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June 2005

In-Use Testing Program for Heavy-Duty Diesel Engines and Vehicles

Summary and Analysis of Comments

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

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1.0 General Comments Supporting Proposal

What Commenters Said:

The North Carolina Department of Environmental and Natural Resources and the Texas Commission on Environmental Quality supported the proposed in-use testing program.

Our Response:

EPA thanks the commenters for their support and agrees that this program will be an important resource in ensuring in-use compliance with heavy-duty engine regulations.

2.0 Comments Supporting the Rule with Reservations

What Commenters Said:

The Engine Manufacturers Association (EMA), Detroit Diesel Corporation (DDC), International Truck and Engine Corporation (International), and the Pennsylvania Department of Environmental Protection (PDEP) all supported the proposed in-use testing program, but either asked for a clarification or expressed a reservation on certain aspects of the proposal.

Our Response:

EPA thanks the commenters for their support. The specific comments are discussed in the remainder of this document.

3.0 Applicability

3.0.1 Model Year Applicability for Pilot Program

Proposal:

We proposed that under the 2005 and 2006 pilot program, 2002 through 2006 model year vehicle may be designated for testing.

What Commenters Said:

EMA commented that the pilot program should be limited to 2005 and 2006 model year vehicles because some 2002 through 2004 engine families were not specifically certified to NTE requirements. International Truck and Engine Corporation submitted similar comments. (EMA p. 26 and International p. 3)

Our Response:

For the pilot program, we will select engine families produced between the 2002 and 2006 model years which have been designed to comply with the NTE. This includes engines certified under consent decree requirements, California NTE regulations, and the voluntary NTE provisions contained in EPA guidance document VPCD 98-13 and Advisory Circular 24-3. EPA will only select engine families for which the manufacturer's Statement of Compliance specifically describes the engine as being designed to comply with the NTE either by requirement or voluntary measures.

For engines not designed to comply with the NTE, EPA does reserve the right to use the NTE as a means to evaluate the appropriateness of a manufacturer's auxiliary emissions control devices (screen for defeat devices) as explained in the EPA guidance documents above. In such a case, EPA would conduct the testing and would not require the manufacturers to do so.

In the event the duration of the pilot program is extended as the result of a failure to satisfy the provisions in §86.1935, the testing could include model year engines up through the last calendar year the pilot program is conducted (e.g. 2007 model year engines could be selected if the pilot program for gaseous emissions is extended through calendar year 2007).

3.0.2 Engine Family Selection

Proposal:

We proposed that we will typically make our engine family selections by approximately June 1 of each calendar year to increase the likelihood that EPA will be able to choose from a manufacturer's entire product offering for that same model year. In the event one or more engine families are certified by a manufacturer after June 1 of a calendar year, we will update our calculation of the number of engine families we can order tested in that year and, if appropriate order further testing.

What Commenters Said:

EMA commented (p.26) that we should specify a specific point in time for identifying the engine families that must be tested for that calendar year's selection since the number of certified families changes over the year.

Our Response:

Manufacturers normally certify all or most of their engine families by June 1of each year. Therefore, a manufacturer will know either its complete liability under the in-use testing program or the bulk of its responsibility by that time. Should a manufacturer plan to certified an engine family after that date, it should also calculate the possible testing exposure associated with that action and plan accordingly relative to the expenditure of resources. This does not

seem overly burdensome, since all selected engine families are provided the same 18 month minimum testing and reporting period, regardless of the date the family was selected for testing. Therefore, we will make our engine family selections as proposed, including the option to order further testing if additional engine families are certified after our original selection date, which will typically be approximately June 1 of each year.

3.0.3 Exclusion of Unsuitable Engine Families/Applications

Proposal:

We did not propose to exclude an engine family from being selected for in-use testing because of concerns that the installation of portable emission measurement equipment would be impractical.

What Commenters Said:

DDC commented that certain chassis and applications are entirely unsuitable for in-use testing. As an example, the company identified fire truck and emergency vehicles with unique engine families as falling into this category because they can not be instrumented without compromising the utility of the chassis. Also, DDC suggested that there are numerous applications where interior space constrains would not allow mounting the test equipment inside the cab and still provide for the presence of a technician. In this latter regard, the company noted that weatherproof systems are yet to be developed by instrument manufacturers. Consequently, DDC recommended that EPA not require in-use testing of engine families constrained by such application considerations.

Our Response:

In general, EPA will avoid selecting engine families, and vehicle chassis and applications where testing with portable emissions sampling systems is infeasible, impractical, or unsafe. We anticipate that such testing challenges would generally be isolated to a specific sub-class of vehicle chassis or application. Therefore, engine families are not expected to be wholly eliminated from consideration for reasons of portable testing incompatibility. To the extent incompatible engine families exist, they will likely be characterized by small volume annual production of fewer than 1,500 units. In general, these low production engine families will be selected for testing less frequently than their larger volume counterparts which makes it easier to avoid compatibility issues.

The in-use testing requirements provide manufacturers sufficient latitude to avoid selecting vehicles which are not suitable for in-use testing. We have successfully tested fire trucks and emergency vehicles in our in-use testing program using portable measurement devices. Nonetheless, we have revised the regulations to allow a manufacturer to reject an unsuitable vehicle if insufficient space is available for safe and proper mounting of the measurement equipment without prior notification to us. The manufacturer will, however, need to report any such rejection with sufficient justification, including photographic evidence, in

their quarterly or optional 30-day reports.

We expect that concerns about the suitability of portable testing will continue to diminish as portable emissions measurement systems evolve into more compact, durable, user friendly devices.

3.0.4 Need for a Consistent Program Nationwide

Proposal:

We noted that California was involved in the development of the manufacturer-run, in-use testing program that was critical in assuring that engine manufacturers are subject to a consistent national in-use NTE test program and noted CARB's intent to adopting an identical program soon after EPA completes its final rule for this program. Also, we expected to fully coordinate in the annual selection of engine families to be in-use tested and to work together in determining whether Phase 2 testing is warranted for families where the number of passing engines in Phase 1 does not automatically lead to no further testing. Finally, we noted that CARB has its own authority and decision process in determining remedial action for failing families, but that CARB expects to work with EPA and the manufacturers in this process in 2007 and subsequent model years.

What Commenters Said:

EMA commented that it is vital that the in-use program be administered on a uniform, nationwide basis, without any unique or special provisions for particular jurisdictions, including California. They further stated that this approach is embodied in the settlement agreement. (EMA pp. 2 and 3)

Our Response:

We agree with the comment and have continued to work closely with CARB to develop a nationally consistent program.

4.0 Recruiting, Screening, and Adjustment of Test Vehicles

4.0.1 General Test Plan Submission

Proposal:

We proposed that each manufacturer submit a general plan that describes how they will identify, locate, and screen vehicles for in-use testing. The general plan is intended to cover all engine families selected for testing by EPA. The plan must indicate whether the procurement and screening method may result in an emphasis on testing engines from a particular type of driving route or from a particular geographic area. The plan should identify business relationships, such as with vehicle manufacturers or fleet operators, that will be used to recruit

vehicles. Finally, the plan must describe the methods that will be used to gather available information about whether vehicles and engines meet the seven general vehicle criteria described above, including any forms or procedures that will be used. Deviations from the general plan need to be submitted to EPA for evaluation.

What Commenters Said:

EMA stated that the general plan requirements would unacceptably increase the burden of the overall test program by adding multiple layer of costs, delays, and complexities. Further, the requirement is not consistent with the "screening" nature of the Phase 1 testing as described in the settlement agreement. A more reasonable approach for dealing with this issue, as described in the preamble, is for EPA and the engine manufacturers to work together to develop appropriately detailed guidance documents relating to recruitment, screening, and preparation of vehicles for testing. International submitted similar comments. (EMA pp. 20-22 and International p. 4)

EMA also commented that if the general plan requirements are retained, EPA should specify its review time for plan approval. (p. 26)

Our Response:

We agree it would likely be more efficient to obtain the information contained in the general plan through guidance and have decided to remove those provisions from the regulatory text. The guidance will establish a template for manufacturers to submit the information suggested in the general plan.

The information contained in the voluntarily submitted general plan will provide EPA a greater understanding of how the manufacturers are conducting their testing programs and increased confidence in the test results. Without this information, EPA will feel compelled to perform an increased level of its own in-use testing to validate the manufacturer's test results.

We expect the plans will be sufficiently general to cover multiple engine families. We envision an annual or maybe even a one-time submission of the general plan where manufacturers would then only highlight deviations from the plan for a given engine family. The aforementioned template will accommodate a discussion of any deviations. We are designing the guidance with help from CARB and the engine manufacturers.

4.0.2 Testing with Malfunction Indicator Light (MIL) or Onboard Diagnostics (OBD) Code Displayed

Proposal:

We proposed that manufacturers may not, as a general rule, exclude vehicles from in-use testing if the vehicle has an OBD trouble code or MIL illuminated. Further, we proposed that manufacturers would not, as a general matter, be allowed to remedy the cause of the trouble code or MIL illumination prior to or during in-use testing. The existence of these trouble indicators may yield important information regarding the in-use emissions of the vehicle. In such cases, therefore, the vehicle will be tested with the OBD trouble code or MIL illuminated. However, the existence of these codes or lights during the screening process may indicate that the vehicle has been poorly maintained, tampered with, or improperly fueled. In these cases the manufacturer may request that the vehicle be rejected from the program. If trouble code or malfunction light is displayed after the vehicle has been accepted into the program, this also would not be automatic grounds for eliminating a vehicle or aborting a test once it has begun. Here the manufacturer may either test the vehicle with the code or ask for approval to remedy the cause of the code if it is maintenance related.

What Commenters Said:

EMA commented that testing with MILs or codes represents abnormal operation because owners of heavy-duty vehicles attend to these problems promptly in order to protect their business operations. Hence it does not make sense to require testing of vehicles with these conditions unremedied and it is inconsistent with the negotiated outline that calls for testing vehicles during their "normal operations." EMA also stated that there is no comprehensive OBD program aimed at flagging emission exceedences or specific flaws in an engine's emission control system. Therefore, it is unfair to presume that an activated MIL or trouble code necessarily would signify an emissions-related issue. Finally, EMA claimed that having to ask EPA for permission to reject or repair a vehicle would cause delays in conducting the program and be unnecessarily expensive. (pp. 11-13)

International submitted comments that were consistent with those summarized above. (p. 4)

Our Response:

Although there is currently no federal OBD requirement for heavy-duty diesel engines, EPA is in the early stages of developing such as requirement. The heavy-duty in-use testing program needs to be designed to accommodate the expected future OBD regulations. Further, manufacturers currently use diagnostic routines systems to varying degrees to assist service technicians in the repair of today's engines. To the extent those diagnostic routines identify potential problems with the emissions control system, it is appropriate for that information to be considered in the in-use test program, even if the OBD system is not designed to flag emission

exceedences. At a minimum, today's OBD systems can potentially identify flaws in an engine's emission control system could cause an emissions exceedence. We continue to believe that OBD information can potentially be valuable in identifying potential in-use emissions exceedences and understanding their cause.

