

Heavy-Duty 2027 and Beyond: Clean Trucks Final Rulemaking

This final action “Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards,” adopts new, stronger emissions standards that will reduce nitrogen oxide (NO_x) emissions from the heavy-duty vehicles and engines starting in model year Model Year (MY) 2027. These standards will result in widespread air quality improvements across the U.S., especially in areas already overburdened by air pollution and diesel emissions.

The final program includes new, more stringent emissions standards that cover a wider range of heavy-duty engine operating conditions compared to today’s standards, and it requires these more stringent emissions standards to be met for a larger portion of the time these engines operate on the road. This rule does not include final action regarding the proposed targeted updates to the existing Heavy-Duty Greenhouse Gas Emissions Phase 2 program (HD GHG Phase 2). We intend to consider potential changes to certain HD GHG Phase 2 standards as part of the Phase 3 GHG rulemaking.

The comprehensive national NO_x program for heavy-duty engines and the rigorous regulatory regime established by this rulemaking is based on a robust, complete technical record consistent with the authority set forth in the Clean Air Act. EPA consulted with a wide variety of stakeholders, including State and local governments. Additionally, this final rule provides a comprehensive approach to ensuring the new, much more stringent emissions standards are met during more of the operating life of these vehicles by including provisions for longer useful life for engines and longer emission-related warranty periods for pollution control equipment.

Clean Trucks Plan

This final rule is one of three major actions being taken under EPA’s “Clean Trucks Plan.” Under this plan, the Agency intends to propose two additional rulemakings in 2023 which, when considered cumulatively with this final rule, would put in place stringent long-term standards that would reduce smog, soot, and climate pollution from heavy-duty vehicles and would include consideration of greater adoption of

zero-emissions vehicle technologies. These actions are consistent with President Biden’s Executive Order (E.O.) 14037, Strengthening American Leadership in Clean Cars and Trucks.

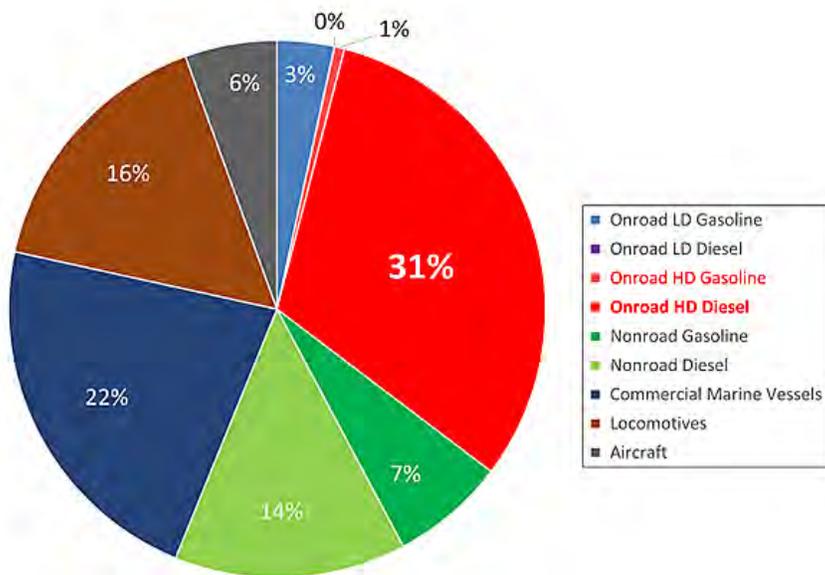
By the end of March 2023, EPA intends to release the proposals for the remaining two steps in the Clean Truck Plan. This includes the proposal for the heavy-duty greenhouse gas (GHG) standards “Phase 3” rule for Model Years 2027 and later, and the multipollutant standards proposal for light- and medium-duty vehicles for Model Years 2027 and later. EPA intends to also issue final decisions in early 2023 regarding several California waiver requests for California’s heavy-duty vehicle and engine emission standards.

Air Quality and Health Impacts of Heavy-Duty Vehicles

Emissions from heavy-duty vehicles contribute to poor air quality and health across the country, especially in overburdened and underserved communities. Without further reductions, heavy-duty vehicles will continue to be one of the largest contributors to mobile source emissions of NO_x, which react in the atmosphere to form ozone and particulate matter (PM). Heavy-duty vehicles would contribute 32 percent of the mobile source NO_x emissions, and 90% of on-road NO_x emissions, in calendar year 2045. These pollutants are linked to respiratory and/or cardiovascular problems and other adverse health impacts that lead to hospital admissions, emergency department visits, and premature deaths.

Pollution from trucks also directly affect people who live near roads and other areas of high truck activity like ports. Populations who live, work, or go to school near high-traffic roadways experience higher rates of numerous adverse health effects. EPA has estimated that 72 million people live within 200 meters of a truck freight route, and, relative to the rest of the population, people of color and those with lower incomes are more likely to live near truck routes. NO_x pollution from heavy-duty vehicles also impairs visibility and causes damage to terrestrial and aquatic ecosystems.

Mobile Source NO_x



Source: MOVES3 for onroad and nonroad and 2016 Emissions Modeling Platform for all other mobile sectors.

Significant Benefits to Public Health and Welfare

This final rule will deliver significant and needed public health benefits through ambitious standards that are feasible for the trucking industry, with appropriate consideration to cost and other factors. In 2045, this final rule will reduce NO_x emissions from the in-use fleet of heavy-duty trucks by almost 50% and would result in widespread air quality improvements across the U.S., especially in areas already overburdened by air pollution and diesel emissions. Reducing these emissions will provide cleaner air for communities across the country, prevent health issues like asthma, and ultimately save money, lives, and trips to the hospital.

