State of California
AIR RESOURCES BOARD

**Final Statement of Reasons for Rulemaking,
Including Summary of Comments and Agency Response**

PUBLIC HEARING TO CONSIDER TECHNICAL STATUS AND PROPOSED REVISIONS TO ON-BOARD DIAGNOSTIC SYSTEM REQUIREMENTS FOR PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES AND ENGINES AND HEAVY-DUTY ENGINES ON-BOARD DIAGNOSTIC SYSTEM REQUIREMENTS, AND TO CONSIDER ENFORCEMENT PROVISIONS FOR HEAVY-DUTY ENGINES ON-BOARD DIAGNOSTIC SYSTEM REQUIREMENTS

Public Hearing Date: May 28, 2009
Agenda Item No.: 09-5-2

I. GENERAL

The Staff Report: Initial Statement of Reasons for Rulemaking ("staff report"), entitled *Technical Status and Revisions to Malfunction and Diagnostic System Requirements for Heavy-Duty Engines (HD OBD) and Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines (OBD II)*, released April 10, 2009, is incorporated by reference herein.

Following a public hearing on May 28, 2009, the Air Resources Board (the Board or ARB) by Resolution 09-37 approved, with modifications, the adoption of amendments to California Code of Regulations, title 13, sections 1968.2 and 1971.1, and adoption of California Code of Regulations, title 13, section 1971.5. Upon becoming operative, the amendments to sections 1968.2 and 1971.1 update the OBD II and HD OBD requirements for light-duty, medium-duty, and heavy-duty vehicles and engines, and section 1971.5 establishes enforcement procedures and requirements for HD OBD systems.

Within the resolution, the Board directed the Executive Officer to adopt the proposed amendments and enforcement regulation after making available for public comment all changes specifically directed by the Board and any other necessary changes to the regulatory language as originally proposed in the staff report released on April 10, 2009. The changes directed by the Board, in addition to other changes were made in response to comments received during the 45-day period at the hearing. The changes were made available for public comment in the Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information (15-Day Changes) issued on October 20, 2009. Descriptions of and rationales for the modifications were provided in the attachment to the 15-Day Notice. The 15-Day Notice is incorporated by reference herein.

Additionally, staff made a few minor non-substantive changes to the final regulation order for section 1971.1 to correct numbering errors in the proposed regulatory

language that were originally made available with the staff report. Specifically, sections 1971.1 (e)(4.1.1), (e)(4.1.2), (h)(4.2.3)(B) and (C), and (i)(2.3.1) contain numberings that should have been underlined (i.e., shown as proposed additional text) as well as numberings that should have not been underlined since they were already present in the existing regulatory text.

In the 45-Day Notice for this rulemaking, the ARB referenced a few new Society of Automotive Engineers (SAE) documents and updated several SAE and International Organization of Standards (ISO) documents that would be incorporated by reference in sections 1968.2 and 1971.1. The new and updated SAE and ISO documents that are incorporated by reference in the regulations are:

ISO 15765-4:2005 “Road Vehicles – Diagnostics on Controller Area Network (CAN) – Part 4: Requirements for emission-related systems,” January 2005;

SAE J1699-3 “OBD II Compliance Test Cases”, May 2006;

SAE J1930 "Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms – Equivalent to ISO/TR 15031-2," October 2008;

SAE J1978 "OBD II Scan Tool – Equivalent to ISO/DIS 15031-4: December 14, 2001," April 2002;

SAE J1979 "E/E Diagnostic Test Modes," May 2007;

SAE J2012 "Diagnostic Trouble Code Definitions," December 2007;

SAE J2403 “Medium/Heavy-Duty E/E Systems Diagnosis Nomenclature,” August 2007;

SAE J2534-1 “Recommended Practice for Pass-Thru Vehicle Programming”, December 2004;

SAE J1939 “Recommended Practice for a Serial Control and Communications Vehicle Network,” March 2009;

SAE J1939/1 “Recommended Practice for Control and Communications Network for On-Highway Equipment,” September 2000;

SAE J1939/11 “Physical Layer, 250K bits/s, Twisted Shielded Pair,” September 2006;

SAE J1939/13 “Off-Board Diagnostic Connector,” March 2004;

SAE J1939/15 “Reduced Physical Layer, 250K bits/sec, UN-Shielded Twisted Pair (UTP),” August 2008;

SAE J1939/21 “Data Link Layer,” December 2006;

SAE J1939/31 “Network Layer,” April 2004;

SAE J1939/71 “Vehicle Application Layer (Through February 2008),” January 2009;

SAE J1939/73 “Application Layer—Diagnostics,” September 2006;

SAE J1939/81 “Network Management,” May 2003; and

SAE J1939/84 “OBD Communications Compliance Test Cases For Heavy Duty Components and Vehicles,” December 2008.

Additionally, the following document has been incorporated by reference in section 1971.1:

ARB Mail-Out MSC#09-22, “Guidelines for Heavy-Duty On-Board Diagnostic (HD OBD) Certification Data,” July 7, 2009.

Existing administrative practice of ARB has been to have technical recommended practices, such as the above, incorporated by reference rather than printed in the California Code of Regulations. These procedures are highly complex technical documents. Because ARB has never printed these types of documents in the California Code of Regulations, the affected public is accustomed to the incorporation format utilized in sections 1968.2 and 1971.1. Moreover, printing portions of the documents in the California Code of Regulations when the bulk of the procedures are incorporated by reference would be unnecessarily confusing to the affected public. Additionally, the documents from SAE and ISO are copyrighted and are available only for purchase on the organizations’ websites. The full documents are instead available for public inspection from the Clerk of the Board at 1001 I Street, 23rd floor, Sacramento, California 95814.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has prepared an estimate in accordance with instructions adopted by the Department of Finance, and determined that the regulatory action would not create overall costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary cost or savings to state or local agencies.

Alternatives. For the reasons stated in the staff report and the Board’s response to comments in this Final Statement of Reasons (FSOR), the Board has determined that no alternative considered by the agency would be more effective in carrying out

the purpose for which the regulatory action was proposed or would be as effective and less burdensome to affected private persons than the action taken by the Board.

II. SUMMARY OF COMMENTS AND AGENCY RESPONSE

At the May 28, 2009 hearing, ARB received written comments and/or oral testimony from:

Ms. Lisa Stegink, Engine Manufacturer's Association (EMA)
Mr. Mark Stepper, Cummins Inc. (Cummins)
Mr. Michael Read, Navistar Inc., Engine Group (Navistar)
Mr. Eric T. Swenson, Navistar Inc., Truck Engineering Group (Navistar)
Mr. John Trajnowski, Ford Motor Co. (Ford)
Mr. Tim Carmichael, Coalition for Clean Air and American Lung Association (ALA)
Mr. Chung Liu, South Coast Air Quality Management District (SCAQMD)

Written comments in response to the 45-Day Notice were received during the 45-day comment period prior to the hearing from:

Mr. Jed R. Mandel and Ms. Lisa A. Stegink, EMA
Mr. Barry R. Wallerstein, SCAQMD

Written comments in response to the 15-Day Changes were received during the 15-day comment period from:

Ms. Lisa A. Stegink, EMA
Mr. Hironori Narita and Mr. Chikako Sato, Hino Motors, Ltd. (Hino)

Below is a summary of each objection or recommendation made regarding the specific regulatory actions proposed, together with an explanation of how the proposed action was changed to accommodate each objection or recommendation, or the reasons for making no change. The comments have been grouped by topic wherever possible. Comments not involving objections or recommendations specifically towards the rulemaking or to the procedures followed by ARB in this rulemaking are not summarized below.

45-DAY COMMENTS

COMMENTS IN SUPPORT

1. Comment: We support ARB's continuing efforts in developing OBD II requirements for California vehicles. OBD II is the primary monitoring and enforcement tool in identifying and monitoring in-use emissions of light-, medium-, and heavy-duty vehicles, and has proven very valuable in ensuring that continuous and life-cycle performance standards for light- and medium-duty engine and emission control systems are met. OBD requirements for heavy-duty vehicles will be of even greater importance since they are not subject to an

inspection and maintenance program. We support the proposal to develop and implement a heavy-duty OBD-specific enforcement regulation (section 1971.5) comparable to that for light- and medium-duty OBD II, and believe this regulation will adequately address in-use testing of OBD systems and provides ARB with authority to discourage the use of system defeat devices as previously experienced with some heavy-duty diesel engine manufacturers. (SCAQMD)

2. Comment: EMA supports the proposed elimination of the monitoring requirement for MIL circuit malfunctions in the HD OBD regulation. (EMA)

3. Comment: EMA agrees with ARB's proposed changes to section 1971.1(h)(1) to reference the more relevant versions of the SAE standards for standardized communications, which better harmonizes details in the standard to details in the regulations. Industry will continue its efforts to maintain these standards as the regulations evolve. (EMA)

4. Comment: EMA agrees with the proposed HD OBD regulation change requiring diagnostic connectors to be located and oriented such that it is possible to safely operate the vehicle with the connector in use. (EMA)

5. Comment: EMA supports the proposed clarifications to the standardization requirements in the HD OBD regulation regarding test results. ARB should continue to work with industry to better understand the measurement methods used in diesel engine monitors and review the list provided in this section for additional cases where unique test results are not practical. (EMA)

6. Comment: EMA supports allowing multiple CAL IDs and CVNs in the HD OBD regulation, which some manufacturers already use in their production and record-keeping systems. (EMA)

7. Comment: EMA supports the proposed HD OBD requirement to make the engine serial number available, as this aids the administration of engine service today. (EMA)

8. Comment: EMA supports the changes to the idle time definition in section 1971.1(h)(5) where engine speed may be substituted for vehicle speed for engines not equipped with a vehicle speed sensor. (EMA)

9. Comment: It is important to the future of air quality in California that ARB have the ability to gather data and enforce its regulations. We support OBD for light-duty, heavy-duty, diesel, and hybrid vehicles. On the point seemingly most contentious to the industry, we strongly believe in-use enforcement testing should happen. There is ample evidence over time indicating there is a difference between engines tested on the bench and in-use. If testing is necessary, considering the options available to ARB, having manufacturers conduct this testing appears to be the most efficient method. An alternative

would be for ARB to charge fees on every new engine sold in California to fund testing; however this is not the most efficient way for ARB to proceed. (ALA)

10. Comment: Heavy-duty is the last mobile source category without an adequate OBD regulation and a routine Smog Check program. Heavy-duty is a significant category. Staff offers a good rationale for in-use testing, that there could be major differences between certification pass results and in-use results. A test program is necessary to assure that NOx, PM, and ROG emission reductions can be achieved. SCAQMD staff has reviewed the proposals and procedures and believe this rule is a reasonable approach. I cannot believe that the engine manufacturer would like somebody else to do the testing, since they have the capability and knowledge to do such testing. (SCAQMD)

11. Comment: We support staff's proposal and encourage the Board to adopt the staff proposal as drafted. (ALA)(SCAQMD)

    Agency Response to Comments 1-11: We appreciate the comments.

GENERAL COMMENTS ABOUT THE REGULATIONS

12. Comment: Though ARB uses the term “medium-duty” to describe engines and vehicles in the 8,500-14,000 pound GVWR range, these engines/vehicles are actually “heavy-duty” under the federal Clean Air Act (CAA). Unlike the light-duty industry, the heavy-duty engine industry (which also encompasses the medium-duty industry) is a non-vertically integrated industry where manufacturers of engines are not typically the manufacturers of the chassis or vehicles in which those engines are used. Heavy-duty engine manufacturers produce and sell their engines to customers who put them in many different types of chassis or vehicles with many different types of customer specifications and performance requirements, so they simply cannot predict all the variations in which their engines will be used and do not have control over vehicles. Thus, it is an extreme burden for these manufacturers to calibrate OBD monitors for use in these myriad of vehicle configurations. Light-duty manufacturers, however, produced both engine and vehicle, integrating all systems into a single product for sale. Thus, further changes must be made to limit engine manufacturers’ responsibility for vehicle matters outside their control. Heavy-duty engines and vehicles also play a far more significant role in commerce (construction to goods transport, tow trucks to utility vehicles, waste haulers to delivery trucks) than light-duty vehicles, and are commercial assets of their respective businesses and represent a significant capital investment by their owners. Any regulatory provisions covering heavy-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. (EMA)

    Agency Response: In developing the changes to the HD OBD (and medium-duty diesel OBD II) regulation, the staff limited the scope of the requirements as much as possible to the engine and tried not to involve items outside of the engine.

However, there are interactions between the engine and the vehicle in which it is installed that do have to be taken into account when designing and implementing a robust OBD system that actually works when the engine is being operated in a vehicle on the road. Like other emission and safety requirements, in some cases the engine manufacturer does have to impose limitations on how the vehicle builders integrate the engine into the vehicle to ensure the engine and its emission controls remain in a certified and legal configuration. OBD will likely add more limitations to the existing ones and will become part of the build specifications that engine manufacturers provide to vehicle manufacturers to ensure proper integration of the engine.

ARB does not fully agree with the commenter's statements regarding the non-vertically integrated nature of medium-duty vehicles and their role in commerce when compared to heavy-duty vehicles. In contrast to the heavy-duty sector, the vast majority of medium-duty engines are indeed partnered and integrated with a specific full size pick-up chassis. Nonetheless, ARB largely aligned the amendments for medium-duty engines with the requirements previously adopted for heavy-duty engines where there is much more diversity in application and usage. Additionally, the proposed changes, which significantly better address the new emission control technologies that will be used in future diesels, are indeed modifications to the OBD II system requirements that have been successfully implemented for ten years on medium-duty diesels and are not expected to adversely affect their role in commerce.

13. Comment: Timely and thorough biennial reviews are essential. California law requires ARB to conduct biennial rulemaking reviews to evaluate manufacturers' progress towards meeting ARB's standards. 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 (which they need to know), and not take place at the last minute, when manufacturers have already invested their limited resources in meeting the requirements (they need to use these resources most effectively) and are under time constraints to certify their products. As manufacturers work toward achieving the aggressive OBD threshold standards ARB proposed, they will learn more and become smarter about what is possible and technologically feasible. It is crucial that biennial reviews be a true review of the current and expected technology capability and manufacturers' progress towards meeting the regulations previous established, with an updated assessment of the expected costs associated with the requirements. These reviews are not meant to be and should not 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. (EMA)

Agency Response: Although not required under the Health and Safety Code, the Board, consistent with its policy of periodically reviewing OBD regulations, directed staff in two years to closely monitor vehicle manufacturers in complying with the requirements of sections 1968.2 and 1971.1, title 13, California Code of Regulations, and the implementation of section 1971.5, title 13, California Code of Regulations, and to report back to the Board in approximately two years, if amendments to the regulations are necessary. The staff understands the manufacturers' needs to have the requirements defined well in advance and has made every effort to accommodate the manufacturers. The requirements set forth are technically feasible and are not expected to change appreciably in subsequent biennial reviews of the regulation. Most often, changes at biennial reviews add clarification or additional requirements where staff has identified emission-related malfunctions that are not adequately covered by the current language. In other cases, lead times have been extended to accommodate manufacturers' requests for more time to meet the requirements. However, these changes are not made because of technical infeasibility.

Additionally, as ARB staff gains more experience and knowledge in the field, it is entirely appropriate for staff to adopt new monitoring requirements in order to assure robustness of the OBD systems and durability of emission control components. Through annual certification efforts, staff has often identified areas where current monitoring requirements are insufficient to ensure proper emission control operation for the life of the vehicle and took action to address those areas. Staff has also found cases of high-emitting vehicles without MIL illumination in the field that have necessitated new monitoring requirements for previously unanticipated failure modes in order to prevent more pollution. Likewise, new emission control technologies emerge and the requirements are updated to provide as detailed requirements as possible to manufacturers regarding the appropriate level of monitoring that is necessary. Given the technical nature of the OBD system and the ever evolving emission controls used by vehicle manufacturers, it would be completely inappropriate to focus biennial reviews solely on revisiting the past requirements.

14. Comment: ARB must ensure that its actions with respect to the amendments support a meaningful federal preemption waiver process. ARB should not delay in submitting the amendments to the Environmental Protection Agency (EPA) for review and 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. But based on the lead time requirement of the CAA, it's already too late to submit a waiver request and obtain EPA approval for the new requirements that would apply to 2010 model year heavy-duty diesel engines. In that regard, ARB must refrain from enforcing the proposed amendments until at least the 2013 model year. Any other approach would render the requirements of the federal CAA and California law meaningless. (EMA)

Agency Response: ARB has no intent or plan to unnecessarily delay the waiver process. Historically, ARB has submitted applications for waivers for OBD

rulemakings in a very timely manner and has not contributed to delays in the waiver process and plans to do so for this OBD rulemaking as well. As the commenter is aware, the HD OBD regulation was initially adopted by ARB and approved by the Office of Administrative Law in 2006, and the request to the U.S. Environmental Protection Agency (EPA) was filed within several months, more than three years prior to commencement of the 2010 model year. EPA granted the waiver in September 2008. ARB recognizes that the application for a waiver is a necessary element in the process and works to complete the application as soon as possible and intends to file its request for a waiver, including a request that EPA confirm that certain of the adopted amendments fall within the scope of the 2008 waiver, expeditiously. To the extent that the amendments apply to 2010 to 2013 model-year engines, the amendments address requirements that were adopted in 2006 and covered by the 2008 waiver. The amendments provide immediate relief to manufacturers through relaxed criteria, additional compliance options, or clarification of previously adopted requirements. In its request to EPA, ARB will take the position that those amendments fall within the scope of the previously granted waiver.

For those requirements that are new or more stringent, ARB has provided lead time to meet these requirements, with a start date of 2013 model year or later. ARB will request that EPA grant a new waiver for these requirements.

15. Comment: While EMA's comments below focus primarily on heavy-duty monitors under the HD OBD regulation, the same issues apply to medium-duty diesel engines under the OBD II regulation, requiring similar changes as those EMA recommends for the HD OBD regulation. (EMA)

    Agency Response: ARB understands this and will address the comments accordingly.

LEAD TIME, FEASIBILITY, AND COST-EFFECTIVENESS

16. Comment: Many of the proposed HD OBD amendments constitute new emission standards that engine manufacturers must meet before selling their products. Thus, the standards are subject to clear mandates by the U.S. Congress in the federal CAA and by California legislature in state law. As required by CAA Section 209(b), any mobile source emission standards adopted by ARB for on-highway engines and vehicles from over 8,500 lbs. require a waiver of federal preemption from U.S. EPA, must be technologically feasible and cost-effective, and may be implemented only if the requisite lead time and period of stability are provided to manufacturers (according to CAA Section 202(a)). If ARB's standards don't meet these requirements, California cannot obtain the necessary preemption waiver from EPA. (EMA)

    Agency Response: In Resolution 09-37, the Board directed staff to request a waiver from U.S. EPA and made all the necessary findings necessary to obtain a waiver. Contrary to the unsupported assertions of the commenter, the staff

report fully supports the findings of the Board that the requirements of this regulation are technologically feasible and cost-effective. Although technological feasibility and cost-effectiveness, along with a finding that the regulations are necessary, are requirements under California law (Health and Safety Code section 43013) cost-effectiveness is not a required element for granting a waiver under section 209(b) of the CAA. Additionally, the OBD requirements are not subject to the lead time and stability requirements specified in the CAA. See agency response to comments 17-20 for more details.

17. Comment: ARB must adopt OBD requirements that are technologically feasible. However, staff has failed to justify the technological feasibility of many of the proposed requirements, and they must be revised. According to CAA Section 209(b), which authorizes California to adopt emission standards for mobile sources only if certain conditions are met, the standards must meet CAA Section 202(a), which requires that, among other things, "standards 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." California law also requires that emission standards be justified and technologically feasible (Health and Safety Code §43013). Manufacturers have spent and continue to spend significant resources in meeting the OBD standards, and are forced to expend resources each time changes to the OBD rule are adopted to meet the new technological challenges. Yet many times, those challenges were proven to be infeasible requiring last minute changes. As ARB staff explained in the staff report, some of the thresholds and requirements that ARB adopted in 2005 for HD OBD were not feasible and must now be revised. While ARB can set technology-forcing standards, it has an obligation to set standards that reasonably can be projected to be technologically feasible. Manufacturers should not be required to expend time and effort (i.e., their limited resources and precious test cell time) in trying to develop costly monitoring strategies that are not feasible. (EMA)

    Agency Response: Contrary to the unsupported assertions of the commenter, the staff report fully supports the findings of the Board that the requirements of this regulation are technologically feasible. Further, the proposed amendments have set forth technically feasible monitoring requirements, and it is not expected to make significant changes to the regulation in the future. As required, staff has identified methods that are already in-use or could be used to meet each proposed monitoring requirement, determined that such methods will likely succeed in getting there, and addressed all technical issues regarding the monitoring requirements raised by industry. Additionally, as noted in the agency's response to comment 14 above, several of the amendments relax previously adopted monitoring thresholds to a higher emission level. However, as noted in the staff report, these changes were not made because the initially adopted requirements were technically infeasible. In all cases, at least one or two manufacturers appeared to be on track to meet the existing requirement

without the need for relaxation. However, staff recommended interim relief due to the complexity of the 2010 emission control solutions being pursued by several manufacturers—including some configurations that appear to be negatively impacting OBD monitoring capability. As stated during the original rulemaking for HD OBD, manufacturers must take OBD monitoring capability into account when designing and calibrating emission control solutions to achieve a solution that meets all ARB requirements, not just some of them. Nonetheless, staff felt some interim relief was needed because of the last minute struggles some manufacturers were having in meeting the 2010 heavy-duty vehicle emission standards with the emission control solutions that they had chosen to pursue. This, in turn, left their OBD engineers with very little time to address the OBD monitoring requirements (i.e., to discover the key design factors they needed to influence and modify to allow for OBD compliance). Staff expects that the interim relief will provide additional stability and time for the OBD engineers to improve their capability and/or better influence the design to ensure an integrated and fully compliant solution, especially for those that have a less then optimal configuration in 2010. As historically has happened, manufacturers will likely gravitate toward solutions that provide for full compliance especially as they gain experience in-use as well as evaluate competitor's solutions.

18. Comment: The proposed amendments must be cost-effective. 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 and Safety Code establishes a similar mandate for ARB, requiring the Board to adopt emission standards which will result in the most cost-effective combination of control measures on motor vehicles and fuel. And California Government Code sections 11346.3 and 11346.5 require the Board to assess the proposal's economic impact. The ARB staff has not met the burden of showing its proposal is cost-effective. Staff has both underestimated the costs to engine manufacturers and vehicle owners and has not fully analyzed the cost-effectiveness (the costs vs. the emission benefits). ARB's cost effectiveness and emissions benefit discussion in the staff report points to ARB's previous analysis of cost-effectiveness from the 2005 adoption of the HD OBD regulation. ARB relies on past analysis for its current rulemaking. The extent of ARB's analysis is to conclude that, based on the 2005 numbers and ARB's assumptions, a new heavy-duty diesel engine will cost only $132.39 additional due to the OBD requirements of this rule. It is not realistic to assume that heavy-duty manufacturers will meet the extremely complex, ever-more-stringent OBD requirements and increase engine durability while holding down the cost of new products as ARB estimates. Further, ARB failed to assess the cost impact and anticipated benefits of significant new requirements. EMA questions whether ARB could justify any of those requirements if it were to properly analyze and assess the OBD rule and its costs against the anticipated emissions benefits. ARB must conduct a thorough, updated and focused analysis on the amendments to determine their true costs for manufacturers and consumers as well as their true benefits. (EMA)

Agency Response: The staff disagrees. The staff's calculations, developed with input from engine manufacturers, did include all costs to the engine manufacturers for development, calibration, testing, personnel, and hardware costs to sufficiently cover all of the proposed requirements. Further, all but one of the proposed changes with this rulemaking do not materially impact the costs to develop or implement a compliant OBD system, which incorporates the most recent amendments, making the cost estimates from the original rulemaking in 2005 appropriate. Lastly, the one proposed change that does materially affect the costs to manufacturers is the self-testing requirements within the enforcement regulation and additional costs were calculated and applied as a result. For more details regarding cost estimations, see agency response to comments 74-78. Regarding cost-effectiveness being a criterion for receiving a waiver under the CAA, see agency response to comment 16 above.

