

Electrifying Heavy-Duty Vehicles Will Benefit the U.S. Economy, Environment, and Public Health

Heavy-duty vehicles (HDVs) like large trucks, buses, and tractor trailers are an important mode of transportation for people and products throughout the United States, but they are also among the highest emitters of harmful pollution. Though only 1 in 10 on-road vehicles is an HDV, they account for *over half* of the particulate matter pollution produced by the vehicle transportation sector and a significant share of other harmful emissions.

This problem presents an important opportunity to invest in the health of our families, environment, and economy by replacing inefficient, high-polluting, diesel-powered HDVs with clean heavy-duty electric vehicles (HDEVs) throughout our transportation systems. States like California and New Mexico are already taking bold action by setting strong state-level regulations that support HDEVs, and Democrats in Congress and the Biden Administration have taken pivotal steps to accelerate HDEV adoption and strengthen charging infrastructure. The recently announced Environmental Protection Agency (EPA) [rules](#) for HDV emissions represent an important positive step towards bolstering our economy, public health, and environment. Quick implementation of these rules and other policies will benefit our communities and turbocharge the adoption of HDEVs.

HDVs produce an outsized share of pollution in the transportation sector.

The transportation sector is [responsible](#) for more than a quarter of all greenhouse gas emissions in the United States. Though they only make up 10% of on-road vehicles, [HDVs](#) (defined as [vehicles](#) with gross vehicle weight ratings greater than 8,500 pounds) produce 28 percent of greenhouse gas emissions, 45 percent of nitrogen oxide emissions, and 57 percent of particulate matter emissions that come from on-road vehicles. This is largely because HDVs are more likely to use higher-polluting diesel engines, have low fuel economy, and are driven more miles compared to other vehicles. Together, these qualities exacerbate their negative climate, economic, and health impacts.

Electrifying the heavy-duty vehicle fleet can mitigate a range of environment and public health risks and benefit Americans.

Larger vehicles are much more likely to burn diesel fuel, which is particularly problematic for public [health](#). [Diesel](#) pollution is composed of nearly 40 toxic chemicals that can cause high blood pressure, blood clots, Chronic Obstructive Pulmonary Disease (COPD), allergies, asthma, stroke,

heart attack, and pregnancy complications. The Clean Air Task Force has estimated that diesel pollution is responsible for as much as one trillion dollars in annual health damages, including over 3,700 heart attacks, 8,800 deaths, and hundreds of thousands of cases of respiratory illnesses. [Children](#) are especially vulnerable to adverse health effects, such as [exacerbated](#) allergies, because they breathe fifty percent more air per pound of body weight than adults.

Some of this diesel pollution is produced when drivers leave their trucks idling with the engine on while they wait to pick up [cargo](#) or when they rest at truck stops. HDVs used for long distance transportation, such as semi-trucks, [idle](#) for around 1,800 hours per year, consuming roughly 1,500 gallons of diesel fuel. Trucks in the United States consume an estimated one billion gallons of fuel each year while idling during rest periods, at a cost of approximately \$3 billion dollars. This equates to over eleven million tons of carbon dioxide, 55,000 tons of nitrogen oxides, and 400 tons of particulate matter emissions while the vehicles are not even moving. Though drivers can reduce emissions from idling by using auxiliary power units or heating and cooling technologies, transitioning to electric vehicles would remove this source of pollution entirely.

