

QUESTIONS AND ANSWERS REGARDING APPLICATION OF THE NTE TO ENGINE CERTIFICATION

March 24, 2003

ADVISORY CIRCULAR 24-3

Question 1

The Advisory Circular (A/C 24-3) refers to a manufacturer voluntarily submitting data on its certification test engines demonstrating that the engine does not exceed the NTE and the EURO III steady-state test (hereinafter, SET) screening limits in the A/C. Would you describe in more detail the kind of test data this would involve if a manufacturer elected to make such a voluntary submission, including whether on-highway emissions testing is necessary?

Answer

NTE and SET limits will not become enforceable requirements under EPA regulations until MY 2007. The Advisory Circular (A/C) addresses certification of engines subject to MY 2004 standards during the interim period before the MY 2007 regulations take effect. Under the A/C, the NTE and SET are to be used not as mandatory emission standards but as voluntary screening tools to help simplify and potentially expedite the review of engine designs for defeat devices.

For the SET, this screening purpose can best be accomplished by submitting the composite and modal test data in relation to the SET screening limits. For the NTE, the manufacturer could submit a statement that, based on the information in its possession at the time of certification, it believes the engine will meet NTE screening limits under all conditions which can reasonably be expected to be encountered in normal vehicle operation and use. Since the A/C does not impose enforceable requirements, the submission of this statement is optional. If a manufacturer does submit such a statement, EPA could review the test data, analyses, and other information forming the basis for the statement. However, because the submission of such a voluntary statement is intended to help speed the certification review process, EPA expects that any further evaluations would only be necessary in limited circumstances. EPA also would make every effort to complete its review within 30 days of the receipt of a full and complete application for certification. In the absence of a voluntary statement by the manufacturer, EPA could review information bearing on the engine's emission performance and design. EPA's goal would be to determine whether the engine contains a defeat device in relation to the underlying FTP-based standards for the 2004-2006 model years. EPA would make every effort to complete its evaluation as expeditiously as possible.

EPA believes that there is a variety of information that a manufacturer could use as a reasonable basis for a statement that engines are expected to meet NTE screening limits. For example, a reasonable basis could include FTP data, SET data, a robust

engine emissions map derived from laboratory testing (e.g., an emissions map of similar resolution to the engine's base fuel injection timing map) and technical analyses relying on good engineering judgment which are sufficient, in combination, to project emissions levels under NTE conditions reasonably expected to be encountered in normal vehicle operation and use. Data generated from on-highway testing to determine emission levels could, at the manufacturer's option, also be part of this combination. However, a reasonable basis for the manufacturer's statement does not require on-highway emissions test data. This statement could reasonably be based solely on laboratory test data, analysis, and other information reasonably sufficient to support a conclusion that the engine will meet the NTE screening limits under conditions reasonably expected to be encountered in normal vehicle operation and use. If a manufacturer has relevant on-highway emissions test data, it should be taken into consideration by the manufacturer in developing the basis for its statement.

Question 2

In determining whether a 2004-2006 model year engine will meet the NTE screening limits under all conditions which can reasonably be expected to be encountered in normal vehicle operation and use, can a manufacturer take into account the NTE exclusion, carveout, and deficiency provisions from the 2007 regulations?

Answer

Yes. A/C 24-3 refers to 40 CFR 86.1370. As modified in EPA's MY 2007 engine rule, those provisions include a variety of mechanisms for excluding certain load/speed/ambient conditions from the NTE control zone. See 40 CFR § 86.007-11(a)(4)(ii)-(iv); 86.1370-2007(b)(7), (f) and (g). Manufacturers that opt to make a statement of NTE compliance for screening purposes may utilize each of the relevant NTE provisions in developing the basis for the statement. Manufacturers should identify the provisions they propose to utilize in their applications for certification with an explanation of the applicability of each relevant provision to its engines. If EPA agrees with the manufacturer's proposal, then the Agency would provide the flexibility described in the regulations to the applicable portions of the NTE zone in the Agency's NTE screening review under the A/C, either during certification or during any evaluation of engines operating in use. For example, where EPA agrees with an engine manufacturer's proposal to designate a region of the NTE control zone that represents 5.0% or less of all in-use operation of an engine family, § 86.1370-2007(b)(7) provides that operations falling within that region may not represent more than 5.0% of any NTE sampling period. If 5.0% or more of any sampling period of engine operation is comprised of operations falling within such 5.0% region of the NTE zone, that sampling period would not be considered on its own in evaluating the engine's compliance with NTE screening levels.

Question 3

During the 2004-2006 time period, will NTE exceedences caused by Auxiliary Emission Control Devices (AECDs) approved during the certification review process be subject to any further screening, including NTE screening, to determine if the engine is in violation of the prohibition against defeat devices?

Answer

As noted above, the purpose of NTE screening levels during the 2004-2006 period is to determine whether certain engine operations should receive fuller evaluation as possible defeat devices. A/C 24-3 reviews the EPA definition of AECD and the relationship between AECDs and the defeat device prohibition. The A/C outlines the process EPA will use to determine whether an AECD disclosed in the manufacturer's application for certification falls outside the defeat device definition and therefore will be approved during the certification process. Agency-approval of an AECD is a determination that it is not a defeat device, based on the information then available to EPA. Engine operations within the terms and coverage of an approved AECD will not trigger further screening under the A/C even if such operations result in emissions levels over the NTE limits. However, should EPA obtain emissions data or other information suggesting that the AECD operates in a manner different than that described at certification, then EPA could conduct additional evaluation of the AECD.

Question 4

Does EPA intend to use the NTE as an *in-use* screening tool for defeat devices for 2004 through 2006 model year engines?

Answer

Yes. As stated in A/C 24-3, acceptable emissions performance during certification testing does not guarantee acceptable emissions performance on typical production engines or during normal consumer operation. Engines operating in use are required to comply with the prohibition against defeat devices. EPA believes emissions data on engines operating in use can be a useful screening tool to help evaluate compliance with the defeat device prohibition. As discussed in the A/C, the Agency plans to use the NTE screening thresholds to assist in evaluating whether engines in use comply with the defeat device prohibition as it pertains to the applicable FTP-based standards for 2004 through 2006 model year engines. For example, EPA may test engines in trucks during normal service using portable emissions measuring devices to generate emissions data under NTE test conditions which correspond to conditions which may reasonably be expected to be encountered in normal engine operation and use, taking into account the accuracy, precision, and repeatability of the measurement equipment used.

As A/C 24-3 discusses, an exceedance of the NTE screening limits is not a determination that the engine has a defeat device. On the contrary, it only means there may be the need to further evaluate the engine on a case-by-case basis to determine whether the exceedance is caused by an approved AECD, which would not be evidence of a defeat device, or whether some other device is being employed to reduce the effectiveness of the emissions control system and otherwise meets the definition of a defeat device.

This evaluation could involve, among other things, consideration of the level of the exceedance of the NTE screening levels, the accuracy, precision and repeatability of the measurement equipment used, as well as consideration of the engine's overall emissions performance. The evaluation may also include further on-road or laboratory testing and review and analysis of the engine designs at issue. The evaluation would be expected to include discussions with the manufacturer about the characteristics and performance of the engine. Both the need for a case-by-case evaluation, as well as the nature and scope of any such evaluation, would be determined based on the facts of each situation.

2007 REGULATIONS

NTE Certification Statement

Question 5

Starting with model year 2007, the regulations require that a manufacturer's application for certification include a statement that the diesel heavy-duty engine family will comply with the applicable NTE limits when operated under all conditions which may reasonably be expected to be encountered in normal vehicle operation and use. 40 CFR 86.007- 21(p)(1). Does this require manufacturers to obtain or submit different or additional certification test data or information (e.g. on-highway testing data) beyond the manufacturer's statement of compliance with the NTE?