19. Comment: The HD OBD regulation must provide sufficient lead-time and a period of stability. Engine manufacturers need sufficient time to develop OBD technology that is feasible and practical. California law requires that the standards must be adopted within reasonable time frames (Health and Safety Code section 43013). Section 202(a) of the CAA requires that 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. Lead time is needed to provide manufacturers with sufficient time to research, develop, and produce engines for commercial use, and the stability period is needed to provide manufacturers time to begin to recoup some of the significant investments they have made in new technology to meet the standards. It is essential to the way manufacturers do business. Unless California meets these requirements, it has no authority to adopt emissions standards for on-highway heavy-duty engines. (EMA)

    Agency Response: The commenter submitted the same comments regarding lead time and stability during the engine manufacturer diagnostic (EMD) rulemaking in 2004, the heavy-duty OBD rulemaking in 2005, and the OBD II rulemaking update in 2006. In each of these rulemakings, ARB had provided a detailed response indicating why the federal lead time and stability provisions do not apply to the OBD regulations (see the Final Statement of Reasons for Rulemaking for the EMD, heavy-duty OBD, and OBD II regulations). Yet, the commenter has given the same comments again for this rulemaking. Thus, the following response is essentially the same as those given in the previous rulemakings.

    Regarding the commenters lead time and stability arguments, since 1970, U.S. EPA has typically applied a "two-pronged" test of whether California standards are consistent with CAA section 202(a) as required by section 209(b)(1)(C). The standards first must be technologically feasible in the lead-time provided considering the cost of compliance, and second must be compatible with the

federal test procedures so that a single vehicle could be subjected to both tests. No more should be required.

This is in accord with the legislative history of section 209. When the California waiver provisions and the "consistent with section 202(a)" language were first placed in the CAA in 1965, section 202(a) consisted of just one sentence requiring adequate lead time in consideration of technological feasibility and economic costs. In the 1977 CAA amendments, Congress amended section 209 "to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare." (H. R. Rep. No. 294, 95th Cong., 1st Sess. 301 (1977), reprinted in 4 Leg.Hist., at 2768.) At the same time, Congress expanded section 202(a) to add several directives to U.S. EPA regarding its adoption of emission standards, including the four-year lead time requirement for heavy-duty vehicles. (Emphasis added.) Given Congress's expressed intent to strengthen the waiver provisions, it is unlikely Congress intended to apply the specific four-year requirement to California, which would effectively narrow the deference provided to the state.

This is especially true in the case of OBD requirements. Congress clearly did not intend the OBD requirements to be subject to the lead-time and stability provisions of CAA section 202(a)(3)(C). First, as indicated above, those requirements were first enacted in 1977 and specifically applied to heavy-duty vehicle emission reductions, which at that time solely consisted of tailpipe and evaporative emission standards that Congress directed U.S. EPA to implement for new heavy-duty vehicles. (1977 CAA, section 202(3)(B).)

It was not until the 1990 CAA amendments, that Congress enacted an entirely new provision, section 202(m), which directed the Administrator to adopt regulations to implement OBD requirements. Under the new provision, Congress directed the Administrator to promulgate regulations for new light-duty vehicles and light-duty trucks within 18 months of enactment. (CAA section 202(m)(1).) Additionally, at the Administrator's discretion, Congress provided U.S. EPA with equivalent authority to adopt OBD requirements for new heavy-duty vehicles. (*Id.*) The federal CAA further provided that the effective date for those regulations initially adopted under section 202(m) shall be the model year 1994, unless the Administrator postpones application for certain classes and categories of vehicles until the 1996 model year. The Administrator could decide to delay implementation for reasons that the OBD requirements were infeasible or to be consistent with the policies adopted by the ARB. (CAA section 202(m)(2).) Thus, theoretically, under the provisions of CAA section 202(m), the Administrator had effective authority to promulgate and implement OBD requirements for heavy-duty vehicles as early as the 1994 model year. Assuming that such requirements were adopted in June 1992 (18 months after the enactment of the CAA), Congress would have provided less than the requisite time allowed for implementation under CAA section 202(a)(3)(C). Accordingly, it would be appropriate to infer that Congress never intended that

the OBD requirements be subject to the lead-time provisions of section 202(a)(3)(C).

This is confirmed by the administrative actions of U.S. EPA. Although the Administrator chose initially not to adopt OBD requirements for heavy-duty vehicles (58 Fed.Reg.9485 (February 19,1993)), OBD requirements were subsequently adopted and applied to medium-duty passenger vehicles (a subclass of heavy-duty vehicles). (64 Fed.Reg.23925 (May 4, 1999).). Adopted federal regulations provide, "Except as otherwise indicated, the provisions of this subpart apply to new 2001 and later model year Otto-cycle and diesel cycle light-duty vehicles, light-duty trucks, medium-duty passenger vehicles ["MDPVs"] . . .." (40 Code of Federal Regulations ("CFR"), subpart, S §86.1801-01. Emphasis added.) Under the Administrator's adopted definition, a heavy-duty vehicle is defined as "any motor vehicle rated at more than 8,500 pounds GVWR [gross vehicle weight rating] or that has a vehicle curb weight of more than 6,000 pounds or that has a basic vehicle frontal area in excess of 45 square feet. (40 CFR 1803-01.) MDPV is defined as "any heavy-duty vehicle . . . with a [GVWR] of less than 10,000 pounds that is designed primarily for the transportation of persons." (Id). The specific OBD requirements were set forth in section 86.1806-01 of the same regulation and provide that certain MDPVs, as well as light-duty vehicles and trucks, are required to meet the OBD standards set forth therein. An exception applied to diesel-fueled, chassis-certified MDPVs and engine-certified diesel engines used in MDPVs, but no exception exists for Otto-cycle MDPVs, which are subject to the requirements of section 1806-01. (40 CFR 1806-01(a)(2). These vehicles were only subject to the requirements if the exhaust emission certification of the applicable test group is being carried across from a California configuration to which California OBD II requirements are applicable.) The OBD provision does not provide for a separate and distinct implementation date for MDPVs to meet the OBD requirement. Accordingly, under the terms of section 1806-01, the 2001 and later model year implementation requirements would deem to be applicable to the OBD requirement. In such a case, the lead-time provided under the regulations would be less than two years from the May 4, 1999 initial promulgation date of the regulation.

Section 1806-05, which establishes OBD requirements for heavy-duty vehicles weighing 14,000 pounds GVWR or less, including diesel-powered MDPVs, provides a similarly abbreviated lead-time period. (68 Fed.Reg. 35800, June 17, 2003, 40 CFR section 1806.05.) The regulations were adopted in June 2003 and apply to 2005 and later model year vehicles. The lead-time again is well below the minimum four years of lead-time required under section 202(a)(3)(C). For the foregoing reasons, the only reasonable inference is that Congress did not intend that the provisions of CAA section 202(a)(3)(C) apply to OBD requirements and specifically not to California adopted OBD requirements.

In granting California a waiver for the HD OBD regulation in 2008, EPA did not consider the lead time and stability provisions of CAA section 202(1)(3)(C).

20. Comment: Manufacturers need sufficient time to research, develop, and produce emission control technology, OBD technology/software, and engines for commercial use, which 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, as technologies are tried, tested, adjusted, or abandoned, and developed and tested some more. OBD is technically complex, with the level of coding needed being extremely complicated, accounting for the inter-connectedness of numerous systems, sub-systems and components, and the base software needs to be developed and further developed for each engine model and rating. After years of development, manufacturers begin the production and certification process, which requires testing to regulatory procedures and measuring the compliance of the technology (both emission control and OBD monitoring technology) to the required standards and obtaining approval from the regulatory agencies. Because of how a model year is defined, engine manufacturers may certify (emissions and OBD) their 2010 products as early as January 1, 2009. Some manufacturers' development deadlines require the OBD software to be finalized in the fall of 2008. Once the certification process begins, it is generally too late to make changes. ARB's rulemaking process, and this rule in particular, disregards those real notice and time issues that manufacturers face in many ways, the three most significant ways being: (1) proposing new, last-minute requirements with less than four months (let alone four years) of lead time and in some cases even after the model year has started, (2) failing to specify the actual standards or any defined methods to meet the requirements, and (3) attempting to codify a practice that allows ARB to change the standards from year to year. Some of ARB's proposed changes are to be effective in 2010, so ARB is making these changes too late – manufacturers' product designs are already settled. (EMA)

    Agency Response: For the comment regarding "proposing new, last-minute requirements," staff has provided enough lead time for manufacturers to implement each new requirement being proposed. Changes that apply as early as the 2010 model year are limited to those that relax current requirements or provide further clarification but do not impose new requirements. Any changes that include new requirements take effect in the 2013 model year or later. This lead time for the new requirements would allow for manufacturers to research, develop, and produce the requisite technology, including the software, needed to comply with the requirement. Additionally, the amount of lead time provided with these amendments are comparable to lead time provided to manufacturers in past regulatory updates of the OBD II regulation, and the manufacturers have, in general, been able to comply with these past amendments within the lead time provided. More specific details can be found in various agency responses to comments below. And, as stated in agency response to comment 14, any changes that apply prior to 2013 model year are limited to those that provide immediate relief to manufacturers through relaxed criteria, additional compliance options, or clarification of previously adopted requirements. For staff's response

regarding specifying actual standards, see agency response to comments 34 and 66.

MONITORING REQUIREMENTS

21. Comment: The proposed HD OBD amendments include one for gasoline fuel system monitoring that refers to a phase-in of the air-fuel cylinder imbalance monitor (proposed section 1971.1(f)(1.2.6)), which was taken from the light-duty rule. This section doesn't apply in HD OBD, as there is no phase-in of the requirement, and should be deleted, as should the first clause in section 1971.1(f)(1.2.1)(C). (EMA)

    Agency Response: ARB staff agrees and made these changes as part of the 15-day Notice.

22. Comment: ARB has proposed an OBD NOx threshold of 0.4 g/bhp-hr for 2010. To meet 2010 emission standards, engine manufacturers will use two NOx sensors: one upstream of the SCR catalyst and another downstream. At issue is the different range and resolution/accuracy required for OBD monitoring. Current NOx sensors do not have the required narrow range and greater accuracy nor the long term durability necessary for monitoring. Development and validation requirements for 2010 emission standards have forced manufacturers to make design decisions based on existing NOx sensor technology. Current NOx sensor accuracy is not capable of achieving the threshold requirement of 0.4 g/bhp-hr for 2010, as also revealed in research (Reference "Threshold monitoring of urea SCR systems," SAE Paper # 2006-01-3548).

    While sensor suppliers in 2007 predicted aged NOx sensor accuracy to be at +/-10ppm, that level of accuracy has not been achieved or demonstrated for 2010 products. Current information from NOx sensor suppliers indicate the accuracy specification is +/-15% in the range of 0-100 ppm for temperatures below 85°C. Recent aged NOx sensor data supplied to ARB staff from 2010 model year engines have shown an output loss up to 12.4% in less than 100,000 miles, adding further doubt to accuracy claims by a long-term NOx sensor supplier and supporting manufacturers' fears and concerns regarding inadequate NOx sensor accuracy as being well-founded. The discussion of feasibility in the staff report fails to account for the combined tolerance error impact associated with the use of two NOx sensors on the same engine/aftertreatment system. An illustration has been provided showing the impact of a 15% error, indicating that the accuracy error takes up most of the standard and does not allow for any separation between good and bad catalysts. Thus, monitoring to a threshold at two times the standard is not technically feasible. ARB must revise the NOx catalyst and NOx sensor NOx thresholds upward to four times the standard, to the "standard/FEL +0.60 g/bhp-hr", until such time as durable, reliable, and effective sensing technology has been developed. (EMA)

Agency Response: First, the commenter is mistaken about the proposed requirements. Specifically, the proposed NOx threshold for 2010 is not 0.4 g/bhp-hr (or two times the standard) – the threshold is the NOx standard plus 0.4 g/bhp-hr (or three times the standard).

Second, staff believes that basing NOx emissions data on the average NOx concentration over an entire FTP cycle, as the commenter has done, is not appropriate. The average NOx concentrations over an entire FTP cycle are representative of tailpipe certification compliance and not representative of the level of detection capabilities for a malfunctioning NOx converting catalyst. Manufacturers should be concentrating on designing monitors that run during specific operating conditions where NOx levels are expected to be high and, thus, separation between a good and bad NOx converting catalyst is possible for monitoring. Therefore, staff remains convinced that the current threshold is technically feasible.

Aside from inappropriately using the average NOx concentrations instead of looking at specific operating conditions that are more conducive to monitoring, the commenter appears to have incorrectly calculated the magnitude of the error relative to expected concentration levels. As staff understands it, the sensor suppliers are representing the accuracy of the sensor to be +/- 15 ppm in the range of 0-100 ppm and +/- 15 percent error above 100 ppm. The commenter's example shows a downstream sensor average reading of approximately 35 ppm and an upstream sensor reading of approximately 275 ppm with a good catalyst. The manufacturer appears to multiply the maximum error of the downstream sensor (15 ppm) by an additional 15 percent to represent the upstream sensor error and then doubles that result for no apparent reason. Not only does it seem inappropriate that an error of the front sensor would directly increase or decrease the reading of the downstream sensor, it also seems inappropriate that the commenter doubles this whole error. Staff understands that a NOx converting catalyst monitor that calculates the conversion efficiency based on the front and rear sensors would have error in both the front and rear sensor readings but does not agree that the commenter has accurately represented this error in their illustration nor that their methodology is appropriate. Even based upon the commenter's example for front and rear sensor readings, staff's calculations of worst case error conditions for front and rear sensors show there is no overlap between good and threshold catalysts. Further, if monitoring is performed when concentrations are higher than the average during the FTP, the separation between good and threshold catalysts increases dramatically.

23. Comment: The 2010 NMHC emission thresholds are too low and will be exceeded on engines meeting 2010 model year emission requirements when total failure of the diesel oxidation catalyst (DOC) or diesel particulate filter (DPF) NMHC conversion efficiency (DOC/DPF) occurs. This will require manufacturers to implement an emissions threshold-based monitor rather than revert to functional-only monitors. Current monitoring technology cannot robustly monitor NMHC converting capability at 2.5 times the NMHC standard with IRAF

correction factor applied without a significant risk of setting false MILs. ARB should increase the threshold for NMHC converting catalysts to a high-enough level to ensure that 2010 model year engines will only have to meet functional monitoring requirements. A threshold of four times the NMHC standard would ensure functional monitoring on most engine applications. There is a significant risk if manufacturers are required to meet this infeasible emissions threshold-based monitoring requirement for reasons as follows:

a.) There is a tradeoff between engine-out NMHC and NOx emissions, resulting in higher NMHC levels in order to meet the more stringent 2010 NOx standard;

b.) As a result of higher engine-out NMHC levels, oxidation catalysts will be operating at a higher efficiency in order to meet the 0.14 g/bhp-hr NMHC standard; and

c.) Although medium-duty engine manufacturers were able to avoid threshold monitoring requirements for 2007 through 2009 model year engines, those engines were designed to meet higher NOx emission levels. Reducing NOx emissions from 1.2 g/bhp-hr to 0.2 g/bhp-hr in 2010 will also force these engines to decrease engine-out NOx levels, resulting in higher NMHC levels. These medium-duty engines will be faced with the same dilemma as heavy-duty engines.

There is no monitoring technology available to meet ARB's emission threshold monitoring requirement. SAE Technical Paper 2005-01-3602, "Diagnostics for Diesel Oxidation Catalysts," evaluated the feasibility of monitoring DOC/DPFs to specific emissions threshold levels and the feasibility of both the exhaust oxygen sensor and catalyst temperature monitoring approaches. Some of the major findings and conclusions are as follows:

a.) DOCs age by shifting light-off to a higher temperature. Exotherm from higher temperature-aged and fresh catalysts were indistinguishable at higher catalyst temperatures. As a result, the exotherm monitor must be operated in a narrow window around the catalyst light-off temperature (200 to 400 degrees C).

b.) HC levels in diesel exhaust are too low to generate any appreciable exotherm to monitor at the required threshold levels. The DPF regeneration event does not provide optimal monitoring conditions since temperatures are above the catalyst light-off temperature.

c.) The error stack-up of RTD temperature sensors create significant uncertainty for monitoring the DOC/DPF. The uncertainties evaluated were due to sensor variability, sensor aging, measuring circuit, sensor length and mounting orientation, and analog-to-digital processing. The cumulative error for these uncertainties was related to a 3 sigma error band that manufacturers must account for in determining threshold monitoring capability.

d.) A monitoring approach using oxygen sensors to infer HC conversion efficiency by determining the difference in oxygen concentration before and after the catalyst was evaluated and found to be less accurate than the exotherm monitoring approach for diesels. This was because lambda sensor accuracy deteriorated rapidly for lean air/fuel ratios. Data was presented to

show this effect. An analysis was provided to show the uncertainty of HC conversion measurements to be between 2000 to 3000 ppm during typical diesel lambda values of 1.5 to 2, as compared to an exotherm measurement uncertainty of 1000 to 1500 ppm HC found in the catalyst light-off temperature range.

e.) Adding all the noise factors together for a normalized exotherm metric, separation between a marginal and threshold catalyst was very poor, resulting in false MILs and undetectable failures.

The paper concluded that emissions threshold-based monitoring of the HC conversion capability of the DOC was not feasible. On the other hand, manufacturers have found an exotherm monitoring approach to be feasible for functional monitoring of the DOC/DPF.

ARB conveyed some monitoring approaches in the staff report to justify the current threshold monitor requirement. ARB indicated that intermediate levels of catalyst deterioration that cause increases in light-off temperature and lower conversion efficiencies can be detected. Looking at the catalyst behavior during active regeneration (e.g., by investigating how much time and/or fuel is needed to generate an exotherm, tracking the actual temperature rise from the exotherm versus the expected, and using better temperature sensors), ARB staff believes manufacturers will be able to better determine the characteristics exhibited as an NMHC catalyst degrades, even if it is still capable of eventually getting to a high enough exotherm to achieve regeneration of the PM filter. Although there is some validity to monitoring catalyst light-off, there are also significant limitations. For example, manufacturers must warm-up the catalyst as quickly as possible after a cold start in order to minimize HC slip. As a result, as stated in the SAE paper referenced above, the exotherm monitor must run in a fairly narrow temperature and time window around catalyst light-off, making it very difficult to complete the monitor and detect a partially deteriorated catalyst, especially when you take into account other noise factors that affect catalyst light-off. Further, these monitoring feasibility projections are based on the best temperature sensors that will be available for 2010 model year production.

ARB also offered an alternate approach involving monitoring the catalyst during cold start by tracking the light-off and/or temperature rise characteristics during intrusive actions intended to quickly bring the catalyst up to the desired temperature after a cold start. This approach has limitations as well, as there are many factors other than the condition of the DOC that can affect catalyst warm-up.

ARB also indicated that manufacturers simply work on reducing engine-out NMHC levels such that degraded catalysts will have less of an emissions effect. However, as previously stated, measures taken to lower engine-out NMHC will result in higher engine-out NOx levels. This jeopardizes both the ability to comply with the NOx emission standard and the ability to meet NOx catalyst monitoring requirements due to the resulting higher NOx conversion efficiency that would be needed. Manufacturers must strike a fine balance for engine-out

NMHC and NOx levels to ensure that both requirements are met and cannot simply jeopardize one to meet the other. In conclusion, ARB has not presented any data demonstrating that the proposed threshold monitoring requirement for the DOC/DPF can be met. (EMA)

Agency Response: ARB staff disagrees and did not make any changes to the NMHC malfunction thresholds. The purpose of interim higher thresholds for monitors such as the NMHC catalyst are not to make such monitors gross functional checks in early years and stringent threshold checks in later years. Higher interim thresholds are intended to start the manufacturer down the path of a threshold-type monitor albeit with reduced stringency to provide time to refine the monitor over time. Raising the thresholds to ensure solely functional checks for every manufacturer would likely lead to implementation of cruder diagnostics that would not lend themselves to refinement to final thresholds and would not give manufacturers as much insight and experience as to what will be necessary to get to the final threshold. Further, the higher interim thresholds still set a ceiling for the emission impact a component can have before it must be monitored, and the existing threshold of 2.5 times the standard ensures that manufacturers that more heavily rely on the NMHC catalyst will indeed need to have a monitor capable of identifying such a level of deterioration. While staff understands there are tradeoffs between NOx and NMHC emissions, manufacturers have always had to deal with such tradeoffs and strike a balance that is best suited to meet all ARB requirements (including OBD) and not just to meet tailpipe standards. Those that have chosen emission configurations that are less dependent or sensitive to the NMHC catalyst will be able to let the catalyst deteriorate further before the need for detection of a fault. This is consistent with all OBD monitors in that designs that are less sensitive to faulty components are easier to make compliant because they can tolerate additional deterioration before the OBD thresholds are exceeded.

Further, in the staff report, staff did identify possible monitoring techniques for the catalyst including some that, despite the commenter's position on the difficulty of doing so and the cited SAE paper's conclusion that it is infeasible, are currently being used by manufacturers to achieve compliance (e.g., monitoring the catalyst during warm-up from a cold start or during an intrusive action to rapidly light-off the catalyst). Additionally, as the commenter notes, with this and every other diagnostic, there are always other influences that must be filtered out and distinguished by use of enable conditions and the control and diagnostic algorithms themselves to differentiate properly-functioning components from malfunctioning components, including accounting for sensor tolerances and errors.

Lastly, staff also indicated that some manufacturers have indeed taken monitoring capability into account when selecting their emission control configuration and have chosen solutions which represent the best compromise for that manufacturer to comply with all of ARB's requirements. Such choices do involve trade-offs in one area versus another but are no different from the types

of choices manufacturers routinely consider when balancing emissions, OBD, fuel economy, durability, drivability, and performance.

