-0031, p. 6

Nonroad OBD, if implemented, should not extend beyond the engine sizes and horsepower range associated with highway engines.

Caterpillar Inc., 2005-0047-0030, p. 6

Agency Response:

We appreciate the time, effort, and thought put into preparing these comments and will consider them when we begin development of any possible future nonroad OBD proposals.

I.F.2 What is the appropriate level of OBD monitoring for nonroad diesel engines?

Comments:

The diverse range of operating characteristics for nonroad engines and the differences in typical duty cycles compared to highway engines strongly suggest taking somewhat different approaches. Therefore, we support the concept of developing nonroad OBD requirements that rely more heavily on monitoring component performance (e.g., after-treatment devices, sensors, and fuel systems), compared to monitoring emissions thresholds. However, we support including emissions threshold approaches for nonroad OBD systems where practical. For example, if certain engine families are commonly used to operate nonroad equipment under prolonged steady-state conditions, an emissions threshold approach may be quite practical. In addition, analogous to the drive cycle options to be made available for OBD monitoring of highway vehicles, it may be possible to identify common nonroad duty cycles for which an emissions threshold monitoring approach is practical.

NESCAUM, 2005-0047-0024, p. 3-4
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 6

If regulatory authorities proceed with OBD requirements for nonroad diesel engines, those requirements should be focused on aftertreatment devices only and should be limited to functional monitoring – without emission threshold monitoring – with no tracking of in-use performance ratios. In the context of the nonroad market, designing a single OBD approach that would ensure frequent monitoring events on all possible applications would be almost impossible. Furthermore, EPA or any other regulatory body should not adopt monitoring requirements for equipment. There is extreme diversity in nonroad equipment and little, if any, emissions benefit from equipment and drivetrain diagnostics. Moreover, engine manufacturers do not manufacture equipment and cannot, and

should not, be held responsible for diagnostics beyond aftertreatment devices. Nonroad OBD requirements should be implemented no earlier than 2020 to allow manufacturers to focus development activity on requirements of other future regulations including highway HDOBD, nonroad Tier 4, and Tier 3 and 4 locomotive and marine.

EMA, 2005-0047-0026, p. 44-45
Caterpillar Inc., 2005-0047-0030, p. 4-6
Cummins Inc., 2005-0047-0031, p. 6

Unit costs and in-use maintenance costs will be significantly reduced if the OBD monitoring requirements for nonroad engines essentially parallel those for on-highway engines. TMA recommends that nonroad OBD requirements minimize potential mechanical differences between on-highway and nonroad engines.

Truck Manufacturers Association, 2005-0047-0028, p. 2

Agency Response:

We appreciate the time, effort, and thought put into preparing these comments and will consider them when we begin development of any possible future nonroad OBD proposals.

I.F.3 What should the OBD standardization features be?

Comments:

Current practices in the nonroad service network are adequate to support needed scan tool interface and product serviceability. The extremely high cost of nonroad equipment downtime has already driven the market to robust diagnostics, accurate troubleshooting and a service infrastructure focused on minimal customer downtime. Nevertheless, the global nature of the nonroad industry would merit (in a perfect world) from a single communication protocol. However, there are more than one protocol, data link and connector used today in the nonroad market with electronically controlled engine platforms. Whatever the ultimate design choice is, it is desirable that a link does exist conforming to a recognized standard and that the connector be accessible to a service technician. It also is desirable that the use of a dedicated MIL be optional. EMA anticipates that many of these standardization issues will be worked out through the ongoing SAE and ISO standardization and/or the WWH-OBD processes.

EMA, 2005-0047-0026, p. 45

Cummins believes that a standardized interface would be a benefit (connector, protocol, critical subset of services) for the nonroad industry. Allowing SAE J1939 and ISO 15765-4 is appropriate.

Cummins Inc., 2005-0047-0031, p. 6

On-highway engine data link parameters number in the hundreds. However, nonroad parameters number in the thousands. While Caterpillar does support J1939 on many products, there is a need to continue use of proprietary protocols. Some nonroad equipment is manufactured in extremely small volumes, and some have annual sales volumes of 10 or less. These products are very complex, have numerous control modules, and require specialized communication needs. From a cost and development time perspective, it is impractical to obtain standardized or public approval for communication parameters required for these products because much of the information is so specific to a product and unlikely to be used by other manufacturers. These factors essentially drive

the industry to require the use of proprietary protocols. Caterpillar is requesting the EPA consider the need for proprietary protocols and their co-existence with standardized protocols.

Caterpillar Inc., 2005-0047-0030, p. 7

The Department also supports requirements for wireless communication protocols for diesel non-road land based equipment so that onboard information can be read by a universal scan tool or other offboard device. In order for an engine emissions problem to be effectively diagnosed and repaired, there must be the ability to download stored onboard information. Common communication protocols that are readable by universal scan tools are extremely important. Universal scan protocols will enable equipment owners and service providers to diagnose engine and emission control system problems for a wide variety of equipment without the requirement of purchasing multiple specialized scan tools. This capability especially becomes important as equipment ages, becomes more prone to malfunction, and manufacturer support diminishes as newer products are introduced.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 6

Agency Response:

We appreciate the time, effort, and thought put into preparing these comments and will consider them when we begin development of any possible future nonroad OBD proposals.

I.F.4 What are the prospects and/or desires for international harmonization of nonroad OBD?

Comments:

EMA believes that international harmonization of nonroad OBD is essential. EMA will actively participate in the development of a nonroad global technical regulation under the direction of UNECE WP-29 World Forum of Global Harmonization of Vehicle Regulations. The government/industry experience gained during the development and ultimate approval of the WWH-OBD (on-road) global technical regulation will prove invaluable to the nonroad OBD development process. EPA is encouraged to participate in the development of a nonroad world harmonized OBD global technical requirement rather than promulgate a separate U.S. regulation. However, if a WWH effort leads to allowing different solutions for any region that adopts a newly developed WWH Nonroad OBD regulation then that would not be desired because it would mean there are possibly more certification combinations to satisfy than there are today.

EMA, 2005-0047-0026, p. 45
Caterpillar Inc., 2005-0047-0030, p. 7
Cummins Inc., 2005-0047-0031, p. 6-7

Agency Response:

We appreciate the time, effort, and thought put into preparing these comments and will consider them when we begin development of any possible future nonroad OBD proposals.

II. What are the Proposed OBD Requirements and When Would They be Implemented?

II.A General OBD System Requirements

What We Proposed:

This section contained the general proposal that engines be equipped with an OBD system, that the system contain a malfunction indicator light (MIL) to alert the driver of a problem, and also store diagnostic trouble codes to assist repair technicians when making repairs. We also presented the concept of monitoring conditions and how they differed for different OBD monitors. Lastly, this section presented our proposal for addressing infrequent regeneration adjustment factors when determining OBD thresholds.

II.A.1 The OBD System

Comments:

Since heavy-duty vehicles, especially diesel vehicles, have an extended useful life often lasting hundreds of thousands of miles, the need to detect emissions related problems throughout the operational period is important in reducing nitrogen oxides (NOx) and particulate matter (PM) emissions.

Texas Commission on Environmental Quality, 2005-0047-0020, p. 1
NESCAUM, 2005-0047-0024, p. 3
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 8
National Automobile Dealers Association, 2005-0047-0034, p. 3

Agency Response:

We agree with these comments and require that the OBD system remain functional according to its original design throughout the lifetime of the engine.

II.A.2 Malfunction Indicator Light (MIL) and Diagnostic Trouble Codes (DTC)

Comments:

Commenters stating an endorsement of the ISO engine symbol (F01) as the OBD MIL:

NESCAUM, 2005-0047-0024, p. 7
American Trucking Association, 2005-0047-0029, p. 2
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 8
Cummins Inc., 2005-0047-0031, p. 10-11
NY State DEC, 2005-0047-0033, p. 1
California Air Resources Board, 2005-0047-0035, p. 1-2

Commenters stating an endorsement of the ISO emissions symbol (F22) as the OBD MIL:

Caterpillar Inc., 2005-0047-0030, p. 4

Commenters stating an endorsement for having one MIL for all emission related malfunctions:

American Trucking Association, 2005-0047-0029, p. 2
Truck Manufacturers Association, 2005-0047-0028, p. 2

The F01 symbol has been used by HD highway vehicles for many years and is understood to have a meaning different than what the OBD MIL intends to convey. The F22 symbol would better communicate the need for emissions related repair and would reduce confusion for operators of HD highway vehicles. Since EPA prohibits the use of the OBD MIL for non-OBD purposes, two amber warning lamps will be expected on HD vehicles – one OBD lamp and one non-OBD lamp. Therefore, it is best to continue to use the F01 symbol for non-OBD events (as today) and the F22 for the OBD MIL.

Caterpillar Inc., 2005-0047-0030, p. 4

ISO warning light symbols should be configured to be easily understood by the equipment operator. In this regard, we support using the engine symbol as proposed by EPA. The symbol preferred by the Department of Transportation is confusing and therefore would be less likely to properly inform the operator of an engine or emissions control system-related problem.

NESCAUM, 2005-0047-0024, p. 7
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 8

The symbol selected for the OBD MIL must be acceptable for use across all North American markets. There are advantages and disadvantages to either F22 or F01 ISO symbols – TMA does not have a specific recommendation on this selection.

Truck Manufacturers Association, 2005-0047-0028, p. 2

The proposed MIL symbol, the ISO F01 engine symbol, is already widely used as a check engine light (with the word “check” written across it). Insofar as the two symbols are similar, their meanings blur. Freightliner appreciates that EPA has tailored its proposal to match CARB where possible and appreciates the use of the same symbol. However, EPA should clarify the meaning of the MIL symbol and, at the same time, create uniformity across the HD highway market by either choosing a symbol not already in use or by more precisely specifying the symbol (e.g., requiring that the ISO engine symbol be accompanied by the letters “OBD”). If EPA chooses to deviate in its symbol from that described in the CARB regulation, EPA should require that CARB change their requirement to maintain uniformity (via the CARB waiver process currently being considered, see 72 FR 8726).

Freightliner, 2005-0047-0025, p. 2

Freightliner supports the proposed requirement for a key-on/engine-off MIL bulb check as short as five seconds. Currently, all of Freightliner’s other bulb checks are three to five seconds. CARB requires a 15-20 second bulb check (see 13 CCR 1971.1(d)(2.1.2)). This long bulb check is likely to generate confusion amongst drivers. EPA should not grant a CARB waiver until CARB eliminates their potentially confusing bulb check requirement.

Freightliner, 2005-0047-0025, p. 2
Cummins Inc., 2005-0047-0031, p. 11

EPA's proposed rule deviates from the CARB adopted heavy-duty, light-duty, and medium-duty OBD rules in that it requires the MIL to only illuminate for a minimum of five seconds in the key-on, engine off position as a bulb check feature. CARB regulations mandate a minimum of 10 seconds and this was a result of discussions primarily with inspection and maintenance program managers and inspectors that were having difficulty discerning the MIL from the other warning lights that all illuminate during a bulb check. Ten seconds was chosen as a reasonable value to ensure inspectors have sufficient opportunity to look for and locate the MIL during the bulb check with

minimal risk of falsely failing the vehicle because it extinguished too quickly. Five seconds was considered and rejected as insufficient given the number of warning lights on today's vehicles.

California Air Resources Board, 2005-0047-0035, p. 2

Requirements to monitor datalink telltale systems and light emitting diode (LED) MIL lamps – both of which have a high degree of reliability – for proper circuit function and lamp illumination is difficult and costly and may prompt manufacturers to opt for older-style, inherently less reliable lamps and driver interface systems than LEDs and datalink systems. Freightliner requests that EPA omit the requirement for MIL circuit monitoring and that, during CARB's waiver process, EPA require that CARB do the same.

Freightliner, 2005-0047-0025, p. 2
Cummins Inc., 2005-0047-0031, p. 9

Integrated dash panels should be allowed to provide the MIL function, and the MIL functionality and wait-to-start lamp functionality requirements should be written such that the applicable suppliers be burdened with satisfying them – i.e., the engine manufacturer should not be the responsible party for an item under the control of the vehicle manufacturer or other member of the heavy truck industry.

Cummins Inc., 2005-0047-0031, p. 9-10, p. 12

LED technology MIL and wait-to-start lamps should be exempted from comprehensive component monitoring requirements.

Truck Manufacturers Association, 2005-0047-0028, p. 3

EPA should allow the existing engine Amber Warning Lamp and engine Red Stop Lamp along with the newly proposed OBD MIL. Implementation of the OBD MIL should be aligned with CARB (i.e., mandatory use of an OBD MIL should begin in 2013).

Cummins Inc., 2005-0047-0031, p. 10

We support the concept of defining a driving cycle according to a specified period of continuous engine-on operation. This will help to ensure that OBD monitors that run only once per driving cycle will operate frequently enough to detect system malfunctions and that sustained engine operation does not effectively turn off these monitors. We support the concept of requiring certain monitors to run continuously throughout the driving cycle, including certain threshold monitors (e.g., fuel system monitor) and most circuit continuity monitors.

NESCAUM, 2005-0047-0024, p. 4
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 8

EPA should consider shortening the driving cycle to one hour rather than the proposed four hour maximum. More frequent monitoring is preferable to less frequent longer intervals that may miss triggering engine malfunction codes in extended drive cycles.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 8

The definition of the term "pending DTC" is inconsistent with the definitions used in the CARB light and medium-duty OBDII regulation, the CARB HDOBD regulation and the WWH-OBD regulation. The EPA definition states that a pending DTC is a "diagnostic trouble code stored upon

the detection of a potential malfunction." A potential malfunction is then defined as meaning that "conditions have been detected that meet the OBD malfunction criteria but for which more drive cycles are allowed to provide further evaluation prior to confirming that a malfunction exists." The commenter recommends a definition that clarifies that a pending DTC be stored only for conditions detected on the current or most recent drive cycle. The commenter also recommends removing the term "potential DTC" from the regulation and replacing it with the recommended "pending" DTC term.

Cummins Inc., 2005-0047-0031, p. 4-5

Caterpillar strongly supports EPA's definition of "pending" DTCs. Caterpillar believes that the original definition of "pending" which would allow DTCs to be simultaneously "pending" and "confirmed" is not logical and would cause confusion for the HD service industry.

Caterpillar Inc., 2005-0047-0030, p. 4

Agency Response:

Regarding the MIL symbol (F01 versus F22), only Caterpillar supported F22 so we have decided to remain consistent with our proposal and require the F01 symbol. Other commenters argued that the F01 symbol has been used in the past and, as such, the OBD MIL should not use the F01 symbol and should use something different. However, given the lack of support for the F22 symbol and knowing of no real viable alternatives to the F01 or F22 symbol, we believe that the F01 symbol is the best choice and have faith that engine manufacturers will be able to educate their customers on the new significance of that symbol should drivers see it illuminated on their dash.

Regarding the illumination time upon key-on, CARB argues that a minimum of 10 seconds should be stipulated while others argue for the 5 second given current practice of 3-5 seconds. A system designed to meet the 10 second CARB minimum would clearly meet our 5 second minumum. We believe that inspectors, should HDOBD one day become part of inspection and maintenance programs, can be trained if necessary to find the illuminating MIL given a 5 second window and, therefore, we consider our proposed 5 second interval acceptable

Regarding LED based wait-to-start lamps and MIL lamps, we agree with commenters and have changed our final rule such that these lamps need not conduct circuit checks. We will monitor the situation in-use to ensure that the reliability claimed by industry is reality. Note that a message must be present via the datastream indicating any situation where the MIL is being commanded 'on' by the OBD system. Therefore, anyone can easily determine that a lack of MIL illumination at the dashboard when the MIL is being commanded 'on' suggests that there is a problem with the MIL circuit.

Regarding timing of the mandatory MIL as Cummins commented, we agree with the comment and require that existing lamps be used in the 2010-2012 timeframe and the mandatory lamp be used beginning in 2013. This remains as we proposed.

Regarding the drive cycle related comments and expressed desires for more frequent monitoring, we understand these comments but have some reservations which we believe outweigh the concerns expressed by commenters. Please refer to our response in section II.A.3 for more detail.

Regarding the comment from Cummins, and others, on the definition of pending DTC, the intent behind the definition put forth in the proposal was not to generate an entirely new definition of an existing term. As we understand, there are slightly different methods to storing and deleting pending DTCs depending on which communication protocol is used (i.e., SAE versus ISO protocols).

Our intent was to define the term in a generic enough way so as to convey its general meaning, but leave it to industry to determine how to best inform their repair technicians about the status of malfunctions and potential malfunctions (i.e., leave it to the standards setting bodies to standardize the implementation). As a result of comments received, we believed that our intent, while good, had served to generate confusion and leave open the possibility that someone would use, say, the SAE standard but store/erase pending DTCs according to the ISO standard. In subsequent discussions with EMA, it was decided to leave things generic and up to the manufacturer how best to deal with pending DTCs. We consider our primary concern to be the MIL-on DTC so are willing to structure the requirement for pending DTCs as industry prefers.[3]

As for the requirement to define a pending DTC as a DTC stored only for events detected on the current or most recent drive cycle, we do not believe this is necessary. The CARB definition is a "diagnostic trouble code stored upon the initial detection of a malfunction (e.g., typically on a single driving cycle) prior to illumination of the MIL…" We believe that the erasure clarification mentioned above along with the proposed definition of pending DTC makes the EPA regulation consistent in every way with the CARB HDOBD regulation.

II.A.3 Monitoring Conditions

Comments:

We support the general monitoring conditions as proposed. Particularly, we support the concepts that:

- monitors should run during conditions that are technically necessary to ensure robust detection of malfunctions, avoiding false passes and false indications of malfunction;
- enabling criteria should ensure monitoring will occur during normal vehicle operation;
- monitoring should occur during at least one FTP transient cycle or SET; and
- monitors will run at least once per driving cycle in which the applicable monitoring conditions are met.

In regard to the 4th general monitoring condition above, we have taken note that throughout the proposal for various monitors, "monitoring must occur every time the monitoring conditions are met during the driving cycle in lieu of once per driving cycle as required for most monitors." Among those for which monitoring is required only once per drive cycle are so-called "major monitors (e.g., catalyst, EGR, CDPF, other diesel aftertreatment devices)". The proposal is unclear as to why some components are monitored only once per drive cycle, whereas others apparently will be monitored whenever the applicable conditions are met. We urge EPA generally to require monitors to operate whenever the applicable conditions are met unless there is some compelling reason to monitor only once per driving cycle.

NESCAUM, 2005-0047-0024, p. 5

In addition to the general monitoring conditions, NESCAUM supports requirements for in-use performance tracking for the 11 listed system components (§ 86.010-18(d)(1), FR page 3292). We take note of the fact that initially EPA is proposing a minimum in-use performance ratio of 0.100 for all monitors specifically required to track in-use performance (i.e., monitors must make valid diagnostic decisions during 10 percent of the vehicles trips) and that this ratio may be revised downward, following initial years of implementation as EPA works with industry to gather data on in-use performance ratios. We further take note of the fact that 10 percent is a minimum, subject to first meeting the general monitoring conditions. For example, if a particular monitor is capable of ensuring robust detection of malfunctions during 50 percent of vehicle trips, then the higher

[3] See memorandum to Docket ID No. EPA-HQ-OAR-2005-0047 from Todd Sherwood, "Meetings with the Engine Manufacturers Association," document ID # EPA-HQ-OAR-2005-0047-0053.

percentage requirement would prevail. Further, we assume that any decision to revise the in-use performance ratio for any particular monitor will require further revision of this regulation, so will be subject to a new public comment process.

NESCAUM, 2005-0047-0024, p. 5

EPA's preamble indicates that EPA is committed to working with industry to collect and reassess in-use data but it appears limited to the extent that it would only consider revising the minimum ratios "lower as appropriate". CARB's stated intent for the minimum ratios of 0.100 is to set an interim ratio that can then be raised or lowered, as appropriate. Based on the statistical analysis done when developing the in-use ratios for light- and medium-duty vehicles, a ratio of 0 .100 reflects fairly infrequent in-use monitoring for a substantial portion of the fleet and it would not be considered acceptable by ARB for long term use. For the particulate matter filter alone, this ratio could translate to as little as three monitoring events per year for a typical medium-duty application.

California Air Resources Board, 2005-0047-0035, p. 2

Agency Response:

We understand NESCAUM's concern that major monitors are only required to run once per drive cycle. Major monitors usually override the emission control system to in order to detect a failure of the component they are monitoring. Increased emissions are created during monitoring override, so it is not desirable to run these monitors from both the stand point of the manufacturer who is trying to meet the emissions standard and the EPA who wishes to have vehicles create the fewest emissions possible while still determining the robustness of the emissions control system.

We understand both NESCAUM's and CARB's concerns with having the initial in-use performance ratio set to 0.100. This introductory ratio does not take effect until 2013. Data will be gathered by the manufacturer and submitted to EPA as specified in the final regulation at §86.010-18(j)(3). The minimum ratio may be increased or decreased based on real world data. Manufacturers should not be setup to fail based on this new requirement. It is EPA's opinion that starting with an in-use performance ratio of 0.100 is fair and reasonable, and may be increased when the data available to justify it.

II.A.4 Determining the Proper OBD Malfunction Criteria

Comments:

EMA does not support the inclusion of infrequent regeneration adjustment factors (IRAFs), as proposed in §86.010-18(f)(2), for numerous reasons, including feasibility and stringency concerns, the workload burden, and because further analysis is necessary before it can be determined whether and how IRAFs should be applied to OBD monitors.

Applying IRAFs to OBD thresholds increases the stringency of the OBD standards and makes them infeasible. When designing engines to meet emissions standards, manufacturers must leave "headroom" or margin to account for variability and other factors that may increase engine or OBD emissions in a given situation. Maintaining that headroom is essential to manufacturers' ability to comply with the thresholds. Adding IRAFs – whether they are emission certification adjustment factors or uniquely-calculated adjustment factors – erodes or eliminates that margin, assuring that the OBD threshold standards would not be technologically feasible. Adding IRAFs is unnecessary since regeneration emissions are already accounted for in the emissions standards.

Requiring IRAFs for OBD creates an unreasonable workload. EPA has no basis for adopting a requirement over which EPA has expressed substantial concern at 72 FR 3211 where EPA expresses concern that "manufacturers may find themselves in a difficult iterative process calibrating

such monitors that, in the end, will not be correspondingly more effective." The commenter then explains that, assuming there are 13 OBD threshold monitors and two regeneration devices (e.g., DPF and NOx adsorber), a manufacturer would have to determine unique upward adjustment factors (UAF) and downward adjustment factors (DAF) for 26 unique (i.e., OBD specific) IRAFs. The process for conducting this effort and the required testing is then described, including descriptions of the difficulty of generating "perfect threshold parts" and the time and testing burden needed to do so. The commenter then states that all the testing on all the emission threshold monitors for all applicable test cycles and each infrequent regeneration device and engines/aftertreatment translates to an enormous amount of engineering resources, expense, test cell time, and leatime required to obtain the data necessary to develop unique IRAFs for each OBD threshold monitor. In fact, engine manufacturers estimate that the proposed requirements would increase their OBD threshold development work far more than double that which manufacturers currently predict for achieving threshold compliance without including IRAFs. Having had no experience with determining the impacts of regeneration events on OBD emissions and developing appropriate adjustment factors, engine manufacturers do not believe that engineering analysis is sufficient for fulfilling these requirements.

EMA, 2005-0047-0026, p. 25-29
Cummins Inc., 2005-0047-0031, p. 4

Uncertainty exists around the process for determining IRAFs for emissions certification for 2010, let alone for OBD. For 2007 emissions IRAFs, there were multiple, ever-changing guidance documents issued from EPA, as late as the second half of 2006 when manufacturers were in the middle of certifying their products. The changing guidance resulted in re-development work and wasted testing. EPA and the manufacturers will revisit the process for determining IRAFs for 2010 emissions certification. The lack of solid guidance in this area makes the inclusion of OBD IRAFs, which will require even more complex process development, infeasible for 2010.

Cummins Inc., 2005-0047-0031, p. 4

The costs of adding IRAFs far outweigh the benefits. Given the high cost and the minimal anticipated benefits from requiring that IRAFs be considered, EPA should not adopt IRAF requirements for HDOBD.

EMA, 2005-0047-0026, p. 29-30

Using emissions certification IRAFs for OBD certification, as suggested by EPA as perhaps being the best approach, is technically incorrect. Those IRAFs are based on baseline engine emissions not on emissions using OBD threshold parts. EPA should not adopt a compromise position that is not technically correct – it is bad regulatory policy and wrong from an engineering perspective. Doing so would not advance air quality. EPA should not adopt requirements to adjust malfunction thresholds for regeneration emissions.

EMA, 2005-0047-0026, p. 30

Under the proposed rule, it is possible that the MIL may be triggered by a component that is subject to periodic maintenance checks and operating within its expected range of function. In such cases, premature replacement or repair of engine components may be required to prevent the MIL from illuminating. Also, trucks may be forced out of service for maintenance for malfunctions not affecting emissions, which is beyond the scope and intent of this proposed rule. TRALA also encourages the consideration of an OBD system that helps the driver understand whether or not a malfunction is emission-related and requires the truck to be pulled out of productive service for repair.

Truck Renting and Leasing Association, 2005-0047-0032, p. 2

EPA's preamble opens the discussion for consideration of alternatives to including the regeneration emissions in determining malfunction criteria. As EPA certainly knows from certification test results submitted by the manufacturer, the inclusion of regeneration emissions and the frequency with which they occur is critical in determining the average emissions from the engine and, as a result, compliance with the tailpipe emission standards. The same principle holds true for regeneration emissions and frequency when determining malfunction criteria. To the extent that deterioration and malfunction of a component increases the frequency of a regeneration event or increases the emissions of the event itself, that increase in emissions should be considered in establishing the threshold for the monitored component. In fact, for some components such as the oxidation catalyst where the primary purpose is for the regeneration event itself, failure to consider the regeneration events would essentially exclude the component from monitoring and let the increase in emissions go unchecked in-use.

California Air Resources Board, 2005-0047-0035, p. 2-3

Agency Response:

This issue remains a difficult issue to resolve. We agree with the CARB comment that regeneration emissions are clearly part of the emission standard. In fact, we consider those emissions to be a very important part of our emission standards hence our inclusion of them in the standards. What is less clear is whether those emissions should be part of the OBD threshold. Further, we agree with industry comments that the burden imposed by including regeneration emissions in the OBD threshold may well be very large (as we noted in our proposal at 32 FR 3211). In the end, we simply do not believe that the burden imposed is properly aligned with the benefit of including the regeneration emissions in the OBD threshold. Therefore, we have changed our final provisions in a small way by stating, in §86.010-18(f)(2), that the manufacturer need not adjust emissions to reflect the regeneration emissions when determining OBD thresholds. Note also that we believe our new DOC monitoring requirements (i.e., detecting the inability to achieve a 100 degree C temperature change or achieve the regeneration temperature, etc.) will serve the purpose of detecting malfunctions associated with the DPF regeneration system which is the primary purpose of including regeneration emissions in the OBD threshold, at least where the NMHC catalyst is concerned. Should CARB continue with their inclusion of the regeneration emissions, we will closely monitor things as they develop to ensure that we are not missing the identification of malfunctions causing significant emission impacts and would consider including the regeneration emissions in a possible future OBD proposal.

II.B Monitoring Requirements and Timelines for Diesel-Fueled/Compression-Ignition Engines

What We Proposed:

The proposal contained the following table showing our proposed thresholds.

Thresholds for >14,000 pound Certification (g/bhp-hr) – EPA Proposed

Component/Monitor	MY	NMHC	CO	NOx	PM
NMHC catalyst system	2010-2012	2.5x	--	--	--
	2013+	2x	--	--	--
NOx catalyst system	2010+	--	--	+0.3	--
DPF system	2010-2012	2.5x	--	--	0.05/+0.04
	2013+	2x	--	--	0.05/+0.04
Air-fuel ratio sensors upstream	2010-2012	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	2x	2x	+0.3	0.03/+0.02
Air-fuel ratio sensors downstream	2010-2012	2.5x	--	+0.3	0.05/+0.04
	2013+	2x	--	+0.3	0.05/+0.04
NOx sensors	2010+	--	--	+0.3	0.05/+0.04
"Other monitors" with emissions thresholds (see section II.B)	2010-2012	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	2x	2x	+0.3	0.03/+0.02

Comments:

EMA provided the following table of suggested OBD malfunction thresholds.

EMA, 2005-0047-0026, Appendix B, p. 11

EMA Proposed Thresholds for >14,000 pound Certification (g/bhp-hr)

Component/Monitor	MY	NMHC	CO	NOx	PM
NMHC catalyst system	2010-2012	**Functional Check Only**			
	2013+	**Functional Check Only**			
NOx catalyst system	2010+			**+0.6**	
DPF system	2010-2012	**--**			**0.10/+0.09**
	2013+	**--**			**0.10/+0.09**
Air-fuel ratio sensors upstream	2010-2012	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	2x	2x	+0.3	0.03/+0.02
Air-fuel ratio sensors downstream	2010-2012	2.5x		+0.3	0.05/+0.04
	2013+	2x		+0.3	0.05/+0.04
NOx sensors	2010+			**+0.6**	**--**
"Other monitors" with emissions thresholds (see section II.B)	2010-2012	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	2x	2x	+0.3	0.03/+0.02
Misfire	2010+		**No Requirement**		

Note: Boldfaced text and entries of "--" denote differences from the EPA proposal.

Agency Response:

We have changed some thresholds for the 2010-2012 model years, many of which align our final thresholds with the EMA suggestions. Our final thresholds are shown below.

Thresholds for >14,000 pound Certification (g/bhp-hr) – EPA Final

Component/Monitor	MY	NMHC	CO	NOx	PM
NOx catalyst system	2010-2012			+0.6	
	2013+			+0.3	
DPF system	2010-2012	2.5x			0.05/+0.04
	2013+	2x			0.05/+0.04
Air-fuel ratio sensors upstream	2010-2012	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	2x	2x	+0.3	0.03/+0.02
Air-fuel ratio sensors downstream	2010-2012	2.5x		+0.3	0.05/+0.04
	2013+	2x		+0.3	0.05/+0.04
NOx sensors	2010-2012			+0.6	0.05/+0.04
	2013+			+0.3	0.05/+0.04
"Other monitors" with emissions thresholds (see section II.B)	2010-2012	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	2x	2x	+0.3	0.03/+0.02

Note: See preamble Table II.B-1 and §86.010-18(g), Table 1.

With respect to the NMHC catalyst monitoring, we have eliminated the thresholds and are requiring functional checks only. Please refer to our responses under sections II.B.5 and III.A.5 below for more detail. We have aligned our NOx catalyst thresholds with EMA in the 2010 timeframe. Please refer to our responses under sections II.B.7 and III.A.7 below for more detail. We have not revised our PM thresholds for DPF monitoring relative to our proposal, but we have added an optional monitoring requirement for the 2010-2012 model years. This optional requirement provides an effective monitoring approach using available technology and thereby satisfies the feasibility concerns raised by EMA. Consistent with EMA, we have eliminated our NMHC thresholds associated with the NMHC converting function of the DPF. We have retained NMHC thresholds associated with the DPF in the context of the regeneration frequency monitoring requirement. Please refer to our responses under sections II.B.8 and III.A.8 below, which pertain to DPF monitoring, for more detail. Regarding NOx sensors, we have aligned our NOx thresholds with EMA in the 2010 timeframe but have retained our PM thresholds unlike suggested by EMA. Please refer to our responses under sections II.B.9 and III.A.9 below for more detail. As for misfire, we have not followed the EMA suggestion to eliminate the requirement. Please refer to our responses under sections II.B.2 and III.A.2 below for more detail.

II.B.1 Fuel System Monitoring

What We Proposed:

We proposed that fuel system malfunctions related to injection pressure, injection timing, injection quantity, and feedback control be individually detected prior to emissions exceeding the thresholds for "other monitors." Further, we proposed that pressure and feedback related malfunctions be monitored continuously and that quantity and timing related malfunctions be monitored once per trip.

Comments:

For fuel injection quantity, EPA should eliminate thresholds and require only functionality or circuit continuity testing. For fuel injection timing, EPA should eliminate thresholds and require only functionality or circuit continuity testing and should limit that requirement to common-rail systems.

In lieu of eliminating thresholds for injection timing and quantity, EPA should limit the scope of threshold monitoring to those failure modes that are detectable during idle and deceleration fuel cutoff.

Threshold monitoring for fuel injection pressure should be eliminated for fuel systems that do not use common rail fuel injection because only common rail systems directly measure fuel injection pressure. Threshold monitoring of fuel injection timing should be required only on non-common rail fuel systems.

EMA, 2005-0047-0026, p. 14-15
Caterpillar Inc., 2005-0047-0030, p. 3

Agency Response:

We have made considerable changes to the fuel system monitoring requirements for diesels. Please refer to our response in section III.A.1 for details of those changes.

II.B.2 Engine Misfire Monitoring

What We Proposed:

We proposed that, for 2010-2012, a continuous engine misfire be detected during engine idle. For 2013 and later, we proposed that engines equipped with combustion sensors monitor continuously for misfire during the full operating range and detect a malfunction prior to emissions exceeding the thresholds for "other monitors."

Comments:

EPA's proposal for diesel misfire detection is without justification and imposes significant costs without any benefits. Diesel misfire detection requirements should be eliminated from the final rule.

EMA, 2005-0047-0026, p. 16
National Automobile Dealers Association, 2005-0047-0034, p. 3

If EPA's primary concern with respect to misfire is with monitoring of homogeneous charge compression ignition (HCCI) engine technology, then misfire monitoring requirements should be limited only to the use of such technology and should not be required of other technologies where misfire monitoring is redundant, costly and unnecessary.

EMA, 2005-0047-0026, p. 17-18

Agency Response:

We disagree with EMA's concerns that diesel misfire detection adds cost with no benefit. We believe that costs for detecting misfire on engines without combustion sensors are small and have been done by manufacturers for several years to comply with California's OBDII regulation on CARB's medium-duty applications. As for engines equipped with combustion sensors, again we believe that costs are minimal since the combustion sensing technology can easily detect lack of combustion (i.e., misfire). We are concerned with misfire on all engines not just engines with HCCI technology as mischaracterized by EMA. The mention of HCCI in our regulation is simply an example of systems expected to employ combustion sensors. Misfire on a diesel (just like misfire on a gasoline engine) is a significant emissions concern, and may damage the after treatment system.

Elaboration on the condition and frequency of misfire is not necessary, since different amounts of misfire at different speeds and loads will either cause an emissions problem and/or damage the after treatment system.

We have more discussion of misfire monitoring in our response to issue III.A.2.

II.B.3 Exhaust Gas Recirculation (EGR) System Monitoring

What We Proposed:

We proposed that malfunctions of the EGR system related to low flow, high flow, slow response, feedback control, and cooler performance be detected prior to emissions exceeding the thresholds for "other monitors." Further, we proposed that flow and feedback related malfunctions be monitored continuously, response related malfunctions be monitored whenever conditions were met, and that cooler malfunctions be monitored once per trip.

Comments:

Continuous monitoring of EGR flow (low and high) is neither necessary nor feasible. It is reasonable to limit operation of the monitors to those areas that yield the best separation between normal and malfunctioning systems as long as a minimum performance ratio is met. The EGR monitoring requirement should be defined as a requirement to run "whenever the entry conditions are met" rather than being defined as "continuous monitoring" as proposed. This would result in monitoring strategies designed such that they detect the failure modes that exhibit an effect on emissions throughout the engine operating range, which extends beyond the entry conditions of the monitor.

EMA, 2005-0047-0026, p. 20

Agency Response:

We disagree with the commenter that continuous monitoring of the EGR system is not necessary. EPA believes that EGR system continuous monitoring is necessary for specific monitors on complex systems and it can be accomplished by a combination of both system and comprehensive component monitoring. By reducing the monitoring requirements to less than continuous, (i.e. once per trip), malfunctions under some operating conditions may not be detected if those operating conditions happen to differ from the monitoring conditions. Because EGR operates under almost all operating conditions, and because the possibility exists for malfunctions to manifest under only specific operating conditions, all operating conditions should be monitored. However, we believe that there may have been some confusion as regards our proposed "continuous" monitoring requirements. We have revised slightly our proposed EGR monitoring conditions to provide greater clarity to the "continuous" monitoring requirement and believe that this change addresses the primary concern raised by the comment. Please refer to our response under section III.A.3 below for a more detailed discussion on this issue and the revision we have made for the final rule.

