

**Innovative Technology Regulation (ITR): September 28, 2015 Public Workshop  
INITIAL DRAFT REGULATORY CONCEPTS FOR STAKEHOLDER REVIEW**

This document provides initial draft regulatory concepts and language that, along with staff's workshop presentation, is intended to facilitate stakeholder feedback at the September 28, 2015 ITR Public Workshop. This document is only intended to encourage stakeholder feedback, is incomplete, and should not be construed as a formal regulatory proposal. Staff comments and questions to facilitate stakeholder review are provided in blue test boxes.

The possible initial draft regulatory concepts and language are organized as follows:

- Section 2208: ITR Purpose, Applicability and Definitions.
- Section 2208.1: New Engine Certification Flexibility Element, including
  - 1) ITR Certification Flexibility Application and Compliance Plan;
  - 2) Optional Low NOx Engines eligibility criteria and flexibility;
  - 3) Hybrid HD Engine eligibility criteria and flexibility;
  - 4) Technology Diversity Provisions and off-road engines; and
  - 5) General Requirements and ARB ITR approval.
- Section 2208.2: Hybrid Conversion System Requirements.
- Section 2208.3: Chassis or vehicle emission testing requirements for new hybrid engines and hybrid conversions (not yet developed, includes potential emission testing concepts for stakeholder discussion).

Attachments A, B, and C are intended to help illustrate applicability and sunset provisions for the possible concepts described in this draft document. Staff welcomes stakeholder feedback regarding all elements of this document, including but not limited to technology eligibility criteria, certification flexibility provisions, and regulatory sunset provisions.

**Certification Flexibility for Innovative Heavy-Duty Engine and Vehicle Technology and Certification and Installation Procedures for Medium- and Heavy-Duty Vehicle Hybrid Conversion Systems (Innovative Technology Regulation)**

**SECTION 2208**

**(a) PURPOSE**

This regulation sets forth targeted, optional California Air Resources Board (ARB) certification and on-board diagnostics (OBD) approval flexibility to encourage market launch and early deployment of the heavy-duty engine technologies that California needs to meet its long-term air quality, greenhouse gas, and petroleum reduction goals, including, engines meeting California's optional low oxide of nitrogen (NOx) emission

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standards, hybrid engines, and other innovative new, heavy-duty engine and vehicle technologies. The regulation also defines protocols for ARB approval of innovative hybrid conversion systems for medium- and heavy-duty vehicles, in order to encourage California deployment of robust aftermarket hybrid aftermarket systems in the existing truck and bus fleet.

### **(b) APPLICABILITY**

This regulation applies to the following:

- (1) a 2016 or subsequent model year engine certifying to optional low NOx emission standards set forth in Title 13, Section 1956.8(a)(2)(A) of the California Code of Regulations (13 CCR 1956.8(a)(2)(A) as amended on December 5, 2014). These standards are 0.10 grams per brake-horsepower-hour (g/bhp-hr), 0.05 g/bhp-hr, and 0.02 g/bhp-hr;
- (2) a 2016 or subsequent model year engine certified for use in a heavy-duty hybrid vehicle (hybrid engine);
- (3) a 2016 or subsequent model year engine certified to the emission standards set forth in 13 CCR 1956.8(a)(2)(A) utilizing a technology that is determined to be innovative pursuant to this regulation and that presents a qualified certification or OBD compliance challenge, as determined by this regulation (*Technology Diversity Provisions*); and
- (4) a hybrid conversion system for a medium- or heavy-duty vehicle which demonstrates potential to achieve a reduction in CO<sub>2</sub> emission reductions without increasing emissions of other pollutants, as demonstrated in accordance with section 2208.3.

### **(c) DEFINITIONS**

“All-Electric Range” or “AER” means the total miles driven electrically (with the engine off) before the engine turns on for the first time, after the battery has been fully charged.

“Applicant” or “manufacturer” means any person who manufactures an engine, vehicle, or hybrid conversion system for sale in California and requests engine certification flexibility of hybrid conversion system certification pursuant to this regulation.

“Average” means the arithmetic mean.

“Base vehicle” or “base engine” for the purposes of section 2208.1 means the appropriate California certified configuration of a non-hybrid vehicle to be used for comparison with its hybrid counterpart for the purposes of determining the emission impact of the hybrid vehicle’s hybrid system.

“Base vehicle” or “base engine” for the purposes of section 2208.2 means a California certified configuration of a motor vehicle or motor vehicle engine prior to any modifications necessary to operate as a hybrid vehicle.

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“Baseline test” means the applicable emissions or fuel economy test conducted pursuant to section 2208.3 on a non-hybrid vehicle for the purposes of comparison with emission or fuel economy testing results for its hybrid counterpart to determine potential emission or fuel economy impacts of hybridization.

“Class 2a commercial or public fleet vehicle” means an on-road vehicle of between 6,001 and 8,500 pounds gross vehicle weight rating (GVWR) that is used by a business or public, governmental, or non-profit agency to carry people, property or hazardous materials in the course of that business or agency’s official duties.

“Class 2b vehicle” refers to a vehicle between 8,501 and 10,000 lbs GVWR.

“Class 3 vehicle” refers to a vehicle between 10,001 and 14,000 lbs GVWR.

This definition of a Class 8 tractor, below, excludes Class 8 vocational tractors like urban beverage delivery tractors (which are more like vocational trucks) for purposes of defining the hybrid vehicle technology categories.

“Class 8 Tractor” means a Class 8 motor vehicle with a gross vehicle weight rating of greater than 33,000 lbs designed to pull a 53-foot or longer semitrailer on a highway by means of a fifth wheel mounted over the rear axle(s). This definition excludes vocational class 8 tractors.

“Commercial Vehicle” means a motor vehicle or combination of motor vehicles as defined in California Vehicle Code, section 260.

Definition below would be for purposes of determining a manufacturer’s annual average sales volume, and resulting ITR MY sales allocations.

“Common Ownership or Control” means being owned or managed day to day by the same person, corporation, partnership, or association. Entities managed by the same directors, officers, or managers, or by corporations controlled by the same majority stockholders are considered to be under common ownership or control even if their title is held by different business entities.

“Conversion system manufacturer” or “converter” refers to a person or company who manufactures or assembles a hybrid conversion system for sale in California and requests or is granted an Executive Order certifying the hybrid conversion system.

“Criteria Pollutant” means an air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set, and includes ozone, carbon monoxide, NOx, sulfur dioxide, particulate matter with an aerodynamic diameter less than or equal to a nominal 10 microns (PM10) and with an aerodynamic diameter less than or equal to a nominal 2.5 microns (PM2.5).

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“Days” when computing any period of time, means calendar days.

“Demonstration Volume” means the maximum allowable California sales volume of hybrid heavy-duty engines or hybrid conversion systems for which the Executive Officer has approved Tier 1 certification flexibility.

“Drivability” of a vehicle refers to the smooth delivery of sufficient and reliable power for the intended vehicle type and duty cycle, as demanded by the driver.

“Engine family” means a grouping of vehicles or engines in a manufacturer’s product line determined in accordance with 40 CFR 86.098-24.

“Executive Officer” means the Executive Officer of the Air Resources Board or the Executive Officer’s designee.

“Gross vehicle weight rating” or “GVWR” means the “GVWR” as defined in California Vehicle Code section 350.

“Heavy-duty vehicle” means any motor vehicle having a manufacturer’s gross vehicle weight rating (GVWR) greater than 14,000 pounds.

“Hybrid conversion system” is a package of energy storage and delivery, ignition, emission control, on board diagnostic, and engine components that are modified, removed, or added during the process of modifying a base vehicle to operate as a hybrid vehicle.

“Hybrid vehicle” refers to a vehicle that has both of the following on-vehicle sources of stored energy and can draw propulsion energy from the source mentioned in 2): 1) a consumable fuel and 2) an energy storage device such as a battery, capacitor, pressure reservoir, or flywheel.

“Hybrid with Significant Zero-Emission Range” refers to: 1) a vehicle that achieves a minimum 35 mile all-electric range, or 2) a Class 8 tractor that achieves a minimum 20 mile all-electric range that also operates as a hybrid vehicle when not in zero-emission mode.

“Installer” or “hybrid conversion system installer” refers to a person who installs hybrid conversion systems on motor vehicles and/or engines for compensation or consideration of value; but does not necessarily include any person that assembles or produces a hybrid conversion system for resale.

“Low NOx Engine” or “Optional Low NOx Engine” refers to an on-road heavy-duty engine that is certified to a NOx emissions level of 0.10 g/bhp-hr, 0.05 g/bhp-hr or 0.02 g/bhp-hr.

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“Market launch” or “market launch model year” means the first model year in which at least two engine families have received certification flexibility for a particular technology category pursuant to this regulation.

“Medium-duty vehicle” means a medium-duty vehicle as defined in Section 1900, title 13, CCR.

The definition of a mild hybrid system, below, could be needed for hybrid conversion systems. Staff is proposing that certification of a mild hybrid conversion system may not be counted towards the two systems that would trigger “market launch”. Staff welcomes stakeholder comment on this concept, as well as other possible definitions of a “mild” hybrid system.

“Mild hybrid conversion system” means a hybrid conversion system in which the maximum available power from the hybrid’s rechargeable energy storage system during a standard ten second pulse power or equivalent test is: 1) between ten and twenty percent of the vehicle’s total traction power, in the case of a vehicle that has a GVWR of between 6,001 and 14,000 lbs; or 2) between 15 and 20 percent of the vehicle’s total traction power, in the case of a vehicle that has a GVWR of more than 14,000 lbs.

“Pilot Deployment Volume” means the maximum allowable California sales volume of a hybrid conversion system for which a Hybrid Conversion System Pilot Deployment Application has been approved.

“Portable Emissions Measurement System (PEMS)” means a measurement system meeting the requirements of Code of Federal Regulation (CFR), Title 40; Part 1065, Subpart J.

“Technology category” means one of the six possible combinations of engine types and low-NOx engine standards identified in Table 1, the six vehicle vocation and hybrid technology combinations identified in Table 2, or the six vehicle vocation and hybrid conversion systems identified in Table 3.

“Total traction power” means the sum of peak power from the rechargeable energy storage system and the heat engine peak power of the vehicle, except that if the storage system is the sole means by which the vehicle can be driven, the total traction power is the peak power of the storage system.

“Technology category” means the one of the six possible combinations of engine types and low-NOx engine standards identified in Table 1, the eight vehicle vocation and hybrid technology combinations identified in Table 2, or the six vehicle vocation and hybrid conversion system combinations identified in Table 3.

“Urban bus” means a passenger-carrying vehicle owned or operated by a public transit agency, powered by a heavy heavy-duty engine, or of a type normally powered by a

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heavy heavy-duty diesel engine, intended primarily for intra-city operation. A bus normally powered by a heavy heavy-duty diesel engine is usually 35 feet or longer, and/or greater than 33,000 pounds GVWR.

“Valid Warranty Claim” means a request from an end user, installer, or distributor to the applicant for an inspection, repair, adjustment, replacement, or modification of a specific part or component of the hybrid conversion system or the base engine for which the hybrid system converter is invoiced for compensation pursuant to the warranty provisions and compensation is actually provided, excluding warranty repairs made solely for customer satisfaction purposes (i.e., good faith repairs).

“Vocational Class 8 tractor” means a low-roof motor vehicle over 33,000 lbs GVWR intended for intracity pickup and delivery, such as those that deliver bottled beverages to retail outlets.

“Vocational Truck or Bus” or “Vocational Vehicle” means: 1) a vehicle between 14,000 and 33,000 lbs GVWR that is not an urban bus; 2) a vehicle above 33,000 lbs that is not a tractor (with the exception of a vocational Class 8 tractor) or an urban bus; and 3) a vocational class 8 tractor.

“Warrantable condition” means any condition of a hybrid conversion system or base engine that triggers the responsibility of the converter to take corrective action pursuant to sections (l) and (m).

“Warranted part” means any part installed on a certified hybrid conversion system or base engine, or installed in a warranty repair, which affects any regulated emissions from a previously certified vehicle or engine that is subject to any of the standards prescribed in the test procedures and the documents incorporated by reference herein.

“Warranty period” means the period of time, mileage, and/or hours, as identified in Table 4, that the certified hybrid conversion system or part thereof are covered by the warranty provisions.

“Warranty Claim” means a request from an end user, installer, or distributor to the applicant for an inspection, repair, adjustment, replacement, or modification of a specific part or component of the hybrid conversion system or base engine impacted by the hybrid conversion system.

“Zero-emission power take-off” means a method for taking power from an on-vehicle source (typically a battery) that produces no emissions of pollutants and which can be used to power a non-vehicular device that is permanently connected to the vehicle, such as an aerial boom or pump.

**SECTION 2208.1**

**(a) INNOVATIVE TECHNOLOGY CERTIFICATION FLEXIBILITY REQUEST AND COMPLIANCE PLAN**

Each manufacturer wishing to participate in the ITR would submit a single Innovative Technology Certification Flexibility Request and Compliance Plan (Innovative Technology Compliance Plan) each model year prior to or concurrent with its engine certification application(s) for that model year. This annual plan would identify the manufacturers proposed innovative technology categories, anticipated sales volume per technology category, and compliance with anti-backsliding, surplus emission reduction requirements, and other applicable requirements. ARB approval of a manufacturer's Innovative Technology Compliance Plan would be intended to provide each participating manufacturer with clarity regarding the applicable certification and OBD flexibility for the model year.