As in the proposal, EPA will require manufacturers to supply known OBD information both in regards to the history of the vehicles and their performance once accepted in to the manufacturer-run in-use testing program. This information is important in that it may indicate emissions-related problems relevant to whether the engines have been properly designed to meet emission standards for the useful life of the engine and whether the engines are in fact meeting such standards during the useful life of the engine.

However, EPA agrees with the comment that owners of heavy-duty vehicles are instructed and are likely to attend to OBD related problems promptly. Therefore, manufacturers will not be required to test vehicles with a MIL illuminated or a trouble code set. We believe it is more appropriate to review emissions-related concerns identified by the OBD system without requiring manufacturers to use such vehicles in the in-use testing program, and the information that we receive from manufacturers will aid in this review. At their discretion, a manufacturer may generally test the vehicle with the MIL illuminated or trouble code stored, repair the vehicle and then test it (without EPA approval), or reject the vehicle from the test program as follows:

1. If a vehicle is received into the program and the length of MIL illumination or trouble code storage is consistent with proper maintenance and use, then the vehicle must be tested as received or repaired prior to testing. If the vehicle is repaired, the manufacturer must report the repair and the associated MIL illumination or trouble code to EPA;

2. If the vehicle is received into the program and the length of MIL illumination or trouble code storage is inconsistent with proper maintenance and use, the manufacturer has ~~t~~three options. First, test the vehicle as received. Second, reject the vehicle from the test program and replace it with another vehicle. Third, repair the vehicle and initiate the test. The manufacturer must still report ~~r~~repaired and rejected vehicles and ~~its~~ their associated MIL illumination or trouble codes to EPA; and

3. If a MIL goes on or a trouble code is set during an in-use test, the manufacturer also has two options. First, stop the test, repair the vehicle, and re-start the testing. In this case, only the portion of the full test results without the MIL illuminated or trouble code set would be used in the vehicle pass determination. Second, stop the test, repair the vehicle, and initiate a new test. In this case, only the post-repair test results would be used in the vehicle pass determination. Again, any repair, and the associated MIL illumination or trouble code must still be reported to EPA.

We will develop a guidance that addresses a number of issues pertaining to vehicle recruitment, screening, maintenance, and testing. This document will also identify the activity

thresholds referred to above. This guidance will be developed with the help of CARB and the engine manufacturers.

4.0.3 Notification of Vehicle Unavailability

Proposal:

We proposed that a manufacturer notify EPA if a prospective vehicle is rejected from the program for reasons other than failing to meet acceptance criteria contained in the general plan. The rejection would also be reported to us in the quarterly report that contains the final results for any engine family that completed testing in that period.

What Commenters Said:

EMA commented that a manufacturer should not be required to notify EPA that a candidate vehicle has been rejected if the owner decides not to make the vehicle available for testing. (p. 26)

Our Response:

We agree that our proposal to require advanced notification in this instance could be burdensome. We have amended the regulations to clarify that no notification is required prior to rejecting a vehicle if the owner refuses to participate in the program. We have also clarified the regulations to require that a manufacturer must document and report the rejection to EPA as part of there normal reporting requirements under the program.

4.0.4 Test Fuel

Proposal:

We proposed that manufacturers establish appropriate means to ensure test vehicles are operated only on diesel fuels meeting the requisite specification for the model year in which they were emission certified.

What Commenters Said:

EMA asked that EPA provide a mechanism or approach to ensure no failures were due to bad fuel. Specifically, the association requested that a real pre-testing method of ensuring that a vehicle has been operated only on proper diesel fuels must be developed and integrated into the in-use testing program to avoid improper and wasteful testing. (pp. 24-25)

EMA also commented that the proposed provision would require testing to be performed using fuel meeting the specifications for certification fuel. Requirements to find and ensure use of such fuel will be overly burdensome. Finally, EMA recommended that the test fuel provision

be modified to specify that diesel fuel consistent with the engine manufacturer's recommendations be used for testing. (p. 27)

Our Response:

From the comments it is clear that engine manufacturers and EPA share the same goals regarding the use of test fuels that are appropriate for in-use testing, e.g., they are representative of commercially available in-use fuels and a reasonable method be identified to avoid wasteful testing on inappropriate fuels. After further discussions with EMA members on this issue, we have fashioned the following solution.

A prospective test vehicle's fuel tank(s) may be drained and refilled with fuel conforming to the ASTM D975 specifications prior to conducting any test. Manufacturers may not provide special fuel for in-use emissions testing. If fuel is needed before initiating or during an in-use test, it must be procured from a local retail establishment near the site of vehicle procurement or screening, or along the test route. Alternatively, the fuel may be drawn from a central fueling source provided that the fuel used is representative of that which is commercially available in the area where the vehicle is operated. If the manufacturer can document that owner/operator of the prospective test vehicle has an established pattern of using one or more specific fuel additives and the fuel treatment is not prohibited in the vehicle's owner or operator manual, the manufacturer may continue to add that same fuel treatment for in-use testing. Also, the engine manufacturer may take pre-test and post-test fuel samples from recruited vehicles to ensure that appropriate fuel was used during in-use emissions testing. All fuel test results must be reported to EPA.

Engine manufacturers have indicated a special concern with the use of biodiesel fuel blends in prospective test vehicles. We want to make it clear that the past use of biodiesel fuels is not grounds for automatically rejecting the vehicle from the test program. A vehicle recruited into the program with a biodiesel fuel blend that is either expressly allowed or not otherwise indicated as an unacceptable fuel in the owner/operator manual, may not be rejected from testing. Of course, vehicles using biodiesel fuel blends may have their fuel tank(s) drained and refilled with ASTM D975 compliant fuel or an acceptable biodiesel fuel prior to testing. The use of fuel additives is also allowed as described above.

Finally, if a test vehicle fails the vehicle pass criteria and the manufacturer can prove that a non-compliant ASTM diesel fuel or prohibited biodiesel fuel blend was used at any time during the in-use emissions test, that particular test may be voided. In this case, the vehicle will be treated as described above.

4.0.5 Setting Adjustable Parameters

Proposal:

We proposed that a manufacturer must set any adjustable parameter to the midpoint of its adjustable range prior to testing.

What Commenters Said:

EMA asked that the adjustment allowance be expanded to include an adjustment to the manufacturer's recommended setting. (p. 27)

Our Response:

We agree with EMA's comment will revise the regulation to state an out of range adjustable parameter maybe adjusted to the manufacturer's recommended setting or the midpoint of its adjustable range prior to testing.

4.0.6 Recalibrating Engine Controls Prior to Testing

Proposal:

We proposed that engine manufacturers conduct a thorough screening of each engine before making any allowable adjustment or maintenance prior to testing. The results of this screening are to be reported to EPA. Also, manufacturers must screen each selected vehicle for proper use and maintenance and reject those vehicles which have not been properly maintained and used. A guidance will be developed to address specific vehicle screening and maintenance issues.

What Commenters Said:

The PDEP commented that the process of implementing supplemental test procedures, e.g., the NTE, was developed because engine manufacturers programmed their engines to recognize when they were being tested by the federal test procedure and when they were traveling on the highway. What contingencies is EPA considering to stop engine manufacturers from re-flashing the vehicle's electronic control module in order to pass the screening process?

Our Response:

Obviously, a manufacturer that reflashed a vehicles electronic control module to pass the screening process would not be generating a representative sample of emissions results which is required when deciding whether an engine family is complying with the emissions standards. Such a test would likely be voided by EPA. We have required that manufacturers report any steps they take to maintain, adjust, modify, or repair the vehicle or its engine prior to testing.

Further, falsifying the emissions performance of an engine under this program could possibly constitute ground for voiding a certificate under regulatory section 1901(b), though we would likely only consider the use of such a substantial penalty for eggregious violations.

We do not anticipate manufacturers resorting to such practices and expect to physically participate in the manufacturer testing programs to some extent, including during vehicle screening and maintenance prior to testing. Finally, EPA will continue to conduct some level of its own in-use testing to validate the manufacturers test results and gain confidence in their test programs.

4.0.7 Ensuring Selected Test Engines are Dissimilar in Build Date and Conditions

Proposal:

We proposed two basic different types of requirements to help ensure that the vehicles selected for testing within an engine family displayed variations in operating regimes and other usage characteristics. First, manufacturers must recruit test vehicles from at least two different sources. Second, manufacturers were to submit a general test plan that was designed, in part, to identify if there was any bias, i.e., pre-selection, in a manufacturer's recruiting program.

What Commenters Said:

The PDEP asked how we would ensure that a varying sample of engines within an engine family were tested. Specifically, they hypothesized that one fleet may have 10 vehicles with the same engine family, and that the engines may all have been produced on the same day under the same conditions. Further, PDEP suggested it may be tempting for an engine manufacturer to test all these very similar engines. Therefore, they wondered if EPA had a strategy to ensure that test engines were produced at different times and for different fleets.

Our Response:

The concern expressed by PDEP is unlikely to be encountered since manufacturers are required to select vehicles from at least two different sources and submit to EPA detailed information on the vehicles they select. Further, even though the general plan is now a voluntary submission, we generally expect manufacturers will provide this information. This will help ensure the manufacturer test programs are reasonably diverse in test vehicles and conditions. Finally, EPA has the authority to conducts its own in-use testing if it has concerns with the representativeness of the manufacturers' test results.

4.0.8 Small or Unavailable Engine Families

Proposal:

We proposed that if an engine manufacturer made a good-faith effort to recruit enough test vehicles to complete Phase 1 or Phase 2 testing requirements for an engine family, but was unable to do so, they could ask us either to modify the testing requirements for the selected engine family or, in the case of Phase 1 testing, to select a different engine family.

What Commenters Said:

The PDEP stated that the term "modify" was unclear. They were concerned that if it meant a significant reduction in the number of vehicles tested, then this should be limited to a small number of engine families per year for the affected engine manufacturer.

Our Response:

As discussed in regards to the comment on the exclusion of unsuitable engine families or applications (see 3.0.3.), EPA will avoid selecting engine families and vehicle chassis or applications where testing with portable emissions sampling systems is infeasible or impractical. That applies relative to the inability to recruit an adequate vehicle sample for testing. We anticipate that such testing challenges would generally be isolated to families characterized by small volume production of fewer than 1,500 units per year. In general, these low production engine families will be selected for testing less frequently than their larger volume counterparts which makes it easier to avoid compatibility issues.