II.B.4 Turbo Boost Control System Monitoring

What We Proposed:

We proposed that malfunctions of the boost control system related to underboost, overboost, variable geometry slow response, feedback control, and undercooling be detected prior to emissions exceeding the thresholds for "other monitors." Further, we proposed that underboost, overboost,

and feedback related malfunctions be monitored continuously, that slow response related malfunctions be monitored whenever conditions were met, and that undercooling related malfunctions be monitored once per trip.

Comments:

Boost monitoring should not be done continuously, but should be done whenever entry conditions are met.

EMA, 2005-0047-0026, p. 20

Agency Response:

As noted above under II.B.3 for EGR monitoring, we disagree with the commenter that continuous monitoring of the turbo boost system is not necessary. EPA believes that turbo boost system continuous monitoring is necessary for specific monitors on complex systems and it can be accomplished by a combination of both system and comprehensive component monitoring. By reducing the monitoring requirements to less than continuous, (i.e. once per trip), malfunctions under some operating conditions may not be detected if those operating conditions happen to differ from the monitoring conditions. Because EGR operates under almost all operating conditions, and because the possibility exists for malfunctions to manifest under only specific operating conditions, all operating conditions should be monitored. However, we believe that there may have been some confusion as regards our proposed "continuous" monitoring requirements. We have added a new provision to the turbo boost monitoring conditions that is analogous to the provision noted above for EGR monitoring conditions. This new provision, as with EGR, provides greater clarity to the "continuous" monitoring requirement, and we believe it addresses the primary concern raised by the comment. Please refer to our response under section III.A.4 below for a more detailed discussion on this issue and the new provision we have added for the final rule.

II.B.5 Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring

What We Proposed:

We proposed that malfunctions related to NMHC conversion efficiency be detected prior to emissions exceeding the thresholds for "NMHC catalyst." We also proposed that, should the NMHC converting catalyst be used to assist other aftertreatment devices, that malfunctions be detected if that assistance is no longer occurring. Further, we proposed that conversion efficiency and aftertreatment assistance be monitoring once per trip.

Comments:

EPA should not adopt an emissions threshold monitoring requirement for DOCs and should, instead, require only functional monitoring.

EMA, 2005-0047-0026, p. 14

Agency Response:

We agree with this comment and have eliminated our emission threshold for NMHC catalyst monitoring. As discussed in more detail in section III.A.5, we know of no good means to monitor the NMHC conversion function. The exotherm generated during normal NMHC conversion is too low to be accurately detected. To generate an exotherm that can be detected, such as that which occurs

during a DPF regeneration event, excess fuel must be used which not only increases that rate of deterioration of the device but also generates emissions. As such, the exotherm monitoring approach can verify that sufficient temperatures are being generated to assist in DPF regeneration, but we see no good reason to increase deterioration and emissions on a per-trip basis to generate such an exotherm for the purpose of evaluating NMHC conversion efficiency. In summary, we still require a functional check of the NMHC catalyst to ensure that it is providing the necessary exotherm to assist in any regeneration functions it may have, and we still require a functional check to ensure that some level of NMHC conversion is occurring, but we have eliminated the NMHC threshold associated with that monitoring. Please refer to our response under section III.A.5 for more detail.

II.B.6 Selective Catalytic Reduction (SCR) and Lean NOx Catalyst Monitoring

What We Proposed:

We proposed that malfunctions related to conversion efficiency, active/intrusive reductant delivery, active/intrusive reductant quantity, active/intrusive reductant quality, and feedback control be detected prior to emissions exceeding the thresholds for "NOx catalyst system." Further, we proposed that conversion efficiency and reductant quality be monitored once per trip and that reductant delivery, quantity, and feedback control be monitored continuously.

Comments:

An adequate supply and proper type of reductant will be critical to the functioning of SCR systems for NOx control. Therefore, we believe that in all circumstances, there should be an alternative indicator capable of readily notifying the operator of a problem with the reductant level and reductant type. The Driver Warning System, as described in EPA's November 8, 2006 Draft Guidance Document for Certification Procedure for Light-Duty and Heavy-Duty Diesel Vehicles Using Selective Catalyst Reduction (SCR) Technologies includes the necessary elements for such an alternative indicator (i.e., visual warning, escalating in intensity, distinguishable from general OBD monitors). In addition to the alternative indicator, if the reductant tank becomes empty or is filled with an ineffective reductant (e.g., water), a MIL should be illuminated and DTC registered.

NESCAUM, 2005-0047-0024, p. 6-7

The Department disagrees with providing manufacturers the option of delaying illumination of the MIL; storage of a MIL-on DTC; and using an alternative indicator for notifying the vehicle operator when the reductant tank is empty, the reductant tank contains improper reductant, a malfunction exists in the reductant system, or deterioration of the reductant delivery system occurs. If the MIL is not activated when a malfunction of this type is detected and reconfirmed a MIL-on DTC will not be stored. An activated MIL and a stored MIL-on DTC for this malfunction should be included if HD OBD I&M is implemented. Malfunctions of these types in the reductant system would likely cause the engine to exceed the proposed emissions thresholds and should trigger illumination of the MIL and storage of a MIL-on DTC. This type of malfunction should be treated no differently than any other malfunction that would result in emissions from an engine exceeding the proposed thresholds. The Department would support the activation of an alternative indicator if the MIL is also activated and a MIL-on DTC stored.

The Department supports the allowance for immediate MIL deactivation and DTC(s) erasure once the OBD system has verified the reductant tank has been properly refilled and the MIL has not been activated for any other malfunction. The Department recommends addition of an indicator light that activates when the reductant tank reaches a low level, similar to the low fuel level indicator in light-duty vehicles, which will allow the vehicle operator sufficient time to replenish the tank before it is empty. While requiring the low level indicator may be beyond the scope of HD OBD, it would be a

useful tool for the vehicle operator and would avoid a significant number of unnecessary failures in an I/M program. The Department would support the use of a low level warning light for all areas that may require vehicle operator attention, such as low reductant tank level, low fuel tank level, and low or high battery or system voltages.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 9

The current proposed NOx emissions threshold of NOx standard/FEL plus 0.3 g/bhp is not achievable and should be revised in the final rule to the NOx standard/FEL plus 0.6 g/bhp. EMA supports EPA's proposal not to further reduce the NOx aftertreatment emissions thresholds for 2013 and later.

EMA, 2005-0047-0026, p. 12

A late comment suggested that EPA require that the OBD system be capable of verifying that the liquid in the urea tank is indeed urea. The commenter believes that such a requirement should be placed on the OBD system rather than allowing the system to rely on NOx sensors or other sensors to monitor the SCR catalyst's NOx conversion which would only alert the driver to a low conversion efficiency but would not identify the problem as being an improper liquid in the urea tank.

Mitsui Mining & Smelting Co, Ltd., 2005-0047-0040, p. 1

Agency Response:

In general, the comments concerning the warnings and/or driver inducements associated with the urea fill level and quality are being addressed by our manufacturer guidance on that subject (see Manufacturer Guidance letter CISD-07-07, March 27, 2007). That guidance specifies a need to have a separate driver warning system to indicate malfunctions associated with the reductant fill level and the reductant quality. The guidance does not specify that a urea quality sensor be used. We do not believe that a quality sensor is required provided there are other sensors – presumably NOx sensors or oxygen sensors – capable of monitoring NOx conversion over the SCR catalyst. Those sensors would be capable of detecting a loss of NOx conversion which would illuminate the OBD MIL, although they would not necessarily be capable of pinpointing the problem as being associated with urea quality. Provided the SCR catalyst is being monitored for proper NOx conversion, a urea quality sensor could be considered redundant and representing unnecessary cost. There may be other reasons beside emissions control – such as safety and/or durability of the reductant system – for which manufacturers may choose to employ a urea quality sensor, but those reasons are beyond the scope of an emissions-related OBD system.

We have revised our NOx threshold for the 2010-2012 timeframe from the NOx FEL+0.3 to FEL+0.6 based on our understanding of NOx sensor capabilities. We are keeping our proposed threshold of the NOx FEL+0.3 for model years 2013 and later given our continued confidence that sensor technology will continue to improve. Please refer to our response under section III.A.6 below for more detail.

II.B.7 NOx Adsorber System Monitoring

What We Proposed:

We proposed that malfunctions related to adsorber system capability, active/intrusive reductant delivery, and feedback control be detected prior to emissions exceeding the thresholds for

"NOx catalyst system." Further, we proposed that adsorber capability be monitored once per trip and that reductant delivery and feedback control be monitored continuously.

Comments:

The current proposed NOx emissions threshold of NOx standard/FEL plus 0.3 g/bhp is not achievable and should be revised in the final rule to the NOx standard/FEL plus 0.6 g/bhp. EMA supports EPA's proposal not to further reduce the NOx aftertreatment emissions thresholds for 2013 and later.

EMA, 2005-0047-0026, p. 12

Agency Response:

We have revised our NOx threshold for the 2010-2012 timeframe from the NOx FEL+0.3 to FEL+0.6 based on our understanding of NOx sensor capabilities. We are keeping our proposed threshold of the NOx FEL+0.3 for model years 2013 and later given our continued confidence that sensor technology will continue to improve. Please refer to our response under section III.A.7 below for more detail.

II.B.8 Diesel Particulate Filter (DPF) System Monitoring

What We Proposed:

We proposed that malfunctions related to the DPF filtering performance, regeneration frequency, regeneration completion, NMHC conversion, active/intrusive reductant injection, and feedback control be detected prior to emissions exceeding the thresholds for "DPF system." We also proposed that a missing DPF substrate be detected. Further, we proposed that all of these functions be monitored whenever conditions were met.

Comments:

EPA should revise the proposed DPF threshold monitoring requirement to a threshold of the PM standard or FEL+0.09 g/bhp-hr, or an absolute level of 0.10 g/bhp-hr, whichever is higher, and maintain that threshold through 2013 and beyond, until advancements in sensor or detection technology justify further changes. Further, EMA supports EPA's language that allows an exception to the DPF monitoring requirements to exclude detection of specific failure modes such as partially melted substrates, if the most reliable monitoring method developed requires it. Current monitoring technology is very limited in terms of detecting "non-homogenous failures," which is what such language is intended to address. EMA also supports maintaining the 2010 threshold through 2013 and beyond, which differs from the ARB approach to step the threshold down in 2013. EMA agrees with EPA that there is no technical data supporting such a step in 2013 (72 Fed. Reg. 3255).

EMA, 2005-0047-0026, p. 9

EMA knows of no practical method to determine the NMHC conversion capability of the DPF. EPA should eliminate the proposed requirement to monitor NMHC conversion efficiency of the DPF.

EMA, 2005-0047-0026, p. 10

Agency Response:

The PM thresholds are not being changed for the final rule. We understand that there are manufacturers that intend to certify systems to that threshold level. However, for the final rule, we have added a new alternative monitoring requirement for DPF filtering performance. This alternative requirement will be available during model years 2010-2012 only and would allow the system to detect a malfunction when a detectable decrease in the in the expected pressure drop - relative to a clean, nominal filter - occurs for a period of 5 seconds or more. The monitoring area for this alternative approach is determined using the test cycles and procedures for the supplemental emissions test (SET) under §86.1360-2007. The monitored area shall include all engine speed and load points greater than a region bounded by a line connecting mode numbers 2, 6, 3, and 13 (i.e., a line connecting A100, A75, B50, and C50). At engine speeds greater than "speed C", the monitor shall run whenever engine load is greater than 50%. The detectable change in pressure drop is determined by operating the engine at the "B50" speed and load point (as described in the SET test procedures), observing the pressure drop on a clean, nominal DPF, and multiplying the observed pressure drop by 0.5 or other factor supported by data and approved by the Administrator (see §86.010-18(g)(8)(ii)(A)). We believe that this alternative addresses the feasibility concerns raised by EMA. With this alternative approach, it is the pressure sensing capability of existing delta pressure sensors which define a minimum detectable change in the pressure drop across the DPF. In addition, this optional approach will only monitor during higher load conditions, where the delta pressure across the DPF is significant and within the working range of the sensor. For 2013 and later model years, when tailpipe soot sensors are expected to be available and capable of detecting the quantity of PM passing through the DPF, the thresholds will remain as we proposed. Regarding the NMHC conversion monitoring in our proposal, which required the OBD system to detect loss of NMHC conversion for DPFs that converted NMHC emissions (e.g., catalyzed DPFs), we have eliminated this requirement in the final rule because we know of no good way to monitor the NMHC conversion efficiency with the accuracy required to detect very minor losses in efficiency. Please refer to our response under sections III.A.5 and III.A.8 below for more detail.

II.B.9 Exhaust Gas Sensor Monitoring

What We Proposed:

We proposed that malfunctions related to sensor performance be detected prior to emissions exceeding the applicable thresholds. We also proposed that malfunctions related to circuit integrity, feedback functions, monitoring functions, and heater performance and circuit integrity be detected prior to those functions being lost. Further, we proposed that sensor and heater performance be monitored once per trip, that monitoring functionality be monitored whenever conditions were met, and that circuit integrity and feedback functionality be monitored continuously.

Comments:

EMA recommends that EPA revise the proposed NOx emissions threshold in the final rule to the NOx standard/FEL plus 0.6 g/bhp based on the capability of NOx sensor technology. In addition, the reference to a PM threshold requirement for NOx sensors should be eliminated from Table 1, as it is not appropriate to require monitoring of PM emissions in relation to a NOx sensor based on the premise that the NOx sensor is meant to measure and control NOx not PM. EMA generally supports the Agency's proposal regarding air/fuel ratio sensor monitoring.

EMA, 2005-0047-0026, p. 13

Agency Response:

We agree with EMA's concern and have changed the 2010 through 2012 NOx threshold to the NOx FEL+0.6g/bhp based upon our understanding of NOx sensor capability. We discuss this in more detail in our response to issue III.A.9, below. We disagree with EMA's comments that there is a valid reason to remove the PM threshold. PM increases as NOx decreases. If a NOx Sensor shows an artificially high NOx value, the control system will decrease NOx and increase PM. Therefore, the PM threshold will remain.

II.C Monitoring Requirements and Timelines for Gasoline/Spark-Ignition Engines

II.C.1 Fuel System Monitoring

We received no comments pertaining to this section that require analysis.

II.C.2 Engine Misfire Monitoring

We received no comments pertaining to this section that require analysis.

II.C.3 Exhaust Gas Recirculation (EGR) Monitoring

We received no comments pertaining to this section that require analysis.

II.C.4 Cold Start Emission Reduction Strategy Monitoring

We received no comments pertaining to this section that require analysis.

II.C.5 Secondary Air System Monitoring

We received no comments pertaining to this section that require analysis.

II.C.6 Catalytic Converter Monitoring

We received no comments pertaining to this section that require analysis.

II.C.7 Evaporative Emission Control System Monitoring

What We Proposed:

We proposed that gasoline evaporative emission control systems be monitored and malfunctions detected. We proposed no monitoring for diesel evaporative emission controls. Note that diesel engines and vehicles have no evaporative emission control system.

Comments:

To the extent that heavy-duty gasoline and diesel vehicles contribute evaporative emissions, how will they be addressed?

Maryland Department of the Environment, 2005-0047-0022, p. 1

Agency Response:

Gasoline evaporative emissions are addressed via §86.010-18(h)(7). Diesel engines do not contribute significantly to evaporative emissions since diesel fuel has very low volatility which results in negligible evaporative emissions.

II.C.8 Exhaust Gas Sensor Monitoring

We received no comments pertaining to this section that require analysis.

II.D Monitoring Requirements and Timelines for Other Diesel and Gasoline Systems

II.D.1 Variable Valve Timing and/or Control (VVT) System Monitoring

What We Proposed:

We proposed that VVT system malfunctions related to achieving the commanded valve timing and/or control within a crank angle and/or lift tolerance and slow system response be detected prior to emissions exceeding the thresholds for "other monitors." Further, we proposed that these malfunctions be monitored whenever conditions were met rather than once per trip.

Comments:

EMA generally supports the Agency's proposal regarding VVT system monitoring.

EMA, 2005-0047-0026, p. 24-25

Agency Response:

We agree with this comment.

II.D.2 Engine Cooling System Monitoring

What We Proposed:

We proposed that cooling system malfunctions related to proper thermostat function and engine coolant temperature (ECT) sensor readings be detected. Further, we proposed that malfunctions tied to the thermostat be monitored once per trip and that most ECT malfunctions be monitored once per trip except that circuit malfunctions must be monitored continuously.

Comments:

EPA must eliminate the cooling system monitoring requirement from the proposed HDOBD requirements, and reduce the engine coolant temperature sensor requirement to comprehensive component monitoring with rationality.

EMA, 2005-0047-0026, p. 22

We ask the EPA not to impose OBD requirements that are impractical for non-vertically integrated engine manufacturers to implement, specifically, the cooling system monitoring requirement to determine if an engine has reached a warmed-up temperature and thermostat monitoring. Because the cooling system is essentially both a vehicle-installed system and has high variability from vehicle-to-vehicle, it is practically impossible for an engine manufacturer to diagnose accurately. Such diagnosis would require unique OBD calibrations for each engine vehicle combination.

Caterpillar Inc., 2005-0047-0030, p. 3
National Automobile Dealers Association, 2005-0047-0034, p. 3

OBD failure detection on the performance of the engine cooling system (and the charge air cooling system) must recognize that a prolonged period of severe use, in addition to lack of ordinary care by vehicle owners and operators, may inappropriately indicate that components have failed when they may only need to be cleaned. Such indications of "emission control system failures" may reduce the confidence vehicle owners have in the HDOBD system and may lead to adverse behavior, such as ignoring an illuminated MIL, on the premise that it is only a dirty radiator. Stringent diagnostic requirements on vehicle manufacturer-provided heat exchangers must be avoided to minimize this risk.

Truck Manufacturers Association, 2005-0047-0028, p. 2

Agency Response:

The direct emission impact of a malfunctioning thermostat or cooling system is only a secondary reason for the requirement. The primary reason the cooling system is monitored for proper operation is because the engine manufacturer itself elects to use engine coolant temperature as a primary enabling criteria for monitoring of nearly every emission critical component. The requirement for cooling system monitoring is simply stated as a requirement to verify that the engine properly warms up to the highest temperature required by the engine manufacturer for monitoring of other components. The relative stringency of this monitor is a direct result of how high the manufacturer requires engine coolant temperature to get before monitoring other components and engine manufacturers can effectively desensitize algorithms to vehicle factors by enabling other monitors at lower temperatures. While we understand engine manufacturers' concerns that actions by truck builders and users can impact their monitor design, the intent of OBD systems is to have monitoring of the emission components during real world operation of heavy-duty vehicles. Failure to achieve the necessary warmed-up temperatures required for monitoring would effectively mean monitoring is indefinitely disabled on real world vehicles, thus negating nearly the entire OBD system. Verifying the cooling system is operating properly is a crucial and necessary element to ensure OBD systems continue to operate on real world vehicles throughout their life.

We suspect that the OBD requirements will result in the limitations and specifications that the engine manufacturer will have to place on the vehicle builders to ensure the engine remains in a legally certified configuration. This cooling system monitoring requirement may result in additional calibration work or classification of the exact extent to which the vehicle builders can modify the

cooling system to maintain a compliant system. Failure to do so could result in MIL illumination. However, while eliminating the cooling system monitoring requirements would avoid this potential MIL illumination, it would also re-open the possibility that such a system would be put into service and all of the OBD monitors would be disabled for the entire life of the vehicle.

Subsequent to the closing of the comment period, we met with EMA to discuss, among other things, cooling system monitoring provisions.[4] Based on those discussions, we have changed the requirement to allow the manufacturer to have a temperature lower than the "normal 20 degrees below the nominal thermostat regulating temperature" at which a malfunction must be detected provided the ambient temperature is between 20 F and 50 F. To do so, the manufacturer must present data justifying the new temperature to be reached at the lower ambient temperatures. EMA also commented on the number of trips for engine cooling system monitor when we met with them. We don't feel that increasing the number of trips to more than two for any OBD monitor is acceptable, since it will lead to decreased trust in the reliability of faults. Monitoring conditions for diagnostics must be setup such that diagnostics only run in regions where they are reliable.

II.D.3 Crankcase Ventilation System Monitoring

Comments:

EMA generally supports the Agency's proposal regarding crankcase ventilation system monitoring.

EMA, 2005-0047-0026, p. 24-25

Agency Response:

We agree with this comment.

II.D.4 Comprehensive Component Monitors

What We Proposed:

We proposed that, in general, the OBD system must detect a malfunction of any electronic engine component or system that either provides input to or receives commands from the onboard computer(s). Further, we proposed that malfunctions related to circuit continuity and/or out-of-range values be monitored continuously and that malfunctions related to input data rationality and/or output component functional response be monitored whenever conditions were met.

Comments:

Regarding glow plug and intake air heater system monitoring, EPA should eliminate the glow plug and intake air heater system monitors as a requirement for 2010. EPA should conduct further analysis of HD vehicle confounding issues related to these cold start aids to establish what is needed for a future rulemaking, if any. Should EPA determine that such monitoring is appropriate for 2013 and beyond, the monitoring should be for functional response and circuit continuity only with no monitoring for low to moderate degrees of degradation, comprehensive component monitoring should be required for only the operating controls for power relays or independent

[4] See memorandum to Docket ID No. EPA-HQ-OAR-2005-0047 from Todd Sherwood, "Meetings with the Engine Manufacturers Association," document ID # EPA-HQ-OAR-2005-0047-0053.

controller feedback, and detection only of a single glow plug failure should be required. Regarding other comprehensive component monitors, EMA is generally supportive of the Agency's proposal.

EMA, 2005-0047-0026, p. 19
National Automobile Dealers Association, 2005-0047-0034, p. 3

TMA notes that the examples cited for comprehensive component monitoring do not include operator controls, and submits that operator controls are ill-suited for comprehensive component monitoring. Examples of operator controls include accelerator pedals, cruise control switches, brake switches, and clutch switches. Defining rational use of individual controls and combinations of controls by the operator would be fraught with exceptions and subsequent errors of omission for the rationality monitors. Most commercially available switches, purchased by vehicle manufacturers for operator controls, are not available in forms that can be readily diagnosed for circuit failures. Adding comprehensive component monitoring to these circuits would be accomplished at significant expense to vehicle manufacturers with no additional emissions reduction benefit. Vehicle manufacturers also strongly recommend that remotely-mounted fuel filters be excluded from comprehensive component monitoring requirements. The term "fuel preparation systems" is overly broad and could be construed to include fuel filtration systems that are not mounted on the engine. These systems sometimes indicate excess water in diesel fuel and work to separate it out, but they do not measure fuel qualities such as cetane level or sulfur level. Many filters heat the fuel before it is filtered and water is separated to minimize the impact of wax crystals on vehicle performance. Indeed, if a water separator becomes clogged with wax, the engine stalls because it becomes fuel starved—clearly not an emissions problem. Addressing full water bowls and gelled fuels in fuel filters are considered routine maintenance and should not be MIL-on failures. Heater elements in fuel filters are self-regulating and are not powered by the engine control system.

Truck Manufacturers Association, 2005-0047-0028, p. 3

Agency Response:

For the final rule, we have changed the regulation consistent with EMA's comments to allow circuit checks only on glow plugs for 2010-2012. For 2013 and beyond, the regulation requires a functional check of the sensors. The functional requirement can be met by determining the current used by the sensor is rational. Intake air heaters will require both a circuit and a functional check in 2010, since all sensors needed to do the testing are available.

We disagree with TMA on monitoring of some operator controls. The primary reason some operator controls are monitored for proper operation is because the engine manufacturer itself elects to use them as parameters in monitoring strategies of emission critical components. All inputs to monitors must be monitored to prevent both false MIL illuminations and disabling of monitors. If an input such as the cruise switches are not used in any diagnostic or used to switch between emissions strategies, then they do not need to be diagnosed. Inputs such as accelerator pedal, brake switch, and clutch switch will probably be used as inputs to diagnostics or emissions controls, and will need to be diagnosed. We understand the manufacturers do not have experience with diagnosing operator controls, but we have seen from both the medium duty and light duty industries that such diagnosis is capable of being robust.

We agree with TMA that fuel filters that are self regulating and do not prepare the fuel for combustion (such as heating the fuel to a specific temperature) do not need to be diagnosed. We do believe under some conditions, a fuel filter that is not operating properly may cause a malfunction of a monitor for fuel pressure, fuel quantity, or fuel timing to occur. We do not feel this is an issue since there is something to repair. In the future, if fuel filters are capable of heating fuel for proper combustion, we would expect that feature to be diagnosed.

II.D.5 Other Emissions Control System Monitoring

What We Proposed:

We proposed that, for other emission control systems that are not otherwise specifically addressed be monitored, and that the manufacturer submit a plan for Administrator approval of the monitoring strategy, malfunction criteria, and monitoring conditions prior to introduction on a production engine.

Comments:

We received no comments pertaining to this section that require analysis.

II.D.6 Exceptions to Monitoring Requirements

What We Proposed:

We proposed that certain monitors could be disabled under specific conditions related generally to ambient conditions. Further, we proposed that most such disablements be approved by the Administrator.

Comments:

We expect that monitors will be automatically re-enabled whenever an extreme condition is no longer in effect. NESCAUM does not support the use of systems that need to be manually re-enabled. As experience is gained with OBD systems, manufacturers will have opportunities to improve the reliability of OBD systems. Therefore, we urge EPA not to grant open-ended authorizations to disable monitors, but rather require manufacturers to investigate improvements to the reliability of OBD systems and sunset the exceptions to monitoring requirements in subsequent model years. In addition, whenever a monitor is disabled, a subsequent OBD scan should reveal the disablement. We have questions regarding disablement for low temperature and low fuel levels. Regarding low temperature, we assume the disabled monitors would be those affected by cold start conditions. However, even under extreme cold conditions, the engine eventually will reach normal operating temperature, allowing monitors affected by cold start conditions to operate properly. We assume these monitors can be re-enabled at this point, regardless of ambient temperatures, but the proposal appears to allow for continued disablement until ambient temperatures rise above 20 degrees. If this is in fact EPA's intent, we request an explanation. Regarding low fuel level, 15 percent of nominal tank capacity may represent a large volume of fuel, particularly in a large vehicle such as a heavy-duty truck. We therefore request an explanation as to how EPA determined that the 15 percent threshold is appropriate across the entire fleet of affected engines.

NESCAUM, 2005-0047-0024, p. 6
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 9-10

While supporting the concept of "permanent" DTCs, there is concern over the ready status allowances of §86.010-18(k)(4)(i)(A) which would allow certain monitors to be set to "ready" despite not having run in-use by satisfying the disablement allowances of §86.010-18(i)(5)(ii). Many areas will routinely experience temperatures below 20 degrees Fahrenheit for several weeks. In consideration of permanent DTCs as an I/M failure criterion, a vehicle with a permanent DTC could take several weeks until the temperature-based enable criterion was achieved to perform the needed drive cycles to erase the permanent DTC. Section 86.010-18 should require the HD engine manufacturers to report to EPA those monitors affected by the allowable cold weather disablement;

whether the status of these monitors can/will be reported as “ready” when the temperature enable criterion is not met; and to list permanent DTCs that could be affected by prolonged cold temperature.

NY State DEC, 2005-0047-0033, p. 2-3

Agency Response:

Regarding disabling monitors when certain conditions are present – ambient temperatures below 20 degrees F and/or altitudes above 8,000 feet – these are long standing provisions in the <14,000 pound OBD requirements and, we believe, are important elements to our HDOBD program given the difficulties associated with monitoring under such extreme conditions. Note that the provision requires the manufacturer to request such disablements and to support those requests with data or engineering analyses. Therefore, we believe that we have provided protection against manufacturers using these provisions as a means of disabling monitors during any significant portion of real world driving. While it is true that OBD monitors may be disabled for extended periods in areas where such extreme conditions are common, that outcome is far better than keeping monitors active and triggering false malfunctions. As for manual re-enablement of monitors, this would certainly not be the case. Any such disabled monitors – and it is important to note that while specific monitors may be disabled the entire OBD system is not disabled – would be re-enabled either when the necessary operating conditions are met or at the next key-on provided the extreme conditions were no longer present. There is no specific requirement to keep track of such disablement or to communicate this disablement via an OBD scan. We remind the commenter of the rate based monitoring requirements whereby we can keep track of how often monitors run. We consider this a more important metric than how often it is disabled. As for re-enabling monitors once the engine has warmed-up even though ambients may still be low, we do not disagree with this. However, some monitors affected by cold ambients at start-up – and again, we remind that it would be specific monitors being disabled and only upon request with supporting data – may only run at start-up (e.g., some evaporative system monitors run only at start-up). Such a monitor could not be re-enabled during that trip once start-up conditions have passed, although the monitor would be re-enabled at the next start-up provided the extreme conditions were no longer present. As for the fuel level disablement, this would be allowed only for monitors impacted by low fuel levels. If the manufacturer cannot provide data or analysis to substantiate their request, they would not be allowed to disable any monitors based on fuel level.

Regarding the comment from the NY State DEC, we believe that the regulatory provision requires this information to be provided to EPA prior to being allowed to employ any such disablement(s).

II.E A Standardized Method to Measure Real World Monitoring Performance

II.E.1 Description of Software Counters to Track Real World Performance

Comments:

EPA has proposed that numerators and denominators cease incrementing if a malfunction is detected on a sensor or signal that is used to determine the conditions required for incrementing. Further, if the condition no longer exists, the OBD system must once again begin incrementing these counters. However, EPA further requires that, if a malfunction exists that prevents these counters from incrementing, and the system receives a “clear codes” command, these counters should start incrementing again. In some cases, such a requirement could cause the OBD system to increment

these counters erroneously. This requirement also adds unnecessary complexity. Instead, EPA should allow manufacturers the option of whether to restart the incrementing of these counters immediately after a scan tool "clear codes" command or after a key-off cycle following a "clear codes" command.

EMA, 2005-0047-0026, p. 39

Agency Response:

We disagree with EMA's concern about re-enabling incrementing of numerators and denominator after a clear codes event or when a malfunction no longer exists. We will clarify the meaning of a malfunction here, since many EMA members do not have experience with OBD. Once a malfunction has been determined during a drive cycle, it cannot be considered to be gone until the end of the drive cycle, since it may reoccur at a later time during the drive cycle. A malfunction is only considered to exist if a pending DTC (or MIL-on DTC) has been logged. A malfunction continues to exist until one of two things happens. 1) The pending DTC is cleared. 2) The MIL for a malfunction has been extinguished.

Manufacturers must put in protect to prevent counters from incrementing more than once per drive cycle. Once the protection is in place, the "clear codes" command will not erroneously allow incrementing of of counters. Most manufacturers use bits to keep track of what needs to be increment then increment the counters at the end of a driving cycle. We do feel this protection is necessary though we expect the number of "clear codes" commands that occur during driving to be statistically insignificant.

II.E.2 Proposed Performance Tracking Requirements

We received no comments pertaining to this section that require analysis.

II.F Standardization Requirements

Comments:

We support standardization of various features, including diagnostic connectors, computer and wireless communication protocols, hardware and software specifications for service technician tools, information communicated by the onboard computer, methods for accessing onboard information, numeric designations of DTCs, and service manual terminology. Effective standardization facilitates diagnosing and repairing malfunctions and potential use of OBD checks in heavy-duty I/M programs.

NESCAUM, 2005-0047-0024, p. 6

Agency Response:

We agree with these comments.

II.F.1 Reference Documents

Comments:

Volvo Powertrain supports the CARB and EMA position that OBD communication standardization is not to be required before 2013.

Volvo Powertrain, 2005-0047-0021, p. 1

In §86.010-18(k), EPA should add language to the introductory paragraph to clarify that the standardization requirements, which do not become effective until 2013, must be met "when specified." As written, the implication is that datalink standardization could be required in 2010. In addition, the dates for SAE J1939 and J1979 should be updated to more recent versions. Also, SAE J2534, a recommended practice for pass through reprogramming, is not referenced elsewhere in §86.010-18(k) or §86.013-18(k) and so should not be referenced at all in this section but should only be referenced in §86.010-38 which pertains to service information availability.

EMA, 2005-0047-0026, p. 36

Agency Response:

As in the CARB rule, our intent was to propose that standardization begin in the 2013 model year. The proposed regulatory text, at §86.010-18(k)(1), is confusing where it reads "The OBD system must conform with the following Society of Automotive Engineers (SAE) standards and/or the following International Standards Organization (ISO) standards." That text has been removed so that §86.010-18(k)(1) now reads "*Reference materials*. The following documents are incorporated by reference, see §86.1". The standardization requirements are then contained elsewhere in individual paragraphs of §86.010-18 and superseding sections.

Reference to SAE J2534 has been removed from §86.010-18 and superseding sections since, as noted by EMA, that recommended practice is relevant only in §86.010-38 pertaining to service information availability.

II.F.2 Diagnostic Connector Requirements

Comments:

The requirement to locate the connector in the driver's foot-well is inappropriate for some vehicle types, especially those without a driver's side door (e.g., a bus). Since this connector is installed by vehicle manufacturers and these vehicles may be designed after the certification data for the engine is provided, alternate locations will need to be requested for specialty vehicles on an on-going basis.

EMA, 2005-0047-0026, p. 37-38

ATA supports the use of a standard data link connector conforming to SAE J1962 or J1939-13 as well as use of a generic scan tool and communication protocol.

American Trucking Association, 2005-0047-0029, p. 5

TMA members supported their customers' efforts in the American Trucking Association's Technology and Maintenance Council to develop TMC RP1202. TMC RP1202A recommends use of either a connector specifically for SAE J1708/J1587or the J1939-13 connector. The J1939-13 connector includes provisions for J1708/J1587. Use of the J1939-13 connector in the future for HD OBD access will not deprive vehicle owners of access to J1708/J1587. SAE J1968 (2002) does not provide accommodations for J1708/J1587. Vehicles that select the SAE J1978/J1979 approach will

need a separate connector for J1708/J1587, if this data stream is continued to be supported by engine manufacturers in 2013.

Truck Manufacturers Association, 2005-0047-0028, p. 4

Agency Response:

Regarding the EMA comment that alternate locations will need to be requested for specialty vehicles, we agree and have provided for their allowance upon Administrator approval (see §86.010-13(k)(2)(i)).

Regarding the TMA comment about the standard diagnostic connectors, we do not allow the mixing of protocols on standard connectors (on the defined communication pins). Manufacturers have not been prohibited from using multiple styles of diagnostic connectors on the same vehicle. In addition, there are discretionary pins on the standard diagnostic connectors that are available for their use.

II.F.3 Communications to a Scan Tool

Comments:

Volvo Powertrain is currently planning to use the World Wide Harmonized OBD communication standard (ISO 27145) at the earliest possible time, and requests that ISO 27145 be an optional communication standard within §86.013-18 and within §86.010-18 in the event that EPA requires standardization in the 2010-2012 timeframe.

Volvo Powertrain, 2005-0047-0026, p. 1

In the main, Hughes supports EPA's proposal but believes that EPA should provide the option to vehicle owners and operators to utilize wireless communication protocols for data transmission. Hughes believes that EPA should allow heavy truck owners and operators the benefits derived from wireless data transfer.

Hughes Telematics, Inc., 2005-0047-0037, p. 1-2.

Agency Response:

The ISO 27145 standard is being developed as part of the Worldwide Harmonized Heavy-duty OBD global technical regulation (WWH-OBD).[5] We will consider allowing that standard for model year 2013 and later implementation, and may issue a technical amendment, direct final rule, or proposed rule to address it.

Regarding the comment from Hughes, we do not believe that our rule prohibits wireless data transfer so the option suggested by Hughes is available. So, while we do not intend to require wireless data transfer at this time, it is allowed as long as the required wired data transfer is also provided.

