STATE OF CALIFORNIA
AIR RESOURCES BOARD

Notice of Public Hearing to Consider Technical Status and Proposed Revisions to Malfunction and Diagnostic System Requirements and Associated Enforcement Provisions for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines On-Board Diagnostic (OBD II) and Emission Warranty Regulation	**)**	**Hearing Date: September 28, 2006** **Agenda Item 06-8-4**

COMMENTS OF THE ENGINE MANUFACTURERS ASSOCIATION

Jed R. Mandel
Lisa A. Stegink
Engine Manufacturers Association
Two North LaSalle Street, Suite 2200
Chicago, Illinois 60602
(312) 269-8000

September 26, 2006

TABLE OF CONTENTS

Page

TABLE OF CONTENTS
(continued)

Page

STATE OF CALIFORNIA
AIR RESOURCES BOARD

Notice of Public Hearing to Consider Technical Status and Proposed Revisions to Malfunction and Diagnostic System Requirements and Associated Enforcement Provisions for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines On-Board Diagnostic (OBD II) and Emission Warranty Regulation	**)**	**Hearing Date: September 28, 2006** **Agenda Item 06-8-4**

COMMENTS OF THE ENGINE MANUFACTURERS ASSOCIATION

The Engine Manufacturers Association is the national trade association representing worldwide manufacturers of internal combustion engines. EMA's members include the major manufacturers of heavy-duty engines used in vehicles between 8,500 and 14,000 lbs. GVWR ("medium-duty engines and vehicles") that are the subject of the proposed amendments to the on-board diagnostic ("OBD II") rule (the "proposed amendments"). Although EMA's comments focus primarily on the proposed amendments to the medium-duty aspects of the OBDII rule, there are a number of issues that overlap with those concerning light-duty OBDII requirements. In that regard, EMA supports the comments of the Alliance of Automobile Manufacturers.

I. Background and Principles Underlying the OBD II Proposed Amendments

Although ARB uses the term "medium-duty" to describe engines and vehicles in the 8,500-14,000 lbs. GVWR range, engines in this range actually are "heavy-duty" engines as defined in the federal Clean Air Act. The medium-duty engine and vehicle industry (encompassed within the heavy-duty industry) is unlike the passenger car and light-duty industry. The medium-duty industry is generally a non-integrated industry, where the manufacturers of engines are not typically the manufacturers of the chassis or vehicles in which those engines are used. Rather, medium-duty manufacturers produce and sell engines to customers who then incorporate the engines into many different types of chassis or vehicles, with many different types of customer specifications and performance requirements. In contrast, in the light-duty industry, a single manufacturer produces both engine and vehicle, integrating all systems into a single product for sale to consumers.

Medium-duty engines and vehicles also play a far more significant role in commerce than do light-duty vehicles. Medium-duty engines and vehicles are used to perform work – from construction to goods transport, tow trucks to utility vehicles, waste haulers to delivery trucks. Such vehicles are commercial assets of their respective businesses, and represent a significant capital investment by their owners. Any

regulatory provisions covering medium-duty engines and vehicles must account for the fact that such vehicles engage in a wide range of commercial activities supporting California's economy and the economy nationwide.

A. **ARB's Obligation To Adopt Technologically Feasible Standards**

In recognition of the nature of this industry and its importance in commerce, the U.S. Congress established unique provisions and protections in the federal Clean Air Act for engines used in vehicles over 6,000 lbs. GVWR, which encompasses the medium-duty engines covered by the proposed amendments. Those provisions of the CAA, as well as California law, require ARB to adopt technologically feasible and cost-effective standards (see detailed discussion in Section III). Manufacturers have raised with Staff their substantial feasibility concerns with the existing OBD thresholds and requirements and the proposed amendments to those thresholds and requirements.

The OBD requirements constitute emission standards within the meaning of the CAA because they are established and intended by ARB to control engine and vehicle emissions. Principally, the OBD standards achieve that control by placing upper limits (thresholds) on the emissions from each engine, above which no OBD system may be certified. And, only engines certified to the ARB-promulgated OBD standards may be sold in California. Both federal and state law require that ARB demonstrate that the technology needed to meet those OBD standards is both feasible and cost-effective. In several cases, detailed below, ARB's proposal for medium-duty engines and vehicles is neither technologically feasible nor cost-effective.

While ARB has had OBD requirements for medium-duty engines and vehicles in place for several years, those requirements have evolved into more sophisticated and complex provisions with each new round of OBD amendments. Manufacturers have spent and continue to spend significant resources in meeting the OBD standards. Each time changes to the OBD rule are adopted and new technological challenges are added, manufacturers are forced to expend resources to meet those challenges. Yet many times those challenges have proven to be infeasible, requiring last minute changes, and wasting the limited resources available to manufacturers. This rulemaking is another example of an infeasible proposal which will have to be corrected later and which will compel the waste of manufacturers' resources.

As Staff explains in the Staff Report: Initial Statement of Reasons for Proposed Rulemaking ("ISOR" or "Staff Report"), many of the thresholds and requirements that ARB adopted in 2002, despite manufacturers' best efforts, are not feasible and now must be revised. While such relief is absolutely necessary in this instance, ARB should not again adopt standards that are beyond technological reach, yet cause manufacturers to use limited resources and precious test cell time in attempting to meet them.

Manufacturers should not be required to expend time and effort in attempting to develop costly monitoring strategies that are not feasible. While ARB can set technology-forcing standards, ARB has an obligation to set standards that reasonably can be projected to be technologically feasible. Unless changes are made to the proposed

amendments to the OBD II rule to make those provisions technologically feasible, manufacturers will again find themselves having wasted resources and subject to changes "at the eleventh hour," when manufacturers are asked to certify engines and vehicles subject to OBD standards that are far beyond their reach.

B. Leadtime and Period of Stability Requirements Established By Law

In addition to assuring that the standards are technologically feasible and cost-effective, ARB also has an obligation under the CAA and California law to adopt standards within reasonable time frames. The federal CAA provisions include a requirement that any standard affecting emissions may not be adopted unless the regulating agency provides at least 4 years' leadtime (measured in full model years) between the adoption of the final standard and the time the standard becomes effective, plus at least 3 years' period of stability – in other words, at least 3 years between each new change or step-down in standards. (See detailed discussion in Section III.)

Leadtime is needed in order to provide manufacturers with sufficient time to research, develop and produce engines for commercial use. A period of stability is necessary to provide manufacturers time in which they may, in theory, begin to recoup some of the significant investments they have made in new technology to meet those standards. As a category of heavy-duty engines, the medium-duty engines and vehicles covered by the proposed amendments are subject to the 4 years' leadtime and 3 years' stability protections of the Clean Air Act. Furthermore, California law also requires that standards must be adopted within reasonable time frames. As will be discussed more fully below, ARB's proposed amendments do not provide sufficient leadtime or stability for the medium-duty engines and vehicles covered by the rule.

C. The Realities And Impact Of ARB's Rulemaking Process

As discussed above, providing manufacturers with sufficient leadtime and period of stability between changes in standards is required under federal and California law. Providing reasonable notice of the standards that manufacturers must meet, and giving them enough time in which to attempt to comply with those standards, is not just a legal or academic exercise. It is absolutely essential to the way manufacturers do business.

Manufacturers must devote substantial time and resources to the process of researching, developing and producing engine emissions control technology and OBD monitoring technology to meet the standards that regulators adopt. It is not an easy task and cannot be done "on the fly." Manufacturers first have to research possible technology options, develop those that look promising, and spend countless hours in the test cell to achieve products that can meet the standards. It is not necessarily a linear process, either, as technologies are tried, tested, adjusted or abandoned, and developed and tested some more. After years of going through the development process, manufacturers begin the production and certification process, which requires testing to regulatory procedures and measuring the compliance of the technology (both engine emission control technology and OBD monitoring technology) to the required standards and obtaining approval from the regulatory agencies. Because of the way in which model

year is defined, engine manufacturers may certify (both "emission-certify" and "OBD-certify") their 2007 products, for example, as early as January 1, 2006. Once manufacturers begin the process of certifying their products, it is generally too late to make changes.

There are a number of ways in which ARB's rulemaking process – and this rule in particular – disregards those real notice and timing issues that manufacturers face. The most significant of these are three areas, detailed more fully in Section II (Technical Discussion), in which ARB is (i) proposing new, last-minute requirements with less than four months' (let alone four years') leadtime and in some cases even after the model year has started, (ii) failing to specify the actual standards or any defined method to meet the requirements, and (iii) attempting to codify a practice that allows ARB to change the standards from year to year. In other words, ARB is making changes to the rule and adding new requirements when it is too late – manufacturers' product designs are already settled. Moreover, ARB is refusing to set standards and then stick with those standards for the necessary period of stability.

Such an approach causes an undue burden and unjustified expense for manufacturers, who have invested their limited resources in meeting ARB's regulatory requirements only to find out, at the last minute, that those requirements have changed or that new requirements have been added on. Manufacturers need certainty so they may use their limited resources most effectively – certainty in knowing what standards they must meet and the time frame in which to meet them. ARB's rulemaking process has failed to provide such certainty. ARB must provide the certainty that manufacturers need by assuring that it upholds the leadtime, stability, notice and process requirements of federal and California law. ARB must revise its rulemaking process, must adopt clear standards and requirements, and must provide sufficient time for meeting those standards.