- (1) Overview. An engine or hybrid driveline manufacturer wishing to receive certification flexibility for early market introduction of a heavy-duty low-NOx engine, hybrid engine, or other innovative new engine or vehicle technology must complete a two-step process in each model year:
  - (A) First submit an Innovative Technology Pre-Certification Application and Compliance Plan (Innovative Technology Compliance Plan) for all engine families for which the manufacturer is requesting certification flexibility pursuant to this regulation;
  - (B) If the Innovative Technology Compliance Plan for the model year is approved by the Executive Officer, the applicant must then apply to certify the engine family with ARB pursuant to CCR sections 1956.8 and 1971.1, utilizing the applicable certification flexibility provisions of this regulation.
- (1.1) Submission Requirements. In order to receive Tier 1 or Tier 2 certification flexibility for an engine family or vehicle technology pursuant to this section, a manufacturer must receive Executive Officer approval of its Innovative Technology Compliance Plan for that engine family's or vehicle technology's model year, completed and submitted pursuant to this section.
- (1.2) An Innovative Technology Compliance Plan must be submitted in the format to be supplied by the Executive Officer. Applications the Executive Officer requests in writing shall be sent to:

Chief  
Emissions Compliance Automotive Regulations and Science Division  
9528 Telstar Avenue, El Monte, California 91731

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- (1.3) An Innovative Technology Compliance Plan must be submitted for every model year and include required data and information for each engine family for which the manufacturer wishes to request Tier 1 or Tier 2 certification flexibility under this regulation.
- (1.4) For required information that is not applicable to the proposed engine family or technology category, the applicant must indicate “not applicable”. If the Executive Officer concurs with the applicant’s determination that the required information is not applicable, the Executive Officer shall waive the requirement to provide the information requested in that section.
- (2) Innovative Technology Compliance Plan Format. The Innovative Technology Compliance Plan shall, at a minimum, include the elements identified in this section. The Executive Officer may require additional elements or information if needed to evaluate the application and will inform the applicant of such request in writing.
- (2.1) Introduction
- (A) Company information: Business name, tax identification number, physical address and business mailing address.
  - (B) Contact Person: Name, business phone number, business physical address, and business e-mail address.
  - (C) Location of Records: Physical address where required information will be maintained and available for inspection.
  - (D) Technology Category: Description of whether application is for a low NOx engine, pursuant to subsection 2208.1 (b); hybrid engine, pursuant to subsection 2208.1 (c); or an innovative new engine or vehicle technology, pursuant to subsection 2208.1 (d). For a hybrid or low NOx engine, identify the applicable technology and vocational combination (as illustrated in Tables 1 or 2).
- (2.2) Engine and/or Vehicle Technology
- (A) Detailed explanation of principles of operation and system design
  - (B) Schematics depicting technology and after-treatment operation
  - (C) Detailed description of the OBD system discussion of OBD system advancements and the OBD compliance challenge(s) for the applicable engine family.
- (2.3) Engine Certification Flexibility Eligibility Requirements. Applicant must demonstrate compliance with the applicable Tier 1 and Tier 2 eligibility requirements by providing the following information.
- (A) Agree to not Exceed Maximum Allowable California Sales Volume: Demonstration that number of engines or vehicles proposed to receive innovative technology certification flexibility falls within the limits described in this regulation, as applicable. Manufacturer must identify the number of proposed engines by engine family for which the manufacturer is



requesting certification flexibility in the applicable model year for which the application is being submitted. Manufacturer shall provide these sales volumes both as a number of total anticipated California sales in the model year, and as a percentage of average annual California sales, where annual average sales is determined pursuant to subsection 2208.1(f)(1). These numbers must be provided for all engine families for which the manufacturer intends to request certification flexibility in the applicable model year.

- (B) Demonstrate Achievement of Surplus Reductions: Demonstration that engines proposed for California sale in the model year as described in subsection 2208.1 (a)(2.3)(a) is surplus to all applicable rules, regulations, and air quality mandates pursuant to subsection 2208.1 (f)(2).
- (C) Comply with Anti-Backsliding Provisions: Demonstration, pursuant to subsection 2208.1 (f)(3), that manufacturer is not requesting relief from certification or OBD requirements with which it has previously complied on identical or virtually identical engine families.
- (D) Agree to Complete Year-End Reporting: Agreement to complete and provide end of model year reporting to ARB, pursuant to subsection 2208.1 (f)(5).

(2.4) Hybrid Heavy-Duty Engines. An application for a hybrid heavy-duty engine to receive Tier 1 or Tier 2 certification flexibility must, in addition to the above, also include the following:

- (A) For Tier 1 applications only:
  1. An engineering analysis and/or data providing credible evidence supporting the manufacturer's determination that the hybrid propulsion and energy storage system will enable the vehicle in which it is installed to achieve at least a 20 percent fuel economy benefit relative to the appropriate non-hybrid base vehicle, pursuant to section 2208.3 (*tbd*). CO<sub>2</sub> emission reductions provided by stop-start or other anti-idle technology shall not be considered in this determination.
  2. An engineering analysis and/or data demonstrating the hybrid vehicle meets the requirements to be defined as a hybrid with significant zero-emission range pursuant to section 2208.3 (*tbd*), if applicable.
  3. Data demonstrating that the maximum power available from the hybrid conversion system's energy storage system during a standard ten second pulse power or equivalent is at least 15 percent of the vehicle's total traction power
  4. An engineering analysis and data describing any potential for increased cold start or low temperature operation that could lead to increased NOx emissions.
  5. A detailed plan or plans for chassis dynamometer or PEMS emission testing, pursuant to section 2208.3. (*tbd*)
- (B) For Tier 2 applications only: Provide detailed required emission testing results and all supporting data upon ARB request demonstrating the

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vehicle in which the engine is installed meets the criteria identified pursuant to section 2208.3. (Tier 2 Application only)

- (C) For both Tier 1 and Tier 2 applications: Agreement to equip all hybrid engines to be sold in California pursuant to subsection 2208.1 (c)(3) with the necessary hardware and software to generate engine parameter and telematics data pursuant to requirements of section 2208.3. *(tbd)* Engine parameter and telematics data must be collected, maintained, and, upon request of the Executive Officer, shared with ARB.

(2.5) *Technology Diversity Provisions.* An application for an innovative new engine technology to receive Tier 1 or Tier 2 certification flexibility pursuant to the technology diversity provisions set forth in subsection 2208.1 (d) must also include:

- (A) an engineering evaluation, operating principles, data, and other information documenting that the innovative new engine or vehicle technology meets the eligibility requirements of subsection 2208.1 (d)(1)
- (B) a description of whether the proposed technology represents a modification to an existing engine architecture or a unique engine architecture pursuant to subsection 2208.1 (d)(2).

(2.6) *Appendices.* Applicant may provide any additional data or other information it believes relevant for determining compliance with the requirements of this regulation as part of the application appendices.

### (b) **CERTIFICATION FLEXIBILITY FOR EARLY MARKET INTRODUCTION OF LOW NO<sub>x</sub> ENGINES**

- (1) A manufacturer shall receive the Tier 1 certification flexibility identified in subsection 2208.1 (b)(3.1) or Tier 2 certification flexibility identified in subsection 2208.1 (b)(3.2) for a low-NO<sub>x</sub> engine family if the manufacturer's Innovative Technology Compliance Plan requesting said flexibility has been approved by the Executive Officer pursuant to subsection 2208.1 (g).

Subsections (A), (B) and (1.1), below are intended to indicate that a manufacturer would be eligible to receive two MYs of Tier 1 flexibility and two MYs of Tier 2 flexibility subsequent to market launch for a low NO<sub>x</sub> engine family, as long as the engine family is first certified within four MYs of market launch. *Attachment A: Potential ITR Process for Certifying Low-NO<sub>x</sub> Heavy-Duty Engines* illustrates how this section would potentially be implemented.

- (A) A manufacturer is eligible to apply to the Executive Officer for Tier 1 or Tier 2 certification flexibility for an engine family in a particular technology category in any model year prior to or within the applicable technology category's market launch model year.
- (B) If an engine family first receives Tier 1 certification flexibility within four model years after the market launch model year, a manufacturer is eligible to: 1) apply to the Executive Officer for Tier 1 certification flexibility for that

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engine family annually for two consecutive model years; and 2) apply to the Executive Officer for Tier 2 certification flexibility for that engine family annually for two consecutive model years.

- (C) A low NOx engine family that receives Tier 2 certification flexibility shall be ineligible for Tier 1 certification flexibility in any subsequent model year.
- (D) A low NOx engine family shall not be eligible for more than four model years of Tier 1 certification flexibility.

(1.1) **Technology Category Sunset Model Year.** The fifth model year after the market launch model year shall be defined as the technology category sunset model year. An engine family that has not received Executive Officer approval for Tier 1 or Tier 2 certification flexibility prior to the technology category sunset model year shall not be eligible for Tier 1 or Tier 2 certification flexibility pursuant to subsections (b)(3.1) and (b)(3.2).

(2) *Manufacturer Sales Allowance for Low-NOx Engines Receiving Certification Flexibility.* A manufacturer’s maximum allowable California sales allowance of low-NOx engines that receive certification flexibility in any given model year must not exceed ten percent of the manufacturer’s average annual California heavy-duty engine sales volume, as determined pursuant to subsection (f)(1), or 200 units, whichever is greater.

**Table 1:  
Heavy-Duty Low-NOx Engine Innovative Technology Categories**

	0.1 g/bhp-hr NOx	0.05 g/bhp-hr NOx	0.02 g/bhp-hr NOx
Compression-Ignition Engine	√	√	√
Otto Cycle Engine	√	√	√

(3) *Low NOx Engines: Certification Flexibility Provisions.*

Tier 1 and 2 flexibility for Low-NOx engines (below): The draft potential flexibility provisions identified below have been identified by various stakeholders. These are intended to generate stakeholder feedback, and should not be considered an official ARB staff proposal. ARB staff is still working with stakeholders to identify the appropriate suite of flexibility provisions that would encourage early deployment of multiple low-NOx engine families while ensuring the most expeditious progress towards compliance with full certification and OBD requirements. Other concepts staff is considering include: one level or tier of flexibility (rather than two); a more expansive definition of an engine family for the purposes of triggering specific OBD requirements; full OBD compliance requirements but more leniency regarding enforcement; and alternate ITR compliance paradigms for a manufacturer with multiple eligible low-NOx engines in a given model year (i.e., one low-NOx engine family might meet full OBD in exchange for additional flexibility for an another low-NOx engine family). Staff encourages stakeholder comment regarding these alternate concepts, the regulatory language identified below, and other potential approaches.

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(3.1) *Tier 1 Flexibility.* A heavy-duty low-NOx engine family for which the Executive Officer has approved Tier 1 certification flexibility pursuant to subsection 2208.1(g) shall be eligible for the following flexibility when certified in the applicable model year by ARB.

- (A) *OBD Emission Test Data Sets.* For the purposes of demonstrating compliance with section 1971.1(i)(2.2.3), one engine family per model year that has been approved by the Executive Officer for low NOx engine Tier 1 certification flexibility will be excluded from calculation of a manufacturer's total number of engine families for the purposes of this section.
- (B) *In-Use Monitoring Performance Ratio (IUMPR):* *IUMPR testing required for all low NOx engines after in service for one year, but no enforcement based upon the results (i.e., reporting only for greater system understanding). (engine family would potentially be exempt from elements of section 1971.5, potential draft regulatory language to be determined)*
- (C) *Use of Part-1065 Certified Cells.* *Flexibility regarding use of Part 1065-certified cells (for OBD compliance purposes only).*
- (D) *Calculation of OBD Deficiencies for Low-NOx Technology Monitoring.* Up to five deficiencies per engine family related to monitoring of a technology needed to meet an engine's low-NOx emission level, including but not limited to the engine's cold start emission reduction strategy, crankcase ventilation system, SCR catalyst, NOx adsorbers, exhaust gas recirculation, and air/fuel ratio imbalance monitoring, shall be exempt from the specified fines of section 1971.1(k)(3) and these deficiencies shall not be included in the count of deficiencies used in section 1971.1(k)(2) to determine the number of deficiencies subject to fines. *(may need language referencing section 1971.5(a)(ii.))*
- (E) *Assigned Deterioration Factors.* ARB-assigned deterioration factors (DF) may be used to determine compliance with applicable emission standards. If ARB does not have an applicable assigned DF, an applicable US EPA assigned DF may be used.

(3.2) *Tier 2 Flexibility.* A heavy-duty low-NOx engine family for which the Executive Officer has approved Tier 2 certification flexibility pursuant to subsection 2208.1(g) shall be eligible for the following flexibility when certified in the applicable model year by ARB.

- (A) *OBD Emission Test Data Sets.* One engine family per model year that meets the low-NOx standard and that has received Executive Officer approval for Tier 2 certification flexibility shall be excluded from calculation of a manufacturer's total number of engine families for the purposes of section 1971.1(i)(2.2.3).
- (B) *IUMPR:* Meet the requirements of section 2208.1 (b)(3.1)(B)
- (C) *Calculation of OBD Deficiencies for Low-NOx Technology Monitoring.* Up to three deficiencies per engine family related to monitoring of a technology needed to meet an engine's low-NOx emission level, including but not

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limited to the engine’s cold start emission reduction strategy, crankcase ventilation system, SCR catalyst, NOx adsorbers, exhaust gas recirculation, and air/fuel ratio imbalance monitoring, shall be exempt from the specified fines of section 1971.1(k)(3), and these deficiencies shall not be included in the count of deficiencies used in section 1971.1(k)(2) to determine the number of deficiencies subject to fines. *(may need additional language referencing section 1971.5(a)(ii.))*

**(c) CERTIFICATION FLEXIBILITY FOR EARLY MARKET INTRODUCTION OF HEAVY-DUTY HYBRID ENGINES**

- (1) *Certification Flexibility for Early Market Introduction.* A manufacturer shall receive the Tier 1 certification flexibility identified in subsection 2208.1(c)(3.1) or Tier 2 certification flexibility identified in subsection 2208.1(c)(3.2) for an engine family certified for use in a hybrid heavy-duty vehicle if the manufacturer’s Innovative Technology Compliance Plan requesting said flexibility has been approved by the Executive Officer pursuant to subsection 2208.1(g).

**Table 2:  
Innovative Hybrid Engine Technology Categories and Associated  
Demonstration California Sales Volume per Engine-Driveline Manufacturer  
Combination<sup>1</sup>**

	Hybrid with <35 Miles AER	Hybrid with 35+ Miles AER <sup>1</sup>
<i>Class 2b/3 Pick-up or Van</i>	<i>tbd</i>	<i>tbd</i>
Class 4 – 8 Vocational Vehicle	100	200
Class 8 Urban Bus	<i>tbd</i> <sup>2</sup>	100
Class 8 Tractor (non-vocational)	50	100

1 – Class 8 Tractors capable of a minimum twenty miles all-electric range that also provide hybrid propulsion are also eligible.

2 – Staff welcomes stakeholder comments regarding whether this regulation should apply to a Class 8 urban bus with < 35 miles AER given that hundreds of these vehicles are already deployed in California and multiple manufacturers in this technology category have demonstrated OBD compliance.

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Section (A), below, is intended to illustrate eligibility requirements and sunset provisions for heavy-duty hybrid engines. *Attachment B: Potential ITR Process for Certifying Hybrid Heavy-Duty Engines* illustrates how provisions of this section could potentially be implemented. Staff also welcomes stakeholder comment regarding defining a “manufacturer” for the purpose of the new engine certification element of the ITR as the engine manufacturer only, with one exception. The manufacturer for the purposes of sales limits identified in Table 2 (above), would refer to each combination of engine and hybrid driveline manufacturers. For example, if engine X is paired with hybrid drivelines A, B, and C, all from different manufacturers, the total number of engine X sold in a model year may not exceed 10 percent of the engine manufacturer’s annual average sales volume, as defined in section (f)(1). However, each of the three engine driveline combinations (X-A, X-B, and X-C) would be subject to the Demonstration Sales Volumes identified above. This potential approach has not yet been included in this draft regulatory language.

