

State of California  
**Air Resources Board**

**BOARD ITEM SUMMARY**

**ITEM # 20-8-2:**      **Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments: Proposed Amendments to the Exhaust Emissions Standards and Test Procedures for 2024 and Subsequent Model Year Heavy-Duty Engines and Vehicles, Heavy-Duty On-Board Diagnostic System Requirements, Heavy Duty In Use Testing Program, Emissions Warranty Period and Useful Life Requirements, Emissions Warranty Information and Reporting Requirements and Corrective Action Procedures, In-Use Emissions Data Reporting Requirements, Phase 2 Heavy-Duty Greenhouse Gas Regulations, and Powertrain Test Procedures**

**STAFF RECOMMENDATION:**

Staff recommends that the California Air Resources Board (CARB or Board) approve for adoption the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, which would establish new exhaust emission standards, test procedures, and other emission-related requirements for 2024 and subsequent model year California-certified on-road heavy-duty engines, including:

1. Proposed amendments to the oxides of nitrogen (NO<sub>x</sub>) and particulate matter (PM) exhaust emission standards on existing regulatory cycles as well as new exhaust emissions standards on a new low load certification cycle (LLC),
2. Proposed amendments to the heavy-duty in-use testing (HDIUT) program,
3. Proposed amendments to the emissions warranty and useful life periods and to the emissions warranty information reporting (EWIR) and corrective action procedures,
4. Proposed amendments to the heavy-duty durability demonstration program,
5. Proposed amendments to the emissions averaging, banking, and trading (ABT) program,
6. Proposed powertrain certification test procedures for heavy-duty hybrid vehicles, and
7. Proposed amendments to the On-Board Diagnostic (OBD) Requirements.

Staff also recommends that the Board approve for adoption proposed amendments to clarify and correct certain requirements related to the Phase 2 Greenhouse Gas (GHG) standards, diesel auxiliary power unit (APU) requirements, and medium-duty engine requirements.

**DISCUSSION:**

On-road heavy-duty vehicles comprise the largest NO<sub>x</sub> emission source category in the state, contributing approximately 31 percent of the total statewide NO<sub>x</sub> emissions inventory as well as 26 percent of total statewide diesel PM emissions. Thus, significant NO<sub>x</sub> emissions reductions from on-road heavy-duty vehicles are needed in order to meet federal ambient air quality standards for ozone and ultrafine particles (PM<sub>2.5</sub>).

The Proposed Amendments would implement two measures included within CARB's Revised Proposed 2016 State Strategy for the State Implementation Plan (2016 State SIP Strategy): a "Low-NO<sub>x</sub> Engine Standard" which aims at significantly reducing NO<sub>x</sub> emissions from new engines during certification; and a "Lower In Use Emission Performance Level," which aims at ensuring in-use heavy-duty vehicles continue to control emissions throughout their useful lives.

The Proposed Amendments would modify several existing on-road heavy-duty program elements, including the NO<sub>x</sub> and PM emissions standards, the HDIUT program, certification test procedures, including durability demonstration and powertrain test procedures for heavy-duty hybrid vehicles, emissions warranty and useful life periods, and other emission-related requirements. Changes to these program elements are needed because (1) it is cost-effective and technically feasible to reduce the standards significantly below today's levels to achieve needed NO<sub>x</sub> reductions, (2) some elements of the existing programs need modification to achieve desired emission reductions, and (3) some provisions would benefit from additional clarification of the requirements.

The Proposed Amendments were developed in an open public process that included public workshops, workgroup meetings, and other meetings with the heavy-duty engine industry, component suppliers, academia, non-governmental organizations, trade associations, the Truck and Engine Manufacturers Association, members of the Manufacturers of Emission Controls Association (MECA), the United States Environmental Protection Agency (U.S. EPA), and local and state air agencies. These meetings provided an opportunity for stakeholders to engage CARB staff in an open discussion in order to achieve the maximum possible, technologically feasible, and cost-effective regulatory proposal.