Also, if a situation does occur where vehicle recruitment fails after a good-faith effort and the manufacturer asks us to modify the test plan, this will be evaluated on a case-by-case basis. If this occurred early in Phase 1 testing, we would likely chose a different engine family rather than significantly reduce the number of test vehicles in the originally selected family. On the other extreme, if this occurred after Phase 2 testing was initiated, we may reduce the number of engines that needed to be tested and evaluate the test data that was available. In such a case, a possible nonconformance with the applicable emission standards may already be evident. In summary, we do not expect that manufacturers will frequently encounter a lack of available vehicles for testing. Hence, we believe the occurrence of this problem in the in-use testing program will be self limiting.

5.0 Test Specifications and Conditions for Phase 1 Testing

Proposal:

We asked for comment on whether EPA should be allowed to direct a manufacturer to test specific engine configurations, test routes, and driving conditions for Phase 1 testing when we have particular information suggesting that these stipulations may help focus testing on areas

where EPA has particular emission-related concerns. This would be similar to the allowance proposed for Phase 2 testing.

What Commenters Said:

EMA commented that the settlement agreement does not call for directing Phase 1 testing and that this allowance was expressly discussed and rejected during the discussions that lead to that agreement. Phase 1 testing is meant to quickly screen vehicles for NTE compliance. Specifying detailed test conditions for Phase 1 adds unacceptable complexities, time constraints, costs, and vehicle recruitment difficulties, and should not be adopted. International submitted similar comments. (EMA p. 25 and International p.4)

Our Response:

We agree that the settlement agreement does include an allowance for EPA to direct testing in Phase 1. We proposed the allowance and clearly noted it was beyond the agreement. However, we believed that under certain conditions such directed testing might be advantageous to both the engine manufacturers and ourselves. However, due to the concerns raised in the manufacturers' objection, we are not including this allowance in the final rule. EPA will conduct tests on specific engine configurations, test routes, and driving conditions of interest in its own in-use program.

6.0 Voiding Certificate of Conformity for Failure to Comply with In-Use Testing Requirements

Proposal:

We proposed that the certificate of conformity for an engine family may be voided if the engine manufacturer did not meet its obligation under the in-use testing rules.

What Commenters Said:

International commented that during the settlement negotiations, all parties recognized that the 2005 and 2006 pilot programs must remain flexible in order for it to work. Therefore, the potential consequences of voiding a certificate of conformity for failing to strictly adhere to the 2005 and 2006 pilot programs directly contradicts the cooperative nature of the in-use testing program. (p. 3)

Our Response:

We agree with the commenter that the pilot program needs to remain flexible and cooperative in nature. We are retaining the provision for the pilot program as a way to assure that all engine manufacturers participate in the pilot program. We do not anticipate a reason to revoke a certificate of conformity if the manufacturer shows a good faith effort in conducting the pilot program.

7.0 Engine Family Evaluation Criteria and Testing Outcomes

Proposal:

We proposed a two-phase test program. In the first phase of testing (Phase 1) the manufacturer would test a minimum of five and a maximum of 10 vehicles per engine family selected for testing. The exact number of vehicles and the consequences of failure depends on how many of the tests exceed a specified numerical emissions limit, or the vehicle pass criteria. Depending on the number of failures we may decide: 1) no further testing is needed because a nonconformity with the applicable emission standards is not indicated; 2) further testing in Phase 2 of the program or other information is needed to better evaluate a potential nonconformity; or 3) if some form of remedial action may be warranted. This level of testing is intended to provide a quick indication of an engine family's emissions compliance without being overly burdensome to engine manufacturers.

In the second phase of testing (Phase 2) a manufacturer would test up to 10 vehicles from the designated heavy-duty diesel engine family. A pass/fail determination for each vehicle will be made by comparing its measured emissions to the same vehicle pass criteria used in Phase 1. We believe that testing up to 10 additional vehicles under this phase of the program will provide valuable information regarding whether the engine family conforms with the applicable requirements. Our action would again be guided by the number of tests exceeding the vehicle pass criteria.

What Commenters Said:

The Pennsylvania Department of Environmental Protection (PDEP) commented that our methodology for determining when to conduct further testing on a particular engine family seems slightly arbitrary. They noted that if a total of 10 engines are tested in Phase 1, and six out of the 10 engines satisfy the vehicle pass criteria (i.e., 6 out of 10 pass), then the engine manufacturer must join EPA in follow-up discussions to determine whether any further testing, investigations, data submission, or other actions may be warranted. PDEP did not fully understand our rationale in this instance, stating that when four out of 10 engines fail, additional in-use testing would seem warranted, i.e., Phase 2, regardless of what mandatory discussions with engine manufacturers reveal.

PDEP further stated that if five or fewer engines out of 10 in a particular engine family satisfy the vehicle pass criteria and EPA gives the manufacturer the possibility of not conducting Phase 2 testing, then the converse should be true. If eight out of 10 engines pass, then the possibility should exist that additional testing would be required: Phase 1 testing may indicate false positives in addition to the false negatives.

Our Response:

Phase 1 testing is designed to screen for potential compliance problems that warrant further investigation. The screening nature of Phase 1 testing seeks to strike a balance between conserving manufacturer testing resources and generating sufficient quality information to make credible compliance decisions. This balance requires a flexible approach --one that is not fundamentally different from the discretion EPA has used in it's traditional light-duty in-use testing programs. For the light-duty program, EPA has never specified a cut-point where it will always pursue a compliance action. Before making such a decision, EPA considers information such as the reason why vehicles fail and how much the standard is exceeded. It's highly likely that EPA would look to pursue Phase 2 testing in the event four or more engines fail Phase 1 testing. However, Phase 2 requires testing of 10 additional engines, and we want to carefully consider the test results and other evidence before requiring additional testing.

We believe that, in the context of the manufacturer-run program, if the first 5 vehicles (or even 5 of the first 6 vehicles) in an engine family pass, it is not the best use of finite resources to require further testing.

8.0 Reporting Requirements

8.0.1 Data Elements and Reporting Format Burden

Proposal:

We proposed that the results from in-use testing be reported in a comprehensive manner and listed many of the individual reporting requirements in the regulatory text. More specifically, we asked manufacturers to report all emissions data, engine operating parameters, test conditions, test equipment specifications, vehicle and engine information generated during the test program, vehicle pass results, etc. The proposal described our intent to develop addition details, including the final reporting format, as a separate guidance document.

What Commenters Said:

EMA commented that the extensive list of proposed data requirements was overly burdensome, while at the same time acknowledging that the negotiated outline specifies the submission of a "...comprehensive report...." EMA also stated that the negotiated agreement called for a standardized reporting format to be jointly developed by EPA/CARB and the engine manufacturers. However, since no jointly developed reporting format had been completed, EMA commented that no final rule should be promulgated until that time. International submitted similar comments. (EMA pp. 22-24 and International p.4)

Our Response:

The majority of data that must be reported under this rulemaking is either generated electronically during the course of on-road testing or would have generated even in the absence of the reporting requirements. This data is needed so we can understand how the vehicle was operated, and tested. Also, submitting the emissions data will allow us to independently interpret the test results and more quickly focus on the root cause of any potential noncompliance. Therefore, we do not believe the reporting requirements create an unreasonable burden. Nonetheless, we have entirely eliminated some of the items that we proposed manufacturers report based on their comments such as the vehicle owners name and address, and test results for incomplete, void, and voluntary in-use testing. These items have generally been moved to the record keeping requirements. As discussed in the proposal, EPA is jointly developing a standardized reporting format with CARB and industry. The standardized format will be issued as a guidance in the form of a template for electronically reporting the required information.

8.0.2 Reporting Deadlines

Proposal:

Pursuant to the in-use testing outline, we proposed that manufacturers send us reports for all engines tested during a calendar year quarter within 30 days after the quarter ends. Alternatively, we proposed that they may submit a report for individual engines within 30 days after testing is completed.

We also proposed that all required testing and reporting for an entire engine family be completed within 18 months after we designed that family for testing. An engine manufacturer could request up to a six-month extension of the above deadline to complete Phase 2 testing, if the need for additional time could be justified.

What Commenters Said:

EMA commented that it may be more appropriate for manufacturers to submit reports upon the completion of Phase 1 or Phase 2 testing for a specific engine family instead of submitting reports on a calendar year basis for all engines tested during that quarter. This would consolidate information from a single phase of testing into a single report and would avoid the illogical inclusion of dissociated information from multiple families into the same report. It would also ensure more timely reporting of information on completion of a phase of testing. Accordingly, EMA asked for the option of reporting either on a quarterly basis, as specified in the proposal, or 30 days after the completion of a specific phase of testing is concluded. (pp. 23-24)

EMA also commented it was dissatisfied with the proposed requirement to complete all testing of a designated engine family within 18 months, with an option to request a six month

extension for Phase 2 testing if justified. They concluded that it may be impossible to meet these deadlines in some cases, although no specific examples were provided. Instead, EMA asked that the provision be deleted or modified to allow unlimited extensions where circumstances dictate. (p. 26)

Our Response:

EPA envisions that manufacturers will conduct multiple test programs concurrently and believes reporting in-use testing results on a calendar basis will provide the most timely and effective status updates of those testing programs. We expect manufacturer testing to be continuous over multiple calendar quarters. A number of individual vehicles will likely be tested over that span of calendar quarters before a given phase of testing is complete. Waiting until the end of a phase of may not provide EPA sufficient opportunity to follow the progress of ongoing test programs. EPA's database will be designed to accept test results as they become available and update the database records in a logical manner for easy reading.

Allowing unlimited extensions is unnecessary and could result in engine families exhausting their useful lives before meaningful compliance data is generated. We believe 18 months is sufficient to complete testing under normal circumstances. Manufacturers agreed to this in the settlement document, which states that data from the testing of a designated heavy-duty on-highway diesel engine family will be completed and reported to EPA and CARB within 18 months from of the designation of that family by EPA/CARB. In the proposal, we went even further and acknowledged there may be situations where an additional 6 months could be warranted due to unforseen and infrequent events.

We are adopting the reporting period as proposed. However, we have modified the final regulations to allow a manufacturer to request additional time beyond the 6 month extension. A successful request for this second extension will be limited to extraordinary circumstances beyond the control of the manufacturer and its customers whose vehicles are being tested. The threshold for such consideration is intended to be extremely high, and the frequency of such manufacturer requests, much less EPA approval, extremely low. In no instance, would the second deadline extension exceed 6 months.

8.0.3 Completing the Reporting Format After the Final Rule

Proposal:

While we proposed a specific list of reporting requirements in the proposal, we also noted our intention to complete a guidance document providing additional details on reporting requirements and specific reporting format outside of the final rulemaking process. The guidance would be developed jointly with CARB and EMA member companies, as specified in the settlement outline. Finally, the guidance would be completed well in advance of the first reports from manufacturers.