D. The Many Challenges Manufacturers Face In Meeting Emission Standards And OBD Standards

Engine manufacturers are in the midst of a multiple-year effort to meet stringent new federal and California emissions standards that begin in 2007 and that will be fully realized by 2010 for on-highway engines used in vehicles over 8,500 lbs. GVWR. The new emission standards will reduce engine emissions by an additional 90% over the previous standards, and those reductions will come primarily through a systems approach of advanced engine technology, 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 have essentially completed their work to develop and produce 2007 through 2009 model year engine and aftertreatment technology systems meeting the stringent new emission standards. Yet, significant work remains to meet the even more-stringent emission standards for 2010. Manufacturers will devote thousands of hours of engineering time and expertise and thousands of hours of time in the emissions test cell to achieve those standards. During the time leading up to the

implementation of the 2010 standards and beyond, they also must address the challenges of the new manufacturers' run heavy-duty in-use test program applicable to those engines federally and in California.

On top of those underlying emission standards, and the in-use compliance program, the OBD II rule would further require manufacturers to certify engines and vehicles to new, stringent OBD requirements. OBD is technically complex, and requires the development and commercialization of 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 2007, 2010 and later standards.

Finally, it is worth noting that just over one year ago, ARB adopted a comprehensive new OBD program for heavy-duty on-highway engines and vehicles over 14,000 lbs. GVWR (the "HDOBD Rule"). Much of what ARB has included in the proposed amendments mirrors provisions in the HDOBD Rule, which will go into effect with the 2010 model year. Throughout the course of the HDOBD rulemaking, Staff acknowledged many of the concerns raised by manufacturers and, in fact, delayed the initial implementation of the rule until 2010 to address, in part, some of those concerns.

In sum, in light of the legal framework underlying the OBD standards, the impact on manufacturers of ARB's rulemaking process, and the many challenges manufacturers face, all described in great detail below, ARB must make substantial changes to the proposed OBD II amendments.

II. Technical Discussion

In the following technical discussion, EMA details its significant concerns with the proposed amendments, including how ARB's proposal fails to provide the necessary leadtime and stability and to demonstrate that the proposed amendments to ARB's OBD II standards are technologically feasible and cost-effective.

A. Infrequent Regeneration Adjustment Factor Provisions Should Not Be Included In This Rule

One of EMA's primary concerns with the proposed amendments are brand-new provisions that would immediately increase the stringency of the OBD threshold standards by at least 10% and maybe more, and that would lead to even greater stringency in the OBD standards over a short period of time. ARB calls these provisions "noteworthy" (ISOR, p. 10) and EMA agrees – they are noteworthy, because ARB is proposing to make significant changes to an already complex and highly technical OBD II rule by adding more complex, technical and burdensome requirements for which ARB has not established any need. Those are the proposed infrequent regeneration adjustment factor requirements.

1. ARB's Proposal

ARB is proposing that, beginning in 2007, manufacturers must adjust emission test results that they use to determine the malfunction thresholds for OBD monitors by factoring in adjustment factors that they use when certifying engines to the underlying emissions standards. Beginning in 2008, manufacturers would be required to develop unique adjustment factors for NMHC catalyst monitoring using appropriately deteriorated (malfunctioning) NMHC catalyst monitors. And, beginning in 2010, manufacturers would have to develop unique adjustment factors for *every* monitor using monitors that have been appropriately deteriorated to the malfunction threshold. (1968.2(d)(6.2))

EMA strongly opposes the application of infrequent regeneration adjustment factors ("IRAFs") to OBD monitors in this rulemaking for numerous reasons, including feasibility and stringency concerns, the workload burden IRAFs would place on manufacturers, the lack of necessary leadtime in imposing these new requirements, and the fact that further analysis is necessary before it can be determined whether and how IRAFs should be applied to OBD monitors.

2. Applying Infrequent Regeneration Adjustment Factors Increases The Stringency Of The OBD Standards And Makes Them Infeasible

The issue of IRAFs related to OBD monitors is brand new. When ARB adopted OBD thresholds for medium-duty engines and vehicles in previous rulemakings, and when it proposed new thresholds in this rulemaking, it did so without any consideration of IRAFs, or of the additional stringency created by the addition of IRAFs. Indeed, as OBD thresholds were reviewed and set in previous OBD II rulemakings and in the workshop and discussions leading up to the proposed amendments at issue, regulators and industry did not even mention – let alone analyze and account for – the feasibility and cost impacts of having to apply IRAFs to OBD emission threshold testing results to determine appropriate thresholds. This is also true for the HDOBD rulemaking.

As industry and ARB reviewed the technological feasibility issues with the existing OBD thresholds and likely changes to those thresholds throughout the past year, no mention was made of having to account for IRAFs in setting the appropriate thresholds. Manufacturers certainly had no expectation that they would be asked to account for infrequent regeneration events in the course of certifying their OBD systems and meeting established OBD thresholds. It was not until shortly before ARB published its proposal that ARB began discussing this possibility with one or two individual manufacturers. Indeed, throughout discussions in the last several years on heavy-duty OBD as well as medium-duty OBD, manufacturers have focused on the "baseline" case of how to meet OBD thresholds during non-regeneration events.

A "regeneration" event is one in which an aftertreatment device, such as a PM filter or NOX adsorber, is "regenerated" or restored to its original performance necessary to reduce the emissions levels from an engine in order to meet the emissions standard.

The underlying emission standards (federally and in California) require that emission results from an engine-aftertreatment system may need to be adjusted to account for infrequent regeneration events (for both increased and decreased emissions during regeneration) in order to provide for "a representative average emission level from the [engine or] vehicle" (ISOR, p.11). Thus, the underlying emission standards already require the application of IRAFs before an engine may be certified and sold.

Applying IRAFs to OBD monitors, as ARB is proposing, increases the stringency of the OBD thresholds which, as discussed below, already are of highly questionable feasibility. As EMA commented in great detail during the HDOBD rulemaking, achieving the OBD thresholds that ARB adopted last July is by no means assured. Those HDOBD thresholds, for the most part, are proposed to apply also to medium-duty engines and vehicles. While EMA supports having the same medium-duty OBD II thresholds as those for HDOBD, it is not because manufacturers know with certainty that they will be achievable. Indeed, the same feasibility concerns and uncertainty that manufacturers have with meeting the HDOBD thresholds and requirements also apply when it comes to meeting the proposed medium-duty OBD II thresholds and requirements. Adding IRAFs to already highly questionable thresholds simply assures that the IRAFs are technically infeasible.

When designing engine-aftertreatment systems to meet emission standards, and designing OBD systems to meet OBD 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. In other words, if the standard is 2.5 g/bhp-hr or .01 g/bhp-hr, manufacturers must design to some level below that number. Adding IRAFs – whether they are emission certification adjustment factors or uniquely-calculated adjustment factors – reduces or eliminates that margin, thereby increasing the stringency of the OBD threshold standards.

ARB's focus on adding IRAFs for OBD thresholds is unnecessary. Infrequent regeneration emissions from medium-duty engines already will be accounted for in the underlying emission standards beginning in 2007. Manufacturers must certify all their engines to emissions standards which are based on average weighted emissions over a test cycle, including not-to-exceed emissions and supplemental test requirements, and which include adjustments for infrequent regeneration events. These medium-duty engines and vehicles for which ARB is so keen to add more stringent OBD requirements already are meeting incredibly stringent standards. Requiring the calculation of IRAFs in OBD emission threshold test results is unnecessary, unreasonable and unjustified.

3. Requiring The Use Of Infrequent Regeneration Adjustment Factors For OBD Creates An Unreasonable Workload

ARB's proposed requirement to calculate IRAFs for every monitor creates an unreasonable and extremely high workload for manufacturers. In order to develop unique IRAFs for every OBD monitor, manufacturers would have to test for and calculate both upward and downward adjustment factors on each relevant component fully deteriorated to malfunction levels (that is, the threshold part). As defined in federal

regulation, upward adjustment factors (UAFs) are added to measured emission rates for all tests in which regeneration does not occur. Downward adjustment factors (DAFs) are added to measured emission rates for all tests in which regeneration does occur. . To be clear, this section of the Federal Register addresses defining the requirements for IRAFs for normally operating systems and does not begin to define a process that should be used for developing IRAFs that are unique to each OBD emission threshold monitor.

The following illustrates – in a very simple way – what the workload burden of the proposed requirement for IRAFs unique to each OBD emission threshold monitor begins to look like:

Assume that there are 13 OBD threshold monitors which a manufacturer must certify. Assume further that the engine has two regeneration devices (e.g., a PM filter and NOx adsorber). A manufacturer must determine unique UAF and DAF values for each OBD threshold monitor to each regeneration device. So if there are 13 emission thresholds monitors and two infrequent regeneration devices, there would be 26 unique IRAFs.

The process which a manufacturer must follow breaks down into the following steps, detailed more fully below:

1. Run emission tests to determine IRAFs for engine at the end of useful life.
2. Determine monitor #1 threshold part considering IRAF#1 (PM filter).
3. Determine monitor #2 threshold part considering IRAF#2 (NOx adsorber).
4. Determine monitor #3 through #13 threshold parts considering IRAF#1.
5. Determine monitor #3 through #13 threshold parts considering IRAF#2.

As required by the proposed amendments, the test configuration for each of the steps below requires the use of an end-of-useful life engine and aftertreatment system.

Step 1 in the process would be to determine the baseline IRAFs for the end of useful life engine. For this example, there are two infrequent regeneration systems (PM filter and NOx adsorber). This set of tests could require as many as 20-30 Federal Test Procedure (FTP) tests to be run for the PM filter infrequent regeneration and as many as 20-30 FTPs for the NOx adsorber infrequent regeneration. This would require running the normal emissions test cycle (e.g., FTP) and collecting emissions on the four emission constituents of interest (NOx, PM, NMHC and CO) during the test. This presumes that the manufacturer has determined that the transient (FTP) versus the steady-state emissions test cycle is the one that causes the worse case IRAF values.

