Zero-Emission Switcher Locomotive Approval Criteria Workgroup Meeting

April 21, 2022
Agenda

• Overview of Concept
• Development of Approval Criteria for Zero Emission Switcher Locomotives – Discussion
  • Performance Metrics
  • Information Available to Operator, Warranty and Recall, Durability/Data Reporting
  • Other Potential Types of Criteria
• Next Steps
Overview of Concept: Approval Criteria for Zero-Emission Switcher Locomotives
Overview of Concept

• Switcher locomotives are a source of harmful emissions, particularly in communities adjacent to major rail yards.
• Zero-emission technology is currently market-ready.
• CARB proposes to develop basic approval criteria for zero-emission switcher locomotives:
  • As voluntary guidance;
  • With the goal of promoting transparency and consistency;
  • To support market penetration of zero-emission technology;
  • To facilitate eligibility determinations for incentive funding programs.
# Existing CARB Program Approval Criteria

<table>
<thead>
<tr>
<th>Innovative Technology Regulation</th>
<th>ZEP Cert</th>
<th>CORE</th>
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</thead>
<tbody>
<tr>
<td><strong>Technology Applicability</strong></td>
<td>On-Road Medium- and Heavy-Duty Hybrids (includes conversions)</td>
<td>On-Road Heavy-Duty Zero-Emission Powertrains</td>
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<tr>
<td><strong>Performance</strong></td>
<td>At least 10% GHG reduction, no criteria pollutant increase</td>
<td>Standardized battery capacity test</td>
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<tr>
<td><strong>Warranty</strong></td>
<td>3 years/50,000 miles → 7 years/70,000 miles (increasing by cert tier)</td>
<td>3 years/50,000 miles</td>
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<tr>
<td><strong>Transparency</strong></td>
<td>• Tier 1 → Tier 3: Increasing on-board diagnostics requirements. • Third-party repairability</td>
<td>• Disclose on-board diagnostics/information capability • Third-party repairability</td>
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<tr>
<td><strong>Reporting to CARB</strong></td>
<td>Report to CARB if warranty claims on more than 1% of units sold or 4 units total, whichever is greater</td>
<td>NA</td>
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<tr>
<td><strong>Enforcement / Recalls</strong></td>
<td>Recall may be triggered in warranty claims on more than 4% of units sold or 25 units, whichever is greater</td>
<td>Recalls based upon Executive Officer discretion</td>
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Development of Approval Criteria for Zero-Emission Switcher Locomotives

- Potential types of approval criteria being considered:
  - Basic Overview of Product/Technology
  - Performance Metrics
  - Information Available to Operator
  - Warranty and Recall
  - Durability/Data Reporting
Basic Overview of Product

- Manufacturer to provide a detailed description including:
  - Technology engineering principles
  - Favorable and unfavorable operating conditions, and possible implications on performance
  - Identification of failure modes and potential consequences
  - Maintenance requirements
  - Other information?
Performance Metrics

- Intended to facilitate transparency and consistency
- Preferably demonstrated via existing standardized test procedures
- Aligned with types of information already accessible to/collected by manufacturers
Performance Metrics (continued)

• Examples of potential criteria:
  • Nameplate energy storage
  • Usable capacity
  • Other battery-related metrics: Discharge rate, energy throughput, time to recharge
  • Maximum and nominal power
  • Starting and continuous tractive effort
  • Estimated operating times under a full charge or tank
Discussion – Performance Metrics
Information Available to Operator

- Battery state-of-charge
- Detected malfunctions
- Other in-use performance information
Warranty and Recall Criteria

- Evaluate possible range of warranties
  - Defined number of years, miles, or energy usage
- Require reporting of warranty claims
  - Threshold for reporting: A percent of units sold or a defined number of units
- Goal is for warranty requirements to be as comprehensive as possible without deterring early market growth
- Define recall criteria?
Durability/Data Reporting

• Provide in-use telematics data
  • For a defined number of initial units sold
  • For defined number of years or hours of operation
  • At specific time intervals (e.g., quarterly) or another type of threshold (e.g., energy usage)

• Data could inform development of in-use duty cycle, technology deterioration rates (e.g., battery degradation), and inform future phases of approval criteria development and refinement
Discussion – Information Available to Operator, Warranty and Recall Criteria, Durability/Data Reporting
Next Steps

• Intended timeline for development of approval criteria:
  • April-June 2022: CARB staff collaboration with stakeholders
  • June-July 2022: Share draft guidance document with work group, incorporate stakeholder comments
  • July-August 2022: Publish final guidance document on CARB website
Contacts

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• Zero Emission Switcher Locomotive Approval Criteria Website: