CALIFORNIA AIR RESOURCES BOARD

Zero-Emission Off-Road Strategies

The Governor's Executive Order N-79-20[1] directs the California Air Resources Board (CARB) to develop and propose strategies to achieve 100% zero-emission from off-road vehicles and equipment operations in the State by 2035 where feasible. While CARB will work out details on how to achieve this goal during the public outreach process, many of CARB's existing programs and ongoing work focus on advancing and increasing adoption of zero-emission technologies in off-road applications. CARB, with our stakeholder partners, has developed a range of programs that focus on rapid adoption of the cleanest available commercial technologies to innovative demonstration projects supporting commercialization. These highly effective programs support early cost-effective actions that have consistently delivered air quality and climate benefits in an achievable timeframe, creating economic opportunities for individuals and businesses.

Incentives

Incentives are critical for supporting the advancement and wide-scale deployment of zero-emission 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 zero-emission technologies in various applications or to increase adoption of those technologies before required. Additionally, regulatory programs can provide strong incentives for businesses to develop or adopt zero-emission technologies in order to generate credits, which may be used for compliance or have monetary value (e.g., the Low Carbon Fuel Standard). Below are examples of traditional incentive programs that provide funding for zero-emission 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 zero-emission freight and marine projects in California.
- **Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program:** The FARMER Program has opportunities for zero-emission demonstration projects in agricultural applications and provides funding for zero-emission equipment used in agriculture.
- **Low Carbon Transportation Program:** The Low Carbon Transportation Program focuses on advancing technologies through off-road zero-emission demonstration projects and supports early deployments of off-road zero-emission technologies.

Many of CARB's off-road demonstration projects have focused on advancing zero-emission technology in freight applications and continued support is necessary for commercialization. Additional demonstrations will be necessary to advance and assess the feasibility of zero-emission technology in other sectors, such as construction and agriculture. Once commercially available, incentives will play a critical role in increasing deployment of zero-emission technology in construction and farm equipment.

Regulations

Regulations can require manufacturers to develop and commercialize zero-emission technologies as well as increase or accelerate user adoption of those technologies. CARB sets certification standards through new engine emission control regulations, and the development of zero-emission certification standards will be critical for the widespread deployment of zero-emission technologies through

[1] Executive Order N-79-20: https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

regulations and incentive programs. When developing new or amending existing regulations, CARB collaborates closely with stakeholders to ensure regulations are cost-effective, feasible, and provide the near-term reductions needed to meet federal air quality standards, while paving the way for long-term air quality and climate benefits. Below are some of the regulations that CARB currently has in place or under development to accelerate the deployment and adoption of zero-emission technologies in off-road applications:

- **Vessels At Berth:** The At Berth regulation requires the control of exhaust emissions from vessels while at berth using shore power, a zero-emission technology, or other CARB approved control strategies. The At Berth regulation was recently amended to include additional vessel types, ports, terminals, and visits and provide additional oxides of nitrogen (NOx), particulate matter (PM), and greenhouse gas (GHG) emissions reductions.
- **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 is developed concepts to transition truck TRUs to zero-emissions, trailer TRUs to zero-emission operation, and usage of refrigerant with lower global warming potential. A TRU regulation is in development for Board consideration in 2021.
- **Commercial Harbor Craft:** Commercial harbor craft includes fishing vessels, ferries, excursion vessels, tug boats, tow boats, crew and supply boats, barges, dredges, and other vessel types. Amendments to existing rules will include zero-emission opportunities for all vessels while at dock, some ferries operating over shorter routes, and new excursion vessels, and are expected to go to the Board for consideration in mid-2021 with full implementation of zero-emission requirements by 2028.
- **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 are developing concepts to reduce criteria pollutants, toxic air contaminants, and GHG emissions for locomotives in-use, idling, and maintenance activities through the accelerated usage of cleaner locomotive engines, and zero-emission operations where feasible. CARB is in the process of developing a regulation for Board consideration in 2022.
- **Cargo Handling Equipment:** Cargo handling equipment is any motorized vehicle used to handle cargo or perform routine maintenance activities at California's ports and intermodal rail yards and includes yard trucks (hostlers), rubber-tired gantry cranes, container handlers, and forklifts. CARB is considering amendments to existing rules to include the transition to 100% zero-emission operations starting in 2026.
- **Zero-Emission Forklifts:** Forklifts are used in many different industrial sectors, but are most prevalent in manufacturing and at freight facilities, such as warehouse, distribution centers, and ports. CARB is in the process of developing a regulation for Board consideration in 2022 to increase zero-emission 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 zero-emission technology may be used to comply. Future amendments under consideration may ban older, high-emitting vehicles from fleets and include additional opportunities to encourage and incentivize zero-emission adoption where feasible.
- **Off-Road New Compression-Ignition Engines:** CARB staff currently plan to propose more stringent emission standards (i.e., Tier 5 standards) for off-road, land-based diesel engines around 2024. The Tier 5 standards would apply to engines used in farming, construction, and industrial applications in equipment like tractors, excavators, dozers, scrapers, portable generators, and

irrigation pumps; and they could be implemented as early as 2028 for non-federally preempt equipment. Staff plan to consider efficiency and zero-emission-transitional strategies within the Tier 5 standards and potentially in related rulemakings shortly thereafter.