Step 2 would be to determine the OBD emission threshold part for the OBD emission threshold monitor #1 (PM filter efficiency monitor). The emissions test cycle would need to be run repeatedly and emissions collected on all constituents until a regeneration cycle has completed (e.g., accumulation through complete regeneration). At this point, the IRAF information can be calculated and the emissions impact of the first attempt at the OBD threshold part for monitor #1 determined. The probability that the first threshold part creation results in emissions performance just at the right margin

below the OBD threshold is unlikely. Therefore, most, if not all, threshold parts require multiple iterations of step 2 to arrive at a threshold part that achieves the desired margin. Once this desired margin is achieved, then the manufacturer has obtained the "perfect threshold part" for monitor #1.

Throughout this process, the following two points should be kept in mind: (1) the time in an engine test cell or on a vehicle needed to create this perfect threshold part could be lengthy, and may be difficult to repeat. In other words, by whatever means is used to create the perfect threshold part, there is no means to accelerate the aging process to create additional copies of this part; and (2) the original perfect threshold part may become further deteriorated through repeated testing. Because the perfect threshold part has a finite life, the same time-consuming and costly process must be begun again to achieve a perfect threshold part.

Step 3 would be to determine the OBD emission threshold part for the OBD emission threshold monitor #2 (NOx adsorber efficiency monitor). The emissions test cycle would need to be run repeatedly and emission collected on all constituents until a regeneration cycle has completed (e.g., accumulation through complete regeneration). At this point, the IRAF information can be calculated and the emissions impact of the first attempt at the OBD threshold part for monitor #2 is determined. The probability that the first threshold part creation results in emissions performance at just the right margin below the OBD threshold is unlikely. Therefore, most, if not all, threshold parts require multiple iterations of step 3 to arrive at a threshold part that achieves the desired margin. Once this desired margin is achieved, then a manufacturer has obtained the "perfect threshold part" for monitor #2.

Step 4 would be to determine the OBD emission threshold part for the OBD emission threshold monitor #3 considering the impact on infrequent regeneration device #1 (PM filter). The emissions test cycle would need to be run repeatedly and emission collected on all constituents until a regeneration cycle has completed (e.g., accumulation through complete regeneration). At this point, the IRAF information can be calculated and the emissions impact of the first attempt at the OBD threshold part for monitor #3 determined. The probability that the first threshold part creation results in emissions performance at just the right margin below the OBD threshold is unlikely. Therefore, most, if not all, threshold parts require multiple iterations of step 4 to arrive at a threshold part that achieves the desired margin. Once this desired margin is achieved, then a manufacturer has obtained the "perfect threshold part" for monitor #3.

Step 5 would be to determine the OBD emission threshold parts for OBD emission threshold monitors #4 through #13 considering the impact on infrequent regeneration device #1 (PM filter).

Step 6 would be to determine the OBD emission threshold part for the OBD emission threshold monitor #3 considering the impact on infrequent regeneration device #2 (NOx adsorber). The emissions test cycle would need to be run repeatedly and emissions collected on all constituents until a regeneration cycle has completed (e.g. accumulation through complete regeneration). At this point the IRAF information can be

calculated and the emissions impact of the first attempt at the OBD threshold part for monitor #3 determined. The probability that the first threshold part creation results in emissions performance just at the right margin below the OBD threshold is unlikely. Therefore, most, if not all, threshold parts require multiple iterations of step 6 to arrive at a threshold part that achieves the desired margin. Once this desired margin is achieved, then a manufacturer has obtained the "perfect threshold part" for monitor #3.

Step 7 would be to determine the OBD emission threshold parts for OBD emission threshold monitors #4 through #13 considering the impact on infrequent regeneration device #2 (NOx adsorber).

The information available from steps 4 and 5 would then be compared to that from steps 6 and 7 to determine which creates the correct "perfect threshold part." According to the OBD regulation, the worst case IRAFs would have to be the ones used as the correct "perfect threshold part."

As illustrated above, all the testing on all the emission threshold monitors for all applicable test cycles and each infrequent regeneration device and full useful life engines/aftertreatment translates to an enormous amount of engineering resources, expense, test cell time, and leadtime required to obtain the data necessary to develop unique IRAFs for each OBD emission threshold monitor. In fact, engine manufacturers estimate that the proposed requirements would increase their OBD threshold development work by at least double that which manufacturers currently predict for achieving threshold compliance *without* the addition of IRAFs. ARB simply should not impose such unreasonable, unjustified and costly requirements.

ARB attempts to justify adding IRAFs by, among other things, stating that manufacturers will be able to use engineering evaluation and analysis to determine the impact of regeneration events on OBD emissions (ISOR, p. 12). 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. At best, manufacturers have no knowledge of whether engineering analysis is sufficient. Either way, even in the limited circumstances (as the ISOR points out) in which engine manufacturers could rely on engineering analysis to develop appropriate IRAFs, manufacturers still would need to conduct some level of testing and obtain some amount of data to use as a basis for the judgments. Staff is well aware that engineering analysis cannot be pulled out of thin air, but must be based on real data and knowledge gained from testing.

4. The Costs Of Adding IRAFs Far Outweigh The Benefits

Given the high cost of calculating infrequent regeneration adjustment factors for OBD II threshold monitors and the minimal anticipated benefits from adding IRAFs, ARB should not adopt IRAF requirements in this rule. The sections of the Staff Report describing the overall emission benefits and cost-effectiveness of the OBD II rule provide little justification for the proposed amendments generally (see Section III.B) and

completely fail to provide any analysis of the costs vs. benefits of adding IRAF provisions.

In fact, when discussing the benefits of requiring IRAFs, Staff admits that their value is low: "[S]taff expects some monitors will have no, or a negligible[,] impact on the regeneration events and thus require no recalculation of adjustment factors" (ISOR, p. 12). As noted above, Staff believes that, in many cases, engineering analysis will be sufficient to determine whether regeneration events change incremental emissions or frequency of regeneration. Typically, engineering analysis is considered sufficient when the impacts of a given event or characteristic are anticipated to have little or no impact. Thus, by their own arguments, Staff is admitting that there will be little or no incremental emissions benefit from adding IRAFs to the OBD requirements. If that is the case, then IRAFs are not needed at all. More important, balancing the enormous workload and costs against the anticipated emissions benefit, there is simply no comparison – adding IRAFs is not cost-effective.

5. ARB's "Compromise" Proposal To Use Emission Certification Adjustment Factors Beginning In 2007 Is Technically Incorrect, Does Not Provide Sufficient Leadtime, And Should Not Be Adopted

When manufacturers learned of ARB's intent to require the development of unique IRAFs for OBD threshold components shortly before ARB published the proposed amendments, manufacturers outlined the significant workload involved in developing those IRAFs. In the ISOR, Staff noted the workload issues and indicated that it was proposing to provide "interim relief" to address manufacturers' resource issues. What Staff proposed is that manufacturers would not have to develop unique IRAFs for each threshold monitor until 2010, with the exception of unique IRAFs for the NMHC catalyst monitor in 2008, but that manufacturers could use the "baseline" adjustment factors used for certification to the underlying emissions standards beginning in 2007. In other words, manufacturers would be expected to "transfer" the emissions certification IRAFs to use as OBD certification IRAFs. In that way, Staff believed that manufacturers could avoid the significant workload issues and "simply…add in the adjustment factor when calibrating the OBD II monitors" (ISOR, p. 12). That proposed approach, however, is not technically correct, does not provide sufficient leadtime, and should not be adopted.

a. Using Emissions Certification Infrequent Regeneration Adjustment Factors For OBD Certification Is Technically Incorrect

ARB's proposal to use emission certification IRAFs is not technically correct. The IRAFs that manufacturers have developed or are just now developing for 2007 model year engine emission certification are based on baseline engine emissions, not on OBD threshold emissions. There is no technical justification for simply carrying over the adjustment factors for one purpose and declaring them appropriate for another purpose. In discussions with manufacturers, Staff admitted that it did not have technical justification or data for applying emissions certification IRAFs to OBD monitors. Rather,

ARB is proposing their use simply as a "placeholder" for specific OBD threshold component IRAFs yet to come.

It should be noted that the development and application of emissions certification IRAFs which ARB assumes can be used are still being discussed among industry and the regulatory agencies (ARB and EPA). Three years ago, the agencies and industry began discussions on emissions certification IRAFs and the development of an appropriate guidance document for manufacturers. Over the course of the past three years, there have been numerous drafts of a guidance document from EPA on how IRAFs were to be developed and used for emissions certification purposes. EPA issued its "final" version of the guidance document less than four months ago, and that final document includes provisions to which manufacturers strongly object and are seeking further revision. To assume that something that is still unclear and in flux for the purposes for which it was designed (IRAFs for emissions certification) is now "ready" to be used for a different purpose (IRAFs for OBD certification) is not logical.