- (A) A manufacturer is eligible to apply to the Executive Officer for Tier 1 certification flexibility for California sale of the “Demonstration Volume” of one hybrid engine family within each hybrid technology category identified in Table 2 beginning in the 2016 model year.
  - (B) A manufacturer is eligible to apply to the Executive Officer for Tier 1 certification flexibility for an engine family in any model year prior to or within the applicable hybrid technology category’s market launch model year.
  - (C) If an engine family receives Tier 1 or Tier 2 certification flexibility in any of the four model years immediately following the market launch model year, the manufacturer may apply to the Executive Officer for Tier 1 or Tier 2 certification flexibility for that engine family, pursuant to subsection 2208.1(c), annually for up to: 1) four consecutive model years if the engine will be installed on a hybrid vehicle with less than 35 miles all-electric range; or 2) six consecutive model years if the engine will be installed on a hybrid vehicle with 35 or more miles all-electric range.
  - (D) California sales of an engine family must not exceed Demonstration Volumes unless a manufacturer completes emission testing pursuant to section 2208.3 (*tbd*) to demonstrate no increase in criteria pollutant emissions and a minimum twenty percent CO<sub>2</sub> emissions benefits.
- (1.2) *Technology Category Sunset Model Year.* The fourth model year after the market launch model year shall be defined as the technology category sunset model year. An engine family that has not received Executive Officer approval for Tier 1 or Tier 2 certification flexibility prior to the technology category sunset model year shall be ineligible for Tier 1 or Tier 2 certification flexibility.
- (2) *Manufacturer Sales Allowance for Hybrid Heavy-Duty Engines Receiving Certification Flexibility.*

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- (2.1) *Hybrid Engine Sales Allowance.* A manufacturer's maximum allowable California sales allowance of hybrid heavy-duty engines that receive certification flexibility in any given model year must not exceed ten percent of that manufacturer's average annual California heavy-duty engine sales volume, as calculated pursuant to subsection 2208.1 (f)(1), or 200 units, whichever is greater.
- (2.2) *Hybrid and Low NOx Engine Cumulative Sales Allowance.* Each manufacturer's maximum allowable California sales allowance for all heavy-duty engines in the technology categories identified in Tables 1 and 2, cumulatively, that receive Innovative Technology Certification Flexibility shall not in any given model year exceed twelve and one-half percent of that manufacturer's annual average heavy-duty engine and vehicle California sales volume, as calculated pursuant to subsection 2208.1 (f)(1), or 250 units, whichever is greater.

Tier 1 and 2 flexibility for hybrid engines (below): The draft potential flexibility provisions identified below have been identified by various stakeholders. These are intended to generate stakeholder feedback, and should not be considered an official ARB staff proposal.

- (3) *Hybrid Technology Certification Flexibility for Early Market Introduction*
- (3.1) *Tier 1 Flexibility.* A manufacturer whose Tier 1 Certification Flexibility Application for a hybrid engine family has been approved by the Executive Officer shall certify the engine family with ARB utilizing the applicable Tier 1 flexibility provisions in this section, but shall not exceed the Demonstration Volume identified in Table 2 for the applicable technology category.
- (A) A hybrid heavy-duty engine family for which a Hybrid Engine Tier 1 Certification Flexibility Application has been approved by the Executive Officer shall meet requirements of section 1971 rather than section 1971.1 (title 13, CCR).
- (B) *Assigned Deterioration Factors.* ARB-assigned deterioration factors may be used to determine compliance with applicable emission standards. If ARB does not have an applicable assigned deterioration factor, an applicable US EPA assigned deterioration factor may be used.
- (3.2) *Tier 2 Flexibility.* A manufacturer whose Tier 2 Certification Flexibility Application for a hybrid engine family has been approved by the Executive Officer shall certify the engine family with ARB utilizing the Tier 2 flexibility provisions in this subsection.
- (A) Basic OBD (i.e. circuit and functionality checks) required, may light separate MIL and use proprietary scan tools (*potential draft regulatory language to be determined*)



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- (B) Demonstrate that OBD readiness can be achieved to ensure compatibility with Smog Check or other heavy-duty engine or vehicle inspection and maintenance programs (*potential draft regulatory language to be determined*)
- (C) *OBD Emission Test Data Sets*. For the purposes of demonstrating compliance with section 1971.1(i)(2.2.3), one engine family per model year that has been approved by the Executive Officer for hybrid engine Tier 1 certification flexibility shall be excluded from calculation of a manufacturer's total number of engine families for the purposes of this section.
- (D) *IUMPR*. IUMPR testing required for all hybrid engines after in service for one year, but no enforcement based upon the results (i.e., reporting only for greater system understanding). (*engine family would potentially be exempt from elements of section 1971.5, potential draft regulatory language to be determined*)
- (E) *Assigned Deterioration Factors*. ARB-assigned deterioration factors may be used to determine compliance with applicable emission standards. If ARB does not have an applicable assigned deterioration factor, an applicable US EPA assigned deterioration factor may be used.

### **(d) CERTIFICATION FLEXIBILITY FOR EARLY MARKET INTRODUCTION OF INNOVATIVE HEAVY-DUTY ENGINE TECHNOLOGY**

This section is intended to address other promising heavy-duty engine or vehicle technologies. This initial draft regulatory language is intended to generate stakeholder feedback and should not be construed as a formal regulatory proposal.

- (1) A manufacturer shall receive the applicable certification flexibility identified in this section for an innovative heavy-duty engine or vehicle technology whose eligibility has been determined pursuant to this section if the manufacturer's Innovative Technology Compliance Plan requesting said flexibility has been approved by the Executive Officer pursuant to subsection 2208.1 (g).
  - (1.1) *Eligibility Criteria*. The Executive Officer, upon receipt of an Innovative Technology Compliance Plan from the manufacturer requesting certification flexibility pursuant to this section, will determine, based upon his or her evaluation whether the new technology meets the following criteria:
    - (A) The technology reduces NO<sub>x</sub> or CO<sub>2</sub> emissions when properly applied to the applicable heavy-duty engine or vehicle class and vocation.
      - 1. A vehicle or engine technology identified as a potential heavy-duty vehicle NO<sub>x</sub> or CO<sub>2</sub> reduction technology in any of the following reports shall be assumed to meet the NO<sub>x</sub> or CO<sub>2</sub> emission-reduction criteria of subsection 2208.1 (d)(1.1)(A):
        - a. California Air Resources Board; Draft Technology Assessment; Engine/Power Plant and Drivetrain Optimization and Vehicle Efficiency; June 2015.



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- b. National Research Council of the National Academies; *Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles*; National Academies Press; 2010.
  - c. National Research Council of the National Academies; *Reducing the Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles*, Phase Two; First Report; 2014.
2. The Executive Officer shall also determine that a potential heavy-duty vehicle technology meets the NO<sub>x</sub> or CO<sub>2</sub> emission-reduction criteria of subsection 2208.1 (d)(1.1)(A) based upon his or her engineering evaluation of the following information:
- a. relevant data and information provided in the manufacturer's Innovative Technology Compliance Plan;
  - b. ARB or other independent emissions data or information; evaluation of peer reviewed literature;
  - c. inclusion of the technology as a California State Implementation Plan section 182(e)(5) "black box" advanced technology strategy;
  - d. selection of the technology to receive public funding from ARB or other California or federal public agency based upon its NO<sub>x</sub> or CO<sub>2</sub> emission reduction efficacy; or
  - e. other relevant data and information regarding the applicable technology, whether submitted by the applicant or available to ARB.
- (B) The technology has not been commercialized in a medium- or heavy-duty on-road vehicle in a prior model year, with cumulative California sales exceeding 100 units.

Section 1, below, is intended to address advancements within a specific technology type. For example, suppose ITR flexibility for basic waste heat recovery sunsets in 2020, but a manufacture comes up with a significant advancement that achieves additional emission reductions beyond existing, commercialized waste heat recovery technology. How can/should we define an advancement within the same advanced technology category? Can the language below be strengthened?

- 1. An improvement to an existing technology that has been previously certified for use in a medium- or heavy-duty vehicle does not preclude it from being eligible for the flexibility pursuant to this subsection, if the technology advancement employs differing hardware, software, or principles of science and engineering than the existing, certified version of that technology in order to achieve additional NO<sub>x</sub> or CO<sub>2</sub> emission reductions than the existing, certified version of that technology. For example, mechanical turbo-compounding and electric turbo-compounding based upon electric turbo-compounding different technology hardware, different principles of engineering, and greater potential CO<sub>2</sub> emission benefits.
- (C) The technology presents a significant certification or OBD compliance challenge to the manufacturer.

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There are so many potential “innovative” engine technologies, staff’s intent with (1), below, is to differentiate between minor modifications to existing engine architecture and a fundamentally new technology. Staff believes that the vast majority of new engine technology would be defined as using “existing engine architecture”, but believes it may make sense to offer significantly more certification flexibility for new technologies that use a fundamentally new engine platform (particularly those that offer zero-emission operation).

- (1) An heavy-duty engine or vehicle technology meeting the eligibility criteria of subsection (d)(1.1) shall be defined as either a modification to an existing medium- or heavy-duty engine architecture or a unique medium- or heavy-duty engine or vehicle architecture:
  - (A) Existing Engine Architecture. A technology based upon an existing engine architecture means a technology that updates or otherwise modifies the hardware or operational characteristics of a traditional California-certified medium- or heavy-duty spark-ignition or compression-ignition engine to achieve a CO<sub>2</sub> or NO<sub>x</sub> reduction. .
  - (B) Novel Heavy-Duty Vehicle Propulsion Technology. A novel heavy-duty vehicle propulsion technology means fundamentally new and non-traditional medium- or heavy-duty engine platform or architecture intended to achieve a CO<sub>2</sub> or NO<sub>x</sub> reduction, such as a microturbine, camless engine, or other engine technology that has not been previously California-certified for use in a medium- or heavy-duty vehicle or has had cumulative California sales of 100 or fewer units in previous model years.

Subsection (2.1) and (4) indicate that certification/OBD flexibility for a technology based upon an existing engine architecture would be the same as the flexibility provided for a low NO<sub>x</sub> engine in Tier 1 and 2. **However, it is likely that the specific flexibility provisions will ultimately differ than what is provided for low NO<sub>x</sub> engines due to potentially different certification or OBD challenges.** Staff looks forward to working with stakeholders to define the framework and specific flexibility provided pursuant to this regulation’s technology diversity provisions.

- (2.1) An engine technology based upon an existing engine architecture pursuant to subsection (2) shall conform to the requirements of subsection (4).

Subsection (2.2) and (5) indicate that certification/OBD flexibility for a novel heavy-duty vehicle propulsion technology would be the same as the flexibility provided for a hybrid engine. **However, it is likely that the specific flexibility provisions will ultimately differ than what is provided for hybrid engines due to potentially different certification or OBD challenges.** Staff looks forward to working with stakeholders to define the framework and specific flexibility provided pursuant to this regulation’s technology diversity provisions.

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- (2.2) An engine or vehicle technology based upon a novel heavy-duty vehicle propulsion technology pursuant to subsection (2) shall conform to the requirements of subsection (5.)

Subsections 2.3 and 2.4 are intended to ensure clarity regarding what section low NOx and hybrid medium- and heavy-duty on-road engine would be subject to.

- (2.3) A heavy-duty engine meeting California's optional low-NOx standard shall be subject to subsection 2208.1(b) rather than this section.
- (2.4) With the exception of a hybrid engine receiving certification flexibility pursuant to the criteria identified in subsection 2208.1(e), hybrid engines shall be subject to subsection 2208.1 (c) rather than this subsection.
- (3) *Technology Diversity Provision Market Launch Model Year.* The model year after two engine families utilizing similar new engine or vehicle technology (based upon similar engine or other vehicle componentry and the same principles of science and engineering to achieve NOx and/or CO<sub>2</sub> emission reductions) have received Executive Officer approval to receive Tier 1 certification flexibility, shall be defined as the market launch model year (market launch) for that new engine or vehicle technology.
- (3.1) A manufacturer is eligible to apply to the Executive Officer for Tier 1 certification flexibility for an engine family utilizing an innovative engine or vehicle technology in any model year prior to the applicable innovative engine or vehicle technology market launch model year.
- (4) *Technology Diversity Provisions – Existing Engine Architecture.*
- (4.1) An engine family based upon an existing engine architecture for which the Executive Officer has approved Tier 1 or Tier 2 certification flexibility as part of a manufacturer's Innovative Technology Compliance Plan shall be eligible for the Tier 1 certification flexibility identified in subsection (4.6) or the Tier 2 certification flexibility identified in subsection (4.7), respectively.
- (4.2) If an engine family based upon an existing engine architecture first receives Tier 1 certification flexibility in the market launch model year or in the following model year, a manufacturer is eligible to: 1) apply to the Executive Officer for Tier 1 certification flexibility for that engine family for one model year; and 2) apply to the Executive Officer for Tier 2 certification flexibility for that engine family for one model year.
- (4.3) *Existing Engine Architecture Sunset Model Year.* For an engine family based upon an existing engine architecture, the second model year after the market launch model year of the specific innovative engine technology (based upon similar engine or other vehicle componentry and the same principles of

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engineering to achieve NO<sub>x</sub> and/or CO<sub>2</sub> emission reductions) shall be defined as the engine technology sunset model year. An engine technology that did not initially receive Executive Officer approval for Tier 1 or Tier 2 certification flexibility in a model year prior to the technology category sunset model year shall be ineligible for Tier 1 or Tier 2 certification flexibility pursuant to sections (4.6) and (4.7) in any subsequent model year.

- (4.4) Notwithstanding all other requirements and criteria of this section, no engine family based upon an existing engine architecture shall be eligible for more than three model years of Tier 1 flexibility and one model year of Tier 2 flexibility.
- (4.5) *Manufacturer Sales Allowance for Existing Engine Architecture.* A manufacturer's maximum allowable California sales allowance of all engine families based upon a specific existing engine architecture that receives Tier 1 and Tier 2 certification flexibility pursuant to this section shall not exceed 200 engines in any given model year.
- (4.6) *Existing Engine Architecture Tier 1 Certification Flexibility.* An engine family based upon an existing engine architecture for which a Tier 1 Certification Flexibility Application has been approved shall be eligible for the certification flexibility pursuant to subsection 2208.1(b)(3).
- (4.7) *Existing Engine Architecture Tier 2 Certification Flexibility.* An engine family based upon an existing engine architecture for which a Tier 2 Technology Diversity Certification Flexibility Application has been approved shall be eligible for the certification flexibility pursuant to section 2208.1(b)(3.2).

(Note: Section 4.8, below, is placeholder only. Staff is evaluating potential approaches for the ITR to encourage an engine family with multiple innovative technologies that would individually be eligible pursuant to this section)

- (4.8) *Suite of Innovative Technologies in a Single Engine Family.* An engine family based upon an existing engine architecture that the Executive Officer determines employs three or more technologies that each would individually be eligible for certification flexibility pursuant to subsection (d)(1.1) shall be eligible for one model year of Tier 1 certification flexibility pursuant to subsection 2208.1(c)(3.1) and one model year of Tier 2 flexibility pursuant to subsection 2208.1(c)(3.2).
- (A) An engine family that receives certification flexibility pursuant to subsection (d)(4.6) or (d)(4.7) shall not be eligible for certification flexibility provided pursuant to subsection (d)(4.8), and an engine family receiving certification flexibility pursuant to subsection (d)(4.8) shall not be eligible for certification flexibility pursuant to subsection (d)(4.6) or (d)(4.7).

