

State of California
AIR RESOURCES BOARD

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

**PROPOSED REGULATION TO PROVIDE CERTIFICATION FLEXIBILITY FOR
INNOVATIVE HEAVY-DUTY ENGINES AND CALIFORNIA CERTIFICATION AND
INSTALLATION PROCEDURES FOR MEDIUM- AND HEAVY-DUTY VEHICLE
HYBRID CONVERSION SYSTEMS (INNOVATIVE TECHNOLOGY REGULATION)**

Public Hearing Date: October 20, 2016
Agenda Item No.: 16-9-2

I. GENERAL

A. ACTION TAKEN DURING THIS RULEMAKING

At its October 20, 2016, public hearing, the California Air Resources Board (CARB or Board) approved for adoption proposed California Code of Regulations, title 13, sections 2208, 2208.1 and 2208.2 (Innovative Technology Regulation or ITR), and proposed “California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems” (“associated test procedures”). The Innovative Technology Regulation and associated test procedures provide targeted, short-term certification flexibility for: a heavy-duty engine meeting California’s optional low-oxides of nitrogen (NOx) emission standards; an engine that is to be installed in a hybrid heavy-duty vehicle; a heavy-duty engine that meets the proposed regulation’s optional low-carbon dioxide (CO₂) emission standards; and a truck or bus hybrid aftermarket conversion system. These technologies will each play a role in helping California meet its long-term air quality and climate goals, yet could face initial certification challenges inherent in certifying a new technology for the first time. At this Board hearing, the Board also approved for adoption proposed amendments to California Code of Regulations, title 13, section 1956.8 to establish heavy-duty engine optional low-CO₂ emission standards; as well as proposed amendments to “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles,” and proposed amendments to “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles.” Finally, the Board directed the Executive Officer to consider public comments submitted during the 45-day (and any 15-day) public comment period(s) and make any further modifications that are appropriate available for public comment for at least 15 days.

The Staff Report: Initial Statement of Reasons for Rulemaking (Staff Report or ISOR), entitled “Board Hearing to Consider the Proposed Regulation to Provide Certification Flexibility for Innovative Heavy-Duty Engines and California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems (Innovative Technology Regulation),” released August 30, 2016, is incorporated by

reference herein. The Staff Report contains the rationale for the proposed regulation, associated test procedures, and amendments to California Code of Regulations, title 13, section 1956.8 and the other test procedures described above. The text of the proposed regulation, amendments and test procedures were included in appendices to the Staff Report. On August 30, 2016, all documents associated with this rulemaking, including references relied upon and identified in the Staff Report, were made available to the public. These documents are available on CARB's website at: <https://www.arb.ca.gov/regact/2016/itr2016/itr2016.htm>.

After the October 20, 2016, public hearing, staff proposed modifications to the originally proposed regulation and associated test procedures in order to address comments received during the 45-day public comment period, clarify and update regulatory language regarding outstanding technical issues, and correct typographical errors. The text of the proposed modifications to the originally proposed regulation and supporting documents were made available for a supplemental 15-day comment period through a "Notice of Public Availability of Modified Text and Availability of Additional Documents" (15-day notice). The first 15-day notice, the modified regulatory and test procedure text, and additional supporting documents were posted May 31, 2017, on CARB's website (at the web address listed above), accessible to all stakeholders and interested parties. All modifications to the regulatory and test procedure text are clearly indicated in the version posted May 31, 2017. The first 15-day notice and its attachments are also incorporated herein by reference.

Staff posted a second 15-day notice, modified regulatory and test procedure text, and additional supporting documents on August 16, 2017, to correct unnecessary incorporations by reference, add a title to a couple of subdivisions, correct the date of a document incorporated by reference, and to add and remove documents to the record, as necessary. All modifications to the regulatory and test procedure text are clearly indicated in the version posted August 16, 2017. The second 15-day notice and its attachments are also incorporated herein by reference.

The Board also directed the Executive Officer to finalize the Final Statement of Reasons (FSOR), this document, for the regulatory action, and to submit the final rulemaking package to the Office of Administrative Law for review. The FSOR updates the Staff Report by identifying and providing the rationale for the modifications made to the original proposed regulatory and test procedure text, including non-substantial modifications and clarifications made after the close of the first and second 15-day comment periods. This FSOR also contains a summary of the comments received by CARB staff on the proposed amendments during the 45-day and two 15-day comment periods, and of oral comments given at the Board hearing on October 20, 2016, modifications made to the proposal as a result of those comments, and staff's responses to those comments.

B. MANDATES AND FISCAL IMPACTS TO LOCAL GOVERNMENTS AND SCHOOL DISTRICTS

CARB staff has determined that this regulatory action will not result in a mandate to any local agency or school district the costs of which are reimbursable by the state pursuant to Part 7 (commencing with Section 17500), Division 4, Title 2 of the Government Code.

C. CONSIDERATION OF ALTERNATIVES

For the reasons set forth in the Staff Report, in staff's comments and responses at the hearing, and in this FSOR, the Board determined that no alternative considered by the agency would be more effective in carrying out the purpose for which the regulatory action was proposed, or would be as effective and less burdensome to affected private persons, or would be more cost-effective to affected private persons and equally effective in implementing the statutory policy or other provisions of law than the action taken by the Board.

II. MODIFICATIONS MADE TO THE ORIGINAL PROPOSAL

A. CLARIFICATION ON THE 45-DAY NOTICE OF PUBLIC HEARING

This section describes corrections to the information contained in the 45-day Notice of Public hearing as posted August 30, 2016.

1. Language in the 45-Day Notice stated "However, it is not anticipated that any new businesses would be created or eliminated within California as a result of the proposed regulatory actions (page 11)." To be consistent with other statements in the 45-Day Notice, the statement should read "However, it is not anticipated that any new businesses would be created or eliminated within California as a result of the proposed regulatory actions, but the proposed ITR could lead to some minor level of business creation in terms of the amount of business, leading to business expansion within California as a result of the proposed regulatory actions."

B. UPDATE OF INFORMATION CONTAINED IN THE STAFF REPORT

This section describes corrections to the information contained in the Staff Report posted August 30, 2016, as modified through the first 15-day Notice posted May 31, 2017,

1. While the information contained in the following language is either already stated in, or can be inferred from, the existing content of the Staff Report, staff is presenting this language here as an addendum to Subsection C., "Economic Costs and Benefits of Proposed Regulation," of Section VI., "Economic Impacts," to facilitate better understanding of the proposed regulation's anticipated benefits:

Because the proposed regulatory actions set performance standards requiring that engines be 'cleaner than required' by current regulations

to be eligible for the compliance flexibilities of the regulation, it is expected that the new technologies would lower emissions of these vehicles. Greenhouse gas (GHG) and criteria pollutant emissions will be inherently reduced as these “cleaner” engines with innovative technologies displace “dirtier” engines with conventional technology that would normally be offered for sale under existing regulations.

For example, to qualify for the “low-NOx engine” category of the proposed regulatory actions, engines would be required to have NOx tailpipe emissions that are 50% to 90% cleaner than engines meeting current requirements. Additionally, the proposed regulatory actions would require heavy-duty hybrid vehicles to demonstrate that CO₂ tailpipe emissions are reduced by at least ten percent, with no increase in criteria pollutant emissions, when compared to a non-hybrid vehicle equivalent operated over anticipated in-use drive cycles. Similarly, heavy-duty engines in the ‘high-efficiency’ category of the proposed regulatory actions are required to demonstrate a 15-percent CO₂ emission reduction relative to a 2017 MY baseline compression-ignition engine.

However, the extent to which the new innovative truck and bus technologies can reduce emissions or improve fuel economy (potentially resulting in fuel-savings) is not known because of the uncertainty associated with the time when the new technologies would become available and the rate at which those technologies would be adopted. Additionally, because the proposed regulatory actions would temporarily relax some certification requirements to encourage heavy-duty engine, vehicle, and hybrid driveline manufacturers to develop innovative technologies for early implementation, there would also be inherent uncertainty about the emission reductions achieved by these vehicles relative to conventional vehicles as the vehicles age.

For these reasons, quantifying the lifetime emission reductions and fuel economy performance of these vehicles would be difficult until the vehicles are actually deployed and driven in use. That said, while it cannot be definitively quantified at this time, staff believes the proposed regulation would result in significant emission reductions and improved fuel economy in the long term as technology performance improves and deployment volumes increase.

2. Certain documents relied upon, identified in the body and in the footnotes of the Staff report, were not transferred to the list of references. A placeholder of “explanatory” was instead used. These documents were:
 - o 8. Explanatory – National Renewable Energy Laboratory; Data Collection, Testing, and Analysis of Hybrid Electric Trucks and

Buses Operating in California Fleets: Final Report; June 2015; www.nrel.gov/docs/fy15osti/62009.pdf as seen in the footnote on page 21

- 10. Explanatory – “More information regarding heavy-duty zero-emission vehicle approval letters can be found at: <https://www.arb.ca.gov/msprog/cihd/approvals/approvals.htm>” as seen in the footnote on page 3.
- 20. Explanatory – “ARB; 2016 Mobile Source Strategy, May 2016; <http://www.arb.ca.gov/planning/sip/2016sip/2016mobsr.htm>” as seen in the footnote on page 12.
- 37. Explanatory – “ARB; Innovative Technology Regulation Staff Discussion Document: New Engine or Vehicle Certification Public Work Group Meeting; May 27, 2015; <http://www.arb.ca.gov/msprog/itr/documents/itrconcepts052715.pdf> .” as seen in the footnote on page 32.
- 39. Explanatory – “Electric Power Research Institute, Plug-in Hybrid Medium-Duty Truck Demonstration: Final Report; September 2015; <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002006566> .” as seen in the footnote on page 34.

C. MODIFICATIONS APPROVED AT THE BOARD HEARING AND PROVIDED FOR IN THE FIRST 15-DAY COMMENT PERIOD

Various modifications to the original proposal were made in order to address comments received during the 45-day public comment period, to clarify the regulatory language, and to add documents to the record, as necessary. Pursuant to the Board direction provided in Resolution 16-20, CARB staff released the first 15-day notice on May 31, 2017, which placed documents into the regulatory record and presented modifications to the regulatory and test procedure text, as well as to the Staff Report posted on August 30, 2016.¹ The first 15-day notice described each substantive modification to the original proposal and the rationale for the modifications.

Modifications made to the August 30, 2016, Staff Report

This section describes corrections to the information contained in the Staff Report posted August 30, 2016. These corrections are consistent with the proposed language of the regulation and test procedures put out for 45-day comment or the modifications proposed in the first 15-day notice, posted May 31, 2017, and do not affect any other part of the August 30, 2016, Staff Report. These modifications do not change implementation of the regulation in any way that affects the conclusions of the environmental analysis included in the Staff Report, and so do not require additional environmental analysis or recirculation of the analysis, because the modifications consist primarily of clarifications that do not alter the compliance responses.

1 - CARB, *First Notice of Availability of Modified Text and Availability of Additional Documents*; Posted May 31, 2017; www.arb.ca.gov/regact/2016/itr2016/itr2016.htm.

3. Although the original proposal, put out for comment on August 30, 2016, would have required evaporative emissions of hybrid conversions to be evaluated in accordance with the three-day diurnal plus hot soak evaporative emission test (three-day test), the cost of the less-costly *two-day* diurnal plus hot soak evaporative emission test (two-day test) was used instead in the original economic analysis.

Section VI., “Economic Impacts,” of the Staff Report estimated that the proposed regulation would result in lifetime cost savings of between \$23.0 million to \$48.6 million. Because of the error described in the previous paragraph, the \$48.6 million estimate slightly overstated the cost savings of the proposed ITR by approximately \$27,600.

However, because the required evaporative emission test has been modified as part of the first 15-day notice from the three-day test to the two-day test for the reasons described in Section II.B. of this FSOR, the original cost savings estimate is an appropriate projection for the current proposal.