Engine manufacturers appreciate ARB's attempt to propose a "compromise," but we do not support a "compromise" that has no technical basis and may lead to the wrong result. As a regulatory agency, ARB should not adopt a requirement that is technically incorrect. It is bad regulatory policy and it is wrong from an engineering perspective. Moreover, adopting a technically incorrect requirement does not in any way advance air quality in the State of California. ARB's obligation as a regulatory agency is to adopt technologically feasible, technically correct, and justifiable requirements.

b. ARB Has Failed To Provide Sufficient Leadtime And Period Of Stability For The Application Of IRAFS

Even if applying emission certification adjustment factors were technically correct, ARB has failed to provide the necessary leadtime and stability for this new requirement. ARB has proposed that this new requirement would begin in 2007. As discussed above, anything that reduces or eliminates the margins on which manufacturers have been relying in developing technologies to meet the OBD threshold standards makes those threshold standards more stringent. Requiring manufacturers now – at the time they are in the midst of certifying engines for the 2007 model year – to use IRAFs to calculate whether the OBD thresholds have been met suddenly and without warning makes the OBD threshold standards more stringent, does not provide enough time for manufacturers to incorporate necessary technology changes, and fails to provide sufficient leadtime and period of stability.

Even without having to develop unique IRAFs for each OBD threshold monitor now, applying the emissions certification IRAFs to the OBD emissions results automatically makes the OBD threshold standards some percentage more stringent. Manufacturers have provided data to Staff demonstrating that using emissions certification IRAFs reduces the margin and increases stringency of the OBD threshold standards by about 10%. ARB cannot change the OBD threshold standards now without providing any leadtime at all. ARB must provide at least four model years' leadtime before making any changes that would increase the stringency of the OBD standards.

Moreover, ARB's proposal to require the calculation of unique IRAFs for the NMHC catalyst monitor beginning in 2008 also fails to provide the necessary four years' leadtime and three years' period of stability required by the CAA or the "reasonable time" required by California law. With the new OBD threshold standards becoming effective in 2007, the first time any new standards could be implemented (assuming sufficient leadtime was provided) would be in 2010. Implementing new IRAF requirements for 2008 does not provide sufficient leadtime or period of stability. To illustrate, as a practical matter, a manufacturer that was relying on a functional check to meet the OBD threshold standard for the NMHC catalyst during the 2007-2009 time frame could be forced to change monitoring strategies and perhaps add new hardware in order to meet the new IRAF requirement effective in 2008. It is simply too late to make such changes and assure that the monitoring strategies are properly validated and in place for the 2008 model year.

Any changes – including new OBD threshold requirements – that might undermine the success of meeting the new heavy-duty emissions standards in 2007 should not be considered. It is simply too late to make a change for 2007, 2008 or 2009. Manufacturers recognize that there are many issues related to IRAFs that must be evaluated and we are willing to work through those issues with the regulatory agencies. But ARB cannot proceed with its proposed new requirements for IRAFs now because ARB's proposal fails to provide sufficient leadtime and period of stability.

c. ARB, EPA And Industry Should Engage In A Collective Consideration And Analysis Of IRAFs In The OBD Context Outside Of This Rulemaking

On-board diagnostics is a complex and highly technical issue. Determining whether and how infrequent regeneration events have an impact on OBD performance, and whether and how IRAFs should be integrated into the OBD threshold standards, further complicates an already-complex set of regulations. Any steps that ARB takes to address infrequent regeneration issues should be taken with care and deliberation, not as a last-minute measure.

Discussions on the current proposed amendments began well over a year ago. Staff held a workshop for all interested parties last November, shared draft regulatory language changes at that time, and engaged in numerous meetings and discussions with manufacturers over the last year. ARB did, in fact, share a draft of the regulatory language early this year, which apparently included new regulatory language covering adjustment factors. Yet, despite periodic, regular exchanges of information with both the medium-duty and light-duty industry, ARB did not highlight to manufacturers the significant change it was planning to propose regarding IRAFs and did not attempt to engage the industry in any discussions on this issue. Not until individual manufacturers began discussing with ARB their plans for 2007 OBD certification did Staff make clear its intent to add IRAFs. Manufacturers believe that process was not provided in a way to allow meaningful comment and interaction on the IRAF issue.

In light of the significant concerns of manufacturers regarding the addition of IRAFs in calculating OBD emission threshold standards, EMA recommends that ARB, EPA and manufacturers engage in a collective industry effort over the next two to three years to assess the issue of infrequent regeneration adjustment factors in the OBD context. Specifically, such an effort should include assessing the need for IRAFs in determining compliance with OBD threshold standards, assessing the feasibility issues associated with adding IRAFs to OBD thresholds, assessing the cost-effectiveness of adding IRAFs to OBD thresholds, determining how to apply IRAFs, if deemed necessary and appropriate, for 2010 and later years, and any other analyses the industry group believes necessary to fully evaluate the IRAF issue. If IRAFs are deemed necessary and appropriate, one of those additional analyses should include the development of specific measures, equivalent to those required for medium-duty, for defining and calculating how light-duty and medium-duty chassis-certified vehicles meet the IRAF requirements (not currently defined).

EMA envisions that this industry effort will begin now, as EPA is set to propose its federal heavy-duty OBD program later this month, and will continue with the biennial review set to start in 2007 to review the heavy-duty OBD program adopted in 2005. The IRAF issues brought to light within the context of this medium-duty OBD II rule apply equally in the heavy-duty context, and EMA recommends that they be considered together. The joint agency-industry effort would continue into 2008, at the time when the OBDII rule and proposed amendments currently being considered come before ARB in another biennial review. In that regard, we ask the Board to direct Staff to eliminate IRAF requirements from the proposed amendments and engage in discussion and analysis with EPA and industry as described here to evaluate future IRAF requirements.

B. ARB Must Revise The 2007 And 2010 Medium-Duty OBD II Threshold Standards And Requirements

Manufacturers support many of the changes that ARB has proposed to make to the requirements for 2007 and 2010 OBD monitoring requirements. While the ISOR correctly notes that many of the emission malfunction thresholds have been "relaxed" from those currently in the regulation (ISOR, p.9), the current threshold requirements that ARB adopted in 2002 were not technologically feasible. Thus, changes to the existing thresholds are absolutely necessary. But ARB has not gone far enough to adopt technologically feasible thresholds in the proposed amendments and further changes are needed.

EMA supports aligning the medium-duty diesel OBD requirements – both the threshold levels and implementation dates – with those adopted last year in the HDOBD rulemaking. Such an approach is appropriate because many of the engines complying with the medium-duty and heavy-duty requirements are the same engines. As noted above, however, achieving the aggressive OBD thresholds that ARB established for heavy-duty diesel engines is by no means assured. And, the more that manufacturers are learning as they begin to develop OBD technologies, the more they question the threshold standards that were adopted for HDOBD. It follows then, that the feasibility of those

OBD standards and requirements for medium-duty engines and vehicles is questionable as well.

EMA has recommended numerous changes to the 2007 medium-duty OBD threshold requirements in many cases. In some cases, ARB has added new requirements for which there is insufficient leadtime. Staff refers to these in the ISOR as "substantially more detailed and rigorous monitoring requirements" (ISOR, p.9). EMA agrees that many such monitoring requirements are substantially more detailed and rigorous. Where that is the case, then, ARB must provide sufficient leadtime to achieve those substantially more detailed and rigorous monitoring requirements. In some cases, the requirements are new as applied to diesel engines and, in those cases, sufficient leadtime also must be provided. Finally, in some cases, ARB has proposed amendments which are still not technically feasible. EMA presented to Staff in recent discussions its recommendations for 2007 thresholds. Attached to these Comments are EMA's specific monitoring proposals, which in some cases include revisions to the thresholds and in others recommend functional monitors in lieu of specific thresholds (Exhibit A). EMA recommends that ARB revise its 2007 requirements accordingly.

We also recommend changes to the 2010 requirements, which changes we will be discussing further with Staff as the biennial review of the HDOBD program begins next year. In summary, where ARB has adopted NOx thresholds of 2.5x standard, EMA recommends now for medium-duty – and plans to recommend next year for heavy-duty – that those be revised to 3.5x standard. The more data that manufacturers gather, the more they are learning about the significant technical feasibility concerns with the program that ARB adopted for heavy-duty and is proposing to adopt for medium-duty. In short, engine manufacturers seriously question whether they will reach the 2010 OBD targets in time. EMA recommends that ARB revise the proposed 2010 thresholds also as outlined in the attached Exhibit A.

C. ARB Should Adopt Clear, Technologically Feasible OBD Standards For Medium-Duty Chassis Certification

ARB has proposed OBD II thresholds for 2007 and 2010 for engine-dynamometer certified engines ("engine-dyno engines") that are too stringent and must be revised. But for medium-duty chassis-dynanometer certified engines ("chassis-dyno engines") ARB has proposed no standards at all. Rather, ARB proposes that medium-duty chassis-dyno engines be required to meet the engine-dyno thresholds only if manufacturers can demonstrate "equivalency" of those thresholds to the engine-dyno thresholds (1968.2(f)(17.1.5)). In other words, ARB is proposing a "standard" without establishing what the standard is that manufacturers must meet or what the method is to meet that standard. Standards do not exist in a vacuum but must be based on a clear method of measurement. Under ARB's proposal, however, medium-duty chassis-dyno engines would not be able to be sold in California unless they can meet this "standard-not-a-standard."

In order to meet its obligations under federal and California law, ARB must define a clear process or method as to how manufacturers may meet the medium-duty

chassis-dyno thresholds. Engine manufacturers proposed to Staff such a method, which involves using ratios based on the standards and thresholds developed for engine-dyno engines. This "ratioing" method is based on the assumption that EPA and ARB applied an equal stringency logic to the development of the underlying emission standards for chassis-dyno engines. EMA proposed to Staff that ARB adopt chassis-dyno thresholds which reflect the same ratios of the OBD II engine-dyno thresholds to the engine-dyno emission standards in order to treat engine-dyno and medium-duty chassis-dyno engines on an appropriately equivalent basis. To clarify, EMA is not proposing that the same numerical threshold limits should apply, but that the same ratios of standards to thresholds apply.