What Commenters Said:

EMA commented that a reasonable, standardized reporting format needs to be jointly developed and agreed upon by EPA, CARB, and the engine manufacturers before the Agency finalizes the in-use testing rule. Otherwise, a consistent, efficient, and manageable implementation of the proposed rule will not be feasible. (p. 24)

Our Response:

EPA will jointly develop a standardized reporting format with CARB and the industry before the final rule is promulgated. The standardized format for electronically reporting all required information will be presented as a template and issued via guidance.

8.0.4 Reporting Incomplete, Invalid, or Voluntary Tests–In process

Proposal:

We proposed that engine manufacturers must report all results from emissions testing, including incomplete tests, invalid tests, and additional tests that are voluntarily conducted.

What Commenters Said:

EMA objected to reporting results from the types of tests described above. They stated that such a requirement is overly burdensome and intrudes on a manufacturer's right to conduct voluntary tests without EPA "supervision." Further, EMA also specifically objected to reporting results when Phase 2 testing was voluntarily undertaken. (p. 27)

Our Response:

We continue to believe that the results of incomplete and invalid tests can yield valuable information regarding NTE emissions compliance and that it is legitimate to have access to this information under in the context of the in-use program. However, to keep the reporting burden to a minimum, we will only require manufacturers to notify us in their formal reports when such tests were conducted and why the test was not valid or completed for a selected engine family. Further, manufacturers will simply be required to keep all test data and other relevant information as part of their recordkeeping in case we ask for it.

Regarding other voluntary tests that a manufacturer may conduct outside of the manufacturer-run, in-use testing program, we find that it is important for us to be aware when a manufacturer conducts such testing. Beyond providing valuable information, we want to prevent a situation where voluntary testing might be interpreted as having been conducted to screen test vehicles for passing results, which might then be submitted to us as valid tests under the in-use program. We do agree with the manufacturers, however, to the extend that our proposal could be interpreted as too broad and overly burdensome.

To accommodate these legitimate concerns, we have refined our requirements in this area as follows. First, we will limit this requirement to voluntary tests conducted on the same engine families that are being tested under the in-use test program. Second, we will focus the requirement on the period between the time the family is first selected for testing, until the final results of all testing for that family are reported to us. Third, as described above for invalid and incomplete tests, we will only require manufacturers to notify us in their formal reports when such tests were conducted for a selected engine family. The notification must clearly describe the purpose of the voluntary testing and how it is unrelated to the vehicle recruitment, screening, and testing conducted under the manufacturer-run, in-use testing program. Fourth, and finally, manufacturers will simply be required to keep all test data and other relevant information as part of their recordkeeping in case we ask to review it.

8.0.5 Ability to Request Additional Information

Proposal:

We proposed that we may require manufacturers to send us more information than specified in the reporting requirements if needed to evaluate whether an engine family meets the in-use testing requirements.

What Commenters Said:

EMA commented that the allowance for EPA to request additional information was an open-ended requirement there is unreasonable and unacceptable. (p.28)

Our Response:

The allowance for EPA to request additional information is a general requirement common to all of EPA's regulations. There is nothing unique about the heavy-duty in-use test program that would diminish the important of this allowance. Therefore, it will be retained in the final rule.

8.0.6 Public Availability of In-Use Testing Data

Proposal:

We proposed to make the in-use test data available to the general public for review and analysis.

What Commenters Said:

EMA objected to providing public access to all test data. Specifically, information pertaining to how a manufacturer "controls" an engine when achieving in-use emissions compliance is confidential business information and must be treated as such. Public information should be limited to emission results and vehicle pass ratios. (p. 28)

Our Response:

Our goal is to ensure the confidentiality a manufacturer's confidential business information (CBI) while making the in-use test program as transparent and useful to others as possible. After carefully considering how to balance these competing interests, we will make the following information publically available: engine family, model, and rating identification; description of test route and test conditions; engine speed and torque, mass emissions, and work performed each at a 1 Hz interval; emissions results (for each valid NTE event); vehicle pass ratio; and any other information needed to calculate the summary emissions results and the NTE zone for that engine. We will also make available a generic indication as to whether a deficiency or carve-out has been encountered for each second of the test. Information that a manufacturer may designate as CBI will be safeguarded and withheld from public release by the Agency subject to EPA's CBI regulations.[1] Except as previously indicated to be publically available, such information will include, but is not limited to, engine operating and control parameters designated CBI during the certification process (including those associated with auxiliary emissions control devices) and the information necessary to identify specific and complete regions of the NTE control zone where: 1) a manufacturer has been granted an allowance by EPA to temporarily exceed the NTE standards under certain limited circumstances (i.e., deficiencies), or 2) the emissions contribution from a portion of the NTE zone has been limited in determining compliance with the NTE standards (i.e., carve-outs).

8.0.7 Rapid Reporting of Individual Engine Failures

Proposal:

We proposed to require a report within 15 days after completing a test for any individual engine failing the vehicle pass criteria. The report would include all emissions and engine data along with any diagnostic results and conclusions after testing was complete.

[1] If EPA receives a request under the Freedom of Information Act for records relating to manufacturers' required in-use testing, it is EPA's standard operating procedure to initially deny the requestor any responsive records containing information submitted under CBI claims by the manufacturers. The manufacturers who submitted the information under CBI claims will be required to substantiate their claims, and the EPA Office of General Counsel will make a final determination of confidentiality for the information. See 40 CFR 2.204 and 205.

What Commenters Said:

EMA opposed the requirement, citing that the provision was unduly burdensome and unnecessary. (p.28)

Our Response:

As we stated in the proposed rule, the accelerated reporting of vehicle failures is designed to give us an opportunity to participate in the diagnosis of failing vehicles and any resulting follow-up activities. This is no different than the opportunity we provide manufacturers in our own test programs. In light of the comment, however, we have reconsidered how our objective can be achieved while minimizing any associated reporting burden.

We think there are two points in the testing scheme when failures become of sufficient interest to us that we may want to have the opportunity to participate in the test program. The first is when an engine family has experienced three failures in Phase 1 testing. This is the point where a manufacturer is fully committed to testing a total of 10 vehicles. Further, this is the threshold where, at the conclusion of Phase 1 testing, a manufacturer must join EPA in follow-up discussions to determine whether or not any further testing (i.e., Phase 2), investigations, data submissions, or other actions may be warranted. The second point is each time a vehicle fails during Phase 2 testing. This is significant because of the greater likelihood of a possible nonconformance and the possibility that testing needs to be focused on specific vehicle configurations, environmental conditions, etc.

We also think that our objective can be met and the associated reporting burden reduced by simply requiring that a manufacturer electronically notify us upon any failure described above. This eliminates the need to provide a full, detailed report. Therefore, we will require that a manufacturer notify us by email within 15 days when the initial review of the test data for a selected engine family indicates that a third failure in Phase 1 testing has occurred. For Phase 2 testing, we will require a more immediate notification because of the increased significance of such failures. In this phase of the program, we will require that a manufacturer notify us by email within 3 days when the initial review of the test data for a selected engine family indicates that a vehicle failure has occurred.

8.0.8 Identifying Operation in Carve-Outs and Deficiencies

Proposal:

We requested comment on requiring manufacturers to identify when the engine is operating in a carve-out or deficiency region as part of the emissions data report.

What Commenters Said:

EMA stated that the requirement was too costly and time intensive. They stated that valuable ECM processing would be taken up just to provide an "easy" electronic indicator for NTE operation. (p. 28)

Our Response:

The engine manufacturers provided no data or other information to support their claim that the requirement was "too costly and time intensive". Upon further consideration, we recognize that requiring manufacturers to add the electronic capability to flag NTE deficiencies and carve-outs as part of this rulemaking might present an unreasonable burden from the perspective of lead-time for the 2007 model year, which is less then two calender years away. We continue to believe that electronically reporting NTE deficiency and 5 percent limited testing region flags on a real time basis is necessary to improve the efficiency of collecting and analyzing in-use test data. EPA believes that the 2010 time frame would provide adequate time for manufacturers to begin implementing such an ECM-based reporting requirement. We intend to pursue this in a future rulemaking regarding onboard diagnostic systems for heavy-duty vehicles.

In the interim, we are requiring that a manufacturer's report for each engine tested must describe the parameters that activate and de-activate each NTE deficiency as well as the engine load and speed points used to define an NTE carve-out tested under the program. This information must generally be in a form that can easily be used to determine whether a particular deficiency or carve-out was encountered when evaluating 1 Hz NTE test results. The information must be in a form that can be either loaded directly in EPA's electronic database or readily converted by us into the required data input structure.

For each NTE deficiency, the manufacturer must provide every engine and operational parameter(s) used to activate and deactivate the deficiency as well as the associated activation and deactivation thresholds. If more than one parameter is used to activate or deactivate a deficiency, the manufacturer must supply the logic that defines how those parameters interact. For any approved carve-out, manufacturers must provide the equation or equations that define the carve-out region as a function of engine load and speed. The engine computer must broadcast at 1 Hz, each parameter used to activate or deactivate a deficiency. EPA, CARB, and the engine manufacturers will jointly develop a template for submitting the information to EPA and CARB. This template will be included in a guidance document on this subject.

9.0 Measurement of Emissions

9.0.1 Comment Period and Companion Test Procedure Proposed Rule

Proposal:

We proposed to adopt the test procedures in part 1065, subpart J, "Field Testing" for conducting any emissions testing required in the in-use testing program, as well as any other onboard testing required for heavy-duty engines under Part 86, Subpart N. We noted that changes were being proposed the current version of Part 1065, which would be published in a separate companion Notice of Proposed Rulemaking (NPRM). The relevant test procedures were generally described, and we asked that comments on the companion NPRM be directed toward that notice.

What Commenters Said:

EMA and International requested that the comment period on the in-use testing program be extended to align it with that of the companion test procedure proposal. They argued that the field testing provision had not yet been published and that this made it impossible to comment in total on the proposed in-use testing program. (EMA p. 7 and International p. 3)

Our Response:

We chose not to extend the formal comment period for this rule, but have continued to exchange information with affected companies over an extended period up to the conclusion of the final rule. Manufacturers were able to provide any comments regarding the interaction of the regulations for this rule and the rule revising part 1065 during the comment period for that rule. There were no comments on that rule that would indicate that the effectiveness of this rule will be undermined by the proposals in that rule. We have addressed each of the comments submitted, as described elsewhere in this document, and in the companion rulemaking to adopt changes to the test procedures in 40 CFR part 1065.

9.0.2 Availability of Portable Emission Measurement Systems

Proposal:

We proposed that portable units meeting the proscribed performance specifications be used in the 2005 and 2006 pilot programs as well as for the enforceable program beginning in 2007.