24. Comment: ARB has revised the PM filter threshold upward to 0.07 g/bhp-hr for 2010. While the change is directionally correct, a better approach would be to raise the threshold to 0.09 g/bhp-hr and/or add a requirement based on the physics of the PM filter system where a malfunction is detected based on a decrease in the expected pressure drop at specified speeds and loads. EPA has adopted this approach as an alternative to a threshold requirement in the nationwide HD OBD rule. The PM filter threshold of 0.03 g/bhp-hr for 2013 must also be revised upward, since current PM sensor technology cannot meet this threshold. Whether the threshold is right for 2013 will depend on the capabilities of the PM sensor and must be carefully evaluated in the next biennial review. (EMA)

    Agency Response: ARB staff disagrees with this comment and did not make any of the suggested changes. In evaluating manufacturer's capabilities, staff concluded that the commenter's proposed threshold of 0.09 g/bhp-hr was too high and that 0.07 g/bhp-hr (approximately seven times the PM standard) better reflected the current capability. While a few manufacturers were on track to meet the existing 0.05 g/bhp-hr requirement, staff felt some interim relief was appropriate to give other manufacturers the chance to refine their strategies and configurations. The commenter did not present any information or data supporting the need for the proposed increase to 0.09 g/bhp-hr. With respect to the alternative offered by EPA, staff does not believe such an approach will put manufacturers on the path towards the types of monitors that are needed to meet the final thresholds. As mentioned in agency response to comment 23, the purpose of interim higher thresholds is to put manufacturers on track with the types of monitoring algorithms that will be needed for the final thresholds but provide time for manufacturers to refine their approaches as they gain experience. The alternative offered by EPA provides no incentive for manufacturers to explore innovative monitoring approaches or push as far as they can. It also presumes that the best possible monitoring approaches have already been identified and refined as much as possible and that no further work could yield any gains—a fairly large presumption given how rapidly emission control and monitoring technologies have and continue to advance in the last few years.

    Regarding the need to revise the 2013 threshold of 0.03 g/bhp-hr, it is important to note that only one engine family per manufacturer will be required to meet that threshold in 2013 and all others will meet a less stringent threshold. Further, development and refinement of PM sensors continues at a rapid pace with several suppliers now having prototype parts for manufacturers to evaluate. As of this rulemaking, PM sensor development still appears to be on track to have commercially available products for the limited market share needed in 2013. Additionally, new monitoring techniques have begun to surface as an alternative to pressure sensor-based systems or PM sensor-based systems, including a

concept of an additional PM filter-like device located downstream of the PM filter to capture PM that escapes through the main PM filter. Such a device could be optimized for OBD only (e.g., not have to handle the full exhaust volume or be sized to accommodate ash loading maintenance intervals or frequency between regeneration events) and allow for more sensitive monitoring.

25. Comment: ARB has proposed engine manufacturers be required to detect a thermostat fault if, after the coolant temperature has reached the highest temperature required by the OBD system to enable other diagnostics AND reached a warmed-up temperature within 20 degrees Fahrenheit of the manufacturer's nominal thermostat regulating temperature, the coolant temperature drops below the highest temperature required by the OBD system to enable other diagnostics. This requirement is unnecessary since the OBD regulation already requires detection of thermostat malfunction; therefore there is no further need to define a failed thermostat. Moreover, such a temperature drop does not necessarily represent a failure. Indeed, coolant temperature can drop below the highest OBD enabling coolant temperature during the course of normal operation without malfunction of the thermostat in cold operating conditions. Examples of these include hysteresis (where the temperature rises a few degrees above threshold and then drops back down), the operator turning on the heater, temperature increasing at idle and then driving at a high speed with a high wind cooling down the radiator, idle operation, and down hill operation in cold temperatures. If adopted, such a requirement also would have a significant impact on vehicle design. Engine manufacturers do not and cannot dictate how their customers design vehicles. ARB should eliminate this requirement or, at a minimum, provide substantial lead time before such a requirement would go into effect. (EMA)

    Agency Response: ARB does not agree with the commenter's statement that the proposed requirement is not necessary because the current HD OBD regulation already requires detection of thermostat malfunctions. As with all monitors in the OBD regulation, the criteria that define a failure are listed in the regulation (in lieu of requirements such as 'detect a failed thermostat' with no definition of what constitutes a 'failed thermostat'). Failure to define the requirements so precisely would result in vastly different interpretations by different manufacturers and would not achieve the end goal of systems that will robustly detect emission component failures in-use. The current requirements specifically define failures of the thermostat or cooling system as failures that prevent the ECT from warming up to a minimum specified temperature. Other failures of a thermostat undoubtedly exist (e.g., a stuck closed thermostat) yet are not included as part of the failure criteria and, thus, are not required to be detected. The failures that are specified are included because they have a direct impact on emissions and/or the enablement of other diagnostics in the system. As was discovered with light-duty vehicles several years after OBD systems were first implemented, failures that prevented proper warm-up resulted in large numbers of disabled monitors and have led to in-use vehicles with high emissions due to faulty emission components that go undetected. Accordingly, the importance of proper

warm-up and the role the thermostat plays in that were identified and incorporated as part of the requirements. Additionally, a new failure mode was identified and added in this rulemaking for future systems (starting with the 2013 model year for medium-duty and the 2016 model year for heavy-duty) to detect failure modes that allow initial system warm-up but then cool back down sufficiently to disable diagnostics. Again, in-use vehicles with such failures were identified that prevented monitors from detecting emission component failures and led to excessive in-use emissions. As with any monitor, there are other influences such as driver behavior, heater usage, and engine operating conditions that must be accounted for when developing and calibrating a successful algorithm. Some can be directly determined and used in the algorithm as part of the enable conditions or failure criteria while others require manufacturers to calibrate for additional worst case assumptions given the unknown state. As stated in the staff report, it is expected that the cooling system monitoring requirements will have an impact on vehicle design and that engine manufacturers will need to include additional specifications/restrictions on engine purchasers as to how they must install the engine to keep it in compliance. Manufacturers have historically included specifications on the minimum heat rejection specifications that a cooling system provided by the vehicle manufacturer must achieve (to prevent overheating/damage of the engine). With today's emission controls and OBD systems, maximum heat rejection specifications may also be necessary to ensure engines are not over-cooled such that emission controls or OBD monitors are disabled under conditions where they should be functional.

26. Comment: EMA supports the clarification made to the misfire malfunction criteria in section 1971.1(e)(2.2.4) and requests ARB provide further clarity and specify "50% of all cylinders." (EMA)

    Agency Response: ARB agrees that clarifications should be made to the language and proposed to change the language to "50 percent of all engine firings." This change was proposed as part of the 15-day changes.

27. Comment: ARB has proposed that manufacturers submit an aging and monitoring plan for EGR coolers and for charge air cooling systems consisting of more than one cooler. Development of this plan is extremely burdensome, requiring not only a monitoring strategy for each component and combination of components but also requiring aging to be representative of the real world under normal and malfunctioning engine operating conditions. This requires manufacturers to anticipate every potential engine system malfunction that could occur in the real world and the effect on these systems. These requirements should be removed or at a minimum, greatly simplified. (EMA)

    Agency Response: The issue of configurations that consist of multiple coolers in series to constitute the entire cooling system was discussed at length with industry during this rulemaking process. Initial proposals to require monitoring of each individual cooler to ensure proper in-use repair were eventually dropped in

favor of staying with the overall cooler system monitoring requirement. However, discussions with manufacturers about cooler system monitors identified several varying approaches and interpretations by manufacturers as to what was required when developing and calibrating such monitors. Accordingly, staff included a requirement for manufacturers to fully disclose their system monitoring approach for multiple cooler systems to ensure a consistent interpretation and stringency of monitoring across all manufacturers. As to this requirement being burdensome, manufacturers are already expected to be anticipating the failure modes that can occur as a part of their normal job duties (e.g., failure modes and effects analysis) as well as designing monitors that comprehend interaction of various components and failure modes to ensure robust monitoring strategies. Certainly, calibration could not be done correctly if a manufacturer did not comprehend the type and severity of aging the components would be subject to in the real world. For any manufacturer that is doing the job correctly, the information required in the plan will already be known as part of the normal development and calibration activity, so disclosure to ARB should not result in any additional burden.

28. Comment: The requirements to monitor output shaft vehicle speed sensors should be eliminated. (EMA)

29. Comment: Cummins urges the Board to direct staff to more openly consider industry's input regarding the vehicle speed sensor monitoring requirements. We believe enough thorough reasoning has been provided for staff to accept EMA's proposed changes. The vehicle cannot legally operate without the speedometer being functional and those vehicles with an automatic transmission cannot be used to do the work that they've been bought to do. Updates to this ruling should be completed prior to the need for certification. (Cummins)

30. Comment: Policies regarding vehicle speed sensors for electronically controlled transmissions will require vehicle manufacturers to install a separate duplicate vehicle speed sensor at an additional cost of $30 to $100 per vehicle. We request these costs be considered in the cost benefit analysis of future biennial reviews along with other unanticipated costs. (Navistar)

31. Comment: Engine manufacturers appreciate the need for comprehensive component monitoring for HD OBD systems. We disagree that electronically controlled transmissions are not robust, and that failure of output shaft speed sensor systems, when used to estimate vehicle speed, go undetected and uncorrected for indefinite periods of time.

    Electronic transmission control technologies have been sold in heavy-duty vehicles for nearly 20 years. Automated manual transmission technologies exceed 10 years use on public highways. To suggest existing technologies are not robust for HD OBD also suggests they are unfit for commercial vehicle use. Electronically controlled transmissions are equipped with failure indication lamps that illuminate when transmission output shaft speed sensors fail (e.g., "Check

Trans" and/or "Range Inhibited"). Owner's manuals direct vehicle operators to move the vehicle to the side of the road and seek assistance. Vehicles with speedometer or transmission control system failures are not suitable for continued use in public passenger, private, or commercial carriage. Continued use is prohibited by state and federal Motor Carrier Safety regulations and Motor Vehicle Safety standards; therefore the commercial vehicle is placed out of service.

Implementation costs reviewed during the original HD OBD rulemaking in 2005 do not discuss the requirement for an additional, independent vehicle speed sensor (VSS), estimated by engine manufacturers at $100 including transmission effects. In addition to the discussions in the staff report, there are three additional questions to review to complete the discussion:

a.) What is the engine emissions warranty for parts not provided with the engine and not under the engine manufacturers' control? ARB staff suggests vehicle owners may not be covered under the engine manufacturer's emission warranty for repair of a VSS. Lack of coverage under the mandated emissions warranty will not create a significant barrier for vehicle owners to seek warranty repairs for transmission output shaft speed sensors, since vehicle manufacturer warranty terms for commercial heavy-duty vehicles typically range from 1 to 3 years and 100,000 to 300,000 miles, with extended warranties routinely offered. These terms are comparable to the required engine emissions warranty coverage. Transmission manufacturers may be willing to provide a warranty for transmission output shaft speed sensor failures equivalent to the emissions' 5-year 100,000 miles warranty.

b.) Are engine manufacturers able to demonstrate all the desired qualities of the transmission manufacturers' diagnostics? Engine manufacturers have agreed to light the MIL for VSS failures when vehicle speed is used for OBD monitors; however, instead of detecting all possible transmission output shaft speed sensor and circuit failures, engine manufacturers propose to leverage the existing capabilities of transmission manufacturers for speed sensor and speed sensor circuit error detection, and not duplicate these methods with likely inferior methods at a higher-per-vehicle cost than anticipated in the 2005 staff report. The method for collaboration with the transmission control unit (TCU) is simple in concept. When the transmission detects a failure with the VSS or VSS circuit, this failure will be communicated by the TCU to the HD OBD engine control module (ECM), which will demand the MIL be illuminated, according to the rules in SAE J1939-71 for vehicles using SAE J1939-73 (manufacturers using proprietary control bus descriptions will provide alternate means for conveying a failed transmission output shaft speed sensor signal). The ECM will also provide a signal data rationality check of the engine manufacturers design for the transmission output shaft speed value communicated by the TCU that will indicate failures undetected by the TCU. This rationality check algorithm would be fully disclosed to ARB by the engine manufacturer as a part of the certification package. Lastly, the

engine ECM will light the MIL when the data from the TCU is not available on the vehicle's data link. These methods can be demonstrated by the manufacturer prior to production and post-production as a part of the production vehicle evaluation tests and are sufficient to diagnose VSS failures.

ARB staff and industry disagree on the capabilities of transmission manufacturers' output shaft speed diagnostics. Industry believes that the diagnostics are more robust than those provided by engine manufacturers using an additional speed sensor since transmissions have additional data to base diagnostic decisions on, such as input and intermediate shaft speeds and transmission gear ratio. Also, If an additional sensor is used, variable reluctance and Hall effect technologies used for measuring the rotational velocity of ferrous gears have limitations in the capability to support open and short circuit diagnostics. This is due to Hall effect sensors typically mimicking open circuits when not excited by ferrous material and variable reluctance sensors having very high peak to peak operating voltages at high speeds that challenge circuit failure detection with typical A/D devices that measure voltage (where negative voltage is not out-of-range low but part of its rotational speed to frequency transfer function). Lastly, all agree that the ECM's ability to diagnose the TCU's VSS is limited since the ECM is not directly connected to the sensor.

c.) What is practical for industry to provide, including transmission, engine, and vehicle manufacturers? Transmissions are manufactured by separate corporations from the engine and vehicle manufacturers. As a result, engine and vehicle manufacturers do not own TCU diagnostics, control algorithms, designs, or service literature copyrights for electronically controlled transmissions; therefore it is impractical to assume that engine manufacturers can provide ARB with transmission manufacturer proprietary data regarding the TCU system's detailed diagnostic capabilities or effect permanent changes in transmission ECU operation.

Engine manufacturers have sought to eliminate VSS from HD OBD requirements and monitor designs to eliminate this point of contention, and to minimize the potential costs of a HD OBD engine installation in a vehicle. Moreover, engine manufacturers anticipate the HD OBD rule as providing a model for future stationary or marine applications where there will be no VSS. Unfortunately, all use of vehicle speed data has not been successfully eliminated to date. A plurality of the required HD OBD monitors have been made independent from vehicle speed conditions and will operate correctly without the use of vehicle speed. (EMA)

Agency Response to Comments 28-31: Staff and industry were involved in several rounds of discussions regarding the use of vehicle speed sensor information and explored many proposals to find a workable middle ground. Per the manufacturers' original requests, the regulation was initially structured to

allow compliance without any reliance on vehicle speed information. However, since that time, manufacturers have determined that they want and need to use vehicle speed information to improve the robustness of several monitors. At the Board Hearing, the issue was raised again and specifically to the most recent proposal that had been discussed between staff and the manufacturers. Staff indicated that they believed the proposal could work, and the Board directed staff to make the necessary changes in the subsequent 15-day notice. Thus, language was included with the 15-day package to allow manufacturers to use the vehicle speed sensor information, including diagnostic decisions made by other entities (such as the transmission manufacturer), to disable other OBD diagnostics. Further, while not part of this rulemaking, additional changes to other ARB regulations may be required to fully implement the compromise reached by industry and ARB regarding this handling of vehicle speed information. Specifically, there may be warranty implications in terms of possible inclusion of the vehicle speed sensor and signal processing components as well as warranty reporting implications for faults of these components since they are used by the OBD system. Given the non-integrated status of the heavy-duty market, it is staff's intent to continue to avoid requiring transmission manufacturers for conventional (e.g., non-hybrid) heavy-duty vehicles to go through a certification review and approval of their OBD system or subjecting them to emission warranty provisions including reporting. Although staff has already discussed this intent and has general agreement within the relevant staff at ARB, staff intends to work with the ARB sections responsible for the warranty regulations and investigate whether the existing language is sufficient enough to continue to avoid inclusion of these components into the warranty regulation even with this interaction with the HD OBD system or whether additional regulatory changes will be needed (and pursue such regulatory changes if needed).

32. Comment: The proposed OBD rule compels engine manufacturers to diagnose the operation of hybrid drive systems, which they do not design, develop, manufacture or sell. The costs of OBD for hybrid drive systems are more properly borne by hybrid drive manufacturers, who are separate corporations in our horizontally integrated industry. 2010 model year engine control systems are not designed to diagnose the operation of hybrid drive systems, which suggests hybrid drive systems cannot be certified for HD OBD, unless the engine manufacturer requires his own certification to this separate corporation to ensure that hybrid drive system controls include the appropriate diagnostics. The issues with hybrid drive systems are better served with a separate rulemaking that includes manufacturers of the engine, vehicle, hybrid drive, and transmission. (Navistar)

33. Comment: ARB staff appears concerned about whether the engine and emissions controls on a hybrid drive system will operate as effectively in a hybrid drive vehicle as with a traditional, mechanical transmission. Vehicle buyers and manufacturers are also concerned whether the emissions savings of a hybrid drive will pay back the initial investment in the batteries, traction motors, and

control systems to make hybrid systems economically attractive. Such concerns are better addressed within emissions and emissions certification regulations rather than HD OBD regulations. OBD thresholds are not appropriate since hybrid-drive systems do not emit specific combustion species and produce no brake-specific emissions. The brake-specific operation of the engine has no effect on emissions produced by a drive system (i.e. generator, motor, and battery) with no internal combustion components. Given the broad nature of these concerns, engine manufacturers should not be required to certify diagnostics on the emissions created by a hybrid drive system until the nature of such emissions are better understood and there is data to direct appropriate policy on the diagnostics desired. ARB should eliminate specific OBD monitoring of hybrid components from the HD OBD rule, including section (g)(3.1.5) and the first clause of new proposed section (g)(3.1.4).

The heavy-duty emission regulation (California Code of Regulations, title 13 section 1956.8) currently references “California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes” to provide supplementary certification of hybrid electric drive systems. The principal function of the interim procedures has been the estimation of NOx emissions reduction through comparative testing of a baseline vehicle and modified vehicle on a chassis dynamometer. This testing creates Emissions Factor (EFs) and Emissions Factor Ratios (EFRs) for use to scale the brake specific NOx emissions of the engine, i.e., (HEB NOx Emissions = EFR * Engine NOx Rating). These interim procedures have not been revised since their adoption in 2002 to define test procedures for vehicle applications other than urban buses. Therefore, other applications, including many providing essential public services such as fire trucks, ambulances, electrical utility, road maintenance, towing and recovery vehicles, have the effectiveness of their hybrid drive systems determined by the “Orange County Urban Bus Cycle.” These interim procedures do not address whether the engine and its emission controls will operate as effectively as with a traditional mechanical transmission. If the desired policy outcome of HD OBD for hybrid drives is the monitoring of EFs and EFRs (which define the emissions reductions created by the hybrid drive system), varying vehicle loading and operating profiles create questions, especially for vehicles other than an urban bus. The interim certification process contains formulations for EF and EFR that are test cycle sensitive and focused on urban buses, not other vehicle applications.

Engine manufacturers are concerned about certifying HD OBD diagnostics for systems installed on equipment not of their own design or manufacture, produced by relatively few suppliers, and vehicle-mounted apart from the engine. The manufacturing structure for heavy-duty vehicles in North America is horizontally integrated with an infrastructure of a few key technology suppliers, including engine, transmission and brake manufacturers, serving multiple heavy-duty vehicle manufacturers. For example, Allison Transmissions and Eaton Corp together exceed 50% of the market share for the United States and Canada in supplying heavy-duty vehicle transmission systems. Existing transmission

manufacturers, including Allison Transmissions and Eaton Corp, have sought to develop their own hybrid drive technologies, in case their traditional mechanical transmission business is supplanted by hybrid drive technologies. Multiple engine manufacturers cannot be expected to each certify these products at their own expense for the hybrid manufacturers. Under ARB's current regulatory framework, hybrid drive systems of these two manufacturers are to be certified by each engine manufacturer for each 2010 and subsequent model year engine family desired to operate with the given hybrid drive. Thus a single, generic system for a heavy-duty vehicle will be certified multiple times by each engine manufacturer. This is wasteful in the interim certification procedure as well as in HD OBD certification. The current proposed regulation creates huge disincentives for any hybrid drive technology to reach the California marketplace.

Creating HD OBD requirements for hybrid drive systems is premature without addressing these issues regarding interim certification and the responsibility for certification of the hybrid drive. (EMA)

Agency Response to Comments 32-33: While staff agrees that there are still unresolved tailpipe certification issues regarding how manufacturers would be required to emission test hybrids, the existence or lack of a defined procedure is immaterial as to whether hybrid system components impact the OBD system. According to the comprehensive components monitoring requirements, components are required to be monitored if they either cause a measurable emission increase during any reasonable in-use driving condition or are used for other OBD monitors. This assessment does not rely on a defined test procedure that will eventually be used for tailpipe emissions certification. As is done today and historically, for components that might be subject to this requirement, manufacturers discuss the function and impacts of failures of the components with staff to decide on test conditions that would represent a reasonable in-use driving condition where an emission impact would most likely to occur. Even setting aside the emission impact, hybrid components or systems can impact the OBD system (the second part of the comprehensive components monitoring requirements). As a simple example, a diagnostic that gathers data over a long period of engine operation may be effectively disabled by a hybrid system that frequently turns the engine off and erases all data collected by the diagnostic to that point. Such a modification could make a certified HD OBD engine system noncompliant. Another example could be diagnostics that rely on cold engine starts to monitor the warm-up performance of other components such as the cooling system. Hybrid systems that enable engine shut-off shortly after cold start could prohibit such diagnostics from properly operating or ever completing. Accordingly, it is appropriate for the regulation to require manufacturers looking to put an engine into a hybrid vehicle configuration to submit information to ARB about the operation of the system and begin the process to identify which, if any, hybrid components need to be monitored to account for in-use emissions or adverse impact on other diagnostics. Regarding certification responsibilities however, it is expected that the entity that is modifying the engine to make it operate in a hybrid is the responsible party that would be required to certify the

system and ensure that any changes it made to use the engine in a configuration different than the one certified would still be compliant.

34. Comment: The proposed monitoring requirement under "Other Emission Control System Monitoring" for emission control strategies not covered under any of the other sections is unreasonable, unlawful, and fails to provide manufacturers with notice of what they must meet, and thus must be deleted. ARB has added what could be termed as a "catchall" clause which would require manufacturers to meet the monitoring requirements for anything that is not specified in the rule but that ARB believes should be monitored. Manufacturers have no clarity as to what is expected to meet such "standards" and not even any notice as to what those standards might be. They need notice and also sufficient lead time and stability to be able to incorporate new monitoring requirements into their designs. (EMA)

    Agency Response: ARB staff disagrees and did not delete these requirements. First, it is important to note that this section is primarily used to address new emission controls that emerge and are implemented by manufacturers. Once a technology is identified and understood well enough, specific regulatory language targeting that emission control and the minimum monitoring requirements are added to provide additional direction to manufacturers. The section clearly identifies that it only includes emission control systems not otherwise addressed in the regulation. It does not and cannot apply to systems that are not emission control system components or force the manufacturers to monitor a component simply because "ARB believes" it should be monitored. As the stated purpose of the OBD regulation is to 'monitor emission systems', it would be inappropriate for systems to be certified with emission controls that are not monitored. As already stated in the staff report, staff recently had concerns with manufacturers designing the OBD system without monitoring certain aspects of the emission control system solely because those emission controls or aspects were not "specifically" identified in the regulation. Further, some manufacturers were not readily disclosing to ARB the presence of these controls or even considering OBD monitors for these emission controls or strategies. Leaving this new monitoring language out would continue to encourage manufacturers to avoid sharing information with ARB about emerging emission control technologies so that they can implement them prior to ARB staff having the time to add explicit language in the regulation or play similar games to avoid monitoring key emission control components. Lastly, this language does provide clear direction to manufacturers as to what is expected and what their responsibilities are and is the same language that has existed in the light-duty regulation for over ten years. It directs manufacturers to submit a proposed monitoring plan to ARB explaining the component, how it functions, and how they will detect failures of the component. It also indicates the ARB will review the proposal based on the effectiveness in detecting malfunctions and includes direction to two other criteria (if applicable) that provide further clarity as to the minimum required monitoring capability.