Such an approach is workable and provides clear and technically reasonable standards for engine manufacturers. ARB should not adopt the proposed language for medium-duty chassis-dyno thresholds unless it includes a clear method for determining those thresholds. Staff has suggested additional language that it believes may define such a method. Until engine manufacturers have sufficient time to review it and understand the implications of the suggested modifications to the proposed amendments, EMA cannot comment with any specificity. We do note, however, that the additional language relies on consideration of "best available monitoring technology." As discussed more thoroughly in connection with another provision in the proposed amendments, EMA does not support such language because it also fails to provide a clear and constant standard (see Section II.D).

To the extent ARB fails to include clear standards or a clear method for meeting medium-duty chassis-dyno requirements, or does not adopt the ratio method, ARB must in any event clarify in the regulation that any method used to meet the requirements is not intended to, and will not, require manufacturers to conduct additional testing beyond that necessary for calibrating the OBD system on a single test cycle. Staff confirmed that intent in discussions with manufacturers, and ARB must include such a clarification in the regulation.

D. ARB Should Eliminate "Best Available Monitoring Technology" Language From The Proposed Amendments

In another variation on "standard-but-not-a-standard," the proposed amendments would allow the Executive Officer to determine whether a manufacturer has met an OBD standard in a given year by comparing that manufacturer's technology with that used by other manufacturers. Specifically, ARB would require the Executive Officer to review manufacturers' proposals for monitoring components that are required to be monitored "to the extent feasible" by considering, among other factors, "best available monitoring technology [BAMT]" (1968.2(f)(17.7)). What that would mean in practice is that when a manufacturer presented its monitoring plan on a given component to ARB for approval, ARB could review and reject the plan because it did not use the technology that another manufacturer used, and on that basis deny certification.

BAMT is not an appropriate measure for ARB to use in establishing OBD standards, and ARB should eliminate the BAMT language from the proposed

amendments. The BAMT language the ARB has proposed to add (both in section (f)(17.7) and in revised section (f)(17.1.5)) would subject manufacturers to a standard that is, at worst, completely unknown (and, therefore, not a standard at all) and, at best, a moving target that unquestionably violates the 4-year leadtime and 3-year period of stability requirements.

Essentially, the proposed language would require manufacturers to use their competitors' technology when ARB decided it was appropriate. But that results in no clear standard at all. Manufacturers do not know their competitors' technology. Even if they know what technologies their competitors may be using generally, they do not have access to the specific information and details required to successfully apply the OBD monitoring technology to the engine component at issue.

Moreover, each manufacturer must develop OBD technologies appropriate to its own engine systems and technologies used to meet the underlying emission standards. One manufacturer's OBD monitoring approach may or may not be appropriate for another manufacturer or technology. Emission standards and OBD standards must be developed based on what is technologically feasible, as determined by looking at various technologies which manufacturers are developing, and are meant to be technology-neutral. In other words, the standards do not – nor should they – prescribe technologies manufacturers must use in meeting those standards. ARB's proposed amendment to consider BAMT when approving a monitoring plan (or meeting medium-duty chassis-dyno standards) would do just that.

Furthermore, basing approval of manufacturers' monitoring plans on "best available monitoring technology" would create a "standard" that is constantly moving and would codify ARB's practice of playing manufacturers off against each other year after year after year. Staff has acknowledged that their current practice is to review what manufacturers are doing year to year and suggest changes to OBD monitoring technology that must be incorporated for the next year's OBD certification, thereby changing the standards on a yearly basis. Staff also has indicated that ARB could, in fact, deny certification in any given year (i.e., without giving manufacturers even a year to adopt the new suggested approach) based on consideration of BAMT and the other criteria that have been proposed. Such an approach ignores and, indeed, violates the leadtime and stability requirements of the CAA (and California law) by forcing yearly changes in monitoring strategies.

In discussions with manufacturers, Staff has suggested that it may be willing to revise the BAMT criteria to tie it to what manufacturers "knew or should have known" and to the limitations of manufacturer hardware. While EMA supports that language as an improvement to the current proposal, because it attempts to minimize some of the unknown, such language does nothing to eliminate the risk that a standard may change year by year.

In sum, ARB should eliminate references to "best available monitoring technology" because relying on BAMT creates an unknown, ever-changing standard that violates federal and California law. In fact, ARB should include specific language in the

regulation that maintains leadtime and stability and prohibits the Executive Officer from forcing yearly changes in years between the implementation of adopted OBD thresholds and monitoring requirements.

E. The Proposed AECD-Related Requirements Are Not Appropriate Or Justified OBD Measures

The proposed amendments would require the OBD II system to keep track of how often a subset of "auxiliary emission control devices" ("AECDs") are activated. As ARB describes them, AECDs are typically software strategies that alter the way an engine or its emission control system works when specific conditions are met in order to protect the vehicle, engine, or other emission control components from damage. The subset of AECDs at issue in the pending OBD II rulemaking are those AECDs that: (a) are justified by the manufacturer as necessary to avoid vehicle, engine, or emission control component damage; and (b) reduce the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered during normal vehicle operation and use (hereinafter, "emission-increasing AECDs" or "EI-AECDs"). Significantly, for medium-duty vehicles, an AECD that is certified as a "NTE deficiency" will not be considered an EI-AECD. Further, an AECD that does not sense, measure, or calculate any parameter or command or trigger any action, algorithm, or alternate strategy will not be considered an EI-AECD.

The proposed OBD II requirements for EI-AECDs are extensive and very onerous. Specifically, starting with the 2010 model year, manufacturers of diesel engines installed in medium-duty vehicles will need to develop software algorithms to individually track and report in a standardized format the total engine run time during the time period that each separate EI-AECD is active (e.g., total run time with EI-AECD #1 active, total run time with EI-AECD #2 active, and so on up to total run time with EI-AECD #n active). In addition, for any EI-AECDs that have variable actions or degrees of action, those EI-AECDs will need to be tracked with two separate counters. The first of the two counters is required to be incremented whenever the EI-AECD is commanding some amount of reduced emission control effectiveness up to but not including 75% of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding during in-use vehicle or engine operation. The second of the two counters is required to be incremented whenever the EI-AECD is commanding 75% or more of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding during in-use vehicle or engine operation (1968.2(g)(6)).

In its ISOR for the proposed amendments, Staff describes the rationale for the EI-AECD requirements as follows:

> For those strategies that meet all the requirements above to be considered an EI-AECD, the on-board computer would be required to count cumulative time each one is operated and update the stored counter at the end of each driving cycle with the total cumulative time during the driving cycle. Further, each EI-AECD would be counted and

> reported separately (EI-AECD #1, etc.). ARB staff would be able to use this data to confirm or refute previous assumptions about expected frequency of occurrence in-use, and use the data to support modifications to future model year [certification] applications and better ensure equity among all manufacturers. This data will also help ARB staff identify "frail" engine designs that are under-designed relative to their competitors and inappropriately relying on EI-AECD activation to protect the under-designed system.
>
> * * *
>
> During inspections or other programs, the data could be read-out from the vehicle's computer, and staff would be able to see the actual in-use frequency of operation of these [AECD] strategies that increase emissions. Strategies that are activated more frequently than originally estimated by the manufacturer (and documented at the time of certification) would warrant further investigation and trigger the need to be re-evaluated prior to approving future model year vehicles using the same strategy. Large differences in activation time between various manufacturers' EI-AECDs would also warrant further investigation to determine if the inequity is a result of a manufacturer using a system that is inadequately designed and is utilizing an EI-AECD to make-up for it.
>
> (ISOR, pp. 74, 13.)

EMA has very significant concerns with the proposed amendments as they pertain to EI-AECDs.

As an initial matter, the proposed EI-AECD requirements have nothing to do with OBD-related issues and functions. The EI-AECD requirements at issue are not in any way related to the identification, diagnosis or remediation of malfunctions in engine emission control systems or their various components. Instead, the proposed EI-AECD requirements are only potentially germane to initial engine family certification determinations. Consequently, there is no justification for including such EI-AECD requirements in an OBD regulation.

Moreover, ARB Staff has not demonstrated why the current certification process -- which requires engine manufacturers to provide ARB with extensive disclosures, detailed descriptions and data relating to the necessity for and operation of any AECD -- is insufficient to protect ARB interests and prevent unwarranted uses of AECDs. This is especially true since the AECDs at issue here are not those related to approved "NTE deficiencies," and so are not those that could result in any non-compliance with the

underlying emission standards in any event. Indeed, even if the EI-AECDs at issue could impact emissions compliance in-use (again, not the case here), any such deficiency-related AECDs, by their very nature, may only be provisional measures that manufacturers are required to phase-out over time, and may not be carried over routinely from one model year to another. ARB's existing regulations are very clear on this point, and unambiguously state, as follows:

> Deficiencies for NTE Requirements
>
> 3.1 For model years 2005 through 2009, upon application by the manufacturer, the Executive Officer may accept a HDDE as compliant with the NTE requirements even though specific requirements are not fully met. Such compliances without meeting specific requirements, or deficiencies, will be granted only if compliance would be infeasible or unreasonable considering such factors as, but not limited to: technical feasibility of the given hardware and lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers. Deficiencies will be approved on an engine model and/or horsepower rating basis within an engine family, and each approval is applicable for a single model year. A manufacturer's application must include a description of the auxiliary emission control device(s) which will be used to maintain emissions to the lowest practical level, considering the deficiency being requested, if applicable. An application for a deficiency must be made during the certification process; no deficiency will be granted to retroactively cover engines already certified.
>
> 3.2 Unmet requirements should not be carried over from the previous model year except where unreasonable hardware or software modifications would be necessary to correct the deficiency, and the manufacturer has demonstrated an acceptable level of effort toward compliance as determined by the Executive Officer. The NTE deficiency should only be seen as an allowance for minor deviations from the NTE requirements. The NTE deficiency provisions allow a manufacturer to apply for relief from the NTE emission requirements under limited conditions. ARB expects that manufacturers should have the necessary functioning emission control hardware in place to comply with the NTE.

(40 CFR (Subpart N), §86.1370-2007 (California provisions, ¶¶ 3.1 and 3.2).)

Thus, there is no justification for including the AECD-related requirement at issue in the pending amendments to the OBD II rule. Those requirements have nothing to do with the maintenance and repair of malfunctioning emission control components, and ARB already has ample means at the time of certification to ensure that AECDs are not claimed or relied upon inappropriately by engine manufacturers. Indeed, since the AECDs at issue here are not those that could occasion an NTE deficiency in any event, the rationale for compelling such detailed tracking of those AECDs as additional elements of an already over-taxing OBD program is, from an environmental perspective (let alone from a cost and feasibility perspective), without basis.

Turning to feasibility concerns, ARB has failed to demonstrate the technical feasibility of implementing the proposed EI-AECD requirements (including the dual tracking requirements for EI-AECDs that have variable degrees of action) on top of all of the other onerous requirements at issue in the OBD II proposed amendments. The potential impacts and strains that the proposed EI-AECD requirements will impose on already-strained ECM storage and operational limits have not been assessed, nor has the feasibility of discerning the proposed 75% threshold been established (i.e., requiring the development and installation of counters capable of distinguishing on a second-by-second basis when an EI-AECD is operating above and below "75% of the maximum reduced emission control effectiveness that the EI-AECD is capable of commanding"). Until such time as ARB has clearly demonstrated the feasibility of the EI-AECD tracking requirements at issue, those requirements should not be adopted or implemented.

Similarly, ARB has made no showing whatsoever of the cost-effectiveness of the proposed EI-AECD requirements. Indeed, because those requirements are not directed at detecting and correcting any excess vehicle emissions that might occur in-use as a result of malfunctioning emission control components (the focus of legitimate OBD-related requirements) there are no emission benefits that can be associated with the EI-AECD requirements at issue. The lack of emissions benefits is particularly obvious since, as noted above, the EI-AECDs at issue are specifically defined to exclude those AECDs that might occasion an NTE deficiency. As a result, the cost-effectiveness of the proposed AECD-tracking requirements simply cannot be established.

In sum, ARB should not include any of the proposed EI-AECD requirements in the final OBD II regulations. Those EI-AECD requirements are wholly unrelated to any legitimate OBD objectives and functions. Moreover, the feasibility and cost-effectiveness of those requirements has not been and cannot be established.

F. The Proposed NTE-Related Requirements Are Not Appropriate Or Justified OBD Measures

ARB is proposing to include additional non-OBD requirements in the OBD II regulation. Specifically, ARB would require that all diesel engines installed in 2010 and subsequent model year medium-duty vehicles must implement standardized functions to track the following items: "NOx NTE control area status (*i.e.*, inside control area, outside control area, inside manufacturer-specific NOx NTE carve-out [5% limited testing] area, or NTE deficiency for NOx active area) and PM NTE control area status (*i.e.*, inside

control area, outside control area, inside manufacturer-specific PM NTE carve-out [5% limited testing] area, or NTE deficiency for PM active area)" (1968.2(g)(4.2.5(E)). Like the EI-AECD provisions, these proposed NTE-related requirements have nothing to do with the purpose and function of OBD requirements -- detecting and correcting malfunctions in key emission control system components.

The ISOR confirms that the foregoing NTE-related requirements have nothing to do with the diagnosis and facilitation of emission control component repairs -- the core functions of OBD systems. In that regard, the ISOR states as follows:

> In recent years, feedback from technicians in the field has identified the need for additional parameters to be made available by the vehicles' OBD II system to assist them in effective repair. Thus, the proposed amendments define some additional parameters (data stream and freeze frame values) that manufacturers would be required to report. Further, the proposed amendments better address diesel vehicles by requiring many new diesel engine specific parameters to be reported on all diesel vehicles.
>
> While the data parameters are generally used for technicians to assist them in repairs, some of the data is also used for the Smog Check program and for compliance or enforcement testing by ARB staff. An example of one of the parameters that manufacturers would be required to report to facilitate in-use emission compliance testing by ARB staff is the real-time status of the NOx and PM "not-to-exceed" (NTE) control areas.
>
> (ISOR, p. 71.)

There is no adequate basis to include NTE-related "in-use emission compliance testing" requirements in an OBD rulemaking. In fact, a separate in-use compliance rulemaking is being considered by the Board on the very same day that the proposed amendments to the OBD II rule are being considered. An assessment of that in-use emission compliance testing program, which is essentially identical to a federal EPA program and which is already being implemented in California, demonstrates that the NTE-related components of the OBD II proposal are wholly unnecessary and unjustified.

Under the ARB's pending in-use emission compliance regulation, engine manufacturers will utilize portable emissions measurement systems ("PEMS") to assess the in-use compliance of designated diesel engine families with their applicable NTE emission limits. Specifically, in-use vehicles containing engines from ARB-designated engine families will be recruited and tested during their normal driving patterns pursuant to a detailed and comprehensive test program previously negotiated and agreed upon by EPA, ARB, and engine manufacturers. As a part of that program, very specific second-by-second data -- including all of the NTE-related data at issue in the OBD II proposal --

will be recorded and reported to ARB and EPA pursuant to an expansive electronic data submission template.

In addition, the pending ARB in-use compliance testing regulation already explicitly requires engine manufacturers to provide detailed information to ARB to enable ARB to gather the exact same NTE-related information at issue whenever ARB requests it to facilitate ARB's own in-use compliance testing of vehicles. Specifically, proposed regulatory section 86.1370-2007 (California provisions, ¶5) of the pending ARB in-use compliance testing rule provides as follows:

> 5. Submission of NTE deficiencies and limited testing region information. Manufacturers are not required to provide engine information exclusively related to in-use testing as part of initial certification. However, upon request from ARB, the manufacturers must provide the information which clearly identifies parameters defining all NTE deficiencies described under subparagraph B.3. of this section and parameters defining all NTE limited testing regions described under 86.1370-07(b)(6) and (7) that are requested. When requested, deficiencies and limited testing regions must be reported for all engine families and power ratings in English with sufficient detail for us 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 referenced in 86.1375. Such information is to be provided within 60 days of the request from ARB.

(Initial Statement of Reasons, Public Hearing to Adopt California's Heavy-Duty Diesel In-Use Compliance Regulation, p. B-16.)

Thus, all of the NTE-related data that ARB is seeking under the proposed amendments will already be made available pursuant to the thoroughly-negotiated in-use compliance testing regulation that ARB is poised to adopt, and is otherwise accessible by ARB through its own in-use compliance testing of vehicles with PEMS. In light of this, there simply is no justification for placing this additional NTE-reporting burden on all engine manufacturers with respect to all engines under the OBD II program. For those engines that will be subject to in-use testing, either by manufacturers under the in-use testing program or by ARB, the NTE-related data at issue is already available through the PEMS and manufacturer-supplied information that are being utilized in conjunction with the in-use compliance testing regulation. Accordingly, ARB should not proceed at the very same time to include redundant, ineffectual and unduly burdensome NTE-related requirements in the OBD II rule. Instead, those requirements should be removed from any final version of the OBD II regulation.

G. ARB Should Not Force Manufacturers To Provide A "Smart" Component For Tolerance Compensation Matching

ARB has proposed that, beginning with the 2013 model year, manufacturers must incorporate software strategies to detect the use of fuel system components that have the incorrect tolerance ("component tolerance compensation matching") (1968.2(f)(15.2.2)(E)). Staff indicated it has included this provision to ensure service technicians make the right repairs and do not have to manually code in the tolerance compensation features of the fuel system component being repaired or replaced.

EMA has discussed with Staff that modifying the design of the engine control system to automatically detect the use of fuel system components without proper or "matched" tolerance compensation is not a practical solution to the perceived problem. The cost to add software code to automatically detect this type of error – creating a "smart" component because someone might make a mistake – is very costly and is not justified. In fact, manufacturers question whether or not this is a problem that causes in-use emission issues. While accidentally coding in the wrong tolerance compensation features could occur, that is the case with many of the mechanical components on the engine. But it would be impractical to try to guess at and anticipate, and force manufacturers to make a fix for, every error that may or may not occur.

Manufacturers rely on service technicians working on medium-duty engines to be properly trained to ensure the correct parts are installed when the engine is serviced. Those who want to service the product correctly – particularly those who service, or themselves rely on, the product for commercial purposes – will have the information to do so. Manufacturers already ensure – and will continue to ensure – that adequate and appropriate service information is provided to allow mechanics to be trained properly and to have the ability to identify the properly toleranced parts for the specific application. ARB should not adopt the proposed amendments to this provision.

H. Additional In-Use Compliance Flexibility Is Needed For Meeting Monitoring Ratio Requirements

In addition to meeting OBD II threshold standards, manufacturers also must meet other requirements, including provisions establishing minimum times in which a monitor must run, known as "monitoring ratios." ARB has proposed to allow manufacturers some in-use compliance flexibility in meeting the monitoring ratio requirements. Specifically, ARB has proposed that engine manufacturers may meet "interim" monitoring ratios of 0.100 (rather than 0.33) until 2012 (1968.2(d)(3.2.1)(D)(iii)). EMA supports this change, as it is necessary to provide manufacturers some flexibility in meeting the new and increasingly more stringent monitoring requirements that become effective in 2007, 2010 and 2013. But this added in-use flexibility is needed beyond 2012.

