Zero-Emission Switcher Locomotive Application for Voluntary Approval Process

Part I. Application Information

1. Company Name
2. Mailing Address
3. City
4. State
5. Zip Code
6. Country
7. Contact Name and Title
8. Contact Email Address
9. Company Website Address

Part II. Cover Letter

Submit a signed letter on company letterhead requesting CARB approval for a zero-emission switcher locomotive model or a zero-emission conversion system for existing chassis.

Part III. Application Requirements

Before completing and submitting this application, please read through the entire Guidance Document for Approval of Zero-Emission Switcher Locomotives.

For zero-emission technologies other than battery-electric or hydrogen fuel cell, provide an alternate equivalent metric were indicated by an asterisk (*).

If you believe any of the information provided is trade secret and you wish for it to remain confidential, please identify the specific information for which you are asserting trade secret protection. See Question 8 of the Application and Approval Procedures for more details regarding confidentiality of this application.

1. Basic Locomotive Information

This section applies to new-build switcher locomotive models or zero-emission conversion systems. For zero-emission conversion systems, provide specifications of compatible locomotive chassis.

See the Guidance Document for additional information about the requirements of this section.

a. Switcher locomotive or zero-emission conversion system model designation information as applicable:
    i. Model name/number

    ii. Family designation and names/numbers of models or variants within family
b. Model year of initial product commercial introduction
c. Number of axles
    i. Powered
    ii. Total
d. Weight and Dimensions
    i. Total weight (lb or tons)
    ii. Axle load (lb or tons)
    iii. Length (ft-in)
    iv. Height (ft-in)
e. Technical and physical description of the zero-emission powertrain.
f. Description of necessary charging or fueling infrastructure and site requirements, including charging or fueling standards (if applicable) that are compatible with the model.
g. Detailed description of zero-emission system (e.g., energy storage system, hydrogen fuel cell system, etc.):
    i. Manufacturer/assembler of battery system, hydrogen fuel cell system, or other zero-emission system.
    ii. Battery chemistry (e.g., lithium nickel manganese cobalt oxide (NMC), lithium iron phosphate (LFP), lead acid, etc.) if applicable.
    iii. Description of energy and power management system, controls, and thermal management strategy.
    iv. Certification/standards met (e.g., UL standards for battery safety, fuel cell safety, hydrogen storage), as applicable.
    v. Describe any other system components critical to the system including but not limited to power electronics, fuel cell air handling system, energy storage devices, hydrogen storage, ultra-capacitors, flywheels, or hydraulic assist devices.
    vi. Provide expected longevity (in units of hours, energy throughput, or other appropriate metric) of the energy storage system, hydrogen fuel cell system, inverter, hydrogen storage system, and motors, as applicable, in the locomotive's intended application.
    vii. Provide an estimate of the battery capacity at the end of its useful life as a percentage of its original capacity.
    viii. Indicate whether storage system can be replaced at the end of its useful life. Describe options for replacement, including cost as a percentage of total equipment cost. Include a description of potential upgradability or compatibility with future battery types.
h. Additional information for zero-emission conversion of existing locomotives:
    i. Provide a complete listing of all systems and subsystems to be removed from the base locomotive.
    ii. Provide a complete listing of all systems and subsystems to be refurbished/rebuilt from the base locomotive.

iii. Provide a complete listing of all systems and subsystems included in conversion. Indicate which systems/subsystems are standard and optional, as applicable.
iv. Name and contact information for authorized third party conversion system installer(s), if applicable.

i. Provide copies of the owner's and service/repair manuals that will be provided to the locomotive or zero-emission conversion system purchaser/lessee. If the full manual is not available at the time of application, conditional exceptions may be granted on a case-by-case basis as noted in the Guidance Document. Refer to the Guidance Document for a complete listing of manual requirements.
j. Provide specification sheet or brochure (sales-level information).

2. Commercial Operation/Demonstration Information

a. Provide a summary of the locomotive or zero-emission conversion system's demonstration and/or commercial history, including (as applicable):
    i. A summary of demonstration project(s) planned, in progress, or completed.
    ii. The first year that locomotive model/zero-emission conversion system was offered for sale/lease.
    iii. The number of units sold/leased within the U.S. at the time of application and location(s) of operation.

3. Operating Conditions and Limitations

a. Operating conditions limitations.
    i. Ambient temperature limits.
    ii. Provide any other applicable operating condition limitations.
b. Describe potential failure modes (such as excess heat, vibration, puncture, collision) and strategies for mitigation.