35. Comment: EMA requested deleting the monitoring requirements for wait-to-start lamps, which ARB denied, indicating that industry costs for providing monitors for LED lamps is less than the emission benefit provided, which is without quantitative justification. We believe malfunctioning wait-to-start lamps with no other failures will result in inconsequential emissions increase. The cold start strategy monitoring requirements require detection of consequential increase in emissions during a cold start, while section 1971.1(g)(3.2.2)(C) requires that cold starting aids be directly diagnosed for failures. Engines that do not reliably start are repaired promptly in order to meet the demands of commercial vehicle owners, who must have reliable equipment to return the capital on their investment in a heavy-duty vehicle. The costs of meeting this monitoring requirement will be borne by vehicle manufacturers who are not directly regulated by the HD OBD regulation or by California Code of Regulations, title 13 section 1958.6. By requiring wait-to-start lamp monitoring, ARB is actually re-regulating emissions performance which is more properly regulated in section 1958.6 than in the HD OBD regulation. (EMA)

    Agency Response: ARB disagrees and did not delete this requirement. As staff stated in the staff report, malfunctions of the wait-to-start lamp would have a direct impact on emissions since a vehicle operator may crank the engine too soon resulting in extended crank time with partial combustion events. Other OBD monitors for cold start emission controls are not designed to (or required to) detect operators who unknowingly crank the engine before the engine manufacturer has indicated it is ready to start. They are solely designed to detect component or system failures that do not properly operate once the engine is started. Further, a failed wait-to-start lamp does not necessarily equate to an engine that does not reliably start—it may simply lead to extended cranks or premature cranking of an engine before it eventually starts and will not likely compel owners of 10, 15, or 20 year old engines to promptly seek repair as the commenter suggests. Lastly, staff does not understand how the commenter believes this is re-regulating emissions performance. This requirement does not dictate emissions during engine starting, starting performance, or even the use of a wait-to-start lamp (e.g., how long it must be illuminated). This requirement solely requires detection of a fault when the lamp used by the manufacturer to indicate when the engine is ready to be cranked has failed. Lastly, staff does not understand why the commenter believes the vehicle manufacturer, not the engine manufacturer, will bear the cost of complying with this requirement. The engine manufacturer, not the vehicle manufacturer, dictates whether a wait-to-start lamp is used as well as decides when the lamp is illuminated and extinguished. It seems logical that the engine manufacturer would also be the entity that would be capable of monitoring that the lamp actually works when commanded to do so. Nonetheless, the monitoring requirement is a performance standard and there are multiple ways that the system could be configured to meet the requirements ranging from a lamp directly hardwired and monitored by the engine controller to a lamp controlled by an instrument panel control unit and connected to the engine controller via a communication/network line. Any of these scenarios can be made compliant, yet the actual hardware configuration

used would ultimately dictate where various portions of the diagnostic solution must reside. Lastly, even today there are various constraints imposed on vehicle manufacturers by the engine manufacturers to maintain the compliance of the certified engine. Such constraints range from equipping the engine with adequately sized radiators or charge air coolers and associated sensors to not reconfiguring the exhaust lay-out of aftertreatment devices beyond the specifications. The wait-to-start lamp is no different and already does impose further constraints on the vehicle manufacturer to include such a lamp in a manner supported by the engine controller. The additional constraints imposed to ensure compliance with the monitoring requirement would be insignificant.

36. Comment: ARB should eliminate, or at a minimum delay until 2016, the proposed idle control/fuel injection quantity monitoring requirement in sections 1971.1(g)(3.2.2)(B)(ii)(d) and 1968.2(f)(15.2.2)(B)(iv). Robust monitoring is impossible for several reasons, and significant work is needed to address the following issues prior to adopting any such requirement. There are, for example, no immediate solutions for the following: (1) poor fuel quality, particularly low cetane fuel with low energy content, which would result in high than "normal" fuel to maintain the same idle speed as using a high cetane fuel given the same environmental conditions – there is no practical way to determine fuel quality through OBD; (2) variable engine loads that would have the most pronounced effect on idle fuel quantity (accessory loads like A/C, power steering, vacuum pump during brake applies, and alternator, will use up most of the allowed +/- 50% idle fuel requirement), and sensing these loads would require new inputs/output and would bring new non-ECU-controlled components into OBD; (3) manual transmission applications which would routinely exceed the idle fault tolerance during idle-only launch or when the idle governor is driving the vehicle in gear – this has no reliable monitoring method; and (4) decelerations (coasting) which will routinely cause the idle fuel to drop below the minimum allowed tolerance. On diesel engines, the idle speed is closed-loop controlled by the ECM using fuel, but it does not target a specific fuel quantity to achieve a specific idle speed. The fuel quantity for a specific idle speed varies greatly depending on environmental conditions as mentioned above. In typical PID fashion, idle fuel can be zero to a calibrateable maximum authority of the idle control system as required to maintain the desired speed. Engine manufacturers don't agree with ARB's assessment that a "normal" engine that requires 10mm^3 of fuel to maintain a desired idle speed has a malfunction if the system requires 15mm^3 of fuel to maintain the same speed – this may instead be due to environmental conditions that can't be robustly monitored or accounted for. The repair procedure for this code can be problematic. Other regulations already require a monitor to set if the idle governor is unable to maintain the desired idle speed within fault tolerances. (EMA)

    Agency Response: ARB staff disagrees and did not delete nor delay this requirement. As the commenter indicated, a typical diesel control system does not have any checks and balances in place to ensure that the amount of fuel being injected at idle is appropriate for the operating conditions. Thus, failures

that lead to reduced engine output power such as incomplete or poor combustion would result in increases in fueling and higher consequential emissions without detection of any fault. The idle governor monitor mentioned by the commenter will not detect a fault if the desired engine speed is achieved, regardless of how much excessive fuel it takes to get there. ARB does believe that an engine that normally requires a specific fuel quantity for a given set of conditions has a problem if it now requires 50% more fueling for the identical set of conditions (including all conditions such as environmental, operating, etc.). ARB also understands that manufacturers cannot directly measure every single factor that influences idle fueling quantity. This monitor, like virtually all other OBD monitors, must account for the factors that it can directly measure and calibrate with an appropriate tolerance to include those factors which are unknown and cannot be directly accounted for. Items such as system voltage, ambient temperature, and coolant temperature are known and can be accounted for while things like A/C compressor status may be unknown and require the calibration to cover the worst case of unknown items possibly being used.

37. Comment: The regulation requires readiness status for all monitors to be reset to indicate "not complete" during PTO operation, then restored to its "previous state" once out of PTO mode. Some vehicle applications, such as refrigeration trucks, have an extensive use of mobile PTO operation. As a result, manufacturers request a regulation change to allow retaining the readiness status for all monitors for a limited amount of continuous PTO mobile operation, provided only one or two monitors are disabled and the onboard computer is able to distinguish between mobile and stationary PTO operation, and to require resetting the readiness status for only the disabled monitor(s) if continuous mobile PTO operation exceeded a certain amount (more than 750 minutes or 500 miles). Resetting and restoring the readiness status to the "previous state" for monitors that are not disabled creates a data mismatch for monitors that are continuing to run. However, ARB should also maintain the current language and add new language only as an additional way to handle readiness status for mobile PTO operation, since many manufacturers have already developed systems to meet the current requirements. (EMA)

    Agency Response: ARB staff agrees that some changes were needed in the case of extensive PTO operation and proposed language to allow an alternative readiness status clearing strategy in both the OBD II and HD OBD regulations as part of the 15-day notice. Specifically, the new strategy would keep track of the cumulative time that the PTO device has been active and the time since the affected monitor(s) had last run. Only if cumulative PTO operation reached 750 minutes and the affected monitor(s) had not run (e.g., neither during PTO operation where it was disabled nor during periods of engine operation between PTO operation, if they occurred), would the readiness status be cleared. This would allow vehicles with frequent PTO activation (including perhaps, PTO devices that cannot be easily disabled during an emission inspection) to output a valid readiness status that would allow for vehicle inspection of emissions and proper OBD II operation in all situations except where a sufficiently long period of

time has passed since the monitor(s) last ran. However, unlike the proposed language for the OBD II regulation where manufacturers can elect to use the existing or new readiness handling strategy, the proposed HD OBD language requires use of this alternate readiness handling strategy for 2013 and subsequent model years. Given the much more common expected usage of PTO devices in the heavy-duty market and the unscheduled nature of roadside heavy-duty inspections, the new strategy will be required in that it should provide inspectors and technicians with more accurate and useful information about the current state (and recent history) of the diagnostic system.

38. Comment: ARB should not adopt the amendment to require manufacturers to incorporate software strategies to detect the use of fuel system components that have incorrect tolerance ("component tolerance compensation matching") on 2013 and subsequent model year engines (section 1971.1(g)(3.2.2)(F)). Staff indicated that this provision was 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 replaced/repaired. Modifying the design of the engine control system to automatically detect the use of the fuel system component 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 error, creating a "smart" component because someone might make a mistake, is very costly and not justified. 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 guess at and anticipate, and force manufacturers to make a fix for, every error that may or may not occur. ARB has identified emission and drive-cycle requirements for specific fuel system components that are significantly more stringent than other comprehensive components such as emission-related sensors. ARB should set more reasonable malfunction criteria and emission threshold requirements so manufacturers can identify a cost-effective solution for these components. At issue are the following requirements – detecting the fault that causes a measurable emission increase, detecting it over any reasonable driving condition, and isolating the failure to the specific component. Manufacturers rely on service technicians working on heavy-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 rely on the product for commercial purposes – will have the information to do so. Manufacturers already and will continue to ensure that adequate and appropriate service information is provided to allow mechanics to be trained properly and have the ability to identify the proper parts for the specific applications. (EMA)

    Agency Response: During discussions with manufacturers, staff discovered that virtually all manufacturers conduct highly accurate flow measurements on each and every injector prior to assembly and identify specific flow characteristics that are coded on the injector and ultimately, into the engine control module. With

this information, the injection events for each injector can be tailored to match the specific flow characteristics, resulting in more consistency in injection quantity from injector to injector. Manufacturers and their suppliers go to great effort to make these measurements and ensure they are properly configured during engine assembly. Once out in the field, however, it is entirely incumbent on a repair technician that is replacing an injector to not only know about the injector coding but to also own and use manufacturer-specific reprogramming tools for each brand of engine that is worked on and to utilize such equipment to correctly enter in the new coefficients of any injector that is replaced. Staff is not convinced that repair technicians will consistently have access to the necessary equipment or will remember to take such steps upon undertaking such a formerly simple repair as replacing an injector. Further, manufacturers have indicated that such individual injector coding results in lower overall emissions. Correspondingly, staff expects higher emissions if one or more injectors are inappropriately configured and the proposal would require such an event to be detected as a malfunction. If the manufacturer has determined that it is important enough for proper emission control to utilize such an individual injector compensation method, it is also important enough that the system detect a fault when one or more injectors is not being correctly compensated. Under the proposal, the HD OBD system would also be able to detect if the manufacturer had made a mistake during assembly (e.g., swapped injectors from one cylinder to another) or if the engine control unit (ECU) could not get the proper information from the injector for any other reason. Staff recognizes that this will likely require hardware changes to meet the monitoring requirements (such as a network connection for each injector to be able to send its information directly to the ECU) and, as such, provided additional lead time up to the 2013 model year.

DEMONSTRATION TESTING REQUIREMENTS

39. Comment: The number of demonstration tests required for model year 2011 and 2012 heavy-duty vehicles should be reduced from two vehicles per year to one. (EMA)(Cummins)

40. Comment: Some manufacturers are not required to provide any demonstration testing until the 2013 model year. (Cummins)

41. Comment: This reduction to one vehicle tested should be done regardless of the number of engine families certified. Also, the engine to be tested should come from the OBD child rating that has changes from the 2010 model year OBD parent rating. Manufacturers will be analyzing development test results and making engineering judgments on the child ratings to ensure that they satisfy the extrapolated OBD requirements. (EMA)

    Agency Response to Comments 39-41: ARB staff disagrees and did not make any changes to this requirement. For the 2010 through 2012 model years, manufacturers are required to implement a “full OBD” system on just one engine rating within one engine family, which requires manufacturers to do the more

extensive calibration work (including running emission tests for the emission threshold-based monitoring requirements) to ensure monitors meet the OBD requirements. For all other engine ratings within that one engine family, manufacturers are allowed to implement "extrapolated OBD" systems, which allow manufacturers to avoid the extensive calibration work done for the 'full OBD" engine rating and instead allow them to rely on "good engineering judgment" to develop a methodology to apply/adjust the calibrations to the extrapolated OBD systems. The demonstration testing in the HD OBD regulation, which requires manufacturers to conduct emission testing on engines to ensure they meet the emission threshold-based requirements of the regulation, will provide some verification in the 2011 and 2012 calendar years as to whether the manufacturer's methodology for applying/adjusting the calibration from the "full" rating to various "extrapolated" engine ratings is actually working or whether the manufacturer needs to further refine it before using it in 2013 across the entire product line. Ultimately, manufacturers will be liable for proper malfunction detection on each and every engine regardless of whether it was originally a "full" rating or an "extrapolated" rating, and this demonstration testing will provide valuable feedback to ensure the manufacturer is adequately calibrating the systems prior to incurring this in-use liability.

And yes, some manufacturers are required to test more engines than others but it is appropriately based on the number of engine families a manufacturer certifies. The more engine families a manufacturer certifies, the broader range of engines offered and the more important it will be that the manufacturer's methodology for calibration results is in compliance across all ratings. And yes, some manufacturers are not required to provide any demonstration testing until 2013, but that is because they are small volume manufacturers that are completely exempt from the entire HD OBD regulation until 2013.

42. Comment: The proposed HD OBD regulations impose greater in-use data collection and testing burdens on manufacturers, requiring them to collect and report in-use emissions data from 2010 and later model year real world aged engines to demonstrate the emissions performance of aged engine components. This would include removing the systems (engine and aftertreatment) from the vehicles, installing the vehicles on engine dynamometers, running emission tests to quantify the system deterioration, and reporting the data to ARB. This requirement has the same difficulties in procuring engines for testing and data collection as mentioned for manufacturer self-testing (section 1971.5(c)).

This expensive and time-consuming testing is unnecessary. EMA, ARB and the EPA are currently involved in establishing an emissions data collection program to show that applied deterioration factors accurately predict end of useful life emissions. This same data can provide ARB information to correlate OBD engine and aftertreatment aging system projections. The data then can be used on a going-forward basis to make adjustments to aging to show that demonstration testing is representative of full useful life, in other words, on a prospective basis for informing future certification demonstration testing, provided

manufacturers are given at least four years' lead-time to implement changes. The data should not be used for recalls or other enforcement action against manufacturers for previously certified product. Engine manufacturers do not dispute that it is appropriate to seek real-world emissions information; however, they dispute ARB's methodology, which disregards existing programs and the substantial costs, work effort, and resources involved. ARB should not add additional expense to manufacturers' already-strained resources when it is unnecessary, especially in the extreme economic situation of industry and our nation's economy. ARB is compelling manufacturers to obtain data from full useful life engines and aftertreatment to minimize manufacturer risk of noncompliance and recall, fines, or other remedial action. ARB stated its concern is about trying to protect manufacturers from synergistic effects and total system deterioration. Yet manufacturers, who are taking the risk and will be held responsible if projections are wrong, support an approach using emissions deterioration information as a baseline. Also, the proposed requirements are beyond ARB's statutory authority and thus unlawful.

Therefore, ARB should remove the data collection requirements of section (i)(2.3.2) and (2.3.3) of the proposed HD OBD rule, and revise section (i)(2.3.1) of the proposed HD OBD amendments and section (h)(2.3) of the medium-duty OBD II rule to require test engines for all model years to be 125-hour engines and aftertreatment aged to be representative of full useful life. (EMA)

Agency Response: ARB staff disagrees and did not delete these requirements. As was discussed extensively in the staff report, the current work being done with respect to showing tailpipe compliance with full useful life standards is not redundant with the requirements in the HD OBD regulation. For the tailpipe work, the emphasis is on a properly-operating engine and identifying the rate of gradual/'normal' degradation *of the system as a whole* within the useful life. For the OBD requirements, the emphasis is, after the engine has reached full useful life, how well do *each of the individual components* compensate or otherwise adjust for malfunctions that occur. It may well be appropriate and accurate to track gradual deterioration of the whole system for a short portion of full useful life and extrapolate to the likely tailpipe emission levels of the whole system at full useful life. However, it is completely inappropriate to determine the emission impact of a malfunction that strains or relies on increased performance of other emission controls by evaluating what the system does at low mileage and guessing what the individual components would do later in life. Manufacturers that guessed and got it wrong would end up calibrating inappropriately and have faults that exceed required emission thresholds before faults are detected.

The commenter suggests that the risk is all on the manufacturer so ARB should not care if manufacturers guess wrong or using methods that will not accurately work. But that is a circular argument because manufacturers want to be able to use an inappropriate method to calibrate and then use the same inappropriate method when they are required to test it and show compliance with demonstration testing. Such a system would never reveal whether the method is

inappropriate or not because it never verifies the method against real world-aged components. That only leaves in-use enforcement testing to possibly reveal the flaw in the methodology. But it is inappropriate to allow manufacturers to use un-validated methods and hope that the flaw will eventually get caught by in-use enforcement testing after the products have been on the roads for several years and several more model years of engines have been similarly calibrated and introduced into commerce as well. The purpose of demonstration testing is to verify that the manufacturer has appropriately calibrated the system prior to introduction of the engine, and the purpose of the requirement to validate the manufacturer's aging methods for this testing is to ensure that it correlates to real world performance so that systems will be designed correctly from the start. The commenter also argues that, although the OBD requirement does focus on gathering real world data and incorporating that into aging procedures as the manufacturer goes forward with future model year work, manufacturers should really be granted four years of leadtime if they discover they are doing it wrong before they should have to change. Thus, according to the commenter, a manufacturer that finds they have made a mistake and calibrated inappropriately should be rewarded with an additional four years to continue making the same noncompliant systems before a change is required. This would seemingly encourage every manufacturer to make a deliberate mistake to ensure an additional four years of reduced in-use liability, which is completely inappropriate. The real world aging validation procedures required by the HD OBD regulation appropriately requires manufacturers to compare their methodologies with real world aged parts, make any mid-course corrections needed to better align their methodologies to the real world, and use the knowledge gained as they go forward. For more detailed comments and agency responses concerning ARB's statutory authority for this testing requirement, see comments 80-81.

INFREQUENT REGENERATION ADJUSTMENT FACTORS

43. Comment: EMA has concerns with the brand-new proposed provisions regarding infrequent regeneration adjustment factors (IRAFs) in the HD OBD regulation. The IRAF provisions are noteworthy since ARB is proposing to make significant changes to an already complex and highly technical OBD rule that ARB has not established any need for. One of the reasons EMA opposes this requirement is the lack of necessary leadtime in imposing these requirements. (EMA)

    Agency Response: The commenter is incorrect – this IRAF requirement is not brand new to the HD OBD regulation. Staff proposed this requirement in 2005 when the HD OBD regulation was first adopted. Manufacturers did not comment on or indicate any concerns about this requirement back then, and the regulation and this requirement were subsequently adopted. Only during the 2006 rulemaking for the OBD II regulation update, in which staff proposed the same IRAF requirement, did manufacturers first comment on this requirement. Nonetheless, there is no leadtime issue with this requirement given that it has been present since the original rulemaking and there are no new provisions that

materially alter the requirement or the responsibility of the engine manufacturer to account for emissions from infrequent regeneration events.

44. Comment: EMA opposes this requirement because of feasibility and stringency concerns. Applying these adjustment factors would immediately increase the stringency of the OBD thresholds (which are already of highly questionable feasibility) by at least 10%, making them infeasible, and would lead to even greater stringency over a short period of time. When ARB adopted OBD thresholds in 2005 and proposed new thresholds in this current proposal, it did so without consideration of the additional stringency due to IRAFs. During discussions (including the workshop) leading up to the requirements, ARB had not sufficiently analyzed and accounted for the feasibility and cost impacts of apply IRAFs. EMA's detailed comments on feasibility issues were made during the 2006 OBD II rulemaking ("Comments of the Engine Manufacturers Association," Agenda item 06-8-4, September 26, 2006). When designing engine aftertreatment systems to meet emission standards and designing OBD systems to meet OBD standards, manufacturers must leave "headroom"/margin to account for variability and other factors that may increase engine or OBD emissions in a given situation (i.e., if the standard is 2.5 g/bhp-hr or 0.01 g/bhp-hr, manufacturers must design to some level below that number). Adding adjustment factors (emission certification or uniquely-calculated) reduces or eliminates this margin. Requiring IRAFs is unnecessary, unreasonable, and unjustified, since infrequent regeneration emissions are already accounted for in the underlying emission standards – manufacturers must certify all their engines to incredibly stringent standards 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. Further analysis is needed to determine if and how IRAFs should be applied to OBD. (EMA)

    Agency Response: As staff explained in the FSOR for the 2006 OBD II rulemaking, manufacturers must take into account the impact the malfunction has on the infrequent regeneration events when calibrating. To do so otherwise is illogical and would result in inequity among manufacturers as well as uncertainty as to the actual emission levels at which a fault would assuredly be detected. In regards to malfunctions of components that play an active role during regeneration or otherwise significantly alter regenerative frequency or emissions (such as the oxidation catalyst), ignoring the impacts would largely defeat the purpose of OBD -- to ensure that vehicles with virtually any emission-related malfunction can be identified as needing repair. In general, HD OBD malfunction thresholds are at least 2.5 times the applicable standards in the initial years of implementation. The commenter indicated that regeneration factors are nearly 10 percent of the standard, making a 2.5 times the standard monitor effectively a 2.4 times the standard monitor and, therefore, infeasible. While the adopted thresholds are indeed technology forcing, staff does not believe a difference of 10 percent of the standard is the dividing line between a requirement being technically feasible or not. It is not reasonable to believe that regeneration

emissions should be ignored for OBD, thus gaining an additional 10 percent of margin that they do not get for certification. Furthermore, while the 10 percent number may be a reasonable approximation for baseline certification adjustments, the case of the oxidation catalyst offers a striking comparison. Most medium-duty manufacturers have indicated that a completely missing oxidation catalyst would still result in emissions being less than 1.0 times the standard during non-regeneration events. If the OBD threshold did not require malfunction-specific adjustment, the manufacturer could calibrate the system to only detect a fault when the catalyst was completely missing. However, during a regeneration event, where emission levels can be 10 or more times above the emission standard, a missing catalyst resulted in emissions so high that one manufacturer was unable to quantify the results because the analyzers were not expecting such high levels. If the manufacturer has to adjust for such results, a malfunction of the oxidation catalyst will have to be detected at some intermediate level of deterioration in lieu of a completely-missing catalyst. As a result, a malfunction will be detected when the actual average emissions of the vehicle reach the threshold (e.g., 2.5 times the standards) instead of much higher (and unknown) emission levels. Just as there is no question that regeneration emissions must be included when doing emission testing for tailpipe certification, there should be no question that they are needed and relevant when doing emission testing for OBD certification and calibration.