Answer

No. EPA only expects manufacturers to provide a statement of NTE compliance at the certification stage for engines subject to the MY 2007 standards. EPA may ask for the data supporting this statement pursuant to 40 CFR 86.007-21(p)(1). As described in the Answer to Question 1, there is a variety of information that could provide a reasonable basis for this statement. In-use emission data will not be necessary to support an NTE compliance statement but should be taken into account if available.

5.0% Limited Testing Regions

Question 6

How does the Agency expect the 5.0 percent limited testing regions as set forth in 40 CFR 86.1370-2007(b)(7) to operate in practice for the screening of engines during the 2004-2006 time frame, and for the certification of engines starting in 2007?

Answer

Under this provision, manufacturers may propose to designate a region of engine operation within the NTE zone where the manufacturer demonstrates that the applicable engine family and/or rating operates within the designated region for no more than 5.0 percent of the in-use operations of that engine. A boundary of this region must touch the outer limit of the NTE zone. Upon approval of the designated region, an NTE sampling period will not be considered in assessing that engine's compliance with the NTE if the engine is operating within the manufacturer-designated region for more than 5.0 percent of the sampling period. The 5.0 percent is calculated on a time-weighted basis, e.g. no more than 2 seconds out of 40 seconds.

Question 7

What type of information would EPA expect manufacturers to provide as a basis for demonstrating that operations within a defined speed and load region account for less than 5.0% of all in-use operations?

Answer

Manufacturers should provide analyses of typical engine operation that reflects known or reasonably anticipated engine use patterns. These analyses should be based on in-use data from testing of representative vehicle/engine configurations, valid engineering calculations corresponding to operational data from in use vehicles, or a combination of the two. As an example of engineering calculations that would support a 5.0% region, some manufacturers have developed methodologies which predict speed/torque operations for certain engine/vehicle configurations based on inputs such as vehicle weight, axle, torque and expected driving cycle and vehicle use. Where the manufacturer can reasonably demonstrate that these methodologies correlate with actual on-road operation and use realistic input data, it would provide an adequate basis for defining 5.0% regions under this provision. Of course, other types of engineering analyses might also support determination of a 5.0% region if their validity can likewise be demonstrated.

Question 8

The regulations state that the manufacturer's "demonstration must include operational data from representative in-use vehicles." 40 CFR 86.1370-2007(b)(7). How will this requirement be applied?

Answer

As noted above, EPA will accept demonstrations of 5.0% regions based on reasonable methodologies which predict that certain speed/load points represent less than 5.0% of anticipated in-use operations. For example, some manufacturers have developed methodologies which predict speed/torque operations for certain engine/vehicle configurations based on inputs such as vehicle weight, axle, torque and expected driving cycle and vehicle use. Operational data from representative in-use vehicles used to demonstrate the validity of a methodology can satisfy the requirements of this regulation. For example, the manufacturer might measure speed/torque levels during in-use operation and correlate predicted levels with these measured values. Alternatively, the manufacturer might develop in-use data confirming that the driving conditions assumed in applying the methodology are in fact typical of on-road operation of the vehicles in question. EPA expects these kinds of operational data would be part of the demonstration which the manufacturer submits to the Agency.

Question 9

How many different engine/vehicle configurations would need to be analyzed to support a 5.0% demonstration?

Answer

EPA expects that separate 5.0% demonstrations would be needed for each engine family and for significantly different engine/vehicle combinations within those families. However, it is not necessary to perform separate analyses for each possible configuration of engines and vehicles and for each possible set of operating conditions under which these engine/vehicle configurations might be used. Rather, a manufacturer can submit a 5.0% demonstration for a representative engine/vehicle use configuration that is generally reflective of similar configurations within that engine family.

Question 10

Must the 5.0% region always be of elliptical or rectangular shape?

Answer

The regulations state that the region must “generally” be of elliptical or rectangular shape. 40 CFR 86.1370-2007(b)(7). This does not preclude EPA from approving a 5.0% region that is some other single shape so long as it shares some portions of its boundary with the outside limits of the NTE zone, and so long as the shape does not create a discontinuity or division in the remainder of the NTE zone. However, we do not expect that the portion of the region’s boundary that it shares with the outside limits of the NTE zone will be a single point.

