

Methodology:

Under Attack: Vital Clean Air Standards and Historic Investments

Updated October 2025

Methodology

This report looks at the pollution reductions, health endpoints, and societal benefits of the important EPA actions¹ finalized between 2021 and 2024 and some of the important emission reducing provisions in the Inflation Reduction Act, listed below.

Included Important Clean Air Actions and IRA Provisions

- Power Sector
 - EPA Mercury and Air Toxics Standards for Power Plants
 - EPA New Gas and Existing Coal GHG Standards
 - EPA Good Neighbor Plan for 2015 Ozone
 - Important power sector tax credits including for renewable and nuclear energy, hydrogen, and CCS
- Transportation
 - EPA Heavy-Duty NOx standards for MY2027 and later vehicles
 - EPA Light-Duty GHG Standards, MY2023-2026
 - EPA Heavy-Duty GHG Standards, MY2027-2032
 - EPA Light/Medium-Duty Multipollutant Standards, MY2027-2032
 - Preemption Waiver on Advanced Clean Trucks
 - Important light-duty vehicle tax credits including for new zero-emission vehicles and EV batteries
- Methane
 - EPA Methane Standards for New and Existing Oil and Gas Sources
 - EPA Methane Waste Emission Charge
- NAAQS
 - Fine Particulate Matter NAAQS

To understand the full impact of the actions listed above, we also account for the significant impacts associated with the Inflation Reduction Act (IRA). The IRA investments into clean energy and manufacturing will spur substantial climate and air pollution reductions within the power and transportation sectors that are not accounted for in EPA's most recent rulemakings. Therefore, our analysis looks at the important clean air rulemakings since 2021 and EPA's modeling of the impact of the IRA on the power sector and on light- and medium-duty vehicle rulemakings.²

¹ California's Advanced Clean Trucks rule was issued a waiver by EPA in April 2023. Including California, 11 states have adopted ACT. For the ease of discussion in this paper, the rules are referred to as being EPA actions.

² To prevent double counting, the power sector benefits of the Good Neighbor Plan are excluded from the total summation as they are likely accounted for the in reductions of emissions from the power sector from the IRA. The industrial emission impacts remain. More discussion below in Methodology.

To quantify the climate pollution reductions from these actions, we looked at changes in emissions of CO₂ and methane. These reductions in CO₂e emissions are largely from agency estimates from each rulemaking's Regulatory Impact Analysis or the associated modeling outputs. For the impacts of the IRA tax incentives on the transportation and power sectors, we used EPA modeling. In the results, these impacts are captured in their respective sectors, transportation and power. EPA also characterized the impact on vehicle sales for the ACT rule in their HD GHG rulemaking. Described in more detail below is the methodology related to the ACT rule.

To quantify the health benefits from these actions, we looked at projected changes in primary PM_{2.5}, PM_{2.5} precursor emissions (i.e., NO_x and SO₂), and ozone precursor emissions (i.e., NO_x and VOC) and applied reduced-form tools developed by EPA to estimate the number of health outcomes (incidences) avoided. EPA-derived incidence per-ton (IPT) factors relate changes in emissions from 21 sectors to various health incidences. Specifically, we multiplied EPA sector-specific IPT factors (e.g., for electric generating unit, internal combustion engine, upstream refinery, and oil and natural gas sectors) by tons of emissions reductions, for specific health outcomes (e.g., premature mortality).³ Using this methodology, we were able to estimate the collective benefits resulting from these EPA actions.⁴

For the power sector standards, EPA used its Integrated Planning Model (IPM) to estimate emissions reductions that would occur in certain years during the implementation period of the rules—e.g., in 2028, 2030, 2035, 2040, and 2045 for the power sector NSPS; and in 2028, 2030, and 2035 for the power sector MATS. To evaluate the cumulative impacts of these rules we assumed emissions reductions in intervening years in the same way that EPA applied values in intervening years in the IPM—e.g., EPA mapped the calendar years 2028-29 to the 2028 model run year, calendar years 2030-31 to the 2030 model run year, calendar years 2032-37 to the 2035 model run year, calendar years 2038-42 to the 2040 model run year, calendar years 2043-47 to the 2045 model run year, and calendar years 2048-52 to the 2050 model run year.

In addition to the sector specific standards, EPA also updated the National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM_{2.5}). The allowable level of annual PM_{2.5} was strengthened in 2024, with EPA reducing the annual standard from 12 µg/m³ to 9 µg/m³. We assumed the same level of emissions reductions that EPA modeled in 2032—i.e., reductions needed to meet an annual standard of 9 µg/m³ and a 24-hour standard of 35 µg/m³—in each subsequent year through 2051, consistent with EPA's assumption that present value costs and net benefits, before discounting, are steady from year to year.⁵

³ EPA maintains incidence per-ton (IPT) factors for direct PM_{2.5} and PM_{2.5} precursors and for ozone precursor emissions from 21 sectors in 2025, 2030, 2035, and 2040. This analysis uses IPT factors published January 17, 2023. See <https://www.epa.gov/benmap/estimating-benefit-ton-reducing-directly-emitted-pm25-pm25-precursors-and-ozone-precursors>

⁴ The EPA methodology includes high and low IPT factors, with health benefits presented here based on the high values. In determining cumulative health benefits we applied the following IPT factors, choosing a year that falls within the rules' timelines: we used IPT factors from 2040 to estimate cumulative health benefits from the Power Sector NSPS and all four of the transportation actions; we used IPT factors from 2035 to estimate cumulative health benefits from the power sector MATS rule, the PM_{2.5} NAAQS reconsideration, and the two methane rules; and we used IPT factors from 2030 to estimate cumulative health benefits from the Good Neighbor Plan.