45. Comment: EMA opposes the IRAF requirement because of the unreasonable and extremely high workload burden to implement this requirement. Robust determination of IRAFs for all applicable threshold monitors would require a prohibitive amount of testing (despite staff's comment in the staff report), requiring multiple test cycles to determine regeneration frequencies and establish emissions impact. In the workshop and hearing proposals, ARB proposed language that would allow manufacturers to submit alternative plans for IRAF determination for administrative approval upon determining the plans were based on good engineering judgment. Such flexibility is welcome for certification, but has concerns with potential in-use risks during the initial years of HD OBD. (EMA)

    Agency Response: Manufacturers are required to determine the appropriate factors to account for regeneration as a part of normal tailpipe certification—the amount of workload or resources to do so has nothing to do with OBD or the proposed amendments. Starting with that as a baseline, manufacturers are required to determine appropriate adjustments to those factors—a relative comparison that should in no way entail the level of resources used to generate the original factors. Thus, a manufacturer would not have to replicate the entire process for every OBD malfunction.

    OBD calibration work is, by definition, an iterative process. No manufacturer ever "guesses" right on the very first try as to the degree of component deterioration that will cause emissions to be exactly at the OBD malfunction threshold. A manufacturer partially deteriorates or simulates a malfunction and

conducts emission tests to see if it is above or below the limits and to take steps accordingly for the next test to pinpoint the actual levels. Requiring manufacturers to account for impacts to regeneration doesn't happen independent of this process or after it is completely done—it happens simultaneously. Manufacturers, who themselves design the regeneration strategies and calibrate the triggers to begin them, have access during this iterative process to the strategies and accumulation of data towards those triggers. A manufacturer is expected to (and would be foolish not to) gather data during emission testing regarding the progress towards regeneration triggers and should be able to compare it directly to previously acquired data on the speed with which the baseline system accumulates over the exact same cycle. There would be no need to actually ignore these data and operate the engine unnecessarily all the way to the trigger point just to quantify the relative increase or decrease in accumulation. Furthermore, just as the manufacturer must assess the first test results and see if it is above or below the requirements to determine whether to simulate a less or more deteriorated component, the manufacturer would make assessments about the magnitude of the impact on frequency of regeneration in making that determination. For those malfunctions where it is expected to have an impact on the actual emissions during regeneration, an additional data point would need to be measured. However, staff's recent discussions with manufacturers have revealed that they often encounter regeneration events during testing and attempt to work around them by triggering them before scheduled emission tests or interrupting testing to operate the truck on the road to allow the regeneration cycle to occur. There would be opportunities for manufacturers to measure emissions during one of those regeneration events in lieu of aborting or delaying emission tests to get around them and, again, make a relative comparison to the baseline system to determine the appropriate adjustments.

46. Comment: The costs of adding IRAFs far outweigh the benefits – there would be high cost of calculating IRAFs for OBD threshold monitors and minimal anticipated benefits from adding IRAFs. The sections in the staff report describing the overall emission benefits and cost-effectiveness of the OBD rule provide little justification for the requirement and generally and substantially underestimate the costs associated with the IRAF requirement. (EMA)

    Agency Response: Staff's cost analysis apportions a small amount of resources to the specific task of adjustments to the infrequent factors because it should only require a small amount of analysis and, in some cases, emission testing to complete. There is nothing to support the commenters' statements that it will require enormous workload and costs. As discussed to some extent in the response to the previous comments, the costs and resources necessary should be very limited and nowhere near the level of effort required to generate the factors for certification. Manufacturers are expected to make relative quantifications to determine the appropriate adjustments using experience and data gathered during calibration of each OBD monitor. As an example, if a manufacturer is calibrating a malfunction, he will be measuring emissions during

non-regeneration events and will be able to compare those emission levels to the baseline levels. The manufacturer will also have access during those tests to regeneration triggers/counters and will be able to assess if the malfunction it is testing is significantly altering those counters. Armed with these data, manufacturers would likely be able to infer, relative to the baseline, whether the system is working towards a regeneration event at a slower pace or faster pace and by how much and apply a similar correction to the certification derived factors. Further, engineers with understanding of the aftertreatment, control system, and implanted malfunction should also be able to accurately identify those malfunctions likely to alter emission levels during regeneration events. Those that are identified would require an additional emission test during a regeneration event to then compare that with the baseline measured values and scale the factors accordingly. As the manufacturer applies similar control strategies and controls across its product line, this process would likely be refined even further to make capturing the necessary data an automatic step during the calibration process and thus virtually eliminating the need for any additional testing.

Regarding the cost-effectiveness of requiring this one element of the proposal, staff's analysis did assume that vehicles would be emitting at the prescribed emission levels when a fault is detected. To redo the analysis assuming the manufacturers did not account for regeneration factors would result in higher emission levels before a fault is detected, and thus, less emission benefit and a worse cost-effectiveness. Further, if staff's analysis is correct and the additional resources consist primarily of engineering analysis of data captured during the calibration process, the additional cost is essentially negligible for additional engineering hours of crunching data relative to the resources for developing and calibrating monitors and the test cell resources and costs.

47. Comment: EMA proposed a number of changes following the 2008 workshop that would lessen the burden of the IRAF provisions on engine manufacturers, changes that staff has either minimized or entirely dismissed. The challenges with calculating and applying IRAFs are substantial and would put a severe strain on facilities already committed to development, validation, and certification of new monitors. Allowing for relief from this testing burden will allow manufacturers to manage available resources without committing significant capital investments into facilities required only for the initial years of the HD OBD regulation's applicability. The risk of allowing this accommodation is minimized by offering better-defined criteria for deriving the IRAFs. Risks due to the uncertainty of fulfilling the IRAFs requirement are mitigated by in-use allowances during the early years provided that the resulting emissions do not grossly exceed the applicable threshold. Therefore EMA proposed new language, which it submitted to ARB. The proposed changes include reference to EPA Guidance Document CIDS-06-22(HD-HWY) dated November 6, 2006 when citing adjustment factor determination methods, allowance of approval of certain IRAFs pending new supporting data from manufacturers for other IRAFs, limiting of the number of non-analytical unique IRAFs required (i.e., a maximum of four

monitors), more prescriptive language for alternate IRAF determination plans based on existing data, limiting of manufacturer liability for analytically-derived IRAFs through the 2015 model year, deadlines for ARB to approve a manufacturer's IRAFs (at least six months prior to the desired OBD approval date or one month after the request for IRAF approval, whichever is later), and a minor revision to the certification documentation requirements acknowledging analytically-derived adjustment factors. At a minimum, ARB should provide a written guidance on what constitutes good engineering judgment for calculating IRAFs – this is needed to provide direction to manufacturers, to lessen the burden associating with calculating a unique IRAF for each monitor, and to assure uniform judgment by ARB on whether a manufacturer's engineering judgment meets the requirements by leveling the playing-field for manufacturers. (EMA)

Agency Response: ARB staff did not accept EMA's proposed language regarding IRAF determination for several reasons. The main issue was that EMA's proposed language did not specify the minimum level of quality required of manufacturers' analysis and data in developing the IRAFs. For example, some of EMA's proposed language indicated that manufacturer's data/analysis "shall be considered sufficient" for ARB's request for new supporting data or for IRAF estimation (e.g., "The IRAF at the OBD threshold may be approximated by interpolating or extrapolating data from a malfunction that results in emissions above or below the OBD threshold…New data used in this way will be considered sufficient to fulfill an Executive Officer request for additional data..."). With this wording, any level of analysis or data manufacturers submit would be considered "sufficient" to meeting our requirements - thus, the IRAF plans of manufacturers that had put very little or poor work in developing their IRAFs would be considered just as sufficient as plans of manufacturers that had put in much more effort in developing the IRAFs. There should be language that at least acknowledges that there is a minimum level of quality a manufacturer's data/analysis must meet to be considered "sufficient" to meeting our requirements.

Concerning manufacturers' proposal to limit the number of monitors they would be required to develop unique IRAFs for, staff also disagreed with setting such limitations. First, it would be inappropriate to artificially limit accounting for real world emissions when some malfunctions occur just because the manufacturer already did account for it on a couple of other malfunctions. The OBD requirements are intended to ensure that faults are detected before tailpipe emissions exceed prescribed levels. Allowing manufacturers to arbitrarily meet this on some monitors but not other monitors is inappropriate. Further, such a restriction would create an inequity between manufacturers that design non-robust systems that have large impacts on IRAFs when malfunctions occur and other manufacturers that devote extra resources and work to develop a more robust solution that has minimal impacts on IRAFs. In the former case, the manufacturer would escape liability for accounting for these excess emissions by only requiring it to account for these impacts on a few monitors, while in the latter

case, the manufacturer loses its advantage of developing the more robust solution and saving on subsequent work to account for the excess emissions. Manufacturers largely argued that they needed this limitation to constrain the resources they would need to quantify and account for the excess emissions. As stated in the staff report (and restated here), during development of the regulation, staff and manufacturers made progress towards a common ground by agreeing to account for IRAFs primarily by using engineering analysis and/or data to estimate modifications to the baseline IRAFs rather than full rigorous testing and development of new IRAFs for each malfunction, provided the engineering analysis/data demonstrate the estimation is based on "good engineering judgment." The manufacturers, however, have argued that they are unsure as to what constitutes good 'enough' engineering judgment to be accepted by ARB, and thus proposed the monitor limitation because of this concern. This argument seems specious, however, since a great deal of OBD decisions require sound engineering judgment to be applied. This includes determining what kind of malfunction is most likely to yield the highest emissions for a given threshold-based monitored component and deciding what kind of driving cycle will reveal the highest emission increase to determine whether a component even needs to be functionally monitored. What matters most is that the analysis and data used in arriving at the adjusted IRAF are documented and well-founded. Should an estimating methodology contain a flaw that isn't easily anticipated, leading to higher than expected regeneration emission impacts during in-use compliance testing or some other reasonably non-anticipated effect takes place, the new heavy-duty OBD enforcement regulation provides relief in two forms: (1) through the 2012 model year, the ARB will use the adjusted IRAF estimated by the manufacturer at the time of certification even if it is found to be wrong, and (2) the ARB will not consider a system noncompliant if it is caused by something that could not have been reasonably foreseen by the manufacturer.

ARB also has issues with EMA"s proposed language that set deadlines for ARB approval of a manufacturer's IRAF estimations. EMA's language does not preclude manufacturers from initially submitting incomplete or poor analysis, which would start the clock but give ARB staff insufficient time to thoroughly review a manufacturer's IRAF plan.

ARB staff, however, agrees that some guidelines are needed to help manufacturers in their implementation of IRAFs and had indicated to industry that it will issue such guidance in the near future.

HEAVY-DUTY VERSUS MEDIUM-DUTY DIESEL OBD REQUIREMENTS

48. Comment: There are several inconsistencies between the heavy-duty and medium-duty diesel engine requirements in the HD OBD and OBD II regulations. A manufacturer's diesel engines used in a medium-duty truck is often used in a heavy-duty truck application over 14,000 lbs. GVWR as well, so differences in the OBD requirements between these two weight categories would create

additional workload and complexity. There is no reason these requirements should be different. (EMA)

Agency Response: ARB staff agrees that generally OBD requirements for medium-duty and heavy-duty engines should be the same for the reasons the commenter mentioned above. However, there are a few requirements staff believes should be different given the nature of the medium-duty and heavy-duty engines. For more details, please see agency response to comments 52 and 53.

49. Comment: The proposed NOx malfunction thresholds for upstream air-fuel ratio sensor monitoring and variable valve timing (VVT) system monitoring are not consistent between the HD OBD and OBD II regulations. Specifically, the proposed malfunction thresholds in the HD OBD regulation are 2.5 times the NOx standard for the 2010 through 2012 model years and 2.0 times the NOx standard for 2013 and subsequent model years, while the malfunction thresholds in the OBD II regulation are the NOx standard plus 0.3 g/bhp-hr for the 2010 through 2013 model years and the NOx standard plus 0.2 g/bhp-hr for 2013 and subsequent model years. The thresholds in the HD OBD regulation should be changed to match the thresholds in the OBD II regulation. (EMA)

Agency Response: ARB staff agrees that there should be consistency between two regulations regarding this NOx threshold. Prior to the publication of the 15-day notice, staff indicated to industry its intention to change the HD OBD thresholds for these monitors to match the OBD II thresholds as industry had specifically suggested above. However, industry expressed additional concern that the current OBD II NOx "additive" thresholds would not provide significant margin for robust monitoring on engines certified to a NOx FEL above 0.2 g/bhp-hr as part of the averaging, banking, trading program. Industry thus proposed that the current HD OBD NOx "multiplicative" thresholds apply to engines certified to a NOx FEL above 0.2 g/bhp-hr and that the current NOx OBD II NOx "additive" thresholds apply to engines certified to a NOx FEL at or below 0.2 g/bhp-hr for both the medium-duty and heavy-duty OBD requirements. Industry's new proposal, however, is too substantive a change to be proposed as part of the 15-day notice for this rulemaking. Industry will need to resubmit this proposal during a later rulemaking update for ARB to consider. Thus, ARB staff has not made any changes to the NOx thresholds for these monitors as part of the 15-day notice and intends to harmonize the thresholds in a future rulemaking. In the interim, it should be noted that for engines certified to the official standard of 0.2 g/bhp-hr, the additive and multiplicative thresholds equate to the exact same emission levels.

50. Comment: The proposed malfunction thresholds for downstream air-fuel ratio sensor monitoring and NOx/PM sensor monitoring are not consistent between the HD OBD and OBD II regulations. Specifically, the OBD II downstream air-fuel ratio sensor monitor malfunction criteria include a carbon monoxide (CO) threshold and the NOx/PM sensor monitor malfunction criteria include a NMHC threshold, while these CO and NMHC thresholds are not included in the HD OBD

malfunction criteria for these same monitors. ARB should remove the CO and NMHC thresholds from the OBD II monitoring requirements to be consistent between the two regulations. (EMA)

Agency Response: ARB agrees that there should be consistency between the medium-duty and heavy-duty diesel monitoring requirements. During the biennial review for the OBD II regulation in 2006, ARB staff carried over the heavy-duty diesel monitoring requirements to the medium-duty OBD Ii requirements. Additionally, staff added in the CO and NMHC thresholds to the OBD II downstream air-fuel ratio sensor and NOx/PM sensor monitoring requirements after determining these thresholds were necessary and intended to carry over these additional thresholds to the HD OBD regulation in the next rulemaking review. However, ARB staff mistakenly forgot to include these thresholds during this review. Additionally, these changes are too substantive to include as part of the 15-day notice. ARB staff will include these thresholds in the next biennial review for the HD OBD regulation, and thus will not delete these thresholds from the OBD II regulation. It should be noted, however, that the CO standard (and thus, the threshold) is quite high for diesel engines and rarely, if ever, becomes the limiting pollutant when calibrating a threshold monitor. For completeness, staff will add the CO threshold at the next opportunity, but except for a possible rare or unusual case, it is not expected to materially alter the level of sensor degradation that will need to be detected as faulty.

51. Comment: The OBD II regulation requires turbocharger boost pressure control system slow response failures to be detected if "proper functional response of the system to computer commands does not occur" while the HD OBD regulation requires these slow response failures to be detected if "no detectable response to a change in commanded turbocharger geometry occurs" for the 2010 through 2012 model years. ARB should change the OBD II regulation language to be the same as that of the HD OBD regulation to be consistent. (EMA)

    Agency Response: ARB staff agrees and modified the OBD II regulation language to be the same as the HD OBD regulation language as part of the 15-day notice.

52. Comment: The proposed amendments for thermostat monitoring are not consistent between the HD OBD and OBD II regulations. In the HD OBD regulation, staff is proposing that manufacturers monitor for thermostat faults where the coolant temperature reaches but then drops below the threshold temperature starting in the 2016 model year, while in the OBD II regulation, staff is proposing that manufacturers monitor for these faults starting in the 2013 model year. ARB should delete this proposed requirement in both the HD OBD and OBD II regulations for the reasons mentioned in comment 25. (EMA)

    Agency Response: ARB staff disagrees and did not make any changes to these requirements. Concerning the differing start dates for implementation, as heavy-duty engine manufacturers have mentioned to staff numerous times, the heavy-

duty industry is horizontally-integrated, so these manufacturers will have less control over the vehicle applications that their heavy-duty engines will be used in and the longer leadtime is justified. Conversely, medium-duty engine manufacturers have more control over the types and number of vehicle applications their engines are used in, and thus are currently more capable of monitoring for these faults than on heavy-duty engines. For details on the technical feasibility of thermostat monitoring, please see agency response to comment 25.

53. Comment: The proposed amendments for idle control system monitoring are not consistent between the HD OBD and OBD II regulations. In the HD OBD regulation, staff is proposing that manufacturers monitor for faults where the idle speed cannot be controlled within 50 percent of the target, while in the OBD II regulation, staff is proposing that manufacturers monitor for faults where the idle speed cannot be controlled within 30 percent of the target. ARB should change the OBD II requirement to 50 percent to be consistent with the requirement in the HD OBD regulation. (EMA)

    Agency Response: ARB staff disagrees and did not make any changes to these requirements. As stated above, the heavy-duty industry is horizontally-integrated, so heavy-duty engine manufacturers will have less control over the vehicle applications that their engines will be used in, necessitating a larger malfunction threshold. Conversely, medium-duty engine manufacturers have more control over the types and number of vehicle applications their engines are used in, and thus can monitor to a tighter threshold than heavy-duty engines.

STANDARDIZATION REQUIREMENTS

54. Comment: PM sensor technology must be subject to further biennial reviews and the use of PM sensor data as proposed in the standardization requirements should be subject to agreement between industry and ARB staff that the PM sensor technology is durable, reliable, accurate, and appropriate to the desired task at reasonable production costs which closely match the costs calculated in the 2005 Staff Report. (EMA)

    Agency Response: The HD OBD regulation does not dictate the use of a particular sensor including a PM sensor. The regulation does, however, establish performance standards such as monitoring of the PM filter to detect a malfunction before a specific tailpipe emission level is exceeded. In establishing such thresholds, staff evaluated the feasibility of various methods to meet the monitoring requirements and has indeed identified PM sensors as a likely path to achieve the required monitoring performance. Accordingly, staff has established monitoring requirements and standardized requirements that would apply to PM sensors, should they ultimately be used in a manufacturer's monitoring system. Ignoring likely technologies until they are introduced would result in a lack of clear direction to manufacturers as to what minimum monitoring requirements are applicable as well as put repair technicians at a disadvantage by preventing

access to critical sensor data integral to the manufacturer's diagnostic system. Further, the HD OBD regulation is scheduled for further biennial reviews and, as always, the review assesses manufacturers' progress towards meeting the monitoring requirements set forth in the regulation as well as evaluates technology development to determine if any mid-course corrections are needed. Lastly, as noted above, the HD OBD regulation establishes performance standards. A PM sensor may ultimately not be utilized by any manufacturer to meet the monitoring requirements, so it would be inappropriate to determine now that the future is completely dependent on some agreement between industry and staff as to the capabilities of a PM sensor.

55. Comment: An engine cannot reliably measure and predict hybrid battery pack remaining charge – no engine will be so equipped. Battery charge is not measured by engine control systems that perform HD OBD functions. (EMA)

    Agency Response: Staff routinely works closely with the SAE committee that establishes the standardized data in SAE J1979 that is output from a vehicle to a generic scan tool. In this particular case, the committee had already established a standardized parameter named 'hybrid battery pack remaining charge' and staff included that parameter in the regulation. As with other such parameters, it is only required to be supported in systems/control units that have access to such data. The commenter seems concerned that a non-hybrid engine and engine controller certified by an engine manufacturer could be modified by a third-party to become a hybrid with a battery pack and suddenly staff would be expecting the engine controller to support battery pack charge. In this particular case, the third party that is modifying the previously-certified, stand-alone engine to make it a hybrid would be responsible for ensuring the modified configuration complies with the HD OBD standards (which could include support and reporting of this parameter from a controller other than the engine controller).

56. Comment: Regarding the requirement to allow multiple CAL IDs and CVNs (sections 1971.1(h)(4.6) and (h)(4.7)), engine manufacturers interpret the term "vehicle" to mean "engine" where an engine dynamometer is typically used to certify emissions and HD OBD performance, given that they can only insure that a CAL ID and CVN are provided for the engine and engine's subsystem. (EMA)

    Agency Response: The use of the term 'vehicle' or 'engine' is irrelevant in the sections cited regarding CAL ID and CVN. Both sections dictate that each diagnostic or emission critical electronic control unit (ECU) reports a CAL ID and a CVN, with the term 'diagnostic or emission critical control unit' defined in the regulation itself. Further, the references within the sections to allow multiple CAL IDs and CVNs make no mention of vehicle or engine and refer directly to an allowance that pertains to individual ECUs and whether each ECU will output a single CAL ID and CVN or be allowed to output more than one CAL ID and CVN.

57. Comment: Section 1971.1(h)(4.8.3) should refer to (h)(4.10.1) instead of (h)(4.9.1). (EMA)

Agency Response: ARB staff agrees and made this change as part of the 15-day notice.

58. Comment: The ECUNAME requirement (section 1971.1(h)(4.9)) needs to be clarified for engines using SAE J1939-73, if it is not restricted to only engines using SAE J1979. Engines using SAE J1939-73 will provide the function field as defined for SPN 2848 Name in SAE J1939-81. The function field of the name will suffice to identify what job (OBD) controllers perform, and individual function definitions are listed in Appendix B of SAE J1939, with the engine listed as function 0. (EMA)

    Agency Response: To this point, staff has been heavily reliant on industry to identify areas that need further clarification with respect to SAE J1939—a standard that staff has limited experience with and is not required until the 2013 model year. The same sort of reliance was used with the light-duty industry during the early years of the OBD II regulation. However, the heavy-duty industry has apparently not been as thorough as needed in assessing the requirements in the regulation and assuring that they are appropriately addressed or clarified with respect to the SAE J1939 protocol. Accordingly, staff will become more involved in the development of SAE J1939 and incorporate any additional revisions needed in the next biennial review and prior to the implementation of SAE J1939 in the 2013 model year.

59. Comment: Future Federal Motor Carrier Safety Administration rules may require vehicle manufacturers to provide incident-recording devices on vehicles which will likely be programmed with their own copy of the vehicle's VIN as a means for detecting unlawful substitution of devices among vehicles. At such time, vehicle manufacturers may no longer be able to provide a single source for the VIN on the vehicle. (EMA)

    Agency Response: The HD OBD regulation requires manufacturers to output, in a standardized format to a generic scan tool, the vehicle (chassis) VIN. VIN is used in most registration paperwork and in vehicle inspections (e.g., roadside heavy-duty inspections, etc.) and is critical to identify the vehicle and owner. To minimize issues with multiple ECUs on a vehicle that may all have VIN in them and may or may not have been subsequently reprogrammed or replaced with the VIN not properly updated, the regulation dictates that only one ECU shall respond with the chassis VIN. With this method, there is only one ECU that needs to have the VIN correct (or be corrected in case it is not), so there is no chance for multiple ECUs to respond with conflicting VINs. However, this requirement does not prohibit manufacturers from including the VIN in multiple ECUs or responding to enhanced, proprietary, or non-generic commands to request the VIN from other ECUs. In the light-duty industry, it is quite common for multiple ECUs to have the VIN for security reasons, yet they are able to comply with the requirement for only one ECU to respond with the VIN to an off-board tool using the generic command to request VIN. There is no reason to

believe the heavy-duty industry couldn't similarly address this issue and satisfy both rules.