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- (5) *Novel Heavy-Duty Vehicle Propulsion Technology.*
- (5.1) A manufacturer's Innovative Technology Compliance Plan providing a novel heavy-duty vehicle propulsion technology with Tier 1 or Tier 2 certification flexibility must be approved by the Executive Officer for a novel heavy-duty vehicle propulsion technology to receive, respectively, the Tier 1 certification flexibility identified in subsection 2208.1 (5.6) or the Tier 2 certification flexibility identified in subsection 2208.1 (5.7).
- (5.2) If a novel heavy-duty vehicle propulsion technology first receives Tier 1 certification flexibility in the market launch model year or in the following model year, a manufacturer is eligible to: 1) apply to the Executive Officer for Tier 1 certification flexibility for that technology for two model years; and 2) apply to the Executive Officer for Tier 2 certification flexibility for that technology for two model years.
- (5.3) *Novel Heavy-Duty Vehicle Propulsion Technology Sunset Model Year.* For a novel heavy-duty vehicle propulsion technology, the fifth model year after the market launch model year of any specific novel propulsion technology (based upon similar engine or other vehicle componentry and the same principles of engineering to achieve NO<sub>x</sub> and/or CO<sub>2</sub> emission reductions) shall be defined as the technology category sunset model year. A novel heavy-duty vehicle propulsion technology that has not received Executive Officer approval for Tier 1 or Tier 2 certification flexibility prior to the technology category sunset model year shall be ineligible for Tier 1 or Tier 2 certification flexibility.
- (5.4) Notwithstanding all other requirements and criteria of this section, no novel heavy-duty vehicle propulsion technology shall be eligible for more than four model years of Tier 1 flexibility and two model years of Tier 2 flexibility.
- (5.5) *Manufacturer Sales Allowance for Innovative Technology.* A manufacturer's maximum allowable California sales of a novel heavy-duty vehicle propulsion technology that receives Tier 1 and Tier 2 certification flexibility pursuant to this section shall not exceed 200 engines in any given model year.
- (5.6) *Novel Heavy-Duty Vehicle Propulsion Technology Tier 1 Certification Flexibility.* A novel heavy-duty vehicle propulsion technology for which an Innovative Technology Compliance Plan has been approved shall be eligible for the certification flexibility pursuant to subsection 2208.1(c)(3.1) when certified in the applicable model year.
- (5.7) *Novel Heavy-Duty Vehicle Propulsion Technology Tier 2 Certification Flexibility.* A Novel Heavy-Duty Vehicle Propulsion Technology for which a Tier 2 Innovative Technology Compliance Plan has been approved shall be eligible for the certification flexibility pursuant to subsection 2208.1(c)(3.2) when certified in the applicable model year.

**(e) OTHER TYPES OF HYBRID HEAVY-DUTY ENGINE**

Staff is evaluating how to potentially allow for an off-road, stationary, or on-road light-duty engine to be evaluated in a heavy-duty series hybrid on-road application and, if they meet emissions criteria in-use, to be commercialized in-use. Such engines could potentially be evaluated, and receive certification flexibility, similar to hybrid heavy-duty on-road engines as described in subsection 2208.1(c). Such engines could also potentially be categorized as a Novel Heavy-Duty Vehicle Propulsion Technology pursuant to the previous subsection (but would still have to meet in-use emissions criteria demonstrating criteria pollutants in-use are at or below levels seen in an appropriate base vehicle). The initial draft language below identifies potential off-road engine eligibility criteria.

- (1) Model year 2017 and later engines with rated horsepower at or above 56 kW that will be installed in a heavy-duty hybrid vehicle receiving certification flexibility pursuant to this regulation may meet alternative emission standards as follows:
  - (1.1) The engine must be of a configuration that is identical to one that is certified under CCR, Title 13, section 2423 or 2433.
  - (1.2) The engine must meet all the requirements that apply under section 2403, 2423 or 2433, as applicable, instead of the comparable requirements of 1956.8. Treat these engines as part of the corresponding engine family under “off-road” for compliance purposes such as selective enforcement audits, in-use testing, defect reporting, and recall.
  - (1.3) The engine must meet the following engine labeling requirements:
    - (A) The engine shall meet requirements of 49 CFR section 1036.135
    - (B) The engine label shall include the ARB Engine Executive order number
- (2) Any engine certified pursuant to this section shall meet the following requirements:
  - (2.1) The engine must be calibrated to run at a steady state to power a battery or generator, and shall not at any time directly propel the vehicle in which it shall be installed.
  - (2.2) The engine shall be exclusively installed in a vehicle meeting this regulation’s definition of a hybrid vehicle with thirty-five or more miles all-electric range.
  - (2.3) The engine must meet the most stringent NO<sub>x</sub> emission standard for its size and classification and meet a 0.01 g/bhp-hr or more stringent particulate matter emission standard.
  - (2.4) A diesel engine must be equipped with a certified diesel emission control system that has been calibrated for steady-state operation.

Staff is evaluating whether to also require use of only mechanical engines for the purposes of this section to facilitate eventual OBD compliance.



**(f) GENERAL REQUIREMENTS**

- (1) Calculation of a Manufacturer's Annual Average Sales Volume. A manufacturer's annual average California sales volume for the purposes of this regulation shall be based on that manufacturer's average number of heavy-duty engines sold in California in the three previous consecutive model years for which complete sales data is available. A manufacturer's California sales shall consist of all vehicles or engines delivered for sale in California. For manufacturers certifying for the first time in California, the maximum number of engines receiving certification flexibility pursuant to this regulation in a given model year shall be 200 low-NOx engines, 200 hybrid engines, or 250 combined low-NOx plus hybrid engines. The manufacturer of record for the purposes of determining manufacturer sales volume shall be the engine or vehicle manufacturer that applies for the engine or vehicle Executive Order. For technologies such as a hybrid system in which the engine, driveline, and or other components are manufactured by separate entities, the engine manufacturer's sales volume shall be used to for the purposes of this section.
- (2) *Demonstration of Surplus Emission Reductions.* In order to be eligible for innovative technology certification flexibility, the NOx and CO<sub>2</sub> emission reductions achieved by a low-NOx engine and a GHG reduction strategy, respectively, receiving certification flexibility pursuant to this regulation must not be required or assumed throughout the time of the flexibility duration by any local, state or federal permit, rule, regulation, law, ordinance or the most recent locally approved air quality plan or control measure implementation date. In addition:
  - (A) Emissions averaging, banking or trading of NOx emission reductions or credits achieved by a technology category meeting the low NOx standard and utilizing certification flexibility provisions provided by this regulation is prohibited.
  - (B) Emissions averaging, banking or trading of CO<sub>2</sub> emission reductions or credits achieved by a hybrid engine or hybrid engine and driveline combination that utilizes certification flexibility provisions provide by this regulation is prohibited.
  - (C) Emissions averaging, banking or trading of NOx or CO<sub>2</sub> emission reductions or credits for any engine receiving certification flexibility pursuant to subsection 2208.1(d) is prohibited.
  - (D) Notwithstanding all provisions of this regulation, certification flexibility for any technology category shall be revoked if at any time the technology is no longer surplus to existing requirements due to adoption of a new rule, regulation or other air quality mandate.

Subsection (3), below, is intended to prohibit an engine family from complying with less stringent certification requirements than it has already met or meets federally. A manufacturer would be exempt from paying for or addressing deficiencies for that engine until the flexibility for other engine families within that technology category had sunset.

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- (3) *Anti-Backsliding Provisions.* An engine family or vehicle model shall not be eligible for any certification or OBD flexibility provision of this regulation if the same or a virtually identical engine has previously met said provision when certified by ARB or US EPA in any model year.
- (3.1) For an engine family subject to this section, any deficiency related to a manufacturer being required to meet a provision of subsections 2208.1(c)(3.1) or (c)(3.2) pursuant to this section shall be exempt from the specified fines of section 1971.1(k)(2) and the deficiency shall not be included in the count of deficiencies used in section 1971.1(k)(2) to determine the number of deficiencies subject to fines until the model year in which innovative technology certification flexibility sunsets for the technology category to which the engine family belongs.
- (3.2) An engine family which is not eligible for provisions of subsections 2208.1(c)(3.1) or (c)(3.2) because of the requirements of subsection (f)(3) is exempt from requirements of section 1971.1(k)(4) until the model year in which innovative technology certification flexibility sunsets for the technology category to which the engine family is certified by the Executive Officer.

Engine labels, below, would define the engine and vehicle's level of OBD compliance to facilitate engine and vehicle evaluation by a diagnostic technician. In addition, ARB is considering requiring labeling of hybrid demonstration vehicles as per subsection 4.1, below, due to their minimal diagnostic capabilities.

- (4) *Additional Labeling Requirements.*
- (4.1) A hybrid engine subject to Tier 1 certification requirements identified in subsection 2208.1(c)(3.2) must be clearly and legibly labeled with the following language in a clear location when the hood is open:
- DEMONSTRATION ENGINE NUMBER <X> OF <Y> <HYBRID *or* ADVANCED ZERO-EMISSION HYBRID (*select applicable technology type*)> <VOCATIONAL VEHICLES *or* TRANSIT BUSES *or* CLASS 8 TRACTORS (*select applicable vocation*)>
- where Y = the manufacturer's allowable Demonstration Volume for the applicable technology category;  
X = that engine's unique production volume number between 1 and Y;  
Label text identified above in *italics* is not to be included on the label;  
this information provides labeling instructions only.
- (5) *Year-End Compliance Report.* Within 90 days of completion of each model year of sales for an engine or vehicle that has received Tier 1 or Tier 2



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certification flexibility, a manufacturer must submit a Year-End Compliance Report to ARB. This report shall include the following information:

- (5.1) Total California sales of each engine family that received certification flexibility in the applicable model year, and updated demonstration that the manufacturer did not exceed the applicable sales allowance identified in subsections 2208.1(b)(2) or (c)(2).
- (5.2) The following information for each engine or vehicle:
  - (A) a copy of the ARB Executive Order.
  - (B) For certified hybrid vehicles, the make, model, gross vehicle weight rating (GVWR), vehicle identification number (VIN) and vocation of each certified hybrid vehicle sold; or for certified engines, the vehicle make, model, GVWR, VIN, and vocation of the vehicle in which the certified engine was installed.
- (5.3) Documentation of any additions, deletions or changes since any previous Year-End Compliance Report pursuant to this section or Application for Innovative Technology Certification Flexibility, pursuant to subsection 2208.1(a). This updated documentation must include any changes to previously reported or submitted information regarding manufacturer sales volume, demonstration of surplus emission reductions, compliance with anti-backsliding provisions, collection of vehicle or engine telematics data, emission testing plans or results, compliance with notification or labeling requirements, or any other element of this regulation that has changed since a previous reporting period.
- (6) *Record Keeping.* Manufacturers must maintain copies of the information, reports, records and data used to support an application for certification flexibility pursuant to section 2208.1(a) for a minimum of five years from the date of application submittal, and provide this information to an agent or employee of the ARB within ten business days upon request.
- (7) If the Executive Officer determines that he or she needs any further information from the manufacturer related to any application, compliance plan, or other information required to be submitted under this regulation, the manufacturer or its representative shall submit this information to the Executive Officer upon his or her request within ten business days.
- (8) The manufacturer or its representative shall follow the requirements and protocols of 13 CCR 91100 when submitting any confidential information to the Executive Officer.

**(g) ARB APPROVAL OF INNOVATIVE TECHNOLOGY  
CERTIFICATION FLEXIBILITY REQUEST AND COMPLIANCE PLAN**

- (1) When an applicant submits an Innovative Technology Compliance Plan pursuant to this regulation, the Executive Officer shall, within 30 working days of its receipt, or after an extension if agreed to by both parties, take one of the following actions:
  - (1.1) Disapprove the Innovative Technology Compliance Plan: The Executive Officer may find the applicant or technology does not meet minimum eligibility requirements and disapprove the Innovative Technology Compliance Plan. Plan disapprovals must be in writing, and must describe the reason for plan disapproval. These could include:
    - (A) The applicant is not an eligible technology manufacturer.
    - (B) The vehicle or engine vocation, technology, or vocation-technology combination is not eligible.
    - (C) The applicable certification flexibility provisions have sunset.
    - (D) The manufacturer has already exceeded its California sales allowance pursuant to this regulation.
    - (E) The technology does not meet any other eligibility criteria pursuant to this regulation.
  - (1.2) Request Innovative Technology Compliance Plan Modifications or a New Plan: The Executive Officer may find the applicant and technology may potentially be eligible for certification flexibility pursuant to this regulation, but that the Innovative Technology Compliance Plan is unclear, incomplete, provides insufficient information, or is otherwise not approvable in its current state. In this circumstance, the Executive Officer may suggest the applicant make specific modifications to the Innovative Technology Compliance Plan or submit a new, more complete plan. If the applicant does not submit a new plan or additional information needed pursuant to the Executive Officer's request, the plan shall be deemed to be disapproved.
  - (1.3) Approve the Innovative Technology Compliance Plan: The Executive Officer may find the Innovative Technology Compliance Plan meets all requirements for plan approval and approve the application. In this case, the Executive Officer shall send the applicant an approval letter in writing which includes the following information:
    - (A) Technology category or innovative engine technology for which the approval applies.
    - (B) For an innovative engine technology pursuant to this regulation's Technology Diversity Provisions, determination as to whether the approved engine family represents an incremental engine technology, a suite of incremental engine technologies, or a transformational engine technology.
    - (C) The California sales allowance for the approved engine family.
    - (D) Confirmation of the specific certification flexibility for which the innovative technology is eligible in that model year.

- (E) Information regarding the engine family's or engine technology's remaining years of potential ITR eligibility pursuant to this regulation.

(2) Placeholder for appeals process

**SECTION 2208.2**

**CERTIFICATION AND INSTALLATION PROCEDURES FOR MEDIUM- AND HEAVY-DUTY VEHICLE HYBRID AFTERMARKET CONVERSION SYSTEMS**

**(a) HYBRID CONVERSION SYSTEM APPLICATION**

- (1) Overview. Manufacturers may submit one of three possible Applications for ARB-Approval of a Hybrid Conversion System, depending upon the circumstances outlined for each application:
- (A) *Hybrid Conversion System Demonstration Application.* A manufacturer submits this application to receive initial ARB certification pursuant to this regulation of the hybrid conversion system for sale in California. A hybrid conversion system that complies with this regulation's Tier 1 hybrid conversion requirements may be sold in numbers up to the Demonstration Volumes identified in Table 1.
  - (B) *Hybrid Conversion System Pilot Deployment Application.* A manufacturer submits this application if it has successfully conducted the required emission testing for the conversion system and it wishes to sell more than Demonstration Volumes. A hybrid conversion system that meets more rigorous Tier 2 requirements may be sold in the Pilot Deployment Volumes identified in Table 1. However, this option is only available during the first four years after market launch of a hybrid conversion system in each technology category.
  - (C) *Application for Hybrid Conversion System Final Certification.* A manufacturer submits this application if it has successfully conducted the required emission testing for the conversion system and it wishes to sell more than Demonstration or Pilot Deployment Volumes. A hybrid conversion system that meets the most stringent Tier 3 hybrid conversion system certification requirements is not subject to sales volume restrictions.