[5] Global Technical Regulation Number 5: Technical Requirements for On-board Diagnostic Systems for Road Vehicles; ECE/TRANS/180/Add.5; 23 January 2007, see www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29glob_registry.html

II.F.4 Required Emissions Related Functions

Comments:

The proposed NTE-related requirements of §86.010-18(k)(4)(ii)(B)*(4)* have nothing to do with the purpose and function of OBD requirements – detecting and correcting malfunctions in key emission control system components. There is no adequate justification for including NTE-related "in-use testing program" requirements in an OBD rulemaking. Nor is there justification for requiring such data in the HD in-use testing (HDIUT) rulemaking. The data EPA seeks are otherwise readily available (in the relatively few instances in which such information will be needed) to the Agency. The HDIUT rule stemmed from the settlement of multiple NTE-related lawsuits filed against the Agency, and resulted from many months of detailed negotiations regarding all aspects of the HDIUT program, including the manner in which in-use data would be recorded and reported. EPA should not now unilaterally include under the cover of the HDOBD rule requirements that were considered and rejected as part of a negotiated, good faith resolution to litigation. As part of the HDIUT program, very specific second-by-second data – including all of the NTE-related data at issue in the HDOBD rule – will be recorded and reported to EPA pursuant to an expansive electronic data submission template. In addition, the HDIUT rule requires that the manufacturer make available to EPA, within 60 days of an EPA request, written descriptions of all NTE deficiencies and parameters defining all NTE limited testing regions with sufficient detail for EPA to determine if a particular deficiency or limited testing region will be encountered in the emission test data from the portable emission-sampling equipment and field testing procedures. The NTE requirements that EPA has proposed are inconsistent with the negotiated settlement between industry and the Agency and impose unnecessary and unjustified costs without benefit. These requirements should be eliminated from the HDOBD rule.

EMA, 2005-0047-0026, p. 22-24

EPA should revise the calibration ID (CAL ID) and calibration vehicle number (CVN) language to allow manufacturers to have one or multiple CAL IDs/CVNs per engine control module. A single, unique CAL ID and its CVN is ill suited for the HD industry where engine control software is often managed as classes of software objects. Variation in engine systems and accessories have made the exercise of creating unique top-level part numbers for engine assemblies inefficient as the number of top level part numbers exceeded the number of unique component parts. Moreover, light duty engine manufacturers intend to leverage existing software architectures that utilize multiple CAL IDs and prefer to sustain the existing OBD II (13 CCR 1968.2) software architectures. Furthermore, for engine control systems that use component-driven software architectures, each component class has one or more members which tailor the performance of engine control system to match the differing mechanical components used across engines. Members from separate classes are combined to create a full set of operating instructions and data constants for the engine control system. Software implementing the scan tool interface proposed by §86.013-18(k) and evaluated under §86.013-18(j)(1) is one example of a such a class. Specific identification of this class as its own CAL-ID is desirable for the purposes of aiding the administration of production evaluation standardization testing for OBD Groups. Other examples where separate identification of classes is desirable are to separately identify operating instructions (or algorithms) from data constants (calibration). The commenter suggests the following text, in lieu of that proposed, to simultaneously provide regulators with the desired information while giving manufacturers additional flexibility to document software that is standardized among product lines:

> (k)(4)(vi) Software calibration identification (CAL ID). Each engine shall contain at least one CAL-ID, which can be directly traced to the certified engine family. Engine control systems that simultaneously support more than one certified engine family shall provide a CAL-ID that displays a unique value for each engine

family supported. The value displayed shall match the engine's operating engine family performance specification. Additional CAL-IDs may be provided at the manufacturer's option. When additional CAL-IDs are provided the 1st CAL-ID shall be directly traceable to the certified engine family. Each CAL-ID provided shall represent a unique stream of data, any changes to the data, including a single bit, shall be represented by a separate CAL-ID. All CAL-IDs shall be reported through the standardized data link connector in accordance with the SAE J1979/J1939 specifications.

EMA, 2005-0047-0026, p. 36-37

HD vehicles have a history of being built with multiple responses to a request for the vehicle identification number (VIN) via the datalink. While engine manufacturers will do their best to ensure that devices ordered by the customer, including the engine control system, will provide only one response to a request for a VIN via the datalink, they cannot assure EPA that the customer (e.g., the vehicle manufacturer and/or truck owner) cannot and will not install aftermarket devices that also reply to a request for the VIN via the datalink.

EMA, 2005-0047-0026, p. 37

TMA members support the ability to provide a VIN by extending the existing collaborative agreements with their engine suppliers, and not requiring the VIN to be provided exclusively by the engine control system.

Truck Manufacturers Association, 2005-0047-0028, p. 4

How will HD engine manufacturers allow for the modification of the electronic VIN (in the case of an engine swap) but still maintain adequate security measures to ensure the validity of this data element?

NY State DEC, 2005-0047-0033, p. 3

The datastream requirements of §86.010-18(k)(4)(ii)(A) through (C) may need to be adjusted to better suit the emissions control and diagnostic methods achieved from 2010 to 2016. Manufacturers should be allowed to petition to omit data in section (B) that is not relevant to their system designs. EPA should also institute some mechanism to update the list to the relevant content.

EMA, 2005-0047-0026, p. 38

Section 86.010-18(k)(4)(ii)(B)(*1*) requires that the OBD system report the most accurate calculated load and torque parameter values that are calculated within the applicable electronic control unit. Most accurate is stated as being of sufficient accuracy, resolution, and filtering to be used for the purposes of in-use emission testing (e.g., with a PEMS device). However, the torque information that was created in the standardized protocol was created for improved power train integration, not for PEMS for which the torque precision may not be adequate. Proprietary protocols (versus the standardized protocols) use different scaling which can lead to more precise load or torque information than that required through the public protocols. Users of the raw proprietary data have to know the sampling techniques, noise factors, and other characteristics to properly filter the data for use. For these reasons, this paragraph of should be removed from the regulation.

Cummins Inc., 2005-0047-0026, p. 9

EPA should clarify the the examples given in §86.010-18(k)(4)(iv)(B) – pertaining to use of separate diagnostic trouble codes for circuit checks and out-of-range checks of a given monitor – are not prescriptive and it is not intended to require the OBD system to always discriminate malfunction conditions. That is, these examples should not modify the full requirements that are given in §86.010-18(i)(3)(ii)(A) and (B) – which pertain to the comprehensive component malfunction criteria for input components.

EMA, 2005-0047-0026, p. 38

While the option to report readiness status using the MIL appears to be consistent with CARB's approach, it is not sufficiently clear. In 2010, the manufacturer may provide readiness status in a manufacturer-defined format, if the manufacturer does not voluntarily use J1979 or J1939-73 definitions to provide this data. EPA should clarify that there is no intent to require two trips to confirm ready status, but should ensure that the language is consistent with that adopted by CARB.

EMA, 2005-0047-0026, p. 39

EPA should revise the requirement that permanent diagnostic trouble codes be erased upon reprogramming of the engine control computer. When engine controllers are reprogrammed, the erasure of permanent DTCs is not always required. If erroneous DTCs are resolved with a reprogramming event, the proposed OBD regulation already permits the engine controller to automatically clear any permanent DTCs immediately after the OBD system has tested them once and determined a malfunction no longer exists. EPA should not make it mandatory that permanent DTCs be made erasable after a reprogramming event but, rather, it should be left up to the manufacturer whether these codes are required to be erased upon reprogramming, made erasable, or remain un-erasable upon reprogramming.

EMA, 2005-0047-0026, p. 39

There should be a method to determine whether or not a particular engine family or equipment chassis is OBD equipped. This information is especially important to have during the early OBD phase-in period. It would also be useful for the scan tool to be able to determine what type of OBD system is present (e.g. OBD1 vs. OBD2). The states need some method to determine if the vehicle can be OBD inspected during an annual/roadside inspection.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 7

Agency Response:

Regarding the New Jersey comment that the type of OBD system be communicated via the data link connector, we have put forth such a requirement (see §86.010-18(k)(4)(ii)(A)(*3*) and §86.010-18(k)(4)(ii)(B)(*3*)).

Regarding the EMA comment that NTE type information is not pertinent to an OBD rule, we ask where is such information pertinent? Within the context of an NTE based rule or a HDIUT program rule, we suspect that EMA might make the argument that this requested information was really OBD-related and should not be handled via a NTE or HDIUT program rule. We believe the OBD regulation is the proper place to require this information be made available since the OBD rule sets the communication requirements. As a general principle though, the primary topic of a rule does not prohibit inclusion in that rule of items that do not seem pertinent to that rule. We proposed that this information be available because we believe it will help us in our in-use testing program.

Regarding the EMA comment that reporting the readiness status using the MIL is not sufficiently clear, we believe that the current text contained in section (k)(4)(i)(C) is clear, sufficient, and consistent with language adapted by CARB. The text clearly states that the reporting of the readiness status using the MIL is for "all monitored components or systems", and does not imply that it is for a single monitor or that multiple trips may be required.

Regarding the EMA comment concerning erasing diagnostic trouble codes upon reprogramming of the engine control computer, we believe that all DTCs should be cleared. We have given great consideration to this issue and believe that when the controller has been reprogrammed, all diagnostic information related to the previous program is no longer valid and should be cleared. Not clearing them could easily lead to incorrect diagnosis of issues, and association of faults with incorrect software and/or calibrations.

Regarding the EMA comment that the EPA shoud clarify the examples given in §86.010-18(k)(4)(iv)(B), we agree that the text is confusing and could be interpreted to appear contradictory to section §86.010-18(i)(3)(ii)(B). The text of section §86.010-18(k)(4)(iv)(B) has been modified (by adding the phrase "to the extent possible") to be more clear and consistent with section §86.010-18(i)(3)(ii)(B).

Regarding the EMA comment that the EPA should allow multiple CAL IDs and CVNs per engine control module, the EPA has agreed to allow this upon request. The text of sections §86.010-18(k)(4)(vi) and §86.010-18(k)(4)(vii)(A) will be updated to allow multiple CAL IDs and CVNs per emissions critical powertrain control unit. This change would make the requirement consistent with CARB's most recent OBDII update (November 2007), and we believe that CARB may consider this change in their next HDOBD biennial review.

Regarding the Cummins comment that the OBD system must report the most accurate load and torque parameter values, we are confident that the parameters specified in section §86.010-18(k)(4)(ii)(B) can be calculated in such a way that they meet the specifications of J1939 and the requirements of sections 18(k)(4)(ii)(B). If the parameters in question are of higher resolution than is specified in J1939, then they would need to be scaled in a manner to satisfy the J1939 specifications.

Regarding the EMA comment concerning the datastream requirements of section §86.010-18(k)(4)(ii)(A) through (C), manufacturers would not need to report values of parameters not relevant to their system design. If the list of parameters in this section needs to change in the future, we will address them appropriately at that time.

Regarding the comment by the EMA concerning multiple responses to a request for the vehicle identification number via the datalink, we have not required that the VIN be located on a specific electronic module. Which module responds to a VIN request has not been specified, only that there is a single response. This is a system design issue that will have to be coordinated between the vehicle manufacturer and the manufacturer of all modules on the datalink.

Regarding the comment by the NY State DEC and the comment concerning modification of the electronic VIN (in the case of an engine swap), we have not specified that the electronic VIN be located in a module that would necessarily need to be moved with the engine. The data validity, how to reprogram the VIN, and which module contains the electronic VIN are all system design issues that will have to be handled by the vehicle manufacturer.

II.F.5 In-use Performance Ratio Tracking Requirements

Comments:

The definition provided in §86.010-18(k)(6)(i)(B) for determining the engine idle time is too prescriptive. Methods for assessing engine idle time based on engine load can be equally effective and should not be eliminated by a prescriptive definition. Instead, EPA should define a minimum performance standard which would not prohibit alternate methods. The commenter suggests a revised version of (k)(6)(i)(B) to read as follows:

> (B) Total idle run time shall include all time where the accelerator pedal is released by the driver, the vehicle is not moving, engine speed is greater than or equal to 50 to 150 rpm below the engine's normal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission), and power take-off not active. Total idle run time may include additional time where the engine is being operated at low loads, as determined by the manufacturer.

The rationale for this suggestion includes the nature of existing variable reluctance sensor (VRS) technology use for vehicle speed measurement in vehicles, and potential implications of the existing text when compared against the anti-idle provisions of 13 CCR 1956.8. Given that the sensitivity of the vehicle speed system is subject to factors beyond the direct control of the engine manufacturer, it is impractical for engine manufacturers to assure that a numeric standard can always be met. Other regulations (e.g., those by the National Highway Traffic Safety Administration (NHTSA)) govern vehicle speedometers and odometers. Less prescriptive regulation on EPA's part would minimize potential conflicts with those other regulations. Moreover, EPA's definition must not conflict with the anti-idling provisions of 13 CCR 1956.8 which require a tamperproof idle shutdown system. EPA's proposed text, when interpreted literally, suggests that all time with the accelerator depressed is not idle time, even if the accelerator is depressed by some mechanical means (e.g., a broomstick).

EMA, 2005-0047-0026, p. 38-39

Agency Response:

We will change some of requirement (k)(6)(i)(B) as requested by EMA. As requested by EMA in August of 2008,[6] we will change "vehicle speed less than or equal to one mile per hour" to "vehicle speed less than or equal to one mile per hour or engine speed less than or equal to 200 rpm above normal warmed-up idle (as determined in the drive position for vehicles equipped with an automatic transmission)". We will not include "Total idle run time may include additional time where the engine is being operated at low loads, as determined by the manufacturer." We want a consistent statistic, and allowing each manufacturer to determine which low load conditions to be included will not give us a comparable measure.

Other commentors have requested that the minimum load for incrementing the denominator be changed from 15% to 50%, and that we add that either load or vehicle speed be used for incrementing the denominator. The purpose of the denominator is to have a standard drive cycle for the ratio static. We cannot allow some manufacturers to use load while others use vehicle speed, and still have a consistent statistic to measure by. The purpose of the "300 seconds of engine load above 15%" was to have criteria that would represent that an engine had been doing work for 300 seconds. After consideration, we have determined that "above 1150 engine RPM for 300 seconds" is a better measure of engine work, and will replace the 15% load in the regulation. We will also add language to allow "vehicle speed greater than 25 mph for 300 seconds" for 2010 to 2012. After 2012 only "above 1150 engine RPM for 300 seconds" will be allowed.

[6] See memorandum to Docket ID No. EPA-HQ-OAR-2005-0047 from Todd Sherwood, "Meetings with the Engine Manufacturers Association," document ID # EPA-HQ-OAR-2005-0047-0053.

II.F.6 Exceptions to Standardization Requirements

We received no comments pertaining to this section that require analysis.

II.G Implementation Schedule, In-use Liability, and In-use Enforcement

II.G.1 Implementation Schedule and In-use Liability Provisions

Comments:

The regulations should be implemented by an earlier date than proposed.

Community Board #1, 2005-0047-0015, p. 2

NESCAUM is concerned about the inconsistency regarding the date when EPA proposes that all engine families and ratings become liable to certification thresholds (2019), compared to the effective date for California engines (2016).

NESCAUM, 2005-0047-0024, p. 4

EMA supports EPA's proposed implementation schedule and we urge EPA to finalize the implementation schedule as proposed. EMA also recommends that EPA become actively engaged with ARB in the upcoming biennial review of ARB's heavy-duty OBD diagnostic requirements in order to achieve alignment of ARB's implementation requirements with those of EPA. Allowing adequate, if not generous, time for implementation will serve to help guarantee OBD system stability and in-use performance and thus any hoped for environmental improvements.

EMA, 2005-0047-0026, p. 31
National Automobile Dealers Association, 2005-0047-0034, p. 4

EMA supports EPA's proposal to allow interim in-use compliance standards set at two times the emission threshold level for each monitor for a period of three years after the time an applicable engine rating is required to meet full OBD requirements. However, additional compliance flexibility is needed for the DPF through 2019. Given manufacturer feasibility concerns at the threshold level proposed, and to be consistent with the CARB HDOBD requirements (see 13 CCR 1971.1(m)(3.1)), EPA should allow for a two times in-use threshold through 2019. EPA should also urge CARB to align with EPA on other in-use compliance flexibility provisions.

EMA, 2005-0047-0026, p. 31-32

The proposed OBD implementation schedule, requiring manufacturers to install OBD in all engines by 2019, is too long. A 2016 deadline is sufficient to implement full OBD.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 3

Agency Response:

Regarding the comment from Community Board #1, unfortunately there simply is not sufficient time to implement HDOBD any earlier than the 2010 model year.

Regarding comments on inconsistency with CARB on our implementation schedule, which has not changed for the final rule, we believe it is consistent with that put forward by CARB in their July 2005 version of 13 CCR 1971.1. In proposed §86.016-18(o)(2), which has been moved to §86.010-18(o)(3)(ii) in the final rule, the manufacturer is required to "implement an OBD system meeting the requirements of this section on all engine ratings in all engine families." The commenter may be confusing our in-use compliance provisions of proposed §86.016-18(p)(2), which has been moved to §86.010-18(p)(3)(ii) in the final rule, which states that certain OBD systems must meet thresholds in-use that are double those required for certification. This in-use provision is consistent with CARB's 1971.1(m)(3.2).

Regarding EMA's request for a 2x in-use threshold through 2019, as provided by CARB, we do not agree. CARB made available CCR section 1971.1(m)(3.1) specifically to address those engines meeting their more stringent 2013 DPF PM thresholds and to afford manufacturers a full six model years of the 2x in-use threshold. We have not included that more stringent 2013 DPF PM threshold. We, similarly, will have afforded manufacturers a full six years of the 2x in-use threshold for the DPF (from 2010 through 2015). If we decide at some point to include the tighter 2013 DPF thresholds, we would consider allowing for a 2x in-use threshold through 2018 for engines subject to it. Excluding the issue of the more stringent DPF PM threshold, we believe we are entirely consistent with the CARB requirements with respect to implementation dates and intermediate in-use compliance standards.

Regarding the New Jersey comment that 2019 is too long for OBD installation, we believe there may be some misunderstanding. In fact, we are requiring that all engines be equipped with OBD systems that monitor the complete emission control system for model years 2013 and later. We note that an extrapolated OBD system, as discussed in our regulation, is still a fully functioning OBD system that monitors the entire emission control system. There are in-use flexibilities that extend through 2018, consistent with flexibilities provided by ARB in their HDOBD program, but these flexibilities affect the in-use threshold level (i.e., not the certification threshold level) and not whether an engine is or is not equipped with an OBD system.

II.G.2 In-use Enforcement

Comments:

The USEPA needs to include in this rule adoption enforcement provisions specific to HDDV OBD that include emission control warranty, recall and other in-use enforcement provisions applicable to the certifying party. Specifically, the USEPA must propose that the party certifying the engine and OBD system (typically, the engine manufacturer) also be the responsible party for in-use compliance and enforcement actions. Outside of neglect and tampering, the certifying party would be the culpable party for noncompliance identified during in-use or enforcement testing. In cases where remedial action would be required (e.g., recall), the certifying party would take on the responsibility for arranging to bring the vehicles back into compliance and providing state specific repair and recall data.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 5

Agency Response:

We believe that we have made it clear in section II.G.2 of our proposed (72 FR 3253) and final preambles that the certifying party (presumably the engine manufacturer) will be the responsible party when and if we need to pursue in-use compliance and/or enforcement actions.

II.H Proposed Changes to the Existing 8,500 to 14,000 Pound Diesel OBD Requirements

Comments:

We support EPA's proposal for harmonized malfunction thresholds between HD engines certified over and under 14,000 pounds.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 8
EMA, 2005-0047-0026, p. 41

Having already certified engines in the under 14,000 pound category for the 2007 model year does not really allow for meaningful notice and comment regarding the 2007 threshold relaxations proposed by EPA. If, as EMA recommends, EPA makes modifications to the thresholds for engines in >14,000 pound vehicles, the same modifications should be made to thresholds for engines in <14,000 pound vehicles such that harmonization is maintained.

EMA, 2005-0047-0026, p. 41

Regarding the chassis certified OBD requirements (subpart S), EMA supports EPA's proposed approach to specify vehicle-based thresholds (i.e., g/mile thresholds). This is a better approach than that adopted by CARB which requires manufacturers to initiate a time and workload intensive initiative to determine unique vehicle-based thresholds based on detection capability and then to pursue approval on an individual basis. However, EMA has concerns. In some cases, the g/mile threshold levels do not align with the corresponding g/bhp-hr thresholds (i.e., those for engine certified systems) when compared on a multiplicative basis. This is especially true for the proposed additive NOx thresholds, which do not consider the difference in the NOx standards between the 8,500-10,000 pound and 10,000-14,000 pound categories. For example, the additive NOx threshold for the NOx catalyst (and other monitors) for 2010 and later is specified as +0.3 g/mile. Considering the NOx standard is 0.2 for 8,500-10,000 pounds and 0.4 for 10,000-14,000 pounds, EPA's proposal results in an equivalent threshold multiplier of 2.5x and 1.75x, respectively. EPA proposes more stringent NOx and PM thresholds to most monitors in the 2013 model year, which is inconsistent with the engine-based requirements. Of particular concern is the 2013 model year DPF threshold of +0.04 g/mile, which results in a multiplier of 3x the PM standard of 0.02 g/mile. This compares unfavorably with the 4x multiplier for 2010 through 2012. It also compares unfavorably with the 5x PM multiplier for g/bhp-hr thresholds in 2013. EPA should not adopt more stringent malfunction thresholds for any monitor effective in 2013 for NOx and PM.

EPA must finalize vehicle based g/mile thresholds that are equivalent on a multiplicative basis to those for engines. The same feasibility issues that apply to the engine based OBD requirements also apply to vehicle based OBDII issues. The commenter provides the following tables of suggested thresholds.

EMA, 2005-0047-0026, p. 41-42 and Appendix B

EMA Proposed Thresholds for 8,500-14,000 pound Chassis-dyno Certification (g/mile)

Component/Monitor	MY	NMHC	CO	NOx	PM
NMHC catalyst system	2010-2012	**Functional Check Only**			
	2013+	**Functional Check Only**			
NOx catalyst system	2007-2009			**4x**	
	2010+			**4x**	
DPF system	2010-2012	**--**			**10x**
	2013+	**--**			**10x**
Air-fuel ratio sensors upstream	2007-2009	2.5x	2.5x	**3.5x**	**5x**
	2010-2012	2.5x	2.5x	2.5x	3x
	2013+	2x	2x	2.5x	3x
Air-fuel ratio sensors downstream	2007-2009	2.5x		**3.5x**	**5x**
	2010-2012	2.5x		2.5x	**5x**
	2013+	2x		2.5x	**5x**
NOx sensors	2007-2009			**4x**	
	2010-2012			**4x**	
	2013+			**4x**	
"Other monitors" with emissions thresholds	2007-2009	2.5x	2.5x	**3.5x**	**5x**
	2010-2012	2.5x	2.5x	2.5x	**4x**
	2013+	2x	2x	2.5x	**4x**
Misfire	2007+	**No requirement**			

Note: Boldfaced text and entries of "--" denote differences from the EPA proposal.

EMA Proposed Thresholds for 8,500-14,000 pound Engine-dyno Certification (g/bhp-hr)

Component/Monitor	MY	Std/FEL	NMHC	CO	NOx	PM
NMHC catalyst system	2010-2012	All	**Functional Check Only**			
	2013+	All	**Functional Check Only**			
NOx catalyst system	2007-2009	>0.5 NOx			1.75x	
	2007-2009	<=0.5 NOx			**+0.6**	
	2010+	All			**+0.6**	
DPF system	2010-2012	All	**--**			**0.10/+0.09**
	2013+	All	**--**			**0.10/+0.09**
Air-fuel ratio sensors upstream	2007-2009	>0.5 NOx	2.5x	2.5x	1.75x	0.05/+0.04
	2007-2009	<=0.5 NOx	2.5x	2.5x	+0.5	0.05/+0.04
	2010-2012	All	2.5x	2.5x	+0.3	0.03/+0.02
	2013+	All	2x	2x	+0.3	0.03/+0.02
Air-fuel ratio sensors downstream	2007-2009	>0.5 NOx	2.5x		1.75x	0.05/+0.04
	2007-2009	<=0.5 NOx	2.5x		+0.5	0.05/+0.04
	2010-2012	All	2.5x		+0.3	0.05/+0.04
	2013+	All	2x		+0.3	0.05/+0.04
NOx sensors	2007-2009	>0.5 NOx			1.75x	**--**
	2007-2009	<=0.5 NOx			**+0.6**	**--**
	2010+	All			**+0.6**	**--**
"Other monitors" with emissions thresholds	2007-2009	>0.5 NOx	2.5x	2.5x	1.75x	**0.03**
	2007-2009	<=0.5 NOx	2.5x	2.5x	+0.5	**0.03**
	2010-2012	All	2.5x	2.5x	+0.3	**0.03**
	2013+	All	2x	2x	+0.3	**0.03**
Misfire	2010+		**No requirement**			

Note: Boldfaced text and entries of "--" denote differences from the EPA proposal.

Agency Response:

We agree that changes to the above 14,000 pound OBD thresholds, based on technological feasibility, must also be made to the under 14,000 pound OBD thresholds. This is, in fact, what we have done for the final rule where the engine certified thresholds are identical above and below 14,000 pounds.

Regarding the chassis based NOx thresholds being different for 10,000 to 14,000 pound applications when considered on a multiplicative basis versus and additive basis, we disagree with this comment. We have stated the OBD threshold as an additive threshold of the NOx FEL (or standard) +0.6 g/bhp-hr (for engines) and +0.6 g/mi (for vehicles). Stating these thresholds on multiplicative terms, they would be 4x the NOx FEL (for engines having a NOx FEL of 0.2 g/bhp-hr) and 1.75x (for vehicles having a NOx standard of 0.4 g/mi). But, were we to state both NOx thresholds on multiplicative terms, striving for consistency, we would state the vehicle-based threshold as 4x the NOx standard, or 1.6 g/mi (for a vehicle having a NOx standard of 0.4 g/mi). This could then be argued as being the NOx standard+1.2 which would clearly be far less stringent than the engine-based threshold. The logic becomes circular and no right answer exists except the level that can be done given the technology expected to be used. In the end, we believe that the +0.6 threshold is feasible and is the appropriate threshold for vehicles in the 10,000 to 14,000 pound range. The end result is thresholds as shown in the table below which we believe our thresholds provide greater consistency (column labeled "EPA Result") than do EMA's (column labeled "EMA Result"). This same argument can be made for the PM thresholds as commented by EMA.

EMA versus EPA threshold levels for NOx, 2010-2012 model years

Weight	NOx std	EMA Proposal	EMA Result	EPA Final	EPA Result
8.5-10K	0.2 g/mi	4x NOx std	0.8 g/mi	Std+0.6	0.7 g/mi
10-14K	0.4 g/mi	4x NOx std	1.6 g/mi	Std+0.6	1.0 g/mi
>14K	0.2<FEL<0.5 g/bhp-hr	FEL+0.6	0.8 to 1.1 g/bhp-hr	FEL+0.6	0.8 to 1.1 g/bhp-hr

Lastly, we disagree that we should provide thresholds that are equivalent on a multiplicative basis to those for above 14,000 pound applications. This suggests that all thresholds should be multiplicative which is not our preference. We have concerns with multiplicative thresholds applied to aftertreatment devices since future emission standard decreases carry with them an automatic threshold decrease which may or may not be feasible. We also have concerns with additive thresholds for the exact opposite reason. The primary goal must be the maximum feasible thresholds and we believe our final thresholds represent that goal.

II.H.1 Selective Catalytic Reduction and Lean NOx Catalyst Monitoring

We received no comments pertaining to this section that require analysis.

II.H.2 NOx Adsorber System Monitoring

We received no comments pertaining to this section that require analysis.

II.H.3 Diesel Particulate Filter System Monitoring

We received no comments pertaining to this section that require analysis.

II.H.4 NMHC Converting Catalyst Monitoring

We received no comments pertaining to this section that require analysis.

II.H.5 Other Monitors

We received no comments pertaining to this section that require analysis.

II.H.6 CARB OBDII Compliance Option and Deficiencies

We received no comments pertaining to this section that require analysis.

II.I How do the Proposed Requirements Compare to California's?

Comments:

NESCAUM is concerned about the potential inconsistency between EPA's and California's threshold requirements beginning in model year 2013. We take note of EPA's intent to monitor the efficacy of the California thresholds for the purpose of determining whether equally stringent Federal

thresholds are appropriate. Consistent with the 2004 EPA-CARB memorandum of agreement, we urge EPA to strive to harmonize the federal heavy-duty OBD program with California's.

NESCAUM, 2005-0047-0024, p. 4

It is critical to establish a uniform, nationwide HDOBD program and is imperative that no conflicts exist between the federal and CARB regulations. The trucking industry must be provided common engines in all fifty states to control costs and maintain the variety of engine and vehicle choices the industry needs. Without EPA leadership, disharmonized OBD requirements could adversely lead to the California standard becoming a de facto national standard should California requirements be more stringent than federal standards.

American Trucking Association, 2005-0047-0029, p. 2

A state-by-state patchwork of varying standards for OBD systems would be impractical and make compliance excessively costly. Commercial trucks regularly travel interstate in the normal course of commerce. Both scheduled and unscheduled repair and maintenance on a specific vehicle can frequently take place in different jurisdictions. Fleets should not have to invest in different maintenance equipment with separate diagnostic tools for trucks that may travel interstate.

Truck Renting and Leasing Association, 2005-0047-0032, p. 1

Any new EPA OBD standard should do no harm to fleet turnover, thereby helping to achieve expected environmental benefits on a timely basis. One way to avoid undue OBD standard complexity, and thus performance concerns and excessive costs, is to ensure harmonization. EPA should do everything in its power to see that any final OBD standard it issues is harmonized with California's standard. In some instances, this means EPA should strive to follow California's lead, in other instances it means EPA should exert its authority and influence to see that California's OBD standard is revised appropriately to reflect what is practical, achievable and feasible. California's biennial review process and EPA's waiver approval process are but two of several venues to address this important issue.

National Automobile Dealers Association, 2005-0047-0034, p. 2

Agency Response:

In general, we agree with commenters that a nationwide HDOBD program is critical and most beneficial to all stakeholders. As noted in the preamble to our proposal, we cannot, at this time, argue the appropriateness of the 2013 NOx threshold for NOx aftertreatment and the 2013 PM threshold for DPFs that are unique to the CARB regulation. For that reason, at this time, we are not finalizing those thresholds.

The concern expressed by TRALA will not come to pass. No one will be required to invest in different maintenance equipment or separate diagnostic tools. Both the CARB and EPA regulations contain the same requirements for service tools and communication protocols.

Regarding the NADA comment that EPA do everything in its power to harmonize with California by either following California's lead or exerting authority to see that California follow EPA's lead, EPA's intent is to harmonize with California where possible and to engage California in discussion where we cannot harmonize. That said, regarding exerting our authority, we can only do what the Clean Air Act authorizes us to do.

III. Are the Proposed Monitoring Requirements Feasible?

III.A Feasibility of the Monitoring Requirements for Diesel/Compression-Ignition Engines

III.A.1 Fuel System Monitoring

What We Proposed:

We proposed that fuel system malfunctions related to injection pressure, injection timing, injection quantity, and feedback control be individually detected prior to emissions exceeding the thresholds for "other monitors." Further, we proposed that pressure and feedback related malfunctions be monitored continuously and that quantity and timing related malfunctions be monitored once per trip.

Comments:

Regarding fuel injection quantity, one of EPA's suggested means of monitoring—by delivering fuel to one cylinder at a time during a deceleration fuel cutoff condition and measuring the effect this has on crankshaft speed fluctuation—is limited to small injected quantities of fuel and, thus, it would not necessarily detect problems occurring at higher commanded fuel rates. EPA's suggestion of an extension of cylinder balancing tests that manufacturers use to improve idle quality suffers the same problem. In summary, combustion sensors (also suggested by EPA) are an expensive and unproven technology and are infeasible due to cost a reliability, air-fuel ratio sensors (also suggested by EPA) are unproven, and crankshaft speed fluctuation approaches are limited in their range of applicability, if feasible at all.

Regarding fuel injection timing, EPA again suggests a crankshaft speed fluctuation approach. Using crankshaft speed fluctuation suffers from the problems described for fuel injection quantity and also would require the fluctuations ot be accurately correlated to crankshaft position which is difficult for engine manufacturers to do. Heavy-duty engines typically have at least six cylinders, making resolution of the specific contribution of individual cylinders more difficult. Also, since timing is electronically controlled and can vary across the engine operating map, validation of timing at idle will not necessarily confirm that it is functioning correctly elsewhere. Thus, EPA's suggested monitoring method does not cover the entire range of engine operation. Looking for an electrical feedback signal from the injector that would indicate injector opening/closing (another method suggested by EPA) has not been proven by EPA and, thus, cannot be used as a basis for demonstrating feasibility.

Regarding fuel injection pressure, non-common rail fuel systems are not able to monitor fuel injection pressure, although they are able to monitor injection timing.

EMA, 2005-0047-0026, p. 14-15

Agency Response:

The comments raised issues on the techniques of monitoring of the fuel system with limitations that do not cover the entire engine operating range and the ability to monitor fuel injection pressure on non-common rail fuel systems. Additional comments include the request to change threshold monitoring to functional monitoring for non-common rail fuel systems and limiting the

scope of threshold monitoring to those failure modes that are detectable during idle and deceleration fuel cutoff.

The current proposal requires “continuous” threshold monitoring for fuel system pressure and threshold monitor “once per drive cycle” for fuel system quantity and timing. The requirements for fuel system monitoring does not differ for “Common Rail” (CR) or “Electronic Unit Injector” (EUI) type systems.

The differences between CR and EUI fuel system hardware cause distinct system advantages and disadvantages along with individual system operating monitoring challenges. By design, CR systems are able to accurately monitor fuel pressure directly and measurement of quantity and timing during most engine operation conditions. Some EUI systems are not able to independently monitor pressure, quantity or timing but can monitor the overall fuel system functionality by crankshaft speed fluctuation during steady state events (e.g. idle or decel conditions) or other methods. EUI systems by design are able to achieve higher fuel injection pressures and are critical to lowering engine out emissions in future engine designs.

For some of the major emission control systems and components, the proposed heavy-duty OBD regulation requires malfunctions to be identified before any problem becomes serious enough to cause vehicle emissions to exceed the standards by a certain amount above the threshold. EPA is proposing more stringent emission thresholds for major components and systems (e.g., EGR and fuel system) located upstream of the aftertreatment as the aftertreatment is expected to compensate for some of the emission increase caused by a deteriorated emission control component, thereby reducing the actual impact on tailpipe emissions even though a failed component exists. Specifically for fuel system, reduced fuel pressure causes increased particulate matter emissions which may be captured by the downstream particulate trap.

In lieu of these system differences, the regulation has been modified to reflect the differences of CR and EUI systems based upon the capabilities deemed feasible for current and future fuel system and component designs.

For common rail type fuel systems, the 2010 regulation will remain at “continuous” threshold monitoring for fuel system pressure and at least “once per drive cycle” for both quantity and timing monitors. The “once per drive cycle” monitoring is achievable during conditions such as deceleration operation. EPA agrees with the comment that a non-failure detection at one operating point does not necessarily indicate a lack of failure at a different operating point. Therefore, in 2013, the regulation will remain at “continuous” threshold monitoring for fuel system pressure but be changed to “when conditions are met” for fuel system quantity and timing. This will incorporate more monitoring points, where feasible, which will be more effective at capturing failures at various operation points but does not require monitoring in non-feasible operating areas. The manufacture has the option to combine the quantity and timing monitors into a single monitor for both 2010 and 2013 regulations as both indicate a failure of the fuel injector. The allowance to combine malfunctions was part of our proposal and remains part of our final rule (see proposed and final §86.010-18(a)). That said, we have added new text in §86.010-18(g)(1) to clarify this fact and highlight where the Administrator is open to such combining by manufacturers. We would still expect the manufacturer to demonstrate that their approach is robust and effective at detecting malfunctions.

For EUI systems, the 2010 regulation has been changed to require functional monitoring “once per drive cycle” for fuel system pressure, quantity and timing. We are making this change based on current OBD system capability. As noted above, the manufacturer has the option to combine the pressure, quantity and timing monitors into a single monitor as both indicate a failure of the fuel injector (see §86.010-18(a)). This addresses the issue of discrete pressure monitoring on EUI systems while ensuring system integrity. In 2013, to be consistent with CR type systems and

because we believe manufacturers may add additional sensors and will certainly gain experience with monitoring strategies, the regulation will be remain consistent with our proposal by requiring threshold monitoring. Further, we have changed the monitoring conditions to require monitoring "when conditions are met" for fuel system pressure, quantity and timing. The continuation of the option to combine the monitoring of pressure, quantity and timing into one system monitor remains in place (see §86.010-18(a)). This will incorporate more monitoring points, where feasible, to capture additional failures at various operation points but does not require monitoring in non-feasible operating areas.

