

## Draft Framework for ARB Mail-out XX-XXX for 2013 and subsequent model year heavy-duty hybrid vehicles

### **2013 model year:**

Purpose: Staff is proposing additional regulation language (section 1971.1(g)(5.9)) to allow heavy-duty hybrid vehicle/systems to comply with these “Hybrid OBD” mail-out requirements in lieu of HD OBD for the 2013 model year only. Entities certifying heavy-duty hybrids must either certify to (and comply with) the HD OBD requirements of section 1971.1 or they certify to (and comply with) the requirements identified in this document. The HD OBD regulation (section 1971.1) language will reference a Mail-Out or some form of ARB publication (that this document will be cleaned up and become). This document solely addresses OBD requirements and does not provide any relief or guidance on other emission standards, requirements, or regulations (e.g., tailpipe standards, inducement strategies, auxiliary emission control devices, etc.) applicable to hybrid systems/vehicles.

#### Requirements:

- Hybrid system must be mated to an HD OBD compliant engine (not an EMD engine or older model year engine or special calibration with all HD OBD monitors turned off).
- Any changes to the engine HD OBD system (e.g., calibration, thresholds, etc.) must be limited to the minimum change that is necessary for robust detection of faults (e.g., accurately detecting faults and avoiding false MILs).
  - Responsibility of certifying entity to ensure that change is the minimum needed to keep the system robust. (i.e., the language would read... “the certifying party shall ensure that any changes to the engine’s HD OBD system are limited to the minimum changes that are necessary...”)
  - Not allowed to make a change so substantial that it would result in the system no longer meeting EMD+ requirements (defined in section 1971.1(d)(7.1.4)).
- Certification required to be legal for sale in California
  - “Hybrid OBD” certification: Covers the entire system of engine plus hybrid system/components. For those using this option for 2013 model year, a responsible entity must file a “Hybrid OBD” application identifying the configurations to be produced for sale:
    - Include identification and description of hybrid system
    - Include identification of certified engine to which it will be mated (e.g., engine family, description of specific changes made to the certified engine to accommodate the hybrid, etc.).
    - Include identification of the vehicles/applications the system will be installed in (e.g., make/models, weight class(es), usage type (bus, delivery, line-haul, vocational, etc.)
    - Entity filing the application can be any responsible party (e.g., integrator, hybrid manufacturer, engine manufacturer)
- HD OBD and “Hybrid OBD” in-use liability

- Original engine manufacturer (certification holder for HD OBD compliant engine prior to being mated to a hybrid system) not liable for any in-use HD OBD noncompliance(s) caused by/as a result of the hybrid system.
- Certifying entity for “Hybrid OBD” system (engine plus hybrid/powertrain) (e.g., hybrid manufacturer, engine manufacturer, vehicle integrator, etc.) is liable for in-use issues but only for those that result in the “Hybrid OBD” system failing to meet EMD+ requirements
  - EMD+ defined in section 1971.1(d)(7.1.4)
  - If a noncompliance is caused by/as a result of the hybrid system and the noncompliance effectively results in the “Hybrid OBD” system failing to meet the EMD+ requirements, the certifying entity will be subject to possible enforcement (e.g., recall, fines, etc.)
- California incentive funding (and legal to sell in Calif) only available for packages that get OBD certified
  - Must use one of the two paths for 2013 model year: “Hybrid OBD” (this document) or “HD OBD” (1971.1) certification.
  - Likely will have significantly higher incentives (from the CARB Hybrid Truck and Bus Voucher Incentive Program--HVIP) for packages certified to HD OBD relative to those certified to the “Hybrid OBD” requirements of this document for 2013 model year.

**2014 model year and beyond:**

Purpose: Ensure ARB certifies and provides incentive funds (HVIP) to the most capable hybrids going forward (e.g., packages that are integrated sufficiently with the engine and vehicle to maximize efficiency and make serious efforts to comply with all of ARB's emission regulations including HD OBD).

- Regulation language of section 1971.1 will not be changed for 2014 model year and beyond
  - Hybrid conversions will need to meet all of the requirements with no special relief or extra provisions beyond what already exists for engine manufacturers.
- HD OBD Certification required
  - Certification can be done by any responsible party (e.g., integrator, hybrid manufacturer, engine manufacturer) but certifying party is liable for entire OBD compliance (engine + hybrid).
  - ARB will use certifying entity as representative/point of contact for questions/application review/enforcement
  - No alternate certification path to be legal for sale in Calif
- Certified system must meet HD OBD (and is eligible for deficiencies just like any HD OBD engine per section 1971.1(k)—deficiency regulatory language attached at end of document for reference)
  - Integrated/system/top-down approach needs to be used to target full system compliance (and demonstrate good faith effort is being made to comply in full)
    - System interactions must be taken into account
      - E.g., engine monitors need to work correctly in the hybrid vehicle.
    - Needs cooperative involvement from sub-system suppliers (e.g., hybrid system supplier, engine manufacturer, etc.) rather than independent/compartmentalized approach
  - Engine must meet HD OBD
  - Hybrid components must meet HD OBD (monitored under comprehensive components)
- For any engine monitor that is directly modified (e.g., recalibrated, etc.), it must:
  - Still be compliant with HD OBD requirements after the modification; or
  - If noncompliant after the modification, have modifications (e.g., recalibrated threshold, enable conditions, etc.) limited only to that necessary for avoiding false detection or maintaining robust detection to be eligible for a deficiency (in addition to meeting the other criteria for a deficiency)
- For any engine monitor that is indirectly modified (e.g., not directly recalibrated but runs less frequently because enable conditions are unable to be met as often, etc.), the burden is on the certifying entity to identify such diagnostics and to show they have maintained compliance with HD OBD (or have met the