4. In Table VI-1 in Section VI., “Economic Impacts,” of the Staff Report, several values in the “Incremental Cert. Costs (per engine family)” column were incorrect. The correct values were provided as part of the first 15-day notice and are reproduced below:
 - a. Under the “Low NOx Engine Cert. Flexibility” heading, in the “Range of Costs” row, the correct range is a cost savings of \$0.9M to \$2.9M, not a cost savings of \$1.0M to \$3.0M, as originally stated;
 - b. Under the “Hybrids” heading, in the “Tier 2 Cert. Flexibility” row, the correct lower end of the range is a cost savings of \$0.4M, not a cost savings of \$0.1M, as originally stated;
 - c. Under the “Hybrids” heading, in the “Range of Costs” row, the correct range is a cost savings of \$0.2M to \$0.6M, not a cost of \$0.1M to a cost savings of \$1.3M, as originally stated; and
 - d. In the “Absolute Range of Costs” row, the correct range is a cost savings of \$0.2M to \$2.9M, not a cost savings of \$0.4M to \$3.0M, as originally stated.
5. In Subsection C., “Economic Costs and Benefits of the Proposed Regulation,” of Section VI., “Economic Impacts,” of the Staff Report, under “3. Costs and Savings to an Individual,” the language incorrectly described the incremental cost calculation for Tier 2 hybrids derived from an off-road, light-duty, or medium-duty engine. The actual procedure for calculating the \$500 incremental cost involved summing all the miscellaneous per-vehicle costs, such as those for engine labeling, volume reporting, and data reporting, and

then subtracting the minimum per-vehicle cost savings projection of \$1,300. This was corrected as part of the first 15-day notice.

6. In Subsection C., “Economic Costs and Benefits of the Proposed Regulation,” of Section VI., “Economic Impacts,” of the Staff Report, under “4. Reporting Costs,” the language incorrectly stated, “The total reporting costs for a new hybrid conversion manufacturer would then amount to \$2,200 per year (i.e., volume reporting costs of \$400 plus data reporting costs of \$1,800).” The errors are:
 - a. The \$1,800 data reporting costs would only apply to *new* hybrids derived from an off-road, light-duty, or medium-duty engine, not hybrid conversions; and
 - b. The \$2,200 figure was incorrectly derived through the addition of a per-engine (i.e., \$1,800) cost projection with a per-engine-family (i.e., multiple engines) cost projection (i.e., \$400). Because the \$400 volume reporting cost estimate assumed 400 engines, the estimated cost per-engine is \$1. Assuming this, the correct methodology is to add the \$1,800 data reporting cost with the \$1 volume reporting cost, which results in an estimated total annual reporting cost per engine of roughly \$1,800 (i.e., the nominal volume reporting cost plus the \$1,800 data reporting cost).

These corrections were also made as part of the first 15-day notice.

7. In Section 2, “Heavy-Duty Hybrid Engine Certification Flexibility Provisions,” of Appendix A to the Staff Report (Appendix A), under “Tier 2 OBD Flexibility Provisions” (page A-6), the description for the proposed Tier 2 certification flexibility provisions for a new heavy-duty hybrid engine indicated that the regulation would exempt up to three heavy-duty hybrid engine families from the calculation of a manufacturer’s total number of engine families for determining the number of on-board diagnostics (OBD) system demonstration vehicles for a given model year. The Staff Report was incorrect. Section 2208.1, as proposed on August 30, 2016, would have allowed only one engine family to be exempted, which is what staff intended. This was corrected as part of the first 15-day notice.
8. Section 2, “Heavy-Duty Hybrid Engine Certification Flexibility Provisions,” in Appendix A, under “Tier 2 OBD Flexibility Provisions” (page A-7), indicated that the proposed regulation would extend the “free” deficiency provision of the OBD regulation by allowing up to four deficiencies related to monitoring of hybrid engine and driveline technologies to be excluded from the calculation of fines described in California Code of Regulations, title 13, section 1971.1, subdivision(k)(2). Appendix A was incorrect; the correct number of allowable “free” deficiencies on the hybrid engine and driveline technologies should only

be three, which is how the provision is written in proposed section 2208.1. This was corrected as part of the first 15-day notice.

9. Section 3, "OBD System Requirements for Hybrid Conversion Systems," of Appendix A, under "Tier 1 Hybrid Conversion System OBD System Exceptions" (page A-10), indicated the proposed regulation would require manufacturers of Tier 1 hybrid conversion systems to submit in-use monitoring performance ratio data from a minimum of one hybrid conversion vehicle to CARB within one year after the certified hybrid conversion system is first manufactured for sale in California. Appendix A was incorrect. It was not staff's intent to subject manufacturers to this requirement, which is supported by the fact that such a requirement was not included in the proposed regulatory language. This was corrected as part of the first 15-day notice.

Modifications to the Regulation to Provide Certification Flexibility for Innovative Heavy-Duty Engines, and Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems.

1. Section 2208(a) was updated to add language to specify the particular sections of title 13 of the California Code of Regulations that make up the proposed regulation.
2. Sections 2208(b)(1)(A) and (b)(1)(C) were updated to remove unnecessary incorporation by reference language.
3. Sections 2208(c)(1), 2208(c)(10), 2208(c)(12), 2208(c)(13), 2208(c)(18), 2208(c)(19), and 2208(c)(21) were updated to correct improper capitalization of certain words, to correct internal references, to remove unnecessary incorporation by reference language, or to add necessary incorporation by reference language.
4. Section 2208(c)(18), which sets forth the definition for "low-NOx engine," was modified to include low-NOx Otto-cycle engines. The definition, as originally proposed, only included low-NOx diesel engines. This conflicted with the applicability of the proposed Innovative Technology Regulation, which would apply to both low-NOx diesel and low-NOx Otto-cycle engines.
5. Sections 2208.1(a)(1) and (a)(2) were updated to correct internal reference errors, to make word choice more accurate, or to remove unnecessary incorporation by reference language.

6. Sections 2208.1(a)(2)(C), 2208.1(b)(3)(D), 2208.1(c)(2)(A)1., 2208.1(c)(2)(B)1., 2208.1(c)(3)(D), and 2208.1(c)(4)(D)2. were updated to correct internal reference errors.
7. Section 2208.1(b)(2) was updated to modify the format of an internal reference so that it is consistent with the format of other references in the proposed language.
8. Section 2208.1(c)(1)(C) was updated to correct improper capitalization of certain words, to define the acronyms that are being used, and to correct the incorporation by reference language.
9. Section 2208.1(c)(2)(A)2.b. was modified to clarify that only deficiencies related to the engine's integration into a hybrid vehicle would not be subject to the fines set forth in California Code of Regulations, title 13, sections 1971.1(k)(2) and (k)(3). Staff made this change because the language, as originally proposed, could have been interpreted to mean all deficiencies would not be subject to said fines. The original language conflicted with staff's intent, which is described in Appendix B to the Staff Report, "Summary and Rationale for Each Proposed Regulatory Provision" (Appendix B). In addition, staff removed redundant language that could have caused confusion.
10. Section 2208.1(c)(2)(B)2.a.i. was modified to clarify that the allowance to exclude one hybrid engine family from the calculation of a manufacturer's total number of engine families for the purposes of California Code of Regulations, title 13, section 1971.1(i)(2.2.3) applies on a per-model-year basis.
11. Section 2208.1(c)(2)(B)2.a.iii. was intended to allow a manufacturer to request an exemption from demonstration testing monitors that are not impacted by modifications such manufacturer has made to the engine or OBD system. However, the original proposed language would have allowed manufacturers to request an exemption from *implementing*, rather than just demonstration testing, said monitors. This was not staff's intent, which is described in Appendix B to the Staff Report, and the section was modified to correct the provision to accurately reflect that intent.
12. Section 2208.1(c)(4)(A)6 was corrected so that it would only require a manufacturer of a hybrid powertrain utilizing an off-road, light-duty, or medium-duty engine to demonstrate no NOx emissions increase pursuant to section D of the "*California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes*"² (Hybrid Vehicle Certification Procedures), instead of requiring such manufacturer to *certify* to such procedures. This modification was made to address the fact that in order to

2 - CARB; California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes; October 21, 2014.

certify to the Hybrid Vehicle Certification Procedures, manufacturers would have been required to demonstrate compliance with the NOx emission factor ratio pursuant to Section E of those procedures through grams per brake-horsepower-hr (g/bhp-hr) emission values. Because g/bhp-hr emission values are not typically generated for light- and many medium-duty engines at the time of certification, meeting this requirement would have required those engines to be re-tested on an engine dynamometer. This was not staff's intent, as indicated in the Staff Report, which states that for an off-road, light-duty, or medium-duty engine utilized in a heavy-duty hybrid, "[t]he engine would not be required to be re-certified as a heavy-duty engine on an engine dynamometer."

13. Section 2208.1(c)(4)(B)3. sets forth a requirement for off-road-equivalent engines used in on-road heavy-duty hybrids to meet the most stringent applicable emission standards for NOx and PM. This section was modified to clarify that the standards that would apply are, appropriately, off-road, not on-road, emission standards.
14. Section 2208.1(c)(4)(C)2.c.ii., which sets forth production/sales limits for Tier 2 hybrids using light- and medium-duty engines, was modified so that the language is consistent with the language in section 2208.1(c)(4)(B)2.c.ii., which sets forth equivalent production limits for Tier 2 hybrids using off-road engines. This change was made to address staff's concern that the language difference could cause confusion.
15. Section 2208.1(c)(4)(C)3. would require the engine manufacturer, for an engine certified pursuant to section 2208.1(c)(4)(C), to first obtain written assurances from a hybrid vehicle manufacturer with regard to the total number of such engines they would need before shipping the engine to that hybrid vehicle manufacturer. This section, as originally proposed, would have limited this requirement to light-duty engine and vehicle manufacturers only. Medium-duty engine manufacturers were inadvertently omitted from this requirement in the originally proposed language, and the omission conflicted with the fact that section 2208.1(c)(4)(C) applies to both light- and medium-duty engines. Therefore, the section was corrected so that both light- and medium-duty engine manufacturers would be subject to requirement, as intended.
16. Section 2208.1(c)(4)(D) was modified to clarify that the requirement to collect the specified data parameters applies to the vehicle manufacturer, not the actual engine or vehicle. In addition, the requirement to collect the data specified in section 2208.1(c)(4)(D)2. was deleted because that section does not actually specify data to be collected, and so such a requirement could have caused confusion.

17. Section 2208.1(c)(4)(D)1. was modified to clarify that the manufacturer would be the entity responsible for presenting the data in the specified format. The language, as originally proposed, was not clear as to who would be responsible for presenting the data. The section was also modified to remove redundant language and to correct word choice.
18. Section 2208.1(c)(4)(D)2. was modified to improve clarity. The section, as originally proposed, cited the eligibility criteria in section 2208.1(c)(4)(A)6. as a condition for the section's applicability. Because the eligibility criteria in section 2208.1(c)(4)(A)6. would apply to all engines certifying pursuant to section 2208.1(c)(4), the reference was updated to refer to section 2208.1(c)(4) instead. Staff believes this change improved the clarity of the regulatory language. In addition, the section was modified so that manufacturers would only be required to provide the specified data if the Executive Officer requests them. This change helped streamline the certification process in situations where the Executive Officer determines the specified data are not necessary.
19. Section 2208.1(d)(1)(B) was modified to correct an inadvertent omission of Otto-cycle engines from a provision that would restrict hybrid engines certifying to the proposed optional low-CO₂ emission standards in California Code of Regulations, title 13, section 1956.8 from receiving the flexibilities intended for high-efficiency heavy-duty engines. This section, as originally proposed, would have inadvertently applied only to diesel engines.
20. Incorporation by reference language related to the California Code of Regulations sections was removed, because references to and incorporation of California Code of Regulations sections need not include this language. In addition, the adoption, amendment, and revision dates for test procedures, Code of Federal Regulation sections, and other references were updated to the most recent versions, where applicable.

Modifications to the "California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems."

1. Sections 4(a)(2)(A) through (C) of the proposed *California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion System* (Hybrid Conversion Emission Test Procedures) have been modified to replace the requirement for a hybrid conversion manufacturer to demonstrate compliance with the three-day diurnal plus hot soak evaporative emission standard with a requirement to demonstrate compliance with the two-day diurnal plus hot soak evaporative emission standard instead. The modifications, which were introduced and presented at the October 20, 2016, public hearing, were made based on staff's concerns that the three-day test would be unnecessarily burdensome for a conversion manufacturer to perform, and staff's belief that the two-day test is sufficiently effective for the

purpose of ensuring no evaporative emission increase from the applicable medium- or heavy-duty hybrid vehicle conversion relative to the pre-converted vehicle.