60. Comment: ARB should delete the requirements to track and report emission increasing auxiliary emission control device (EI-AECD). These requirements are extensive and very onerous, and there is no justification for including the requirements in an OBD regulation since it is unrelated to the OBD system (i.e., is not related to the identification, diagnosis, or remediation of malfunctions in engine emission control systems or components). 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. Even if the EI-AECDs 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 (40 CFR Subpart N, section 86.1370-2007). ARB already has ample means at the time of certification to ensure that AECDs are not claimed or relied upon inappropriately by engine manufacturers. Additionally, ARB has failed to demonstrate the technical feasibility of implementing the requirements (including the dual tracking requirements for EI-AECDs that have variable degrees of action). The potential impacts and strains that the EI-AECD requirements will impose on already-strained ECM storage and operational limits have not been assessed, nor has feasibility of discerning the 75 percent threshold been established (i.e., requiring the development and installation of counters capable of distinguishing second-by-second when and EI-AECD is operating above or below 75 percent of the maximum reduced effectiveness). Until ARB has demonstrated this, those requirements should not be adopted or implemented. ARB also has made no showing of the cost-effectiveness of the requirements. Since these requirements are not directed at detecting and correcting any excess vehicle emissions that might occur in-use when an emission-related malfunction occurs, there are no emission benefits from this requirement. This is particularly obvious since the EI-AECDs exclude those AECDs that might occasion an NTE deficiency, and thus are not those that could result in any non-compliance with the underlying emission standards in any event. Thus, the cost-effectiveness of this requirement cannot be established. (EMA)

    Agency Response: As was re-iterated many times to the commenter during this regulatory update and during the OBD II regulatory update in 2006, the argument that this requirement is unrelated to the detection, diagnosis, or repair of malfunctions is irrelevant. ARB is not precluded from including this requirement within the OBD regulation so long as it is properly noticed and ARB demonstrates that the requirement is necessary, cost-effective, and technically feasible. As set forth in the staff report and below, ARB has met these requirements. Further, the OBD regulation is indeed the only ARB regulation that specifies standardized

communication between a vehicle and an off-board tool (e.g., a scan tool) and specifies the entire content of what information must be available through that link. The requirement to track and report EI-AECDs is an example of one piece of information that must be reported over that very same data link. ARB can and has required other information to be made available through this data link that also are not solely related to the detection, diagnosis, or repair of malfunctions but are intended to facilitate vehicle inspection and/or make ARB's job of determining compliance on in-use vehicles easier. The OBD regulation is the appropriate place for all required data link information to be specified.

The requirement targets a very specific type of AECD to be tracked and reported—specifically, *emission-increasing* AECDs that are not otherwise accounted for (such as through NTE deficiencies). The commenters' statements that there is no environmental benefit is wrong because, by definition, this data tracks emission-increasing events and would give certification staff additional data to ensure such events are limited to those technically necessary and justified.

Currently, manufacturers are required to disclose all AECDs to ARB during certification and to explain why they are needed, how they work, what the emission impacts are when they are activated, and how often they are expected to be activated in-use. As one can expect, these software strategies are often very complex and difficult to assess how often they might really occur. Further, the onus is on ARB certification staff to discern those that are limited to conditions technically justified versus those that are overly protective or are being used to support an under-designed system—one that is inferior to that commonly used by competitors in the same area. By definition of AECDs and included in U.S. EPA guidance, manufacturers are not allowed to use AECDs to make-up for non-robust or inferior designs. Manufacturers typically include data from one or two vehicles operating for a few hours to give examples of in-use frequency despite the broad spectrum of vehicle types the engines are used in and the wide variety of driving patterns and ambient conditions that are relevant to activation. By requiring manufacturers to track how often each EI-AECD is activated, data can be gathered in-use to validate manufacturers' claims during certification and, importantly, ensure equity among all manufacturers by identifying outliers where emission controls are more frequently being deactivated, which could be a sign of an under-designed system.

Manufacturers already track numerous vehicle and engine activity events in the engine computer. Many are done at the request of fleet operators to the vehicle and/or engine manufacturer for purposes of monitoring fleet driver activity and include data such as time spent in specific vehicle speed ranges, time at idle, etc. These data can be used by fleet operators to reward drivers who stay below the speed limit or to optimize routes to minimize idle or low speed driving due to traffic or other conditions. Likewise, the tracking and reporting of EI-AECDs would be information stored in the computer and available for download via an off-board tool. The amount of additional computer memory space to

accommodate these values is negligible relative to the typical memory space in the computer. Further, staff included money in its cost analysis for additional computer memory and processing power to handle all of the OBD requirements including the EI-AECD storage. Regarding the additional burden this requirement places on engine manufacturers, EI-AECDs are only activated when specifically commanded to do so by the engine manufacturer. Thus, the software in the computer already has the information to discern whether or not it is currently commanding a specific activity to occur, so simply keeping track of cumulative time with it active is not a demanding software design or processor task. The commenter notes that it may not be feasible to meet the requirements to separately track when the action is commanding more or less than 75 percent of its full authority. This is not true. Working with manufacturers, staff modified the proposal to ensure that it would not take further testing or validation to determine a cut point (e.g., a certain emission level) on which to track the events. By linking it to 75 percent of the authority of the EI-AECD, manufacturers can strictly evaluate the system on paper, determine the maximum authority that they have calibrated that AECD to have, calculate 75 percent of that maximum authority, and divide the activation there. There is no question of technical feasibility given it is based not on physical quantities of what happens (such as tailpipe levels) but literally on the level of the action commanded by the manufacturer in the software.

61. Comment: If ARB does not remove the EI-AECD tracking requirements from the HD OBD regulation, it should revise the requirement and the definition of EI-AECDs to require tracking of EI-AECDs that are activated solely based on altitude up to 5500 feet, not 8000 feet. California has only two counties with altitudes above 5500 feet, which is about 1 percent of vehicle miles traveled, and under existing emission certification requirements, a cutpoint of 5500 feet is consistent with the federal NTE requirements and definition of AECDs, so there is no justification for the 8000 feet criteria. (EMA)

    Agency Response: During development of the proposed changes, the commenter had brought up this issue and the foregoing contentions for wanting to lower the 8000 feet criteria to 5500 feet. Prior to the Board Hearing, ARB staff discussed this with the specific manufacturer for whom the commenter is representing, and ARB had determined that the manufacturer had misinterpreted the requirement, believing it to prohibit it from invoking an AECD until the vehicle is above 8000 feet, to require extending the FTP and NTE compliance to up to 8000 feet, and to cause additional development, none of which is true. Thus, the manufacturer agreed it had no more concern with this particular issue. So staff does not understand why the commenter continues to raise the issue. The proposed requirement would require manufacturers to track EI-AECDs that are activated based solely on the altitude, and tracking would stop when the altitude is higher than 8000 feet. The area of issue (altitudes between 5500 feet and 8000 feet) should not be of concern, especially considering the commenter's statement that vehicle operation above 5500 feet in California is very rare, and minimal software work is expected to track this area.

62. Comment: ARB should delete the service information requirements from the HD OBD regulation. The adoption of California Code of Regulations, title 13 section 1969, which incorporate heavy-duty engine requirements into the existing light- and medium-duty service information rule, supersedes the requirements in the HD OBD regulation. It is at best inappropriate to have two separate rules promulgated and administered on the same topic. ARB HD OBD staff's concerns should be addressed within ARB by making changes to section 1969 in a new rulemaking and not within separate rules. Moreover, an obligation to comply with service information rules can occur only after certification of a manufacturer's heavy-duty OBD system. To require engine manufacturer's to fully prepare engine service literature and tools to meet an OBD-service information requirement creates a workload burden for materials which the manufacturer is not obligated to provide, if the HD OBD certification is denied. (EMA)

    Agency Response: ARB staff disagrees and did not delete the requirements from the HD OBD regulation. Staff already stated the reasons in the staff report for keeping the service information requirements in the HD OBD regulation. To summarize, the requirements in section 1969 for 2010 through 2012 model year heavy-duty engines are unclear and have been interpreted in different ways. Specifically, the language requires engine manufacturers for these engines to make available information and tools they already currently provide to dealers and independent facilities. Since these manufacturers currently do not make any OBD-related information or tools available (since HD OBD is not even implemented until the 2010 model year), the requirement could potentially allow manufacturers to provide information only to authorized dealers, denying access to all independent facilities, which is inappropriate and would jeopardize the start of the HD OBD program. Staff had discussed this issue with manufacturers prior to the publication of the staff report, and manufacturers indicated that they believed section 1969 requires them to sell their diagnostic tools that perform OBD and emission-related diagnosis and repair to the aftermarket industry during the 2010 through 2012 model year timeframe. In response, staff proposed modifications to the service information requirements in the HD OBD regulation to clarify that the sale of a manufacturer's service tool to non-dealers is an option for compliance. Such language parallels the requirements of section 1969, and presented this language to industry for comment. No comments were received prior to the regulation's initial notice and publication.

OTHER HD OBD REQUIREMENTS

63. Comment: ARB should revise the pending code storage requirement for engines using ISO 15765-4 or SAE 1939 to indicate that the pending fault code may be erased or retained when the fault is again detected on the next driving cycle in which monitoring occurs and a confirmed/MIL-on fault code is stored. This would support the use of common diagnostic executives across medium-duty and heavy-duty engine control systems. The U.S. EPA HD OBD rule and the ARB rule differ in what is required when the pending fault matures into a

confirmed/MIL-on fault – U.S. EPA allows the pending code to be either retained or erased while ARB requires the pending fault to be erased. There are advantages and disadvantages to both methods, and ARB should modify their regulation to harmonize with U.S. EPA's requirement. SAE J1939-73 MIL-on faults are captive to the "three trip rule" and will appear in the MIL-on list provided by DM12 when not detected (i.e., active) for at least three trips. Pending faults can be compared to the MIL-on list to understand those established or redetected during the current trip. Dividing confirmed faults into MIL-on and MIL-off (in DM23) only separates recently detected faults from those confirmed faults waiting to be erased in 40 trips. This was intended to allow repair efforts to concentrate on the most recently detected problems that illuminated the MIL, but does not eliminate the potential confusion between pending and confirmed faults under a two-trip regimen. (EMA)

Agency Response: As previously stated in the staff report, the SAE J1979 protocol does not provide a method for repair technicians to distinguish between faults currently commanding the MIL on and faults that are no longer commanding the MIL on. As such, a compromise was established to try and use a combination of pending code status and confirmed code status to help communicate that information to a repair technician and to teach technicians that newer model year vehicles work this way. However, this compromise is far from ideal and still leaves open the possibility to mistakenly conclude that a particular fault is commanding the MIL on when it is not or that a fault is no longer commanding the MIL on when it actually is. Further, it requires re-training technicians to non-intuitively determine that a fault that is reported as both pending and confirmed is not conflicting information but is actually complementary information that means it is confirmed and currently active/commanding the MIL on. The SAE J1939 protocol, on the other hand, provides direct accurate distinction by separately reporting whether a fault is currently commanding the MIL on or previously commanded the MIL on. There is no need for a technician to try to infer that distinction based on pending code presence or absence as it is directly and separately reported by the vehicle and scan tool. Further, by having distinct states, there is no need to provide a technician with "conflicting" information when reporting both pending and confirmed codes at the same time. A fault may be indicated as pending the first time a failure occurs and then be changed to confirmed (and no longer pending) once it fails a second time. For purposes of harmonization, the commenter is asking to ignore the advantages of the SAE J1939 protocol in this particular aspect and allow the use of the less informative and less intuitive way that SAE J1979 is forced to present the data. Staff does not believe the small advantage of common software for the few manufacturers that certify products to both the SAE J1939 and J1979 protocols outweighs the devaluation of the repair data to repair technicians and again rejected the same request for change.

64. Comment: The proposed amendments require denominators for certain output components to increment if and only if the component is commanded to function on two or more occasions for greater than two seconds or for a cumulative time

greater than or equal to ten seconds, whichever occurs first. ARB should remove the condition related to the component being commanded to function two or more times for greater than two seconds, but allow the heavy-duty manufacturers the option to use the original proposed language (i.e., the specifications set forth in section 1968.2). We believe this is a simple and straightforward approach and would meet ARB's intent to only count denominators if the component is actually used and covers both components that operate frequently (but briefly) and less frequently (but for a longer time). The option to use the specifications in section 1968.2 is for manufacturers with control systems used on vehicles below 14,000 lbs. GVWR that require compatibility with the light-duty requirements. (EMA)

Agency Response: ARB staff agrees and modified the regulation as requested as part of the 15-day notice.

65. Comment: The HD OBD regulation requires that to increment the denominators for monitors of emission controls that experience infrequent regeneration, there must be at least 750 minutes of cumulative engine runtime since the last time the denominator was incremented. This doesn't align with the medium-duty OBD II requirements, which require at least 500 miles of cumulative operation – these should be consistent between the two regulations. If the same engine was certified for both HD OBD and medium-duty OBD II, HD OBD would have a denominator based on time while medium-duty OBD II would have it based on distance for the same monitor, introducing additional complexity. The HD OBD regulation should have the option to use either the 750-minute condition or the 500-mile condition. Additionally, at the workshop on the draft regulation, ARB indicated the 750 minutes would be "non-idle" engine runtime, which EMA supports. There will be "clean-idle" heavy-duty engines meeting California's idling rule that will be idling for substantial periods of time, with very little filter loading at idle (so measuring at idle is not critical), so the denominator should be based on non-idle time to assuring incrementing at proper intervals. Alternatively, the time-based criteria could be limited to light-heavy-duty engines (≤19,500 lbs. GVWR). (EMA)

Agency Response: Staff disagrees with both of the commenter's suggested changes. While ARB generally wants consistent OBD requirements for heavy-duty and medium-duty engines, the different operation, certification procedures, and integration of engine and powertrain of heavy-duty engines versus medium-duty engines necessitated different criteria for incrementing the denominator. Additionally, contrary to the commenter's statement, ARB staff did not indicate that the 750-minute engine runtime was "non-idle" runtime during the workshop. Staff believes requiring "non-idle" runtime is overly conservative. However, staff believes that increasing the 750-minute criterion would address the idling concern, and proposed to increase the time requirement to 800-minutes of engine runtime as part of the 15-day notice.

66. Comment: The reference to "best available monitoring technology" (BAMT) should be deleted from the "to the extent feasible" definition in section 1971.1(g)(5.7). This is a vague requirement and would mean in practice 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 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 lead time and 3-year period of stability requirement. Essentially, the language would require manufacturers to use their competitors' technology when ARB decided it was appropriate, which results in no clear standard at all, since 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 emission standards, so one manufacturer's 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. The standards should not prescribe technologies manufacturers must use to meet those standards. This proposed amendment also creates a "standard" that is constantly moving and codifies ARB's practice of playing manufacturers off against each other year after year. Staff has acknowledged that their current practice is to review what manufacturers are doing every 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 indicated that ARB could, in fact, deny certification for 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 being proposed. Such an approach ignores, even violates, the lead time and stability requirements of the CAA (and California law) by forcing yearly changes in monitoring strategies. (EMA)

    Agency Response: The commenter submitted the same comments during the OBD II rulemaking update in 2006. During that rulemaking, staff modified the original proposed language with a 15-day change to appease the manufacturers, requiring the Executive Officer to consider the "best available monitoring technology to the extent that it is known or should have been known to the manufacturer and given the limitations of the manufacturer's existing hardware," which is the same language being proposed in the HD OBD regulation. Additionally, staff had provided a detailed response addressing all of the commenter's statements (see the Final Statement of Reasons for Rulemaking for

the OBD II 2006 regulation update). Yet, the commenter has given the same comments again for this rulemaking (i.e., have added nothing new to their arguments), and have not specifically addressed why the modified language is still of concern. Thus, the following response is essentially the same as those given in the 2006 rulemaking.

Staff does not agree with the commenter, and thus did not delete "best available monitoring technology" from the regulatory language. In past OBD II cases where ARB staff has reviewed whether or not a manufacturer has monitored a component "to the extent feasible", staff has always considered what the "best available monitoring technology" is. By definition, this includes "available" and would preclude proprietary or confidential items known or able to be used only by one of their competitors. It refers to monitoring technology including hardware and software that is available to manufacturers to meet the requirement. This has been ARB's practice for almost a decade to ensure equity is maintained among the manufacturers in meeting the requirements. This process is familiar to light- and medium-duty manufacturers as, from the start of OBD, they have had to discuss and seek approval of their future monitoring plans to ensure they were on track to meeting the requirements.

Regarding the commenter's assertion that ARB staff currently force manufactures to change their OBD monitoring technology for the next year's OBD certification based on reviewing what other manufacturers are doing and that staff could deny certification in any given year based on consideration of the BAMT and other criteria, ARB disagrees that this has ever been done or could be done as a result of this language. ARB routinely provides feedback to manufacturers when they present future monitoring proposals to ARB as to areas of concern or areas where they might be falling short of meeting the requirements. It has been common practice for ARB to provide feedback in the OBD certification approval letters when, upon seeing the final calibrations of the monitors and the interactions between monitors, staff has identified additional problem areas. In some cases, the problems are clearly non-compliances and result in deficiencies which, by definition, require the manufacturer to implement changes to remove the deficiency in an expeditious manner. In other cases, the problems are not as egregious non-compliances but still represent loopholes or areas of overlap where the system is not as robust to all types of failures as it should be. For these latter cases, rather than be extremely rigid and label everything deficient, staff attempts to work with the manufacturers to identify the need for improvement and an appropriate timeframe to implement such an improvement. Generally, this has worked to the manufacturers' benefit by avoiding additional deficiencies, making the certification process easier, and providing them time to coordinate the changes with other scheduled changes. Lastly, in some cases where staff believes a substantial change in technology has occurred and suddenly made something feasible that was previously not feasible, staff has historically issued guidance documents in addition to identifying it in OBD approval letters and eventually adding it to the regulation during a biennial review. In all cases, manufacturers are afforded the necessary

time to make the changes in a cost-effective manner. Regarding the 4-year lead time and 3-year period of stability comment, see agency response to comments 19-20.

HD OBD ENFORCEMENT REQUIREMENTS

MANUFACTURER SELF-TESTING REQUIREMENTS (SECTION 1971.5(c))

67. Comment: ARB should remove section 1971.5(c), which detail manufacturer self-testing requirements, from the proposed HD OBD regulation. (EMA)(Cummins)(Navistar)(Ford)

68. Comment: This section should be removed given the unreasonable costs and burdens that this testing would impose on manufacturers and that ARB has no authority under California or federal law to compel manufacturers to pay for the costs of in-use enforcement of their own engines. (EMA)

69. Comment: ARB does not have the authority to require HD engine manufacturers to pay for and conduct their own in-use enforcement testing. Industry is currently required to conduct testing on new engines, engines still in the manufacturers' control. However, HD in-use enforcement testing is different, using engines taken out of in-use trucks and vehicles retrieved from customers. We do not dispute ARB's authority to conduct its own in-use enforcement testing or that ARB shouldn't have data on real world emissions. Despite ARB staff working with us, we have not been able to come to an agreement regarding the enforcement language. In fact, there's still a lot of confusion and misunderstanding over what is in the language. (EMA)

70. Comment: We understand these rules help ensure cleaner vehicles throughout product life; however there are some issues that need to be addressed. ARB staff forewarned us that a HD OBD enforcement rule would be proposed. We thought it would be similar to the light-duty OBD II enforcement rule. However, a new section was added containing a manufacturer-ran testing program, to be totally funded by manufacturers. (Cummins)

71. Comment: Navistar cannot support in good faith the proposed HD OBD enforcement regulation for many reasons, including the practicality of the proposal, ability of manufacturers to meet the desired outcome of the enforcement in a reasonable period of time, cost and cost benefits of the proposal, and standard of pass/fail criteria as applied to HD OBD. Navistar supports further discussion with ARB staff to reach an amicable solution regarding the regulation in a timely and cost-conscious manner. (Navistar)

72. Comment: Manufacturers and ARB staff have worked very hard to negotiate a reasonable compromise with significant progress, however we were unable to reach an agreement due in part to our starting negotiations late and running out of time. An agreement could be reached if additional time were provided to

continue negotiations. Ford requests the Board direct staff to continue negotiations with manufacturers for a minimum 60 days in order to reach an agreement. (Ford)

Agency Response to Comments 67-72: As stated in the staff report, staff evaluated several different mechanisms to ensure in-use compliance and eventually concluded that the manufacturer self-testing was indeed the most cost-effective and appropriate method. The staff report details the rationale behind this decision and the repeated comments above have been fully addressed by the original rationale. Throughout the rulemaking process, staff and industry did engage in continued discussions to refine the proposal to try and achieve most of what staff identified as necessary elements while minimizing the tasks a manufacturer had to do. As a result of that process, some changes were made. Ultimately, however, both sides found themselves at an impasse and were unwilling to further compromise and as a result, the Board was left to determine the outcome. The proposed regulatory language, including 15-day changes, were adopted by the Board and the Board chose not to send both parties back to the table to try and find a previously unreachable compromise. For more discussion about cost issues, refer to agency response to comments 74-78. For discussion about the burdensomeness of the requirements, see response to comment 73. For discussion about ARB's authority to adopt the proposed in-use testing requirements, see response to comments 80-81.

73. Comment: Starting with the 2010 model year, the self-testing requirements would require engine manufacturers to: identify 1 to 3 engine ratings for testing, locate a test sample of in-use engines (i.e., engines installed on heavy-duty vehicles and operating in commerce) with the required mileage, negotiate with the vehicle owners to exchange from 1 to 10 engines and install in their place new replacement engines at the engine manufacturer's expense, transport the engines to the testing facilities, replace the major OBD system components on the engine with deteriorated or defective OBD components that can simulate or cause potential exceedances of the relevant OBD malfunction criteria, test on an engine dynamometer in an iterative one-by-one fashion with each deteriorated OBD component, measure the emissions of the reconfigured engine with each test, perform this test on as many as 10 vehicles from as many as 3 engine ratings, and prepare to respond to an ARB-issued mandatory engine recall order if 50 percent or more of the test engines do not illuminate the MIL if the OBD emissions thresholds are exceeded. The burdens imposed on manufacturers are unprecedented and unreasonable. In essence, manufacturers would be required to give away in trade as many as 30 "free" engines, install these engines in up to 30 vehicles each year, reconfigure each of the uninstalled high-mileage engines with broken OBD system components, and conduct extensive engine dynamometer testing on each of these engines. There are no proper justifications for the costs that such a testing program would force manufacturers to incur.