What Commenters Said:

DDC commented that EPA fails to recognize that in order to begin production of 2007 model year engines with an appropriate level of confidence that those engines will meet in-use requirements, the availability of in-use measurement equipment will be required long before

production of those engines begins. Specifically, the company referred to the need to conduct field validation of final engine calibrations as early as the winter of 2005/2006. Further, that testing would require equipment that has the capability for accurate measurement at below 1 gram/bhp-hr NOx development targets. Therefore, DDC concluded that it is unreasonable to expect that equipment only then being qualified at the 2.5 gram NOx level should also be adequate for development of engines at a 1 gram NOx level, and even more unreasonable to consider its use for developing at levels below the 0.2 gram NOx standard. (p.3)

Our Response:

Given that engine manufacturers are likely to certify MY2007-MY2010 engines at around the 1.1 - 1.3 g/hp-hr level, the corresponding NTE standard from MY2007-2010 will be about 2 g/hp-hr, depending upon vehicle mileage and other NTE flexibilities. Therefore, manufacturers could have started such field validation of final engine calibrations as early as about 2002. In fact, in 2003 Detroit Diesel Corporation gave public presentations showing how they are already using PEMS to field validate final engine calibrations. ["The Use of SEMTECH in On-Road Emissions Testing and Optimization of Heavy Duty Diesel Engine Emissions, SAE Government/Industry Meeting", May 13. 2003., Admir Kreso, Detroit Diesel Co., Carl D. Ensfield, Sensors, Inc.]

For the 2007 NMHC NTE standard of 0.21 g/hp-hr, PEMS have been available since at least 2002 that can reliably measure THC emissions at the 0.21 g/hp-hr level. Recent tests conducted by University of California at Riverside, under contract for the California Air Resources Board, have indicated that even at levels below 0.10 g/hp-hr, the same PEMS technology that was available in 2002 from Sensors Incorporated was consistently within 0.01 - 0.03 g/hp-hr THC, as compared to the laboratory reference measurement method. ["Evaluation of Portable Emissions Monitors (PEMS) for the Heavy-Duty Diesel Engine Not-To-Exceed Regulation", "Task 2: Testing a Diesel Backup Generator: Summary Results", January 2005, J. Wayne Miller, David R. Cocker III, College of Engineering-Center for, Environmental Research and Technology University of California]. In 2004 PEMS were introduced that additionally quantify methane (CH_4) so that PEMS can now report NMHC. Although tests are not yet complete to determine the accuracy and precision of these NMHC PEMS, the CH_4 measurement is based on the same technology as the THC measurement. Therefore, the propagated uncertainty of the NMHC measurement as the difference of two measurements each having 0.01 - 0.03 g/hp-hr uncertainty, might be about 0.015 - 0.04 g/hp-hr, which is about 7 % to 25 % of the NTE standard. Note that a data-driven measurement allowance will be determined as a consequence of this final rule. The measurement allowance will be based on this PEMS technology so that the manufacturers risk of false-positive failure will be mitigated.

PEMS technology has been available since at least 2002 for the measurement of CO at the 2007 CO NTE standard of 19.4 g/hp-hr. Since diesel engines easily meet this standard, neither engine manufacturers nor the Agency are concerned about this measurement technology. Nevertheless, a measurement allowance will be based on the capabilities of PEMS CO measurement technology so that the manufacturers risk of false-failure will be mitigated.

PEMS technology for PM measurement is addressed separately in section 9.0.3.

The Agency acknowledges that compliance with NTE standards will require design engineers to better understand their engines' emission behavior over a wide range of possible engine operation, but we do not feel that access to field-testing systems at an early stage of engine development is a prerequisite for the successful development of engines that meet the NTE standards. Though claims have been made that NTE standards might be interpreted to cover a theoretically infinite degree of variability during in-use operation, we expect that by evaluating a range of in-use duty cycles a consistent level of control for any additional operation may be predicted. This evaluation may be conducted solely in a laboratory by making careful measurements over a statistically sound sampling plan. Such a statistically-based test plan provides reasonable certainty that any future emissions from an engine is likely to be within certain bounds. This approach is frequently used to ensure reliability of engine parts and engine performance even though an engine manufacturer never tests such parts or performance over an infinite number of in-use conditions. We expect a similar approach to be taken when designing engines to meet NTE standards.

We also do not believe that manufacturers will need to test an "infinite" or inappropriately large number of steady state and transient combinations with field test equipment. Rather, manufacturers will be able to quickly narrow their test programs in the laboratory to focus in on those areas of engine operation where emissions come closer to exceeding the NTE standards. Engineering experience and logic dictates that manufacturers will not expend resources testing areas where emissions are well understood and well below the NTE standards.

The same is true with respect to ambient conditions within the NTE zone. The effects of temperature and pressure on emissions are well known, so manufacturers may limit their testing to those ambient conditions that cause the highest emissions. These can be simulated in a laboratory so that field testing would not be needed for engine development. Alternatively, manufacturers might choose to not test under conditions representing the endpoints of the established ranges, but rather they might test under "mid-range" conditions and rely on established extrapolation methods to ensure that their engines will meet emission standards when tested throughout the range of NTE conditions. If a manufacturer shows that engines meet emission standards under the most challenging conditions, then engines will meet the standards under less challenging conditions.

We expect the manufacturers' statements at certification to state that they meet the NTE standards. These statements should be based on reasonable evidence of compliance, engineering analysis and good engineering judgment. We do not expect manufacturers to have tested every possible combination of points in the field to be able to make their certifying statement.

By restricting the NTE standards to "normal operation", we will likely allow manufacturers to include in engine designs any limitations applicable to normal operation. For example, if a manufacturer includes in the emission-related installation instructions a warning that the engine must not be installed to power a vehicle of a certain type or transmission, and

then takes steps to enforce that restriction, we would not consider such engine operation to be "normal operation" under the NTE standards. In some cases, manufacturers may also program their engines with a governor or other device to prevent engines from operating at certain speeds or loads where they believe their engine will not meet the NTE standards.

In conclusion, we expect that in the early years of this program, manufacturers will be more likely to devote more of their engineering effort to meet the NTE standards as they learn better how their engines behave under different types of operation. Part of this effort will include field testing with currently available PEMS devices. However, as they gain experience in designing robust emission-control systems by interpreting NTE test results, we would expect manufacturers to eventually focus more on meeting the duty-cycle standards, knowing that emission variability has been controlled enough that the NTE standards no longer pose a significant additional constraint in their efforts to comply with all of the standards.

9.0.3 Particulate Matter Measurement

Proposal:

We proposed to require emission testing for particulate matter (PM) concurrently with gaseous emissions beginning with the two-year pilot program beginning in 2005 and with the fully-enforceable program starting in 2007. We acknowledged that more development work was necessary before portable PM-measurement systems were available, but that we thought it was possible to complete that work in time to start the pilot program as proposed.

What Commenters Said:

EMA commented that the PM requirement was infeasible. They stated that verified portable sampling systems do not exist at this time. Further, they commented that PM emissions should not be included in the program until such time as validated, properly field-tested, on-vehicle devices become commercially available. EMA also commented that the use of catalyzed PM filters on all heavy-duty diesel trucks starting in 2007 results in extremely low emissions that excess levels would only occur upon a catastrophic failure of the filters. Finally, the industry association commented that it is uncertain whether any portable measurement system can actually measure the same physical quantities as the filter-based method that is used in the laboratory, which is the basis for the regulatory definition of particulate, but also the underlying certification of heavy-duty diesel engines. This is a fundamental issue that remains to be resolved. (pp. 7-9)

Comments from International generally mirrored those summarized above. (p. 4)

Our Response:

The development of portable systems for measuring PM has proven to be more challenging than the development of similar systems for measuring gaseous emissions. Currently, prototype portable systems for measuring PM are available from equipment

manufacturers, and we have tested them in the laboratory with encouraging results. This demonstrates that the overall technology has been identified, although more work is needed to demonstrate its accuracy and efficacy in the laboratory and in the field for the purposes of the in-use testing program. In addition, work is continuing to miniaturize the on-board sampling devices and develop suitable exhaust dilution sampling techniques and hardware.

In our proposal, we acknowledged the significance of the development effort for PM portable measurement systems, especially with regard to being able to start the pilot program in 2005. Manufacturers echoed this concern in their comments. Specifically, we stated that if PM systems were not going to be available for the 2005 pilot program, we would consider delaying the PM requirement until 2006 or 2007, or temporarily relaxing the proposed equipment measurement tolerances. Consistent with that position, our current assessment of the state of portable PM emissions measurement systems has resulted in delaying the start of the pilot and fully enforceable programs for PM by one year from the dates contained in the proposed rulemaking.

We believe that the one-year delay for the PM pilot program (i.e., 2006) will result in the availability of prototype portable devices capable of measuring these emissions as required. We also believe that the one-year delay for the fully enforceable program (i.e., 2008) will result in useable, accurate, and precise portable units in time for use in that program. Our position is based on work that EPA, CARB, equipment manufacturers, and the engine manufacturers either have underway or have committed to performing to resolve the remaining development and verification issues, as described below. However, in recognition of the remaining uncertainties associated with these efforts, we have added a provision to the regulations that would suspend the in-use test program as it applies to PM measurement if we determine that fundamental technical problems with portable in-use PM measurement systems are not resolvable in a reasonable time.

As noted above, prototype portable units for measuring PM have been successfully tested in the laboratory, but further development work is needed to resolve some key challenges. The most significant of these are: quantifying or weighing 30-second samples of semi-volatile hydrocarbons and dilute sulfuric acid PM at the NTE standard (i.e., about 250 nano-grams), proportionally diluting a partial flow of raw exhaust in order to sample PM at the same conditions as our laboratory procedures, and establishing a standard way of evaluating whether or not candidate systems actually meet these challenges. The work to resolve these remaining issues and to verify portable PM measurement technology in terms of usability, accuracy and precision, can generally be divided into four program areas.

The first is our ongoing program that takes prototype portable PM measurement technology, which equipment manufacturers continue to refine, and compare the measurement capability of that hardware with current laboratory measurements. In this regard, we have recently acquired more sophisticated prototype devices for testing. We are evaluating a laboratory-scale quartz crystal microbalance (QCM) versus our laboratory PM measurement procedures. This evaluation is intended to verify whether or not prototype QCM technology reports PM similarly to the laboratory's reported values.