2. Sections 4(a)(3), 5(f)(5)(A), 6(e)(5), 6(e)(5)(C)(ii.), 6(e)(6), and 7(c)(2)(D) were modified to correct internal reference errors.
3. Sections 4(b)(1), 4(c)(1), 5(b)(1), and 5(c)(1) were updated to improve the clarity of provisions that specify the deadlines by which hybrid conversion system certification applications would be required to be submitted.
4. Section 4(f)(4), which would require that revalidation testing of the OBD system be similar in scope to the verification of monitoring requirements described in California Code of Regulations, title 13, section 1968.2 (13 CCR 1968.2), was modified to include the specific subdivision of 13 CCR 1968.2 that contains the relevant requirements for such revalidation testing. The specific subdivision was inadvertently omitted from the original proposal.
5. Section 4(f)(5) was modified to correct a reference error. Specifically, the originally proposed language erroneously referred to California Code of Regulations, title 13, section 1968.2, subdivisions (c)(3)(D)5.a. and (c)(3)(D)5.b. for specific exceptions to the production engine/vehicle evaluation testing requirements set forth therein. It was not staff's intention to reference those subdivisions, which do not actually exist, so the language in Section 4(f)(5) was modified to refer, instead, to its own subordinate subsections, as staff originally intended.
6. Sections 4(f)(1) through (5), including sections 4(f)(5)(A) and 4(f)(5)(B), were moved under Section 4(e). The original proposal erroneously included these sections in section 4(f).
7. Section 5(f)(2) was modified to specify that the section's requirement refers to the *readiness status* of the OBD system. This was only a clarification, as the only OBD element that can be set to indicate "complete" is the readiness status. In addition, the section was modified to clarify that the referenced Society of Automotive Engineers (SAE) documents are to be used for demonstrating the readiness status. The original proposal incorporated the SAE references, but did not specifically state that they were to be used. Lastly, references to California Code of Regulation, title 13, sections 1968.2 and 1971.1 were corrected so that they refer to more appropriate subdivisions in those sections. The references in the original proposal referred to provisions addressing OBD monitors, while the updated references refer to provisions that specifically set forth provisions on readiness status.
8. Sections 5(f)(4)(B) and 6(e)(4) were modified to remove references to subdivision (i)(4) of California Code of Regulations, title 13, section 1971.1.

The references to that subdivision were included in error.

9. Sections 6(e)(5)(A)(i.), 6(e)(5)(A)(ii.), 6(e)(5)(B)(i.) and 6(e)(5)(B)(ii.) were modified to correct provisions that specify the number of OBD monitors that would be required to be demonstrated for a converted hybrid vehicle. These requirements were erroneously reversed in the originally proposed language—that is, the requirements for a converted hybrid vehicle that was originally *chassis certified* were inadvertently included as the requirements for a converted hybrid vehicle that utilizes an engine that was originally *engine certified*, and vice versa. Therefore, these sections were modified to correct this error. The changes align these requirements with how they are described in Appendix A to the Staff Report.
10. Sections 6(e)(5)(C)(i.) and 6(e)(5)(C)(ii.) were moved to new section 6(e)(5)(D) to improve the clarity of the procedures for durability data vehicle testing.
11. Section 6(e)(6)(A) was modified to clarify that the requirement contained therein pertains to production evaluation testing.
12. Section 7(b)(7)(E) was modified to remove an incorrect internal reference to Section 7(d) of the proposed procedures, which sets forth provisions for emission testing on a chassis dynamometer. Section 7(b)(7)(E) would only apply to testing pursuant to Section 7(c), which sets forth the provisions for emission testing using a Portable Emission Measurement System.
13. Section 7(c)(3)(G)(ii.) was modified to correct an error in the provision. The section, as originally proposed, indicated that data from a transient test run are to be excluded if the test run’s “average driving speed” or “average positive kinetic energy” (PKE) is between 15 and 30 mph, or between 0.85 and 1.50 feet per second squared, respectively. This was not what staff intended and was in direct conflict with the test route selection criteria described in section 7(c)(2)(A)(i.) of the proposed procedures. Therefore, the language was corrected to state that data are to be excluded if “average driving speed” or “average positive kinetic energy” is not within the specified range.
14. Section 7(c)(4) was modified in response to commenter requests to clarify that a minimum frequency rate of one hertz is required for the collection of all position or emission data, in order to ensure such data follow the latest technical specifications. This was only a clarification because the section, as originally proposed, stated that the data would be required to be collected and reported on a second-by-second (i.e., one hertz) interval.
15. Section 7(c)(4)(A) was modified to allow data collection through a sensor, if engine control module (ECM) data are not available. This change aligned this section with Section 7(c)(4), which would allow the specified data to be collected from sources other than the ECM.

16. Sections 7(c)(4)(A)(i.) and 7(c)(4)(A)(iii.) were modified to clarify the parameters that must be collected from the ECM, or sensor if necessary, and reported to CARB for the purpose of determining “real-time engine power output.” Section 7(c)(4)(A)(i.), as originally proposed, specified “real-time engine power output” as one of the parameters that had to be collected and provided. However, that parameter is not typically recorded by an ECM. Instead, it is *derived* from other parameters that are recorded or stored on an ECM, such as reference torque, nominal friction percent torque, and actual engine percent torque. Therefore, the section was updated to require the collection and submittal of data for the parameters mentioned above, rather than for “real-time engine power output” itself.
17. Section 7(c)(4)(A)(vi.) was modified to move the “rechargeable energy storage system net energy change” parameter from section 7(c)(4)(A), which lists parameters to be collected from the ECM, to section 7(c)(4)(D), which lists parameters to be calculated. This modification was made because the “rechargeable energy storage system net energy change” parameter is not a parameter that is recorded by the ECM, but rather, a parameter that would have to be calculated from other information.
18. Section 7(c)(4)(A)(x.) was modified to correct an inadvertent error. The appropriate parameter to be collected should be “exhaust temperature,” not “fuel temperature.”
19. Section 7(c)(4)(E) was modified to include the specific section of Title 40, Code of Federal Regulations, Part 86, that contains the procedures for calculating the emission values needed to determine fuel consumption. The original proposal referenced the entirety of Title 40, Code of Federal Regulation, Part 86, without specifying a section. In addition, the reference to SAE J1094a, was updated to refer to the stabilized version of the SAE document, SAE J1094, instead.
20. Section 7(d)(3)(A) was modified to add language, including new sections 7(d)(3)(A)(i.) and 7(d)(3)(A)(ii.), to improve the clarity of the provisions describing the required duty cycles for heavy-duty vehicles that would be tested on a chassis dynamometer. Specifically, subsections 7(d)(3)(A)(i.) and 7(d)(3)(A)(ii.) were added to separate the language in section 7(d)(3)(A) that sets forth the transient duty cycle. Section 7(d)(3)(A) was also modified to delete an existing reference to an obsolete electric power take-off (ePTO) duty cycle.
21. Section 7(d)(3)(B) of the proposed *California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems* has been modified and Section 7(d)(3)(C), including subordinate Sections 7(d)(3)(C)(i.) through (iv.), have been added to incorporate language

that sets forth new requirements applicable to heavy-duty hybrid utility and refuse vehicles with electric power take-off (ePTO) functionality. These modifications, which were presented to the Board at its October 20, 2016, public hearing, align the ePTO duty cycle requirement, as well as provisions on emission calculations and pass-fail determination, with the requirements of the federal GHG Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2 (Phase 2 Program).³

D. MODIFICATIONS APPROVED AT THE BOARD HEARING AND PROVIDED FOR IN THE SECOND 15-DAY COMMENT PERIOD

Various modifications to the original proposal, and some to the proposal as modified by the first 15-day notice, were made through a second 15-day notice. These modifications were made to correct unnecessary incorporations by reference, add a title to a couple of subdivisions, correct the date of a document incorporated by reference, and to add and remove documents to the record, as necessary. CARB staff released the second 15-day notice on August 16, 2017, as well as an errata on August 18, 2017, which placed documents into the regulatory record and presented modifications to the regulatory and test procedure text, as well as to the Staff Report posted on August 30, 2016.⁴ The second 15-day notice described each substantive modification to the original proposal and the rationale for the modifications.

Modifications to the Regulation to Provide Certification Flexibility for Innovative Heavy-Duty Engines, and Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems.

1. Section 2208(c)(13) was modified to remove an unnecessary incorporation by reference of California law. An errata posted on August 18, 2017, corrected inaccurate strikeout and underline and incorrect use of text from a previous version that failed to include modifications made in the first 15-day changes. The corrections made in the errata did not materially affect the substance of the proposal, as they served to clarify the changes in the second 15-day period, which only removed the unnecessary incorporation by reference language and did not change the regulation.

Modifications to the “California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems.”

1. Sections 1(a) and (b) was modified to add a title to each subdivision which more accurately characterized the nature of the paragraph.

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- 3 - Federal Register; Volume 81, Number 206, October 25, 2016; *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2*

4 - CARB, *Second Notice of Availability of Modified Text and Availability of Additional Documents*; Posted August 16, 2017; <https://www.arb.ca.gov/regact/2016/itr2016/itr2016.htm>.

2. Section 1(b) was modified to remove unnecessary incorporations by reference of California law.

3. Section 5(f)(2) was modified to correct the revision date of the incorporated document, Society of Automotive Engineers International J1979, "E/E Diagnostic Test Modes." Although the revision date (August 2014) contained in the original proposal, posted on August 30, 2016, was correct, staff inadvertently changed it to August 2013 when making the modifications described in the first 15-Day Notice. The August 2013 revision date is incorrect. Therefore, the revision date was changed from August 2013 back to August 2014, as originally proposed.

E. NON-SUBSTANTIAL MODIFICATIONS

Subsequent to the 15-day public comment periods mentioned above, staff made additional non-substantial modifications to the *"California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems"* to correct consistency issues. For example, certain section numbers that originally ended with a period were changed so that they are now enclosed by parentheses, and certain section headings that originally ended with a colon were changed so that they now end with a period. Further, in section 7(c)(4)(D), the "and" was moved from between section 7(c)(4)(D)(viii.) and (ix.) to after section 7(c)(4)(D)(ix.) to make it a grammatically correct list, and the colon following section 7(c)(4)(D)(x.) was changed to a period.

The above-described modifications constitute non-substantial changes to the regulatory text because they more accurately reflect the numbering of a section, correct spelling and grammatical errors, or make the punctuation and/or grammar consistent across the text, but do not materially alter the requirements or conditions of the proposed rulemaking action.

III. DOCUMENTS INCORPORATED BY REFERENCE

The regulations and test procedures adopted by the Executive Officer incorporate by reference the following documents:

In California Code of Regulations, title 13, sections 2208, 2208.1 and/or 2208.2:

- U.S. EPA National Vehicle and Fuel Emissions Laboratory guidance letter CD-12-07 (Revised), dated March 30, 2012;
- "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid- Electric and Other Hybrid Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes", amended on October 21, 2014;
- *"California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems,"* as adopted on September 1, 2017.

- Title 40, Code of Federal Regulations, Part 1036, 1036.705(d) , as amended September 15, 2011;
- Title 40, Code of Federal Regulations, Part 86, Section 86.096-24, as amended April 28, 2014;
- Title 40, Code of Federal Regulations, Part 89, Section 89.112(d), as amended July 13, 2005;
- Title 40, Code of Federal Regulations, Part 1065, Section 1065.270, as amended April 28, 2014;
- Title 40, Code of Federal Regulations, Part 86, Section 86.004-2, as amended August 8, 2014.

In amendments to the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" and/or in California Code of Regulations, title 13, sections 1956.8:

- 40 Code of Federal Regulations, Part 1036.108, as amended September 15, 2011;
- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended September 1, 2017
- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted December 27, 2000, as last amended September 1, 2017.
- "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," amended September 2, 2015;
- Title 40, Code of Federal Regulations, Part 1036, Section 1036.108, as amended September 15, 2011;

In new test procedures "California Certification and Installation Procedures for Medium- and Heavy- Duty Vehicle Hybrid Conversion Systems," and in California Code of Regulations, title 13, sections 2208, 2208.1 and 2208.2:

- Title 40, Code of Federal Regulations, Part 1065, Subpart K, as amended October 25, 2016;
- 40 Code of Federal Regulations, Part 1037.510(a), as amended September 15, 2011;
- 40 Code of Federal Regulations, Part 86, Appendix I, as amended on October 25, 2016;
- Title 40, Code of Federal Regulations, Part 86, Section 86.096-24, as amended April 28, 2014;
- Title 40, Code of Federal Regulations, Part 86, Section 86.144-94, as amended on September 15, 2011;
- 40 Code of Federal Regulations, Part 1066.801(c), as amended February 19, 2015;
- 40 Code of Federal Regulations, Part 1037, Appendix I, as amended September 15, 2011;
- Title 40, Code of Federal Regulations, Part 1037, Appendix II, as amended on October 25, 2016;
- Title 40, Code of Federal Regulations, Part 1037, Section 1037.540, as amended on October 25, 2016;
- Title 40, Code of Federal Regulations, Part 1037, Section 1037.615, as amended June 17, 2013;
- 40 Code of Federal Regulations, Part 1065, Subpart J, as amended April 28, 2014;
- 40 Code of Federal Regulations, Part 86.004-28(i)(1), as amended April 28, 2014;
- 40 Code of Federal Regulations, Part 86, as amended February 19, 2015
- 40 Code of Federal Regulations, Part 1037.550, as amended June 17, 2013;
- 40 Code of Federal Regulations, Part 1037.615(b)(2)(iii) as amended June 17, 2013;

- "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," amended September 3, 2015;
- "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid Electric and Other Hybrid Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," amended on October 21, 2014;
- "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" (Refueling Test Procedures)," as amended on September 2, 2015;
- "Procedures for Exemption of Add-on and Modified Parts", amended June 1, 1990;
- "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," amended September 2, 2015;
- Society of Automotive Engineers (SAE) International J1094: Constant Volume Sampler System for Exhaust Emissions Measurement, September 2011;
- SAE International J1526: SAE Fuel Consumption Test Procedure (Engineering Method), September 2015;
- SAE International J1711: Recommended Practice for Measuring the Exhaust Emissions and Fuel Economy of Hybrid-Electric Vehicles, Including Plug-in Hybrid Vehicles, June 2010;
- SAE International J1939: Serial Control and Communications Heavy Duty Vehicle Network - Top Level Document, August 2013;
- SAE International J1939-73: Applications Layer - Diagnostics, July 2013;
- SAE International J1979 "E/E Diagnostic Test Modes," August 2014;
- SAE International J1979-DA: "Digital Annex of E/E Diagnostic Test Modes," June 2014;

- SAE International J2711: Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles, September 2002;
- SAE International J2841: Utility Factor Definitions for Plug-In Hybrid Electric Vehicles Using Travel Survey Data, September 2010.

These documents were incorporated by reference because it would be cumbersome, unduly expensive, and otherwise impractical to publish them in the California Code of Regulations. In addition, some of the documents are copyrighted and cannot be reprinted or distributed without violating the licensing agreements. The documents are lengthy and highly technical test methods and engineering documents that would add unnecessary additional volume to the regulation. Distribution to all recipients of the California Code of Regulations is not needed because the interested audience for these documents is limited to the technical staff at a portion of reporting facilities, most of whom are already familiar with these methods and documents. Also, the incorporated documents were made available by CARB upon request during the rulemaking action and will continue to be available in the future. The documents are also available from college and public libraries, or may be purchased directly from the publisher. SAE documents are also available through the SAE's public website at <http://www.sae.org>.

Additional References and Supplemental Documents

- Federal Register; Volume 81, Number 206, October 25, 2016; *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles- Phase 2*;
- National Renewable Energy Laboratory (NREL); *Characterization of PTO and Idle Behavior of Utility Vehicles*; Technical Report: NREL/TP-5400-6674; July 2016;
- NREL, Fuel and Emission Reduction in Electric Power Take-Off Equipped Utility Vehicles, Presented at Electric Vehicle Symposium and Exhibition (EVS29); June 22, 2016;
- ARB; *Implementation Manual for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project*; Effective Date: June 1, 2016;
- *Synthesis: Medium- and Heavy-Duty Vehicle Innovators Roundtable*, hosted by Calstart and the South Coast Air Quality Management District; May 8, 2016.

IV. SUMMARY OF COMMENTS AND AGENCY RESPONSE

Written comments were received during the 45-day comment period in response to the October 20, 2016, public hearing notice, posted August 30, 2016, and written and oral comments were presented at the Board hearing. Comments were also received during the first 15-day comment period in response to the May 31, 2017, public notice. No comments were received during the second 15-day comment period in response to the August 16, 2017, public notice and August 18, 2017, errata related to that public notice.

Listed below are the organizations and individuals that provided written comments during the 45-day comment period or in-person oral comments at the October 20, 2016, Board hearing:

Commenter	Affiliation
John McNichols (October 4, 2016)	Energetic Drivetrains
James Burns (October 11, 2016)	Transportation Power, Inc.
Glen Naylor (October 14, 2016)	New Flyer Industries
Benoit Lacroix (October 16, 2016)	Effenco Industries
Roger Gault (October 17, 2016)	Truck and Engine Manufacturers Association (EMA)
Sanjay Pimple (October 17, 2016)	Cummins, Inc.
Bill Mammen (October 17, 2016)	Odyne Systems LLC (Odyne)
Michael Geller (October 17, 2016)	Manufacturers of Emission Controls Association (MECA)
Ryan Schuchard (October 17, 2016)	CALSTART
Edward Lovelace (October 17, 2016)	XL Hybrids
Rasto Brezny (Oral, October 20, 2016)	MECA
Thomas Lawson (Oral, October 20, 2016)	California Natural Gas Vehicle Coalition

Listed below are the organizations and individuals that provided written comments during the 15-day comment period:

Commenter	Affiliation
Edward Lovelace (June 15, 2017)	XL Hybrids

Below is a summary of each objection or recommendation made regarding the specific regulatory actions proposed, together with an explanation of how the proposed actions were changed to accommodate each objection or recommendation, or the reasons for making no change. The comments have been grouped by topic wherever possible. Comments not involving objections or recommendations specifically related to the rulemaking or to the procedures followed by CARB in this rulemaking may not be included below. All comments are available at:

<https://www.arb.ca.gov/regact/2016/itr2016/itr2016.htm>.

45-DAY COMMENTS

COMMENTS IN SUPPORT

1. Comment: The proposed regulation allows minimal quantities of emerging technologies into field trials without extensive testing and data collection. By allowing initial deployment to gather real world data on emissions and performance of innovative, new technologies, the proposed regulation will be invaluable to suppliers of these new and innovative technologies. This phased approach allows manufacturers to work with local California fleets to field test and implement these technologies while collecting valuable data for them and CARB. While we think there is still much ground to cover regarding full integration with original engine and vehicle and on-board diagnostics (OBD) compliance, this regulation is a step in the right direction.

We strongly support the passage and “fast track” implementation of this regulation to allow emerging technologies to begin to make an impact on air quality as soon as possible. Many new technologies from many companies are in the works, which will assist in achieving clean air goals set by CARB. Failure to implement this regulation quickly will result in the “status quo” air quality improvement, which is not sufficient to reach the stated goals. (Energetic Drivetrains)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation. Staff believes these regulatory actions will help encourage development and deployment of the next generation of truck and bus technologies that California needs to meet its air quality and climate goals.

2. Comment: We are encouraged and believe future generations will be well served by the inclusion of language and technical considerations embodied in the section of the proposed regulation entitled "Alternate Emission Standards for Heavy-Duty Hybrids with at Least 35 Miles All-Electric Range." This variation of heavy-duty propulsion will be much aided on its path to commercialization by this consistent and forward-thinking regulation. Range-extension of a battery dominant heavy-duty hybrid vehicle using a lighter-duty engine, in a serial generation mode, may help accelerate early adoption of cleaner trucks by reducing up-front dependence on initially scarce charging infrastructure, while at the same time providing deployment flexibility for early adopters. We ask for continuing flexibility of thought as such solutions are brought to market and begin to prove their merits. (Transpower)

Agency Response: CARB staff appreciates the support for the provisions detailed in section 2208.1(c)(4) of the Innovative Technology Regulation regarding alternate emission standards for heavy-duty hybrids with at least 35 miles all-electric range.

3. Comment: This regulation is needed, relevant, and timely. We are the largest heavy-duty transit bus manufacturer in America and offer zero-emission transit buses for sale with trolley bus, battery electric, and fuel cell technology. However, mass deployment of these technologies has not yet occurred, as all face some roadblocks to broad deployment. Battery cost and range pose deployment

challenges for battery electric buses. Fuel cell cost and infrastructure cost are concerns for fuel cell buses. On the other hand, battery dominant series drive electric buses with a small internal-combustion engine-generator for range extension are a realistic path to deploy heavy-duty buses with zero-emission miles that would significantly reduce emissions compared to solutions that are available today. However, today's heavy-duty engines are too large relative to the power required for operation as a range-extended generator, are too heavy, and would not operate in their optimum power range for low emissions and fuel efficiency. There needs to be a reasonable path to certify a small internal combustion engine as a range extender in a zero-emission battery bus. Please continue to develop this regulatory solution. (New Flyer)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation.

4. Comment: We welcome the proposed Innovative Technology Regulation and applaud CARB staff on recognizing the deterring effect that existing comprehensive heavy-duty engine and vehicle certification requirements may have on the introduction of promising new technologies to the Californian market. (Effenco)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation.

5. Comment: We are an advocate for consistent and responsible regulations that recognize the needs of business, offer clear direction and provide incentives to companies that create innovative technologies as well as jobs in this country. Over the course of CARB development of the proposed Innovative Technology Regulation, we have worked with staff to provide policy and technical input in order to improve the rulemaking process. For example, for low-NOx technologies, OBD provides a certification challenge to manufacturers as they develop new products. The proposed Innovative Technology Regulation would help by providing low-NOx technologies with multiple potential pathways of modest OBD relief. First, in addition to the NOx threshold monitor relief of 1956.8(a)(2)(A), sub note O, the proposed regulation would add further flexibility in OBD demonstration and production validation testing, free deficiencies, and relaxed mandatory recall thresholds for major monitors. Alternatively, a manufacturer could elect to forgo the aforementioned OBD relief and instead fully certify an ITR-eligible engine family to CARB low-NOx requirements, while a second ITR-eligible engine family could certify to the optional low-NOx standards while being exempted from OBD emissions threshold requirements for a single model year. These two proposed regulatory options provide potential pathways to incentivize manufacturers to develop and certify low-NOx technology products, supporting CARB's overall goal of encouraging low-NOx options to the California market. We support the efforts of CARB to develop a rule to offer certification flexibilities for innovative technologies, such as low-NOx engines. The proposed Innovative Technology Regulation as written is a step towards achieving California's air quality goals and we appreciate the

opportunity to participate in the rulemaking process and during future collaboration once the rule is finalized. (Cummins, Inc.)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation and CARB's regulatory development process.

6. Comment: We are generally in favor of the proposal and support the proposed regulation. We also appreciate the amount of stakeholder involvement and collaboration during the regulatory development process. (Odyne)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation and CARB's regulatory development process.

7. Comment: We support CARB's proposed Innovative Technology Regulation. We believe the proposal strikes a good balance that will achieve its goal of accelerating new technologies while avoiding erosion of current requirements designed to ensure proper engine operation and preventing backsliding on emission reductions. We also believe this proposal would incentivize manufacturers to accelerate development of new low emission engines, including ultra-low-NOx engines and higher efficiency engines, to achieve early emission reductions and help California meet its State Implementation Plan commitments to improve ambient air quality. Finally, we believe the proposed certification flexibility granted by the proposed regulation, coupled with state funding and a clear path toward low-NOx engine emission standards, would accelerate the introduction of new advanced technologies that reduce NOx emissions into the marketplace. (MECA)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation.