4. Performance Metrics

See the Guidance Document for additional information about the requirements of this section.

a. Testing Requirements
    i. Starting Tractive Effort (lb or kN)
        1. Perform test and provide results as described in the Guidance Document.
    ii. Charge time between defined percentages of battery state of charge (e.g., 10% to 90% of the usable range), or refueling time between hydrogen storage levels, as applicable.
        1. Perform test and provide results as described in the Guidance Document.

2. Provide battery charging speed vs battery life test data, as applicable.

iii. Durability Demonstration

1. 1. Provide durability demonstration information as described in the Guidance Document.

b. Other Performance Metrics

i. Power for traction (kW or hp)

1. Provide continuous power and/or peak power, as applicable.

ii. *Nameplate energy or fuel storage (onboard capacity) (kWh or MWh, kg, or combination).

iii. *Usable capacity (as percent of onboard capacity)

1. Specify whether this is limited by the manufacturer, or if it can be adjusted by the operator during locomotive operation.

iv. Estimated operation time per charge or fueling event

1. Specify duty cycle used for estimate.

5. Information Available to Operator

a. Provide image(s) such as photos, screen captures, or drawings of information display visible to operator.
b. *Indicate status information visible to operator:
   i. Battery state of charge or level of hydrogen fuel on board.
   ii. Battery or hydrogen fuel cell state of health.
   iii. identify any other available metrics.
c. Describe the monitoring and diagnostic system, including:
   i. All faults and conditions that will trigger an alert to the operator.
   ii. Data connector type/standard (e.g., Society of Automotive Engineers standard, wired/wireless, etc.).
   iii. Controller area network protocol (e.g., Society of Automotive Engineers Standard J1939).

6. Service/Repair Information

a. Provide planned maintenance interval(s).
b. Indicate which of the following service and repair options are available in California for this locomotive or zero-emission conversion system. Provide details for each available option:
   i. Manufacturer service and repair facility located in California.
   ii. Manufacturer-approved third-party repair facility located in California.
   iii. Training available to locomotive operators to enable them to perform their own service and repairs.
   iv. Factory-trained service and repair technicians able to travel to customer locations to address service and repair requests – indicate expected response times.

c. Describe any remote monitoring/diagnostic capabilities, and whether they are standard or optional.
d. Describe any disposal, repowering, refurbishment, or recycling services or guidance provided for the battery or hydrogen fuel cell system at the end of its useful life.

7. Warranty Requirements

The minimum warranty coverage period required to receive CARB approval is 3 years as outlined in the Guidance Document, with all parts of the locomotive and labor covered during the warranty period.

a. Provide period(s) of warranty coverage in number of years.
    i. Overall warranty period (entire locomotive or zero-emission conversion system – all systems must be included).
    ii. Specific warranty periods for systems (e.g., powertrain), if longer than overall warranty period.
    iii. For zero-emission conversion of existing locomotives, the warranty coverage also applies to the chassis for at least the minimum period if the zero-emission conversion system manufacturer is supplying one for conversion.
    iv. For new zero-emission locomotives, the warranty coverage must apply to the entire locomotive for at least the minimum period.
b. *Battery warranty:
    i. If the zero-emission system utilizes a battery energy storage system, provide warranty terms pertaining to battery health over the warranty coverage period. For example, specify the minimum usable battery capacity at the end of the warranty period as a percentage of the original usable capacity. Warranty terms should address the expected rate of battery capacity decline over the warranty coverage period, and clearly indicate any operating, handling, charging, or any other conditions that would void the warranty.
c. *Hydrogen fuel cell warranty:
    i. If the zero-emission system utilizes a hydrogen fuel cell system, provide warranty terms pertaining to hydrogen fuel cell power level-based health over the warranty coverage period. For example, specify the hydrogen fuel cell end-of-life power level as a percentage of the beginning-of-life power level. Warranty terms should address the expected rate of hydrogen fuel cell power level decline over the warranty coverage period, and clearly indicate any operating, handling, fueling, or any other conditions that would void the warranty.
d. Indicate agreement to report warranty claims to CARB as specified in the Guidance Document.

e. Indicate agreement to provide extended downtime reports for failures of warranted parts requiring equipment to be out of service for more than 30 business days as specified in the Guidance Document.