We are confident that the QCM is a viable technology for the following reasons:

a. The QCM measures PM by electrostatically depositing mass on the QCM, and as PM deposits on the QCM its oscillating frequency changes in proportion to the total mass of the deposited PM. Because the QCM measures total PM mass directly by inertial acceleration, the QCM measures the same physical property; namely total mass, as compared to our laboratory filter-based procedure, which measures mass by gravitational acceleration (via a PM microbalance).
b. The design and construction of this technology is of a reasonable size and weight, and it's power consumption indicates that this technology is likely to be sufficiently portable for on-vehicle use.
c. This PM PEMS technology is also specified to allow up to eight hours of continuous unattended operation so it will be appropriate for the HDIUT program.
d. Because QCM technology can measure "nano-gram" levels of PM, we believe that it is sufficiently sensitive to measure 30-second samples of PM at the NTE standard. For example, under typical dilution conditions in the NTE, 30 seconds of PM at the 2007 NTE standard (0.03 g/hp-hr) is in the range of 200 to 300 nanograms when sampled at one liter per minute, which is the sample rate of the QCM.

We intend to expand the work described above to include an already available portable partial-flow dilution system and a fully portable QCM.

The second is another internal EPA program that we anticipate beginning in the near future. In this program we will intend to develop techniques to generate "reference PM" in order to fully evaluate portable measurement systems using particles with similar physical characteristics and at the expected PM levels associated with the NTE standard and over intervals as short as 30 seconds.

The third is the PM pilot program. In the pilot, engine manufacturers will use best-available portable measurement systems as part of their testing. This program will give engine manufacturers an opportunity to evaluate the usability of these portable devices. We expect that information gained from this pilot program will be helpful for both EPA, equipment manufacturers, and engine manufacturers to prepare for the 2008 enforceable PM program.

The fourth is our cooperative research, development, and demonstration effort with CARB and the engine manufacturers. Under this comprehensive program, portable PM emission measurement systems will be rigorously tested and data-driven "measurement allowances" will be identified.

Based on the development and demonstration programs described above, as well as the ongoing work of equipment manufacturers, we remain optimistic that portable systems for PM testing will be available for the pilot program in 2006 and the fully enforceable in-use program starting in 2008.

9.0.4 New Measurement Margin for Portable Measurement Systems

Proposal:

We proposed a new "accuracy" margin for portable emission measurement devices that was developed after consultation with CARB and EMA. The allowance accounts for any differences between the accuracy of the measurement instruments currently available for use on a vehicle and the accuracy of those available for use in a laboratory. The allowance also takes into account the different way in which emissions are calculated in a laboratory versus in the field. We described our intent to adjust or phase out such a margin through future rulemaking based upon improvements to the measurement equipment. Specifically, we propose a fixed margin of five percent, or 0.05 times the applicable NTE emissions standard, including any existing in-use compliance margin.

What Commenters Said:

EMA raised several objections to the proposed accuracy margin. First, they claim the accuracy margin was not determined through the collaborative process with EMA as described in the settlement outline. Second, they claim the magnitude of the accuracy margin is directly tied to the accuracy and repeatability specifications proposed in the "companion" rulemaking on field testing, which was not yet proposed. The association said this prevented them from fully commenting on this fundamental issue. Third, the underlying methodology and assumptions upon which the proposed margin is based are seriously flawed.

Regarding this latter comment, EMA stated the following. First, it has not been shown that laboratory measurement systems are capable of adequately measuring emissions from 2007 and later model-year engines. Second, it should not be assumed that on-vehicle measurement equipment meeting the specifications used in the accuracy margin will be commercially available. Third, even if field-testing equipment meeting EPA's specifications is available, it has not been shown that those specifications can be met at the emission levels of 2007 and later engines. Fourth, and finally, it cannot be assumed that simply comparing the accuracy and repeatability of laboratory and in-use test equipment will account for all the "real world" factors that must be included in the in-use measurement allowance.

EMA concluded that EPA's methodology for deriving the proposed accuracy margin was assumption driven when it should be data-driven (i.e., actual field tests of portable systems). The association recommended that the EPA, CARB, and EMA look to a new test program for such data that is currently underway as part of a cooperative effort by EPA, CARB, and the New York State Department of Environmental Conservation, with utilizes CE-CERT and West Virginia University as principal contractors. The focus of the program is to evaluate portable emission measurement devices in the context of using them as part of the heavy-duty diesel engine NTE regulations. Until such data are available, EMA recommended that the proposed five percent allowance be deleted. Instead EPA should simply designate a range of potential accuracy margins (i.e., 5-20 percent). In the event that the data demonstrate that an accuracy

margin greater than the assumed range (i.e., greater than 20 percent) would be necessary, EPA would commit to undertake the necessary rulemaking changes as warranted. (pp. 13-20)

Detroit Diesel Corporation (DDC) commented that proposed accuracy margin was based on the assumption that equipment manufacturers could supply sampling equipment that met all the proscribed performance specifications. They noted that a leading equipment manufacturer told them that relative to NOx measurements, the capability to meet the proposed five percent tolerance has not been demonstrated and may not be able to be met by the emissions analyzer even when only the concentration measurement and exhaust flow measurement errors are considered. Also, the additional assumptions which were made to define the accuracy margin, e.g., the engine manufacturers capability to "report" output torque accurately, make it premature to establish a factor at this time. DDC recommended that EPA initiate a process to define an accuracy factor in the future based on "measured actual capabilities" that would be defined during the pilot phase of the in-use program and additional manufacturer development. (pp. 2-3)

Comments from International mirrored those comments summarized above, and suggested that EPA set an interim accuracy margin of at least 10 percent. (pp. 3-4)

Our response:

We have adequate basis to believe that requiring the use of PEMS as part of this program is technologically feasible and that we have taken into account all sources of uncertainty relating to conducting in-use measurements using PEMS. In the NTE standard itself we have already taken into account the variation in emissions due to varying engine operation and ambient conditions. Examples of this include the NTE multiplier (1.25x, 1.5x) and allowances based on mileage and model year. In this final rulemaking we have addressed concerns about the Phase I and Phase II HDIUT sequential sampling plans by finalizing the pass and fail criteria agreed upon in the related settlement documents. These criteria result in effective Acceptance Quality Limits (AQLs) and Rejection Quality Limits (RQLs) that are more lenient than the corresponding AQLs and RQLs of the sequential sampling plan specified in our Selective Enforcement Audit program. In addition, we proposed to take into account the incremental measurement uncertainty associated with using PEMS instead of laboratory equipment and analyzers.

We proposed a constant measurement allowance equal to 5 % times a given NTE result. We proposed this allowance based upon the differences between the minimum specifications for laboratory equipment and PEMS, which were both proposed in the Part 1065 test procedures portion of this rule. This proposed allowance was also supported by results from laboratory versus PEMS testing over certification test cycles conducted in engine and chassis dynamometer laboratories. Details of these correlation studies are available in the Technical Support Document to this rule.

Based on comments regarding differences in the uncertainty of measurements of different emissions, we are now finalizing emissions-specific measurement allowances, instead of one measurement allowance for all emissions.

Based on comments stating that when an NTE standard is very low, multiplying a fixed percentage times an NTE result does not adequately account for measurement uncertainty, we are now finalizing measurement allowances that are specified on a brake-specific basis. Furthermore, these brake-specific measurement allowances will be added to the final NTE threshold after all other NTE multipliers and flexibilities are applied. This is in contrast to our proposal, which was to multiply a fixed percentage time the results of a given NTE event.

Based on comments that we did not cooperatively develop the proposed measurement allowance as agreed upon in the settlement documents, we have now agreed to work co-operatively with engine manufacturers and the California Air Resources Board on a test plan to determine data-driven measurement allowances. The experimental methods and procedures specified in the test plan for determining, modeling, and comparing each of the various components of measurement error are designed to generate statistically robust data-driven measurement allowances for each of the gaseous emissions, namely NOx, NMHC, and CO. We have also agreed to develop a similar cooperative test plan for the determination of a PM measurement allowance.

As detailed in the gaseous emissions test plan, we have a clear agreement with engine manufacturers and the California Air Resources Board on what components of measurement error are intended to be covered by the measurement allowances. Agreed upon sources of error include differences in emissions concentration measurements, differences in exhaust flow measurements, differences in PEMS environmental conditions, and differences in torque measurement versus inference of engine torque based on electronic control module (ECM) signals. We have agreed upon exploring the following environmental conditions effects on PEMS: ambient temperature and pressure, shock and vibration, electromagnetic radiation, and ambient hydrocarbons. We have also agreed that the test plan will comprehensively explore the sources of error that might arise because torque is not measured in-use, but rather it will be inferred from other signals from an engine's ECM. Specifically, lab measured torque versus ECM-derived torque will be compared over the following different conditions: different engine speeds and torques, different ambient pressures, temperatures, and humidities, different intake air and exhaust restrictions, and different charge air cooler temperatures. Furthermore, engine manufacturers are allowed to submit supplemental information regarding the effects of non-deficiency AECDs on the accuracy and precision of ECM-derived torque.

We agreed that the test plan's measurement allowances will be calculated in a manner that subtracts lab error from PEMS error. Specifically, the lab error associated with measuring heavy-duty engine emissions at stabilized steady-state test points within the NTE zone, sampled over 30-second durations utilizing Part 1065 compliant laboratory emissions measurement systems and procedures will be subtracted from the PEMS error associated with measuring heavy-duty engine emissions utilizing PEMS over 30-second transient NTE sampling events under a broad range of ambient and environmental conditions. This subtraction will yield "PEMS minus laboratory" measurement allowances.

The error model developed in the test plan will not subtract any laboratory accuracy or precision determined from laboratory measurements of *transient* 30-second NTE events.

However, such transient 30-second NTE data will be collected by laboratory measurement instruments during testing. Based on comments we received regarding the ability to conduct NTE testing in a laboratory, this data will be analyzed to determine whether or not we are correct in our belief that Part 1065-compliant engine dynamometer laboratories can accurately and precisely measure transient NTE events as short as 30 seconds. If not, we have agreed with engine manufacturers and the California Air Resources Board on a separate process to address this situation, should it arise. If results show that the lab 95th percentile transient 30-second NTE error is greater than the lab 99th percentile steady-state 30-second NTE error, then EPA, CARB, and EMA would agree to the following:

a. EMA will work with EPA and CARB to optimize laboratory NTE measurement specifications and procedures. This work will primarily be in the form of participating in and supporting joint laboratory NTE test procedure development efforts and meetings.

b. EPA would intend to issue a guidance document and/or propose changes to Part 1065 to reflect any optimized specifications and procedures for laboratory NTE testing as a result of those efforts and meetings no later than the end of calendar year 2008.

We are confident that based on the results of the test plan, we will be able to promulgate emissions-specific, brake-specific, additive, data-driven measurement allowances for NO_x, NMHC, and CO with sufficient lead-time for engine manufacturers to prepare for the 2007 enforceable program for gaseous emissions.

For measurement allowances used in the pilot program, i.e., before the test plan is completed, we have adopted generous emissions-specific, brake-specific, additive measurement margins. These allowances were identified as appropriate for the pilot program in discussions with the engine manufacturers. (See also further discussion in the Technical Support Document for this rule.) Note that because we will not pursue any remedial actions based solely on the emission levels found in the pilot program, the interim measurement allowances in the pilot program would not be an important factor in determining whether to pursue such actions.