8. Comment: In general, we support staff's proposed Innovative Technology Regulation. Accelerating the introduction of innovative, clean and low carbon transportation technologies is a top priority for us. A key means for achieving such acceleration is the streamlining of certification and test processes, for which the proposed Innovative Technology Regulation is a vital tool.

Staff has worked hard to understand the barriers causing the greatest challenges and then to find the right balance between certainty and flexibility. We believe the proposed Innovative Technology Regulation helpfully targets important technology areas that need additional flexibility and reduced barriers to market entry (i.e., low carbon and low-NOx engines, and hybrid configurations of all types, from parallel and series designs to start-stop mild designs). Furthermore, the regulation does provide needed relief from OBD requirements for new technology and small providers. We also believe the proposed Innovative Technology Regulation provides flexibility that will promote faster development of the range-extended electric drive architecture, which is a critical platform for a major heavy-duty electrification pathway.

This past summer, CALSTART, with staff from the CARB, California Energy Commission, South Coast Air Quality Management District, and Environmental Defense Fund, staged an Innovators Roundtable to assess the needs and issues surrounding innovative technology development and suppliers for medium- and heavy-duty vehicles. A key finding from this Roundtable was that innovators strongly call for the state to create more flexible mechanisms to help them deal with regulation and certification barriers when bringing new technologies to market. Traditional regulation has been structured to address high-volume conventional technologies from established companies, yet innovation needed by the state is often initially deployed at very low volume and/or being developed by smaller or less established companies. The proposed Innovative Technology Regulation can help to remedy this. (CALSTART)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation.

9. Comment: We are generally supportive of the proposed Innovative Technology Regulation because it is an effort to address the barriers to technology deployment, such as high initial certification costs and certification engineering challenges. (XL Hybrids)

Agency Response: CARB staff appreciates the support for the efforts and goals of the Innovative Technology Regulation.

GENERAL COMMENTS ABOUT ALL-ELECTRIC RANGE (AER)

10. Comment: We do not understand why hybrid conversion systems must achieve significant all-electric range (AER) to be eligible for the proposed ITR long-term. It is an easier thing to achieve significant AER with light-duty vehicles than heavy-duty vehicles. A heavy-duty vehicle requires much more power and energy due to the wide variety of potential applications and duty cycles. The cost of power electronics and batteries are coming down but that may never reach a point to justify the cost for full electric operation in heavy-duty vehicle applications. If the cost of AER capability does not match the customers' return on investment expectations, demand will decline and have a negative impact on the development of this technology. The U.S. EPA Phase 2 greenhouse gas regulations did not target achievement of AER, but instead focused on the path to reduce fuel consumption, which also reduces emissions. This enables the right technology in the right application to succeed, providing a win-win for both regulators and converters.

Specifically, page E-10 of the ITR hybrid conversion system test procedures⁵ indicates that:

5 - CARB; *Board Hearing to Consider the Proposed Regulation to Provide Certification Flexibility for Innovative Heavy-Duty Engines and California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems*, Staff Report: Initial Statement of Reasons; Appendix E; August 30, 2016; <https://www.arb.ca.gov/regact/2016/itr2016/itr2016.htm> .

- “(1) A manufacturer is ineligible to submit an application for Tier 1 certification of a hybrid conversion system that does not achieve at least 35 miles AER as of January 1, 2022.
- (2) Tier 1 Executive Orders for hybrid conversion systems that do not achieve at least 35 miles AER expire as of January 1, 2027, and additional units of a hybrid conversion system covered by such an Executive Order may not be installed or sold after January 1, 2027.”

Similar language exists in a subsequent section that describes Tier 2 certification requirements. This language seems to indicate that a hybrid system must have AER capability or achieve Tier 3 status by January 1, 2022 in order to continue sales. We do not plan to have full electric drive capability, and therefore would not be eligible for Tier 1 or Tier 2 status after the identified dates. We understand having a sunset date for each tier but feel it should not be related to AER. This will create a major barrier to market for Odyne and others. Please consider rephrasing in these sections to indicate “after January 1, 2022” rather than “as of January 1, 2022”, for clarity. (Odyne)

Agency Response: The proposed ITR has been structured to encourage development and deployment of all medium- and heavy-duty vehicle hybrid conversion systems, and would not limit eligibility to those systems that achieve AER. Staff agrees that the language cited could be misinterpreted to mean that a hybrid conversion system manufacturer must ensure its system achieves at least 35 miles AER by January 1, 2022 in order to be eligible for Tier 1 certification at any time, even prior to this date. Because that is not the intent of the language, staff clarified this language in the hybrid conversion test procedures as part of its first 15-day notice to instead read:

“(1) As of January 1, 2022, a manufacturer is ineligible to submit an application for Tier 1 certification of a hybrid conversion system that does not achieve at least 35 miles AER as of January 1, 2022.”

The language for Tier 2 conversions was also updated to more specifically refer to the eligibility timeframe for Tier 1 and Tier 2 certification, rather than mandate conversion systems achieve at least 35 miles AER by these dates in order to be eligible for Tier 1 or Tier 2 certification in prior years.

11. Comment: Rather than targeting achievement of AER, the ITR should instead focus on how a vehicle is operated during a typical work day. A work day typically has some percentage of driving and stationary operation, which will differ across various work applications. For example, our customers spend most of their time stationary and idling to operate equipment at the jobsite. The amount of fuel consumed and emissions produced is significantly higher while idling than driving. We have optimized our system to provide some benefit while driving, but focus primarily on potential stationary benefits. So the AER for our hybrids, which focus on work site

benefits, is not as important, and focusing on achieving AER would negatively impact the remaining energy to operate at the jobsite. Having an AER requirement defines the type of technology and how it is applied instead of being technology agnostic and focusing on the emission benefit. We do not have any AER capability and do not feel it is appropriate in our application. In addition, other technologies like hydraulic hybrids will not have any AER capability. We have used the term equivalent all-electric range (EAER) to identify the fuel efficiency benefits of these types of vehicles. Perhaps EAER could be considered as a replacement measure for AER. (Odyne)

Agency Response: One significant benefit of hybrid systems is their ability to provide a technology bridge to fully zero-emission technology that is critical for California to achieve its long-term air quality and climate goals. While hybrids that are capable and incapable of achieving significant AER would be eligible for the ITR, the proposed regulation recognizes the significant additional benefits provided by commercial vehicles capable of significant uninterrupted all-electric range as well as the additional certification challenges applicable to such technology. The series hybrid technology required to achieve significant AER generally mirrors that required of fully zero-emission vehicles. For this reason, some stakeholders refer to these vehicles as zero-emission vehicles with range extenders. Trucks and buses with significant AER also have significant potential to promote installation of charging infrastructure, training for fleet mechanics and other personnel, development of battery technology supply chains, and other dynamics that help support a zero-emission truck and bus market. These vehicles will also continue to help drive down the cost of robust electric vehicle propulsion componentry, such as batteries and controllers, as volumes increase. Therefore, hybrids with zero-emission range are likely to be a more effective bridge to widespread deployment of fully zero-emission truck and bus technology than zero-emission technology focused on stationary applications.

In addition, CARB's experience evaluating hybrid truck conversion systems suggests that conversion of an existing truck to a series hybrid, as needed to achieve significant AER, poses greater OBD compliance challenges than less intrusive hybrid conversion systems that do not achieve AER. The ITR is structured to provide greater time for hybrid conversions capable of significant AER to comply with Tier 1 or Tier 2 aftermarket system certification requirements in recognition of the potential additional OBD challenges such systems could face.

12. Comment: The proposed regulation has a fixed AER threshold for different paths of the regulation. We feel that more flexibility in this threshold would have been preferable. For example, what if a vastly more cost-effective product came on the market with only 30 miles AER, and moving to 35 miles AER would make it considerably more expensive. Thirty-five miles AER makes sense as a standard threshold for passenger vehicles but not for the full range of commercial vehicles all the way up to Class 8. (XL Hybrids)

Agency Response: As discussed during ITR workshops and workgroup meetings, the 35 mile AER threshold is intended to differentiate robust series hybrids that provide a significant technology bridge to fully zero-emission trucks and buses, from hybrids with modest or interrupted electric range. During the ITR development process, staff spoke with several manufacturers planning to produce hybrid trucks or buses with at least a 35 mile AER capability, as well as interested fleets. The ITR's 35 mile AER threshold is based upon discussions with these manufacturers and interested fleets regarding the point at which, considering battery size and cost, fleets could optimize zero-emission operation and fuel savings over the course of a typical day. Staff therefore believes a 35 mile AER threshold for defining "significant" AER pursuant to the ITR is appropriate. Additional information regarding AER criteria may be found in the agency response to comment 11, above.

COMMENTS REGARDING HYBRID TEST PROCEDURES

13. Comment: We believe that idle duty cycles and idle reduction technologies should be included as eligible technologies pursuant to the ITR due to their ability to achieve CO₂ emission reductions. Idle is a significant part of real world duty cycles for many medium- and heavy-duty vehicle applications, be it in traffic circulation, at bus stops, at loading-unloading points or at worksites. These conditions are encountered on vocational applications that are generally identified as being the best candidates for hybridization. A myriad of sources now demonstrate that idle (or stationary operations) actually accounts for roughly half of the overall operating time on average for several vocational applications. From our own database that sums up more than 110,000 operating days with 468 vehicles over five truck applications, we observe that stationary operations account for 30 to 70 percent of these vehicles' operation time and that associated fuel consumption ranges between 10 percent to as much as 40 percent of the overall fuel consumption. (Effenco)

Agency Response: Staff agrees that idling can be responsible for a substantial portion of criteria pollutant and greenhouse gas emissions from medium- and heavy-duty vehicles, particularly vocational trucks and buses. Staff also agrees that idle reduction technology, such as automatic engine stop-start (AESS) technology, can have an important role in helping to reduce truck and bus engine idle emissions in some applications. However, the purpose of the ITR is to provide key truck and bus technologies that face certification challenges with certification flexibility in order to encourage their early deployment. OBD compliance, in particular, can pose unique certification challenges for new engine and driveline architectures that may deter their early introduction. Staff does not believe non-intrusive or minimally-intrusive strategies, such as AESS, which consist primarily of engine software modifications, face the same significant OBD compliance challenges as new or innovative engine architecture or hardware. These strategies were, therefore, not included in the ITR.

14. Comment: High proportion of idle time (or stationary operations) is not an exception but rather the norm for many vehicle applications to which the proposed ITR will be useful. However, the proposed ITR stipulates that: "*Emission testing pursuant to these procedures would exclude the benefits of an engine automatic stop-start system...*" and that "*...the proposed ITR test procedures are intended to evaluate the emission benefits of vehicle hybridization, not engine stop-start systems.*" In fact, stop-start operation (or idle reduction) is an important and integral part of hybridization strategy, as are regenerative braking and advanced engine management, for example, and it should be recognized as such. Not only the associated fuel savings are significant but the hardware and software required to realize them is somewhat similar to what is used for propulsion hybrid architectures. For instance, the Active Stop-Start system includes an AC 3 phase, 18kW peak power electric hybrid starter-generator and a 144 volt ultracapacitor pack as energy storage. We believe that the current proposed ITR determines the "how" to achieve

the CO₂ emission reductions in that it favors some hybridization strategies (i.e., regenerative braking) to others, such as an AESS. (Effenco)

Agency Response: As the commenter indicates, ITR test procedures exclude the benefits of an AESS when evaluating the emission benefits of vehicle hybridization. As described in the ISOR, some studies have found that heavy-duty hybrids can produce more criteria pollutant emissions than their conventional counterparts. Therefore, including the benefits of an AESS in emission testing could mask increased emissions due to hybrid vehicle engine operation. For example, a hybrid vehicle that increases NO_x emissions by 15 percent but whose AESS achieves a 15 percent NO_x reduction would pass the ITR emission test criteria for NO_x. In addition, an AESS in some instances could potentially reduce CO₂ emissions by over ten percent, so the same rationale applies to CO₂ as well. Therefore, based on the aforementioned reasons and the reasons specified in the agency response to comment 13, above, staff believes it is appropriate to exclude the benefits of AESS from the emissions test.

