Zero-Emission Off-Road Strategies

The Governor's Executive Order N-79-20 directs the California Air Resources Board (CARB) to develop and propose strategies to achieve 100% zero-emission (ZE) from offroad vehicles and equipment operations in the State by 2035 where feasible. CARB, with our stakeholder partners, has developed a range of programs that focus on rapid adoption of the cleanest available technologies, including ZE technologies.

Incentives

Incentives are critical for supporting the advancement and wide-scale deployment of ZE technologies while simultaneously providing immediate emission reductions to help meet our air quality and climate goals. Traditional, monetary incentives from federal, state, and local sources may be used to demonstrate and assess feasibility of ZE technologies in various applications or to increase adoption of those technologies before required. Below are examples of incentive programs for ZE technologies:

- **Carl Moyer Program:** Once commercialized, the Carl Moyer Program increases the deployment of clean technologies for early fleet and equipment turnover by providing incentives for replacing existing vehicles and equipment with the cleanest available.
- **Volkswagen Environmental Mitigation Trust:** The Volkswagen Environmental Mitigation Trust provides funding for ZE freight and marine projects in California.
- **Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program:** The FARMER Program has opportunities for ZE demonstration projects in agricultural applications and provides funding for ZE equipment used in agriculture.
- **Low Carbon Transportation Program:** The Low Carbon Transportation Program focuses on advancing technologies through off-road ZE demonstration projects and early deployments of off-road ZE technologies, such as through the Clean Off-Road Equipment Voucher Incentive Project (CORE), which provides vouchers that reduce the upfront incremental purchase price of early commercialized zero-emission equipment.

Regulations

Regulations can require manufacturers to develop and commercialize ZE technologies as well as increase or accelerate user adoption of those technologies. Below are some of the regulations that CARB currently has in place or under development to accelerate the deployment and adoption of ZE technologies in off-road applications:

- **Transport Refrigeration Units (TRU):** TRUs are refrigeration systems powered primarily by internal combustion engines and designed to refrigerate or heat perishable products transported in various containers. To reduce emissions from facilities with TRU activities, CARB approved amendments to the existing TRU regulation in 2022 to transition truck TRUs to ZE and require the usage of refrigerants with lower global warming potential with implementation beginning in 2023. A separate non-truck TRU regulation is in development for Board consideration in 2026 that would further expand ZE requirements in this equipment category.
- **Locomotives:** Locomotives are rail transport vehicles that provide the motive power for trains carrying both passengers and/or freight. In the absence of federal action, CARB staff has developed concepts to reduce criteria pollutants, toxic air contaminants, and GHG emissions from locomotives while in-use and during idling and maintenance activities through the accelerated usage of cleaner locomotive engines and ZE operations where feasible. This regulation was approved by CARB in April 2023.

- **Zero-Emission Forklifts:** Forklifts are used in many different industrial sectors, but are most prevalent in manufacturing and at freight facilities, such as warehouses and distribution centers. CARB is in the process of developing a regulatory proposal for Board consideration in 2023 to increase ZE forklift deployment throughout the State.
- **In-Use Off-Road Diesel-Fueled Fleets (Off-Road) Regulation:** The Off-Road Regulation reduces NOx and PM emissions from diesel-fueled off-road fleets operating in California, and ZE technology may be used to comply. CARB adopted amendments in 2022 that ban older, high-emitting vehicles from fleets and include additional opportunities to encourage and incentivize ZE adoption where feasible. The Zero-Emission Technology Application (or ZETA) provides broad flexibility for fleets willing to make a significant investment in a fleet-wide transition to zero emission operations. Implementation of these amendments begins in 2024.
- **Off-Road Zero-Emission Targeted Manufacturer Rule**: CARB staff plans to develop a regulation for Board consideration in 2027 that would require manufacturers of off-road equipment and/or engines to produce for sale ZE equipment and/or powertrains as a percentage of their annual statewide sales volume. This measure is expected to increase the availability of ZE options in the off-road sector and support other potential measures that promote and/or require the purchase and use of such options.
- **Small Off-Road Engines (SORE)**: SOREs are spark-ignition engines rated at or below 19 kilowatts and commonly found in lawn and garden equipment as well as other outdoor power equipment and specialty vehicles. In 2021, CARB approved a measure that will require most newly manufactured SOREs be ZE starting in 2024. In addition, portable generators, including those in recreational vehicles, will be required to meet more-stringent standards in 2024 and meet zero-emission standards starting in 2028.