- requirements in the regulation necessary to qualify for a deficiency). This includes;
- Robust fault detection (e.g., false fails and false passes)
  - Monitoring frequency (e.g., in-use monitoring performance ratios)
  - For emission threshold-based engine monitors (e.g., fault detection before emissions exceed xx), the burden is on the certifying entity to make a showing that the engine monitors will still detect faults before the HD OBD emission thresholds are exceeded (or meet the requirements necessary to qualify for a deficiency).
    - Will be required to submit a plan for Executive Officer approval of how the demonstration will be done. Approval will be based on determining the demonstration will provide reasonable assurance that it is representative of the diagnostic performance in a hybrid vehicle.
    - Emission test data plus rationale expected to be provided for this showing (e.g., engine dyno emission testing to simulate the operation of the engine in a hybrid, chassis dyno “A-to-B” type emission testing, etc.).
  - For any hybrid component subject to comprehensive components (e.g., electronic input/output that can cause a measurable increase in emissions during any reasonable in-use driving condition or is used for another diagnostic), the component must be monitored in accordance with HD OBD requirements (or meet the requirements necessary to qualify for a deficiency). This includes:
    - Circuit monitoring (open, short high/low) and out of range monitoring (high/low)
    - Rationality monitoring (input components) and functional monitoring (output components)
    - MIL illumination and fault code storage protocol (e.g., two in a row to turn MIL on, three in a row to turn it off, illumination of the same MIL used by the engine for HD OBD, support of standardized communication protocols via the same standardized connector use by the engine for HD OBD to output fault information to an off-board tool, separate DTCs/identification of the different detected failure modes, etc).
  - Production Vehicle Evaluation (PVE) (section 1971.1(1)(2)) testing required for system by certifying entity.
    - Done after certification, includes every OBD monitor (engine + hybrid) except comprehensive component out of range and circuit continuity monitors for engine (not hybrid) components that are identical to/have not been directly modified from the originally certified engine.
    - Ensures that all monitors are indeed working and will help reveal if other monitors are affected.
  - Incentive funding (and legal for sale in Calif)
    - Only available to certified packages
    - Likely that the amount of HVIP incentive funding will be tied to level of compliance with HD OBD
      - E.g., significantly higher incentives for systems that are fully compliant or have fewer/more minor deficiencies

**From title 13, CCR, section 1971.1:**

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**(k) Deficiencies.**

- (1) The Executive Officer, upon receipt of an application from the manufacturer, may certify OBD systems installed on engines even though the systems do not comply with one or more of the requirements of title 13, CCR section 1971.1. In granting the certification, the Executive Officer shall consider the following factors: the extent to which the requirements of section 1971.1 are satisfied overall based on a review of the engine applications in question, the relative performance of the resultant OBD system compared to systems fully compliant with the requirements of section 1971.1, and a demonstrated good-faith effort on the part of the manufacturer to: (1) meet the requirements in full by evaluating and considering the best available monitoring technology; and (2) come into compliance as expeditiously as possible. The Executive Officer may not grant certification to a vehicle in which the reported noncompliance for which a deficiency is sought would be subject to ordered recall pursuant to section 1971.5(d)(3)(A).
- (2) For 2013 and subsequent model year engines, manufacturers of OBD systems for which deficiencies have been granted are subject to fines pursuant to section 43016 of the California Health and Safety Code. The specified fines apply to: (1) the third and subsequently identified deficiency(ies), ordered according to section (k)(3), and (2) a monitoring system deficiency where a required monitoring strategy is completely absent from the OBD system.
- (3) The fines for engines specified in section (k)(2) above are in the amount of \$50 per deficiency per engine for non-compliance with any of the monitoring requirements specified in sections (e), (f), and (g)(4), and \$25 per deficiency per engine for non-compliance with any other requirement of section 1971.1. In determining the identified order of deficiencies, deficiencies subject to a \$50 fine are identified first. Total fines per engine under section (k) may not exceed \$500 per engine and are payable to the State Treasurer for deposit in the Air Pollution Control Fund.
- (4) Manufacturers must re-apply for Executive Officer approval of a deficiency each model year. In considering the request to carry-over a deficiency, the Executive Officer shall consider the factors identified in section (k)(1) including the manufacturer's progress towards correcting the deficiency. The Executive Officer may not allow manufacturers to carry over monitoring system deficiencies for more than two model years unless it can be demonstrated that substantial engine hardware modifications and additional lead time beyond two years would be necessary to correct the deficiency, in which case the Executive Officer shall allow the deficiency to be carried over for three model years.

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