15. Comment: Neglecting to impose a minimum proportion of idle (or stationary operation) time in the determination of duty cycles for the hybrid technology emission test procedures will lead to erroneous conclusions. For example, regarding the Test Route Selection for the Portable Emission Measurement System (PEMS) Testing (ref. Appendix E, section 7(c)(2)), the proposed ITR currently only requires manufacturers to identify approximately what percent of time the vehicles are anticipated to operate at zero-speed (i.e., the vehicle idles or is otherwise at rest) (ref. Appendix E, section 7(c)(2)(B)). On the other hand, the procedures impose a range of average driving speed and positive kinetic energy (PKE) for the test route (section 7(c)(2)(A)). It has been clearly demonstrated that PKE, or kinetic intensity (KI): “... relates well to a hybrid electric vehicle’s hybrid advantage for cases where idle fuel usage and vocational loads are small compared with the fuel usage to satisfy roadload.”⁶ Given the importance of stationary operations and related fuel usage, average driving speed and PKE cannot be used as the only metrics. Therefore, we urge the agency to impose a definite range of zero-speed operating time, expressed as a percentage of the overall time, for the selection or elaboration of test routes. Similarly, where specific duty cycles are specified (e.g. section 7(d)), extra idle time should be added to these duty cycles (if required) in order to reflect real world proportions. Failing to do so, technologies that are highly sensitive to PKE and driving speed could potentially be certified with overestimated performances through the proposed procedures, resulting in actual under-achieved emission benefits. Moreover, savings resulting from idle reduction technologies (in a broad sense) would be literally overlooked. (Effenco)

Agency Response: Staff does recognize that idling for some vehicle vocations, such as refuse haulers and parcel delivery trucks, can be significant. However, staff

6 Michael P. O’Keefe, Andrew Simpson, Kenneth J. Kelly and Daniel S. Pedersen, “Duty Cycle Characterization and Evaluation Towards Heavy Hybrid Vehicle Applications”, 2007 SAE World Congress, SAE Paper 2007-01-0302.

believes that a single defined idle time for the purposes of ITR emission testing would be inappropriate, given the range of idle times typical of various truck and bus duty cycles.⁷ Instead, the ITR test procedures allow an applicant to propose an appropriate amount of time it anticipates the vehicle will idle during emission testing as part of its Hybrid Technology Emission Test Plan. The intent of including an idle time in the emission test plan is to ensure the base and hybrid vehicle idle during testing for similar timeframes, and minimize potential for gaming during emission testing. Anticipated idle time is needed to define the test route, since time of operation at zero miles per hour is not captured by the other required variables (i.e., average driving speed and positive kinetic energy or PKE).

The ITR includes average driving speed and PKE due to their demonstrated correlation with criteria pollutant emissions. As discussed in the ITR Staff Report, well-established studies also indicate a strong correlation between average driving speed, PKE or KI (which are equivalent for the purposes of the proposed ITR fixed-route testing), and NO_x, carbon monoxide (CO), hydrocarbon (HC), and CO₂ emissions. European researchers have found that PKE, average driving speed, and relative cubic speed of a vehicle, as driven over a given drive cycle, provided the strongest correlation to resulting NO_x, CO, and HC emissions, with an R² (coefficient of determination) of over 95 percent for each pollutant.⁸ West Virginia University research provides similar results, with non-parametric Spearman's correlations between average driving speed and NO_x, CO, HC, and CO₂ emissions of over 90 percent, and between KI and NO_x, CO, and CO₂ emissions of over 90 percent, with the correlation to HC of 88 percent.⁹ Staff, therefore, believes that average driving speed and PKE remain the most relevant metrics for defining a PEMS duty cycle and comparing similarity of a hybrid and base vehicle as driven over the same route. Additional information regarding the relationship between average driving speed, PKE and hybrid vehicle emissions can be found in Appendix A to the Staff Report (Technical Supporting Information).

16. Comment: In Section 7(c)(1), with regard to PEMS testing, it is stated that for the A to B testing, a manufacturer may be allowed to use the same vehicle with the hybrid system disabled for the conventional emissions test (A) and then again with the hybrid system enabled for the hybrid emissions test (B)? Please verify if this is allowed for chassis-dyno emissions testing as well. (Odyne)

7 - CARB; *Board Hearing to Consider the Proposed Regulation to Provide Certification Flexibility for Innovative Heavy-Duty Engines and California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems*, Staff Report: Initial Statement of Reasons; Appendix A; Table A-1; August 30, 2016; <https://www.arb.ca.gov/regact/2016/itr2016/itr2016.htm> .

8 - Martijn van Ras, TNO; *Report Concerning Drive Cycles: Hybrid Commercial Vehicle (Report No. D.6100.1)*, Table A-3; June 2014; http://www.hcv-project.eu/publications/D6100_1-Report_concerning_drive_cycles-PUBLIC_rev6.pdf

9 - Jun Tu et al.; *Correlation Analysis of Duty Cycle Effects on Exhaust Emissions and Fuel Economy*; Journal of the Transportation Research Forum; Spring 2013.

Agency Response: Staff believes the current proposal provides sufficient flexibility for selecting the appropriate base vehicle for chassis-dyno testing. While the requirements do not specifically state that using a hybrid vehicle with the hybrid system disabled would be allowed as the base vehicle, they give the applicant the ability to justify a base vehicle through the Hybrid Technology Emission Test Plan.

17. Comment: The list of information to be collected is not supported by most vehicles on Society of Automotive Engineers (SAE) J1939 broadcast data. This is a lot of data that are not relevant to emissions performance and will incur substantial additional cost to the manufacturer. Much of it is not supplied by the ECU and will require independent test equipment to collect. (Odyne)

Agency Response: The data to be collected pursuant to Section 7(c)(4) (Data Collection and Quality Control) of the *California Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems* are either supported by most engine control units (ECU) on SAE J1939 broadcast data or accessible via analog instrumentation, field records, or manufacturer information/specification sheets. Although rechargeable energy storage system parameters may not be a standard J1979 broadcast data output, they are generated by most hybrid systems and should therefore not cause additional burden to log. Furthermore, while Section 7(c)(4)(B) would require standard global positioning system (GPS) data, a wide variety of consumer electronics incorporates such functionality, and therefore, GPS data should not be too burdensome to log, either. Although ambient conditions and other data required pursuant to Sections 7(c)(4)(C), 7(c)(4)(D), and 7(c)(4)(E) could incur costs, they are typical data types collected during independent PEMS testing and are critical to ensure valid test results. Therefore, staff does not believe any substantive changes to the PEMS data collection and reporting requirements are warranted. That said, staff has made some small modifications to ITR PEMS test data and reporting requirements as part of the first 15-day notice to provide greater clarity regarding the types of information required and allowable data collection methods, as needed to ensure accurate and transparent emission measurement and evaluation. These modifications are also described in Section II.B. of this FSOR.

18. A minimum frequency rate (one hertz) needs to be called out for position and emissions data collection. (Odyne)

Agency Response: Staff concurs and added this language to Section 7(c)(4) of the Hybrid Conversion Emission Test Procedures as part of the first 15-day notice. See also Section II.B. of this FSOR for additional details on this modification.

19. SAE J1526 states that electronic control unit (ECU) based fuel economy calculations are not accurate enough. Are these still considered the “most accurate values”? (Odyne)

Agency Response: “Most accurate values” is an OBD term, meaning the best

information available to the ECU (in contrast to lookup tables/maps and model-based projections, limp-home default values, and other modified sensor input values used as alternate ECU decision inputs). Staff anticipates that PEMS-based fuel economy values may be more accurate than the ECU's "most accurate values."

20. Comment: The hybrid conversion system test procedures (ISOR Appendix E, page E-35) indicate the following:

"A heavy-duty vehicle with ePTO may conduct chassis-dynamometer emission testing pursuant to the hybrid-PTO test procedures defined in 40 Code of Federal Regulations, Part 1037.525, as amended June 17, 2013, which is hereby incorporated by reference herein, in lieu of the Transient Portion of the Heavy Heavy-Duty Truck 5 Mode Cycle."

We feel this should reflect the Final U.S. EPA Phase 2 greenhouse regulations and reference 40 Code of Federal Regulations, Part 1037.540 rather than 40 Code of Federal Regulations, Part 1037.525 identified in the Phase 2 Notice of Proposed Rulemaking. We also feel this testing should be in lieu of the high speed portion of the testing, rather than the transient. The duty cycle should be designed to account for the typical work day, which will be some ratio of driving and stationary operation. Most vocational vehicles are driven at low speeds over short distances and spend most of their time parked and idling. (Odyne)

Agency Response: Staff agrees that the ITR should reference Title 40, Code of Federal Regulations, Part 1037.540 in order to incorporate the latest duty-cycle requirements and to mirror how the federal Phase 2 program evaluates the potential emission impact of use of an ePTO system in certain work applications. Therefore, ITR language has been updated as part of the first 15-day notice to clarify that both plug-in heavy-duty utility boom vehicles and refuse vehicles utilizing ePTO as part of their work function are to calculate the emission impact of the ePTO system relative to that of the applicable base vehicle in accordance with Title 40, Code of Federal Regulations, Part 1037.540 when evaluating hybrid technology emissions as part of the ITR. See also Section II.B. of this FSOR for additional details on this modification.

Staff does not agree with comments that ePTO testing should be in lieu of the required high-speed emission test. The high speed test is required to incorporate all potential emissions into the ITR emission test profile and ensure hybrids do not increase emissions, even during freeway operation. The relatively low weighting given to high speed emissions recognizes the anticipated freeway operation of these vehicles, and mirrors the approach identified in the final Phase 2 program.

21. Comment: The ITR test procedures indicate that:

"A charge-depleting hybrid electric vehicle is to be emission tested in charge-sustaining mode, from the point at which the engine first turns on at the

end of the vehicle's AER. A charge-depleting hybrid-electric vehicle for which the ratio of the miles driven in charge-sustaining mode relative to the miles driven in charge-depleting mode is at least 0.98 must meet the emission test requirements of a charge-sustaining hybrid for the purposes of these procedures."

This assumes a vehicle runs full electric to a point and then the engine turns on to provide power to the system. In our case the engine is always running since we do not have any full electric drive capabilities. Our system operates in a charge depleting mode and the amount/rate of discharge depends on the launch to regeneration ratio. We do not try to actively maintain a state of charge like a system operating in a charge sustaining mode. If the vehicle is operated long enough and the batteries are fully depleted, the system would just bounce off the bottom depending on the same launch to regeneration ratio. The ratio is not controlled by our system; it is a function of the operator and the driving conditions. It takes a lot more energy to launch the vehicle and it can happen over a longer time frame than what we can capture in regeneration events. Since the purpose of this procedure is to make sure the engine is operating, can you provide some flexibility to account for a blended system instead of just a system that has some full electric range. At least add the option to propose an alternative to CARB staff during the application process. (Odyne)

Agency Response: Staff believes the language, as proposed, is appropriate even for a charge-depleting hybrid that does not have AER. This is because the proposed ITR would require all charge-depleting hybrids, regardless of AER, to be tested in charge-sustaining mode. For hybrids without AER, AER would simply be considered zero and testing could begin immediately upon engine startup. In any case, the hybrid system would have to be configured to run in charge-sustaining mode throughout the test. The strategy for ensuring this would be provided in the applicant's Hybrid Technology Emission Test Plan.

COMMENTS REGARDING ON-BOARD DIAGNOSTICS

22. Comment: The hybrid system manufacturer should be expected to demonstrate the same OBD system capabilities as the base engine/vehicle is capable of achieving. If the pre-converted vehicle cannot complete all monitors then the converted vehicle should not have to. From previous correspondence, the following paragraph has been suggested by the OBD group and we feel this would adequately address this issue:

"If the conversion manufacturer makes a good faith effort to set all readiness monitors but cannot get them all to set because of a flaw with the OEM system, it must at a minimum be capable of setting the readiness on the same monitors as the OEM vehicle." (Odyne)

Agency Response: Staff does not agree. Staff believes that the deployment of engines with a flaw in the original equipment manufacturer's (OEM) OBD system should not be allowed until the problem is remedied. Therefore, in such cases where a flaw in an OEM's OBD system has been identified, the hybrid manufacturer should work with the OEM on a solution, or seek alternative engines for conversion.

23. Comment: Section 4(3)(f)(2) of the Hybrid Conversion Emission Test Procedures states, "[T]he HSDLC must be distinguished from the base engine's or vehicle's OBD system Diagnostic Link Connector (DLC) by locating the HSDLC in the vehicle interior to the right of the centerline of the vehicle." We agree that it must be a distinguished from the OEM DLC but we do not agree with the location specified. Currently we install our HSDLC near the DLC to make it easier for service personnel to locate. It is a separate and unique connector so it cannot be confused with the OEM DLC. We feel you could remove the last part about the location and leave it up to the converter. We feel the best location is near the DLC since most service personnel are already used to locating it in that location. (Odyne)

Agency Response: Staff does not believe a change is necessary. While more restrictive, staff believes the current proposal sets forth a straight-forward and definitive approach of ensuring that the DLC and HSDLC are well distinguished from each other.

24. Comment: While this proposed regulation grants certification flexibility in the form of relaxed OBD requirements, we encourage CARB to consider incentives for OBD equipment manufacturers as they work towards the challenge of developing sensors to measure at lower thresholds necessary for engines certified to future low emissions standards. Manufacturers are committed to providing technologies that will enable operators to identify problems and mechanics to quickly diagnose and perform repairs. (MECA)

Agency Response: California state and local public agencies have a strong track record of funding projects and programs aimed at accelerating the advancement of zero- and near-zero-emission heavy-duty vehicle technologies. These include projects funded through local air districts and the California Energy Commission (CEC) that demonstrate both spark- and compression-ignition ultra-low-NOx engines, as well as demonstration and deployment projects funded by CARB's Air Quality Improvement Program (AQIP) and Greenhouse Gas Reduction Fund (GGRF).¹⁰ Staff encourages interested stakeholders to participate in CARB's public process, as well as in the public process of other funding agencies, for determining funding priorities and allocation of incentive funds, including the annual public process that drives development of each year's AQIP and GGRF funding plan.

10 - CARB, Fiscal Year 2017-17 Funding Plan for Low Carbon Transportation and Fuel Investments and the Air Quality Improvement Program; May 20, 2016; www.arb.ca.gov/msprog/aqip/fundplan/proposed_fy16-17_fundingplan_full.pdf .

25. Comment: CARB might consider a certification pathway under the ITR that would reward manufacturers for including advanced OBD sensor technology and/or foregoing some of the OBD flexibilities being granted. (MECA)

Agency Response: Staff explored a number of options for OBD flexibilities for heavy-duty engines as part of this rulemaking process. Staff does not believe such a change is appropriate at this time. That said, staff is interested in discussing additional ideas for accelerating development and deployment of advanced OBD sensor technology and is willing to consider additional ITR pathways in a future rulemaking, if warranted.

COMMENTS REGARDING TECHNOLOGY SUPPLY OR DEMAND

26. Comment: The heavy-duty hybrid certification flexibility involves a two tier system, where Tier 1 would allow “EMD-plus” in lieu of OBD, followed by Tier 2 with more limited OBD compliance flexibility. While OBD compliance flexibility might be an incentive for manufacturers to provide engines for certain hybrid applications, the relief proposed is not sufficient to justify the research and development expense associated with creation of a special engine for the limited production volumes at issue. Customer interest in heavy-duty hybrid engines has significantly declined due to various economic fundamentals, including fuel costs and the availability of other lower cost technologies. When customers cannot justify the added cost of a hybrid vehicle over a competing vehicle, there is no demand. Similarly, engine manufacturers cannot justify the research and development expense of creating a hybrid-specific engine configuration if sufficient market demand for the engine does not exist. (EMA)

Agency Response: Staff does not agree that the relief proposed is not sufficient. While the ITR would not account for fluctuating economic factors, based on the input received from stakeholders during the public regulatory development process and the availability of potential funding for heavy-duty hybrids, staff believes the ITR proposal provides sufficient OBD flexibility and appropriate volume limits to encourage continued development and deployment of heavy-duty hybrid technology, while ensuring achievement of anticipated in-use emission benefits. Furthermore, in staff's view, it would be appropriate to provide hybrids with additional OBD flexibility due to the critical importance of OBD systems in ensuring low in-use engine emissions.

27. Comment: The proposed ITR hybrid conversion system flexibility assumes that engine manufacturers will support the requested engine changes related to the conversion flexibility. There are few cases, however, where that assumption is viable. Providing a regulatory pathway for hybrid conversions will not be sufficient to overcome sufficient obstacles to developing conversions, including the engine manufacturers' concern about needing to make proprietary engine manufacturer information and trade secrets available to converters. Nor will it permit alterations to

otherwise certified engine configurations, which under any other circumstance would be deemed illegal tampering. (EMA)

Agency Response: Staff recognizes the challenges faced by aftermarket system manufacturers wishing to convert a base engine or vehicle produced and certified by another entity. However, we disagree with the view that these obstacles cannot be overcome. In fact, ITR certification and installation procedures codify requirements for CARB approval of hybrid trucks and bus conversion system to address the increasing number of manufacturers and systems entering the California market. Three aftermarket hybrid conversion manufacturers have already overcome the challenges identified by the commenter, having received CARB approval without requiring an original engine manufacturer's proprietary information be made available.

Staff also disagrees that ITR does not permit alterations to otherwise certified engine configurations. California Vehicle Code Section 27156 and California Code of Regulations, title 13, sections 1900 et seq. prohibit the sale, offer for sale, advertisement, or installation of any device that alters or modifies the original design or performance of a certified engine or its vehicle emission control system, unless that device has been exempted by CARB. As allowed by existing law, ITR only exempts modifications to a certified engine or vehicle if the modifications do not cause the emissions from the modified or altered vehicle to exceed the applicable emission standards for the MY of the vehicle being modified or converted, or if emissions are not higher than those of the unmodified base vehicle. CARB also adopted two other regulations in recent years to define specific criteria for CARB certification of an innovative aftermarket conversion system - *The Plug-In Hybrid Electric Vehicle Test Procedure Amendments and Aftermarket Parts Certification Requirements* (adopted May 2009)¹¹ and *Proposed Amendments to Alternative Fuel Certification Procedures* (adopted September 2013).¹²

28. Comment: We believe that the proposed pathway of certifying to progressively more stringent Tier 1, Tier 2, and Tier 3 requirements is somewhat reasonable. However, the Staff Report for the proposed ITR states that “*This structure is intended to encourage early development and market launch of a diversity of hybrid conversion systems, particularly from the smaller, independent manufacturers that make up today’s market, by minimizing initial engineering challenges and certification compliance costs and scaling up certification requirements as the market develops.*” We agree with this statement and believe the proposed ITR achieves this objective except that the limit of 10 units (or 25 units for systems that achieve at least 35 miles AER) is too low for a small manufacturer to justify the investment and gain the necessary engineering expertise. Furthermore, and more importantly, the Staff Report for the proposed ITR stipulates: “*Finally, hybrid conversion systems provide the opportunity to demonstrate fleet demand that may be needed for original vehicle*

11 - Cal. Code Regs, tit. 13, §§ 1961, 1962, 1962.1, 1976, and 1978.

12 - Cal. Code Regs, tit. 13, §§ 2030 and 2031.

manufacturers to be incentivized to enter the market with new, vertically-integrated commercial hybrid trucks and buses.” It is our experience that fleet demand cannot be demonstrated to OEMs with volumes as low as 10 (or 25) units. While we do not expect that OEMs will necessarily enter the market during the Tier 1 timeframe, demonstrating fleet demand will help smaller, independent manufacturers in obtaining minimal technical support from OEMs, which could help meeting Tier 2 and 3 certification requirements. Thus, we urge the agency to bring the sales limit for Tier 1 certification to 100 units (or 250 units for systems that achieve at least 35 miles AER). (Effenco)

Agency Response: The ITR structure for hybrid conversion systems is intended to provide certification pathways that meet the needs and engineering expertise of various manufacturers whose product may be at different phases of product demonstration and deployment. Prior to adoption of the ITR, a manufacturer wishing to produce a handful of conversion systems for purposes of evaluation and demonstration by California fleets would be required to get an experimental permit for such systems. An experimental permit typically allows use of a new technology by a fleet for up to one year, with sale of the product being prohibited until it is fully certified. ITR allows 10 or 25 Tier 1 units (depending upon AER capability) to meet modest certification criteria (but beyond what is required of an experimental permit) to be sold to California fleets for demonstration purposes. After Tier 1, ITR allows an additional 500 or 1000 Tier 2 units depending on AER capability to be sold. While comparatively more stringent than Tier 1, the Tier 2 provisions offer continued flexibility, which gives manufacturers the additional opportunity to build relationships with original equipment manufacturers and to further develop and refine their products before Tier 3 requirements apply. Therefore, staff believes the allowable volumes are appropriate and should not be increased.

29. Comment: We recommend CARB work with U.S. EPA to explore how elements of the ITR could be implemented nationally to incentivize broader market penetration of advanced technology engines. (MECA)

Agency Response: CARB staff has coordinated development of the ITR with the U.S. EPA staff that developed the federal Phase 2 program. While U.S. EPA's and CARB's existing heavy-duty engine certification requirements are virtually identical, the ITR would provide targeted certification flexibility to new heavy-duty engines when applying to CARB for certification with California criteria pollutant emission standards only. Such California-certified engines would be eligible for sale only in California and in states that adopt the ITR pursuant to Section 177 of the federal Clean Air Act.¹³ U.S. EPA has indicated in the final Phase 2 program that it shall deem a low-NOx heavy-duty engine family receiving certification flexibility pursuant to the ITR as compliant with federal OBD requirements due to the relatively modest OBD compliance flexibility provided, and that it will consider new hybrids

13 - The states that have adopted one or more California on-road motor vehicle regulations are: Connecticut, Delaware, Georgia, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.

participating in ITR to be OBD compliant within the framework of Phase 2, facilitating sale of these engines nationally:

“As described in the proposed (Phase 2 standards), California CARB is in the process of developing similar provisions for a reduced compliance burden for qualifying highway vehicles toward the goal of incentivizing vehicles with hybrid powertrains and low-NOx engines. The incentives generally consist of allowing specific OBD variances of deficiencies (for low-NOx engines) or broadly waiving OBD requirements (for hybrid vehicles). To the extent that California CARB certifies vehicles based on approving OBD deficiencies, we would apply a similar discretion for 49-state certification of the same engine model to allow for nationwide sale of those products. If California CARB approves certification of hybrid systems in which the highway OBD requirements are mostly or entirely waived, we would expect to apply the provisions described in this section to allow vehicle manufacturers to produce up to 1000 such vehicles in a given year.”¹⁴

CARB staff continues to discuss opportunities for engines meeting California’s optional low-CO₂ standard pursuant to the proposed ITR to be recognized as also compliant with federal OBD requirements.

OTHER GENERAL COMMENTS

30. Comment: The proposed certification flexibility for low-NOx engines primarily involves reduced near-term OBD system requirements. Thus, the ITR assumes that manufacturers will be able to overcome challenges meeting OBD compliance for low-NOx engines in a relatively short amount of time. But the ability to comply with full OBD at ultra-low-NOx levels is not only unknown, but very much in doubt. For example, a threshold monitor detection limit of 0.2 grams per brake-horsepower-hour (g/bhp-hr) above the standard for an engine certified to the lowest ultra-low-NOx limit of 0.02 g/bhp-hr is still almost 50 percent lower than the detection limit for an engine meeting the current 0.2 g/bhp-hr standard requirement (0.4 g/bhp-hr). Sensor and monitor performance at ultra-low levels is highly uncertain due to the inherently poor signal-to-noise ratios that come with low NOx. (EMA)

Agency Response: The optional low-NOx requirement provides its own OBD flexibility by having the thresholds set at a flat rate of 0.4 g/bhp-hr (i.e., the same absolute threshold rate for the 0.2 g/bhp-hr standard also applies to the optional lower NOx standards). Thus, although the overall OBD flexibility in ITR for low-NOx engines is limited in time, until there is a future rulemaking to amend the optional low-NOx standards, OBD threshold flexibility will continue to be available to an engine that is certified to the optional low-NOx standards. Because of the extended

14 - Federal Register; Volume 81, Number 206, October 25, 2016; *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2*; Preamble, Section XIII(A)(1).

nature of the OBD threshold flexibility, staff believes that it is appropriate to limit the time period during which additional flexibilities are offered through the ITR, as these flexibilities are provided to encourage the early introduction of low-NOx engines and provide a path to full compliance as expeditiously as possible.