In summary, EPA believes that robust fuel system monitoring is necessary and can be accomplished by a combination of both system parameter and comprehensive component monitoring during conditions that can be monitored. It is anticipated that manufacturers will design fuel system monitoring strategies that accurately control and monitor fuel flow, both directly and indirectly, under both transient and steady state load conditions to meet the heavy-duty OBD regulation for both 2010 and 2013.

III.A.2 Engine Misfire Monitoring

What We Proposed:

We proposed that, for 2010-2012, a continuous engine misfire be detected during engine idle. For 2013 and later, we proposed that engines equipped with combustion sensors monitor continuously for misfire during the full operating range and detect a malfunction prior to emissions exceeding the thresholds for "other monitors."

Comments:

Diesel engine misfire occurs in two different ways:

- Improper fuel injection which can result from an insufficient quantity of fuel injected, inadequate fuel atomization, or mistimed fuel injection; and/or,
- Failure of the fuel to auto ignite upon proper fuel injection which can result from inadequate compression of the air-fuel mixture within the cylinder.

The commenter notes that the latter of these two causes of misfire—failure of the fuel to auto-ignite—is likely due to poor fuel quality rather than any failed component and argues that poor fuel quality is not an engine failure and, thus, should not result in any MIL illuminations. The commenter further argues that misfire under non-idle conditions is rare and presents noticeable performance problems that would cause operators to promptly seek corrective action.

Under most operating conditions, diesel misfire does not result in a significant increase in emissions. If misfire results from a failure to inject any fuel, the emission impact is negligible. Misfire from poor atomization due to low injection pressure, mistimed injection or inability to auto-ignite results in increased engine-out HC emissions, but these are oxidized by the catalytic exhaust aftertreatment systems.

As a practical matter, the tailpipe HC emissions are only significantly increased by misfire during cold conditions before the engine warms up to normal operating temperature. Misfire is most prevalent and is most likely to have a measurable effect on tailpipe emissions only when the engine is warming up under idle conditions. OBD monitoring of misfire is not justified by these insignificant emissions.

Robust detection of misfire is very difficult. Under light-load or idle conditions where misfire is most prevalent, the torque pulses are weak. Crankshaft speed fluctuations associated with torque pulses depend on the rotating inertia of the vehicle driveline which may be influenced by

engagement/disengagement of engine-driven devices such as fans, air compressors, air conditioning systems, etc. Thus, detection of misfire would likely require unique calibrations for each driveline resulting in substantial costs and possibly false failures.

EPA erroneously presumes that there is a method that a manufacturer can use to induce a regular pattern of misfires during emission testing (by requiring that thresholds be determined via defining the percentage of misfires that would result in emissions that exceed the OBD threshold). Emissions threshold monitoring for misfire is problematic because there is no reasonable approach for inducing a regular pattern of misfires and, hence, no means to correlate a misfire percentage with an exceedance of a threshold. EPA has failed to demonstrate feasibility for diesel engines.

EPA's proposed misfire monitoring requirements will have an impact on vehicles and vehicle manufacturers requiring changes to the way vehicle manufacturers do business to ensure that OBD systems work properly. The monitoring requirements will force engine manufacturers to make system changes that will force vehicle manufacturers to make vehicle changes thereby raising the costs of OBD-equipped vehicles. Meanwhile, non-OBD engines will be available at lower cost leaving OBD engines at a competitive disadvantage. As a result, EPA's stated goal of gaining experience with 2010-2012 engines may be substantially defeated. EPA must avoid that result by eliminating all misfire monitoring requirements for diesel engines.

EMA, 2005-0047-0026, p. 15-18

Agency Response:

We do not agree with EMA where it pertains to misfire both from an emission impact perspective and a detection perspective. The emissions impact of misfire on cold starts can be significant. Misfire on a warmed engine can damage the after treatment system if they occur in a large enough quantity.

We also do not agree with the implication that misfire due to poor fuel quality should not be detected. If a vehicle is misfiring a driver needs to be notified. Assuming the poor quality fuel misfiring is at a rate great enough to set a MIL, the driver should be taking the vehicle in for repair. The repair will be to drain the fuel. It is appropriate to have MIL illuminate provided there is something to fix.

EMA is concerned that robust detection is very difficult. The requirement for 2010-2012 is to be able to find a completely dead cylinder in 1000 crank revolutions. We believe this requirement is fair and can be accomplished for 2010.

EMA is concerned that it will not be able to induce a random pattern of misfire. Misfire generation boxes have been created for many years. The concept of randomly shutting off fuel to a cylinder to induce misfire has been around for many years. We do not believe it is beyond manufacturers capabilities to create a misfire generator.

Regarding OBD equipped engines being at a competitive disadvantage, we disagree. In fact, we believe that an OBD system on an engine can be competitive advantage. OBD can require less costly repairs because catching failures early can prevent damage to the aftertreatment systems, and other expensive components. Also, mandatory emission compliance can lead to fines in some states if vehicles are not maintained. A vehicle with a well designed OBD system can be a real cost saver for the purchaser.

III.A.3 Exhaust Gas Recirculation (EGR) Monitoring

What We Proposed:

We proposed that malfunctions of the EGR system related to low flow, high flow, slow response, feedback control, and cooler performance be detected prior to emissions exceeding the thresholds for "other monitors." Further, we proposed that flow and feedback related malfunctions be monitored continuously, response related malfunctions be monitored whenever conditions were met, and that cooler malfunctions be monitored once per trip.

Comments:

EPA has not sufficiently justified the need for continuous monitoring for EGR high and low flow. Continuous monitoring for a system – as opposed to a component under comprehensive component monitoring – has not even been defined. For components, continuous monitoring is an absolute requirement only for out-of-range and circuit failures which are problems that can be detected at any engine operating condition. Continuous monitoring is not feasible for EGR high and low flow monitors and is meaningless at certain engine operating conditions because a low or zero EGR rate is commanded thereby providing slim or no opportunity for assessment. During transient operation, the errors of estimated EGR – used for diagnostics – become high because of the dynamics of the system and of the sensor response time making such monitoring prone to errors and false MILs.

EMA, 2005-0047-0026, p. 20

Agency Response:

The commenter raised issues on continuous monitoring of the exhaust gas recirculation (EGR) flow and recommended the monitoring requirements for EGR high and low flow be changed to "whenever the entry conditions are met" rather "continuous monitoring" as proposed.

The current proposal requires continuous threshold monitoring for EGR low and high flow conditions, "when conditions are met" threshold monitoring for EGR slow response, and "once per drive cycle" threshold monitoring for EGR cooler slow response.

For some of the major emission control systems and components, the proposed heavy-duty OBD regulation requires malfunctions to be identified before any problem becomes serious enough to cause vehicle emissions to exceed the standards by a certain amount exceeding the threshold. EPA is proposing more stringent emission thresholds, where feasible, for major components and systems (e.g., EGR and fuel system) located upstream of the aftertreatment as improved aftertreatment systems are expected to compensate for some of the emission increase caused by a deteriorated emission control component. These thresholds will allow earlier detection of the effected component to reduce excessive emissions during deteriorated conditions and possibly reduce damage to the aftertreatment system. Specifically for EGR system design, excessive EGR flow causes increased PM emissions, and insufficient EGR flow causes increased NOx emissions.

To determine the necessary EGR flow rates and control EGR flow, EGR systems normally use the following components: an EGR valve, valve position sensor, boost pressure sensor, intake temperature sensor, intake (fresh) airflow sensor, and tubing or piping to connect the various components of the system. EGR temperature sensors and exhaust backpressure sensors are also commonly used. EGR is not a stand alone emission control device; it is carefully integrated with the air handling system.

Understanding the limitations of "continuous monitoring" for various systems affecting emissions, including the EGR system, EPA has clarified the continuous monitoring requirements within the EGR monitors to allow disabling of system monitoring during operating conditions that are

determined to be technically necessary to ensure robust detection of malfunctions. System monitoring is expected to occur under conditions which may be reasonably expected to be encountered in normal vehicle operation and use. When continuous system monitoring is suspended, the system must continuously detect malfunctions of input components as specified in the regulation under the comprehensive component monitoring requirements. This will ensure the system is continuously monitored by either direct system monitoring or indirect component monitoring during all operating conditions. Importantly, such monitoring requirements can be and are already being met by the industry.

The EGR monitoring conditions, as proposed, contained a provision for disabling of continuous EGR monitoring under certain conditions (see proposed §86.010-18(g)(3)(iii)(D)). For the final rule, we have made slight changes to those provisions meant to provide greater clarity without changing the content or intent of the provision. The language now allows the manufacturer to request Administrator approval to disable temporarily the EGR system monitor(s) under specific ambient conditions (e.g., when freezing may affect performance of the system) or during specific operating conditions (e.g. during transient, extreme low or high flow conditions). The manufacturer must be able to demonstrate via data or engineering analysis that a reliable system monitor cannot be run when these conditions exist because it cannot distinguish robustly between a malfunctioning system and a properly operating system. The manufacturer is still required to maintain comprehensive component monitoring requirements as required.

In summary, we believe that EGR system continuous monitoring is necessary and can be accomplished by a combination of both system and comprehensive component monitoring. It is anticipated that manufacturers will design EGR systems that accurately, continuously control and monitor EGR flow, both directly and indirectly, under both transient and steady state load conditions to meet the heavy-duty OBD regulation. With continuous system monitoring clarification, the proposal requiring continuous threshold monitoring for EGR low and high flow conditions, “when conditions are met” for EGR slow response and “once per drive cycle” for EGR cooler slow response will remain unchanged.

III.A.4 Turbo Boost Control System Monitoring

What We Proposed:

We proposed that malfunctions of the boost control system related to underboost, overboost, variable geometry slow response, feedback control, and undercooling be detected prior to emissions exceeding the thresholds for “other monitors.” Further, we proposed that underboost, overboost, and feedback related malfunctions be monitored continuously, that slow response related malfunctions be monitored whenever conditions were met, and that undercooling related malfunctions be monitored once per trip.

Comments:

EMA believes that continuous monitoring of boost is neither necessary nor feasible. Continuous boost monitoring would suffer from errors due to the dynamics of the system and sensor response time during transients. Boost monitoring should not be done continuously, but should be done whenever entry conditions are met.

EMA, 2005-0047-0026, p. 20

Agency Response:

The commenter proposes Turbo Boost monitoring should be preformed “whenever entry conditions are met” instead of “continuously” and states that continuous monitoring is neither necessary nor feasible. Also, EMA comments that some boost systems do not control to a desired boost.

The current proposal requires continuous threshold monitoring for turbo boost – under and over boost conditions, “when conditions are met” threshold monitoring for VGT slow response, and “once per drive cycle” threshold monitoring for charge air cooler slow response.

Proper boost control is essential to optimize emission levels. Even short periods of over- or under-boost can result in undesired air-fuel ratio excursions and corresponding emission increases. Additionally, the boost control system directly affects exhaust and intake manifold pressures. Another critical emission control system, EGR, is very dependent on these two pressures and generally uses the differential between them to force exhaust gas into the intake manifold. If the boost control system is not operating correctly, the exhaust or intake pressures may not be as expected and EGR system may not function as designed.

Understanding the limitations of “continuous monitoring” for various systems affecting emissions, including the fuel system, EPA has clarified the continuous monitoring requirements for specific monitors to allow disabling of system monitoring during operating conditions that are determined to be technically necessary to ensure robust detection of malfunctions. System monitoring is expected to occur under conditions which may reasonably be expected to be encountered in normal vehicle operation and use. When continuous system monitoring is suspended, the system must continuously detect malfunctions of input components as specified in the regulation. This will ensure the system is continuously monitored by either direct system monitoring or indirect component monitoring during all operating conditions and can be met by the industry.

This clarification is made, in the final rule, by adding a new provision for the turbo boost monitoring conditions that provides greater clarity without changing the intent of the proposal. The language now allows the manufacturer to request Administrator approval to disable temporarily the turbo boost system monitor(s) under during specific operating conditions (e.g. during transient, extreme low or high flow conditions). The manufacturer must be able to demonstrate via data or engineering analysis that a reliable system monitor cannot be run when these conditions exist because it cannot distinguish robustly between a malfunctioning system and a properly operating system. The manufacturer is still required to maintain comprehensive component monitoring requirements as required.

In addition, addressing the concern on systems that do not have a boost pressure system, the regulation has been changed to reflect that the OBD system must detect a malfunction of the boost pressure control system prior to a decrease from the manufacturer’s commanded boost pressure, or expected boost pressure instead of commanded boost pressure on engines not equipped with a boost pressure control system.

In summary, we believe that turbo boost system continuous monitoring is necessary and can be accomplished by a combination of both system and component monitoring. It is anticipated that manufacturers will design turbo boost systems that accurately, continuously control and monitor turbo boost flow, both directly and indirectly, under both transient and steady state load conditions to meet the heavy-duty OBD regulation. With continuous system monitoring clarification, and the statement to include engines with no boost systems, the proposal of continuous threshold monitoring for turbo boost for both under and over boost conditions, “when conditions are met” for VGT slow response and “once per drive cycle” for charge air cooler slow response will remain unchanged.

III.A.5 Non-Methane Hydrocarbon (NMHC) Converting Catalyst Monitoring

What We Proposed:

We proposed that malfunctions related to NMHC conversion efficiency be detected prior to emissions exceeding the thresholds for "NMHC catalyst." We also proposed that, should the NMHC converting catalyst be used to assist other aftertreatment devices, that malfunctions be detected if that assistance is no longer occurring. Further, we proposed that conversion efficiency and aftertreatment assistance be monitoring once per trip.

Comments:

There is not monitoring technology available to meet the proposed DOC threshold monitoring requirement. A DOC cannot be monitored for oxygen storage because they have no ability to store oxygen. DOCs do not need to store oxygen because there is always excess oxygen in diesel exhaust.

The only monitoring technology available to monitor the DOC is temperature sensing of catalyst exotherms. Such monitoring cannot differentiate between a good DOC and one deteriorated to 2.5x the NMHC standard. The commenter references SAE paper 2005-01-3602 which highlights the limited feasibility of the catalyst temperature monitoring approach and demonstrates that the separation between a good catalyst and a threshold catalyst using the approach is very poor and would result in both false MILs and undetectable failures. The commenter then argues that, given the likely increase in engine-out NMHC emissions from 2010 engines due to the lower NOx standard, and the resultant higher-efficiency DOC needed to meet the 0.14 g/bhp-hr NMHC standard, the ability to meet the proposed requirements via a functional monitor is unlikely (since threshold monitoring would be required).

EMA, 2005-0047-0026, p. 13-14

Agency Response:

We agree with the EMA's position and the conclusions of SAE 2005-01-3602 (Diagnostics for Diesel Oxidation Catalysts) in that temperature- and exotherm-based monitoring strategies do not provide the accuracy necessary to detect a DOC which fails to convert NMHCs at a 2.5x threshold level. We also believe that a strategy of intentional fuel dosing to create an exotherm in the DOC - for the purpose of monitoring DOC performance, - is not an accurate method for determining a failed part, and execution of such a strategy would needlessly increase tailpipe emissions.

Since the DOC is used to create an exotherm which enables DPF regeneration (exotherm created by conversion of excess HCs in exhaust) and to provide an optimum ratio of NO-to-NO2 in the exhaust feedgas (through oxididation of NO to NO2) for proper SCR function, failure of this device will be manifested in the reduced performance of the DPF and SCR catalyst (as these devices which rely on robust HC and NO oxidation to meet emission standards). For example, if the DOC fails to create a sufficient exotherm for DPF regeneration, the trap will soon plug with soot, and the DPF monitor for incomplete regeneration will set a fault. In a similar manner, if the DOC cannot provide the proper NO-to-NO2 ratio in the exhaust for proper SCR function, the SCR catalyst monitor NOx will set a fault.

Given that current monitoring technologies cannot detect a threshold failure of a DOC, and that monitors for components downstream of the DOC will mature faults should the expected performance of the DOC deteriorate, we will not require threshold monitoring of NMHC conversion

over the NMHC conversion catalyst. However, note also that we believe our new DOC monitoring requirement - which requires detecting the ability of the DOC to achieve a 100 degree C exotherm (temperature increase) within 60 seconds, achieve the necessary DPF regeneration temperature, and maintain this temperature throughout the regeneration event - will serve the purpose of detecting malfunctions of the DOC associated with the DPF regeneration function.

III.A.6 Selective Catalytic Reduction (SCR) and NOx Conversion Catalyst Monitoring

What We Proposed:

We proposed that malfunctions related to conversion efficiency, active/intrusive reductant delivery, active/intrusive reductant quantity, active/intrusive reductant quality, and feedback control be detected prior to emissions exceeding the thresholds for "NOx catalyst system." Further, we proposed that conversion efficiency and reductant quality be monitored once per trip and that reductant delivery, quantity, and feedback control be monitored continuously.

Comments:

EPA assumes that NOx sensors will be used by all engine manufacturers to control NOx engine and aftertreatment systems in 2010. EPA further assumes that a viable NOx sensor will be available for 2010 production engine systems. Those assumptions are not accurate. It is not necessarily the case that all engine manufacturers will use NOx sensors for underlying NOx emissions control for 2010. If engine manufacturers can control engine aftertreatment system emissions without NOx sensors, manufacturers will opt not to use them. If compliance with the underlying emission standards does require a NOx sensor, manufacturers likely would apply the sensor in a position where accuracy limitations can be overcome – upstream of the NOx catalyst where NOx levels are higher but the operating environment is more aggressive. Control of NOx aftertreatment might be based on an estimate of NOx produced by the engine. In that case, manufacturers would avoid adding a costly NOx sensor if performance of the system is adequate. For example, for urea SCR systems, urea solution is metered in proportion to the NOx flowing into the SCR catalyst. An estimate of NOx produced by the engine would be used for this parameter. For lean NOx trap systems, the regeneration of the NOx trap is done when storage of NOx in the catalyst nears a certain level relative to trap capacity. An estimate of NOx produced by the engine would be used to calculate how much NOx is stored in the catalyst. (While NOx is being stored, positive and negative errors in NOx estimate will tend to cancel as they are summed together.)

If NOx sensors are used for underlying engine-aftertreatment system control, engine manufacturers would use a NOx sensor of a different range and resolution/accuracy than that required for OBD monitoring. Current NOx sensors do not have the much narrower range and far greater accuracy that would be required for OBD monitoring purposes, nor have they been shown to have the necessary durability for OBD monitoring.

Engine manufacturers have not seen the 2006 NOx sensor accuracy and durability improvements upon which EPA is relying for its proposed NOx threshold. Indeed, what engine manufacturers know to date is that there is one NOx sensor supplier that is advertising a target accuracy of 10%. That "target" is only a target, and has not been proven. And it is based on the supplier's experience with Euro 4 SCR engines, with only limited experience on EGR-equipped engines. Engine manufacturers have not completed long-term EGR evaluations on NOx sensors. Engine manufacturers also believe that the application and placement of NOx sensors will have an impact on accuracy. The data available to engine manufacturers shows poor accuracy on a 1500 ppm-range sensor, which is a far broader range than would be required for OBD-sensing technology, and is limited to use on a light-duty engine at 120,000 miles, not the full 435,000- mile useful life required for heavy-duty engines, much less the full operating life of the engine.

With regard to durability, the picture is similar. Engine manufacturers' best data shows a target – an unproven target – of 185,000 miles durability. That number falls far short of the 435,000-

mile-plus durability needed for heavy-duty engines. And mileage durability is not the only factor. Even sensors that are not in use, but are sitting on a shelf waiting to be installed, lose durability, leading sensor manufacturers to consider very limited time warranties on sensors. Added to that are the problems with use in the real world, including temperature limitations for the sensor control module and packaging and wiring requirements that do not reflect actual operating conditions, as well as problems with potential electromechanical interference from the remainder of the engine system. Research has been conducted at Southwest Research Institute on the durability of NOx sensors. Again, the limited data – limited to 6,000 hours of use – show insufficient accuracy and decreases in sensor response rate at low hours.

Finally, the currently available NOx sensors also are very sensitive to transients and do not provide reliable results during transient operation. Therefore, the FTP cycle is a poor choice for monitoring the NOx aftertreatment system as it contains almost no steady-state points. During most of the FTP cycle, the NOx sensor returns no values. Steady-state operation is much more common for heavy-duty applications than for light-duty, so monitoring strategies based on the steady-state test cycle should be acceptable for NOx aftertreatment and NOx sensor certification testing.

NOx sensors under development with the accuracy necessary to meet the stringent OBD requirements will be very expensive, and will require validation to demonstrate capability to maintain the required long-term accuracy with good reliability. Much more work must be done, and significant improvements in NOx sensor technology must be made, before such sensors can be used for reliable monitoring of NOx emissions for OBD purposes in time for 2010. Indeed, recent research reveals that the accuracy of current NOx sensor technology is not capable of achieving the proposed EPA NOx emissions thresholds requirements (see, “Threshold monitoring of urea SCR Systems,” SAE Paper # 2006-01-3548). At best, current sensor technology would allow measurement to a threshold at just below 4x the NOx standard of 0.20. And EPA has failed to provide a reasonable basis upon which to make a determination that an accurate and durable NOx sensor is projected to be available in time for 2010. Nor has EPA adequately addressed the material and development costs for developing an accurate and reliable NOx sensor that can meet the thresholds proposed in the NPRM.

In sum, the NOx aftertreatment threshold that EPA has proposed is not technologically feasible. Manufacturers’ development and validation activities for providing commercially available products in 2010 require that NOx sensor technology be available within the next few months. Manufacturers cannot wait for potential performance improvements in NOx sensor accuracy.

EMA, 2005-0047-0026, p. 10-12
American Trucking Association, 2005-0047-0029, p. 3

The trucking industry cannot afford to be burdened with faulty or over-sensitive sensor monitoring due to EPA’s technology-forcing mandates. Regarding the OBD thresholds for NOx aftertreatment, NOx sensors must be accurate and durable enough to provide predictable results for monitoring throughout an engine’s actual life. Sensor technologies must be sound and thoroughly tested by the regulatory deadlines and, if not, EPA must adjust the implementation dates under the rule.

American Trucking Association, 2005-0047-0029, p. 3
Truck Renting and Leasing Association, 2005-0047-0032, p. 2-3

Agency Response:

We agree with commenters that detection of NOx aftertreatment malfunctions at the proposed threshold levels will be very difficult. The comments focus primarily on the existence of an acceptable NOx sensor for monitoring NOx aftertreatment devices and the need to raise the threshold from the proposed level due to the inaccuracy of the NOx sensors expected to be available. We are somewhat concerned about the possibility of engines with NOx aftertreatment devices and

perhaps no sensors capable of managing those devices, let alone detecting malfunctions in those devices.

The feasibility of meeting the proposed OBD requirements for monitoring of NOx aftertreatment is not predicated on the successful development of NOx sensors. In our proposal, we discussed monitoring methods for NOx adsorbers that use wide-range air-fuel sensors, not NOx sensors, and these sensors are already being used on diesel applications less than 14,000 pounds. These sensors can be used to quantify the performance of a NOx adsorber and determine if it is above or below the proposed emission thresholds. This technique is very similar to a monitor of a NOx adsorber currently being used on a light-duty gasoline vehicle today and we are not aware of technical limitations that would prevent such a technique from also being used successfully on a heavy-duty diesel application.

For SCR systems, we believe that a robust NOx sensor will be required not only to meet proposed OBD requirements, but to meet the 2010 emissions standards. We believe that a NOx sensor will be needed to measure accurately the real-time NOx emission levels and determine the proper amount of reductant (urea) dosing. Manufacturers have argued that a NOx sensor may be available for use as an SCR system control input. Such a sensor would be placed upstream of the SCR catalyst to measure NOx levels to determine the needed urea injection, but would not be placed downstream of the catalyst to provide any form of feedback to the control system. Manufacturers have further argued that an upstream sensor, where NOx levels are higher, being used for control purposed would not require the accuracy as would be required of a downstream sensor used as feedback and/or for OBD purposes. While this may be true, we question the effectiveness of, as well as manufacturers' willingness to implement, a NOx control strategy that meters urea based on a NOx sensor upstream of the SCR catalyst with no regard for urea and/or NOx levels emitted downstream of the device. At minimum, it seems that a NOx sensor would be placed downstream of the catalyst which, when compared to the upstream sensor, could indicate a lack of NOx conversion activity. This could trigger a dashboard light and cease urea injection which would save the driver money and eliminate urea emissions into the environment. In the end, the ability of a downstream sensor to detect at various NOx levels – whether those proposed by EPA or those suggested by EMA – is of secondary concern to the primary concern of excess NOx and/or urea emitted from the tailpipe. We believe that there must be some assurance that the SCR catalyst is indeed performing at least some measure of its intended purpose.

Regarding NOx sensor accuracy, the EMA comment states that NOx sensors may become durable and accurate enough for SCR control when located upstream of the SCR catalyst, but they still will not be accurate enough for OBD purposes in the lower concentration environment downstream of the catalyst. However, as suggested above, we believe that a system without a feedback mechanism is risky and unlikely. First, we do not believe a manufacturer will be able to robustly and reliably meet the NOx emission standards for the full useful life with only an upstream NOx sensor and no ability to adapt, adjust, or compensate for degradation in the SCR catalyst during the useful life. Catalyst degradation could be substantial over a period of 435,000 miles and failure to compensate for it will likely result in over or under-dosing of reductant and, consequently, higher emissions. Second, a sensor that is accurate enough to measure upstream NOx levels during a variety of engine speeds and loads is also likely to have enough accuracy to measure downstream NOx levels during a portion of engine speeds or loads where engine out NOx emissions are higher. Monitoring during this subset of operation could be sufficient to properly detect malfunctioning SCR systems. Third, other monitoring techniques could be used including intrusive strategies that temporarily interrupt (or hold constant) reductant injection to assess the performance level while exposing the downstream sensor to higher concentrations.

Ultimately, this is more than an OBD issue – it is an emissions compliance and emissions standard feasibility issue. For SCR to be successful, it must first be capable of meeting the emission

standards robustly through the useful life. As such, a NOx sensor seems necessary to properly correct and compensate for catalyst deterioration over the useful life period. Techniques that use SCR without a NOx sensor do not appear to be viable or robust enough to reliably meet the stringent NOx emission standards for the useful life of 435,000 miles. Accordingly, if such a sensor becomes available to make the SCR technology viable, then such a sensor is also available to perform some level of the necessary OBD monitoring.

The question then becomes, what is the appropriate level of OBD monitoring or, in other words, what is the appropriate threshold level? In the context of our heavy-duty highway in-use test program, we have conducted extensive testing using portable emissions measurement systems (PEMS) and have learned that, for model years 2010 through 2012, the PEMS devices are capable of detecting emissions levels of roughly 0.44 g/bhp-hr. If we were to add that to the NOx standard of 0.2 g/bhp-hr, we would arrive at a level of 0.64 g/bhp-hr. On one hand, it might seem inappropriate to require OBD detection at 0.5 g/bhp-hr – knowing that the OBD monitor is not actually measuring emissions levels but is instead measuring NOx and oxygen concentrations in the exhaust and correlating them to a g/bhp-hr level – when an actual emissions measurement device can only detect at 0.64 g/bhp-hr. However, an important distinction exists in these numbers that must be considered. With the PEMS device, we are measuring actual tailpipe emissions in the field. It is hard enough to measure emissions in a test cell with laboratory based computers and constant volume sampling and other sophisticated laboratory equipment. It is another level of difficulty to take that into the field and measure emissions on an actual truck as it drives down the road. OBD monitoring can be considered to be more analogous to the laboratory situation. Engineers are monitoring engine and exhaust system performance characteristics in a laboratory setting and correlating those to an emission level. Once those correlations are determined, calibrations are developed that look for those engine and exhaust system performance characteristics during real world operation. If those performance characteristics are detected, a malfunction is presumed to exist and a diagnostic trouble code of some sort is stored. For that reason, we believe that OBD thresholds should in fact be set at stringent levels since their design is based on laboratory settings. Nonetheless, emissions levels may in fact be somewhat higher in the field than would be expected upon detecting the correlated levels programmed into the OBD calibration. This is particularly true during the initial years of implementation. For that reason, we have included in-use compliance levels that are double those required of certification demonstration engines. Further, we have included in-use compliance provisions for most OBD engines (those having “extrapolated” OBD systems) that are not even evaluated against actual emissions levels (see §§86.010-18(p), 86.013-18(p), and 86.016-18(p)).

Manufacturers have also raised concerns over NOx sensor durability. We note that the emission standards do not mandate that the sensor be able to last for the full useful life of 435,000 miles. The regulations allow engine manufacturers to have maintenance or service/replacement intervals and require periodic replacement of the sensor. If a NOx sensor cannot reliably last for 435,000 miles, a manufacturer could pursue this option and rely on periodic replacement of the sensor. Such replacement would not be for OBD purposes, but for continued compliance with the emission standards. This is not unlike conventional oxygen sensors in the early years of light-duty gasoline OBD implementation. Early sensors had service intervals of just 30,000 miles and, gradually, sensor performance and durability has improved to the point that today’s sensors generally last more than 100,000 miles without any required replacement intervals. NOx sensor technology will likely follow the same path, with durability and performance improving over time and providing longer and longer time intervals between replacements.

We believe that it is not currently possible to know what level of threshold is the most appropriate level. Manufacturers appear to focus their efforts on the other aspects of the emission control system – the engine design, fuel strategy, aftertreatment devices, regeneration strategies – and worry about the OBD system only after those design elements have been decided upon. In

fairness, we cannot necessarily argue that the limited resources be used primarily for controlling the emissions from the tailpipe. But, that suggests that no one today can know what future OBD systems can or cannot do given that the emission control systems they will be monitoring have not yet been determined. After years of experience with OBD and tracking its development and capabilities, it has become clear that, despite our sense that OBD should be a critical element to the design of an emission control system, it is often the last element considered by manufacturers.

Given the wide variety of approaches manufacturers are expected to take in meeting emissions standards, it is likely that different OBD systems and different OBD monitoring strategies will be capable of detecting malfunctions at different emissions levels. While it appears that current technology is capable only of detection at 0.8 g/bhp-hr or 4x the standard – the level suggested by EMA – it seems unreasonable to take a present day detection level and make that the threshold level for all future engines. In the end, we believe that the NOx aftertreatment threshold level suggested by EMA is the most appropriate level for 2010 through 2012, but that the threshold level we proposed is most appropriate for 2013 and later. This strikes the proper balance between forcing manufacturers to design effective OBD monitoring strategies while also providing the flexibility to certify systems when good faith efforts fail to comply fully with the requirements.

III.A.7 NOx Adsorber Monitoring

What We Proposed:

We proposed that malfunctions related to adsorber system capability, active/intrusive reductant delivery, and feedback control be detected prior to emissions exceeding the thresholds for "NOx catalyst system." Further, we proposed that adsorber capability be monitored once per trip and that reductant delivery and feedback control be monitored continuously.

Comments:

See entries under III.A.6.

Agency Response:

See our response to comments under section III.A.6.

III.A.8 Diesel Particulate Filter (DPF) Monitoring

What We Proposed:

We proposed that malfunctions related to the DPF filtering performance, regeneration frequency, regeneration completion, NMHC conversion, active/intrusive reductant injection, and feedback control be detected prior to emissions exceeding the thresholds for "DPF system." We also proposed that a missing DPF substrate be detected. Further, we proposed that all of these functions be monitored whenever conditions were met.

Comments:

The technology that EPA has identified for DPF monitoring is not workable, and the proposed thresholds are not feasible. EPA must relax the emission thresholds that have been proposed and allow more time to assess the feasibility of such a stringent emission threshold in the future.

Substantial uncertainties are associated with the EPA's proposed DPF monitoring method. Those uncertainties make it impossible to use such a method to reliably detect whether and at what level a threshold has been exceeded. Those uncertainties exist in three primary areas: the soot accumulation model; deducing accumulated soot from a delta pressure measurement; and, correlation of PM emissions with disparity between modeled soot loading and soot loading deduced from DPF pressure drop measurements. The commenter provides many sources of uncertainty within each of these three primary areas, including variation in fuel characteristics (Biodiesel, Cetane, sulfur, aromatics, additives, impurities, etc.), assessing completeness of active regenerations (active regenerations may be interrupted before going to completion), a lack of correlation between pressure drop and filter soot loading due to variation in permeability and uniformity of soot layer, imprecision or uncertainty in assessing exhaust flow rate (influenced by vehicle design), low sensitivity of pressure drop to soot load (see Appendix A, Figure 2), imprecision of pressure drop measurement (influenced by vehicle exhaust system design), the confounding effects of ash loading, and correlating PM emissions with the disparity between modeled soot loading and soot load deduced from DPF pressure drop measurements.

The commenter acknowledges that some of the variabilities noted above are factors that engine manufacturers can unilaterally control and will control to the best of their ability such as drift and engine-to-engine differences in fuel injection rates, timing and pressure; engine-to-engine differences in EGR rates; variation in engine-out O_2, NO and NO_2 emissions; variation in oil consumption rate, and variability in FTP and ESC PM emission measurement. But engine manufacturers cannot precisely and absolutely control even those factors. As a result, these uncertainties will contribute to the proposed method's unreliability.

Moreover, many factors are outside of engine manufacturers' control. Vehicle OEMs control or partially control many variabilities such as variation in engine airflow, vehicle-to-vehicle differences in charge cooling effectiveness. Only if vehicle OEMs restrict vehicle designs or engine manufacturers develop OBD threshold calibrations that are unique for each vehicle type can these sources of variability be diminished. But such approaches are unrealistic. Vehicle OEMs should not be restricted in their vehicle designs. And engine manufacturers cannot predict all the unique calibrations that may be required for each and every vehicle in which their engines may be used, and they cannot control where the engines are ultimately used.

The commenter also points out that many of the variabilities noted above are the result of limitations of scientific knowledge (e.g., variation in engine airflow; uncertainty/imprecision in assessing exhaust flow rate; imprecision of pressure drop measurement; lack of correlation between pressure drop and filter soot loading due to variation in permeability and uniformity of soot layer; uncertainties associated with effectiveness of periodic ash cleaning processes; variation in ash morphology, sintering, and non-uniform deposition; lack of correlation between filter pressure drop changes and PM increases for various types of DPF cracks/leaks). Although engine manufacturers and other experts have expended and continue to expend substantial effort to develop the underlying science to allow these processes to be more fully understood and to be accounted for in the modeling, the extent of progress over the next few years is not clear.

Finally, several of the variabilities noted above relate to in-use operating factors that are beyond the scope of what engine manufacturers can know and account for (e.g., variation in fuel characteristics, variation/uncertainty in temperature of soot layer, variability in soot composition, uncertainty in assessing completeness of active regenerations, inability to incorporate full range of operating sequences, variation in oil ash content). As a practical matter, it will not be possible to reduce these sources of uncertainty without imposing impractical limitations on the usage of the engines and vehicles.

Lastly, the commenter states that repeatability of test results, which forms the basis for model development, also is an issue. Even under controlled laboratory conditions, there is significant uncertainty in the repeatability of loading and regeneration.

Given the uncertainties of soot load/oxidation model-based approaches for detection of DPF leakage, industry has also focused on the availability of soot sensing devices for detection of soot leakage past the DPF. The commenter states that, to their knowledge, sensor suppliers are still at "concept" stage for such sensors and are not ready to propose possible future availability or performance specifications. Even if prototype sensors were available today, there is insufficient leadtime to develop and assure the required accuracy of such sensor-dependent diagnostics for use on engine products available for commercial sale in 2010. When EPA has determined that a soot sensor is available and feasible for DPF threshold monitoring, an appropriate rulemaking can be initiated.

Diverting resources from the challenges associated with implementation of reliable DPF systems to develop an overly –aggressive OBD monitor that will not be capable of meeting the proposed thresholds could jeopardize the success of DPF systems. DPF failures will be rare and when failures do occur the delta pressure monitor will detect them.

Current medium-duty (8,500-14,000 pounds) DPF monitors are capable of detection only at the 9-10x the PM standard level. Not everyone is even able to meet that level. Notably, medium-duty vehicles certified to CARB's OBDII (13 CCR 1968.2) represent a limited range of engines in a defined set of applications, where the engine-vehicle configurations were known and for which monitoring calibrations could, in principle, be most readily accomplished. By contrast, HD has a far greater range of engines and potential applications.

Regarding the NMHC threshold associated with the DPF monitor, a commenter states that the DPF NMHC conversion capability is typically lower than that of the DOC, and the normal temperature rise is much lower than that which would be detectable with the temperature sensors. Even if excess NMHC were intrusively "fed" to the DPF, the NMHC conversion capability of a typical DPF would not create a measurable exotherm. Without a measurable exotherm, even functional monitoring of the NMHC conversion capability of the DPF cannot be done.