Given the current availability of PEMS and the very active interest in PEMS for the foreseeable future, we believe that multiple sources of accurate and precise PEMS will be widely available well ahead of time; so that the 2005 gaseous emissions pilot program and the 2007 gaseous emissions enforceable program will be fully implemented on schedule with appropriate dat-driven measurement allowances.

9.0.5 Measuring Non-Methane Hydrocarbons (NMHC)

Proposal:

We requested comment on measuring NMHC in addition to total hydrocarbons (THC).

What Commenters Said:

EMA objected to being required to measure NMHC. They also objected to being required to measure THC from diesel engines with catalyzed PM filters, since that emission control technology results in negligible hydrocarbon emissions. However, EMA wanted engine manufacturers to always have the option of measuring NMHC instead of THC whenever hydrocarbon measurement is required. (p. 28)

Our Response:

NMHC is a regulated emission with an associated NTE standard; therefore, it must be reported. Current commercially available PEMS already report NMHC as the difference between measured THC and methane (CH4) via dual FID/cutter technology. This PEMS measurement technology already meets all the NMHC requirements in Part 1065. Additionally, according to Part 1065 NMHC may be reported as the difference between measured THC and measured CH4, but also it may be reported as 0.98*THC. Since the manufacturer has this option according to Part 1065, measurement of CH4 is not required even though current commercially available PEMS can measure it. Therefore, manufacturers may optionally measure THC and report NMHC as 0.98*THC.

Regarding the comment about "negligible NMHC" emissions, EPA understands that some engine and aftertreatment combinations may emit "negligible "NMHC" emissions, and for those cases there is already a provision in the NPRM that allows a manufacturer to petition EPA to waive certain emissions requirements. Negligible emissions relative to the standard is one reason that can be considered for such a waiver. See 9.0.6. EPA also understands that other engine and aftertreatment combinations can emit NMHC emissions at or above the NTE standard. This is particularly possible if aftertreatment technology uses a hydrocarbon-based reductant, such as diesel fuel, to enable aftertreatment regeneration.

9.0.6 Discontinuation of Measurement Requirements for Certain Pollutants

Proposal:

We proposed to consider requests from engine manufacturers asking to discontinue the measurement and reporting of one or more pollutants from some or all engines. This was predicated on the possibility that future test experience that may show that the effectiveness, durability, and overall performance of new engine technologies and exhaust aftertreatment systems may demonstrate that in-use testing for certain pollutants is unnecessary.

What Commenters Said:

EMA agreed that requests for relief from measuring and reporting for certain pollutants should be allowed. The association also requested that EPA go further and issue guidance outlining reasonable conditions and procedures for manufacturers to follow in requesting the EPA waive the requirements. EMA specifically requested that CO2 and O2 need not be monitored if torque measurement is attained via other methods than fuel consumption torque maps. EMA requested that hydrocarbon measurement not be required due to safety concerns with FID fuel and citing that hydrocarbon levels will intrinsically be low on catalyst equipped engines. EMA requested a waiver on the monitoring of PM due to the possible lack of equipment capable of measuring PM and since PM trap equipped engines will intrinsically have no PM emissions when the traps are working and trap failure will be catastrophic and not incremental in nature. CO measurement waivers were requested due to the nature of CO emissions from diesel engines being orders of magnitude below the CO standard. EMA requested that manufacturers be allowed to request waivers if suitable portable equipment is not available to them. Lastly EMA requested that a manufacturer be allowed to ask for waivers of certain pollutants measurements if equipment problems during a test caused the loss of measurement capabilities on a specific test. (pp. 9-11)

Our Response:

We do not believe that a specific guidance document on this issue is necessary. The basic conditions and procedures for requesting an EPA waiver to avoid measuring a pollutant is obvious enough. Waivers will be reviewed on a case-by-case basis. Manufacturers will need to demonstrate that a pollutant is expected to always emit well below the applicable emission standards and that the underlying emissions control technology is not subject to in-use deterioration or defects that could result in noncompliance.

With regard to not monitoring CO2 and O2 for determinating brake specific fuel consumption when torque is calculated via other means, we will keep this requirement until torque measurement has been proven to be accurate and dependable. The monitoring of hydrocarbons will also be kept as a requirement until sufficient data shows that the catalyst systems are so robust that monitoring is unnecessary. Regarding the safety of FID-based portable equipment, at least one manufacturer is marketing a suitable system that has been

approved as safe by the Department of Transportation for on vehicle use. The measurement of PM is still developing and drawing conclusions regarding how large and user friendly the devices will be in the future is premature. It is also premature to state that trap-equipped systems will never fail in an incremental manner. EPA will consider the need to monitor PM as the technology of both the PM traps and monitoring devices evolves. EPA believes the measurement of CO is still useful at this time in order to assure the accuracy of the data reported. This measurement allows calculations of fuel usage that provides a quality check on the measurement of torque

Under the terms of the final rule, a waiver from measuring emissions in this program due to equipment unavailability is not needed. For gaseous emission measurement, suitable systems already exist (see section 9.0.2. above). For PM emission measurement systems, the final regulations state that if technical problems are identified that can not be resolved in a reasonable amount of time, the fully enforceable program for PM goes into abeyance until such time as the requisite technology is available. Therefore, requests for a waiver based on unavailable equipment is not an issue.

Finally, waivers for deleting the reporting requirement for a pollutants due to equipment failure will be handled on a case-by-case basis.

9.0.7 Determining Test Altitude

Proposal:

In the draft Technical Support Document, we noted that NTE testing will require specific information on a number of ambient conditions to determine if the engine is operating within the defined boundaries of the NTE or to calculate actual test results. We proposed to allow the direct measurement of these values with a specific technology or if the engine manufacturer determines that an engine's Electronic Control Module (ECM) accurately quantifies these parameters, the manufacturer may rely on ECM values for those parameters. For altitude, we identified the use a Global Positioning System (GPS) as a suitable technology.

What Commenters Said:

DDC recommended that EPA also accept sensing of barometric pressure as an adequate surrogate for altitude determination. They noted that detecting barometric pressure and determining the corresponding altitude using standard nominal barometric pressure versus altitude relationship has been practiced by DDC and found to be reliable. (p. 6)

Our Response:

We believe that the guidance given in the Technical Support Document remains appropriate. Direct measurement of the test altitude through a Global Positioning System (GPS) will be preferred as opposed to using a surrogate, e.g., sensing barometric pressure) for determining altitude. Our preference is based on our understanding that there will likely be

errors associated with relying on surrogates such as barometric pressure, since there would be other factors, i.e., ambient conditions, inappropriately excluded from the altitude calculations. Nevertheless, as stated in the Technical Support Document, we will allow the engine manufacturers to use the engine's ECM to determine altitude, but only if it can be demonstrated that it can be done accurately. This would be evaluated on a case-by-case basis.

9.0.8 Portable Emission Measurement Systems Must be User Friendly

Proposal:

We proposed that portable emission measurement systems be used throughout the in-use testing program.

What Commenters Said:

PDEP commented that the system they observed was not very "portable." They noted that the equipment must be easy to install and safe to use in order for the program to be successful. (PDEP p. 2)

Our Response:

We assume that PDEP witnessed an early generation of the portable emission measurement technology. These systems have become much smaller and simpler. We have used the newest generation of these devices in our testing program with success. We also expect that the systems will continue to get progressively smaller and easier to use before the fully enforceable program takes effect.

10.0 Economic Assessment

10.0.1 Cost of Portable Emission Measurement Systems (PEMS)

Proposal:

We estimated the basic cost of a portable measurement device that is capable of measuring gaseous emissions to be approximately $70,000 per unit. We estimated the incremental cost of adding PM measurement to a PEMS unit, which was already capable of measuring gaseous pollutants, to be approximately $30,000, based on our experience and investment in developing portable particulate matter measurement technology. The measurement units were assumed to last five years, before replacement or substantial rebuild was needed. Further, we assumed the measurement devices were durable throughout their 5-year life cycle, and did not require significant maintenance as a general rule, e.g., replacement parts.

What Commenters Said:

DDC commented that we underestimated costs in a number of critical areas. First, the measurement equipment is underestimated by at least 40 percent based on their experience and pricing from a major equipment provider. Likely costs for PM equipment are also underestimated according to a leading manufacturer of such equipment. The cost of PM measurement devices is more likely to be 3-4 times that estimated by EPA. Additional costs for maintenance will also be incurred. DDC provided no specific contractor names or supporting detail to document these assertions. (p. 4)

DDC also stated that equipment will become obsolete prior to the end of its functional life. They suggested that it is likely that additional emissions measurement equipment development will need to be performed by the equipment manufacturers in order to achieve proposed measurement performance requirements at the lower 2007-level emissions. That in turn will likely require significant upgrades or complete replacement in order to meet increasingly stringent control requirements. Consequently, equipment purchased prior to 2007 will not meet EPA's assumed 5-year useful life and added costs will be incurred. (p. 4)

DDC also commented that their experience suggests a 5-year life expectancy is optimistic. Their experience is that significant reliability degradation occurs over a 2-year period. (p. 4)

EMA stated that its information suggests that infield PM-testing systems will cost substantially more than the $30,000 estimated by EPA. (p. 9)

Our Response:

Portable measurement devices are already commercially available that can measure all the gaseous pollutants required by the program. These systems cost approximately $70,000 per unit. DDC mentioned above indicated that costs were 40 percent greater, thus suggesting a cost of closer to $90,000-$100,000 for the gaseous PEMS unit.

Based on our experience and investment in developing portable particulate matter (PM) measurement technology, we estimate that systems capable of measuring both gaseous and PM emissions will cost an additional $30,000 per unit over our estimate for a gaseous unit alone, for a total of about $100,000. The commenter mentioned above indicated interactions with vendors indicating costs 3-4 times greater than EPA's estimate for the PM unit or an additional $90,000. EPA has elected to very conservatively estimate costs ranging from $100,000-$190,000. Taking the average and rounding to the same number of significant digits, we estimate the capital cost for portable measurement devices that measure both gaseous and PM emissions is approximately $140,000 per unit. This assumption has been reflected in the economic analysis as presented in the final Technical Support document. The total cost of the program, based on the new cost estimate for portable analyzers and other changes, is also described section 10.0.2. below.

Turning to the useful life comment, we believe that DDC is referring the change in emission requirement for HC and NOx that become more stringent starting in 2007, as limiting the lifetime of equipment purchased for use in the pilot program. As we have noted in section 9.0.2. of this document, portable analyzers are already available that measure at the levels expected to be encountered for 2007 compliant engines. Therefore, if manufacturers purchase portable measurement systems for the gaseous pilot program in 2005, the equipment should last its full five-year lifetime, i.e., through 2009.