31. Comment: One of the issues brought up recently involves the timing of an ITR certification compared to the timing of incentive funds. Vehicles have typically needed a CARB Executive Order before being eligible for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) or other incentive funding. However, if an Executive Order for a vehicle of a given model year is not completed until late in the calendar year and delivery takes three to six months, then it is possible that the vehicle may never be eligible for HVIP funding because of the lack of overlap in the delivery of compliant vehicles and the HVIP eligibility timing. Does CARB have any plans on how to synchronize incentives with the ITR certification process so that vehicles can consistently access incentives? (Odyne)

Agency Response: Staff believes this challenge is primarily a result of hybrid conversion systems being evaluated and certified by CARB on a case-by-case basis prior to adoption of the ITR. CARB certification staff previously had to work with hybrid conversion manufacturers to evaluate a relatively new technology through a relatively undefined certification pathway. Adoption of the ITR, which was based on what has been learned by these initial certifications, should reduce the needed certification timeframe and help address lag between certification and vehicle availability. In addition, CARB's ITR and HVIP program staffs have coordinated closely during ITR development, with the aim to minimize duplicative requirements between the programs. For example, HVIP staff has signaled, during HVIP public workgroup meetings, its intention that ITR emission test requirements also be considered valid for the purposes of HVIP eligibility.

32. Comment: We strongly recommend that the Board and staff allow themselves flexibility to make adjustments and changes to the ITR to keep it just that: Flexible. At this point, we are concerned the testing provisions still seem complicated, and the allowed number of vehicle platforms allowed per "tier" may be too few to be of sufficient help. However, that is not a reason to block the ITR. Rather, we believe it needs to be put into practice; but that as the staff gets hands-on experience using the ITR they be allowed to adjust and refine it to ensure it function as intended. In conclusion, we support moving forward, but we also encourage the Board to allow the regulation to take the form of a "living document." By allowing periodic assessments and rapid modifications, CARB will be meeting the intent of driving and supporting innovation by staying nimble and able to adjust to the fast-changing technology options coming to market. (CALSTART)

Agency Response: CARB staff is committed to monitoring the implementation of the ITR and, if warranted, to make any necessary regulatory amendments to effectively encourage early deployment of innovative truck and bus technologies, while ensuring achievement of anticipated in-use emission benefits.

33. Comment: CARB staff has been very consultative with the innovative technology companies along the path of development of the proposed ITR, but cost analysis did not come out until the September 2016 ISOR and we feel that the savings or potential increased costs of the ITR are going to vary widely depending on the innovative technology. There are not that many innovative technology companies actively pursuing the CA market today so we do not think it would be an impossible task for CARB to model more fully the range of potential entrants into this regulation and have discussions on the uncertainties. As an example, the proposed regulation requires a three-day evaporative emissions test whereas till this point CARB has only requested a two-day diurnal test for our aftermarket products so this will be a cost increase. I'll also note the 3-day test is one that the El Monte facilities are not even capable of performing today. (XL Hybrids)

Agency Response: The ITR economic analysis was released as part of the ITR ISOR on August 30, 2016, earlier than required to meet the 45-day public comment period requirements for CARB regulations. Staff agrees that the economic impact of the ITR will vary widely depending upon the specific eligible innovative technology, as well as other factors, such as manufacturer size and technical expertise. The ITR Staff Report's economic analysis includes evaluation of potential economic impact of each of the technology types impacted by the regulation: low-NOx heavy-duty engines, heavy-duty hybrids, heavy-duty high-efficiency engines, and truck and bus hybrid conversion systems. For each of these categories, the economic analysis provides an evaluation of potential certification costs or savings achieved by the ITR proposal relative to existing certification procedures, such as labeling, reporting, emission testing, and other proposed certification elements.

As indicated by the commenter, the proposal, as originally posted on August 30, 2016, required the three-day evaporative emission test. In addition, the Staff Report's economic analysis erroneously assumed the cost of the two-day evaporative emission test, instead of the three-day evaporative emission test, for hybrid conversion systems. As a result of this error, the Staff Report overstated the lifetime cost savings by approximately \$27,600. To address this, a correction to the Staff Report was described in the first 15-day notice posted on May 31, 2017, and is also described in Section II.B. of this FSOR.

That said, based in part upon the above comment, CARB has updated the ITR as part of the first 15-day notice to require a two-day evaporative emissions test, instead of the three-day evaporative emissions test, for those hybrid conversions with the least risk of a potential evaporative emissions increase. The rationale for this change is also described in Section II.B. of this FSOR. Therefore, the ISOR's original cost savings projections, which assume a two-day evaporative emission test requirement, are correct as to this final, updated ITR proposal, and need not be revised.

34. Comment: The proposed ITR is relatively long and complex with several different paths. We are concerned that when implemented there is the potential for this actually taking longer and costing more for innovative technology companies depending on details of how CARB staff implements the regulations and works with the innovative companies to get them through the gates in a reasonable timeframe. Because of the complexity of this proposed regulation, we think it will be worthwhile for CARB to provide a significant level of staff support to aid companies in proceeding through the tiered process. The El Monte staff in charge of reviewing applications and issuing Executive Orders understandably needs to remain independent, but this would not prevent another branch within CARB from providing pro-active support services as innovative technology companies attempt to navigate this process. (XL Hybrids)

Agency Response: CARB recognizes the additional complexities in certifying innovative, new heavy-duty vehicle technologies, and is preparing for the additional staff resources needed to ensure timely review and certification of what are expected to be an increasing number of advanced technology options. The ITR is structured to facilitate this effort by providing near-term flexibility from specific certification requirements manufacturers have identified as posing near-term technical challenges. Staff believes that by helping address these challenges, ITR should make certification simpler and more streamlined.

For example, OBD compliance has proven challenging for manufacturers of new heavy-duty hybrids. ITR enables participating manufacturers to forgo demonstration of OBD compliance as part of CARB certification in the near-term, and instead meet less stringent Engine Manufacturer Diagnostic requirements. Reduced OBD and other certification requirements should reduce certification application review time.

For hybrid conversions, the ITR should speed up the certification process by providing clarity regarding specific certification criteria, such as certification application, diagnostics, emission testing, and other requirements, in lieu of the prior case-by-case evaluation process.

FIRST 15-DAY NOTICE COMMENTS

COMMENTS IN SUPPORT

1. Comment: We are very appreciative of the efforts of the CARB team in developing the Innovative Technology Regulations (ITR) and we enthusiastically support the ITR initiative at a high level. We also support the change from a three-day to two-day diurnal test. (XL Hybrids)

COMMENTS OUTSIDE THE SCOPE OF THE 15-DAY MODIFICATIONS

2. Comment: “AER” Should Be Replaced with “EAER without a Minimum AER Restriction” All references to AER in the proposed new ITR and changes to the existing

regulation for “CALIFORNIA CERTIFICATION AND INSTALLATION PROCEDURES FOR MEDIUM- AND HEAVY-DUTY VEHICLE HYBRID CONVERSION SYSTEMS” should be changed to EAER. AER, which is defined in section 7(e), should be changed to EAER as defined in “CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2018 AND SUBSEQUENT MODEL ZEROEMISSION VEHICLES AND HYBRID ELECTRIC VEHICLES, IN THE PASSENGER CAR, LIGHT-DUTY TRUCK AND MEDIUM-DUTY VEHICLE CLASSES” but without the 10-mile minimum AER requirement. First, this new ITR regulation creates new versions of terminology that already exists in other California regulations such as the second one listed above, and chooses as the threshold for ITR categories the more restrictive AER instead of the less restrictive EAER. The rationale for using EAER is that if the overarching goal is to accelerate the market of new technology solutions that will support the path to 2030/2050 GHG reduction goals then EAER solutions today can produce similar GHG reductions with fewer restrictions on the technology solution than AER and likely at more cost effective price points (thus increasing early market penetration of commercial electrified vehicles that are not paid for by government pilot grants). Using AER overvalues the first miles and undervalues the remaining miles in a duty cycle. This is exactly the opposite of what California policy makers should want to do in the commercial sector. The commercial sector is characterized by higher utilization than the passenger car sector. 35 miles AER x 260 days/yr = 9,100 miles which makes lots of sense in the passenger car sector and there are now major OEM solutions that are approaching parity with non-plug-in technology. But in the commercial sector where vehicles are heavier and utilization is higher (25k mi/yr up to over 50k mi/yr) over weighting the value of the first few miles is not in alignment with cost effective progress towards the long-term 2030/2050 goals. Plus, the definitions of AER are not even fully transparent. Most PHEV passenger vehicles will have the engine come on during the AER if conditions are not ideal (e.g., high ambient temperature, low ambient temperature, high throttle demand) so policy makers are being presented something that is not entirely transparent (i.e., some may think that AER really means no engine operation) and potentially devaluing other more cost effective solutions for the commercial market. Now, if your goal is localized air quality in DACs, then we would agree that there should be some extra value to AER, but that is not the stated primary goal. (XL Hybrids)

Agency Response: This comment suggests the use of EAER instead of AER in the proposed rulemaking and is outside the scope of the modifications which were introduced in the 15-day notice. A similar suggestion was provided during the 45-day comment period and is noted as comment 11 above. The agency response to comment 11 is as follows:

“One significant benefit of hybrid systems is their ability to provide a technology bridge to fully zero-emission technology that is critical for California to achieve its long-term air quality and climate goals. While hybrids that are capable and incapable of achieving significant AER would be eligible for the ITR, the proposed regulation recognizes the significant additional benefits provided by commercial vehicles capable of significant uninterrupted all-electric range as well

as the additional certification challenges applicable to such technology. The series hybrid technology required to achieve significant AER generally mirrors that required of fully zero-emission vehicles. For this reason, some stakeholders refer to these vehicles as zero-emission vehicles with range extenders. Trucks and buses with significant AER also have significant potential to promote installation of charging infrastructure, training for fleet mechanics and other personnel, development of battery technology supply chains, and other dynamics that help support a zero-emission truck and bus market. These vehicles will also continue to help drive down the cost of robust electric vehicle propulsion componentry, such as batteries and controllers, as volumes increase. Therefore, hybrids with zero-emission range are likely to be a more effective bridge to widespread deployment of fully zero-emission truck and bus technology than zero-emission technology focused on stationary applications.

In addition, CARB's experience evaluating hybrid truck conversion systems suggests that conversion of an existing truck to a series hybrid, as needed to achieve significant AER, poses greater OBD compliance challenges than less intrusive hybrid conversion systems that do not achieve AER. The ITR is structured to provide greater time for hybrid conversions capable of significant AER to comply with Tier 1 or Tier 2 aftermarket system certification requirements in recognition of the potential additional OBD challenges such systems could face."

3. Comment: We request that responses to all public comments are posted as soon as possible and not wait for a FSOR to be posted on the CARB website for all the comments received more than 6 months ago in October that may warrant responses. (XL Hybrids)

Agency Response: This comment concerns the regulatory development process and is outside the scope of this rulemaking. Responses to public comments will be provided as required by the California Administrative Procedures Act.

SECOND 15-DAY NOTICE COMMENTS

No comments were received.

V. PEER REVIEW

Health and Safety Code Section 57004 sets forth requirements for peer review of identified portions of rulemakings proposed by entities within the California Environmental Protection Agency, including CARB. Specifically, the scientific basis or scientific portion of a proposed rule may be subject to this peer review process. Here, CARB determined that the rulemaking at issue does not contain a scientific basis or scientific portion subject to peer review, and thus no peer review as set forth in Section 57004 needed to be performed.