Specifically, EMA has proposed to Staff the addition of the following language to 1968.2(d)(3.2.1):

> For the first three years after a manufacturer introduces and meets requirements for a new monitor but after the required implementation date, the manufacturer must design the monitor to final ratio requirements, but a 0.100 minimum ratio would apply for in-use compliance determination. This provision may not be used beyond the first five years after a new monitor is required.

EMA's intent with this language is to provide manufacturers essentially three years after introduction of a new monitor by a manufacturer in which the manufacturer would have to design to the higher final ratio but would be held responsible to the lower 0.100 ratio in use. This compliance flexibility would be limited, however, in that a manufacturer could not rely on the provision beyond the first five years after a new monitor was required by the OBD II regulation. Staff has suggested that a more simple approach would be to extend the in-use flexibility through 2015. EMA supports that as an alternative to our suggested language.

I. EMA Supports ARB's Proposed Changes To Allow Manufacturers To Meet Requirements Based on Engine, Not Vehicle, Model Year

Based on discussions between Staff and engine manufacturers since the adoption of OBD II regulations in 2002, ARB is proposing to allow manufacturers of medium-duty engines certified on an engine-dynamometer basis to certify to the OBD II requirements based on the model year of the engine, not the model year of the vehicle, except in cases where the OBD II requirement is specifically intended for use in the California Smog Check program (1968.2(b)). For various reasons that we have outlined previously to ARB, EMA supports this approach. It properly recognizes that engine manufacturers produce engines, not vehicles, and that forcing engines to be certified on a vehicle model year would inappropriately force those engines to meet the wrong standards.

J. ARB Should Make Additional Deficiencies Available To Manufacturers

As part of its OBD requirements, ARB has historically made available to manufacturers the opportunity to take "deficiencies" for limited cases in which manufacturers have attempted to meet the monitoring requirements but for reasons outside their control have not been able to meet a particular requirement. Under the current rule, ARB allows each medium-duty manufacturer two free deficiencies per engine family for any monitors in the 2007-2009 time frame. For various reasons, engine manufacturers recommend that ARB allow four free deficiencies in the 2007-2009 time frame, three of which may be used for any reason, and one of which may be used only in connection with an aftertreatment system.

As described elsewhere in these comments, engine manufacturers have substantial concerns with the technical feasibility of various aspects of the proposed amendments, in particular the aggressive OBD threshold standards that ARB is proposing to amend. Although ARB is proposing to "relax" the stringency of those thresholds from what is in

the existing rule, those thresholds have not been changed sufficiently to make them technologically feasible. Moreover, ARB has added new threshold requirements for which it has failed to provide sufficient leadtime. And, with the 2007 model year having already begun many months ago, ARB's biennial review is occurring too late to be meaningful. Manufacturers already have been asked to meet these new requirements as they attempt now and over the next three months to OBD-certify 2007 model year engines.

EMA does not by any means advocate that deficiencies should be used as a substitute for timely, thorough and appropriate analysis and evaluation of technological feasibility. Having said that, however, the reality is that ARB's OBD II requirements – existing and proposed – put manufacturers at too great a risk to proceed without a "backstop" such as deficiencies, if, despite their best efforts, they cannot achieve what ARB has established.

III. The Proposed Amendments Must Be Feasible, Be Cost-Effective, And Provide Sufficient Leadtime and Stability

The medium-duty OBD II proposed amendments under consideration constitute new emission standards that engine manufacturers must meet before introducing their products for sale into commerce. Because the Board is adopting new standards, it is subject to clear mandates both by the U.S. Congress in the federal Clean Air Act and by the California legislature in state law. Any mobile source emission standards adopted by the ARB for on-highway engines and vehicles from 8,500-14,000 lbs. GVWR require a waiver of federal preemption from EPA and must be technologically feasible, must be cost-effective, and may be implemented only if the requisite leadtime and period of stability are provided to manufacturers.

A. ARB Must Adopt OBD Requirements That Are Technologically Feasible

Under CAA Section 209(b), which authorizes California to adopt emissions standards for mobile sources only if certain conditions are met, California's emission standards must be consistent with CAA Section 202(a). Section 202(a) requires, among other things, that emission standards for heavy-duty engines must be technologically feasible:

> [S]tandards must reflect the greatest degree of emission reduction achievable through the application of technology … determine[d to] be available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology.

CAA Section 202(a)(3); 42 U.S.C. §7521. *See Motor & Equip. Mfrs. Ass'n v. Nichols*, 142 F.3d 449, 463 (D.C. Cir. 1998) ("In the waiver context, section 202(a) 'relates in relevant part to technological feasibility and to federal certification requirements.'") (citing *Ford Motor Co. v. EPA*, 606 F.2d 1293, 1296 n. 17 (D.C. Cir. 1979)); *see also*

Motor & Equip. Mfrs. Ass'n v. EPA, 627 F.2d 1095, 1111 (D.C. Cir. 1979) (consistency with the CAA requires standards to be " technologically feasible").

California law also requires that emission standards be justified and technologically feasible. Under the California Health & Safety Code, ARB "may adopt and implement motor vehicle emission standards … which [ARB] has found to be necessary, cost-effective, and technologically feasible." Cal. Health & Safety Code, §43013. Staff has failed to justify the technological feasibility of many of the proposed requirements.

B. ARB Must Demonstrate That The Proposed Amendments Are Cost-Effective

ARB must demonstrate that its proposed control measures are cost-effective under both federal and state law. Section 202(a) of the CAA requires the Board to consider cost and other related factors in setting new heavy-duty engine and vehicle emission standards. The California Health & Safety Code establishes a similar mandate for ARB, requiring the Board to adopt emissions standards which will result in the most cost-effective combination of control measures on motor vehicles and fuel. And the California Government Code requires the Board to assess the proposal's economic impacts (Section 11346.3 and 11346.5).

Staff has not met the burden of showing the proposed amendments are cost-effective. Staff has both underestimated the costs to engine manufacturers and vehicle owners and has not fully analyzed the cost-effectiveness (the costs v. the emission benefits).

ARB's cost-effectiveness and emissions benefit discussion in the ISOR for the proposed amendments points to ARB's previous analysis of cost-effectiveness from the 2002 amendments to the OBD II rule. Despite wide-ranging new requirements, ARB relies on past analysis for its current rulemaking. The extent of ARB's analysis is to conclude that, based on the 2002 numbers and ARB's assumptions, a new medium-duty vehicle in 2013 will cost only $153 additional due to the OBD requirements of this rule. Part of ARB's assumptions are that, while repairs will cost more, engine durability will increase, thereby balancing out the additional repair cost. It is not realistic to assume that medium-duty manufacturers will meet the extremely complex, ever-more-stringent OBD II requirements and increase engine durability while holding down the cost of new products as ARB estimates. In fact, the 2002 analysis to which ARB points in the ISOR for this rule has very little discussion of the costs vs. benefits of the medium-duty requirements.

Furthermore, despite having proposed to add significant new requirements to the OBD II rule including infrequent regeneration adjustment factors and AECD and NTE tracking, ARB has completely failed to assess the cost impact and anticipated benefits of such requirements. Indeed, EMA questions whether ARB could justify any of those requirements if it were to properly analyze and assess the OBD II rule and its costs against the emissions benefits anticipated from it. ARB must conduct a thorough,

updated and focused analysis on the proposed amendments to determine their true costs for manufacturers and for consumers, as well as their true benefit to air quality.

C. ARB Must Provide Sufficient Leadtime And Period Of Stability

As detailed above, engine manufacturers need sufficient time to develop OBD technology that is feasible and practical. California law requires that standards must be adopted within reasonable time frames (Cal. Health & Safety Code, Section 43013). Section 202(a) of the CAA also requires the ARB to assure that it provides sufficient leadtime and period of stability for any new heavy-duty engine or vehicle standard:

> Any standard promulgated or revised under this paragraph and applicable to classes or categories of heavy-duty vehicles or engines shall apply for a period of no less than 3 model years beginning no earlier than the model year commencing 4 years after such revised standard is promulgated.

In other words, any new emission standards may go into effect only four or more full model years after the year in which they were promulgated. And those new standards must stay in effect for at least three full model years before ARB may establish another standard. Unless California meets those requirements, it has no authority to adopt emissions standards for on-highway heavy-duty engines.

Section 209(b) of the CAA requires that ARB's emission standards must be consistent with Section 202(a) for EPA to waive federal preemption and allow California to enforce its own emission standards. Unless ARB demonstrates that the standards are technologically feasible and cost-effective, and provides sufficient leadtime and stability to engine manufacturers, California cannot obtain the necessary preemption waiver from EPA.

IV. Next Steps

A. ARB Must Undertake A Timely And Thorough Biennial Review

California law requires that ARB conduct biennial rulemaking reviews to evaluate manufacturers' progress toward meeting the standards established by ARB. It is crucial that such biennial reviews be conducted in a timely manner in order to provide manufacturers some degree of certainty with respect to the standards they are being asked to meet. As manufacturers work toward achieving the aggressive OBD threshold standards that ARB has proposed, they will learn more and become smarter about just what is possible and technologically feasible. But ARB's review of technology and any changes to requirements during a biennial review cannot wait until the last minute, when manufacturers have already invested their limited resources in meeting regulatory requirements and are under time constraints to certify their products. As discussed above, manufacturers need certainty so they may use their limited resources most effectively – certainty in knowing what standards they must meet and the time frame in which to meet them.