The final rule will result in a present value of the stream of health-related benefits for the years 2027 through 2045 of \$200 billion, assuming a 3% discount rate. EPA estimates that in 2045, the final standards will result in public health benefits by preventing the following annually:

- Between 860 and 2,900 fewer premature deaths
- 6,700 fewer hospital admissions and emergency department visits
- 18,000 fewer cases of asthma onset in children
- 3.1 million fewer cases of asthma symptoms and allergic rhinitis symptoms
- 78,000 fewer lost days of work
- 1.1 million fewer lost school days for children

The benefits of the final rule would exceed its costs by as much as \$29 billion.

Reducing NO_x Emissions from Heavy-duty Vehicles: Final Standards

We are finalizing a program that will begin in MY 2027, which is the earliest year that these new criteria pollutant standards can begin to apply under CAA section 202(a)(3)(C).¹ The final NO_x standards are a single-step program that reflect the greatest degree of emission reduction achievable starting in MY2027, giving appropriate consideration to costs and other statutory factors. The final rule establishes not only new, much more stringent NO_x standards compared to today's standards, but also requires lower NO_x emissions over a much wider range of testing conditions both in the laboratory and when engines are operating on the road. Further, the final standards include longer useful life periods, as well as significant increases in the emissions-related warranty periods. The longer useful life and emissions warranty periods are particularly important for ensuring continued emissions control when the engines are operating on the road. These final standards will result in significant reductions in emissions of NO_x, PM_{2.5}, and other air pollutants across the country, which we project will meaningfully decrease ozone concentrations across the country. We expect the largest improvements in both ozone and PM_{2.5} to occur in areas with the worst baseline air quality, and EPA conducted an analysis that found larger numbers of people of color are projected to reside in these areas.

The final standards and requirements are based on further consideration of the data included in the proposed rule, as well as additional supporting data from our own test programs, and consideration of the extensive public input EPA received in response to the proposed rule. The EPA proposal included two options for the NO_x program. Proposed Option 1 was the more stringent option, and it included new standards and other program elements starting in MY 2027, which were further strengthened in MY 2031. Proposed Option 2 was the less stringent option, with new standards and requirements implemented fully in MY 2027. The final numeric NO_x standards and testing requirements are

¹ CAA section 202(a)(3)(C) requires that standards under CAA section 202(a)(3)(A), such as the standards in this final rule, apply no earlier than 4 years after promulgation, and apply for no less than 3 model years.

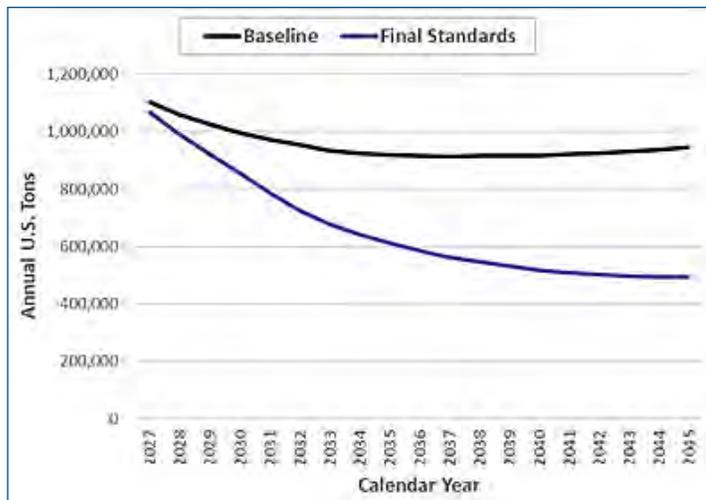
largely consistent with the proposed Option 1 in MY 2027. The final numeric standards and regulatory useful life values will reduce NOx emissions not only when trucks are new, but throughout a longer period of their operational life under real-world conditions. For the smaller engine service-class categories, we are finalizing the longest regulatory useful life and emissions warranty periods proposed, and for the largest engines we are finalizing requirements for useful life and emissions aftertreatment durability demonstration that are significantly longer than required today.

Addressing Emissions Throughout a Heavy-Duty Vehicle's Operational Life

As part of our comprehensive approach, the final rule includes longer regulatory useful life and emission-related warranty requirements to ensure the final emissions standards will be met through more of the operational life of heavy-duty vehicles. The final rule also includes maintenance and serviceability requirements that more clearly describe owner responsibilities for maintenance and use and provide more information on how to diagnose and repair emission control systems. We expect the new maintenance and serviceability requirements for manufacturers would help operators keep in-use engines and emission control systems working properly to maintain their certified emission levels in the real world.

Data also show that tampering and poor maintenance of the engine's emission control system after the useful life period is projected to result in NOx emissions that would represent a substantial part of the HD emissions inventory in 2045. To address this problem, as part of our comprehensive approach, the final rule requires manufacturers to design their engines to prevent operators from reprogramming the engine to bypass or disable emission controls (i.e., tamper). The final rule also includes a balanced approach to engine derates related to the SCR emission control system (i.e., SCR inducements). The final SCR inducement program requires engines to provide more advance notice for operators that their SCR system is not working properly, which we believe will encourage ongoing maintenance while limiting frustration due to unexpected engine derates. The requirements for electronic controls and SCR inducements are expected to reduce the risk of operators completely disabling emission control systems and further ensure that the new, emissions standards continue to be met during in-use operations.

**National Heavy-duty Vehicle NOx Emissions (Annual US Tons)
for Calendar Years Between 2027 and 2045**



For More Information

You can access the final rule and related documents on the U.S. Environmental Protection Agency, Office of Transportation and Air Quality webpage at:

<https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-and-related-materials-control-air-pollution>