CALIFORNIA
AIR RESOURCES BOARD

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

	Innovative Technology Regulation	ZEP Cert	CORE
Technology Applicability	On-Road Medium- and Heavy-Duty Hybrids (includes conversions)	On-Road Heavy-Duty Zero-Emission Powertrains	Zero-Emission Off-Road Equipment (includes conversions)
Performance	At least 10% GHG reduction, no criteria pollutant increase	Standardized battery capacity test	Commercial readiness demonstration (case-by-case)
Warranty	3 years/50,000 miles → 7 years/70,000 miles (increasing by cert tier)	3 years/50,000 miles	3 years/6,500 hours
Transparency	• Tier 1 → Tier 3: Increasing on-board diagnostics requirements. • Third-party repairability	• Disclose on-board diagnostics/information capability • Third-party repairability	• Telematics data system and non-resettable hour meter required • Third-party repairability
Reporting to CARB	Report to CARB if warranty claims on more than 1% of units sold or 4 units total, whichever is greater	NA	Quarterly for 3 Years: • Total time in use (hrs) • Total energy used (kWh) • Avg energy discharge rate (non-idle) 'Extended Downtime Report' if out of operation >30 days
Enforcement / Recalls	Recall may be triggered in warranty claims on more than 4% of units sold or 25 units, whichever is greater	Recalls based upon Executive Officer discretion	Equipment may be removed from eligibility list, funds returned

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

- Robin Pritchard, Lead Staff for Development of Approval Criteria for Switcher Locomotives: (279)208-7494 Robin.Pritchard@arb.ca.gov
- Michael Jaczola, Technical Advisor: (279)208-7969 Michael.Jaczola@arb.ca.gov
- Joe Calavita, Manager, Freight Approvals Section: (279)208-7699 Joe.Calavita@arb.ca.gov
- Zero Emission Switcher Locomotive Approval Criteria Website: https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california/locomotive-emission-verifications-technology