A hybrid conversion system could potentially be certified as achieving a CO<sub>2</sub> emission benefit after emission testing, below. Staff is evaluating potential eligibility criteria for this potential option needed to ensure emission reductions are real and durable, including minimum mileage of vehicles retested to demonstrate emission durability.

A hybrid conversion system shall be certified for sale in California based upon the Executive Officer's determination that it meets this regulation's applicable diagnostic, warranty and other requirements, and does not increase emissions of any criteria pollutant or greenhouse gas. A hybrid conversion system that demonstrates a minimum 20 percent CO<sub>2</sub> emission

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benefit shall be certified as achieving said reductions if requested by the manufacturer, and the manufacturer commits to retesting of the system within two years to demonstrate continued criteria pollutant and CO<sub>2</sub> emission durability. Hybrid conversion systems shall not be certified as achieving a criteria pollutant emission benefit.

**Table 3: Hybrid Conversion System Technology Categories and Applicable California Sales Allowance**

	Hybrid with <35 Mile AER		Hybrid with 35+ Mile AER	
	Tier 1/ Demonstration Volume	Tier 2/Pilot Deployment Volume <sup>1</sup>	Tier 1/ Demonstration Volume	Tier 2/Pilot Deployment Volume <sup>1</sup>
Class 2b or 3 Vehicle	~10	~500	~25	~1,000
Class 4 – 8 Vocational Vehicle	~10	~500	~25	~1,000
Class 8 Tractor	~10	~500	~25	~1,000

<sup>1</sup> – Technology eligibility for Tier 2/Pilot Deployment Volumes shall sunset on January 1<sup>st</sup> of the fifth calendar year subsequent to market launch of a hybrid conversion system in each technology category, as described in section 2208.2(c)(1.2)

- (2) Application Process. To obtain ARB approval of the hybrid conversion system, the applicant must submit an application to the Executive Officer pursuant to this section. The Executive Officer shall use the information provided during the application process to help determine whether the hybrid conversion system relies upon sound principles of science and engineering to meet required emissions criteria, the need for additional analyses, and the appropriateness of allowing for alternatives to the prescribed requirements. The applicant must submit one application for each discrete conversion system as it applies to each potential vehicle test group or engine family within each of the technology categories identified in Table 1. Supporting data in electronic format may be accepted as part of an Application for ARB-Approval of a Hybrid Conversion System at the discretion of the Executive Officer. An Application for ARB Approval of a Hybrid Conversion System must be submitted in the format to be supplied by the Executive Officer. Applications the Executive Officer requests in writing shall be sent to:

Chief  
Emissions Compliance Automotive Regulations and Science Division  
9528 Telstar Avenue, El Monte, California 91731

- (3) Hybrid Conversion System Application.

The Hybrid Conversion System Application shall include the following information:

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- (3.1) Identification of the business contact person, business phone number, physical business address and business email address of the responsible party submitting the application.
- (3.2) Name, business affiliation, business title, business e-mail address and business telephone number for (1) persons authorized to sign documents for submittal to ARB, (2) persons authorized to communicate with ARB staff during the application review process, and (3) applicant's product website information, if applicable.
- (3.3) *Hybrid Conversion System Information.*
- (A) Detailed schematics, wiring diagrams, and parts list, including a unique make and model (if applicable) and identifying part number for all individual components of the hybrid conversion system, such as battery pack, traction motor, controller, inverter, on-board charger, and other components;
  - (B) Detailed description of the energy storage system including (if applicable), battery manufacturer, battery chemistry, connection type (e.g., series, parallel, or other), charge depleting or sustaining system, weight, power, maximum voltage, and voltage at 50 percent state of charge;
  - (C) An explanation of how the hybrid conversion system interacts with or integrates into the base vehicle;
  - (D) Description of any modifications made to the original engine hardware or after-treatment device(s), and any modifications made to the engine original software calibrations.
  - (E) An engineering evaluation of potential negative emission impacts of conversion system installation on the base vehicle, including but not limited to potential for increased cold start or low temperature operation leading to increased NOx emissions, and how the hybrid conversion system could potentially change the engine's certified regeneration cycles or events for emission control devices such as diesel particulate filters;
  - (F) Copy of the supplemental emission control label, owner's manual, warranted parts list, warranty statements, and warranty notifications;
  - (G) Demonstration that the hybrid conversion system meets the applicable Tier 1, Tier 2 or Tier 3 eligibility requirements of subsections 2208.2(c), (d) and (e).
- (3.4) *Hybrid Conversion System Manufacturing, Installation and Maintenance.*
- (A) Names and addresses of the fabrication, assembly line, and test facilities where the hybrid conversion system and its major components are manufactured and tested;
  - (B) Procedures for installing and maintaining the hybrid conversion system, including tune-up specifications and discussion of any special tools or techniques required for proper installation, maintenance, or operation;
  - (C) Business names, physical business addresses, business email addresses and business phone numbers of conversion system installers, and copy of

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contract(s) between the hybrid conversion system manufacturer and installer(s);

- (3.5) *Base Vehicle Information.* Description of the chassis and engine combination(s) on which the hybrid conversion system shall be installed, including base vehicle test group and/or base engine family, base vehicle or engine weight class, and the applicable engine emission standards for non-methane hydrocarbons (NMHC), carbon monoxide (CO), NO<sub>x</sub>, and particulate matter (PM).
- (3.6) A Hybrid Conversion System Pilot Deployment Application shall also include the following information:
- (A) *Application Updates.* The applicant shall identify and explain any modifications or updates to the information provided in its Hybrid Conversion System Demonstration Application for the applicable hybrid conversion system.
  - (B) The application shall include all information needed to demonstrate compliance with the requirements of subsections 2208.2(a), (c), (g), and (h).
  - (C) *Vehicle Duty Cycles.* The applicant shall provide complete duty cycle data within ten days upon ARB request, pursuant to section 2208.3 (*tbd*), for all vehicles converted with the hybrid conversion system. Duty cycle data shall be complete for all vehicles on which a hybrid conversion system has been installed in California and current as of 60 days prior to the date of its Hybrid Conversion System Pilot Deployment Application. Data shall be provided in a format to be defined in writing to the applicant by the Executive Officer.
  - (D) *Engine and Vehicle Operational Data.* The applicant shall provide required engine and vehicle operational data within ten days upon ARB request, pursuant to section 2208.3 (*tbd*), for all vehicles converted with the hybrid conversion system. Data shall be complete for all vehicles on which a hybrid conversion system has been installed in California and current as of 60 days prior to the date of its Hybrid Conversion System Pilot Deployment Application. Data shall be provided in a format to be defined in writing to the applicant by the Executive Officer.
  - (E) *Emissions Testing.* The applicant shall demonstrate pursuant to section 2208.3 that conversion of any base vehicle or chassis requested to be retrofit with the applicable hybrid conversion system shall result in potential for a quantifiable reduction in CO<sub>2</sub> emissions relative to a typical base vehicle or chassis, and that no significant adverse impact on any criteria pollutant from the base vehicle or chassis shall result.
    - 1. The Executive officer, at his or her sole discretion, may identify one or more base vehicles identified in the Application for ARB Certification of a Hybrid Conversion System as representing a worst case scenario or a set of worst case scenarios for the purposes of emissions testing for the purposes of meeting requirements of this section.

- (3.7) An Application for Hybrid Conversion System Final Certification shall also include the following information:
- (A) *Application Updates*. The applicant shall identify and explain any modifications or updates to the information provided in its most recent Application for ARB Approval of a Hybrid Conversion System for the applicable hybrid conversion system.
  - (B) The application shall include all information needed to demonstrate compliance with the requirements of sections 2208.2(d), (g), and (h).
  - (C) *Vehicle Duty Cycles*. The applicant shall provide complete duty cycle data within ten days upon ARB request, pursuant to section 2208.3 (*tbd*), for all vehicles converted with the hybrid conversion system. Duty cycle data shall be complete for all vehicles on which a hybrid conversion system has been installed in California and current as of 60 days prior to the date of its Hybrid Conversion System Pilot Deployment Application. Data shall be provided in a format to be defined in writing to the applicant by the Executive Officer.
  - (D) *Engine and Vehicle Operational Data*. The applicant shall provide required engine and vehicle operational data upon ARB request, pursuant to section 2208.3 (*tbd*), for all vehicles converted with the hybrid conversion system. Data shall be complete for all vehicles on which a hybrid conversion system has been installed in California and current as of 60 days prior to the date of its Hybrid Conversion System Pilot Deployment Application. Data shall be provided in an electronic format to be defined by the Executive Officer.
  - (E) *Emissions Testing*. A hybrid conversion system that has not yet met the requirements of subsection 2208.2(a)(3.6)(E) as part of its Executive Officer approved Hybrid Conversion System Pilot Deployment Application shall meet the requirements of subsection 2208.2(a)(3.6)(E) as part of its Application for Hybrid Conversion System Final Certification.
    - 1. An applicant requesting the Executive Officer approve its hybrid conversion system as achieving a CO<sub>2</sub> emission benefit shall meet the additional emission testing criteria pursuant to section 2208.3.
  - (F) A manufacturer that has met the requirements of subsection 2208.2(a)(3.6)(e) as part of its Executive Officer approved Hybrid Conversion System Pilot Deployment Application shall demonstrate within ten days upon ARB request that updated in-use data provided pursuant to subsections 2208.2(a)(3.7)(c) and 2208.2(a)(3.7)(d), if applied to the emissions testing conducted pursuant to subsection 2208.2(a)(3.6)(e), continue to demonstrate pursuant to section 2208.3:
    - 1. if the manufacturer does not request to certify the hybrid conversion system as achieving a CO<sub>2</sub> emission benefit: a potential for a quantifiable reduction in CO<sub>2</sub> emissions relative to a typical base vehicle or chassis, and no adverse impact on any criteria pollutant from the base vehicle or chassis; or

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2. if the manufacturer requests to certify the hybrid conversion system as achieving a CO<sub>2</sub> emission benefit: a consistent, quantifiable and durable reduction in CO<sub>2</sub> emissions relative to a typical base vehicle or chassis, and no significant adverse impact on any criteria pollutant from the base vehicle or chassis.

### (3.8) *Compliance Statements.*

The application shall be signed and dated by the applicant and include the following statement above the signature and date:

"I affirm that to the best of my knowledge this device shall not cause the emission into the ambient air of any noxious or toxic matter that is not emitted in the operation of such motor vehicle without such device.

I understand that an exemption, if granted, does not constitute a certification, accreditation, approval, or any other type of endorsement by the Air Resources Board of any claims concerning alleged benefits of a device. I further understand that no claims of any kind concerning anti-pollution benefits may be made for an exempted device."

Staff is evaluating how the above paragraphs might be modified for a hybrid conversion system that is certified as achieving a CO<sub>2</sub> benefit.

### **(b) TIER 1 DEMONSTRATION CERTIFICATION**

*Attachment C: Potential ITR Process for ARB Approval of Hybrid Conversion System for Medium- or Heavy-Duty Vehicles* illustrates how hybrid conversion system market launch, sunset provisions, and other elements described in subsections (b), (c), and (d), below, would potentially be implemented.

- (1) A manufacturer must receive Executive Officer approval of its Hybrid Conversion System Demonstration Application to sell up to Demonstration Volumes identified in Table 3 of a hybrid conversion system within each hybrid conversion system technology category.
  - (1.1) Only one hybrid conversion system and base vehicle test group or engine family per manufacturer in a technology category (including carry-over or carry-across vehicle test groups or engine families approved pursuant to subsection 2208.2(f)(2)) shall be eligible for Tier 1 certification flexibility at any given time during the effectiveness of this regulation.
  - (1.2) A manufacturer may apply to ARB for Tier 1 certification of more than one hybrid conversion system within a technology category only if all other of that manufacturer's hybrid conversion systems that are or have been previously



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Tier 1 certified have since successfully completed required emission testing demonstrating no increase in criteria pollutants pursuant to this regulation.

- (1.3) A manufacturer may choose to forgo Tier 1 Demonstration Certification and instead apply directly for Tier 2 or Tier 3 certification at any time.
- (2) Hybrid conversion system Tier 1 eligibility requirements shall include the following:
- (2.1) The maximum power available from the hybrid conversion system's rechargeable energy storage system during a standard 10 second pulse power or equivalent test shall be:
- (A) at least 10 percent of the vehicle's total traction power in the case of a vehicle that has a GVWR of between 6,001 and 14,000 lbs; and
  - (B) at least 15 percent of the vehicle's total traction power in the case of a vehicle that has a GVWR of more than 14,000 lbs (*this is from HVIP, to ensure more robust hybrids*).
- (2.2) *Exhaust Emissions.* The applicant shall demonstrate, based upon sound principles of science and engineering and/or independent, verifiable data that the hybrid conversion system is capable of achieving at least a 20 percent reduction in CO<sub>2</sub> emissions and is unlikely to increase emissions of any criteria pollutant from any base engine, vehicle or chassis identified in subsection 2208.2 (a)(3.5).
- (A) *Emissions Testing Plan.* Applicant shall submit a detailed plan to ARB for approval, describing how the applicant commits to complete independent exhaust emissions testing, in accordance with the requirements of section 2208.3.
- 1. Applicant must complete all required emission testing in accordance with the Executive Officer approved emission testing plan within 18 months of ARB approval of the applicant's Hybrid Conversion System Demonstration Application
- (2.3) *Evaporative Emissions.* The applicant must demonstrate the conversion system will not increase evaporative emissions from the base vehicle.
- (A) A manufacturer of a hybrid conversion system for a Class 2b or Class 3 vehicle shall demonstrate the converted vehicle meets the evaporative emissions standard to which the base vehicle was originally certified by conducting the two-day diurnal evaporative procedure emissions test as specified in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Motor Vehicles" last amended December 6, 2012.
  - (B) A manufacturer of a hybrid conversion system for a Class 4 or heavier vehicle may provide an engineering evaluation demonstrating that the conversion system does not increase evaporative emissions from the base vehicle.

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- (C) A converted vehicle with a compression ignition engine or a sealed fuel system that can demonstrate no evaporative emissions is exempt from evaporative emissions testing. Demonstrations may be based upon an engineering evaluation of the base vehicle and hybrid conversion system and data submitted by the conversion system manufacturer and must show that the hybrid conversion system has no evaporative-related emissions under normal operation. All such demonstrations must be approved in advance by the Executive Officer.

Subsection (2.4), below, is strictly conceptual and provides very draft placeholder regulatory references only.

