

CARB Development of Zero-Emission Switcher Locomotive Approval Criteria

This document provides information regarding California Air Resources Board's (CARB) proposed development of voluntary evaluation and approval procedures for zero-emission switcher locomotives (switchers). While switchers play a critical role in ensuring efficient movement of freight throughout California and North America, they are also a source of oxides of nitrogen (NOx), particulate matter (PM), and other harmful emissions, particularly in communities adjacent to major rail yards. To meet California's air quality, community health, and climate goals, the existing diesel switcher locomotive fleet must transition to zero-emission technologies. CARB staff's (or staff) proposal is intended to facilitate this transition by providing relevant and transparent performance, warranty, and other criteria for market-ready zero-emission switchers. The questions and answers below provide additional information regarding staff's proposed development of CARB zero-emission switcher approval criteria, including how interested stakeholders can participate in their development.

What is a switcher locomotive?

The primary responsibility of switcher (yard) locomotives is to move railcars in and around railyards, and to help assemble trains. They typically have four axles, and based on the federal definition, range between 1,006 to 2,300 horsepower, although locomotives below 1006 hp are used in similar applications (e.g., military and industrial).

What types of performance metrics is CARB considering for zero-emission switcher approvals?

CARB's intent is for performance metrics to facilitate transparency and consistency, rather than setting performance requirements. Examples of potential basic performance metrics applicable to battery-electric switcher locomotives might include battery capacity, battery discharge rate, and energy throughput. However, CARB intends for this proposal to accommodate other zero-emission technologies (e.g., hydrogen fuel-cell) as they are developed. Other types of performance metrics under consideration may be applicable to either battery-electric switchers or those powered by other technologies, including, for example, maximum power, starting and continuous tractive effort, estimated operating times under a single charge or full tank, or metrics related to longevity or durability of systems.

Is CARB considering the inclusion of minimum warranty or recall approval criteria?

Warranty and recall criteria are being considered for inclusion. In general, they are necessary components to ensuring protection for both manufacturers and operators, and as such, they are key indicators of a commercial-ready product. In particular, the inclusion of warranty requirements aligns with other CARB verification and approval processes, as well as eligibility

requirements for incentive funding programs. CARB staff looks forward to discussing the pros and cons of potential warranty and recall requirements with stakeholders.

Would CARB consider any data reporting requirements as part of these procedures? If so, why?

Data reporting requirements are being considered, as they allow manufacturers and CARB to better understand in-use performance and performance degradation of batteries and other systems over time. Analysis of the data collected may help to inform future phases of approval criteria development and refinement.

What zero-emission technologies would be eligible?

While zero-emission switchers deployed thus far have typically been battery-electric, staff's intent is that this proposal would be technology-neutral. Switchers with zero exhaust emissions using hydrogen or other power sources would therefore be eligible.

Would hybrids be eligible? What about retrofits using an existing chassis?

Due to the current feasibility of technology for zero-emission switchers, hybrid locomotives are not likely to be considered under the current proposal. However, retrofits using an existing chassis are likely to be considered, with the possible inclusion of criteria specific to retrofits.

Will these approval criteria be mandatory?

At this time, CARB is anticipating that these approval criteria will be introduced as voluntary guidance. However, incentive programs may opt to require a zero-emission switcher be CARB-approved pursuant to these criteria to be eligible for funding.

Why does CARB propose to focus the development of approval criteria on switcher locomotives to the exclusion of line-haul or passenger locomotives?

CARB is initially focusing on switcher locomotives due to the near-term potential of market-ready technology in this category, and the need for approval criteria to facilitate incentive funding eligibility determinations. Future phases of development of approval processes and criteria could include line-haul and passenger locomotives, as well as other categories of off-road freight, construction, and other types of equipment as technology evolves.

How can I participate in the development of these procedures?

A public workgroup meeting will be held on April 21, 2022, to discuss the development of approval criteria for zero-emission switchers. Please [click here](#) to register for the workgroup meeting. If you have any questions about this topic or workgroup meeting, you may contact Robin Pritchard at robin.pritchard@arb.ca.gov.