EMA, 2005-0047-0026, p. 5-10 and Appendix A
American Trucking Association, 2005-0047-0029, p. 4

Agency Response:

We agree with many of the arguments made by commenters in that uncertainties exist in the technology expected for OBD use. Similarly, uncertainties exist in the technology expected for control of DPF systems. We believe that is true despite the fact that DPF systems are being certified and are being implemented on 2007 model year engines and vehicles are being sold into the marketplace. However, we believe that the uncertainties are not uncertainties over the ability of the technology to work, but rather uncertainties over how much improvement is possible and how much improvement will take place during the initial implementation years that we have entered only recently. A perfect analogy is the situation that existed in the mid-1970s and the early days of gasoline catalytic converters. Those systems improved dramatically over the initial years of implementation and continue to improve even today after more that 30 years since their introduction.

The comments concerning the proposed DPF monitoring requirements, and the proposed NOx aftertreatment monitoring requirements, mirror those submitted in response to EPA's and CARB's initial gasoline-based light-duty OBD proposals. Industry claimed, in general, that the requirements were too stringent, that they could not be met, that they would be too costly, and that

they would not deliver sufficient benefits. Despite those claims, the OBD systems in place today detect malfunctions at greater stringency than originally proposed, they have not been so costly as to be detrimental to automobile sales, and they have provided benefits to consumers and, we believe, to manufacturers themselves.

We believe that it is not currently possible to know what level of threshold is the most appropriate level. Manufacturers appear to focus their efforts on the other aspects of the emission control system – the engine design, fuel strategy, aftertreatment devices, regeneration strategies – and worry about the OBD system only after those design elements have been decided upon. In fairness, we cannot argue that each manufacturer's limited resources should not be used primarily for controlling the emissions from the tailpipe. But, that suggests that no one today can know what future OBD systems can or cannot do given that the emission control systems they will be monitoring have not yet been determined completely. After years of experience with OBD, tracking its development and capabilities, it has become clear that, despite our sense that OBD should be a critical element to the design of an emission control system, it is often the last element considered by manufacturers.

Given the wide variety of approaches manufacturers are expected to take in meeting emissions standards, it is likely that different OBD systems and different OBD monitoring strategies will be capable of detecting malfunctions at different emissions levels. While some strategies may be capable only of detection at 0.10 g/bhp-hr PM or 9x the standard – the level suggested by EMA – it seems unreasonable to take a present day worst case detection level and make that the threshold level for all engines. This reasoning is borne out in the current state of certification to the OBD requirements for vehicles less than 14,000 pounds. Some of those systems have been certified to detect at 12x to 16x the applicable PM standard (note that they have been certified with a deficiency) while others have been certified to detect at 5x to 6x the applicable standard. Does this suggest that the threshold should be 16x the standard or 5x the standard? We believe that current systems should be expected to detect at 5x the standard and, where the system is unable to do so, an alternative monitoring approach can be used.

Instead of monitoring to a PM emissions threshold, manufacturers will have the option of defining a "detectable" change the observed delta pressure across the DPF. It is this change in delta pressure which indicates that exhaust flow is bypassing the filter (i.e. some portion of the filter area is missing). This detectable pressure drop can be determined by running the engine at a single speed/load point, determing the delta pressure at that condition, and multiplying the observed value by 0.5. The engine speed & load conditions for running this detectable pressure drop test, based on the test cycles and procedures for the supplemental emissions test (SET) under §86.1360-2007, will include all engine speed and load points greater than a region bounded by a line connecting mode numbers 2, 6, 3, and 13 (i.e. A100, A75, B50, and C50)). At engine speeds greater than "speed C", the monitor shall run whenever engine load is greater than 50%. The detectable change in pressure drop is determined by operating the "B50" speed/load point, observing the pressure drop on a clean, nominal DPF, and multiplying the observed pressure drop by 0.5 or other factor supported by data and apporved by the Administor. Since the alternative monitor will run under engine speed, load, and exhaust flow conditions which result in a meaningful pressure drop across the DPF – and the detectable change in pressure drop is determined at an operating point where exhaust flow and the resulting pressure drop, are significant, we believe that this is a reasonable approach to establishing a "minumum detectable" pressure drop and monitoring area. For example, if the pressure drop observed on a clean, nominal filter at the "B50" speed/load point was 4 kPa, the "minumum detectable" delta pressure would be 2 kPa (4 x 0.5). Whenever the engine is operating within the boundaries of the monitoring area, the output of the delta pressure sensor will be compared to the expected pressure drop under similar conditions on a clean, nominal filter minus the detectable pressure drop. A permanent fault is set if the actual pressure drop across the DPF is less than the

calculation of expected pressure drop minus the detectable pressure drop for a period of period of five seconds or more, indicating a failed DPF.

We should note that, while some systems are being certified today at 5x the standard, none are certified to detect any and all possible failure modes of the DPF. Hence our provision that allows certification even though all failure modes cannot be detected provided the manufacturer can make such a demonstration (see §86.010-18(i)(5)(i)). We also note that our in-use compliance thresholds are double those for certification engines through 2015, and that extrapolated OBD engines are not even evaluated against emission thresholds until 2016 (see §86.010-18(p)(2) for 2013-2015 model years and compare to §86.010-18(p)(3) for 2016-2018 model years).

In the end, we believe that the threshold levels we have proposed strike the proper balance between forcing manufacturers to design effective OBD monitoring strategies while also providing the flexibility to certify systems when good faith efforts fail to comply fully with the requirements.

III.A.9 Exhaust Gas Sensor Monitoring

What We Proposed:

We proposed that malfunctions related to sensor performance be detected prior to emissions exceeding the applicable thresholds. We also proposed that malfunctions related to circuit integrity, feedback functions, monitoring functions, and heater performance and circuit integrity be detected prior to those functions being lost. Further, we proposed that sensor and heater performance be monitored once per trip, that monitoring functionality be monitored whenever conditions were met, and that circuit integrity and feedback functionality be monitored continuously.

Comments:

As discussed with respect to NOx aftertreatment monitoring, the accuracy of current NOx sensor technology is not capable of achieving the EPA NOx emissions thresholds requirements in time for 2010. To be able to create a diagnosis based on the NOx sensor, the sensor supplier would have to lower the tolerances in time for the engine manufacturers to use these sensors, no later than mid-2007. Manufacturers must make design decisions with respect to 2010 technology by mid- to late-2007, and, therefore, must rely on NOx sensor technology as it exists today. Based on current NOx sensor technology, manufacturers expect to be able to monitor to thresholds at the NOx standard/FEL plus 0.60, not plus 0.30.

EMA, 2005-0047-0026, p. 12-13

Agency Response:

We understand EMA's concern that NOx sensor technology will not support the 2010 NOx threshold and have changed the NOx threshold to +0.6g/bhp-hr.

III.B Feasibility of the Monitoring Requirements for Gasoline/Spark-Ignition Engines

III.B.1 Fuel System Monitoring

We received no comments pertaining to this section that require analysis.

III.B.2 Engine Misfire Monitoring

Comments:

EPA's proposed misfire monitoring requirements for HD gasoline engines generally align with CARB's, with the exception that EPA did not include a provision from CARB's regulation for engines with more than eight cylinders. That provision provides for relief on a case-by-base basis if an engine is incapable of monitoring for misfire under positive torque conditions over the full operating range of the engine up to redline (see 13 CCR 1971.1(f)(2.3.5)[7]). It is absolutely essential that EPA include this provision in the final rule for HD gasoline engines. Ten cylinder spark ignition (i.e., gasoline) engines are used in trucks over 14,000 pounds and cannot detect misfire at the higher speed/loads. This is because crankshaft acceleration levels are less pronounced when a misfire occurs as the number of cylinders increases. Current misfire detection technology is not capable of meeting full-range misfire requirements on those engines. Ten cylinder engines are also used in vehicles under 14,000 pounds, and manufacturers make use of an OBDII provision (see 13 CCR 1968.2(e)(3.3.5)) that is similar to 1971.1(f)(2.3.5). Manufacturers have attempted to implement other monitoring approaches, such as neural network, but have found them to be incapable of meeting the full-range monitoring requirement. CARB has evaluated the issue and concluded that the provision is needed. EPA should include this provision in the federal HDBOD final rule.

EMA, 2005-0047-0026, p. 42-43

Agency Response:

We have no argument with the legitimacy of the CARB provision with respect to misfire detection on engines with more than eight cylinders. Our intention would have been to address this industry concern in a manner identical to that used by CARB, and to call any system needing such relief a deficient system. Such a determination would carry with it no monetary penalty since we do not charge fees association with deficiencies. However, we do have limitations on carry-over of deficiencies which, we believe, manufacturers would need to violate in order to sell engines with more than eight cylinders since, presumably, those engines would need this relief indefinitely. For that reason, we see a need to provide for the relief in the regulatory language rather than addressing the need via our deficiency provisions. This change has been made in the final rule (see §86.010-18(h)(2)(iii)(E)).

III.B.3 Exhaust Gas Recirculation (EGR) Monitoring

We received no comments pertaining to this section that require analysis.

III.B.4 Cold Start Emission Reduction Strategy Monitoring

We received no comments pertaining to this section that require analysis.

III.B.5 Secondary Air System Monitoring

We received no comments pertaining to this section that require analysis.

[7] Note that this is a corrected reference. The EMA comments erroneously referred to the analogous sections of 13 CCR 1968.2.

III.B.6 Catalytic Converter Monitoring

We received no comments pertaining to this section that require analysis.

III.B.7 Evaporative System Monitoring

We received no comments pertaining to this section that require analysis.

III.B.8 Exhaust Gas Sensor Monitoring

We received no comments pertaining to this section that require analysis.

III.C Feasibility of the Monitoring Requirements for Other Diesel and Gasoline Systems

III.C.1 Variable Valve Timing and/or Control (VVT) System Monitoring

We received no comments pertaining to this section that require analysis.

III.C.2 Engine Cooling System Monitoring

What We Proposed:

We proposed that malfunctions related to the cooling system not warming up as expected be detected since cooling system temperature status is an enable criterion for so many OBD monitors. Further, we proposed that the thermostat be monitored for proper operation and that the engine coolant temperature sensor be monitored for circuit continuity, out-of-range values, and to ensure that it provides rational temperature readings.

Comments:

EPA's proposed cooling system requirements are impractical, overly burdensome and costly, and do not adequately account for the unique nature of the heavy-duty industry. Thus, they should be eliminated from the final rule.

The light-duty method of creating a model of heat flow to/from the engine and comparing that to actual coolant temperature to ensure that the cooling system is behaving normally is impractical, if not impossible, to robustly achieve in the horizontally integrated HD engine market. HD engine manufacturers often sell engines without knowing the chassis, transmission, and cooling system with which that engine will be installed. The connections to the cooling system – engine radiator, cab heater, defroster, sleeper heater, but heater, air conditioner, transmission cooler, exhaust throttles, fuel fired heaters, air coolers, block heaters, etc. – are all components that are not supplied by, nor controlled by, the engine manufacturer. However, all those devices affect cooling system behavior and, thus, engine manufacturers cannot practically and cost-effectively achieve a robust diagnostic. The commenter suggests that the proposed requirement would result in each vehicle into which an engine manufacturer's engines were place would need to be calibrated separately since one calibration would not work for all of that manufacturer's engines. The commenter states that such an

outcome is technically possible but so cost ineffective as to be realistically impossible because the calibration burden would be enormous and, in the end, would be the task of the vehicle manufacturer.

EMA, 2005-0047-0026, p. 20-22

If EPA requires OBD to register cooling system malfunctions, one of the following may happen: bus OBD systems will frequently register faults during otherwise regular operation, or truck tractor OBD systems will almost never register faults. The only way to get around such problems would be for EPA to require that engine manufacturers calibrate each engine (and each engine rating, insofar as engine power strongly affects engine heat rejection rates) with each cooling system in each vehicle. The task would be untenably burdensome. In all likelihood, manufacturers like Freightliner would have to extrapolate cooling system settings across a wide range of vehicle configurations (not merely bus versus tractor, but including such configuration options as the type and power draw from alternators and other accessories). Such extrapolation would engender the possibility of false MILs. Moreover, when an OBD-equipped vehicle is repurposed (e.g., converted from a highway tractor to an intracity tractor or dump truck, which is a common practice in HD highway fleets), the warming rate could change in such a way as to lead to false MILs. Freightliner requests that EPA eliminate thermostat monitoring requirements in HD highway applications.

Freightliner, 2005-0047-0025, p. 3

Agency Response:

The comments raised by industry are of great concern because the nature of the comments extends beyond OBD and to emissions compliance itself. The aftertreatment devices expected for 2010 compliance – DPF systems and either SCR or NOx adsorber systems – are very much dependent on the level of heat available in the exhaust. The comments suggest that engine manufacturers will have no control over the amount of heat being removed from the exhaust for use as cabin heating, etc. If true, how do manufacturers intend to comply with emissions standards during real world operation? The comments suggest that the engines and emissions control systems will be designed with the emissions test in mind – where no heat is removed from the exhaust for cabin heating, etc. – and with little regard for real world operation. These comments suggest that the OBD requirements to monitor the engine cooling system are more important than we believed initially.

That said, the direct emission impact of a malfunctioning thermostat or cooling system is only a secondary reason for the requirement. The primary reason the cooling system is monitored for proper operation is because the engine manufacturer itself elects to use engine coolant temperature as a primary enabling criteria for monitoring of nearly every emission critical component. The requirement for cooling system monitoring is simply stated as a requirement to verify that the engine properly warms up to the highest temperature required by the engine manufacturer for monitoring of other components. The relative stringency of this monitor is a direct result of how high the manufacturer requires engine coolant temperature to get before monitoring other components and engine manufacturers can effectively desensitize algorithms to vehicle factors by enabling other monitors at lower temperatures. While we understand engine manufacturers' concerns that actions by truck builders and users can impact their monitor design, the intent of OBD systems is to have monitoring of the emission components during real world operation of heavy-duty vehicles. Failure to achieve the necessary warmed-up temperatures required for monitoring would effectively mean monitoring is indefinitely disabled on real world vehicles, thus negating nearly the entire OBD system. Verifying the cooling system is operating properly is a crucial and necessary element to ensure OBD systems continue to operate on real world vehicles throughout their life.

We suspect that the OBD requirements will result in the limitations and specifications that the engine manufacturer will have to place on the vehicle builders to ensure the engine remains in a legally certified configuration. This cooling system monitoring requirement may result in additional calibration work or classification of the exact extent to which the vehicle builders can modify the cooling system to maintain a compliant system. Failure to do so could result in MIL illumination. However, while eliminating the cooling system monitoring requirements would avoid this potential MIL illumination, it would also re-open the possibility that such a system would be put into service and all of the OBD monitors would be disabled for the entire life of the vehicle.

III.C.3 Crankcase Ventilation System Monitoring

We received no comments pertaining to this section that require analysis.

III.C.4 Comprehensive Component Monitoring

What We Proposed:

We proposed that malfunctions of any electronic engine component or system not otherwise covered by our other proposed requirements be detected. Further, we proposed that such components or systems be monitored for circuit continuity and out-of-range values and to ensure they provide rational information (input components) and proper functional responses (output components).

Comments:

Regarding the proposed requirements to monitor glow plugs and intake air heater systems, EPA has failed to establish a reasonable justification for the requirements or an analysis of the technological feasibility of detecting low to moderate degrees of glow plug degradation. Directly monitoring these devices would require adding hardware to today's systems, which EPA has indicated it intends to avoid. Because of the high current and inrush current flows, monitoring hardware will likely remain separate from the engine control system. Moreover, intake air heaters and glow plugs are unlikely to experience gradual deterioration and will, instead, fail to function altogether. Such total failures are detectable via continuity monitoring making threshold monitoring unnecessary. Degradation aside, intake air heaters can be assessed for providing heat using the engine's intake air temperature sensor which would not likely find low to moderate levels of degradation nor isolate specific failures; however, service bay diagnostic approaches do so today.

EMA, 2005-0047-0026, p. 18-19

Regarding requirements to monitor cold start aids, such requirements will impact vehicles and vehicle manufacturers by requiring significant changes to the way vehicle manufacturers do business to ensure OBD systems work properly. EPA must carefully consider such impacts and the potential impacts on suppressing sales of OBD-equipped engines/vehicles.

EMA, 2005-0047-0026, p. 19

EPA should consider the possibility that OBD requirements to monitor cold start aids may result in them being added in the aftermarket rather than by engine manufacturers. Cold start aids are customer-selected items and are not required for emissions compliance. Engine manufacturers cannot be responsible for monitoring aftermarket parts over which they have no control.

EMA, 2005-0047-0026, p. 19

Agency Response:

We have changed the regulation to allow, for 2010 through 2012 model years, circuit checks only for glow plug monitoring. For 2013 and beyond, we will continue to require both a circuit check and a functional check, as proposed. The functional requirement can be met by determining if the current used by the sensor is rational. Intake air heaters will require both a circuit and a functional check in 2010, since all sensors needed to do the testing are available. We do not believe that the monitoring of cold start aids will drastically change the way vehicle manufacturers do business. Cold start monitoring requirements are already in place for California Medium Duty vehicles without issue. We agree that manufacturers are not required to monitor aftermarket parts.

IV. What are the Service Information Availability Requirements?

IV.A Comparison of the Aftermarket Service Industry Below 14,000 Pounds and Above 14,000 Pounds

Comments:

The Engine Manufacturers Association (EMA) commented that the heavy-duty service industry is significantly and substantially different from the light-duty vehicle service market. The light-duty service industry operates on a wide scale, with tens of thousands of service facilities across the nation – whether franchised or independent – to meet the needs of millions of vehicles. In marked contrast, the heavy-duty service industry operates on a much smaller and more individualized scale, with far fewer service facilities and, although a limited number of products, an enormous number of variations on how those products may be configured and calibrated. Indeed, the volume of heavy-duty vehicles is approximately $1/40^{th}$ that of light-duty vehicles.

EMA also commented that aftermarket service providers have testified at a California public workshop that there was no need to extend service information availability requirements to the heavy-duty industry. The current service information infrastructure is already established and adequate to meet the needs of the heavy-duty engine and vehicle service industry, and assures that emission-related repairs are carried out.

EMA further commented that, in the Preamble, EPA cites data which shows a slight increase in general maintenance and overhaul by “the independent sector” (72 Fed. Reg. 3266) as evidence of the need for service information availability. As described above, heavy-duty service information already is widely available. Moreover, the vehicle census data upon which EPA relies is now a decade old, and the increase in third party general maintenance service is not attributed to a specific cause or for a particular purpose. Such increases do not establish a “need” for service information. In fact, increases in third party maintenance could easily be the result of compliance with OSHA regulations, increasing costs of workers’ compensation insurance, storage and disposal costs for hazardous materials like used engine oil and anti-freeze, or increases in direct labor costs, which may have led vehicle owners to decide that it was no longer practical to perform routine preventive maintenance or general maintenance at their own locations during the period from 1992 to 1997.

The industry now has over 10 years of experience with a vehicle fleet that is predominantly equipped with electronically-controlled engines. Without follow-up data from 2002 and 2007 that would confirm or deny such a trend, and that would provide a better comparison of the impact of engine electronics on service rates, EPA’s data does little to support the Proposed Rule.

EMA concludes that the heavy-duty service and repair industry works so well that users and manufacturers cooperate on the design and development of service equipment, service procedures, and vehicle design. The Technology and Maintenance Council ("TMC") of the American Trucking Association has collaborated with industry on maintenance and design practices for decades.

Lastly, EMA commented that imposing regulatory requirements for service information is like trying to fix something that, in the heavy-duty industry, is not broken. The need is not there. Even EPA must have some sense of the lack of need, because it has requested comment on the need for service information provisions in the heavy-duty industry, as well as the applicability of service information requirements to the heavy-duty service industry. If EPA is going to impose regulatory requirements, then those should be limited to supporting what engine manufacturers already do. Instead, much of EPA's proposal would require significant changes in how engine manufacturers provide information. In fact, the Proposed Rule would require complex, substantial, and time-consuming changes in the current heavy-duty service information infrastructure – changes that will result in increased costs for manufacturers, and in increased costs for providing service information and tools.

Caterpillar commented that, based on the EPA's own comments regarding the US Census data, on a percentage basis the ratio of vehicles being serviced by the aftermarket for light-duty is approximately 2.5x higher than that of heavy-duty. When a 1/40th sales volume difference between heavy-duty and light-duty is factored in, the effective aftermarket volume of for heavy-duty repair is less than 1% that of light-duty on a "number of vehicles" basis. Therefore, the effective heavy-duty aftermarket volume is extremely small in comparison. Also, the EPA should consider that heavy-duty vehicles are serviced through different channels than the light-duty industry. A greater percentage of heavy-duty vehicles are owned in large numbers and thus serviced in larger numbers in company fleets.

Caterpillar also commented that many of the proposed Service Information requirements are already available to the aftermarket. For example, ordering of service literature or offline training can currently be purchased from Caterpillar dealers, and online service information accounts have been purchased by many Caterpillar customers. Regardless of the number of vehicles a business owns, each company is equally able to purchase service information from their local dealer for servicing of Caterpillar products.

The Aftermarket Industry Alliance (AAIA) , the Automotive Engine Rebuilders Association (AERA), the Automotive Parts Remanufacturer Association (APRA), and the Heavy Vehicle Maintenance Group (HVMG) (hereafter referred to as AAIA, ET.AL), collectively commented that the heavy duty independent aftermarket is composed of thousands of shops throughout the nation which service and repair heavy duty vehicles but which are not dealerships or authorized service providers of the heavy duty vehicle or component manufacturers. Truck and other heavy duty vehicle owners benefit by having access to the affordable and convenient repair provided by independent shops. Absent this competitive alternative to manufacturer authorized repair facilities, owners would be forced to pay higher repair prices and endure longer wait times in order to obtain repairs to their vehicles. Thus the independent aftermarket helps ensure that vehicle owners get their vehicles repaired in a timely and economic fashion and that clean air goals are achieved.

AAIA, ET. AL, further commented that it is estimated that there are over 25,000 independent heavy duty engine and transmission service shops and heavy duty machine shops in the United States. These shops perform approximately 25% of the general maintenance on heavy duty vehicles and 30% of the major overhauls on them. This works out to about 1 million general repairs per year and the same number of major overhauls.

Agency Response:

EPA agrees with commenters that there are very clear and distinct differences between light-duty and heavy-duty aftermarket service providers and that our regulations should reflect these differences as appropriate. However, EPA does not agree that the fact that service information is currently available in some form to the heavy-duty aftermarket necessarily precludes the need for regulations for the availability of heavy-duty service information. While heavy-duty manufacturers do currently have avenues in place for making this information available, the purpose of the regulations for heavy-duty service information is to ensure that there is some level of uniformity and consistency across manufacturers to ensure that aftermarket service providers have reasonable access to service information. With these regulations, EPA has taken into account the existing infrastructure of information availability and wherever possible and appropriate, and have structured these regulations to the extent possible to ensure uniform and consistent information availability to aftermarket service providers.

IV.B Information to be Made Available by OEMs

IV.B.1 Definition of Emissions-related Information

Comments:

EMA commented that the purpose of service information requirements is to assure that information is available for the purpose of undertaking *emissions-related* service repairs. It follows, then, that EPA's proposed definition of "emissions-related information" must be revised to assure that engine manufacturers are responsible only for providing information that is truly emissions-related.

EMA commented that EPA's proposed definition would include "information regarding any system, component or part of an engine that controls emissions and any system, component and/or part *associated with the engine, including, but not limited to: the engine, the fuel system and ignition system;…"* (emphasis added). EMA objects to the italicized language as proposed in that it is far too broad. Instead, EMA commented that EPA should adopt the following revised language in place of the italicized language: "and any system, component and/or part *that is part of the diagnostic strategy for an OBD monitor."*

AAIA, et. al. commented that they have a concern with the proposed rule is that the scope of the information to be provided by the rule is much narrower than under the light duty rule. Under the light duty rule, emissions-related information is defined to include any part or component of a vehicle associated with the powertrain system and any information for any system, like the transmission, which is likely to impact emissions. Under this proposed heavy duty rule, emissions-related information appears to be limited to that same type of information but only that related to the engine rather than the entire vehicle. Moreover, the references to the powertrain system and the transmission have been noticeably deleted. We can see no justification for this limitation. If the EPA is requiring OBD systems for heavy duty engines and those systems monitor and trigger a default because of some system failure or problem outside the engine system, then this information also must be made available to the aftermarket so that its service providers can provide the same level of service as the engine manufacturers authorized dealers and service networks. We encountered this same problem in California when the Air Resources Board was finalizing its heavy duty regulation. The engine manufacturers argued that in many instances the parts and components of other manufacturers were combined with their engines to assemble a suitable vehicle for the customer. They argued that because the information on these other systems was not proprietary to them and

might not be available to them, they should not be required to provide it. Our position was that if another vehicle system could adversely affect emissions and if the engine manufacturer elected to have its OBD system monitor that system, then it had the responsibility to make the emissions related information available for whatever was being monitored to anyone who needed to fix it, whether that be a dealer or an aftermarket service provider. California agreed and added language in Section 1969(d)(9)(B) of its regulations to require that if manufacturer elects to have its OBD system monitor inputs from the transmission then information related to what was being monitored and how to repair it had to be made available to the aftermarket. We believe that this language is still too narrow and that the requirement should apply to any system monitored by the OBD system, including the transmission. But at a minimum, EPA should at least adopt the same language as California and allow access to transmission system information.

Agency Response:

EPA agrees that it is reasonable to clarify the definition of “emissions-related” information as put forth by EMA and the regulatory language will amended accordingly.

EPA does not agree with AAIA et al. It is not necessary to adopt the language from the CARB regulations to clarify that manufacturers have to make available information for any systems, including transmission systems, that could impact emissions or for systems that otherwise are monitored by the OBD system. EPA has a detailed description of how we define emissions-related information §86.1808–10(j)(3)(ii)(E) of the regulatory language, which includes a reference to transmission systems and we believe that this definition is sufficient. Additionally, EPA does not agree that the scope of information to be provided under this rule is any narrower in the light-duty rule. The only explicit information limitation discussed in this rule is information pertaining to transmission systems, Other than that limitation, EPA believes that this rule is otherwise very clear that any and all information need to diagnose and service emissions-related repairs must be made available to after market service providers.

IV.B.2 Other Information

Comments:

Cummins commented that that there is some service information that we should not be required to provide to aftermarket service providers. In particular, Cummins commented that information related to warranty repairs should not be required to be made available to the aftermarket. This information should only be made available to service locations that are authorized to perform warranty repairs. Cummins recommended adding the following language to regulations:

> “Manufacturers may take steps to restrict warranty and customer assurance plan information used only for the purpose of providing such manufacturer covered repairs to only those repair locations authorized by the manufacturer.”
>
> Cummins also commented that EPA should add the following regulatory language to Sections 86.010-38 (j)(6)(i)
>
> Informal recall service information such as engineering notes and/or sketches are not required to be made available as long as this information is not made available to manufacturer franchised dealerships in the form of manuals.

Cummins comments that recall service information such as personal notes, documents, spreadsheets, charts, and diagrams that is not formally published should not be required to be made

available on our web site. To require control of this informal documentation would be overly burdensome to the manufacturer.

Agency Response:

EPA agrees that it is not necessary for informal information that is not made available to dealerships to be made available on manufacturer web sites and will change the regulatory language for this section accordingly with one clarification regarding warranty information. While we believe that there is some warranty information that does not need to be made available to aftermarket service providers, such as OEM-specific warranty labor rates, other general warranty information relevant to making emissions-related repairs must be made available to aftermarket service providers.

IV.B.3 Regulating the Cost of Service Information

Comments:

EMA commented that EPA has not cited any authority for its proposal to regulate the pricing of service information by manufacturers. EPA cannot cite any authority, for neither the CAA nor other federal law provide any such authority to EPA. According to EPA, the legislative history for the service information provisions in the CAA included Congress's intent that manufacturers should be able to recover "reasonable costs" for providing service information. But Congress did not take the further step to establish EPA's authority over costs and pricing issues in the language of the statute. In particular, requiring consideration of "the ability of the average aftermarket technician or shop to afford the information" (§86.010-38(j)(80(i)(E)) in pricing decisions is completely outside the scope of the CAA, as it does not even touch on Congress's intent to ensure that manufacturers "recover reasonable costs for making information available" (72. Fed. Reg. 3269).

The American Truck Dealers Division of the National Automobile Dealers Association (ATD) commented that there is absolutely no justification, statutory or otherwise, for EPA to regulate the cost of OBD-related emissions information and any attempt to do so would exceed EPA's authority.

ATD further commented that any heavy-duty OBD rule designed to make essential OBD-related service information generally available must defer to the marketplace to provide such information at market prices. Had it been an issue of concern, the statute would have mentioned regulating cost or price. Moreover, just as there has been no demonstration of any present or potential future unavailability of heavy-duty OBD-related emissions information, there has been no demonstration of any present or potential future OBD-related service information cost concerns. In short, the proposal appears to be addressing problems that don't exist.

Assuming adequate the authority and justification, any attempt by EPA to regulate the cost of necessary OBD-related emissions information must reflect the cost to dealerships for the same or similar information. With its comments, ATD provided the results of survey it's conducted to get some idea of what dealers pay for tools, information, and training.

Agency Response:

EPA disagrees with the EMA and ATD comments regarding regulating the cost of service information. There is significant precedent established throughout the history of EPA's role in regulating service information that the cost of service information is critical to its availability. EPA has long held the position, supported by the legislative history of the service information provisions in the Clean Air Act, that we do have the authority to regulate the cost of service information. The legislative history of the Clean Air Act clearly intends that manufacturers cannot price information

such that it effectively renders it unavailable, or in such a way that it becomes a profit center for the manufacturer.

The provisions being finalized today place no particular restrictions on what manufacturers may charge for access to their information or their scan tools, only that manufacturers must make information and tooling available at a fair and reasonable price. Generally, EPA has interpreted this to mean that information and tool should be priced along the lines of what dealers are charged, taking into consideration that manufacturer's can recoup at least some of their costs for making them available to the aftermarket.

IV.C Requirements for Web-based Delivery of the Required Information

IV.C.1 General Comments on Web Site Availability

Comments:

EMA commented that they generally support making certain heavy-duty information available via Web sites in 2010. However, EPA must revise the Proposed Rule to clarify that publicly-available service information Web sites are not required of heavy-duty engine manufacturers until at least one year after the start of commercial production of the engine. This is not a retroactive rule as was the case when the under-14,000-lb. requirements were implemented. In fact, with the extremely longer useful lives of heavy heavy-duty engines – 435,000 miles – there is no need for public information availability any earlier than one year after the start of commercial production. Given the complexities manufacturers will be facing in meeting the underlying emission standards and OBD, and the fact that commercial customers will seek repair and service from manufacturer facilities during the warranty period, manufacturer-specific Web sites should not be required until at least one year after the start of commercial production of an engine product.

.AAIA, et al. commented that section (j)(12)(i) which contains the time frame when the engine manufacturers have to make the emissions-related information available to the aftermarket has also been modified from it light duty predecessor in a way that could adversely affect the aftermarket . Both sections require that the information be made available within six months of model introduction, or at the same time it is made available to the manufacturer's franchised dealers. However, the light duty rule says that this information must be made available at the time the first of these events occurs.

AAIA, et al commented that the heavy duty rule omits this language, and sees no reason for it. If the engine manufacturer provides the information to its dealers prior to six months after introduction of the model, it should make the information available to the aftermarket at the same time. We request that the "whichever is earlier" language from the light duty rule be reinserted in the heavy duty one.

Caterpillar commented that, even before any heavy-duty service information regulation was in place, Caterpillar was already providing service information to its dealers and customers through online, digital offline, and paper publications. This information could be purchased through Caterpillar dealers. Caterpillar anticipates that the EPA's proposed Service Information Regulation, if adopted, will neither promote any beneficial change to the level of information already available online, nor cause a notable increase in service information sales because businesses that need service information already have access to it.

ATD commented that they support a requirement that the delivery of emissions-related service information occur through individual engine manufacturer (OEM) web sites. On the light-duty side, OEM web sites have proven to be effective for service facilities seeking information necessary to make OBD-related emissions diagnoses and repairs. At the same time, EPA should not micro-manage these web sites. The only essential issue of importance is whether necessary OBD-related emissions information is being made available in a generally user-friendly and timely manner. If a final rule is issued, EPA's heavy-duty OBD web page should link to the various OEM web sites.

ATD also commented that any OEM website mandate should include adequate lead-time. Given the long emissions warranty period for heavy-duty vehicles/engines, ATD suggests OEMs be allowed up to one year after information is made available to dealerships to post that information on their web sites.

Volvo commented that EPA should revise section 86.010-38(j)(11) to allow manufacturers to provide access to text-based service information to the aftermarket in the same manner that it is currently provided to their dealerships rather than search-engine assisted, on-line viewing of emissions-related repair information.

Agency Response:

Regarding the EMA and ATD comment on when the websites need to publicly-available, EPA believes what EMA is requesting is that EPA finalize a provision that service information itself should be not required to made available on the manufacturer websites until at least one year after the start of commercial production of the engine. EPA is somewhat confused by this recommendation. It our understanding that most manufacturers currently have web sites available for their dealer networks and will be using these existing web sites to satisfy these regulations. Further, EPA is providing manufacturers until July 1, 2010, which is several months after the introduction of the 2010 model year and over a year following promulgation of this rule, before they are required to initiate their web sites. It is not clear to EPA why manufacturers would want to invest resources to implement restrictions to aftermarket service providers for after a certain time period when they don't feel the need to do so now.

While EPA agrees that service is generally performed by dealers while the engine is still under warranty, EPA proposed, and will finalize a provision that any emissions-related service information defined in this regulation must be made available to aftermarket service providers at the same time it is made available to the dealer network.

Regarding the AAIA, et al. comment regarding the omission of the language, "whichever is earlier" from section (j)(12)(i), EPA agrees that this language was mistakenly omitted from this section and will amend the final regulations accordingly.

In response to Caterpillar's comments, EPA appreciates that Caterpillar has several avenues available, including a full-text information web site, for aftermarket service providers to obtain service information. EPA believes that the parameters for web site availability being finalized in this action will not require Caterpillar to make significant changes to existing infrastructure.

In response to the Volvo comments, EPA understands that Volvo currently provides all service information to their dealers and the aftermarket in the form of PDF documents rather than HTML or other web based formats that are more conducive to a traditional search engine. It is also EPA's understanding that Volvo currently makes this information available for free to the aftermarket and intends to keep doing so because they do not believe it is cost effective to develop a traditional e-commerce site. First, there is nothing in these regulations that would preclude a manufacturer from presenting information in PDF format so EPA believes that Volvo would not have to make any

changes to the way they present this information. In addition, because Volvo makes this information available for free, the need for searchability is not as essential because an aftermarket service provider has free and unlimited access to all the material on the site and do not have to make any monetary investments in order to view documents to ensure that it is the information they need. To the extent that Volvo changes this existing model in the future and would charge for access, Volvo would be required to allow aftermarket service providers either a free preview or implement search capabilities so that aftermarket shops can reasonably assess that the information they are about to purchase is in fact the information they are seeking.

IV.C.2 Short-Term, Medium-Term, and Long-Term Access

Comments:

EMA commented that EPA has proposed a specific structure of "tiered access" for service information subscriptions over manufacturers' Web sites. EMA does not support the tiered structure that would require manufacturers to provide subscriptions for certain specified time periods.

For heavy-duty manufacturers, requiring specified periods of time for access would require a change in how manufacturers provide information today. Generally, heavy-duty engine manufacturers' Web sites have been very reasonably priced, such that a yearly subscription is typical. EPA has again applied a light-duty paradigm to this aspect of the Proposed Rule, and it is not appropriate.

EMA further commented that short periods of access make it more difficult for manufacturers to recoup the costs of providing a service information site and that the inability to recoup operating and administrative costs for a service information rule site creates a fixed cost that must be spread across a far smaller number of engines compared to light-duty industry volumes. The inclusion of short-term access periods suggests that persons may perform the repair of heavy-duty diesel engines for only short, infrequent periods of time. Occasional use suggests that the persons involved do not seek to repair heavy-duty diesel engines as a principal line of business, and in fact may not meet industry standard qualifications. On the other hand, persons who have invested in a business to provide heavy-duty service likely are in it for the long term and need and want access to service information for the long term.