### *(2.4) On-Board Diagnostics Requirements.*

Staff is evaluating potential Tier 1, Tier 2 and Tier 3 OBD requirements for hybrid medium- and heavy-duty vehicle conversions. For conversions of vehicles that were originally certified as OBD compliant, potential Tier 1 hybrid conversion system requirements include:

- Manufacturer may not disable any elements of the base vehicle OBD system without prior approval from ARB.
- No false illumination of the malfunction indicator light (MIL) from the base vehicle OBD system.
- Manufacturer to provide in-use monitoring performance ratio (IUMPR) data within 12 months of Tier 1 approval, without enforcement of specific IUMPR thresholds.

(A) *placeholder*

(B) *placeholder*

(C) *In-Use Monitoring Performance Ratio.* Applicant shall provide a written, signed, and dated statement of understanding that, should the applicant choose to submit an Application for Hybrid Conversion System Full Certification, at least five Tier 1/Demonstration converted vehicles or Tier 2/Pilot Deployment converted vehicles (if applicable) must be equipped with the necessary diagnostic tools to meet in-use monitoring performance ratio compliance requirements of subsection 2208.2(d)(2)(B).

- (3) The Executive Officer reserves the right to require that an applicant's Hybrid Conversion System Demonstration Application be submitted with a market ready hybrid aftermarket conversion system that is identical in all material respects to the product that will be sold upon receiving ARB approval. If such a request is made by the Executive Officer, the applicant must submit the market ready hybrid conversion system within 30 days or the application will be disapproved. The Executive Officer shall return, at the applicant's expense, the market-ready hybrid conversion system after the Hybrid Conversion System Demonstration Application has been granted, denied, or withdrawn.

**(c) TIER 2 PILOT DEPLOYMENT CERTIFICATION**

- (1) A manufacturer must receive Executive Officer approval of its Hybrid Conversion System Pilot Deployment Application to sell up to Pilot Deployment Volumes identified in Table 3 of a hybrid conversion system within each hybrid conversion system technology category.
  - (1.1) *Technology Category Market Launch Calendar Year.* The calendar year after two hybrid conversion systems within a hybrid technology category receive Tier 1 certification shall be defined as the market launch calendar year for the applicable hybrid conversion system technology category. Executive Officer approval of a mild hybrid conversion system shall not be included in this calculation.
  - (1.2) A hybrid conversion system shall be eligible for Tier 2 certification in any calendar year prior to the market launch calendar year and until January 1<sup>st</sup> of the fifth calendar year subsequent to the market launch calendar year.
    - (A) Beginning on January 1<sup>st</sup> of the fifth calendar year after market launch, a hybrid conversion system manufacturer shall be eligible to apply for hybrid conversion system Tier 3 approval.
- (2) *On-Board Diagnostics Requirements.*

Staff is evaluating potential Tier 1, Tier 2 and Tier 3 OBD requirements for hybrid medium- and heavy-duty vehicle conversions. For hybrid conversions of vehicles that were originally certified as OBD compliant, potential Tier 2 hybrid conversion system requirements include:

- Continue to meet all Tier 1 OBD requirements.
- For monitors that were initially calibrated to an emission threshold on the OEM system, the OBD system must at a minimum detect when the component/system has a total lack of function.
- Manufacturer must demonstrate readiness of all monitors can be set while vehicle is in-use. Vehicle operation would not necessarily have to reflect real world operating conditions.
- May require manufacturer provide additional IUMPR data (without enforcement, similar to Tier 1 requirement) if manufacturer requests eligibility of additional base vehicle makes or model years be eligible for conversion.
- Detailed manufacturer plan for meeting Tier 3 OBD requirements must be approved by ARB.

ARB staff is evaluating potential for certifying hybrid conversion systems as achieving a CO<sub>2</sub> emission benefit, with the primary focus being to ensure emission reductions are real and durable. The language below is intended to generate stakeholder feedback.

- (3) *Certification of CO<sub>2</sub> Emission Benefit.* In addition to meeting all other Tier 2 eligibility requirements, a hybrid conversion system may choose to meet the following requirements in order to receive an ARB Executive Order certifying that the hybrid conversion system achieves a CO<sub>2</sub> emission benefit when retrofit on the approved base test group or engine family:
- (A) Emission testing conducted as required by subsection 2208.2(a)(3.6)(E) and pursuant to section 2208.3 must demonstrate a minimum 20 percent CO<sub>2</sub> benefit.
  - (B) Any CO<sub>2</sub> emission benefit certified by the Executive Officer pursuant to this regulation may not be used to demonstrate compliance with any rule, regulation or other air quality mandate, nor may it be used as part of any emission averaging, banking or trading program.
  - (C) Demonstration of Durable Emission Benefits. A hybrid conversion system that is ARB certified as achieving an emission benefit must retest criteria pollutant and CO<sub>2</sub> emissions pursuant to the requirements of section 2208.3 within two years of issuance of the ARB Executive Order to demonstrate continued system durability.
    - 1. Emission retesting shall be on a vehicle that has accumulated a minimum 75,000 miles since its conversion:
    - 2. The ARB Executive Officer reserves the right to amend or revoke a hybrid conversion system Executive Order upon emission retesting to reflect a demonstrated reduction in CO<sub>2</sub> emission benefit or an increase in criteria pollutant emissions relative to the appropriate base vehicle.

**(d) TIER 3 FINAL CERTIFICATION**

- (1) A manufacturer must receive Executive Officer approval of its Application for Hybrid Conversion System Final Certification before it is no longer subject to the hybrid conversion sales volume allocations identified in Table 3.
- (2) *On-Board Diagnostics Requirements.*

Staff is evaluating potential Tier 1, Tier 2 and Tier 3 OBD requirements for hybrid medium- and heavy-duty vehicle conversions. For hybrid conversions of vehicles that were originally certified as OBD compliant, the intent is that the base vehicle meet full OBD and the conversion system meet basic diagnostics. Potential Tier 3 hybrid conversion system requirements include:

- Base vehicle must meet OBD requirements to which it was originally certified.
- Must light single MIL and use standardized scan tools.
- Comprehensive component monitoring requirements apply for the hybrid conversion system components (e.g., input components are required to detect circuit, out-of-range, and rationality malfunctions and output components are required to detect for functionality).
- Within 12 months of Tier 3 approval, demonstrate ability to comply with IUMPR requirements of CCR section 1968.2 or 1971.1 (for medium- and heavy-duty vehicles, respectively).

Staff is evaluating potential requirements for certification of a hybrid conversion system as achieving CO<sub>2</sub> benefits, below, including an additional round of testing in approximately two years to ensure continued CO<sub>2</sub> benefits and no criteria pollutant disbenefit for the converted vehicle. Staff looks forward to working with stakeholders to develop these eligibility criteria.

- (3) *Certification of CO<sub>2</sub> Emission Benefit.* In addition to meeting all other Tier 3 eligibility requirements, a hybrid conversion system shall meet the following requirements in order to receive an ARB Executive Order certifying that the hybrid conversion system achieves a CO<sub>2</sub> emission benefit when retrofit on the approved base test group or engine family:
- (A) Emission testing conducted as required by subsection 2208.2(a)(3.6)(E) and pursuant to section 2208.3 must demonstrate a minimum 20 percent CO<sub>2</sub> benefit.
  - (B) Any CO<sub>2</sub> emission benefit certified by the Executive Officer pursuant to this regulation shall not be used to demonstrate compliance with any rule, regulation or other air quality mandate, nor shall it be used as part of any emission averaging, banking or trading program.
  - (C) *Demonstration of Durable Emission Benefits.* A hybrid conversion system that is ARB-certified as achieving an emission benefit must retest criteria pollutant and CO<sub>2</sub> emissions pursuant to the requirements of section 2208.3 within two years of issuance of the ARB Executive Order to demonstrate continued system durability.
    - 1. Emission retesting shall be on a vehicle that has accumulated a minimum 75,000 miles since its conversion:
    - 2. The ARB Executive Officer reserves the right to amend or revoke a hybrid conversion system Executive Order upon emission retesting to reflect a demonstrated reduction in CO<sub>2</sub> emission benefit or an increase in criteria pollutant emissions relative to the appropriate base vehicle.
- (4) *Drivability.* The manufacturer shall provide a letter from at least three, or fifty percent of, fleets, whichever is less, that have purchased or leased Tier 1 and Tier 2 approved hybrid conversion systems, attesting that the hybrid conversion technology does not adversely impact vehicle drivability or other vehicle functions after a minimum of 500 hours of field operation.

**(e) GENERAL REQUIREMENTS**

In addition to all other requirements imposed, the following general requirements shall apply to all hybrid conversion systems to be certified under these procedures:

- (1) Minimum Product Specifications.

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- (1.1) In order to be eligible for ARB-approval, a hybrid conversion system shall convert a 2004 or newer model year non-hybrid Class 2b through Class 8 vehicle, or a non-hybrid Class 2a commercial or public fleet vehicle, into a hybrid vehicle.
- (1.2) Off-charge compatible hybrid conversion systems for vehicles using gaseous fuels shall be equipped with a lock-off valve, actuated by an electrical or vacuum signal, preventing delivery of fuel to the fuel injection system while the engine is shut down, and shall be equipped with or designated to operate successfully with any feed-back or feed-forward controls of the base vehicle.
- (2) **Drivability.** The drivability of a vehicle equipped with a hybrid conversion system shall not be degraded in such a way as to encourage consumer tampering or create a safety hazard. To verify that the drivability of a converted vehicle is acceptable, the Executive Officer may require that an independent laboratory evaluate drivability. The Executive Officer's determination that drivability is acceptable must be based on an engineering evaluation of the hybrid conversion system described in the application for certification or on reports or observations that hybrid conversion systems similar in design to the system for which certification is sought have caused drivability degradation. The cost of this evaluation shall be borne by the applicant.
- (3) **OBD Requirements.** This regulation's OBD requirements may necessitate modification of the original vehicle or engine OBD system. All modifications affecting OBD compliance including added, modified, or removed original vehicle hardware, (e.g., components, wiring) or software (e.g., programming, calibration) must be fully documented and described as part of the Application for ARB-Approval of the Hybrid Conversion System.
  - (3.1) No component or calibration of the hybrid conversion system that could affect emission performance shall be adjustable by the system installer or the vehicle user.
- (4) **Anti-Backsliding.** Notwithstanding the provisions of this regulation, the Executive Officer reserves the right to require a hybrid conversion system meet a more stringent emissions compliance, diagnostics, warranty, or other requirement the hybrid conversion system is subject to such a requirement by the US EPA.
- (5) **Emission Control Label:** The emissions control label requirements in Title 13, CCR, Section 1965, shall apply to installations of hybrid conversion systems, with the following additions:
  - (A) The applicant shall provide a supplemental Emission Control Information label, which shall be affixed in a permanent manner to each converted vehicle, in a location adjacent to the original Emission Control Information

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Label. If the supplemental label cannot be placed adjacent to the original label, it shall be placed in a location where it can be seen by a person viewing the original label.

- (B) The supplemental label shall show the vehicle or engine model year; conversion system manufacturer's business name, business address, and business telephone number; and shall state that the converted vehicle or engine complies with California emission requirements (*would the label say that it meets emission requirements, or just information to alert the diagnostic technician what OBD requirements the retrofitted vehicle meets?*). The label shall also list any parts that were added and removed during installation of the hybrid conversion system, as well as any changes in tune-up specifications required for the hybrid conversion system. In addition, the label shall show the installer's business name, business address, and business telephone number; date and mileage (converted vehicle odometer reading) on which the hybrid conversion system was installed; and date and mileage at which the hybrid conversion system warranty expires. It is not necessary for emission control labels installed with hybrid conversion systems to be machine readable.
  - (C) For those vehicles which originally met the diagnostic requirements of section 1968.2 or 1971.1 and no longer meet these requirements as a result of the hybrid conversion, the supplemental label shall... (?) (*must identify appropriate specific language to alert a diagnostic technician that the engine and vehicle are not subject to full OBD*).
- (6) Owner's Manual: Each hybrid conversion system installed shall include an owner's manual containing at least the following information:
- (A) a brief description of the hybrid conversion system, including major components and their theory of operation;
  - (B) battery maintenance best practices and charging procedures and protocols for the hybrid conversion system, if applicable;
  - (C) a listing of necessary service and service intervals, as well as tune-up data which differ from the service requirements specified by the vehicle's or engine's original manufacturer;
  - (D) the name, physical business address, business email address, business phone number, and website, if available, of the manufacturer and installer, as well as a list of the names, addresses, and phone numbers of the major dealers in California who supply parts for, or service, the hybrid conversion system.
- (7) A description of information must be provided to hybrid vehicle dealers/purchasers regarding proper disposal of the hybrid vehicle battery and a copy must be provided to ARB, along with a description of how this information is conveyed.
- (8) Manufacturer Recordkeeping and Reporting Requirement: Hybrid conversion system manufacturers shall maintain a record of the vehicle identification

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numbers and California license plate numbers of those vehicles on which their hybrid conversion systems have been installed. As part of this record, conversion system manufacturers shall identify the installation date and the certification Executive Order number of those hybrid conversion systems installed on each vehicle or engine and shall identify the vehicle owner at the time of installation, including the owners' current physical addresses, email addresses, and phone numbers at the time of installation. The applicant shall supply a copy of all installation information to the Executive Officer within ten days upon request. In addition, each applicant shall report annual sales based on a standard calendar year for each ARB-approved hybrid conversion system, identified by certification ARB-approval number, to the Executive Officer by March 1 of the following calendar year. If any contact information is personal, rather than business, information, that information shall be so identified.

- (9) ARB reserves the right to conduct additional emission testing to evaluate whether a hybrid conversion system adversely impacts emissions. If such tests demonstrate that the hybrid conversion system adversely effects emissions, the Executive Order for the hybrid conversion system shall be rescinded and the Executive Officer shall initiate recall proceedings pursuant to subsection 2208.2(h). Further, if such tests or other evidence provides the ARB with reason to suspect that the hybrid conversion system will affect durability of the vehicle emission control system, the manufacturer shall be required to submit durability data within 30 days, or another mutually agreed upon date, demonstrating that the durability of the vehicle emission control system is not affected.
- (10) A hybrid conversion system manufacturer must have a contractual relationship with any hybrid conversion system installer authorized to install the hybrid conversion system. The hybrid conversion systems manufacturer shall provide the installer with specific, written instructions regarding installation procedures needed to comply with the diagnostics, labeling and other requirements of this regulation. A copy shall be provided by either the manufacturer or the installer to ARB within ten days of request.
- (11) The Executive Officer shall revoke the certification of the hybrid conversion system if the applicant fails to observe the requirements of this regulation. An applicant that fails to submit a recall plan as requested by the Executive Officer or to complete the requirements of an approved recall plan, including the reporting requirements, shall be subject to civil penalties as specified in state law and regulations, including, but not limited to, Health and Safety Code Sections 39600, 39660, and 39674.

### **(f) APPROVAL**

- (1) Issuance of Executive Orders. If, after reviewing the test data and other information submitted by the applicant, the Executive Officer determines that



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the hybrid conversion system meets the requirements of these procedures, he or she shall issue an Executive Order certifying the hybrid conversion system for sale and installation on the vehicles and engines with the test groups or engine families specified in the certification application.

- (2) Carry-Over and Carry-Across
  - (A) Carry-over of emission test data from the previous model year to the following model year and from one test group or engine family to similar test groups or engine families will be allowed if the Executive Officer determines that the carry-over/across data will adequately represent the emission performance of the hybrid conversion system to be certified.
  - (B) Requests for carry-over and carry-across must be accompanied by an engineering analysis that shall include test data demonstrating that the emissions performance of the hybrid conversion system and the test group or engine family for which the certification is sought will be adequately represented by the emission performance of the hybrid conversion system and test group or engine family, and other relevant information. The Executive Officer may request applicable additional information needed to make a decision.
  
- (3) Updated Parts or Calibrations. Changes made to the design or operating conditions of a hybrid conversion system must be reviewed and approved by the Executive Officer. Changes to the design or operating conditions of the hybrid conversion system not approved in advance by the Executive Officer shall invalidate the hybrid conversion system certification at his or her sole discretion.

Potential warranty, reporting and recall provisions, below, are intended to provide ARB a mechanism to address conversion systems that are malfunctioning or not achieving anticipated benefits in-use. The potential provisions described in (g) and (h) are similar to what is required for diesel emission control system verification.

### **(g) WARRANTY REQUIREMENTS**

- (1) Product Warranty
  - (A) The applicant must warrant to all owners, for ownership within the warranty period and lessees, for lease contracts within the warranty period that its hybrid conversion system is free from defects in design, materials, workmanship, or operation.
  - (B) The repair or replacement of any warranted part otherwise eligible for warranty coverage shall be excluded from such warranty coverage if the hybrid conversion system, vehicle or engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

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(C) Failure of the vehicle or engine owner to ensure scheduled maintenance or to keep maintenance records for the vehicle, equipment, engine, or hybrid conversion system may, but shall not per se, be grounds for disallowing a warranty claim.

(2) Installation Warranty

(A) A person or company who installs a hybrid conversion system must warrant that the installation is free from defects in workmanship or materials which cause the hybrid conversion system to fail to conform to the emission performance level for which it was approved for the conversion system warranty period.

(B) The installation warranty period is three years or 50,000 miles, whichever comes first. The installation warranty must cover the full repair or replacement cost of the hybrid conversion system, including parts and labor.

**Table 4: Minimum Manufacturer Warranty Periods**

Conversion System Approval Level	Hybrid conversion system minimum warranty period
Tier 1	3 years or 50,000 miles, whichever comes first <sup>1</sup>
Tier 2	5 years or 60,000 miles, whichever comes first <sup>1</sup>
Tier 3	7 years or 75,000 miles, whichever comes first <sup>2</sup>

1 – Hybrid conversion systems with ePTO shall include a 3,000 hour warranty period.

2 – Hybrid conversion systems with ePTO shall include a 4,200 hour warranty period.

(3) Product Warranty Statement. The applicant must furnish a copy of the following statement in the owner's manual, a copy of which must be provided to each owner upon delivery of the hybrid conversion system. The applicant may include descriptions of circumstances that may result in a denial of warranty coverage, but these descriptions shall not limit warranty coverage in any way.

**YOUR WARRANTY RIGHTS AND OBLIGATIONS**

(Applicant's name) must warrant the hybrid conversion system to be free from defects in design, materials, workmanship, or operation which cause significant degradation in emissions or fuel economy performance during the system warranty period, provided there has been no abuse, neglect, improper maintenance, or improper operation of your hybrid conversion system or vehicle, as specified in the owner's manuals. Where a warrantable condition exists, (applicant's name) will repair or replace your hybrid conversion system at no cost to you, including diagnosis, parts, and labor. The warranty period for this hybrid conversion system is (years or miles of operation) whichever occurs first.

As the vehicle owner or operator, you are responsible for performing the required maintenance described in your owner's manual. (Applicant's name) recommends that you retain all

maintenance records and receipts for maintenance expenses for your vehicle, engine, or hybrid conversion system. If you do not keep your receipts or fail to perform all scheduled maintenance, (applicant's name) may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, engine, and hybrid conversion system to a (applicant's name) dealer or representative as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen applicant's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731, or (800) 363-7664, or electronic mail: [helpline@arb.ca.gov](mailto:helpline@arb.ca.gov).

- (4) Warranty Notification. For all hybrid conversion systems, the manufacturer shall notify the hybrid conversion system purchaser or leaser in writing that installation of the hybrid conversion system may affect the original vehicle manufacturer's warranty. Acknowledgement of receipt of this notification must be signed by the purchaser prior to sale of the hybrid conversion system, must be maintained by the applicant for the duration of the warranty period, and must be supplied upon request of the Executive Officer, within ten days of such request.
- (5) Installation Warranty Statement. The installer must furnish the owner with a copy of the following statement.

**YOUR WARRANTY RIGHTS AND OBLIGATIONS**

(Installer's name) must warrant that the installation of a hybrid conversion system is free from defects in design, materials, workmanship, or operation of the hybrid conversion system which cause significant degradation in emissions or fuel economy performance during the system warranty period, provided there has been no abuse, neglect, improper maintenance, or improper operation of your hybrid conversion system or vehicle, as specified in the owner's manuals. The warranty period and the extent of the warranty coverage provided by (installer's name) must be the same as the warranty provided by the product manufacturer, and the same exclusions must apply.

- (6) Hybrid Conversion System Warranty Report. The applicant must submit a warranty report to the Executive Officer within 30 calendar days if, at any time, the cumulative number of valid warranty claims for the same part or component of the hybrid conversion system exceeds one percent of the cumulative sales or leases for the hybrid conversion system or ten units, whichever is greater. Where valid warranty claims exceed one percent or ten units, whichever is greater, the Executive Officer may deny Tier 2 or Tier 3 certification of the hybrid conversion system, or modify, revoke or suspend the existing ARB certification. Where valid warranty claims exceed four percent or twenty five units, whichever

## POTENTIAL DRAFT INNOVATIVE TECHNOLOGY RULEMAKING LANGUAGE

is greater, the Executive Officer may order a recall per the requirements of subsection 2208.2(h.) of this regulation. The warranty report must include the following information and shall be submitted in the format specified by the Executive Officer:

- (A) The manufacturers corporate name, sales for the given calendar year and cumulative sales, and leases for the given calendar year and cumulative leases of the hybrid conversion system. (*California sales #'s only?*)
- (B) Production for the given calendar year and cumulative production of the hybrid conversion system.
- (C) Annual summary of warranty claims for the given calendar year. The summary must include:
  - 1. A description of the nature of the claims and of the warranty replacements or repairs. The applicant must categorize warranty claims for each hybrid conversion system by the part(s) or component(s) replaced or repaired.
  - 2. The number and percentage of hybrid conversion systems for which a warranty replacement or repair was identified.
  - 3. A short description of the hybrid conversion system part or component that was replaced or repaired under warranty and the most likely reason for its failure.
  - 4. For each part or component replaced or repaired under warranty, the number of annual and cumulative replacements or repairs of each part or component.
  - 5. Name, physical business address, business email address and business phone number of the end-user that filed the warranty claim and, if applicable, company name. If personal, not business, information is given, the applicant shall identify it as such.
  - 6. Date the warranty claims were filed and the engine family and vehicle vocation the hybrid conversion system were used with.
  - 7. Delineate the reason(s) for any instances in which warranty service is not provided to end-users that file warranty claims.
  - 8. A current list of authorized installers for the hybrid conversion system and business contact information.
- (D) An applicant that fails to submit a complete hybrid conversion system warranty within 30 calendar days for valid warranty claims in excess of four percent for the same part or component, may be subject to civil penalties as specified in state law and regulations, including, but not limited to, Health and Safety Code Sections 39600, 39660, and 39674.
- (E) A hybrid conversion system warranty report that does not contain all required information will not be considered complete. A hybrid conversion system warranty report will be considered to be complete as of the date that all required information is submitted.

**(h) RECALL PROVISIONS**

- (1) If the Executive Officer determines, after a review of an applicant's warranty report or any other information, that a hybrid conversion system has the potential to experience catastrophic failure or other safety related failure for the same part or component of the hybrid conversion system, has valid warranty claims in excess of four percent or 25 units, whichever is greater, or a substantial number of units experience a failure of an operational feature, the Executive Officer shall require the manufacturer to conduct a recall. In the event of a recall the Executive Officer shall provide notification to the applicant that includes a description of the nature of the failure or warrantable condition, the factual basis for the determination, and shall designate a date at least 60 days from the date of receipt of such notification by which the applicant shall submit a recall plan for review and approval to address the failures or warrantable condition. Each recall plan must be approved by the Executive Officer in writing.
- (2) Recall Plan. At a minimum, an applicant's recall plan shall contain the following information, unless otherwise specified in the Executive officer's recall notification:
  - (A) A description of each hybrid conversion system subject to the recall including the number of units to be recalled, the conversion system(s) affected, and any information required to identify the recalled units.
  - (B) A description of the type and nature of the failure or warrantable condition and the specific modifications, design changes, alterations, repairs, adjustments, or other changes to be made to correct the failures or warrantable condition with a description of the technical studies, data, or other information which support the applicant's decision regarding specific corrections to be made.
  - (C) A description of the method by which the applicant will determine the names and addresses of the end users and the applicant's methods and schedule for notifying the end users, service facilities, and distributors.
  - (D) A description of the procedure to be followed by the end users to correct the failures or warrantable condition. This shall include the date on or after which the end user can have the failures or warrantable condition remedied, the time necessary to perform the remedy, and the designation of facilities at which the remedy can be performed.
  - (E) The recall plan may specify the maximum incentives, if any, the applicant will offer to induce vehicle or equipment owners to present their hybrid conversion system for repair, as evidence that the manufacturer has made a good faith effort to repair or replace all the hybrid conversion systems in the plan. The plan shall include a schedule for implementing actions to be taken, including identified increments of progress towards implementation and deadlines for completing each such increment.
  - (F) A copy of the letter of notification to be sent to the end users.
  - (G) A description of the system by which the applicant will assure that an adequate supply of parts will be available to perform any repairs under the

## POTENTIAL DRAFT INNOVATIVE TECHNOLOGY RULEMAKING LANGUAGE

- recall plan, including the date by which an adequate supply of parts will be available to initiate the repair or replacement campaign, and the method to be used to assure that the supply remains both adequate and responsive to end user demand.
- (H) A copy of all necessary instructions to be sent to those persons who perform the replacement or repair.

- (3) Reporting Requirements. Unless otherwise specified by the Executive Officer, the manufacturer shall report on the progress of a recall campaign by submitting subsequent reports for six consecutive quarters commencing with the quarter after the recall campaign begins. Such reports shall be submitted no later than 25 days after the close of each calendar quarter to:

Chief  
Emissions Compliance Automotive Regulations and Science Division  
9528 Telstar Avenue, El Monte, California 91731

### **SECTION 2208.3**

#### **CRITERIA FOR EMISSION TESTING OF HEAVY-DUTY HYBRID VEHICLES AND MEDIUMMEDIUM- AND HEAVY-DUTY HYBRID CONVERSION SYSTEMS**

Under Development (see text box, below)

Staff is evaluating three potential options for hybrid engines or hybrid conversion systems to be sold in excess of Tier 1/Demonstration Volumes, pursuant to subsections 2208.1(c) and 2208.2, respectively. Such procedures could potentially also be used to evaluate an off-road or light-duty vehicle engine used in a series hybrid, as discussed in subsection 2208.1(e). Three potential emission testing options for hybrid systems participating in the ITR are described below.

#### Chassis Dynamometer Testing

- *For Medium-duty Hybrids (8,500 – 14,000 lbs):* 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 (Adopted October 2014)
- *For Heavy-Duty Hybrids (14,001+ lbs):* Heavy-Duty Hybrid Electric Vehicle Certification Procedures (Adopted December 2013)

#### Portable Emissions Measurement System (PEMS) Testing

PEMS testing comparing in-use emissions of a hybrid truck or bus relative to its non-hybrid counterpart might be more economical to conduct than chassis dynamometer testing, but has two drawbacks. First, PEMS testing occurs over-the-road and therefore is both less repeatable than chassis dynamometer testing and has greater inherent uncertainty. In addition, no regulatory protocols exist for PEMS testing of vocational-type vehicles that typically utilize hybrid systems.

Staff believes, however, that for the purposes of the ITR – to determine relative CO<sub>2</sub> benefits and no increase in criteria pollutant emissions – PEMS testing could potentially provide a practical compliance mechanism. Staff will work with interested stakeholders to evaluate and, if appropriate, develop a potential PEMS testing protocol for hybrid engine-driveline combinations and hybrid conversion systems to meet this regulations applicable emission testing criteria. The following documents will likely help inform development of any potential PEMS testing protocols:

- *Federal Regulations:* 40 CFR Part 1065, Subpart J - Field Testing and Portable Emission Measurement Systems defines minimum requirements for eligible PEMS equipment, equipment calibration, engine selection and maintenance, and other activities.
- *California Regulations:* California's Heavy-Duty Diesel In-Use Compliance Regulation (adopted in September 2006) identifies PEMS protocols for determining whether a heavy-duty vehicle is exceeding allowable emission limits in-use. This regulation provides some precedence regarding number of vehicles and tests needed to make a PASS-FAIL determination.
- *Guidance Documents:* US EPA's SmartWay Fuel Efficiency Test Protocol for Medium and Heavy Duty Vehicles provides additional background and context regarding A to B (i.e, hybrid versus non-hybrid) emission testing, including discussion of potential vehicle selection criteria and vehicle duty-cycles.  
([www.epa.gov/smartway/forpartners/documents/testing/420p07003.pdf](http://www.epa.gov/smartway/forpartners/documents/testing/420p07003.pdf) )

#### Drivetrain Testing

US EPA's Phase 1 Greenhouse Gas Emissions Standards for Medium- and Heavy-Duty Engines and Vehicles includes procedures for simulating a chassis test for post-transmission hybrid system (40 CFR 1037.555). Staff is evaluating whether these procedures, modified to include criteria pollutant emission testing, could provide an ITR hybrid system emission testing protocol.

For any emission testing option, the ability to utilize a duty-cycle that closely mimics how the vehicle is typically operated in-use will be both challenging and critical for ensuring the most meaningful results.

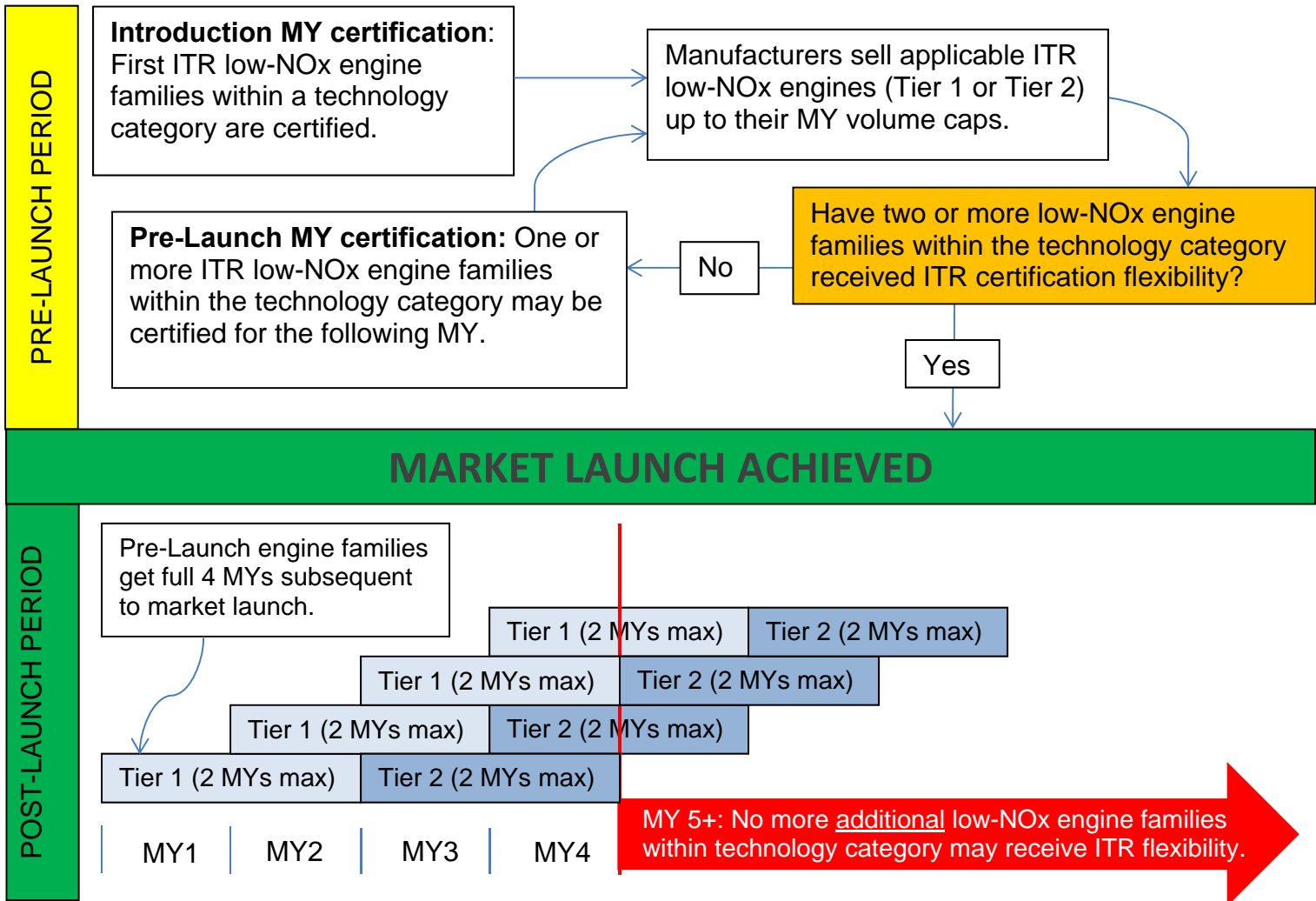


**ATTACHMENT A: Potential ITR Process for Certifying Low-NOx Heavy-Duty Engines**

Low NOx Engine Technology Categories			
Engine Type	g/bhp-hr NOx		
	0.10	0.05	0.02
CI			
Otto Cycle			

For both Tiers 1 and 2, for each model year (MY), manufacturers would be required to:

- 1) Submit Certification Flexibility Application and Compliance Plan for engine family ITR flexibility.
- 2) Once Compliance Plan is approved, certify the engine family in accordance with applicable requirements.
- 3) Submit ITR End of Year Compliance Report, including sales data for the MY.



Annual ITR Heavy-Duty Engine Sales Allowance:

Low-NOx: 10 percent of average annual sales volume or 200, whichever is greater.

Low-NOx + Hybrids: 12.5 percent of average annual sales volume or 250, whichever is greater.

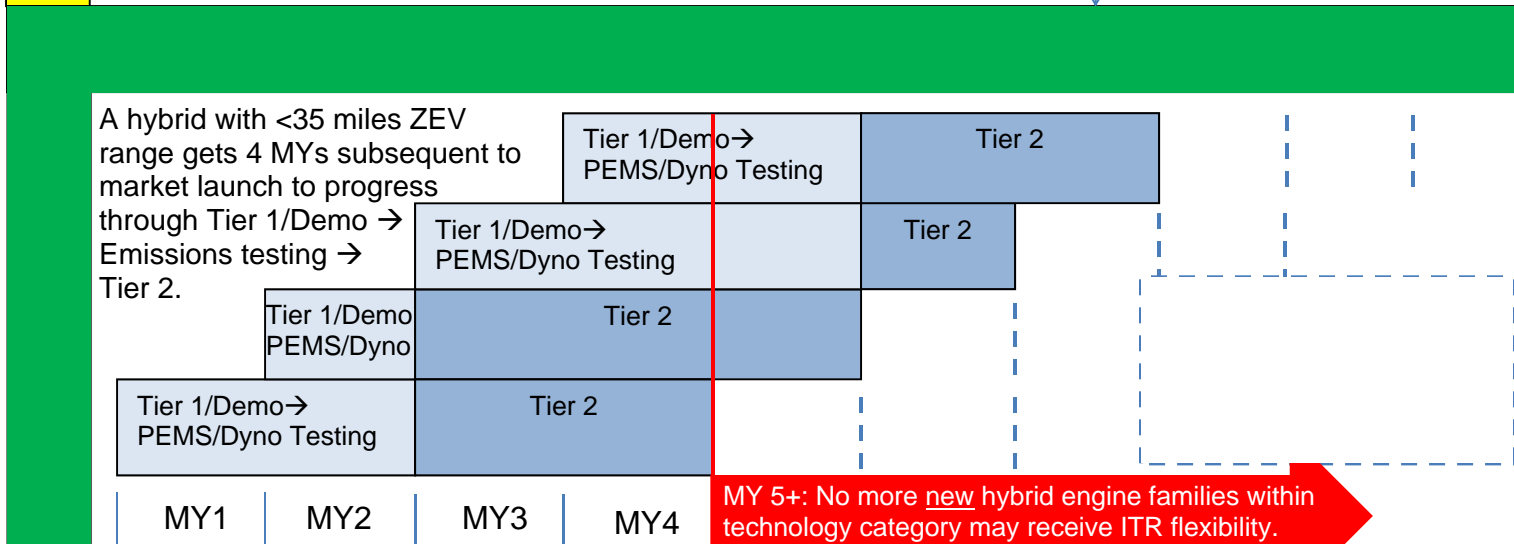
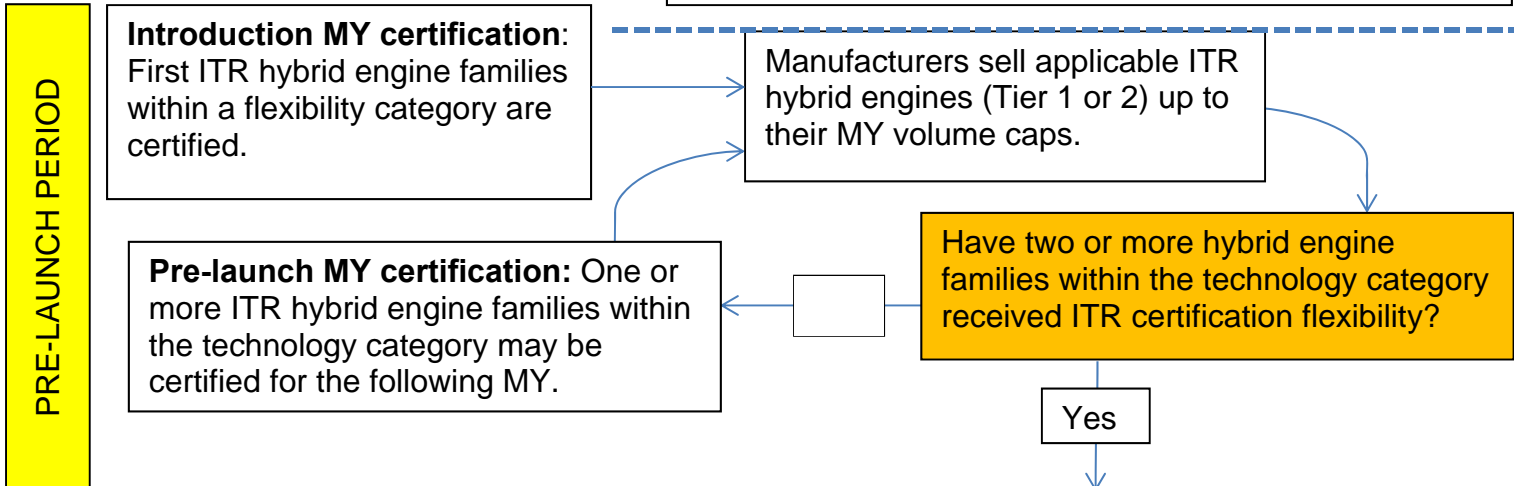
Average annual sales volume = annual average of total California sales over the 3 most recent MYs, not including the immediately preceding MY (e.g., for MY 2017, average based on MYs 2013, 2014, and 2015).

**ATTACHMENT B: Potential ITR Process for Certifying Hybrid Heavy-Duty Engines**

Hybrid engine Technology Categories		
	<35 Mile AER	35+ Mile AER
Vocational (Class 4+)	100	200
Class 8 Urban Bus	tbd	100
Class 8 Tractor	50	100

For both Tiers 1 and 2, for each model year (MY), manufacturers would be required to:

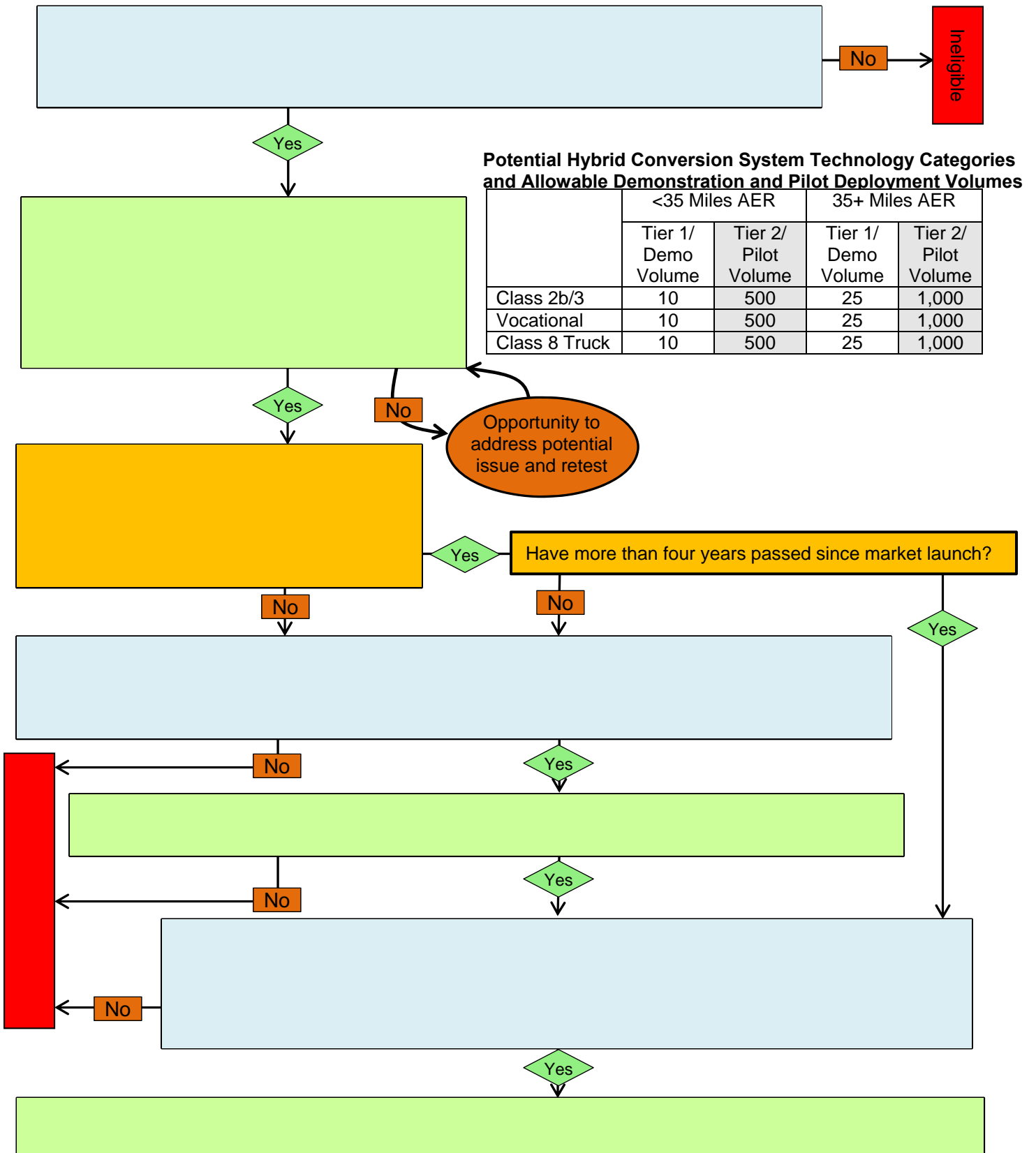
- 1) Submit Certification Flexibility Application and Compliance Plan to qualify engine family for ITR flexibility.
- 2) Once Compliance Plan is approved, certify the engine family in accordance with applicable requirements.
- 3) Submit end of MY Annual Report, including sales data for the MY.



ITR Sales Allowance

Hybrid in Demo/Tier 1: Subject to California sales thresholds identified in table above. Hybrid vehicle must complete PEMS or chassis dynamometer testing to progress to Tier 2.  
Sum of Hybrids in All Tiers and Technology Categories per MY: 10 percent of average annual volume or 200, whichever is greater.  
All ITR Hybrids + Low NOx Engines per MY: 12.5 percent of average annual volume or 250, whichever is greater.

**ATTACHMENT C: Potential ITR Process for ARB Approval of Hybrid Conversion System for Medium- or Heavy-Duty Vehicles**



**Potential Hybrid Conversion System Technology Categories and Allowable Demonstration and Pilot Deployment Volumes**

	<35 Miles AER		35+ Miles AER	
	Tier 1/ Demo Volume	Tier 2/ Pilot Volume	Tier 1/ Demo Volume	Tier 2/ Pilot Volume
Class 2b/3	10	500	25	1,000
Vocational	10	500	25	1,000
Class 8 Truck	10	500	25	1,000