Zero-Emission Powertrain Certification (ZEP Cert) Proposed Concept
Battery Electric Vehicle Workgroup
January 30th, 2018

Workshop materials available on the ZEP Cert Website:
https://ww2.arb.ca.gov/our-work/programs/zero-emission-powertrain-certification

Agenda

• Introduction
  • Discussion topics
    • Definition of a zero-emission powertrain
    • Vehicle vs powertrain certification pathway
    • Tiered certification approach for manufacturers
Agenda (cont.)

- Sales volume based certification tiers
- Required Testing
  - Usable battery energy
  - Range
- Warranty period and language
- Reporting of warranty claims
- System monitoring / diagnostics
- Service information
- Durability / useful life
- Repair/service locations within California
- Fuel fired heaters
- Next steps and adjourn

Definition of a Zero-Emission Powertrain

- Any system of components capable of providing vehicle tractive effort or providing stationary on/off vehicle power for a given application without producing emissions.
  - Includes
    - Motor/generator
    - Power electronics
    - Battery system
    - Fuel cell system
  - Not included
    - Charger (?)
Vehicle vs Powertrain Certification

- Staff originally proposed requiring certification of a ZEP, similar to a HD engine certification
  - Staff’s Goal
    - Allow pathway to market for ZEP manufacturers
    - Reduce certification burden
  - Stakeholder Concerns
    - Vehicle GHG EO still required
    - Separate ZEP Cert would be redundant

- Revised framework
  - Wrap the proposed certification requirements into the Vehicle GHG certification
  - Streamlines certification for vehicle manufacturers and CARB staff
    - Achieves same goal of providing a value added process for manufacturers and consumers

ZEP Cert Tiered Approach (Draft – Deliberative)

<table>
<thead>
<tr>
<th>Certification Level (Based on Sales Volume)</th>
<th>Level 1 (Includes Off-Road Equipment)</th>
<th>Level 2 (Builds on Level 1 requirements)</th>
<th>Level 3 (Builds on Level 2 requirements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annuity</td>
<td>&lt;51 per year</td>
<td>51-250 per year</td>
<td>&gt;250 per year</td>
</tr>
<tr>
<td>Applicability</td>
<td>Class 2B/3 (Incomplete); Class 4-8</td>
<td>Class 2B/3 (Incomplete); Class 4-8</td>
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</tr>
</tbody>
</table>
| Testing | N/A | Usable battery energy | Range testing
  - Battery durability (cycle life, other) |
| Warranty | Manufacturer defined
  - CARB clear language provision | Disclose warrantable battery energy
  - Minimum warranty of X years, Y miles |
| Other | N/A | Disclose repair/service location information within California
  - System Monitoring/Diagnostics
  - Standardized Communication Protocol
  - State of Health Information on Dash
  - Warranty reporting |
  - Useful life
  - Recall
  - Service information |
Vehicle Manufacturer Sales Volume Tiers

- On-Road
  - Level 1 (1-50/year)
  - Level 2 (51-250/year)
  - Level 3 (251+/year)

- Off-Road (optional)
  - No sales volume limits
  - Level 1 certification requirements for equipment
    - Goal is to support funding and incentive programs
    - May revisit mandatory requirements in a future rulemaking.

Required Testing

- Usable Battery Energy
  - Stakeholder feedback
    - Inconsistencies in reporting this value
    - Seen as value added metric/comparison criteria for manufacturers and purchasers

- Staff’s Proposal
  - Perform a battery test at the pack level
    - Potential tests: C/3, pulsed power, dynamic

- Fuel Cell Performance Testing
  - SAE J2615 – power and efficiency
Required Testing (cont.)

• Vehicle Range
  • Chassis Dynamometer
    • SAE J1634 (BEV) and SAE J2572 (Fuel Cell)
    • Limited availability
    • High cost
  • Track/On-Road Closed Course
    • More available/flexible option
    • Lower cost
    • Reference EPA SmartWay Fuel Efficiency Test Protocol for Medium- and Heavy-Duty Vehicles (SAE J1321)

• Required Test Cycles
  • HD-UDDS
  • HFEDS

Warranty Period and Language

• Staff is proposing to have a clear language provision for warranty
  • Full replacement period
  • Prorated period
System Monitoring / Diagnostics

• Stakeholders input
  • SAE J1939 communications network suggested
  • Already widely used across on- and off-road heavy duty equipment

• What parameters should be made available to operators?

Service Information

• CARB’s current service information regulation requires automobile manufacturers to provide all emission-related information about their vehicles, via service manuals, technical service bulletins, OBD II descriptions, and diagnostic tools

• Staff is proposing to adopt similar provisions to allow service technicians access to the tools and information needed to repair heavy-duty electric vehicles
Durability / Useful Life

• Stakeholder feedback
  • Battery testing varies greatly
    • Some vehicle manufacturers perform extensive / custom battery cycle life testing in-house
    • Others rely heavily on battery supplier tests

• Staff’s Proposal
  • Wait on setting useful life requirements
  • Require that durability test data be submitted with certification application
    • Staff considering to allow in-house or supplier generated data, as long as it is reflective of usage through warranty period

Reporting of warranty claims

• Consistent with legacy internal combustion powered vehicles/engines
• Allows CARB to investigate if a recall would be warranted
Repair/Service Locations Within California

• Staff is proposing that repair and service location information be provided with the vehicle at the time of sale
  • Address
  • Phone number
  • Map
  • Including mobile repair options, if offered

Fuel Fired heaters

• Stakeholders have requested flexibility to include fuel fired heaters in heavy-duty zero-emission vehicles
  • Low cost option for vehicles with large passenger occupied space
    • Shuttles
    • School buses
    • Transit buses
Next steps

• Ongoing stakeholder engagement
• Second workshop February 13th, 2018
• Board date June 2018