Question 11

How will a 5.0% region be used during certification and enforcement?

Answer

In any assessment to determine compliance with NTE limits, operation within that region may be included in a valid NTE sampling period, but only if it does not represent more than 5.0% of the sampling period on a time-weighted basis. This would mean, for example, that where an engine operated for 30 seconds in the 5.0% region, a valid NTE sampling period could not be shorter than 10 minutes. Should in-use testing be performed on an engine for which a 5.0% region has been established, speed/load points within that region would need to represent 5.0% or less of the sampling period or the sampling period would be invalid. The time that an engine operates within a 5.0% region would be determined after taking into account the accuracy of the underlying speed and torque measurements, both in assessing the manufacturer’s designation of the 5.0% region, and in any subsequent assessments or testing.

NTE Deficiencies

Question 12

After the 2007 standards take effect, under what circumstances will EPA approve requests for an NTE deficiency determination under § 86.007-11(a)(4)(iv)?

Answer

Starting in model year 2007, emissions above the applicable NTE limits within the NTE zone, excluding areas for carveouts and exclusions, will violate the NTE

requirements if averaged over valid sampling periods of 30 seconds or more. Emissions strategies that cause such NTE exceedences are approvable, but only if they are incorporated in an NTE deficiency granted under § 86.007-11(a)(4)(iv). EPA intends to provide such deficiencies where compliance with NTE requirements would be “infeasible or unreasonable considering such factors as, but not limited to, technical feasibility of the given hardware and lead time and production cycles. . . .” These criteria would likely be met for certain engine strategies that had previously been approved as AECDs. For example, where a request for a deficiency is based on the need to protect the engine or vehicle from damage, the Agency’s analysis may demonstrate that NTE compliance during AECD operations is “unreasonable” or “infeasible.” Other operations where AECDs have been approved for current technology engines may also be suitable for NTE deficiencies; these could include, for example, engine starting operations or modulation of the emission control system under extreme altitude or temperature conditions. Deficiency requests for MY 2007 and later engines will be evaluated in the context of the capabilities of the emission control technologies that are developed to meet the new emission standards. Those capabilities cannot be fully anticipated today. Thus, EPA will evaluate whether conditions disclosed during certification of MY 2007 engines meet the standard for NTE deficiencies on a case-by-case basis in light of then-prevailing technological knowledge.

Deficiencies will be granted for a single model year. Unmet requirements should not be carried over from a previous model year except where unreasonable modifications would be necessary to correct the deficiency and the manufacturer has demonstrated an acceptable level of effort towards compliance. In appropriate cases, EPA may convey its intent to approve a deficiency for an additional model year barring a major change in circumstance; this may occur, for example, where the manufacturer shows that the hardware, software or changes in engine design necessary to correct the deficiency will not be feasible or practicable for more than one model year.

Question 13

Will EPA provide its views on proposed deficiencies in advance of certification?

Answer

EPA understands the need for adequate lead time in the engine design process. EPA encourages manufacturers to consult with Agency staff on AECDs early in the development of a certification package and provides the same encouragement for early consultation on proposed NTE deficiencies. Assuming adequate engine design information, EPA will make maximum effort to communicate its views on the likely outcome of the deficiency request as soon as practicable. To that end, manufacturers may request a deficiency determination as early as two years prior to the certification deadline for a given engine family model year. EPA will make every effort to review requests within 60 days of submission of a full and complete description of the deficiency, and

provide the manufacturer with the Agency's feedback. If the Agency is unable to approve the deficiency at that time, it will advise the manufacturer as to the reasons and specify the steps the Agency expects the manufacturer to take to either eliminate the need for the deficiency or document the justification for the deficiency. In any such case, EPA will make every effort to render a final determination on the allowance of a particular deficiency at least six months prior to production, recognizing that manufacturers must, at some point, freeze design to allow engine production. The Agency's denial of a preliminary deficiency determination request will not preclude a subsequent request by the manufacturer.