Caterpillar commented that a single, yearly tier subscription is what Caterpillar currently provides to its dealers and customers. Requesting manufacturers to create service information or distribution methods that are different than that currently offered is not cost effective for an industry with significantly lower product volumes and service information subscription rates. A single tier of a yearly subscription is non-discriminatory for the aftermarket. Also the current cost of Caterpillar's service information is not significant when compared to the fixed and variable costs of running a legitimate repair business or compared with the owning and operating costs of managing a vehicle fleet, and therefore Caterpillar believes the pricing for a yearly service information subscription should not be a hindrance for those engaged in heavy-duty engine repair.

Caterpillar's further commented that its service information ordering website, that was established because of ARB regulation, has been online for over 4 months in 2007, and to date, has generated only a single sale of service information subscription which was from outside the state of California. While this does not represent the volume of aftermarket service information subscriptions, it should indicate there is not a significant need for service information to be made available for ordering online. The EPA should allow manufacturers to direct service information customers to dealers for purchasing of this information. Any company engaged in the repair of heavy-duty vehicles will need to have some business relationship with a Caterpillar dealer so that parts can be ordered for engine repair.

Caterpillar recommends that the EPA allow manufacturers to provide ordering of service information by phone thus utilizing a manufacturer's dealer network in lieu of having online purchasing of service information. The cost of providing an online website for e-commerce is not justified based on the expected sales volumes. As of May 2007, Caterpillar has comparatively priced service information with the light-duty industry when in fact, due to the significantly lower volume of service information subscriptions in the heavy-duty market, it would be reasonable for Caterpillar's service information to be much higher in cost. Our recommended changes to the EPA's proposed regulation will help keep service information at an affordable cost to the aftermarket.

AAIA, et al commented that a tiered approach to availability and pricing, similar to that provided in the light duty aftermarket, is necessary to provide the flexibility to allow the diversity of repair work performed by the aftermarket service shops to continue to be available at a reasonable price. While many shops specialize in one engine manufacturer or another and would most likely subscribe to that manufacturer's web site on an annual basis, many others service a variety of customers with different makes and models of engines and would need access to the information for only a limited period of time. And even those facilities that specialize in the products of one manufacturer or another will often be required to service another brand to satisfy the needs of their customers. To require these facilities to bear the cost of an annual subscription for the information would be to de facto deny it to them. Therefore, unless a tiered approach to availability and pricing is adopted as part of the regulation (or the manufacturer makes the information available at one low price for all aftermarket service providers) a large segment of the heavy duty aftermarket will be economically barred from effectively using the information on the web site.

Agency Response:

While EPA believes that there may be advantage for some form of shorter term access for the web sites, EPA believes that it is not necessary to finalize a provision that would require short-, mid- and long term access to the manufacturer's web sites that are otherwise required by this regulation in exactly the same fashion as we finalized for the light-duty rule. EPA finalized the tiered approach for the light-duty arena because of the nature of the service and repair work done by the light-duty aftermarket. First, there are approximately 22 light-duty vehicle manufactures. That fact, combined with the fact that the light-duty aftermarket will generally service numerous makes and models, made it sensible to adopt the tiered approach to accommodate the nature of the how aftermarket service is performed for light-duty vehicles. On the heavy-duty side, EPA believes that there is less need for truly short term subscriptions given that there are relatively few HD manufacturers (approximately 6-10) and currently nearly all heavy-duty manufacturers have web sites available with yearly subscriptions that are reasonably priced (generally $1500 or less per year).

In addition, EPA believes that it would be unduly burdensome to require manufacturers to develop the tiered approach to web site access given that their web sites are already developed and available for use by the heavy-duty aftermarket. When we finalized the tiered approach for the light-duty service information rule, the vast majority of manufacturers had not yet developed their web sites and, therefore, was able to develop the infrastructure for tiered access much more efficiently. In addition, based on our experience in implementing the light-duty service information rule, we are aware that it is costly for light-duty manufactures to maintain the tiered approach on their web sites. However, light-duty manufacturers have an increased opportunity to recover at least some of those costs given the relatively larger volumes of aftermarket service that purchase the information. To require heavy-duty manufacturer to retroactively adopt the tiered approach to their existing web sites would be resource intensive and not cost effective given the relatively smaller number of heavy-duty aftermarket shops that would subscribe to the web sites and could ultimately drive up the cost that heavy-duty manufacturers would need to charge aftermarket service providers.

While EPA would encourage manufacturers to make available a reasonable range of web site subscriptions options, EPA will be finalizing the same provision for web site access that CARB uses. It will not require that manufacturers make a range of subscription options available. However, any manufacturer intending to only offer a yearly subscription must demonstrate to EPA that a single subscription option would be comparable to the rates that a competitor charges for monthly or daily subscriptions.

In response to Caterpillar's comments, EPA understands this comment to be recommending that EPA not require heavy-duty manufacturers to develop and maintain an e-commerce site where an aftermarket shop could directly purchase their subscriptions to the manufacturer's service information web sites. EPA believes that Caterpillar is recommending that, while they would still have a web site, Caterpillar would like the option to allow a manufacture to establish a process where an aftermarket service provider would call a 1-800 number or an authorized dealer in order to process the transaction, including the payment and the issuing of passwords and user ids.

Section 86.010-30(j)(4) of the regulations state that '….a manufacturer shall provide or cause to be provided….a manufacturer specific World Wide Web site…." EPA believes that this regulatory language provides the type of flexibility that Caterpillar is looking for to implement this requirement. To the extent that Caterpillar or any other manufacturer wants to implement something other than a traditional e-commerce web site, EPA will work with that manufacturer to ensure that the process they put in place does not put undue burden on the aftermarket to gain access to the web sites and otherwise meets on the requirements for web based access to information as finalized in this regulation.

IV.C.3 Pricing Approval

Comments:

EMA commented that EPA has proposed that manufacturers obtain approval from EPA of the pricing structure of their Web sites 6 months in advance of launching their Web sites. Such a requirement is overly burdensome and unnecessary. Pricing approval should not be needed if EPA eliminates the tiered access approach. At a minimum, EPA should revise the requirement to no more than 60 days' advance notice.

Agency Response:

EPA believes it is reasonable to finalize a requirement that manufacturers must obtain approval from EPA of the pricing structure of their web sites within 60 days of launching their web sites with any changes needed to comply with this regulation.

IV.C.4 Limitations on Makes and Models

Comments:

EMA commented that EPA has proposed that manufacturers may not limit subscriptions to just one make or one model. EMA commented that this is different than what heavy-duty engine manufacturers do today, and must be revised to reflect current access in the heavy-duty market. In many cases, heavy-duty engine service providers only want or need information on one model. Along with elimination of the tiered pricing structure, EPA should eliminate any requirement to offer service information on all makes and models within a single subscription.

Agency Response:

EPA does not agree with EMA that we should eliminate requirements to provide service information for all makes and models within a single subscription. Since EPA is not finalizing provisions that would require short-, mid-, and long-term access to the manufacturers web sites, it is even more important that aftermarket service providers have full access to all of the required information within a single subscription rate in order to keep the price of access reasonable. In addition, manufacturers who currently have web sites available to their dealer networks do not limit access by make or model. To the extent that these manufacturers will open their web sites to the aftermarket, we do not believe that these manufacturers would not spend the resources to limit aftermarket access in anyway. Therefore, in order for consistency across manufacturer web sites, EPA will finalize a provision that manufacturers may not limit web site access to one make or model.

IV.C.5 Length of Information Availability

Comments:

EMA commented that EPA has proposed that engine manufacturers maintain the required full-text information on their Web sites for a minimum of 15 years after model introduction. EPA also has requested comment on whether it should require information to be retained for a longer period of time due to the longer service life of heavy-duty engines and vehicles. EPA should not lengthen the time required to retain information in full-text format on Web sites for longer than 15 years. The provisions to provide access to archived CDs for data older than that to the extent that the same information is provided to a manufacturer's own dealers will be sufficient.

Caterpillar also supports a requirement to keep online service information for 15 years.

AAIA, et al commented that the fifteen year limitation on the availability of information on a web site, which they believe is too short for light duty vehicles, is way too short for heavy duty vehicles. In its 2006 Transportation Energy Data Book, the US Department of Energy estimated the median lifetime for heavy duty trucks manufactured in 1990 at 28 years. EPA itself in the fleet characterization for its Mobile 6 emissions model estimated that in 1996 over 2 .6 million heavy duty vehicles over 15 years old were still on the road. And it is these older vehicles which are more likely to be taken to aftermarket service providers for repair. If EPA allows information on vehicles over 15 years old to be deleted from the engine manufacturer's web site, the aftermarket will be severely disadvantaged. We believe that the information should remain available on the web site for a minimum of 25 years.

Agency Response:

While EPA agrees with the comments of AAIA et al. that heavy-duty engines have a significantly longer useful life than light-duty engines, we do not believe it is necessary to require manufacturers to maintain full-text information on their web sites for longer than 15 years. Manufacturers will be required to post indexes of information and how to order that information once the 15 year window has expired. We believe that this will be more than sufficient to meet the needs of information availability to the aftermarket.

IV.C.6 Correcting Broken or Deleted Web Links on a Weekly Basis

Comments:

Cummins commented that requiring that every link must be checked weekly is unreasonable and that EPA should change the language in Sections 86.010-38 (j)(4)(ix) to read:

"Correct or delete any reported broken Web links on a weekly basis."

Agency Response:

EPA did not intend this language to imply that every link must be checked weekly, only that know broken or deleted web links be addressed in a timely manner. In order to be clear, EPA will change the regulatory language of this section as recommended by Cummins.

IV.C.7 Printing of Information from Web Sites

Comments:

Cummins commented that EPA is requiring the ability to print out any and all of the materials required to be made available on the manufacturers Web site, including the ability to print it at the user's location. However, some of the materials available on their web site, cannot be printed on 8.5x11 or 11x17. For example, wiring diagrams may be as large as 36"x72". In addition, some material is copyrighted. Cummins comments that EPA should remove this requirement.

Agency Response:

While EPA agrees that there may be some material that is not easily printable in the average shop, we do not believe it is necessary to remove this requirement altogether. We will clarify the regulatory language such that only material that the Web sites allow for printing of documents that can reasonably be printed.

IV.D Availability of Training Information

IV.D.1 Delivery of Training Information

Comments:

EMA and Cummins commented that EPA has proposed that training information be shipped within 24 hours of request, with no consideration for weekends and holidays. This requirement appears to be based on the light-duty paradigm where all manufacturers use third party providers for the provision of service information (which is not true for heavy-duty). Shipment within 24 hours is overly burdensome and would impose unnecessary costs on manufacturers. Orders for training materials are not requested or shipped daily, and engine manufacturers should not be required to expend the resources to dedicate one person to this job for which the expected sales rates will be extremely low. Manufacturers should not need to staff fulfillment centers on weekends and holidays to meet a 24-hour deadline. Shipment of training information within 3 business days is a more appropriate turnaround time. In its service information rule, California recognized that fact and has provided additional time, including not requiring shipment of information on Saturdays, Sundays, and federal or California holidays.

In addition, Cummins commented that EPA should remove the requirement to fax the information to the requestor if less than 20 pages as fax technology is outdated.

ATD commented that the statute makes no mention of training or training information, neither should any final rule. Truck dealerships clearly invest thousands of dollars annually in off-site, satellite, and web-based product specific technician training. However, ATD understands that since

the light-duty rule took effect, there virtually has been no demand for "dealer" training information from the service aftermarket. In addition, third-party training providers, while not covered by the statute, are readily able to obtain the information they need to conduct service information training.

Volvo commented that they do not support the use of outside training because of the danger of improper use and that EPA should remove §§86.010-38(j)(11)(ii) and (j)(11)(iii) from the regulations entirely.

Agency Response:

In response to the EMA and Cummins comments on the shipping requirement, EPA agrees that it is reasonable to allow a 3 business day turnaround for the distribution of training information and will change the regulatory language accordingly. EPA also agrees with the Cummins comment that is reasonable to remove the requirement that information less than 20 pages be faxed to the requestor and will change the regulatory language accordingly.

In response to the ATD comment regarding the general provision to require that training information be made available, EPA believes that training materials are covered within the universe of "information including instructions for making emission related diagnosis and repairs." EPA does not dispute that dealerships make significant investments in training technicians and that there are third party training resources available to the heavy-duty aftermarket. We are simply requiring that manufacturers make available these same training materials to aftermarket service providers.

In response to the Volvo comments, EPA does not agree that we should remove §86.010-38(j)(11)(ii) from the regulations. This section of the regulations require that manufacturers make available directly to aftermarket service providers an index of all of their available emissions related training materials and how those materials can be ordered. This provision is not intended to provide an avenue for third party training providers to use that information to conduct their own training. Rather it is intended to be a direct way for an interested aftermarket service provider to have access to manufacturer specific training materials. EPA will include changes to the regulatory language to make sure this is clear and will retain §86.010-38(j)(11)(ii) in the regulations.

With regards to §86.010-38(j)(11)(iii), this provision would require manufacturers to allow to third party training providers to license emission related training courses transmitted via satellite or the Internet for the purposes of repackaging that information for aftermarket service providers. This provision is part of the light-duty service information and to date, there has been no demand from third party training providers to utilize this provision of the regulations and we believe there we be little or no demand on the heavy-duty side as well. Therefore, EPA will remove §86.010-38(j)(11)(iii) from the regulations.

IV.D.2 Availability of Classroom Training

Comments:

Caterpillar commented that they currently provide extensive online service training through our service information website. On an annual basis, the number of people attending Caterpillar-run onsite training is less than 1% of the number of people attending online training. Based on this information, Caterpillar believes the aftermarket demand for onsite training of qualified service technicians, if any, is extremely limited. Therefore, we recommend that the EPA not require heavy-duty engine manufacturers to make classroom training available to the aftermarket.

Agency Response:

EPA did not propose any provisions that would require manufacturers to open their class-room training to aftermarket service providers. EPA did propose, and will finalize, provisions that require manufacturers to make their training materials and information available, but there is no requirement regarding the availability of class room training.

IV.D.3 Duplication of Training Information

Comments:

Cummins commented that section 86.010-38 (j)(11)(i) requires manufacturers to video tape or otherwise duplicate and make available for sale on manufacturer Web sites within 30 days after transmission any emissions-related training courses provided to manufacturer franchised dealerships via the Internet or satellite transmission. Cummins commented that duplication of transmitted emissions-related training courses should not be required if anyone engaged in the repairing or servicing of heavy-duty engines has the opportunity to receive the Internet or satellite transmission, even if there is a cost associated with the equipment required to receive the transmission.

Cummins recommended adding the following regulatory language to this section:

> "The manufacturer shall not be required to duplicate transmitted emissions-related training courses if anyone engaged in the repairing or servicing of heavy-duty engines has the opportunity to receive the Internet or satellite transmission, even if there is a cost associated with the equipment required to receive the transmission."

Agency Response:

EPA agrees that it is not necessary for manufacturers to duplicate training courses that are provided to dealer networks via the web or satellite if those same courses are made directly available to the aftermarket at a fair and reasonable cost. However, EPA will require that, to the extent that manufacturers may already duplicate these training courses for other purposes, these duplicates must be made available to for purchase from the manufacturer at a fair and reasonable price.

IV.E Service Information for Third Party Information Providers

Comments:

EMA commented that third party information providers have not played a large role in the heavy-duty service information segment in the past, except for the limited case of cross-over models that used light-duty cabs and components. Heavy-duty engine and vehicle manufacturers directly sell service publications to their customers. There is no need for provisions in the rule related to third party information providers.

Caterpillar commented that they did an inspection of websites for current major 3rd party providers of service information which shows that these providers do not currently provide heavy-duty service information. Many of these companies have been in the service information business for decades, far before any service information regulation was ever introduced. If these companies have not developed a business case for selling heavy-duty service information, it is unlikely that any new service information regulation will cause this to situation to change. Caterpillar believes that market

conditions do not support a need for mandating engine manufacturers to make service information available to 3rd party providers.

Agency Response:

EPA did not propose an absolute requirement that manufacturers MUST provide their information to third party information providers. Rather, the intent of this provision is to ensure that manufacturers would be willing to consider working with third party information providers who were willing to enter into proper licensing and/or other types of business arrangements to allow for the consolidation of service information by third party information providers. While there may not currently be any demand by third party information providers to enter into these arrangements with manufacturers, EPA believes it is appropriate to maintain these provisions in the final rule to ensure that manufacturers reasonably consider these arrangements should they ever be requested to do so by third party information providers. EPA will revise the regulatory language to make this clearer.

IV.F Recalibration Information

Comments:

EMA commented that EPA should not proceed with finalizing requirements that manufacturers provide recalibration and reprogramming information to third party service providers under the Proposed Rule. If, however, EPA ultimately decides to proceed with that aspect of its Proposal, then any requirements that heavy-duty service tools be made available to third party service technicians (including any and all provisions of (j)(13)) must not be required until at least 2013.

The ARB Service Information Rule (13 CCR 1969), currently in the amendment process to incorporate provisions specific to heavy-duty, would require reprogramming capabilities to be provided for heavy-duty engines beginning in 2013. Although originally proposed for 2010, ARB changed that date to 2013 in recognition of several factors.

One of those factors ties directly in to OBD standardization requirements. The heavy-duty OBD standardization requirements, which direct compliance with certain standards for OBD and provision of service, do not become effective under either the ARB heavy-duty OBD Rule or the proposed EPA rule until 2013. Thus, there is no requirement that heavy-duty engines use standardized protocols until 2013. The timing of service tool and information requirements, if any, must follow the OBD timing.

Agency Response:

EPA does not agree with commenters that we should not finalize provisions for the availability to recalibration information to aftermarket service providers. This provision requires that manufacturers must make available any emissions-related recalibration or reprogramming events that may impact emissions. EPA considers a recalibration or reprogramming event to be a pre-determined ECU software update that a manufacturer issues to address routine issues such as driveability or some other routine update – only emission-related recalibration or reprogramming events must be made available under these regulations. These events are generally made available via CD to dealer networks, and while they may not occur very often, EPA believes these events, when they are needed, are a critical repair procedure to which the aftermarket must have access without having to return the vehicle to a dealer or authorize service network. EPA does agree that it is appropriate to require implementation of this provision beginning with the 2013 model for

consistency with CARB as well as the other standardization requirements of the OBD rule, which take effect in the 2013 model. The regulatory language will be updated accordingly.

IV.G Pass-through Reprogramming Capabilities

Comments:

Caterpillar commented that the process to prepare a vehicle for programming and the programming event itself is a procedure that is much more complicated in heavy-duty than what light-duty manufacturers are required to implement. On a heavy-duty vehicle, there are always multiple devices on the data link that communicate with one another. These devices are accessible through the OBD connector. It is likely that more than one communicating module will be an OBD component. For example, the instrument cluster that drives the MIL (malfunction indicator lamp) is often a separate OBD-related control module that communicates on the data link. For Caterpillar, programming of a control module involves public data link commands that communication with external modules on the data link as well as proprietary command that execute the reprogramming. Because reprogramming is intended to be a secure process, to inhibit tampering, some of these proprietary programming commands are not standardized and may not be communicated through standardized pass-through tools. Requiring manufacturers to support standardized pass-through programming will make the reprogramming process more complicated, thus more costly, and less secure from tampering. Caterpillar agrees with the EPA's comment that for light-duty vehicles, a reprogramming event "does not occur very frequently", but would like to add that reprogramming is even less frequent for heavy-duty engines. If the EPA required heavy-duty engine manufacturers to support standardized pass-through programming, based on information already discussed above, Caterpillar estimates the volume of pass-through programming use in the heavy-duty aftermarket will be less than 1% that of the light-duty aftermarket.

Essentially this would be 1% of an occurrence rate that the EPA already recognizes is very small to begin with. Also, the reason the EPA has indicated why standardized pass-through programming is needed is "to prevent the need for aftermarket service providers to invest in expensive OEM-specific or specialty tools to complete an emissions-related repair". This is simply not accurate for heavy-duty. Caterpillar's proprietary programming adapter can currently be purchased by the aftermarket at a very reasonable price of approximately $1000.

Considering the extremely low rate at which reprogramming will occur in the heavy-duty aftermarket, and the potential for tampering if compliance is required to a standardized pass-through programming tool, Caterpillar urges the EPA to not make pass-through programming a requirement for heavy-duty service information.

Agency Response:

EPA does not agree with Caterpillar comments that we should not require standardized pass-through reprogramming in this regulation. It is not clear to EPA why Caterpillar would oppose this requirement since EPA believes that Caterpillar, and all HD engine manufacturers currently support pass-through reprogramming through RP1210B, which is the equivalent of the light-duty SAE J2534 standard for pass-through reprogramming. Codifying this requirement is intended to ensure future consistency among all manufacturers and does not place any additional burden or require the manufacturers to do anything differently than they are doing today.

IV.H Availability of Generic and Enhanced Information for Scan Tools for Equipment and Tool Companies

IV.H.1 Generic Information

Comments:

EMA commented that the requirement to make available generic scan tool information should be deferred until 2013, due to lack of standardization requirements as well as the time manufacturers need to build in appropriate safeguards to ensure the proper transfer and use of tool development information. From 2010 through 2012, engine manufacturers propose to continue to sell their manufacturers' tools to meet the service industry's needs for diagnostic service tools.

Cummins commented the requirement for bi-directional control information should be changed to be required in 2013.

Agency Response:

Given that OBD systems will not be fully implemented on all engines until 2013, EPA believes it is reasonable to require that all generic and enhanced scan tool information be made available at that time as well and will change the regulatory language accordingly.

IV.H.2 Enhanced Information

Comments:

Caterpillar commented that OBD requirements mandate that OBD modules communicate diagnostic information using J1939 (or ISO15765). Caterpillar's implementation of J1939 is far beyond that which is required for OBD, and includes much of the information that would normally be regarded as "enhanced data link information" for light-duty vehicles. Most engine operating parameters and status information are provided using standardized data link protocols. This is a practical requirement driven by the non-vertically integrated heavy duty vehicle industry.

The services in J1939 are extremely comprehensive for the development an aftermarket service tool. If a company decides there is a market for such a heavy-duty service tool, the capability and information is already available on standardized J1939 to create a full featured diagnostic tool. From a diagnostic/repair perspective, there is little reason why aftermarket service tools would use enhanced data link information. We recommend the EPA review the information that is available from J1939 standards to understand why there is not a need to provide enhanced data link protocols for developing service tools in the heavy-duty vehicle market.

Providing "enhanced" data link information to the aftermarket would provide the basis to create service tools which do have the ability to make permanent changes to engine configurations. Manufacturers must be allowed to keep all proprietary data link information confidential in order to prevent tampering and misconfiguration. Because of J1939 standardization, full-featured service tools can be created using standardized protocols. Caterpillar urges the EPA to not require engine manufacturers to provide enhanced data link information to aftermarket tool manufacturers.

Agency Response:

EPA interprets Caterpillar's comments to be recommending that EPA not require manufacturers to make available any enhanced diagnostic information to equipment and tool

companies because that information contains the data that would allow equipment and tool companies to incorporate the ability to reconfigure engines into aftermarket scan tools. EPA understands the concerns that manufacturers have with releasing reconfiguration information to equipment and tool companies. In fact, EPA believes that scan tool companies have no desire to license reconfiguration information from the manufacturers because devising "generic" reconfiguration capabilities is not possible. However, EPA does not believe that this means that we should not require the availability of any enhanced information at all for those equipment and tool companies that are willing to license it from the manufacturers. Therefore, EPA will finalize provisions that require the availability of enhanced diagnostic information to equipment and tool companies, but will add language to the regulations that this enhances diagnostic information does not include any information related to reconfiguration capabilities.

IV.I Availability of OEM-Specific Diagnostic Scan Tools

IV.I.1 General Provisions for Tool Availability

Comments:

EMA commented that Service tools for heavy-duty are much different for the heavy-duty service industry versus the light-duty service industry. EMA commented that heavy-duty scan tools are much more complex than for light-duty, which is necessary to be able to provide the customization and performance features that are required in a horizontally-integrated market. The recalibration (or re-flashing) and reprogramming (or reconfiguration) of heavy-duty emission-related engine control modules are more complicated than light-duty and require reconfiguration of many engine, vehicle and customer features. The reprogramming and calibration process is time consuming and requires a higher level of training and more powerful electronic tools compared to light-duty. Current heavy-duty reprogramming and calibration tools (in the form of software) have the power to change the horsepower and torque on an engine, which are some of the very features which engine manufacturers sell. The nearly impossible challenge for manufacturers under the Proposed Rule is how to make such tools and systems secure, yet "open" enough for third parties to be able to use them.

EMA further commented that, if EPA proceeds to require the sale of recalibration and reprogramming tools, manufacturers would need time to invent new mechanisms to change the way service and tools are currently provided. Providing reasonable controls to prevent the misuse of service calibrations by the general public needs more lead time than allowed by a 2010 requirement, in part, due to the systems approach that must be taken to 1) modify engine control systems to accept the new calibration file concepts, 2) create new tools to guide the selection of a calibration file and upload it into engine controller; and 3) change existing or create new service support systems that maintain engine (and vehicle) configurations.

In current products, data included in reprogramming and recalibration information includes data that selects the power and torque characteristics of the engine, which are revenue drivers for engine and vehicle manufacturers. Manufacturers also need more time to find ways to protect the engine and vehicle manufacturers' revenue streams and warranty exposure before these powerful tools can be placed in the hands of third parties. Creating a duplicate tool system that is powerful and effective for the customer, yet "novice-safe," is extremely burdensome.

Novice-safe calibration systems would cost engine manufacturers thousands of dollars per calibration performed. Manufacturers need time to make those systems as cost-effective as practical.

Those systems would duplicate existing systems, which must be maintained to service existing engine electronic control systems.

Indeed, in order to assure that manufacturers' proprietary and trade secret information is not divulged to third-party service providers and scan tool makers, heavy-duty engine manufacturers would have to undertake substantial re-designing of current software. For example, with respect to the requirements governing availability of datastream and bi-directional control information, manufacturers first would need sufficient time to undertake the extensive work that would be necessary to organize electronic control module (ECM) software code so that access to proprietary code is adequately secure and cannot be obtained by unauthorized parties.

Manufacturers would need time to develop and test whether the new controls and infrastructure are viable with their own service providers. Once that has been accomplished, manufacturers then would need additional time to determine how the information could be extended to the aftermarket service industry. Making available to the aftermarket reprogramming and calibration methods would require engine manufacturers to modify existing business practices and try to find ways to minimize the risk that engine control system software changes could be misapplied to engines.

In other words, with the introduction of OBD requirements in new engine products beginning in 2010, how heavy-duty engine manufacturers would provide service tools to dealers and authorized service networks while maintaining the necessary security controls is not yet clear, let alone how they would provide such information to the aftermarket industry. The entire infrastructure governing the provision of service information today would need to be re-built so that neither authorized dealers and service networks nor third parties can obtain access to manufacturers' proprietary information.

In fact, even with changes to the way the heavy-duty service tools and infrastructure work now, engine manufacturers have significant concerns with regard to the possibility for tampering that may arise when the service tools and information required by the Proposed Rule are provided to non-authorized service providers. As aftermarket providers are given the tools not just to service, but to calibrate and reconfigure engines, there is a possibility that inadvertent or deliberate mis-configuring may occur.

EMA appreciates the fact that the Proposed Rule includes provisions that would allow heavy-duty engine manufacturers to require training of those using their service tools, and we support such a condition. However, while third party service providers can, in theory, be trained to do the same checks as factory-authorized service facilities, the fact that they typically service several different brands of engines, each with their own idiosyncrasies as far as configuration variations, means that they may be "less specialized" and more likely to make mistakes than factory-authorized outlets that, in many cases, focus on servicing engines from a single manufacturer. As described more fully below, such training is not sufficient to address the concerns raised by the tool availability requirements of the Proposed Rule. EPA must make further significant changes to the Proposed Rule for it to be workable and cost-effective for the heavy-duty industry and to limit manufacturers' liability for third party actions under the Proposed Rule.

EMA also commented on EPA's proposal to make reprogramming and recalibration tools available to aftermarket service providers. EMA commented that engine manufacturers recommend that EPA exempt heavy-duty engines from reprogramming and calibration tool requirements. Sales of reprogramming and calibration tools place engine manufacturers at greater risk that their proprietary access schemes for secured engine programming will be compromised by increased public exposure. Reprogramming and calibration tool techniques cannot be devised to provide what, as a practical matter, is a nearly "hands off" method for reprogramming and calibrating heavy-duty

engines that would ensure that tamperproof features for engine power settings, idle shutdown systems, and vehicle speed limiters will never be compromised. Changing manufacturers' existing methods for supporting engine control system replacement and reprogramming needs – in order to accommodate a requirement for publicly-available reprogramming and calibration tools – is not cost-effective or justified in terms of the benefits to commercial vehicle owners. Requiring aftermarket availability of reprogramming and calibration tools also creates conflicts with existing regulations for limiting engine idling (specifically, California's idle shut-down requirements) and a proposed federal regulation for limiting vehicle speeds.

In addition, recent regulatory actions seek to regulate these features by specifying a fixed time that vehicles are allowed to idle or by specifying a maximum vehicle speed limit setting. In 2008, a recently-adopted California regulation (13 CCR 1956.8 (a)(6)) will require heavy-duty engines to stop idling after 5 minutes. This is achieved through a required idle shutdown system on the engine system produced by engine manufacturers. ARB regulations further require manufacturers to prohibit vehicle owners from disabling (i.e., make "tamperproof") the fixed idle time system by turning it off or by extending the idle time beyond 5 minutes. Further, NHTSA is currently considering a fixed, or maximum, vehicle speed limit of 68 mph. as discussed in docket number NHTSA-2007-26851. Engine manufacturers anticipate that a national vehicle speed limit setting of 68 mph would require manufacturers to prohibit vehicle owners from turning vehicle speed limiting off or increasing the vehicle speed limit setting above 68 mph, in a manner similar to that which is required by the ARB idle shutdown rule.

The ARB regulation exempts many vehicle applications from the fixed idle shutdown limit, including buses, emergency vehicles, and military tactical vehicles. Engine manufacturers must then provide an engine control system that is both capable of shutting down the engine after five minutes and capable of omitting the engine idle shutdown feature on exempt vehicles, because the same engines are sold in both exempt and non-exempt applications. Since duplicate engine control modules are not efficient or cost-effective and cannot be relied upon to control access for non-exempt engines, engine manufacturers have proposed to use existing proprietary access control schemes to address exempt vehicles. These schemes – and ARB's regulation – require manufacturer participation to authorize or enable the change, and permit manufacturers to exercise control over undesirable changes. Since the same engine is sold in exempt and nonexempt applications, the purchase and installation of an "exempt" replacement part on a nonexempt vehicle would defeat the fixed idle shutdown requirement, if a duplicate engine control system were used. Manufacturers view the existing proprietary access schemes as cost-effective measures that minimize risks that vehicle owners could turn off idle control systems on nonexempt vehicles, without requiring duplicate engine control systems.

EMA also commented that even though recalibration/re-flashing events may occur more frequently than reprogramming/reconfiguration of heavy-duty engines, making recalibration tools available to the aftermarket is not appropriate or justified. Typically, re-flashing of software occurs to address emissions issues and performance complaints arising during the warranty period. When such repairs or service are done during the warranty period, they are usually undertaken by manufacturers or authorized dealers. Moreover, in most cases, even if re-flash could be undertaken to address emissions issues, reconfiguration or reprogramming of the engine (by the manufacturer) also is necessary to make a vehicle drivable. In other words, it is difficult, if not impossible, to separate the tools to flash and calibrate an ECM from the tools to reconfigure or reprogram an ECM. In many cases, an entirely new calibration must be flashed in (not just limited to certain parameters).

ATD commented that the proposal would require heavy-duty OEMs who make reprogramming available through dealerships either to offer reprogramming tools **or** to provide aftermarket tool and equipment companies with reprogramming information. The Engine Manufacturers Association indicates that this will present heavy-duty engine OEMs with

considerable challenges and thus should not be mandated. ATD agrees. Fortunately, all service providers will have the option to sublet for emissions-related reprogramming with dealerships and other OEM-authorized service providers that have the capability. ATD is confident that all heavy-duty engines in need of OBD-related emissions reprogramming will be able to get the service.

Agency Response:

Based on these comments, EPA understands that there are multiple types of OEM-specific scan tools used by heavy-duty engine manufacturers. In addition to enhanced diagnostic scan tools, some heavy-duty engine manufacturers have also developed separate tools for recalibration/repgramming/reflashing as well as separate tools for reconfiguration. For clarity EPA believes it is necessary to define all of these terms clearly. On the light-duty side, EPA and the light-duty industry generally use the terms recalibration, reprogramming and reflashing interchangeably to indicate a software update of an ECU with default vehicle parameters and configurations determined and distributed by the manufacturer. These updates are not in any way changeable by the end-user. They are merely loaded into the vehicle, either with an OEM-specific scan tool or an aftermarket pass-through tool. The heavy-duty industry uses the terms recalibration and reconfiguration interchangeably to indicate software that can be adjusted by the end-user for a particular vehicle and/or application. To ensure that the terminology is consistent, EPA has adopted the CARB definitions for recalibration (which now also means reprogramming and reflashing) and for reconfiguration and included these definitions in the regulatory language.

In response to the comments regarding the aftermarket availability of recalibration tools, EPA believes that these tools must be made available to aftermarket service providers since the functionality they provide is essential to the proper completion of emissions-related repairs. Even though EPA is finalizing provisions for generic pass-through recalibration tools, there will likely be aftermarket service providers who will want to purchase the OEM-specific recalibration tools and we believe that these tools must be available. In addition, it is EPA's understanding that there are several manufacturers who are currently making these tools available without the need for any significant additional controls before making them available to the aftermarket, nor have any these manufacturers reported any issues misuse with the aftermarket currently having access to these tools. Lastly, EPA has included provisions recommended by EMA to optionally require training of aftermarket service providers as a condition of the purchase of these tools as well as the additional liability language requested by EMA Therefore, EPA believes that there is no compelling reason to preclude aftermarket availability of recalibration tools.

With regard to reconfiguration tools, EPA appreciates EMA concerns regarding the aftermarket availability of reconfiguration tools. It is EPA's understanding that reconfiguration is not always necessary for the completion of an emissions-related repair. We understand that reconfiguration in most situations permits end-users to change engine configurations to meet the needs of the individual purchaser of the engine/vehicle. While EPA understands that the ability to reconfigure an engine may not always be directly tied to an emissions related repair, we are also aware that there are manufacturers who combine their recalibration functionality and reconfiguration capability into the same tools. In order to address the manufacturers concerns about the release of reconfiguration tools, EPA will require manufacturers to release reconfiguration tools only to the extent that those tools are needed for the completion of an emissions-related repair, including, but not limited to recalibration functions.

In response to ATD comments, EPA believes it is not reasonable to require aftermarket service providers to return the dealer or to an authorized service network in order to have an engine recalibrated. EPA believes this is contrary to the intent of the Clean Air Act to place an aftermarket service provider in the position of having to rely to on a dealer to complete an emissions related repair. As discussed above, we believe the requirements we are finalizing with regards to

aftermarket access to recalibration procedures are consistent with the vast majority of manufacturers who are currently making available to the aftermarket the tools and data necessary for performing recalibration functions.

IV.I.2 Requiring Training as a Condition of OEM-specific Scan Tool Purchases

Comments:

EMA commented that they support provisions that would allow engine manufacturers to require training as a condition of sale of manufacturer-specific diagnostic tools. Engine manufacturers currently require their own authorized service providers to attend training at manufacturers' training centers. Allowing manufacturers to require training as a condition of sale of their service tools to aftermarket service providers is essential, as it provides some protection against misuse of those tools. Training can provide some assurance that purchasers and users of heavy-duty service tools will be knowledgeable regarding the proper use of the tools. With such knowledge, they can substantially avoid misuse that could result in improper engine configurations, possibly leading to increased emissions, engine damage, or other injury.

AAIA, et. al. commented the aftermarket continues to oppose any training requirement for purchase of a scan or diagnostic tool because it believes such training is unnecessary and could be used to unfairly limit or restrict the ability of individual aftermarket providers to obtain OBD-related information. No showing has ever been made that to use a scan or diagnostic tool (as opposed to a recalibration or reconfiguration tool) special training only available through the engine manufacturer is necessary. Such a training requirement could impose unnecessary costs on after-market service providers and create long delays between the time a service provider requests a tool and the time it "qualifies" to purchase one. We request that EPA eliminate any training requirement for purchase of manufacturer specific scan tools and in fact add language that prohibits a manufacturer from imposing such a requirement before a scan or diagnostic tool can be purchased.