10.0.2 In-Field Testing Assumptions

Proposal:

In our economic assessment, we assumed that field testing generally would be performed at test sites that are relatively close proximity to a manufacturer's technical center, test center, maintenance facility, or other similar location to minimize personnel travel and field logistics. Also, we assumed that: 1) test vehicles would depart and return to the same location each day; 2) testing would generally be scheduled around the owners normal schedule; 3) the test equipment would need not attention by a testing technician during the normal shift day of operation; and 4) test equipment could be installed and ready to begin testing in approximately 1.5 hours.

What Commenters Said:

EMA commented that the economic assessment and proposed requirements for a general test plan are inconsistent. Specifically, the association stated that the proposal requires a general plan for selecting test vehicles that must explain if the methodology will result in an emphasis on testing engines with a particular driving route or from a particular geographic area. The requirement implies that EPA may not approve plans that would result in such selections. However, EPA's cost analysis assumes that testing would be conducted relatively close to a manufacturer's facility or similar location. Further, the Agency assumed the test vehicles would depart and return to the same location each day. EMA concluded that EPA needs to explain these contradictory positions. (p. 26)

DDC commented that, first, EPA's scenarios for a typical day underestimates unanticipated delays and interruptions that are characteristic of field testing, especially when testing is conducted a the convenience of the customer/owner of the test vehicles, and his normal operations. Second, EPA makes a very optimistic assumption that customer test site locations are near to engine manufacturer sites. This is more likely not the case. It is more likely that test sites are a day's travel or more away and will require transportation of test equipment by manufacturer personnel. Third, for line haul operations, additional time must be budgeted for those operations where the vehicle does not return to its departure location. For such cases, the costs are likely to be double that of Scenario 2. Fourth, DDC's experience using trained operators with available in-use emissions equipment is that an operator must accompany the vehicle during testing to exchange gas bottles for the HC analyzer and adjust equipment when the opportunity arises. Additionally, the owner/operator cannot be expected to

assume responsibility for the security of expensive test equipment when the vehicle is unoccupied.

DDC commented that we underestimated equipment set-up time at 1.5 hours. Rather the company stated that installing the instrumentation typically includes significant improvision to route heated sample lines and ambient sensors. In fact, installing test equipment may not be practicable for some heavy-duty truck cab designs where sample line exit points would risk damage to the vehicle. Consequently, some travel is required to ensure vehicles are suitable for equipment installation. Set-up time is more likely to be 4-5 hours.

Finally, DDC stated that an estimate from an outside test provider was near $1 million for testing two engine families per year compared to EPA's estimate of $1.02 million for the entire industry, i.e., 24 engine families per year. DDC did not provide any supporting detail for their cost estimate. (pp. 4-5)

Our Response:

After considering the comments, we have made a significant adjustment in the underlying scenario for estimating the cost of in-use testing. The draft economic analysis heavily emphasized our Scenario 1, which assumed that testing would be done close to an engine manufacturer's facilities and that test vehicles would be readily available for in-use testing during normal business hours. We have eliminated that scenario and have chosen to use Scenario 2 as the basis for the analysis in the final economic assessment.

That scenario reflects a less time efficient and travel intense case than Scenario 1. Test vehicles are not assumed to be readily available and the testing technician and engineer must sometimes work around a test vehicle's normal daily work shift. This means that the work day for the testing personnel includes the time the vehicle is being driven over its normal work route. In these instances, we made a worst case assumption that the testing personnel remain "idle" on the job site, with this time charged to the in-use testing program. Overtime pay at 1.5 times the normal fully burdened (i.e., overheard) labor rates are incurred in this scenario. In reality, we expect that the engineer and technician may perform work that could be billed to other assignments for all or part of this time. Also, the test sites are located far enough away from the manufacturer's facility, or employees home base, that a single round trip to and from the job site and overnight travel is required. However, the sites are still close enough to one another that travel between the two locations is not restrictive or prohibitive. The time spent in the various work tasks are estimated based on EPA's direct experience in conducting in-use testing with portable emission measurement devices and on our ongoing awarded Kansas City, Missouri test program.

Adopting this scenario as the base for estimating in-use testing costs and updating the analysis to reflect the most recent EPA certification information regarding the number of engine manufacturers (from 14 to 13) and from (from 24 to 18), increasing the cost of the portable units as described in section 10.0.1, and making with a few other minor changes changed the estimated cost of the manufacturer-run, in-use test program from $1.68 million per year. The

complete analysis is presented in the revised economic analysis that is contained in the final Technical Support Document.

11.0 Inconsistencies with the Settlement Outline

Proposal:

The settlement agreement with EMA identified the basic program elements for a manufacturer run, in-use NTE testing program, and an agreement to go forward with a rulemaking to implement such a program for on-highway heavy-duty diesel engines. We proposed a program that was consistent with that program.

What Commenters Said:

EMA commented that, for the most part, the proposed rule reflects the agreed upon settlement outline. However, they generally argued that there were a number of elements where the proposal either did not fully reflect the terms or intent of the outline, or that otherwise were inconsistent with what was contemplated by manufacturers. (EMA p. 2)

Our Response:

We disagree with the comment. We believe the proposal fully and accurately reflected the letter and spirit of the agreement. If an issue was identified in the proposal that we felt was outside the scope of the settlement outline, we clearly identified it as such and asked for comment. An example of this was seeking comment on an allowance to focus Phase 1testing in certain cases to particular geographic areas or environmental conditions as the settlement outline specified for Phase 2. This deviation was not adopted due to adverse comment from the industry. We have also accommodated many of the engine manufacturers comments on the proposal, as discussed throughout this document. Hence, we believe our final rule is also fully consistent with the settlement outline.

12.0 General Extension of Comment Period

Proposal:

We provided the standard 60 day public comment period for a rulemaking of this type.

What Commenters Said:

The American Trucking Associations (ATA) proposed that we extend the comment period in a manner that will permit meaningful input from the ATA regarding the roles and responsibilities of motor carriers under the proposed rule. (ATA p. 2)

Our Response:

We believe the comment period was adequate, and an extension could jeopardize promulgating the final rule according to the schedule agreed upon in the settlement agreement with the on-highway heavy-duty diesel engine manufacturers. We did, nevertheless, meet with ATA to describe the proposed rule.

13.0 Miscellaneous Regulatory Text Comments

Proposal:

We published the proposed regulatory text to implement the in-use program.

What Commenters Said:

EMA commented that the proposed regulations had a number of errors. (EMA pp. 26 and 27)

Our Response:

The specific comment and our response are shown below.

1. Comment: The proposed engine screening criteria listed in the regulations do not agree with the preamble description.

Response: We have made the two texts consistent in the final rule.

2. Comment: The proposed term "OBD trouble code" should be changed to "OBD fault code," and there is no need to reference an "illuminated MIL," since that will always accompany a fault code.

Response: We believe the proposed text is clearer and have retained it.

3. Comment: The proposed regulations need to be revised to reflect that a vehicle may be counted as meeting the vehicle pass criteria if it operates in non-idle modes at least 3 hours over one-shift day and does not generate any valid NTE sampling event.

Response: We agree and have made the revision.

4. Comment: The preamble for the proposal describes the proposed measurement allowance as being additive, where as the draft technical support document describes it as multiplicative. Further, the proposed allowance in the preamble effectively nullifies the new margin under the pilot program, because it is lost in the rounding function.

Response: We have revised the numerical values of the interim margins for the pilot program based on comments from the engine manufacturers. The final regulations establish new additive brake-specific values for each pollutant. Specifically, these allowances will be added to the final NTE threshold for each pollutant after all other NTE multipliers and flexibilities are applied. This change addresses the concern expressed by the commenter. As also discussed elsewhere in this document, we will be engaging in a research and development project that will help determine the final margins.

5. Comment: The phrasing in the proposed 861912(f)(2) needs to be modified from "emission levels from all valid NTE sampling events " to "the average emission level from each valid NTE sampling event" when describing the comparison of the valid NTE samples to the upper bound numerical limit.

Response: We agree with the modification from "all events" to "each event" and have made that revision. We believe that reference to average emission levels will be more confusing than the proposed language, so are keeping the proposed reference to emission levels.

6. Comment: The reference in the proposed 86.1920(a)(4)(viii) should be 86.1912(b) and not (c).

Response: We agree and have made this change.

7. Comment: The proposed 86.1920(b)(1) references 86.1915(b)(2) incorrectly.

Response: We have revised the regulation in this area and the comment is no longer relevant.

8. Comment: The proposed reporting requirements refer to an unspecified address for submitting the electronic reports.

Response: We have added the proper address in the final regulations.

14.0 Legal Authority for Promulgating an In-Use Testing Rule

Proposal:

We stated in the proposal that the in-use testing program was authorized under the Clean Air Act, in particular sections 202-208 of the Act..

What Commenters Said:

EMA commented that EPA lacked statutory authority to mandate the manufacturer run in-use testing program. (EMA pp. 3-6)

Our Response:

EPA disagrees with the comment. EPA believes that the Act, particularly section 208, provides authority for this program. Section 208 requires manufacturers to submit information and conduct tests not otherwise reasonably available under Title II that EPA may reasonably require to determine whether such manufacturer is in compliance with Title II of the Act and its implementing regulations, or to otherwise carry out the provisions of Title II. This provides EPA with the authority to require post-production testing of vehicles by manufacturers to provide a means of monitoring the emissions performance of vehicles driven under real-world conditions. Such testing serves as a check on the accuracy of the certification procedures and on the levels of in-use compliance with applicable emissions standards. A manufacturer-run testing program is considerably more efficient and reasonably achievable than would be an EPA-run program. Manufacturers already have the information, contacts and relationships in place with customers to efficiently manage such a program. They will be much better equipped to run such a program with minimal disruptions to their customers. Moreover, because of the help of manufacturers, this program has been designed to minimize the burden on industry while providing a strong incentive for manufacturers to build engines that meet standards when in actual use. It is unlikely that EPA could achieve an in-use testing program on the scale, and with the minimal disruption, achieved by this program.

EPA disagrees with the commenter's view that the language in 208(b) regarding EPA's authority to enter the establishment of any manufacturer is somehow a limitation on EPA's authority under section 208. On the contrary, section 208(b) provides this authority to enter the premises of manufacturers in addition to the authority in section 208(a) to require testing and other information. While section 208(b) provides further authority for EPA to enter into premises that may otherwise not be available for inspection, it does not indicate any limitation on the plain language of section 208(a). Moreover, the commenter neglects to note that the full language in section 208(b) includes authority for EPA to enter "any establishment of the manufacturer, or of any person whom the manufacturer engages to perform any activity required by subsection (a)." This language indicates a right of entry considerably broader than the commenter's description.