It also is crucial that biennial reviews be a true review of the current and expected technological capability and progress of manufacturers toward meeting the regulations previously established, including an updated assessment of the expected costs associated with the requirements. A biennial review is not meant to be – nor should it be – ARB's opportunity to increase the stringency of the regulations to make them more difficult to meet. In many cases, as time progresses, the technology development needed to meet the new requirements may not have progressed as expected, resulting in higher costs, increased uncertainty, and potentially less capable systems than ARB assumed during the previous rulemaking. Timely and thorough biennial reviews are essential.

B. **ARB Must Support A Meaningful Waiver Process**

ARB must ensure that its actions with respect to the proposed amendments support a meaningful federal preemption waiver process. In other words, ARB should not delay in submitting the proposed amendments to EPA for review, and ARB must refrain from enforcing any new or more-stringent requirements than those contained in the existing rule until EPA has taken action on the waiver request.

Indeed, based on the leadtime requirements of the CAA, it's already too late to submit a waiver request and obtain EPA approval for the new requirements that would be applied to medium-duty diesel engines in the 2007 to 2009 time frame. And, it is too late for model year 2010 as well. In that regard, ARB must refrain from enforcing the new and more-stringent threshold standards and other requirements that are contained in the proposed amendments until the 2013 model year. Any other approach would render the requirements of the federal Clean Air Act and California law meaningless.

V. **Conclusion and Recommendations**

OBD II regulations are complex, far-reaching, and highly technical. Many of the proposed amendments would establish extremely technology-forcing thresholds that manufacturers do not know how they will meet. A number of changes are necessary to the proposed amendments to make them technologically feasible, cost-effective, and in line with leadtime and stability requirements. EMA urges the Board to direct Staff to work further with engine manufacturers to make the necessary changes to address the issues raised in these comments and in our ongoing discussions with Staff. Specifically, ARB must:

- Eliminate IRAF requirements from the proposed amendments and engage in discussion and analysis with EPA and industry to evaluate future IRAF requirements, if any.

- Revise the 2007 monitoring requirements and thresholds.

- Revise the 2010 monitoring thresholds.

- Adopt clear and technologically feasible standards for OBD II medium-duty engine chassis certification, and clarify that any method used to meet

the requirements will not impose additional testing requirements beyond that necessary for calibrating an OBD system on a single test cycle.

- Eliminate "best available monitoring technology" as a compliance criterion.

- Delete the proposed EI-AECD tracking requirements from the final rule..

- Delete the proposed NTE-related tracking requirements from the final rule.

- Eliminate any requirement forcing manufacturers to provide a "smart" component for tolerance compensation matching.

- Extend in-use compliance flexibility for monitoring ratios through 2015.

- Allow four free deficiencies in the 2007-2009 time frame, three of which may be used for any reason, and one of which may be used only in connection with aftertreatment systems.

- Assure sufficient leadtime and period of stability for all the OBD standards.

The Board also must direct Staff to conduct timely and meaningful future biennial reviews to evaluate whether technology is progressing as ARB predicted and whether manufacturers can meet the OBD II rule's requirements. Engine manufacturers need certainty and stability – they need to know the requirements well in advance and know they are not changing – so that they can work productively and cost-effectively toward the goals that are set. Manufacturers should not be required to expend time and effort on attempting to develop costly monitoring strategies that are not feasible. Without certain changes in this rule, that is exactly what will happen. ARB must make the recommended changes and support engine manufacturers in their efforts and take all steps possible to ensure a timely, cost-effective, and feasible rule.

Respectfully submitted,

ENGINE MANUFACTURERS ASSOCIATION

EXHIBIT A

EMA Proposal
2007/2010 Monitors
Medium-Duty Diesel OBDII (8,500-14,000 lbs. GVWR)

September 1, 2006

2007 Monitors

Existing or New Threshold	**System Fault**	**Proposal >0.5**	**Proposal ≤0.5**	**ARB >0.5**	**ARB ≤0.5**	**Comment**
Existing	Fuel system pressure	1.5x PM std+.02[1]	2.5x PM std+.02	1.5x PM std+.02	2.0x PM std+.02	As standard drops, variability increases; SULEV II analogy
Existing	Low EGR flow	3.5x PM std+.02	3.5x PM std+.02	1.5 x PM std+.02	2.0x PM std+.02	Infeasible as proposed
Existing	High EGR flow	3.5x PM std+.02	3.5x PM std+.02	1.5 x PM std+.02	2.0x PM std+.02	Infeasible as proposed
New	EGR cooler performance	Functional	Functional	1.5 x PM std+.02	2.0x PM std+.02	Lack of leadtime
Existing	NMHC converting cat – conversion efficiency	Functional	Functional	1.75xNMHC NMHC>.14	2.0xNMHC NMHC≤.14	Infeasible as proposed
Existing	NOx converting cat – conversion efficiency	Functional	Functional	1.75x NOx	NOx std+0.3	Infeasible as proposed
New	NOx converting cat – reductant delivery failure	Functional	Functional	1.75x NOx	NOx std+0.2	Lack of leadtime

[1] References to additive PM standards of .02 should be ratioed up to PM std +.04 for chassis-certified engines.

Existing	NOx adsorber capability	Functional	Functional	1.75x NOx	NOx std+0.3	Infeasible as proposed
Existing	PM filter performance	Functional	Functional	PM std/FEL +.04	PM std/FEL +.04	Infeasible as proposed
New	PM filter too freq regen	Functional	Functional	1.75xNMHC NMHC>14	2.0xNMHC NMHC≤14	Lack of leadtime
New	DPF that converts NMHC	Functional	Functional	1.75xNMHC NMHC>14	2.0xNMHC NMHC≤14	Lack of leadtime

New as applied to diesel	Exhaust gas sensor - A/F upstream of aftertx	Functional	Functional	1.5x PM std+.02	2.0x PM std+.02	As applied to diesel, this is a new requirement; lack of leadtime
New as applied to diesel	Exhaust gas sensor - A/F downstream of aftertx	Functional	Functional	2.0x NMHC 1.5x CO 1.75xNOx PM std+.04	2.0x NMHC 1.5x CO NOx std+.02 PM std+.02	As applied to diesel, this is a new requirement; lack of leadtime
New	NOx sensors – deterioration of voltage, current, etc.	Functional	Functional	1.75x NOx PM std+.04[2]	NOx std +.20 PM std +.02	Lack of leadtime

[2] References to additive PM standard of .04 should be ratioed up to PM std +.08 for chassis-certified engines.

2010 Monitors

Existing or New Threshold	System Fault	Proposal	ARB ≤0.5	Comment
Existing	Fuel system pressure	3.5x PM std+.02	2.0x PM std+.02	As standard drops, variability increases; SULEV II analogy[3]
New	Fuel injection quantity	3.5x PM std+.02	2.0x PM std+.02	Same; lack of leadtime
New	Fuel injection timing	3.5x PM std+.02	2.0x PM std+.02	Same; lack of leadtime
New	Full range misfire (HCCI)	3.5x PM std+.02	2.0x PM std+.02	Lack of leadtime
Existing	Low EGR flow	3.5x PM std+.02	2.0x PM std+.02	Infeasible as proposed
Existing	High EGR flow	3.5x PM std+.02	2.0x PM std+.02	Infeasible as proposed
New	EGR slow response	3.5x PM std+.02	2.0x PM std+.02	Lack of leadtime
New	EGR cooler performance	3.5x PM std+.02	2.0x PM std+.02	Lack of leadtime
New	Underboost	3.5x PM std+.02	2.0x PM std +.02	Lack of leadtime
New	Overboost	3.5x PM std+.02	2.0x PM std +.02	Lack of leadtime
New	VGT slow response	3.5x PM std+.02	2.0x PM std +.02	Lack of leadtime
New	Charge air undercooling	3.5x PM std +.02	2.0x PM std +.02	Lack of leadtime
Existing	NMHC converting cat – conversion efficiency	3.5x NMHC	2.0x NMHC NMHC≤.14	Infeasible as proposed
Existing	NOx converting cat – conversion efficiency	3.5x NOx std or NOx std + 0.50	NOx+0.2	Infeasible as proposed
New	NOx converting cat – reductant delivery failure	3.5x	NOx std+.02	Lack of leadtime

[3] The argument for higher thresholds as the standard drops applies broadly across monitors.

Existing	NOx adsorber capability	3.5 x std	NOx std +0.2	Infeasible as proposed; align with HD
Existing	PM filter performance	Higher of PM std/FEL+.04 or .05 (5x std) 2013: higher of PM std/FEL+.02 or .03	PM std/FEL +.02 2013: PM std/FEL +.01	Infeasible as proposed; align with HD
New	PM filter regen too frequently	3.5x std	2.0x NMHC NMHC ≤.14	Lack of leadtime
New	DPF that converts NMHC emissions	3.5x std	2.0x NMHC NMHC ≤.14	Lack of leadtime
New as applied to diesel	Exhaust gas sensor - A/F upstream of aftertx	3.5x std	2.0x PM std+.02	As applied to diesel, this is a new requirement; lack of leadtime
New as applied to diesel	Exhaust gas sensor - A/F downstream of aftertx	3.5x std PM std+.04	2.0x NMHC 1.5x CO NOx std+.02 PM std+.02	As applied to diesel, this is a new requirement; lack of leadtime
New	NOx sensors – deterioration of voltage, current, etc.	3.5x std PM std+.04	NOx std +.20 PM std +.02	Lack of leadtime