AAIA, et.al, further commented that, if training is required, the rule must establish more specific parameters for how that training must be provided. Without some enforceable guidelines, we are concerned that some manufacturers could delay providing training or make training too expensive or inconvenient to discourage aftermarket service providers from obtaining its tools. We would encourage EPA to adopt limitations similar to those in Section 1969 (h)(1)(A) of the California regulations. These require that training only can be required if it is required by the manufacturer for purchase of the tool by its dealers or members of its authorized service network; that the training must be substantially similar to that required of the dealers or members of the authorized service network in terms of material covered and length of classes; that the training must be provided at a fair, reasonable and nondiscriminatory price; that it must be available within six months after a tool request has been made ; and that it must be available at a location reasonably available to the requesting aftermarket facility. Without adding these or similar limitations to the rule, EPA is opening the door for abuse of the training requirement.

Agency Response:

While EPA agrees with AAIA, et.al. that there has been little evidence on the light-duty side of any misuse or other significant issues with regard to making available OEM-specific tools available to the aftermarket, we do also understand that heavy-duty scan tools provide significantly more capability than light-duty tools. In addition, heavy-duty engines are highly configurable to meet the needs of individual customers and agree with EMA that some safeguards should be put in place to ensure that aftermarket service providers can use these tools effectively. Therefore, we will put in place provisions that allow manufacturers to require training as a condition of the sale of a scan tool to an aftermarket service provider. EPA does agree with AAIA, et.al. that EPA must ensure that

manufacturers do not misuse this requirement as a means to unreasonably deny access to aftermarket service providers who may wish to purchase OEM-specific tools. Therefore, we will adopt language similar to that found in the CARB heavy-duty service information regulations which place strict guidelines under which manufacturers may require this training to ensure that there is reasonable access to this training.

IV.J Reference Materials Being Proposed for Incorporated by Reference

Comments:

EMA commented that EPA has proposed the use of SAE J2534 and TMC RP 1210A for standardization of engine diagnostic tools and engine reprogramming and calibration tools. EMA supports the use of those standardized tools (beginning in 2013), but notes that a new version of TMC RP 1210 (1210B) is completing its approval process within TMC. EMA will inform EPA when the TMC RP 1210B revision is complete and published by the American Trucking Association.

Agency Response:

EPA agrees with commenters that we should refer to latest version of TMC RP 1210. EMA submitted their comments in May of 2007 and TMC RP 1210B was finalized in June of 2007. Therefore, EPA will Incorporate by Reference TMC RP 1210B in this final rulemaking.

IV.K Other Comments Received

IV.K.1 Costs Associated with the Rule

Comments:

EMA commented that EPA has not provided any estimate of the costs that engine manufacturers would incur to comply with the requirements of the Proposed Rule. Such a lack of cost information is a significant concern in light of the substantial nature of the changes to the heavy-duty service industry that the Proposed Rule would require.

When California looked at the costs related to its proposed service information rule for the heavy-duty industry, it estimated a heavy-duty engine manufacturer's start-up costs under its rule would be likely to reach as high as $1.5 million per manufacturer, with yearly maintenance costs of approximately $70,000 per year per manufacturer (Rulemaking To Consider Proposed Amendments To Regulations For The Availability Of California Motor Vehicle Service Information (June 22, 2006), Staff Report: Initial Statement of Reasons For Proposed Rulemaking, p.11). Engine manufacturers believe those estimated costs could well be higher, particularly for yearly maintenance of Web sites and tool availability. ARB Staff at that time suggested that engine manufacturers could recover some of those costs from the sale of tools and information. But considering the sales volumes in the heavy-duty industry, and the number of independent service outlets in the industry, heavy-duty engine manufacturers simply cannot recoup those costs by selling their tools and information.

Based on information available from public industry sources, light- to heavy-duty vehicle sales volume is approximately 40 to 1. As noted above, there are a limited number of heavy-duty engine products, but an enormous number of variations on how those products may be configured and calibrated. Adding together those factors, heavy-duty engine manufacturers have little opportunities to spread out and recover the costs of the Proposed Rule.

Furthermore, engine manufacturers make their tools and information available now to anyone who wishes to purchase them, yet there is no great demand for them. And manufacturers do not anticipate any great increased demand for their tools and information. In fact, for purposes of comparison, we have recently obtained from light-duty manufacturers their experience with requests for service information. One light-duty vehicle manufacturer has received through its Web site over the course of one year only 43 requests for year-long subscriptions to service information and only 55 requests for month-long subscriptions from service providers nationwide. Another light-duty vehicle manufacturer has received only 147 year-long subscription requests and only 27 month-long requests nationwide. Those subscription unit sales are from two of the three primary U.S. manufacturers of light-duty vehicles reporting nationwide data. Using that information, if there existed a heavy-duty engine manufacturer with the same volume of subscription sales as those two light-duty manufacturers combined, then calculating the 40 to 1 light- to heavy-duty volume ratio, that heavy-duty engine manufacturer could be expected to sell just 4-5 year-long and 1-2 month-long subscriptions per year. The costs of the Proposed Rule so outweigh its anticipated benefits that the Rule cannot be justified.

Added to the above very high costs, the recovery of which is not likely, is the fact that the Web site requirements necessitate duplicate channels and maintenance. Some manufacturers have manufacturer Web sites that are not available to the public because of concerns about their ability to protect and keep certain non-emissions information secure. Once information was required under the California rule to be made available to the public, some manufacturers created separate public Web sites to meet those current ARB requirements. Manufacturers would anticipate revising those public sites as necessary to meet EPA requirements. But, both the manufacturer and the public Web sites must be maintained, leading to additional costs.

Even though EPA cites Congress's intent that manufacturers be able to recover "reasonable costs" in connection with the provision of service information, EPA has not provided any data that would demonstrate the extremely high costs manufacturers are anticipated to incur. EPA has failed to provide any cost information at all, and has failed to establish that the costs of the Proposed Rule are justified by any benefits that may be gained.

Moreover, service information fees charged to authorized networks are part of a negotiated franchise arrangement, in which the authorized dealers have had to invest resources and meet other conditions as part of the license for what they do. EPA must take such factors into consideration when reviewing price information, including the fact that many manufacturers currently subsidize the costs for providing service information to their authorized net works.

Agency Response:

In response to the EMA comments, EMA did not provide any data that would demonstrate the extreme high costs that manufacturers anticipate they would incur as the result of these regulations. EMA did not provide any data or information to EPA to demonstrate the need to develop separate web sites and the significant changes they say will be needed to their tools in order to prevent misuse or tampering. In fact, EMA suggested throughout their comments that their member companies already make available essentially the same service information tooling that EPA is addressing in this rulemaking without issue to the aftermarket.

EPA does agrees that many elements of the proposal would have required manufacturers to make changes to their existing information and tool distribution infrastructures (e.g. tiered web site access). However, EPA has finalized the vast majority of the service information provisions in such a way that allows manufacturers to continue to use their existing infrastructures to distribute information and tools to the aftermarket without any significant additional burden and in such a way

that will allow the manufacturers to recover at least some of those costs through reasonable web site access charges, training fees, and licensing agreements with equipment and tool providers.

IV.K.2 Alignment with Other Agency and State Requirements

Comments:

EMA commented that EPA must align its service information requirements with California's in certain respects. ARB has regulations in place requiring heavy-duty engine manufacturers to provide certain service information to the aftermarket through Web sites. ARB also is in the process of adopting additional regulations requiring heavy-duty engine manufacturers to provide service tools and limited tool information to the aftermarket beginning in 2013. EPA's Proposed Rule includes a number of provisions that are more burdensome than ARB's and which should be revised to align with the ARB requirements. EMA worked extensively with ARB on the development of ARB's service information rules. Many, although certainly not all, of the issues that we raised were addressed in the ARB rulemaking. To the extent ARB resolved those to the mutual satisfaction of ARB and industry, EPA should align. In some cases, ARB's rule did not adequately address issues associated with the requirements. In other cases, new regulations have come into play that require significant changes from the approach taken by ARB and similarly proposed by EPA. In those cases, EPA must revise the Proposed Rule, and ARB also will need to make further changes to account for those issues.

As discussed in more detail below, there are adopted or pending regulations in California and other federal agencies that will have an impact on some aspects of servicing heavy-duty engines. In both cases of which engine manufacturers are aware – California idle shut-down requirements and federal vehicle speed limiter requirements – certain aspects of an engine system's electronic controls must be made non-programmable, or programmable only to a limited extent. Because the goal of service information, including service tool availability, requirements is to allow aftermarket service providers to service heavy-duty engines, there are potential areas where the service information requirements and the requirements for nonprogrammable, or "sometimes" programmable, systems may conflict. EPA must assure that its Proposed Rule does not require manufacturers to meet requirements that would in any way conflict with other regulatory requirements and provisions that are in place or currently under consideration.

Agency Response:

In response to EMA's comments, although EMA has not provided specific recommendations as to where we should specifically harmonize with the CARB regulations, EPA has attempted wherever possible and appropriate to ensure that manufacturers do not have conflicting regulations with which to comply. In some cases, EPA will be implementing less stringent provisions than the CARB regulations. For example, the CARB regulations require manufacturers to make training information available in full-text on their web sites. EPA's regulations only require that manufactures make their training materials available for purchase.

In response to EMA's comments regarding other Agency requirements such as idle shut-down and federal vehicle speed limiters, we don't believe that any of the provisions we are finalizing today would interfere with the mandates of other state or federal Agencies.

IV.K.3 Scope of the Rule

Comments:

EMA commented that EPA's Proposed Rule would require heavy-duty engine manufacturers to provide service information and tools related to heavy-duty engines used in vehicles over 14,000 pounds. EMA supports the scope of the rule, which does not attempt to cover or require engine manufacturers to provide transmission or other non-engine system information.

EMA further commented that most engine manufacturers produce engines, not transmissions and not vehicles. When an engine is sold to a vehicle manufacturer, the engine manufacturer has no control over what transmission it is paired with or what transmission information is available. That choice is up to the customer and the vehicle manufacturer. Engine manufacturers do not and cannot provide information for components over which they have no control. EPA's proposed heavy-duty OBD rule, on which service information requirements are based, recognizes that fact. The service information that heavy-duty engine manufacturers are required to provide must be limited to only engine information as well.

AAIA, et al. commented that a major problem with the proposed rule is that because it is only to apply to engines, references in the light duty rule to "vehicle" or "vehicles" have been changed to "engine" or "engines" without regard to the consequences of such a change. While many of these changes are correct in light of the more limited scope of the heavy duty rule, others are not and unless changed back will unintentionally deny the aftermarket of necessary repair information or will otherwise affect the rights provided to aftermarket service facilities under the rule.

As an example, AAIA, et al. points to the definition for "data stream information" which limits its scope to information originated within the "engine", however, such information might originate in the fuel, ignition or other system monitored by the OBD system. Therefore, we believe that the language of this definition has to be returned to the same language of the light duty rule which defines it as information originated within the "vehicle". The substitution of "engine" for "vehicle" in the definition of "enhanced service and repair information' is another example because that change would exclude any information related to other systems, such as the fuel system and ignition system, which may be necessary to complete the repair. The reference in this section should also be to the vehicle not just the engine.

Similarly, in Subsection (j)(6)(iii) of the rule, "required information" only includes information related to any system, component or part of an engine, but this again would exclude information related to the systems, such as the fuel system and the ignition system, which may be vital in making the repair. The reference here also needs to be changed from "engine" to "vehicle".

Also the language of Subsection (g)(5)(iv) of the light duty rule regarding information on systems that may effect emissions in a multiplex system has not been included in Subsection (j)(6) of the new rule . While we agree that this language would have to be modified in the heavy-duty rule in situations in which the engine manufacturer chose not to monitor a system for OBD purposes, we believe that, like the California rule, if such information is monitored, it should be provided. Therefore, we request that this language, modified as may be appropriate, be inserted in the proposed rule.

Finally, changing the word "vehicle" to "engine" in one part of Subsection (j)(8) also could unintentionally adversely affect the cost of the information to the aftermarket . Subsection (j)(8) sets forth the relevant factors that a manufacturer may consider when establishing its cost for the information to be provided under the rule. The similar section of the light duty rule has language that was designed to exclude any costs incurred in designing and implementing, upgrading or altering the OBD system or any other vehicle part or component. In Subsection (j)(8)(B) this has been modified to "any other engine part or component" . This modification would allow the manufacturer to pass on any such costs not related to the engine itself. Thus, under the current language, if a portion of the fuel, ignition or other system required change, this cost could be passed on to the aftermarket. The aftermarket should not be reimbursing the manufacturer for such costs and this is certainly not what

EPA intended. This language should also be changed back to refer to the parts and components of the vehicle not just the engine.

Agency Response:

In response to the wording changes recommended by AAIA, et al., EPA does not believe it is necessary to change the word “engine” to “vehicle”. We believe making this change may have the unintended effect of making the scope of the rule broader than intended since the OBD requirements being finalized only apply to engines, not to transmission or other non-engine systems. However, EPA agrees that we need to be clearer on which systems need to monitored and for which service information needs to be made available. Therefore, to address the comment that not making this wording change would lead to the interpretation that manufacturers could exclude information related to systems such as the fuel system and the ignition system or multiplexed systems, EPA has added the following definition to 86.010-2X of the regulations:

> Engine or engine system as used in §§86.010-17, 86.010-18, 86.010-30, and 86.010-38 means the engine, fuel system, induction system, aftertreatment system, and everything that makes up the system for which an engine manufacturer has received a certificate of conformity.

We believe that adding this definition to the regulations will ensure that all information needed for making emissions-related repairs is available.

IV.K.4 Timing

Comments:

EMA commented that EPA has proposed that almost all requirements – availability of emission-related information (manuals, OBD system information, service bulletins, etc.) on manufacturer Web sites, availability of recalibration and reprogramming tools to the aftermarket, and tool development information for tool makers – be made available beginning in 2010. Emissions-related training information is not required to be made available until 2011. EMA generally supports requirements for Web site availability of information beginning in 2010 and training information in 2011, but bi-directional control information, software tools with recalibration and reprogramming capability (if ultimately required) and tool development information should not be required until 2013. Engine manufacturers already are devoting enormous resources to meeting the 2010 emission standards. They will devote substantial resources to meeting the 2010 and later OBD requirements that have been adopted in California and are being developed by EPA. EPA must take all possible steps to assure that the imposition of any new SIR requirements on heavy-duty engines in 2010 and 2013, in particular, will not impede successful implementation and marketplace acceptance of the 2010 and later heavy-duty exhaust emission standards and OBD requirements.

Agency response:

EPA is requiring the availability of bi-directional control information, software tools with recalibration and reprogramming capability and tool development in this final rule. To this extent, EPA agrees that it is reasonable to require compliance with the provisions being finalized for bi-directional control information, software tools with recalibration and reprogramming capability and tool development beginning 2013, which coincides with the timing of full OBD implementation on all heavy-duty engines.

IV.K.5 Persons Entitled to Access

Comments:

EMA commented that EPA has proposed that engine manufacturers must provide service information and tools to “any person engaged in the repairing or servicing of heavy-duty engines.” There are no limitations or qualifications on who may receive these very powerful tools. If EPA does not exempt heavy-duty reprogramming and calibration tools from the Proposed Rule, then in addition to allowing manufacturers to require training, EPA should add language to the rule that would allow engine manufacturers to require purchasers to demonstrate some level of qualification to do heavy-duty service repairs prior to selling the information and tools. Heavy-duty engines are commercial products used in commercial service in business-to-business relationships. They are not “do-it-yourself”-type products and should not be treated casually. Requiring heavy-duty service information to be made available to entities without regard for their qualifications could lead to improper repairs by under-qualified entities. Such threshold qualification could include information such as name, address, business licensing information, and other information necessary to demonstrative minimum capabilities. Manufacturers’ goal is not to be exclusionary or to erect “artificial barriers to access” but to give manufacturers confidence that the persons requesting heavy-duty service tools have the ability to work with these complex tools and systems, and to avoid unintentional mistakes as well as deliberate misuse.

AAIA, et al. commented on this issue as well. They commented that the light duty rule requires access for any aftermarket service provider who was engaged in the diagnosis, service and repair of motor vehicles or engines. The heavy duty rule does not give access to providers who service vehicles but only those which service engines. While we hope that EPA did not intend to limit this access to those providers who only service engines and that this language also covers providers who service engines as part of servicing the entire vehicle, this more limited language creates a question as to whether those servicing the whole vehicle are included among those with access to the information . More importantly, however, there are many aftermarket service providers who work on systems which are auxiliary to the engine and which are likely to be monitored by the OBD system, such as the fuel system and the ignition system, who would not be considered engaged in the diagnosis, service or repair of motor vehicle engines . Therefore, the language must be broadened to cover service providers who do not specifically service engines. We believe that the best way to do this is to allow access to the information for any aftermarket provider engaged in the diagnosis, service and repair of heavy duty vehicles not just engines.

ATD commented that the proposal inappropriately uses the term aftermarket service provider, defined as any individual or business engaged in the diagnosis, service, and repair of a motor vehicle or engine who is not directly affiliated with a manufacturer or manufacturer dealership. 49 CFR §86 .010-38(j)(3)(ii)(A) . The appropriate term, used in the statute, is any person engaged in the repairing or servicing of motor vehicles or motor vehicle engines. This latter language is designed to help ensure that any service information rule applies equally to all persons, including dealerships, engaged in such activities.

ATD commented that heavy-duty truck dealerships typically handle more than one chassis and several engine franchises, each of which requires large investments in special (including emissions-related) tools, in training, and in information. Heavy-duty dealerships also sell out-of-line used vehicles that may be worked on by other service providers. Without question, franchised dealerships are very concerned about the ever-increasing costs and complexities of doing service and repair business. Therefore, EPA should delete all references to aftermarket service providers in order better to reflect the statute's broadly neutral language and intent.

Agency Response:

In response to these comments, EPA does not feel it is necessary to clarify who is entitled to access to the service information required by this rule, beyond the general limitation that the person be a "person engaged in the repairing or servicing of heavy-duty engines." We do not believe it is necessary to add limits or qualifications, as recommended by EMA, as to who is entitled to access. While not explicitly outlined in the light-duty rules in effect today, EPA has provided flexibility for manufacturers to reasonably deny access in instances where they had significant concerns about providing access to an aftermarket service provider. For example, EPA has permitted a manufacturer to deny access to a specific individual who was purchasing their tools and reselling them on Ebay. In addition, while EPA recognizes that heavy duty engines are commercial products that are generally maintained commercially, EPA has added regulatory language recommended by EMA that limits their liability to any third parties who may misuse their information and tooling so we believe that further restrictions are unnecessary. EPA is concerned that adding specific language regarding limits and qualifications could be unintentionally limiting and we do not believe that is necessary. In response to the AIAM, et al comments, EPA also does not believe it is necessary to broaden the language any further as to who is entitled to access. We have clarified the language regarding what systems are covered by these requirements, and believe that service providers not engaged in service of those systems need not be covered by this rule. Nor does EPA believe it is necessary to use a term other that "aftermarket service provider" to describe whom this rule applies to as recommended by ATD. The regulations provide that manufacturers must make available the required information to all service providers. However, EPA must have specific definitions for aftermarket providers because they are distinct entities from franchised dealerships and authorized service networks, and therefore, our regulations need to direct manufacturers specifically regarding providing information for these entities.

IV.K.6 Liability Concerns

Comments:

EMA commented that EPA must include language in the final rule that would specifically limit engine manufacturers' liability for use of tools by third parties. As discussed previously, engine manufacturers have significant concerns with regard to the possibility for misuse that may arise when the service tools and information required by this rule are provided to non-authorized service providers. As aftermarket providers are given the tools to service and repair engines, there is a possibility that inadvertent or deliberate mis-configuring may occur. While allowing manufacturers to require training when those tools are sold to third parties alleviates that concern in part, independent service providers may service several different brands of engines and may have less "specialized" knowledge and be more likely to make mistakes than factory-authorized dealers that focus on servicing engines from a single manufacturer.

In addition, EMA commented that they have greater concern for the provision that requires engine manufacturers to make available to all equipment and tool companies all information necessary to read and format all emission-related data stream information and to activate all emission-related bi-directional controls. The provision is designed to ensure that independent tool manufacturers have the information necessary to produce and make available for sale to service providers diagnostic tools with bidirectional controls. Although bi-directional controls cannot be used to permanently change an engine calibration, they give a service technician the ability to temporarily control the engine.

EMA concludes that EPA must include specific language in the regulatory text that confirms engine manufacturers will not have any emissions warranty, in-use compliance, defect reporting or recall liability for service on a heavy-duty engine that is not undertaken by the manufacturer, for any

damage caused by their own tools in the hands of independent service providers, or for the use and misuse of third party tools.

Cummins and Volvo commented that EPA should revise the language of the Prohibited Acts, Liability and Remedies section (86.010-38(j)(19)) of the regulatory language. The current language refers to personal liability and Cummins and Volvo believe the reference should be to corporate liability.

Agency Response:

EPA believes it is reasonable to add language to the regulations that would limit an engine manufacturers' liability for use of tools by third parties and have added language accordingly.

Regarding the Cummins and Volvo comments, section 203 pf the CAA speaks in terms **of** personal liability, so EPA believes that this language is appropriate. However, as a point of clarification, EPA treats corporations as "people". Therefore, corporations can be the entity that is liable, and we do not believe it is necessary to make any changes to the existing regulatory language.

IV.K.7 Compliance Flexibility

Comments:

EPA has proposed in paragraph (j)(2) to allow engine manufacturers of heavy-duty engines subject to the rule to alternatively comply with service information and tool provisions for 1996 and later vehicles under 14,000 pounds GVWR. EMA supports that provision, as it provides needed flexibility to manufacturers in cases where the same engines are used in similarly-sized vehicles.

EMA states that EPA also should extend that flexibility to engines in the 8,500 to 14,000-pound range. The proposed flexibility would permit manufacturers to provide service information and tools that follow the industry standards and practices that are most familiar to the type of service providers that will work on the vehicles. There is no dis-benefit to providing this flexibility.

EPA should adopt the following additional compliance flexibility language (as sub-section (ii) of (j)(2)):

> (2)(ii) Upon Administrator approval, manufacturers that produce engines for use in vehicles between 8,500 and 14,000 pounds may, for those engines, alternatively comply with all service information and tool provisions in CFR section 86.010-38(j) that are applicable to 2010 and subsequent model year vehicles over 14,000 pounds. Implementation dates must comply with the service information provision dates applicable to engines in vehicles between 8,500 and 14,000 pounds.

Agency Response:

EPA agrees that is reasonable to add this additional language to the regulations to allow more flexibility for manufacturers who produce engines across light-duty, medium-duty, and heavy-duty classifications.

IV.K.8 The Service Information Requirements Must Comply with the CAA and Federal Law

Comments:

EMA commented that Section 202(m) of the federal Clean Air Act (42 U.S.C. 7521) establishes the framework under which EPA may regulate and require service information availability in connection with emissions-related diagnosis and repair of engines and vehicles. EPA proposes to regulate the cost of service information, requiring that manufacturers make information and tools available “at a fair and reasonable price” and providing for approval of pricing based on a number of factors delineated by the Agency.

Moreover, EPA must ensure that no provisions of its Proposed Rule lead to or become an unconstitutional taking of property without due process and compensation. The Proposed Rule would require manufacturers’ proprietary and confidential business information – long recognized as property that is protected from being taken without adequate compensation – to be turned over to the aftermarket. To avoid an unconstitutional taking, manufacturers must be able to charge reasonable prices for that property and not be unreasonably restricted by pricing requirements in the rule. EPA must ensure that manufacturers can indeed recover reasonable costs for providing service information to third parties.

ATD commented that the statute is permissive regarding an OBD mandate for heavy-duty vehicles and engines, as the Administrator may, in the Administrator's discretion, promulgate regulations requiring manufacturers to install such on-board systems on heavy-duty vehicles and engines. 42 USC §7521(m)(1). This arguably renders the information availability section of the statute inapplicable, as it was intended for the light duty rule prescribed by 42 USC §7521(m)(1). 42USC §7521(m)(5).

Second, EPA's cursory citations to highly suspect data supposedly demonstrating a growth trend regarding "independent " repair facilities doing work on heavy-duty vehicles is grossly outdated, makes no effort to break out engine-related (let alone emissions-related) service work, and thus is irrelevant to this rulemaking. 72 Fed . Reg . at 3266. Importantly, no effort was made to forecast where heavy-duty operators likely will have OBD-related emissions work done 5 or so years from now, assuming a heavy-duty OBD mandate takes effect . Such a forecast should be done, taking into account applicable emissions warranty periods and characteristics unique to the heavy-duty service and repair industry, i.e., dealerships, engine distributors, fleet shops, government shops, truck stops, "independent" shops, rebuilders, etc . Third, and most importantly, EPA does not suggest that any segment of the heavy-duty service and repair industry does not now or will not in the future be able to obtain the information necessary to conduct OBD-related emissions service. No permissive rule should be promulgated unless and until the need for it can be demonstrated and it can be shown to be cost-effective.

ATD further commented that the proposal contains several unnecessary and inappropriate provisions given the language and intent of the Clean Air Act's information availability section. 42 USC §7521(m)(5). Importantly, several provisions in the proposal potentially could undermine accurate and effective emission system repairs and the air quality benefits associated with heavy-duty OBD.

ATD also commented that many non-dealer service facilities have a competitive advantage in the heavy-duty marketplace, given their lower overhead and unbridled discretion to purchase and use whatever parts, tools, information, and equipment they choose. In any event, the Clean Air Act does not require or allow EPA to:

- Establish a welfare program for certain segments of the heavy-duty service industry.

- Subsidize automotive maintenance and repair facilities that are unwilling or unable to make necessary business investments.

- Govern the relationship between engine manufacturers and anyone other than any person engaged in the repairing or servicing of motor vehicles or motor vehicle engines (e.g., parts companies, tool companies, information providers, technician trainers, etc).

- Involve itself in issues of intra-industry competition.

Agency Response:

EPA believes that all of the provisions being finalized for heavy-duty service information comply with Clean Air Act and federal law. While EPA would differ with EMA characterizations regarding the issue of confidential business information, EPA does not disagree with the statement that manufacturers must be permitted to charge reasonable prices and recover reasonable costs for supplying service information to third parties.

In response to the ATD comments, First, EPA believes that that section 200(m)(5) does give EPA the authority to regulate heavy-duty service information. The language of section 202(m)(5) does not restrict EPA's authority regarding provision of service information to any subset of motor vehicles and engines. Indeed, unlike section 202(m)(1), the mandate to EPA applies to repair and service of motor vehicles and engines, without qualification. While EPA did not believe it was appropriate to require manufacturers to provide service information for heavy duty engines prior to institution of OBD requirements for such engines, section 202(m)(5) certainly authorizes, if not requires, EPA regulations requiring provision of service information now that OBD is required for such engines. Moreover, the mandate under section 202(m)(5) contains no language with regard to EPA finding need or cost-effectiveness, indicating that Congress had already made its evaluation of the need or appropriateness of these regulations and intended these regulations to apply without relying on any EPA determination of need.

To further respond to the ATD's comments, EPA does not believe that these regulations will adversely impact or otherwise undermine the effective completion of emissions-related repairs, nor does EPA believe that any of these provisions create a welfare program for the aftermarket or otherwise impede industry competition in any manner. These provisions are intended to ensure that manufacturers do not impose artificial barriers to access to tools and information. In addition, the provisions being finalized today allow manufacturers reasonable parameters under which to require aftermarket service providers to make the necessary business investments to properly service and repair heavy-duty engines.

IV.K.9 Tier 1 Suppliers

Comments:

EMA commented that "Third party" suppliers do not play a role in the heavy-duty market. This is another way in which the light-duty and heavy-duty service industries differ. The heavy-duty engine manufacturers to be regulated by the Proposed Rule are Tier 1 suppliers for the vehicle manufacturers. Traditional technology suppliers for engine manufacturers have been fuel system suppliers, turbocharger suppliers, and control system suppliers. More recently, suppliers of EGR components and controls, and of aftertreatment components and controls, have joined traditional technology suppliers. In general, technology suppliers do not provide service information directly to heavy-duty vehicle owners – their recommendations are included in the engine manufacturer's service information.

AAIA, et.al. commented that EPA has requested comments on whether the requirement that information related to the service, repair, installation or replacement of parts or systems developed by Tier 1 suppliers and made available to the dealers, which is a part of the light duty rule, be made part of the heavy duty rule. The commenter sees no reason why it should not. By allowing this information to be disseminated to the engine manufacturer's dealer or authorized service provider network, the supplier has already agreed that it could be used to service the manufacturer's products. Therefore, it should be made available to all facilities who do such service on the same basis.

Agency Response:

In response to EMA comments, EPA believes that the examples provided by EMA in their comments fit EPA's view of a Tier 1 supplier. EPA considers a Tier 1 supplier to be a party other than the manufacturer who has developed and/or supplied a system to the manufacturer that is an integral part of the engine manufacturer's OBD system. Generally this also means that the service information for those systems is developed by the third party, not the engine manufacturers themselves and we understand that the engine manufacture has no direct control over this information.

While the engine manufacturer is not directly responsible for this information, we do believe it is reasonable that the manufacturers provide some general information on their web sites regarding these Tier 1 one systems and where aftermarket service providers can go to find the corresponding service information. Because it appears that manufacturers do in fact install systems from parties that EPA would consider Tier 1 supplies, we believe it is necessary to retain the provisions governing access to this information.

The regulations clearly state that service information from third party suppliers are not required to be made available in full-text on manufacturer web sites. The regulations only require that manufacturers make available on the manufacturer web sites an index of the relevant information and instructions on how to order such information. The regulations also allow manufacturers to create a link from its Web site to the Web site(s) of the third party supplier.

IV.K.10 Adding References to "Authorized Service Network "

Comments:

AAIA, et al commented that anywhere in the rule where there is reference to the manufacturer's dealers that the reference include the members of a manufacturer's "authorized service network". Some engine manufacturers use such networks for repairs more than dealerships and for that reason the "authorized service network" language was included in the California rule. For clarity, completeness and consistency with the California rule, we would request that reference to these networks be made in addition to dealerships.

Agency Response:

EPA agrees that it is reasonable to include this suggested language for clarity as well as consistency with the CARB service information regulations.

IV.K.11 Errors in Section References

AAIA, et al, commented that the proposed rule also contains a number of errors in section references which should be corrected in the final rule. These are:

Section	Incorrect Reference	Correct Reference
(j)(4)	(j)(5)	(j)(6)
(j)(4)(iv)	(j)(2)(i)	(j)(3)(i)
(j)(4)(iv)	(j)(7)	(j)(8)
(j)(6)(i)	(j)(3) (twice)	(j)(4)
(j)(14)	(j)(4)(ii)	(j)(3)(ii)

Agency Response:

EPA agrees with these comments and will make the necessary changes for the final rule.

V. What are the Emissions Reductions Associated with the Proposed OBD Requirements?

V.A Emissions Reductions Associated with the 2007HD Highway Rule

We received no comments pertaining to this section that require analysis.

VI. What are the Costs Associated with the Proposed OBD Requirements?

Comments:

One commenter provided the following list of general comments pertaining to the cost analysis:

- In general, the implementation costs do not account for the technological risks in available aftertreatment and sensor technology, and presume that manufacturers have a clear technology path to meet the regulation.
- Discounting 2004 constant dollar estimates for inflation understates the present value of the costs to be incurred.
- Material costs for key inputs are above the industry's producer price index (PPI) trend.
- Labor rates are unburdened, excluding the costs of benefits from anticipated compensation for algorithm development and test execution.
- Consumption of key resources is understated (labor and economic capital)
- HDOBD development is portrayed as a one-time event
    - The cost to prepare HDOBD technology and calibrations for the 2016 phase-in requirements is not estimated.
    - The ongoing fixed cost to maintain HDOBD calibrations beyond the 2016 phase-in is not estimated.
- HDOBD technologies are assumed to smoothly scale across all diesel engine displacements.
- The declining growth engine sales model understates the number of engines sold.

Conservatively, the combined effect of these factors will double or triple the industry costs for diesel engines used in vehicles over 14,000 pounds.

The commenter then provides an analysis of EPA's net present value (NPV) discounting methodology, the use of constant 2004 dollars to estimate future costs, and the use of certain costs adjusted using the PPI index calculated by the Department of Labor's Bureau of Labor Statistics. The commenter claims that constant dollars understate the actual cash flow since inflation is not considered, and that the PPI understates price increases since the underlying commodity prices have increased at a faster rate than inflation since 2004. A table is provided showing, according to the commenter, that producer prices have increased anywhere from 22 percent to 123 percent from December 2003 to December 2006, and that platinum prices have increased over $300 per Troy ounce since December 2004.

EMA, 2005-0047-0026, Appendix C, p. 12

TMA notes that little of the OBD costs for vehicles over 14,000 lbs. GVW appear to be attributed to vehicle manufacturers for the engines they purchase in 2010 and beyond. OBD-related development costs attributable to having to monitor the performance of new air induction systems, charge air coolers, cooling systems, exhaust systems, instrumentation, and wiring will be incurred by vehicle manufacturers to integrate OBD-equipped engines into vehicles. Vehicle manufacturers that use engines supplied by separate engine manufacturers must expend resources to integrate those engines into their products. EPA's cost proposal should account for these costs.

Truck Manufacturers Association, 2005-0047-0028, p. 4

Agency Response:

Regarding EMA's comment about technological risks, we believe that the final requirements have appropriately considered these risks by decreasing the stringency of some of the near term thresholds. These changes align the thresholds with sensor technology. As for aftertreatment technology risks, we believe those risks have been proven small given that DPFs and SCR systems are already being sold into the market place both domestically and in Europe and Japan. In any case, those systems will be used to meet the underlying exhaust emission standards for these engines, not to meet the OBD requirements in this rule.

Regarding discounting 2004 dollars for inflation, we do not understand this comment. We chose 2004 dollars based solely on the timing of the original analysis. The discounting simply accounts for the fact that a dollar tomorrow, or next year, is worth less than that dollar is worth today. If the comment was meant to suggest that we should include inflation adjustments for future dollars, we disagree. The attempt is to show what the rule costs in present value terms. Adjusting for inflation would confuse that effort. The commenter also argues that development costs for 2016 have not been included. We do not understand what the commenter refers to given that our certification requirements do not change in 2016, although some in-use flexibilities do. We do not expect manufacturers to develop systems with those in-use flexibilities in mind so do not believe that any increased development costs would be incurred. Perhaps the commenter speaks of the CARB HDOBD requirements which do, in fact, have increased stringency for DPF monitors in 2016 on some engines. This increased stringency is not part of our proposed or final regulation. As regards the PPI adjustments used in our draft cost analysis, we agree that using PPI adjustments in this way may or may not be a good way to adjust costs from one year to another. We have begun to consider that perhaps the Consumer Price Index (CPI), which is the overall inflation adjuster, is a better adjuster to use. That said, we only used the PPI adjustment in the context of the HD 2007/2010 program costs to adjust those costs from 1999 dollars to 2004 dollars. The adjustment had no impact on the costs estimated for HDOBD. For the final cost analysis, we have adjusted all costs developed for the draft analysis from 2004 dollars to 2007 dollars using the Consumer Price Index (CPI). As for platinum prices, any rulemaking we do that includes use of platinum group metals runs up against the issue of what cost/ounce is most appropriate – a recent spot price, a 10

year moving average, etc. – and we know of no "best" metric to use. In the end, the price of platinum is of little concern for HDOBD. Platinum costs would impact only the costs associated with limit parts in the context of HDOBD. Platinum represents roughly one-third of our DPF limit-part costs which represent less than one-half of the total estimated hardware costs for limit parts. In turn, the hardware costs for limit parts represent less than one percent of the estimated total costs. In the end, platinum constitutes less than 0.3% of our estimated costs. Therefore, the cost/ounce used for platinum has little impact on the resultant cost estimate.

TMA argues that we did not consider costs they would incur to integrate OBD systems into their vehicles. However, we do not believe that any new integration would occur. OBD systems are already used on heavy-duty engines and are being integrated into vehicle designs today. The real development work – that being for monitors that go beyond their current level of sophistication in order to meet our requirements – will be done by engine manufacturers and/or their suppliers.