⁵ EPA-452/R-24-006. *Final Regulatory Impact Analysis for the Reconsideration of the National Ambient Air Quality Standards for Particulate Matter* (January 2024) Table ES-11

Because NAAQS are not directed at any specific emissions source, the reductions in PM_{2.5} projected from some of the other sector specific actions discussed in this report may contribute to the needed reductions to meet the NAAQS. Since it is possible that some of the reductions would be in locations that need to reduce their annual PM_{2.5} levels to meet the new NAAQS but it's unlikely that there would be perfect overlap, we assess a range of health benefits from the PM_{2.5} NAAQS. Our low end estimate uses a combination of EPA sector-based IPT factors and assumes all of the PM_{2.5} reductions from other actions contribute to the needed reductions to meet the PM_{2.5} NAAQS in 2032.⁶ Taking into account the amount of PM_{2.5} emissions reductions from other EPA actions—e.g., over 5,000 tons from power sector rules and over 200,000 more from transportation standards—we estimate that an additional 430,000 tons of particulate matter emissions would still need to be reduced across the country to meet these standards. Our high end estimate uses EPA BenMAP-CE model-derived IPT factors and assumes none of the PM_{2.5} reductions from other EPA actions contribute to the needed reductions, in the needed locations, to meet the NAAQS (i.e., all 660,000 tons of PM_{2.5} emissions reductions would occur in addition to PM_{2.5} emissions reductions from other EPA actions).⁷

To quantify the impacts of repealing the vehicle GHG standards, we used EDF's modeling from the comment period. This was used in place of EPA's modeling from the 2024 HD Phase 3 rule, 2021 LD GHG rule, and in place of the GHG portions of the 2024 LMD multipollutant rule. In the modeling, due to the uncertainty caused by removing all GHG standards, EDF modeled a low and high emissions case. These are represented in the results. The proposed repeal of the greenhouse gas rules does not impact the criteria pollutant standards in the 2024 LMD multipollutant rule. However, EPA still appears likely to repeal or severely weaken the criteria pollutant standards finalized in 2024 so we still needed to capture those impacts. EDF's modeling of the 2025 proposed repeal assumes no change in LMD tailpipe NMOG+NO_x emissions and very limited change in tailpipe PM emissions. The change in tailpipe PM EDF modeled in 2025 was removed from the reductions estimated by EPA for tailpipe PM in their modeling for the 2024 LMD rule. Then the remaining tons of tailpipe NO_x, PM, and VOC emissions were included in this analysis. Those tailpipe NO_x, PM, and VOCs were also used to estimate health incidences that were included in this analysis. The monetized health benefits from the 2024 LMD rule were also modified to account for just the criteria pollutant portion. To do this, the fraction of reduced premature mortality from the total rule compared to the premature mortality from the narrowed tailpipe emissions were calculated and applied to the health benefits to get a reduced health benefits value.

The monetized benefits are based on EPA estimates in the rulemakings for the following actions: the Power Sector NSPS, MATS and Good Neighbor Plan; the transportation light- and heavy-duty GHG emissions standards, multipollutant emissions standards for light- and medium-duty vehicles, and NO_x emissions standards for heavy-duty vehicles; and methane standards and waste emissions charge program for the oil and gas sector.

⁶ To calculate the health outcomes for this low end scenario, we used a combination of EPA's 2040 sector-based IPT factors representative of the types of emissions reductions expected to meet the PM_{2.5} NAAQS. Based on EPA's modeled emissions reductions by sector, we assumed 10% of emissions reductions are from residential woodstoves and 90% of emissions reductions are from boilers (or similar combustion sources); see apportioned emissions reductions in Table 3-7 of EPA's RIA for the finalized NAAQS reconsideration.

⁷ IPT factors are calculated using the premature mortality and illness incidents, and the annual emissions reductions needed for the 9/35 µg/m³ scenario in Tables 5-5 and ES-2, respectively, of the RIA (EPA-452/R-24-006, January 2024)

Limitations of analysis

This analysis only includes important rulemakings and the important provisions of the IRA modeled by EPA for the power sector and passenger vehicles. There have been many other actions in the past few years that will likely result in additional climate and criteria pollution reductions, such as reforming efficiency codes and the many grant programs in IRA and BIL. As a result, this is likely a conservative estimate of the climate and health benefits from recent clean air actions.

This analysis relies mostly on agency modeling, mostly from EPA. This includes EPA's modeling of the impacts of IRA tax credits on the power and transportation sectors. A limitation of using EPA modeling is the time frames included in their analyses. For some of the rulemakings, EPA included a limited scope when assessing the benefits of the rule. For instance, the methane emissions standards for new and existing oil and gas sites only models out to 2038 while the two recent transportation rules model out to 2055. This likely results in an underestimation of the total emissions impact of the rules out to 2055.

The health outcomes quantified are for reductions in PM_{2.5}, PM_{2.5} precursors, and ozone precursors. Some of these rules, such as MATS, reduce other known health hazards like mercury that are not properly accounted for in the health outcomes analysis. This results in an underestimation of the health benefits.