**SUMMARY AND IMPACTS:**

The Proposed Amendments are projected to reduce statewide emissions of NO<sub>x</sub> by 23.2 tons per day (tpd) in 2031, by 75.9 tpd in 2050, and by approximately 352,795 tons statewide between the years 2022 through 2050. In 2031, the target SIP date to meet the 2008 ozone ambient air quality standards, NO<sub>x</sub> emission benefits relative to the baseline are estimated to be approximately 7.0 tpd in the South Coast Air Basin and 5.7 tpd in the San Joaquin Valley Air Basin.

The projected reductions of NO<sub>x</sub> emissions would provide significant regional health benefits to California residents by reducing exposure to ozone and PM<sub>2.5</sub>, and since

heavy-duty engines typically operate in transportation corridors, it is expected that the Proposed Amendments would provide the greatest benefit to disadvantaged communities that are typically located near these transportation corridors. It is estimated that from 2024 through 2050, the Proposed Amendments would result in a statewide total of approximately 3,900 avoided premature deaths and approximately 3,150 avoided hospitalizations and emergency room visits. In monetary terms, this translates to a total statewide health benefit of approximately \$36.8 billion for 2024 through 2050.

The proposed PM standard of 0.005 g/bhp-hr is intended to prevent “backsliding” by encouraging manufacturers to continue using current robust diesel particulate filters (DPF) that are currently capable of reducing PM emissions down to 0.001 g/bhp-hr levels, and accordingly the Proposed Amendments are not projected to directly reduce PM emissions from the affected engines. However, since NO<sub>x</sub> is also a precursor to secondary PM<sub>2.5</sub> formation, NO<sub>x</sub> emission reductions would also provide ambient PM<sub>2.5</sub> emission benefits resulting in significant health benefits. The Proposed Amendments are not expected to have any significant impacts on GHG emissions.

The Proposed Amendments would require engine manufacturers to produce lower-emitting engines with new technologies and calibration strategies, which would require them to incur research and development costs and would also increase their upfront production and operational costs. The projected compliance costs are \$145 million for 2027 MY engines and approximately \$4.07 billion in total costs for calendar year 2022 through 2050. These costs are small in comparison to the roughly \$36.8 billion in expected monetized health benefits resulting from the Proposed Amendments, which largely stem from avoided premature mortality. Manufacturers are expected to recoup these increased costs by passing them on to purchasers.

Engine and vehicle purchasers would also obtain benefits from the elements of the Proposed Amendments that significantly lengthen manufacturers’ emissions warranty periods by not having to pay for repairs incurred during those lengthened warranty periods. The longer warranty periods and proposed durability demonstration protocol would encourage manufacturers to produce more durable components, and the proposed amendments to the EWIR and corrective action procedures would also benefit purchasers by ensuring that defective components would be repaired or replaced by manufacturers.

The overall net cost impact of the Proposed Amendments is expected to increase average model year 2024 through 2026 vehicle purchase prices by approximately \$2,776 (representing 2.6 percent of the average baseline vehicle cost), to increase 2027 through 2030 model year vehicle purchase prices by approximately \$5,264 (representing 5.2% of the average baseline vehicle cost), and to increase 2031 and subsequent model year vehicle purchase prices by approximately \$5,912 (representing 5.8% of the average baseline vehicle cost).

CARB staff estimated the overall cost-effectiveness of the Proposed Amendments, in terms of dollar spent per emission benefit, to be \$5.45 per pound of NO<sub>x</sub> reduced. This is within the range of the cost-effectiveness of CARB's previously adopted measures.

There are currently no federal regulations that are comparable to the Proposed Amendments, although the U.S. EPA is currently in the process of developing its own package of lower heavy-duty NO<sub>x</sub> emission standards called the Cleaner Trucks Initiative (CTI). Due to federal statutory lead-time constraints, the earliest CTI would likely become effective is with 2026 model year engines.

California has been developing its Proposed Amendments for many years, and its air quality needs require significant emission reductions as soon as possible. To maintain a future harmonized national heavy-duty program, CARB encourages U.S. EPA to align with the Proposed Amendments described in the Staff Report as much as possible in the CTI.