VI.A Variable Costs for Engines Used in Vehicles Over 14,000 Pounds

Comments:

The EPA cost estimates assume that there is no cost increase for sensors to improve their ability to measure or for changes to aftertreatment systems to improve their ability to be measured. Industry analysis hypothesizes that sensors may cost more than originally projected to provide the level of discrimination suggested by the proposed thresholds.

Warranty rates are likely to increase in 2013, not decrease as EPA suggests due to the increased number of extrapolated ratings in 2013. Those engines complying in 2010 may experience a decrease in warranty rates by 2013, due to experience and learning, but that experience may not transfer over to the newly extrapolated engines in 2013.

HDOBD requirements accelerate certain onboard computer related costs by displacing existing computers for which the engine manufacturer continues to experience costs due to the need to ensure that those old computers are supported throughout their life.

EPA's cost analysis assumes a certain number of future engine sales with those sales growing at a two percent rate in early years but only a one percent rate in later years. However, freight tonnage hauled by motor truck is expected to increase at the same rate as the economy, which would support a constant growth model. The lower number of engines sold understates the program's costs.

EMA, 2005-0047-0026, p. 14-15

Agency Response:

We believe that the sensor costs we have estimated are still appropriate and have heard nothing from sensor suppliers to suggest otherwise. We know of no reason why aftertreatment devices will have to be changed to improve their ability to be measured, especially given the changes we have made in the final rule relative to the proposed rule (e.g., elimination of NMHC catalyst monitoring against an emission threshold). We have revised the warranty related costs as suggested by EMA given that many engines will be newly adding OBD in 2013. Rather than warranty costs decreasing in 2013, we have now delayed that decrease until 2016. This has little impact on the cost of the rule. We agree with EMA that computer costs will increase and have accounted for that increase in our final cost estimate as we did in our draft cost analysis. As for

sales projections, we have used a method consistent with our emissions modeling approach which is the most appropriate way for us to project sales.

VI.B Fixed Costs for Engines Used in Vehicles Over 14,000 Pounds

Comments:

The R&D Fixed Costs presented in Table 3 of the Technical Support Document (EPA420-D-06-006) assume that "once an algorithm has been developed, it can … be used over and over again with only minor changes." This statement assumes that the technology available scales equally well across all engine displacements (from 5 to 16 liters) covered by the rule. This assumption may be acceptable below 14,000 lbs GVWR, but is not believed to be valid above 14,000 GVWR, where differences in fuel systems and aftertreatment technologies across product lines, will require that algorithms for specific monitors will need to be developed according to the technology used by the particular engine displacements.

There will be additional effort above the average assumptions (e.g. 30 weeks for a threshold monitor) to develop generalized (or scaleable) algorithms across the full product line for diesel engines. The technology to be used for HD Gasoline engines has a much longer history. There is significantly more experience in developing threshold, functional, and rationality monitors for 3-way catalyst technology. The technology development effort for less mature HD diesel engine technologies (reference Table 3, p. 18) is assigned the same 30-week level of effort as more mature HD Gasoline technologies (reference Table 4, p. 21). Since algorithm development for HD diesel engines entails more risk, a higher average effort should be applied for diesel engines.

The assumption that only 13 threshold monitors, 20 functional monitors and 15 rationality monitors need to be developed per manufacturer ignores the additional effort that arises from multiple technologies. Where it is not practical, due to differences in technology, separate 30- week efforts will be needed to develop the additional threshold monitor algorithms. IRAFs and differences between the emissions DF rating and the OBD rating can also significantly increase test cell time needed to develop threshold monitors.

It is assumed that the technician and engineering labor rates do not include overhead factors for health insurance, workman's compensation, and other similar unit costs of labor. The unburdened unit costs and labor rates understate the development costs by omitting benefit costs typically accorded to professional employees and technicians.

There are no costs in Table 5 of the Technical Support Document for 2013 and beyond. This is carried forward to Table 9 (page 26) which shows no ongoing development costs in Table 9 beyond 2013. While it may not be required to demonstrate HD OBD performance each year, it is required to demonstrate HD OBD performance when improvements are made to individual components or subsystems subject to threshold, functional, or rationality monitoring. These fixed costs will need to be recovered in the prices received for engines, and are not included in the fixed cost per engine estimates.

Accordingly, test cell time will be needed from 2013 to 2016 and beyond. In 2010 new NOx control technology will be installed on HD engines and vehicles. Lessons learned from 2010- 2014 will be applied to future engines in 2016 as refinements to the technology and control systems. Also in 2016, manufacturers are faced with full in-use liability for all engine ratings across all engine families. Thresholds will need to be confirmed and compared with the extrapolated projections to establish sufficient confidence that HD OBD algorithms did scale as intended. From 2007-2013, test

cell demand is understated due to the factors given for pp. 16-10 regarding the number of weeks needed to develop algorithms, the number of algorithms to be developed, and the risks in adapting algorithms across all product lines.

$700 per hour is a competitive estimate for an emissions test cell. The $100 per hour test cell rate for HD OBD development is unrealistic. The weighed average cost (as driven by the 30% and 10% utilization factors) is dramatically understated by this figure. Either the $100 test cell will need to be upgraded to measure constituents accurately, resulting in an increased cost per hour, or additional emissions test cell capacity will need to be used. A $100 per hour test cell will include a low precision dynamometer such as a water brake. It will not include constituent measurement capability that is needed for threshold monitoring design and development. Measurement capability requires capital equipment investment to achieve. The capital investment needed to make "development quality" measurements will make test cell costs approach the $700 per hour figure.

The pricing methodology used for certification limit parts (twice the anticipated production costs) is at the lower end of the range. Prototype parts often cost 3 or 4 times the anticipated production costs. Prototype part prices sometimes do not include costs that are instead amortized over the duration of the production contract. Individual piece prices for HD diesel engine parts are generally higher, due to the lower volume of HD diesel engines, when compared to LD gasoline engines.

Aging parts on engine dynamometers past their full useful life to the point where they can be used as threshold demonstration parts creates an order of magnitude multiplicative factor on the cost of threshold parts. Fuel and test cell costs for aging parts dwarf their initial purchase costs. The cost of fuel alone to age parts to a 435,000 mile useful life will be

435,000 miles / 5 MPG * $ 3 / gallon = $ 261,000

Assuming that 750,000 miles is a reasonable MTTF design goal for a 435,000 mile useful life requirement, the cost of fuel alone to age parts to a MTTF of 750,000 miles would be

750,000 miles / 5 MPG * $ 3 / gallon = $ 450,000

Test cell time at $100 / hour would cost

435,000 miles / 30 MPH * $ 100 / hour = $ 1,400,000
750,000 miles / 30 MPH * $ 100 / hour = $ 2,500,000

Sharing these costs over an assumed inventory of 20 threshold parts for the 2010 HD OBD parent engine adds $ 70,000 to $ 150,000 to the value of the each part.

Assuming that monitor verification engines can be obtained for negligible costs may not be appropriate. Because it should not be assumed that manufacturers can recover the full price of a new engine. Assuming that 50 % of the engine price can be recovered is more reasonable. Depending on the amount of use, i.e. the amount of disassembly and reassembly activity to install monitor demonstration parts to mechanically implant failures that a PVE test engine receives as a part of 'Monitor Verification', it may not be proper to then sell the engine as a "new" engine. Negligible costs also presume that there are no shipping costs to ship the engine to the test facility, where the test engineer and/or technician reside.

EMA, 2005-0047-0026, p. 15-19

EPA's cost estimate for an "OBD threshold" part, estimated at two times the cost of a new production part, is low. Moreover, EPA estimated only two threshold parts. By contrast, some manufacturers estimate at least seven parts would be needed to arrive at a correct threshold part. EPA should revise its estimate to be more in line with actual costs. The commenter provides an appendix to its comments which discusses the EPA cost estimates and its flaws. In that, the commenter suggests that commodity prices such as fuel, steel, platinum, have increases 20 to 123 percent in the time between December 2003 and December 2006 (see Appendix C, page 13 of submitted comments). This is used, along with an estimate of the cost of fuel burned while engine bench aging aftertreatment devices, as part of the basis for threshold, or limit, parts costing far more than estimated by EPA.

EMA, 2005-0047-0026, p. 34-35

Agency Response:

Regarding the R&D costs and our assumption that the OBD technology scales well across all engine sizes, we have attempted to account for costs associated with developing the basic approach as an "Algorithm Development Cost" and then the costs to apply that to various engine families (i.e., engine sizes) via the "Application Costs to Each Family." As such, we believe we have properly considered the costs for applying technology to different engine sizes.

Regarding the comment that we should increase the time required for diesel algorithm development based on our equal estimate for both gasoline and diesel combined with the fact that gasoline OBD is much more developed, we consider this to be an argument for decreasing the gasoline time rather than increasing the diesel time. We have chosen not to undergo that change for our final analysis since leaving the gasoline timeframe as estimated in our draft analysis represents a worst case estimate.

Regarding our estimate that development of threshold monitors ignores multiple technologies, we believe the comment speaks to manufacturers that may offer both a NOx adsorber and a SCR approach to NOx control. While the OBD algorithm development for these two technologies may differ, it is by a given manufacturer's choice to offer these two technologies since, for example, SCR could be used for all HD applications. Importantly, we believe that the monitoring approaches should transfer well between NOx adsorber and SCR systems, with the exception of the urea-specific monitoring requirements that exist for most SCR systems. As regards labor rates, we have used labor rates consistent with other recent HD rules. We believe there is value in being consistent with those rules where possible and have not changed anything for the final analysis.

As for fixed costs beyond 2013, we expect the OBD systems developed to comply with this rule to be sufficient for future applications as well. Should manufacturers choose to fundamentally redesign their OBD systems, they will generally choose to do so only to reduce costs. We have not estimated a cost or savings for such efforts as part of this rule.

Regarding test cell time, we do not agree that increased test cell time will be required due to the increased level of in-use liability in the 2016 model year. This comment suggests that manufacturers may be using the in-use liability provisions as a design target which is certainly not the intent behind them. OBD monitors should be developed to the certification OBD thresholds regardless of the in-use liability provisions and, as such, the major development work should be complete by 2013.

Regarding test cell costs/hour, the commenter agrees that $700 per hour is a good estimate for a certification cell but that $100 per hour for development is not realistic. The commenter then argues that upgrades will be needed to measure constituents. We consider the $100 cell to be a cell

that has no emissions measurement capability, at least not anywhere near the regulatory requirements. The cell we envisioned was simply a dyno with proper ventilation and computer and instrumentation capabilities and perhaps ppm emission measurement capability. We believe that most of the algorithm development will entail testing of this sort and very little development testing will entail full certification testing (i.e., emissions per unit work emissions measurement according to 40 CFR Part 1065 will be done only when algorithm development is nearly complete).

As regards limits parts, we believe that our estimate of double the production part price is a good estimate. In general, these costs, in constant dollar terms, will probably decrease rather than increase in the future.

As regards the aging of limit parts, we did not properly characterize this cost in our draft analysis. Using the approach suggested by EMA, and using our final aging approach which requires aging to represent full useful life (on average, we have estimated this to be roughly 80 percent of useful life as manufacturers will be able to show, we expect, that this is representative of full useful life for OBD), and using a sales weighted useful life of 335,000 miles and sales weighted MPG of 7, and adjusting 2004 dollars to 2007 dollars using the Consumer Price Index (1.10), the fuel costs would be:

(335,000 miles x 80%)/7 MPG x $3/gallon = $115,000 per parent engine

Test cell time would cost:

(335,000 miles x 80%)/30 MPH x $100/hr x 1.10 = $981,000 per parent engine.[8]

The total being $1.1 million per parent engine. We have added these costs to the costs of limit parts in the final analysis. In the final cost analysis, limit part costs consist of the limit part hardware and the limit part aging. Note that we consider this to be an overestimation of the costs to age parts since we believe manufacturers will choose to conduct some sort of rapid aging of parts via exposure to very high temperatures or very extreme conditions. Such aging would more quickly degrade the parts for OBD use than simply bench aging for a useful life's worth of operating hours.

As regards costs for production engine testing, we believe we have properly characterized these costs. These costs are a small portion of the cost of the program.

As regards the comment that seven limit parts would be required per engine per monitor rather than our estimated two, we disagree, especially in light of our removal of IRAFs from the threshold determination. Removing IRAFs from threshold determination should make limit part generation and limit part aging a much less complex process.

VI.C Total Costs for Engines Used in Vehicles Over 14,000 Pounds

Comments:

The ongoing fixed costs per engine decline to near zero in Table 13 of the Technical Support Document (EPA420-06-006). This suggests that in the future, on-going benefits are "free," because the costs have been fully amortized. In fact, the ongoing costs will continue to be borne by manufacturers as they design new components to meet on-going customer demands for transportation capital goods.

[8] The CPI for 2007 was reported as 207 while that for 2004 was 189 (the 1982 to 1984 timeframe=100, see www.bls.gov/cpi/). Therefore the CPI adjustment for 2004 dollars to 2007 dollars is 207/189=1.10.

EMA, 2005-0047-0026, p. 19

EPA's estimate of $50 per diesel engine is rather suspect considering the current state of sensor development and the likely need for a separate platform design being required. If OBD has a cost impact that far exceeds $50, EPA should be aware of the impacts this additional financial burden will have on accelerating the anticipated pre-buy and post low-buy of engines surrounding the 2010 model year.

American Trucking Association, 2005-0047-0029, p. 5

Agency Response:

Regarding the comment that fixed costs will be ongoing, please refer to our response under section VI.B. Regarding HDOBD costs and impacts on pre-buy, we do not believe that OBD systems will result in any significant pre-buy or post low-buy of engines. If anything, we believe that OBD equipped engines will be considered more valuable rather than less valuable as this comment suggests.

VI.D Costs for Diesel Heavy-duty Vehicles and Engines Used in Heavy-duty Vehicles Under 14,000 Pounds

Comments:

Concerns for diesel costs under 14,000 lbs. GVW are similar to those discussed above for vehicles over 14,000 lbs. GVW.

EMA, 2005-0047-0026, Appendix C, p. 20

Agency Response:

We have changed the final analysis for under 14,000 pound costs to be consistent with changes made for the over 14,000 pound costs. Please refer to our responses under sections VI.A through VI.C.

VII. What are the Updated Annual Costs and Costs per Ton Associated with the 2007/2010 Heavy-duty Highway Program?

VII.A Updated 2007 Heavy-Duty Highway Rule Costs Including OBD

We received no comments pertaining to this section that require analysis.

VII.B Updated 2007 Heavy-Duty Highway Rule Costs per Ton Including OBD

We received no comments pertaining to this section that require analysis.

VIII. What are the Requirements for Engine Manufacturers?

VIII.A Documentation Requirements

We received no comments pertaining to this section that require analysis.

VIII.B Catalyst Aging Procedures

Comments:

EMA supports use of “de-greened” (i.e., aged to 125 hours) engines for OBD demonstration testing, but does not support any requirement that aftertreatment devices be aged to their full useful life for such testing. Aging of aftertreatment devices to 125 hours provides sufficient assurance that the components will be representative of emissions in-use. Aging these devices to full useful life (e.g., 435,000 miles for heavy heavy-duty engines), is costly, time-consuming, and would impose undue burdens on manufacturers. Rather, appropriate deterioration factors would be applied to the baseline engine/aftertreatment system to achieve a representative system appropriate for certification demonstration of the OBD system. The deterioration factors determined for emissions certification should be allowed for OBD certification.

EMA, 2005-0047-0026, p. 34
Cummins Inc., 2005-0047-0031, p. 5
National Automobile Dealers Association, 2005-0047-0034, p. 3

Agency Response:

As of this writing, we are developing new emission certification durability procedures that will require manufacturers to demonstrate emission compliance with systems aged beyond the 125 hour aging used for years in engine compliance demonstration. Because that issue remains unresolved, we have not changed our final HDOBD regulation. Therefore, manufacturers will be required to use, for OBD compliance demonstration, engines aged for a minimum of 125 hours and aftertreatment devices aged to represent full useful life aging (see §86.010-18(l)(2)(iv)).

VIII.C Demonstration Testing

Comments:

It is essential that EPA and CARB coordinate carefully to ensure that engine manufacturers are not required to undertake duplicate testing or expend resources where test results can be shared.

EMA, 2005-0047-0026, p. 32

Agency Response:

We agree with this comment and this is our intention.

VIII.C.1 Selection of Test Engines

Comments:

EPA's definition of the "parent" engine rating differs from CARB's definition in that the CARB definition is based on California sales while EPA's is based on U.S. sales. In some cases, this may result in different engines being chosen as the parent and, thus, double testing. Such an outcome should be avoided and the regulation should be revised to ensure that such an outcome will not occur. In fact, some manufacturers have already chosen their parent rating based on the CARB definition.

EMA, 2005-0047-0026, p. 33

Agency Response:

Both agencies have a motivation of having parent ratings be those having high sales in their area of interest. For the most part, we believe that will be the case by default. However, it is not guaranteed. For the final rule, we have inserted a provision that allows the Administrator to accept alternative engine ratings (see final §86.010-18(o)(1)(i) and compare to proposed §86.010-18(o)(1)).

VIII.C.2 Required Testing

Comments:

For certification demonstration to emissions standards, one certification cycle is required while, for demonstration to OBD requirements as proposed, 7 to 10 and perhaps 14 to 20 such cycles would be required. This testing places a huge workload burden on manufacturers. While some level of OBD certification demonstration testing is reasonable, manufacturers must be allowed to carryover engine testing requirements from year to year. It appears from EPA's preamble, that EPA could be considering requiring new parent engines and, thus, new certification demonstration testing every year beginning in 2016. This is unreasonable. There is little, if any, added benefit in requiring OBD system certification demonstration on more and more engines each and every year. Moreover, production evaluation testing already requires ongoing testing after engines are produced. EMA supports EPA's proposed rule where it eliminates the requirement to conduct testing in 2011-2012 and 2013-2015 and the ability to carryover engines from year to year. EPA should eliminate any requirement that new parent ratings could be determined from year to year beginning in 2016 and for those "new" engines to be fully tested for certification demonstration. There should be language that would allow the Administrator to reduce the number of certification demonstration tests beginning in 2016 and later.

EPA must clarify in the final rule that double-testing (for CARB and for EPA) will not occur, and that EPA will coordinate the selection of test engines with CARB to ensure that double-testing will not occur. There must be a reasonable cap on the number of engines required for testing by manufacturers certifying under both EPA and CARB rules to ensure no double-testing.

EPA should work with CARB to align CARB's certification demonstration requirements with those that EPA has proposed, particularly with respect to eliminating additional testing in 2011-2012 and 2014-2015.

EMA, 2005-0047-0026, p. 32-33

Currently, emissions standards are demonstrated using an emissions deterioration factor (DF) test engine aged to its useful life. That DF test engine is chosen using a different set of criteria (i.e., worst case emissions) than that for which the OBD parent rating is chosen (i.e., highest sales weighted by useful life mileage). For 2010-2015, EPA should reduce the anticipated substantial

impacts on engine manufacturers' test cell and development burden by allowing manufacturers to use the OBD engine rating for emissions DF demonstration.

EMA, 2005-0047-0026, p. 35

Agency Response:

Regarding comments about carry-over and/or requiring new OBD certification demonstration every year, it is important to note that we intend to implement the OBD requirements in a manner consistent with our implementation practices for emission standards. In other words, when carry-over of data is acceptable we intend to allow manufacturers to carry-over that data. However, if we consider there to be some reason that carry-over is not acceptable, we intend to require new certification demonstration. We do not intend to require new OBD demonstrations when such demonstration is identical to a previous year. No one would benefit from such a practice.

Regarding double testing, we agree with this comment and do not intend to require any double testing. We have added a provision to our regulation that allows the Administrator to accept other ratings than the rating otherwise required by our regulation (see §§86.010-18(o)(1)(i) and 86.010-18(o)(2)(ii)(B)).

Regarding the comment on OBD demonstration and DFs, please refer to our response under section VIII.B.

VIII.C.3 Testing Protocol

We received no comments pertaining to this section that require analysis.

VIII.C.4 Evaluation Protocol

We received no comments pertaining to this section that require analysis.

VIII.C.5 Confirmatory Testing

Comments:

EPA and CARB must assure that manufacturers are not subject to double-testing to satisfy the OBD confirmatory testing requirements of both agencies. The agencies must confirm that they would not conduct confirmatory testing in the same year. Even a temporary loss of a test engine for confirmatory testing that would otherwise be used for internal development imposes a cost burden on the manufacturer.

EMA, 2005-0047-0026, p. 36

Agency Response:

Regarding double testing, we agree with this comment and do not intend to require any double testing. We have added a provision to our regulation that allows the Administrator to accept other ratings than the rating otherwise required by our regulation (see §§86.010-18(o)(1)(i) and 86.010-18(o)(2)(ii)(B)).

VIII.D Deficiencies

Comments:

EMA supports the proposal to adopt deficiency provisions which have proven to be a necessary component of OBD regulations given their complexity. CARB granted a number of deficiencies for medium-duty OBDII (13 CCR 1968.2) DPF threshold monitors which have a threshold of the standard+0.09 for the 2007 model year. While deficiencies should not and cannot be used as a substitute for a thorough and appropriate analysis of technological feasibility, it is important that deficiency provisions be available in the rule.

Production evaluation testing (see proposed §86.010-18(j)) would greatly expand manufacturers' testing requirements to ensure that software errors and other production glitches are discovered and corrected early on rather than years later. The ability to grant a post-production deficiency (i.e., a "retroactive" deficiency) for less egregious issues discovered by manufactuers during production evaluation testing would provide the ability to correct issues in a manageable time frame with less disruption to existing resources. Such is the case with the CARB OBDII and HDOBD programs which specifically allow for "retroactive" deficiency determinations. With EPA proposing to adopt the same production evaluation testing requirements, it is equally important that EPA not initiate enforcement actions against a manufacturer for similar, "less egregious" issues. While EMA understands EPA's desire to address in-use enforcement issues via defect reporting, where CARB grants a retroactive deficiency it is essential that EPA use reasonable discretion to not initiate enforcement actions. The CARB regulation only allows retroactive deficiencies for less egregious issues with the more egregious issues falling under their enforcement regulation.

EMA, 2005-0047-0026, p. 40

Agency Response:

We agree with this comment in that it provides some level of incentive to manufacturers to find and correct potential errors in their OBD systems early in their life-cycle. It also provides incentive to bring such issue to our attention rather than hoping we do not become aware of them. Therefore, we have added a provision to our production evaluation testing requirements that would allow, on a case-by-case basis, what could effectively be called a "retroactive" deficiency (see final rule §86.010-18(j)).

VIII.E Production Evaluation Testing

Comments:

Although still having concerns with the production evaluation testing requirements, EMA raises no further objections to these requirements provided that EPA and CARB assure that manufacturers will not be required to conduct double-testing under the California and the federal HDOBD requirements. In that regard, EPA should revise the proposal to clarify that EPA will not require "double-testing" by engine manufacturers meeting both the California and federal OBD requirements.

EMA, 2005-0047-0026, p. 35-36
Cummins Inc. 2005-0047-0031, p. 8

Agency Response:

Our intent is to avoid the double testing possibility mentioned by these commenters. We intend to work closely with CARB staff in an effort to ensure that it does not occur. We do not believe it is necessary to state this in our regulatory text.

VIII.E.1 Verification of Standardization Requirements

Comments:

The text envisions that data link standardization requirements will be conducted at vehicle assembly plants. Since HD vehicle assembly plants are not co-located with HD engine assembly plants, the amount and extent of testing that can reasonably and routinely be conducted at vehicle assembly plants is limited. In general, tests should demonstrate the integration of data link communications, but cannot reasonably exercise specific threshold monitors or performance monitor ratios.

TMA members believe it is unnecessary to test all possible details of data link communications at the physical and data link layers, as many of these services are provided by integrated circuits marketed to the automotive engine, vehicle, and tool industries. The performance of these devices is tested by independent agencies as a part of the license requirements for CAN as defined by ISO 11898. Key aspects of other communication capabilities can be readily incorporated into tests for specific services. For example, transport protocol capability is readily demonstrated by requesting data that require multiple CAN frames to accomplish. For example, both freeze frame and VIN require the sender to appropriately support transport protocol.

TMA members support the limited numbers of test vehicles proposed and will collaborate with engine manufacturers to achieve the desired test volumes. Members agree that industry standard software will be developed that is similar to SAE J1699-3 in scope, but will be designed to suit the HD OBD provisions defined in SAE J1939-73 (September 2006). A proposed standard draft has been developed that will meet the needs of 13 CCR 1968.1, and is being revised to satisfy 13 CCR 1968.2 (2006) and 13 CCR 1971.1 (2006).

Truck Manufacturers Association, 2005-0047-0028, p. 4-5

Agency Response:

The first concern expressed by TMA goes beyond the scope of the proposed requirement. In fact, the requirement to verify standardization requirements is to demonstrate the integration of data link communications, not to exercise specific threshold monitors or performance monitor ratios. This is what is suggested by TMA. As regards the second concern, testing all possible details of data link communications, we believe that the requirements we proposed and are finalizing are appropriate especially given the limited number of vehicles required to be tested. The level of communications verification is very important since without proper communications the OBD system is of little value.

VIII.E.2 Verification of Monitoring Requirements

We received no comments pertaining to this section that require analysis.

VIII.E.3 Verification of In-use Monitoring Performance Ratios

We received no comments pertaining to this section that require analysis.

IX. What are the Issues Concerning Inspection and Maintenance Programs?

IX.A Current Heavy-duty I/M Programs

We received no comments pertaining to this section that require analysis.

IX.B Challenges for Heavy-duty I/M

Comments:

The USEPA should make information available to the States regarding the OBD systems and components being used and monitored by the manufacturers, or essentially the "OBD profile", for each engine configuration. As proposed, the manufacturers will be allowed to tailor the OBD system to each engine configuration and that will include monitoring exemptions/alterations, creating a myriad of different OBD configurations. In order to perform the OBD scan correctly, the states need to know what monitors are included in each system to compare those configurations to the information being captured with the OBD scan during the inspection. Further, several components are proposed to have the capability to be switched off under certain conditions. The OBD profile would identify those components and their normal on/off state in a specific configuration.

Under the current light-duty OBDII system, several manufacturers were granted exceptions/exemptions to OBD monitoring by USEPA and the states were not notified of these exceptions leading to problems after states implemented their light-duty I/M programs. It has been difficult for the states to obtain the information regarding the OBD monitoring exceptions/exemptions. Access to this information must be made readily available to the states that implement OBD I/M.

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 6

Agency Response:

We appreciate the time and effort put into providing these comments and will consider them should we move forward with developing an I/M proposal based on HDOBD checks.

IX.C Heavy-duty OBD and I/M

Comments:

This rulemaking will provide an option for states to consider in meeting their SIP requirements. However, the current Mobile6.2 model and the new mobile model under development, Motor Vehicles Emissions Simulator (MOVES), do not provide any credit for conducting diesel testing. The mobile model should be designed so that states are able to take SIP credits for implementing I/M programs for diesels (light-duty and heavy-duty) and heavy-duty gasoline.

Texas Commission on Environmental Quality, 2005-0047-0020, p. 1
Maryland Department of the Environment, 2005-0047-0022, p. 1
NY State DEC, 2005-0047-0033, p. 2

Unfortunately, there is a significant problem in this proposal, as acknowledged by EPA. The current version of EPA's MOBILE model assumes zero deterioration of emissions for most heavy-duty diesel engines over their lifetime. In order to appropriately account for emissions from this

sector in their State Implementation Plans and assess the cost-effectiveness of heavy-duty inspection and maintenance (I/M) programs, it is critical that EPA update the MOBILE model to reflect the technology changes introduced by the new standards and their impact on emissions from affected engines and equipment. We therefore urge EPA to expeditiously develop the necessary technical tools and policy guidance to enable states to determine the deterioration offset benefit from an OBD program.

NESCAUM, 2005-0047-0024, p. 2
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 3-4

EPA is encouraged to move forward with a HDOBD-based I/M program. EPA should make HDOBD as similar to the light-duty side as possible in order to minimize hardware/operating system adjustments and upgrades needed to include HDOBD testing in current I/M programs. EPA is strongly encouraged to ensure standard protocols, connectors, data formats, and technical specifications to the maximum extent possible. EPA is also strongly encouraged to provide guidance for I/M states that identifies areas where standardization has been achieved, and where differences exist.

Maryland Department of the Environment, 2005-0047-0022, p. 1
National Automobile Dealers Association, 2005-0047-0034, p. 3-4

We also take note of the suggestion in the proposal that HDOBD I/M programs may be fleet or corporate-based, rather than following the traditional state models used for light-duty OBD I/M programs. Individual states must have the ability to design I/M programs that best fit their particular circumstance. Consequently, EPA should provide the appropriate technical and policy resources to accommodate these diverse needs. We therefore urge EPA to work with program personnel in the state agencies to develop model I/M program guidance which, among other things, addresses the emissions benefits achievable under I/M programs of varying configurations. EPA should establish emission control warranty requirements tied to possible HDOBD I/M programs.

NESCAUM, 2005-0047-0024, p. 2
New Jersey Department of Environmental Protection, 2005-0047-0027, p. 3
NY State DEC, 2005-0047-0033, p. 3

Since HD diesel vehicles have two data link connectors (DLCs), will I/M states need to access both DLCs for testing purposes, or are the emissions-related data all accessible through one OBD connector? States need significant assurance that when the MIL is illuminated it is only for emissions related failures. Will HD gasoline and HD diesel vehicles use the same OBD test procedures to obtain test data from their OBD systems? Given the growing application of wireless technologies to OBD testing and information gathering on the light-duty side, will such technologies be compatible with HDOBD systems?

Maryland Department of the Environment, 2005-0047-0022, p. 1

EPA should investigate, in a future rule, what it would take to completely specify a HDOBD based I/M program. We recommend that if a HDOBD I/M check is determined to be needed, then industry should be allowed to satisfy the requirements by using a process that is already being run today, such as a periodic preventive maintenance event or a Department of Transportation inspection event.

Cummins Inc., 2005-0047-0031, p. 7

There should be a simple means for state agency personnel, service technicians, and owners (particularly second and later generation owners) to determine, by examining a serial number placed on the chassis (from the VIN itself or a separate label provided by the engine manufacturer) displaying, what engine has been installed, if the installed engine is OBD-equipped, and if so equipped, what type of OBD system is present. The OBD system also should be readily identifiable through a scan tool reading. Recognizing that different engine configurations are likely to have differing OBD monitors, EPA should require engine manufacturers to make their OBD profiles available to state enforcement agencies as a means to verify that all monitors are reporting data.

NESCAUM, 2005-0047-0024, p. 3

ATA views the diagnostic data that identifies the malfunction and is stored in the engine's computer as a fleet's proprietary information. The integrity of the OBD regulatory framework and vehicle inspections can be compromised if MILs light up when there is no failure of an emission systems or component. Such information should only be used by fleets to indicate to them malfunctions of the engine emission control systems. MIL readings should not be used by entities as a basis of commencing enforcement actions or pursuit of emission violations.

American Trucking Association, 2005-0047-0029, p. 3

The California Air Resources Board (CARB) used their emission model (EMFAC) to estimate the emission benefits for future model year vehicles (2010 and subsequent model year), and determined that there could be substantial emission benefits from expanding their current HD diesel I/M program to add an element to ensure that the new generation of ultra-clean HD diesels maintains their low emissions long after being placed in-service. This data supports the growing body of information showing that in-use emissions control performance of HD diesels are now subject to the same factors as light-duty vehicles, if not more so. Without the ability to show emission reduction credits for implementing a HDOBD I/M program, the states may have difficulty justifying implementing such a program. Within the EMFAC model for the heavy-duty fleet, tables exist that allow the user to input various emission component malfunction rates and the associated emission rates with each of those component malfunctions. CARB modified several of the existing components to better reflect the technology that is expected to be used on 2010 and subsequent engines. Specifically, CARB added malfunction categories for particulate matter (PM) filter leaks, missing/tampered PM filters, NOx aftertreatment system malfunctions, and NOx aftertreatment control sensor malfunctions. CARB has estimated that when these aftertreatment devices malfunction, emissions can rise dramatically. For example, for PM exhaust filter leaks and PM filter missing/tampered, CARB estimates PM increases of 600 percent and 1000 percent, respectively and a loss of feedback control (either a NOx sensor for Selective Catalytic Reduction or an air/fuel ratio sensor for an NOx adsorber) would result in significantly lower NOx conversion rates for an emission increase of 200 percent (to a tailpipe emission level of 0.6 g/bhp-hr NOx) (see California Air Resources Board, Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Malfunction and Diagnostic System Requirements for 2010 and Subsequent Model Year Heavy-Duty Engines (HD OBD), June 3, 2005).

New Jersey Department of Environmental Protection, 2005-0047-0027, p. 4

Owners of trucks under rental and lease agreements do not control the daily operation of their vehicles. Driver response to an illuminated MIL is the responsibility of the carrier operating the leased or rented truck. TRALA opposes any attempt to place enforcement penalties or liability on the owners of rented or leased vehicles resulting from a driver's failure to respond to an illuminated MIL.

Truck Renting and Leasing Association, 2005-0047-0032, p. 2

TRALA members request EPA's consideration of an OBD program that uses information gained from regular periodic maintenance performed by our own maintenance technicians to insure that integrity of emissions control systems. Existing inspection procedures could serve as a check on the success of these maintenance practices.

Truck Renting and Leasing Association, 2005-0047-0032, p. 3

Agency Response:

Several commenters supported using heavy-duty OBD as a means for testing vehicles equipped with such systems in inspection and maintenance (I/M) programs that include heavy-duty vehicles. Most of these commenters noted that for states to have a realistic chance of adopting such programs, EPA must first provide a means for quantifying the benefits of such programs, similar to the way that the current mobile source emission factor model, MOBILE6.2, quantifies benefits for light-duty I/M programs. In discussing the MOBILE model, a handful of commenters pointed out that the current model does not account for heavy-duty diesel deterioration, and therefore, there are no excess emissions in the model for an I/M program to reduce. In requesting that the model be revised to quantify a benefit for heavy-duty OBD-based programs, these commenters acknowledged that the model would also need to be revised to include a deterioration curve for heavy-duty diesel vehicles. Lastly, several commenters requested that in addition to quantifying the benefits from an I/M program based on testing heavy-duty vehicles using OBD, that EPA also develop guidance on how to implement such a program.

With respect to comments about modeling, EPA is working on a new mobile source emission factor model - MOVES - that will replace MOBILE6, and will quantify and project deterioration from heavy-duty diesel vehicles. EPA is not intending to make further modifications to the MOBILE model. EPA agrees that with the incorporation of emission control systems on heavy-duty vehicles, there is the prospect that some of these systems will fail in-use and emission rates will rise as a result. However, given the newness of these technologies and the unfamiliarity of there deployment on, for the most part, commercial heavy-duty vehicles, there is no sound basis for estimating the incidence of such failures, the emission impacts of such failures, the impacts of repairs on such failures, or the costs of repair. Under EPA's heavy-duty in-use compliance testing program, EPA will be getting substantial quantities of data on in-use performance of these OBD-equipped vehicles once they enter the fleet. After accumulating sufficient data, EPA anticipates being able to conduct a quantitative analysis of the incidence of failures and the emission impacts.

With respect to other comments, we appreciate the time and effort put into providing these comments and will consider them should we move forward with developing an I/M proposal based on HDOBD checks.

X. Statutory and Executive Order Reviews

We received no comments pertaining to Section X of the proposal preamble that require analysis.

X.A Executive Order 12866: Regulatory Planning and Review

X.B Paperwork Reduction Act

X.C Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 USC 601 et.seq.

X.D Unfunded Mandates Reform Act

X.E Executive Order 13132: Federalism

X.F Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

X.G Executive Order 13045: Protection of Children from Environmental Health and Safety Risks

X.H Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

X.I National Technology Transfer Advancement Act

XI. Statutory Provisions and Legal Authority

We received no comments pertaining to this section that require analysis.

XII. Other comments

Comments:

Are there any plans to make the MIL codes visible to the consumer? Currently the consumer has to go to a repair technician to have the codes read. At some point will the codes be able to appear so the consumer knows what codes have been triggered?

Maryland Department of the Environment, 2005-0047-0022, p. 2

Agency Response:

This is allowed by the regulation (see §86.010-18(b)(1)(iv)). At this time we do not have any intention of requiring manufacturers to provide this information. Should we include OBD checks in a possible future heavy-duty I/M rule, we may revisit this issue.