ARB's approach appears to be that because engine manufacturers can more easily conduct this testing, they should have to pay for it. ARB also completely dismisses (by failing to mention) the significant challenges manufacturers would face in obtaining engines from in-use trucks. Engine manufacturers no longer have control over their engines after they sell them. Yet, staff indicated that engine manufacturers could buy back engines from customers, give them new engines, sell replacement engines at discounts, rent trucks to get the engines, or try to find other ways to obtain high-mileage engines from in-use testing. The manufacturers would also have to find some way to warehouse for years the "perfect threshold parts" that could be implanted into the test engines. There is also significant risk to engine manufacturers that the engines which manufacturers get back for testing will be those engines that customers are having problems with in the first place. (EMA)

Agency Response: The tasks and costs associated with doing in-use testing are not insignificant whether it is ARB, manufacturers, or a third party doing the testing. As such, staff carefully evaluated the costs and the resources that would be needed and both accounted for such costs and resources in the cost-effectiveness calculations as well as sought out a method that would be efficient and viable. The regulation does require manufacturers to test their own engines and figure out ways to procure the engines from vehicle owners just as ARB would have to do. However, the commenter is overstating the requirements in several areas. First, manufacturers would only be required to test 10 engines in an engine family if the first tested engines failed and subsequently procured engines also failed and continued to do so until they hit the maximum of 10 engines. As manufacturers have often indicated they expect their engines to comply, it seems reasonable to assume they will not routinely have to test more than a few engines. Regarding procurement of the in-use engines, manufacturers are not required to give vehicle owners free engines as the commenter noted. Manufacturers are not prohibited from doing so and staff proposed that it may be the most cost-effective method in some cases (in lieu of renting the vehicle or taking it out of service for the length of time necessary to do the testing). But, ultimately, it is up to the manufacturer to find the most efficient and least expensive way to procure the in-use engines. For the largest manufacturers, they would be required to do such testing on up to three engine families per year. Further, the testing would typically target vehicles that were three to four years old that have high enough mileage on them. Thus, if manufacturers choose to 'warehouse' the threshold parts until they were needed for such testing, it would be a maximum of parts from three engine families for three to four years, which certainly cannot be considered an unreasonable request. Manufacturers also would have the ability to choose not to warehouse the parts but to recreate new threshold parts when the time comes for in-use testing. It is expected that manufacturers would choose the solution that makes the most economic sense be it storing a box or two of parts for three years or recreating those parts when the time comes. Lastly, the commenter suggests that the only likely vehicle owners that will be willing to allow the manufacturer to remove their engine for testing will be those that believe they have problematic

engines (or 'lemons'). This is just not true. Certainly manufacturers may have to experiment with their procurement methods and incentives to ensure sufficient participation, but there is no reason to expect that manufacturers will be unable to find a successful mechanism that will appeal to a typical vehicle owner. Many manufacturers have already suggested that they will likely target high volume customers---customers with which they already have an established relationship and have used historically to test new engines or calibrations or other tasks requiring in-use operation. Further, ARB has routinely done light-duty vehicle procurement and has, over time, refined the process to achieve successful participation. In some cases, ARB has had to increase the incentives offered to the consumer based on the relative value of the car (e.g., ARB routinely has to increase the financial incentive offered to luxury car owners relative to non luxury car owners). It is expected that engine manufacturers will similarly refine the process as needed to procure engines under the regulation.

74. Comment: We believe there is substantial exposure for industry and the costs are too high, placing significant stress on an already financially distressed industry. Companies that would have been at the hearing to testify are not present due to financial distress. (EMA)

75. Comment: This program continues indefinitely, without an end date, at the cost of hundreds of thousands of dollars to millions of dollars a year per manufacturer. (Cummins)

76. Comment: We want it to be clear that we expect our engines to comply with OBD requirements if tested for enforcement. Our concern, beyond the authority issue, is with the cost of this program. We have estimated the cost to be unreasonably excessive. The cost must be reduced significantly for Ford to consider supporting it. (Ford)

77. Comment: ARB significantly underestimated the costs of the self-testing program. Even under ARB's underestimated and erroneous cost assumptions, each manufacturer could have to spend more than $3 million each year to implement this testing program. If one assumes the cost of each engine that manufacturers would be forced to give away in trade is $23,000 and that the cost of the engine dynamometer testing is $80,000 per engine, then the per engine cost of this proposed testing program is more than $103,000 per engine (especially when fully factoring in the manufacturer's man-hours for implementing this testing). So under a worst-case scenario where a manufacturer is required to test 30 in-use engines, the total annual cost would be more than $3,090,000. ARB has no authority under the relevant California statutes to impose such an extreme in-use testing burden on engine manufacturers.

    ARB's cost assumptions are incorrect by a very wide margin. Among other errors, ARB has failed to allocate costs over engines sold in California (as opposed to nationwide), include the necessary fully-burdened labor costs, properly account for the full costs of aging the OBD components at issue, and

fully account for the significant fuel costs at issue. EMA conducted a survey of the actual costs that engine manufacturers would incur to implement this test program. The average cost for testing each engine is as follows:

Cost Item	ARB Estimate	Manufacturer Cost
Incentive for vehicle owner (e.g., one-week truck rental, plus oil/fluid change)		$2,000
Replacement engine for vehicle owner	$23,150	$30,000
Transport of new engine to vehicle owner location		$3,000
Labor for engine swap-out		$2,000
Transport of used engine to manufacturer's testing facilities		$3,000
Failed OBD components		$21,000
Demonstration dynamometer testing	$47,770	$220,000
Total cost for testing single engine	$70,920	$281,000
Worst case cost for 30 engine tests	$2,127,600	$8,430,000
Engine sold per year	72,000	(72,000x20%) = 14,400
Total cost per engine sold	$0.99 - $29.55	$19.51 - $585.42

ARB underestimated the costs by a factor of 20 (at a minimum). Consequently, ARB's cost-effectiveness analysis is similarly flawed and cannot be relied upon to justify an in-use testing program that is unlawful in any event.

It should be noted that the above costs were estimated based on testing engines using the emissions certification testing procedure applicable to 2010 and later model year heavy-duty engines. ARB has proposed that engine manufacturers would not be able to use those procedures for this testing, which is outrageous and entirely unreasonable. ARB cannot attempt to change the test procedure applicable to heavy-duty engines – any changes represent changes in the standard and would increase the costs of testing substantially. Changes in the standard may only be proposed after thorough review and assessment of the feasibility of achieving those standards with at least four model years' lead time before such changes are implemented, but ARB has failed to provide both the feasibility assessment and the lead time. (EMA)

78. Comment: Engine manufacturers worked diligently to investigate and proposed to staff other ways to allow ARB to obtain an assessment of OBD detection in-

use at far less cost than manufacturers would be burdened with under these requirements. EMA's proposed alternative in-use testing program, in which all manufacturers would have been required to test a limited number of engines over the next ten years, would have been a reasonable approach that could have satisfied ARB's need for input on in-use engines. (EMA)

Agency Response to Comments 74-78: Again, staff recognizes that the costs and resources to perform this testing are not insignificant and thus accounted for it during the rulemaking procedure. The rationale for the cost estimates is detailed in the staff report. As noted there, staff talked with manufacturers, suppliers and testing facilities to develop the cost estimates and believes staff's estimates are indeed appropriate. Every line item listed in the table above identifies costs that the staff accounted for in the estimate (although staff's estimates for the individual dollar amounts do not agree with the commenter's). The commenter also suggested that it is inappropriate for ARB to distribute the costs of this testing across an engine manufacturer's nationwide sales and instead should have only distributed the costs across the portion of those sales that end up in California. This is inconsistent with the stated intent of ARB, US EPA, and the manufacturers to develop a harmonized OBD requirement that would apply nationwide and allow manufacturers to design and certify a single OBD system for use on all engines. As this remains the intent and is what actually is happening in the 2010 model year with HD OBD engines, staff believes it is appropriate to apportion the costs for in-use compliance testing to the nationwide sales numbers. Further, the commenter's table includes a line item showing the 'worst case' costs a manufacturer could incur by having to test 30 engines in one year. As a reminder, only the largest manufacturers would be subject to testing up to three engine families in a single year, and the only way a manufacturer would reach a sample of ten engines per family is if they all failed at a high rate. Based on manufacturer's repeated comments that they expect their engines to comply, staff estimated that ten percent of the tested engine families would actually be noncompliant and result in a full sample of ten engines for that family. Further, staff estimated a slightly higher percentage that would require intermediate numbers of engines tested and some that even would require a full ten engines before being found to barely pass (e.g., 40 percent of the ten engines failing instead of the 50 percent required to trigger a noncompliance decision). Staff believes these estimates are conservative and represent a more accurate worst case for a typical manufacturer rather than the assumption made by the commenter that the manufacturer would be a large manufacturer and would have all three engine families fail to comply in a single year. Regarding the comment about manufacturers having to use different procedures for this testing than is used for emission certification procedures, see response to the following comment 79. Additionally, as noted in the response to comments 67-72, staff and manufacturers did indeed continue to have discussions up to the Board hearing date with respect to further refining the testing requirements to make them more amenable to both sides. However, those discussions ultimately reached an impasse partially because the

manufacturer's proposal – contrary to the claims of the commenter – would not have satisfied ARB's need for input on in-use engines.

79. Comment: Should ARB proceed with these self-testing requirements, at a minimum, ARB must delete the section restricting engine manufacturers from being able to make the engine taken from an in-use truck compatible with engine dynamometer testing without Executive Officer approval (section 1971.5(c)(3)(D)) since it is unlawful and unreasonable. It seems like an attempt by ARB to change the engine dynamometer emissions certification test procedure in the HD OBD rule, which is unlawful since the heavy-duty engine was previously certified according to this procedure. The test procedure to measure emissions for OBD testing must be the same as that used for emissions certification. This proposed requirement would increase testing costs dramatically. ARB should not and cannot adopt new test procedures without an assessment of their feasibility or without providing at least four model years' lead time to meet this. Manufacturers must be able to make appropriate changes to ensure the engine is compatible with dynamometer testing, and any restriction on manufacturers' ability to ensure the test procedure is consistent with the procedure it was certified to is inappropriate, unfair, and outside of the scope of the HD OBD regulation. (EMA)

    Agency Response: The proposed amendments do not alter the emission testing requirements in the manner the commenter is suggesting. Because the testing is done on a stand-alone engine and not a vehicle with the engine installed, several items must be simulated by the manufacturer to be representative of how the system will perform when it is actually installed in a vehicle. As an example, engines often use charge air coolers which rely on ambient air blowing through the engine compartment of the vehicle as it travels on the highway to work as a heat exchanger and lower the temperature of air going into the engine. In an engine test cell, there is no such airflow, so manufacturers are required to use an alternate heat exchanger to simulate the amount of cooling that would occur in the charge air cooler if the engine was in a vehicle that was actually being operated on the road. Further, for emission testing, manufacturers are required to ensure that emissions standards will be met throughout the useful life of the engine. However, this is typically done by testing an engine representative of a portion of that useful life (e.g., 200,000 miles) and then extrapolating from there until the end of useful life (e.g., 435,000 miles). Accordingly, when they test at a portion of the useful life point, the conditions of the systems on the engine (and the components they are simulating) are required to be representative of what they would be at that point of useful life. For example, if they test at 200,000 miles, the systems and simulated components are required to be representative of what they would be at 200,000 miles on an actual engine. For the testing required in the OBD regulation, manufacturers would be testing actual engines at a different mileage (nominally 75 percent of full useful life) than what is typically done during emission certification (e.g., less than 50 percent of full useful life mileage). Further, just like the emission test procedures, manufacturers would be required to simulate the same components that they did during emission testing. However, manufacturers would be required to simulate the current

performance of the components from the actual in-use engine (e.g., to be representative of the current state of the engine and its components) rather than default to simulating the performance of that component when the engine was brand new or was at some other mileage (e.g., less than 50 percent of useful life as was done for certification). Manufacturers have balked at having to quantify the current performance of these components from the actual engine and having to simulate that level of performance for fear that it may be more heavily degraded in performance than what they originally projected it to be during tailpipe certification. This argument, however, is irrational. Emission standards and OBD requirements are intended to ensure in-use engines emit at or below allowed emission levels, and the testing for OBD compliance would require manufacturers to test the engine in a configuration representative of what it is actually doing at that point of its life. To test as the manufacturer suggests with some components of the engine being actual components at the nominal 75 percent of useful life mileage and with other components simulated to be representative of some other mileage point would be meaningless and would not be representative of the emissions from that engine at any point in its life. Further, the allowance in the test procedures to simulate components during engine testing is intended to address practical issues that arise from the differences in testing a stand-alone engine in a room versus real world operation of that engine in a vehicle. It is intended to allow manufacturers to simulate the components to allow the engine to operate in a manner that is representative of how it will operate in the real world. It is not intended to allow manufacturers to create artificial 'best case' test conditions or other unrepresentative configurations. It would be inconsistent with this allowance to have manufacturers mixing and matching various levels of actual degraded components and simulated components.

LEGALITY OF ENFORCEMENT REQUIREMENTS

80. Comment: The HD OBD regulations, specifically sections 1971.1(i)(2.3) and 1971.5, exceed ARB's limited delegated authority because they unlawfully (i) impose onerous in-use emissions testing obligations on engine manufacturers with respect to non-new engines already sold into commerce and out of manufacturers' custody and control, (ii) fail to provide sufficient lead time with respect to new HD OBD standards, and (iii) impose mandatory engine recall obligations without first requiring proof that there has been any actual exceedance of an engine emission standard in-use. (EMA)

81. Comment: ARB has no statutory authority to impose unreasonable in-use testing burdens of section 1971.1(i)(2.3) and 1971.5(c) on engine manufacturers. The relevant California statutes are very specific with respect to the engine emissions testing engine manufacturers may be required to perform. Specifically, Health and Safety Code (HSC) section 43104 authorizes ARB to adopt test procedures for manufacturers to follow for certification of "new motor vehicles or new motor vehicle engines," procedures which cover the prescribed test methods (based on federal test procedures) necessary to determine whether these vehicles and

engines comply with the emissions standards established by ARB as a precondition to their sale and distribution into commerce. In that regard, a "new motor vehicle" is a motor vehicle "the equitable or legal title to which has never been transferred to an ultimate purchaser" (HSC §39042), and it is conclusively presumed that this title has been transferred to an ultimate purchaser if the vehicle has an odometer reading of 7,500 or more (HSC §43156). Also, HSC section 43202 authorizes ARB to "conduct surveillance testing of emissions of new motor vehicles at [the manufacturer's] assembly facilities or at any other location…assembly line testing is performed and…records are kept" (see also HSC §43210) – again, testing is limited to "new motor vehicles."

Thus, the only statutory authority that ARB has to compel emissions testing on engine manufacturers is in connection with certification and manufacture of *new motor vehicle engines*. Since the manufacturer self-testing requirements are specifically directed at non-new engines with accumulated mileage from 304,500 to 348,000 and the demonstration deterioration testing are directed at engines with mileage between 185,000 and 435,000 - well beyond 7,500 miles – these engines are clearly no longer "new." Thus, it is clear that ARB has not statutory authority to compel engine manufacturers to test these engines.

That ARB would seek to adopt such unlawful requirements is especially troubling considering a recently concluded litigation between EMA and ARB, the result of which is a pending writ of mandate against ARB to withdraw other unlawful test procedures that ARB had improperly sought to link to engine recall liability (EMA vs. ARB, BS114066, Sup.Ct., County of Los Angeles, consolidated with and into, Automotive Service Councils of Ca v. ARB, BS112735 (Dec. 1, 2008). In this case ("EWIR Amendments Litigation"), the Superior Court issued a detailed opinion indicating that while ARB has wide discretion to create the test procedure under HSC section 43104 to determine emission standards compliance, the discretion must be exercised in creating a test procedure for certification purposes, and ARB does not have discretion to include vehicle performance in a test procedure for certification, so ARB's contention that certification testing continues throughout the useful life of the vehicle (and the operation of all of a manufacturer's vehicles and engines is just one long certification test) is unsupportable. In light of the clear, directly applicable precedent as a result of the EWIR Amendments Litigation, and also considering the unambiguous terms of the relevant underlying statues, EMA urges ARB not to move forward with the proposed HD OBD amendments. (See also EMA v. ARB, 05CS00386, Sup.Ct., County of Sacramento (Oct. 2006) (writ of mandate issued to invalidate unlawful ARB regulation seeking to compel engine manufacturers to provide for the retrofit of non-new heavy-duty vehicles and engines)). It should be noted that ARB's response to the EWIR Amendments Litigation is due to the Superior Court on June 1, 2009, just four days after the May 28th hearing for this rulemaking, so ARB should certainly seek to avoid taking any action that could be perceived as constituting contempt of court.

ARB attempted to justify these requirements by citing to existing regulations pursuant to which manufacturers utilize portable emissions measurement system (PEMS) to test a sample of in-use heavy-duty vehicles to assess compliance with the not-to-exceed (NTE) standards. Those requirements, however, are entirely inapposite, stemming from a settlement agreement relating to a series of federal lawsuits challenging the validity of NTE standards, one result being, in essence a contractual agreement by engine manufacturers to implement a limited in-use NTE testing program with PEMS (see Statement of Agreement and Accord (July 11, 2003) entered into by EMA, ARB, and certain heavy-duty engine manufacturers). Such a settlement agreement, however, cannot and does not expand ARB's otherwise limited statutory authority. As the Superior Court directly held in the EWIR Amendments Litigation, "[t]he limits of an agency's rulemaking authority are defined in its enabling statutes, not by contract" (Slip op. at 14, citing Morris v. Williams, 67 Cal.2d 733, 748-49 (1967), and "a settlement agreement cannot expand an agency's rulemaking authority" (Slip op. at 21). (EMA)

Agency Response to Comments 80-81:

ARB's Authority to Adopt title 13, CCR, section 1971.1(i)(2.3)

Contrary to the contentions of the commenter, ARB's has specific authority to adopt the requirements of section 1971.1(i)(2.3) under Health and Safety Code section 43104 as well as general authority provided under Health and Safety Code section 39601, which provides in relevant part:

> The state board shall adopt standards, rules, and regulations . . . necessary for the proper execution of the powers and duties granted to, and imposed upon, the state board.

Section 43104 provides in part:

> For the certification of new motor vehicles or new motor vehicle engines, the state board shall adopt, by regulation, test procedures, any other procedures necessary to determine whether the vehicles or engines are in compliance with the emissions standards established pursuant to Section 43101. (Emphasis added.)

The HD OBD regulation includes emission standards and both test procedures and "other procedures for certification." These additional procedures include requirements that the engine manufacturer submit an application for certification, which the Executive Officer must determine is complete and establishes that the manufacturer has met all conditions required by ARB for certification. See section 1971.1(i)(2.1) ["Prior to submitting any applications for certification for a model year, a manufacturer shall . . . ."] Section 1971.1(2.3) is a part of that certification process. In previous proceedings involving ARB, the commenter has maintained that certification requires that manufacturers only meet established

test procedures, which it has characterized as "the specific tests that are followed in a regular definite order utilizing scientific emissions measurement equipment to measure and prove whether a motor vehicle engine is emitting air pollution constituents … at levels that meet or are below the numeric limitations that CARB has specified for those air pollutants." Petitioner Engine Manufacturers Association's Reply Brief in Support of Writ of Mandate in *Automotive Service Councils of California, et al. v. ARB*, BS 112735, County of Los Angeles (December 1, 2009) (*ASCC*). Such a narrow reading of the certification process is clearly wrong. It is well established that both ARB and EPA require much more for certification than mere compliance with test procedures, as defined by the commenter. The right to certify and sell engines in California is not a right gained by meeting the testing protocol of "test procedures" but a privilege that respectively allows manufacturers to sell engines in California. The same is true for certificates of conformity issued by EPA that allows for federal sale of engines. Both ARB and EPA have authority to establish such "other procedures" that can include conditions for certification that manufacturers must adhere to before engines are certified for sale. For example, see 40 Code of Federal Regulations (CFR) section 86.1848-01 that sets forth the requirements for certification of certain heavy-duty vehicles. There, at subdivision (c), EPA procedures provide in pertinent part:

> (c) All certificates [of conformity [i.e., E.O. certification in California] are conditional upon the following conditions being met:
> (1) The manufacturer must supply all required information according to the [relevant provisions of the CFR].
> (2) The manufacturer must comply with all certification and in-use emission standards . . . both during and after model year production.
> * * * * *
> (5) The manufacturer must meet the in-use testing and reporting requirements contained in [relevant provisions of the CFR]. Failure to meet the in-use testing or reporting requirements shall be considered a failure to satisfy a condition upon which the certificate was issued. A vehicle or truck will be considered to be covered by the certificate only if the manufacturer fulfills this condition upon which the certificate was issued.

See also 40 CFR section 86.1901(b), which provides in part:

> We may void your certificate of conformity for an engine family if you do not meet your obligations under this subpart [i.e., in-use testing].

See other examples of federal certification conditions at 40 CRF section 86.094(a)(10)(ii) and (a)(11)(ii). Like the above, section 1971.1(i)(2.3) sets forth a certification procedure other than a "test procedure," as characterized by the commenter, that is permitted under Health and Safety Code section 43104, which is comparable to the above-described federal conditional certification requirements. As under those federal requirements, ARB has similar authority to

deny certification initially or void it once granted if the manufacturer fails to meet the prescribed conditions for certification.

ARB's Authority to Adopt title 13, CCR, section 1971.5(c)

In the staff report at pages 67-71, ARB fully explained the need for and authority to adopt enforcement protocols for enforcement of the HD OBD regulation, title 13, CCR, section 1971.1, and specifically the need for and authority to require manufacturers to conduct in-use self-testing. As stated there ARB has both general (Health and Safety Code section 39601, which was incorrectly cited as section 39600 in the staff report) and specific authority (Health and Safety Code sections 43013, 43018, and 43101, and 43104) to adopt emission standards and test procedures. Accepting the commenter's position that ARB is without authority to have non-new motor vehicles tested in-use defies logic and well established State and federal history of being able to test vehicles that have been granted the privilege of operating in-use to ensure that they are in compliance.

Contrary to the commenter, ARB is not bound by the superior court decisions of either *ASCC* or *EMA v. ARB*, 05CS00386, Sup.Ct., County of Sacramento (October 2006. First a superior court decision has no binding effect on the agency, except as to the specific litigation itself. Second, the facts and issues of both decisions are inapposite to the facts and issues here. Although *ASCC* deals with an interpretation of authority under Health and Safety Code sections 43104 and 43105, the issues and facts are totally dissimilar. There as stated by EMA itself, the issues before the court were: does the four percent warranty claims rate constitute a "test procedure" and whether ARB has afforded manufacturers the statutorily mandated opportunity, at a public hearing, to present evidence contesting a recall order, when no evidence will be considered if it was not presented before ARB issues a recall order. As stated above, ARB has authority under Health and Safety Code section 43104 to adopt procedures for certification other than "test procedures" and that the conditional requirements of section 1971.1(i)(2.3) is part of such an "other procedure" required for certification. By its terms, section 1971.1(i)(2.3) does not involve a recall order that fails to provide manufacturers the right to present evidence. The protocol adopted in section 1971.5, which is referenced in section 1971.1(2.3) clearly provides manufacturers with such basic due process.

For discussion about insufficient lead time, see response to comment 82. For discussion about the burdensomeness of the requirements, see response to comment 73. For discussion about imposing mandatory engine recall obligations without finding actual exceedance of an emission standard in-use, see response to comment 83.

82. Comment: There is insufficient lead time for the new proposed enforcement standards used to determine whether an engine rating shall be considered non-conforming due to an artificially-engineered OBD system nonconformance and whether mandatory engine recall is ordered as a consequence of this

nonconformance. The proposed standards of nonconformance range from 2.0 times to 1.0 times the applicable OBD malfunction criteria (section 1971.5(b)(6)), and the proposed standards to trigger mandatory recall range from 3.0 times to 2.0 times the applicable OBD malfunction criteria (section 1971.5(d)(3)). Both these standards are being proposed to start with the 2010 model year, which begins no later than January 1, 2010. Approval of the regulation by the California Office of Administrative Law could easily come after January 1, 2010, which would amount to negative lead time for these new standards, which in turn is unfair and unlawful.

Section 209(b) of the federal CAA (42 U.S.C. §7543(b)) requires ARB to obtain a preemption waiver from the U.S. EPA in order to enforce any standard relating to the control of emissions from new motor vehicles or engines. One prerequisite is a finding that the standards are consistent with section 202(a) of the CAA, which requires four years of lead time for any standard applicable to classes or categories of heavy-duty vehicles or engines (42 U.S.C. §7543(a)(3)(C)). ARB has not met this for the proposed nonconformance and mandatory recall standards. Manufacturers need this lead time to design and build the new engine components to meet the new proposed HD OBD-related standards. Even ARB notes in the staff report that mandatory recall standards will impact the design and manufacture of heavy-duty engines, and so comprise the very type of standards for which lead time is most critical – thus, ARB have conceded this lead time is necessary. (EMA)

Agency Response: First, some of the information the commenter stated above is inaccurate with regards to the HD OBD enforcement standards. The commenter stated that the nonconformance standards for the emission threshold-based monitors are newly proposed and would not meet the four-year lead time requirement. When the HD OBD regulation was first adopted, it established the minimum performance criteria (the actual emission thresholds) that systems have to meet to be certified, so they are not newly established by the enforcement regulation that is now proposed to ensure compliance with those very criteria. Further, the original HD OBD regulation also included section 1971.1(m), which specified “intermediate in-use compliance standards”- thresholds less stringent than the certification criteria and meant to be used in the early years of implementation for determining in-use compliance. These non-compliance standards were specified in the HD OBD regulation since ARB had not adopted a stand-alone HD OBD enforcement regulation in 2005. When ARB subsequently proposed adoption of the stand-alone enforcement regulation this year, it carried over the intermediate in-use compliance standards from the HD OBD regulation and proposed deletion of the corresponding section (m) in section 1971.1. Thus, the commenter’s argument that the nonconformance standards do not meet the lead time requirements is not applicable. Additionally, the commenter stated that the proposed mandatory recall standards for emission threshold-based monitors start with the 2010 model year. In fact, the proposed regulation clearly states the mandatory recall requirements start with the 2013 model year (see section 1971.5(d)(3)(A)(ii)). Further, these mandatory recall standards apply to only a

subset of 2013 model year engines, those that are certified to the "full OBD" requirements. So there is sufficient lead time for manufacturers to meet the mandatory recall standards. Additionally, as a reminder, the mandatory recall requirements do not establish new performance standards or alter in any way the performance standards that were originally established by the HD OBD regulation. As with all noncompliances, the manufacturer may be subject to fines and/or remedial actions including recall. The mandatory recall element does not alter this liability but does define a subset of noncompliances that are considered so egregious that recall will be required.

Regarding the four-year lead time argument, as stated many times before, ARB does not believe that conformance with the federal four-year lead-time requirement is required for California to qualify for a waiver of preemption, and does not believe this lead time provisions apply to the OBD regulations. For more details, please see agency response to comments 19-20.

83. Comment: The core of the proposed HD OBD enforcement regulation is a program pursuant to which heavy-duty engine manufacturers must remove non-new, well-used engines from vehicles in commerce, reconfigure the uninstalled engines with deteriorated/defective OBD system components, and conduct extensive dynamometer testing of the reconfigured and artificially defective engines to assess whether a failure can be engineered and generated in an engine test cell before the MIL is illuminated. If such an artificial failure of the new OBD system standards (e.g., two to three times the applicable major monitor malfunction criteria) can be created in the test cell with a deliberately degraded engine, then ARB will order a mandatory engine recall. Thus, the new HD OBD enforcement regulation would premise mandatory recall obligations on a triple hypothesis, to wit: *if* a well-used engine is configured not with its own engine parts but with defective OBD parts, and *if* that engine is tested not in-use in a vehicle as intended but instead uninstalled on an engine dynamometer in a test cell, and *if* that uninstalled engine as reconfigured with defective parts can be made to operate in a test cell in a manner that causes an exceedance of an emissions threshold without MIL illumination, then it can be *assumed* for recall liability purposes that the engine with its original non-defective components in place and installed and operating in a properly maintained vehicle that is free from tampering *might* produce actual excess emissions in-use sufficient to constitute an actual violation of emission standards and an actual OBD nonconformance, similar if not identical to the artificial nonconformance engineered in the test cell. The relevant California statute (HSC §43105) does not permit the imposition of actual engine recall liability on the basis of such a triple-hypothetical, potential violation of an emission standard – this section provides that a new motor vehicle or engine required to meet emission standards pursuant to section 43101 cannot be sold to the ultimate purchaser or registered in this state if the manufacturer has violated emissions standards or test procedures and had failed to take corrective action. The operative question under the governing recall statute, therefore, is whether the manufacturer "has violated emission standards" in-use, not whether it might be postulated or

assumed based on non-representative results using a non-representative engine that an emissions exceedance might occur sometime in the future. An engine recall, along with its attendant costs to manufacturers and vehicle owners, is an extraordinary remedy that the applicable statute reserves only for actual violations of emission standards that produce actual adverse impacts on air quality from the actual operation of motor vehicles in-use.

Since the proposed HD OBD regulations would impose such recall liability based solely on artificially engineered failures of a MIL and without showing any actual emission standard violation in-use, the proposed regulations violate HSC section 43105. In other words, simply because an engine can be deliberately reconfigured with defective parts to produce non-representative excess emissions without MIL illumination does not mean that the engine as originally configured and operating in a vehicle will every produce excess emissions in violation of any applicable standard in-use. (EMA)

Agency Response: First, the core of the HD OBD enforcement regulation is not the subset that involves manufacturer self-testing of a few engines a year. The HD OBD enforcement regulation is structured to define test procedures for how all aspects of HD OBD systems will be tested and judged for compliance with the HD OBD regulation. In addition to a portion of the system that requires emission testing of in-use engines to determine compliance, there are portions that cover all other areas of the requirements such as ensuring monitors run frequently enough in-use or verifying monitors that are not correlated to an emission threshold work properly or even that standardized data is within specification.

Secondly, the commenter is attempting to twist the system into a series of hypothetical scenarios to obfuscate the original requirements. The HD OBD system is designed to detect virtually any emission-related malfunction that happens on an individual engine. It is not intended to identify whether an engine has a design flaw or fails to meet tailpipe standards due to a non-robust design or whether a particular emission control has a pattern defect or high failure rate. It is intended to identify any individual engine that is in need of an emission-related repair.

Most importantly, in response to commenter's objections, because it is impossible to predict which components will fail on which particular engines at any point that engine is operated in-use, the system must be in place on every engine and designed to be capable of detecting a malfunction in any of the emission controls. (Emphasis added.) To design and calibrate such a system, manufacturers are indeed required to implant malfunctions and determine a way to detect such malfunctions and test the system to prove that it does. However, this is not necessarily a new task as automotive engineers historically have been required to do failure mode and effects analyses (FMEA) to ensure engines and control systems will not act unexpectedly in the presence of a malfunction. It would be inefficient for engineers to sit around and wait for actual malfunctions to occur and then and only then determine how to detect such malfunctions and

take appropriate action. As a result, creating an 'artificial' defective engine by implanting the fault is a routine and normal part of designing and building engines and OBD is no different.

The commenter's suggestion that removing engines from vehicles and testing them in an engine dynamometer test cell is equally artificial and unrepresentative is misplaced. While it is interesting that the engine manufacturer's association would take the position that the emission tailpipe certification procedure that they have helped create and used since the start of emission standards is unrepresentative of in-use emissions, the manufacturers have also argued that it is beyond the scope of HD OBD to reinvent or modify the emission test procedures that have been established and used for tailpipe standards. It seems contradictory for the manufacturers to argue in Comment 79 that the HD OBD regulation must maintain consistency with the established engine dynamometer test procedures and then turn around and argue that removing engines and testing them per such procedures is unrepresentative of what they really are doing or is 'artificial' or an otherwise contrived test.

Lastly, the commenter suggests that the HD OBD enforcement regulation is inappropriate because it determines compliance based on whether the system can or cannot detect failures, regardless of whether the tested engines were actually found to have those failures in-use or not. Again, this position makes no sense. Taking the commenter's position to the extreme, a manufacturer could have a completely non-functional HD OBD system capable of detecting no faults at all and the manufacturer should only be liable if 'enough' in-use engines were found with actual malfunctions. This is contrary to the whole purpose of the OBD requirements. As stated above, OBD systems are not there to identify pattern (or abnormally high) failures of a particular emission control component. There are other requirements such as defect and warranty reporting that can identify such noncompliances. Yet, the commenter suggests that only if such a failure is happening (which by itself would merit remedial action) should OBD noncompliance even be considered. As an analogy, the same logic would argue that a faulty airbag system that fails to deploy the airbags in a crash, should not be considered for remedial action or correction until 'enough' of the affected cars are involved in accidents where the airbags should have deployed but did not.

Regarding authority, the California statute (HSC §43105) cited by the commenter clearly grants ARB authority to impose recall on manufacturers for vehicles or engines that violate emission standards or test procedures. It has also been established that the OBD regulations include both emission standards and test procedures and as such, any violation of the OBD regulation is a violation that can result in corrective action such as recall.

OTHER ENFORCEMENT REQUIREMENTS

84. Comment: EMA supports ARB's proposal to provide compliance flexibility to manufacturers by allowing emissions to exceed two times the malfunction criteria

in the early years of the program before a nonconformance is found and remedial action must be taken, since it is absolutely necessary to help manufacturers comply in-use with the stringent OBD standards being implemented over the next several years. But ARB should make corrections to the PM filter monitor nonconformance levels based on previous discussions with ARB staff in recognition of the particular feasibility concerns with the PM thresholds. Specifically, the levels were to be set at two times the malfunction criteria (three times for PM) until 2016 and two times the malfunction criteria for PM until 2019. (EMA)

Agency Response: ARB disagrees with the commenter and did not make the changes. Contrary to the commenter's statement, ARB did not agree to set the nonconformance level for the PM filter monitor to three times the malfunction criteria for 2010 through 2015 model year engines (it is currently proposed as two times the malfunction criteria). Distinct from the nonconformance level, the proposed malfunction criteria for the PM filter monitor are already at seven times the PM standard for 2010 through 2012 model year engines and at five times (for newly phased-in engines) or three times (for previously phased-in engines) the PM standard for 2013 through 2015 model year engines. Thus, two times the malfunction criteria for the nonconformance level will be at 14 times the standard for 2010 through 2012 model year engines (three times would make it 21 times the standard) and at 6 to 10 times the standard for 2013 through 2015 model year engines (three times would make it 9 to 15 times the standard), which are significantly high emission levels. Setting the nonconformance level at three times the malfunction criteria would result in complete failures of the PM filter going undetected and not being subject to enforcement, which is not appropriate at all. Even at the current interim nonconformance levels of10 and 14 times the PM standard, there is a possibility that engine-out emissions will still be less than that level (or very close to it). This means that to be considered nonconforming, the manufacturer would not only have to fail to detect a faulty PM filter at the required malfunction levels of 5 to 7 times the standard but would also have to fail to meet it by so much that it practically cannot detect any level of degradation of the PM filter at all.

85. Comment: ARB should provide an exemption from in-use enforcement testing for low sales volume engine families (engine family volumes less than 1000 per year or engine family ratings with less than 500 per year). (EMA)

Agency Response: Low volume engine families are still subject to HD OBD and must have compliant HD OBD systems. Accordingly, it is also appropriate that such engine families are subject to the HD OBD enforcement regulation. If the commenter is referring to the specific provisions regarding manufacturer self-testing, such provisions already take into account the size of the engine manufacturer (based on the number of engine families that the manufacturer certifies per year). Smaller manufacturers that generally have fewer engine families and lower sales volumes are subject to only one engine family being tested per year while larger manufacturers are subject to up to three engine

families being tested per year. Staff selects the engine families that are subject to manufacturer self-testing and would generally take into account all kinds of factors, including emission standard stringency, new engine designs, new emission controls, complexity, and sales volume, to determine which engine families will be tested. However, it would be inappropriate to grant a blanket exemption to some engine families based solely on low sales volume.

86. Comment: In the 2016 model year, engines with major monitors required to meet the in-use performance ratio requirements are subject to mandatory recall if the average of the ratios in a test sample group or 66 percent of ratios in the group is less than or equal to 33 percent of the applicable minimum ratio. ARB should add language to ensure distribution of the test sample covers different usage patterns – the varied duty cycles of heavy-duty engines make this a critical issue. Based on the experience of some member companies with light-duty applications, ratio results for different test samples with the same engine and calibration can vary significantly based on the duty cycle of the end user – there may be cycles that will not run a monitor but also are not indicative of the entire engine population. To address these issues, an exemption is needed if a disproportionate number of failures result from a single source (e.g., one fleet) and more leadtime beyond 2016 is needed to incorporate monitoring changes and to learn how to sample vehicles and get representative samples. (EMA)

    Agency Response: The HD OBD enforcement regulation already details the methods to be used by ARB in procuring vehicles for inclusion in a sample to determine in-use performance ratios (section 1971.5(b)(3)(C)(i)). Specifically, it includes language indicating the vehicles must be procured from more than one source and identifies other alternatives including methods similar to those used by the engine manufacturer themselves to procure vehicles for in-use emission testing. Additionally, even though manufacturers are required to begin tracking in-use performance with the 2010 model year phase-in engines and on all engines in 2013 model year, mandatory recall does not begin until the 2016 model year. As such, manufacturers will have already had several years of data to look at and ensure that they are on the right track before 2016 model year as well as sufficient time to revisit the sampling requirements should a problem be revealed in terms of variability within a sample group. However, it should be noted that the pass/fail criteria were established to ensure not only that the engines within an engine family meet the criteria on average but also that a significant portion of the engines (more than 66 percent) do not have ratios below the minimum ratio and are not being masked by a small percentage with very high ratios. Lastly, even under the current requirements, manufacturers have the opportunity to gather data from additional vehicles and share the data with ARB to rebut the findings from the ARB sample. The language (section 1971.5 (b)(7)(C)(i)a.) specifically calls out that the manufacturer may submit evidence that the vehicles in the test sample group were inappropriately selected, procured, or tested.

87. Comment: ARB should increase the time within which manufacturers must respond to a notice from the Executive Officer to elect to conduct an influenced OBD-related recall and submit an action plan for the recall from 45 days to 90 days (section 1971.5(d)(2)(A)). 45 days is insufficient time to make a determination and prepare a plan for what engine manufacturers anticipate would be a very complex and time-consuming undertaking. (EMA)

    Agency Response: ARB did not intend for the 45 days to include both the time to respond with a decision as to whether they would conduct an influenced recall and the time to submit an influenced recall action plan. Changes were proposed to clarify this as part of the 15-day notice. Specifically, ARB modified the language to give manufacturers 45 days from the date of service of the notification to elect to conduct an influenced recall, and proposed that manufacturers be given an additional 45 days from the date of election to submit a recall action plan.

88. Comment: ARB should revise the time period in which a manufacturer must respond to and submit a revised remedial action plan after ARB has rejected the previously submitted plan (section 1971.5(e)(1)(B)(iii)) from 10 days to 30 days. Remedial plans are very complicated action plans and more time than 10 days is needed considering heavy-duty engine manufacturers are not generally vertically-integrated. Extending to 30 days would relieve both ARB and manufacturers of the burden of having to submit and entertain extension requests that are likely to occur in almost every case. (EMA)

    Agency Response: There is already a clause in the proposed regulation (section 1971.5(e)(7)) that allows the manufacturer to request extensions on any deadlines in this section if the manufacturer has demonstrated good cause for the extension. ARB believes, however, that the 10 days will be adequate time in the vast majority of cases and that this additional provision to request extensions is sufficient enough to address manufacturer's concerns about time constraints in the few instances where 10 days may not be sufficient, and thus made no changes to the regulation.

89. Comment: ARB should delete the proposed requirement to include "a statement describing the adverse effects, if any, of an uncorrected nonconforming OBD system on the performance, fuel economy or durability of the engine" (section 1971.5(e)(3)(C)(ix)(c)) in the remedial action notices to owners, since it would only create extra work for no benefit. (EMA)

90. Comment: ARB should delete the proposed requirement for manufacturers to maintain records and report to the Executive Officer on "the number of engines determined to be unavailable for inspection and remedial action, during the campaign since its inception, due to exportation, theft, scrapping, and other reasons" (section 1971.5(e)(6)(B)(viii)). Heavy-duty engine manufacturers have no easy source of such information (compared to the light-duty market, where the

information is maintained by third parties), and reporting such information is costly for manufacturers as it is difficult to obtain. (EMA)

91. Comment: ARB should delete the proposed requirement for manufacturers to list the license plate number for all engines and vehicles subject to recall (section 1971.5(e)(6)(B)(x)). This information is not available to heavy-duty engine manufacturers, and they are not responsible for nor are they capable of matching vehicles and license plate numbers on an ongoing basis. (EMA)

    Agency Response to Comments 89-91: This language is standard language that exists for tailpipe emission recalls and was copied and included for HD OBD related recalls. At the manufacturers' requests, minimal changes were made to the procedures and paperwork involved with tailpipe emission recalls in adapting them for HD OBD related recalls and as a result, this language was left identical to what is currently required for tailpipe. If a change is required, the appropriate place to change this requirement would be in the tailpipe emission recall regulations at which time staff would make a similar change to the HD OBD enforcement regulation.

92. Comment: ARB should make clarifications regarding the proposed requirement for manufacturers to maintain records for at least one year past the "useful life" of the engines" (section 1971.5(e)(6)(E)), specifically the definition of "useful life". ARB should clarify that this is the projected useful life of the general engine family, not the particular engine, as that information is not available to heavy-duty engine manufacturers. (EMA)

    Agency Response: ARB agrees that clarification is needed, and proposed modifications requiring the records to be retained for at least one year "beyond when engines within the engine class, on average, exceed the defined useful life of the engines" as part of the 15-day notice.

15-DAY COMMENTS

93. Comment: The proposed text "that are monitored continuously" is erased from section 1971.1(h)(4.1) (when referring to components/systems for which readiness status shall always indicate "complete"), which makes it difficult to understand what is required on the readiness status. Specifically, some rationality checks of sensors are done only at engine start or engine shut down to comply with section (g)(3). Does the proposed regulation intend to allow the readiness status for these components always indicate "complete" even if there are some non-continuous monitors? If this is not the intention, the phrase "that are monitored continuously" should not deleted or the phrase "and (g)(3)" should be deleted so that the readiness status for monitors subject to (g)(3) can indicate "complete" upon the respective monitor(s) being fully executed and determining the component/system is not malfunctioning. (Hino)

Agency Response: Staff made changes to the language due to manufacturers' confusion as to which monitors were required to be included when determining what the readiness status would be for the specific component/system. The original intent of the phrase "components or systems … that are monitored continuously" was to refer to monitors that are "required" to run continuously. But as the regulation allows some of these monitors that are required to run continuously to be disabled during certain conditions (to avoid false detections), the original phrase "that are monitored continuously" would seemingly exclude these monitors. Additionally, it is staff's intent to have the readiness status for "comprehensive components" to always indicate "complete" regardless of the non-continuous rationality monitors. Thus, staff deleted the phrase "that are monitored continuously."

94. Comment: EMA supports the change to section 1971.1(d)(4.3.2)(E) that allows manufacturers to use the criteria for denominator incrementing found in the OBD II requirements as an alternative to those in section 1971.1. (EMA)

95. Comment: Regarding the change to section 1971.1(d)(4.3.2)(G) that included new criteria for incrementing denominators for components that experience infrequent regeneration events but allowed manufacturers to use the existing or alternate criteria until 2013, EMA supports the option to use alternate criteria. (EMA)

96. Comment: EMA supports the clarification to the HD OBD enforcement regulation that specified that manufacturers had an additional 45 days from the date of receiving notice to submit a recall plan for approval. (EMA)

Agency Response to Comments 94-96: We appreciate the comments.

97. Comment: EMA supports the proposed language in section 1971.1(g)(3.1.6) clarifying the monitoring requirements for vehicle speed information. Additionally, ARB should include language in the Final Statement of Reasons that clarifies ARB's intent that transmission manufacturers for heavy-duty vehicle are not required to meet emission warranty, warranty defect reporting, or service information requirements. (EMA)

Agency Response: See Agency Response to Comments 28-31.

98. Comment: Both sections 1968.2(f)(17.6) and 1971.1(g)(5.6) include changes regarding readiness handling during PTO activation. Medium-duty engines and vehicles may use the existing approach or an alternate approach to PTO readiness while heavy-duty engine have to change the readiness handling to the alternative approach by 2013. Though EMA originally recommended the alternate approach, it wanted it as an alternative, not as a requirement now or in the future. Even if it is true that PTO devices may be used more in the heavy-duty market than the medium-duty, that alone does not justify requiring/forcing heavy-duty engines to use the alternative approach when some have no need or

justification to do so, and will only unnecessarily increase costs with a clear benefit. The phrase "For 2010 through 2012 model year engines" should be deleted from section 1971.1(g)(5.6.2) and the alternate approach should be allowed as a true "alternative." (EMA)

Agency Response: See Agency Response to Comment 37.

99. Comment: Regarding the requirement in ARB Mail-Out #MSC 09-22 that the engine serial number (ESN) be reported in the CAL ID/CVN table, engine manufacturers will submit approximately the first ESN that corresponds to the particular engine calibration being reported. Additionally, when manufacturers submit CAL ID/CVN reports for service calibrations, the ESN would be shown as "Not available." Appendix F also requires reporting of "Module ID/Address" in hexadecimal format, showing examples of a single 4-digit value that apply only to 11-bit CAN messaging under SAE J1979. Engine manufacturers believe that 2 hexadecimal digits will be used to report source addresses when 29-bit messaging is used. Network segment device addresses (or source addresses) are 2 hexadecimal digits for systems that use 29-bit identifier CAN messages for diagnostic communication, regardless of whether J1939-73 or J1979 messages are used, and typically will be provided as the network address in the Module ID/Address column, when CAL ID and CVN values are reported using SAE J1939-73 messages. Inclusion of some 29-bit addressing examples may be a useful clarification of Appendix F in any future revision to the mail-out. (EMA)

Agency Response: Staff agrees and will modify the template (Attachment F of the Mail-Out) to include examples of longer Module ID/Address values. The modified template will be made available on the ARB OBD website.

100. Comment: Regarding the requirement in ARB Mail-Out #MSC 09-22 for rate-based data reporting, manufacturers are required to complete all fields of the template and are prohibited from using the abbreviation "NA." ARB must clarify what, if any, indication is to be used in a field when the monitor is not applicable (e.g., when a particular control system is not part of the certified system) or delete the phrase "Manufacturers are required to fill in all fields of this template." We understand that it is ARB's intent that any unused fields may and should be left blank. (EMA)

Agency Response: Staff will modify the template (Attachments D and E of the Mail-Out) to indicate what manufacturers are required to put in the field for non-applicable monitors. The modified template will be made available on the ARB OBD website.

101. Comment: The diesel monitor checklist in ARB Mail-Out #MSC 09-22 for heavy-duty engines has slightly different headings than the OBD II checklist for the comprehensive component monitoring section. Particularly for those manufacturers that certify both light/medium- and heavy-duty products, the goal is to be able to use a common checklist for both OBD II and HD OBD to simplify

referencing and reporting. ARB should allow alignment of the OBD II and HD OBD checklists to the extent appropriate. (EMA)

Agency Response: Staff will modify the checklists (Attachments G and H of the Mail-Out) to ensure common headings where appropriate. The modified checklists will be made available on the ARB OBD website.