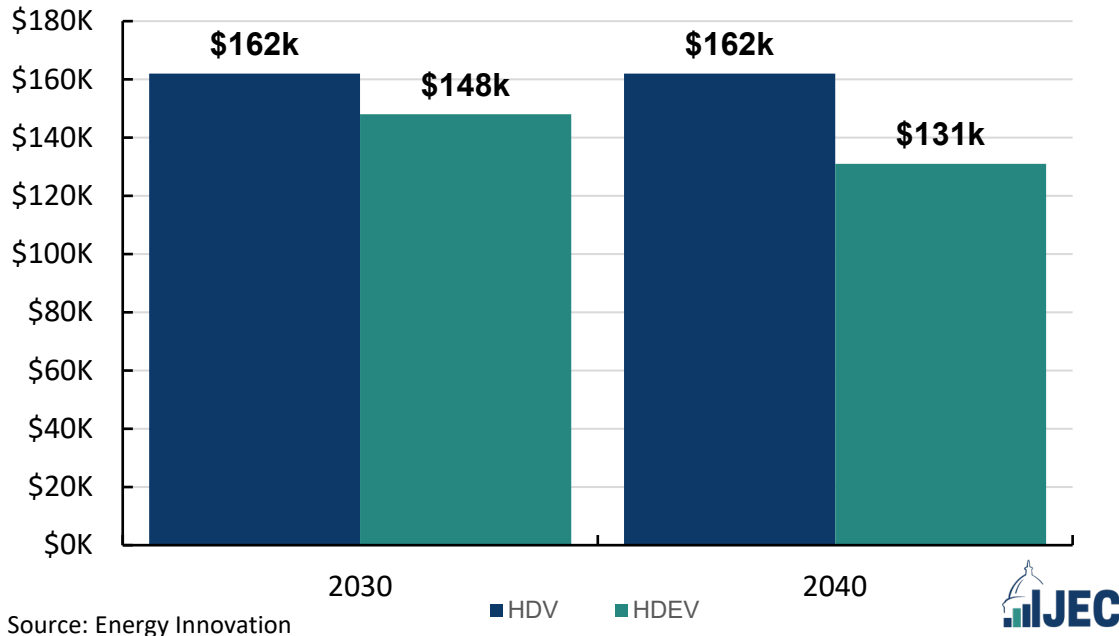
Electrifying the trucks used at large freight hubs and across the country can reduce pollution and benefit the economy. Researchers [estimate](#) that even electrifying roughly a third of HDVs in the Chicago region, North America's largest freight hub, would yield about \$6.3 billion in net climate and health benefits. The true benefits are likely higher, as this study was based on the 2016 electric grid, which was much more dependent on fossil fuels than the grid today. By [continuing](#) to move toward HDEVs and clean energy [grids](#) nationally, the U.S. could see \$735 billion in public health benefits, 66,800 fewer premature deaths, 1.75 million fewer asthma attacks, and 8.5 million fewer lost workdays for U.S. counties closest to major trucking routes by 2050.

Employees and employers can save money and see significant health and economic benefits from HDEVs.

While the upfront cost of an HDEV can be significant, both policies and technological innovation are driving costs down for consumers. Forecasters expect that most classifications of HDEVs will [cost](#) less than their diesel counterparts by 2030 largely due to [falling](#) battery prices, with some classes expected to cost \$24,000 less than their diesel alternatives in 2030. Some HDEVs are already [cheaper](#) when accounting for the total costs of ownership (TCO)—which includes upfront purchase costs, sales tax, average maintenance, battery replacements, and fuel costs. HDEVs with gross vehicle weight ratings over 26,000 pounds, such as tractor-trailers, will possess a \$200,000 TCO advantage over diesel-powered HDVs by 2030. This is a conservative estimate that does not factor in investments from the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL).

Many HDEVs Are Expected to Be Cheaper than Traditional HDVs by 2030

Projected purchase cost by 2030 and 2040 for vehicles with gross vehicle weight ratings greater than 33,000 lbs, in thousands of 2022 dollars



Source: Energy Innovation

HDEVs can also help with driver retention. Mike Roeth, executive director of the North American Council for Freight Efficiency, noted that HDEVs are likely to [improve](#) retention by reducing the physical and mental strain caused by vibrations and noise pollution from traditional HDVs. Retention in this job is especially important as the United States faces growing [shortages](#) of truck drivers, in part due to the investments made through the BIL, the CHIPS and Science Act, and IRA. Indeed, HDV drivers have also been vocal about their appreciation of HDEVs. Donald Disesa, a driver for Penske, [shared](#), “The truck is so quiet, everything is smooth... With the diesel trucks there’s rattling, there’s driver fatigue, things you don’t even know are going on. But as soon as I got in the electric truck, I realized this is the way of the future.”

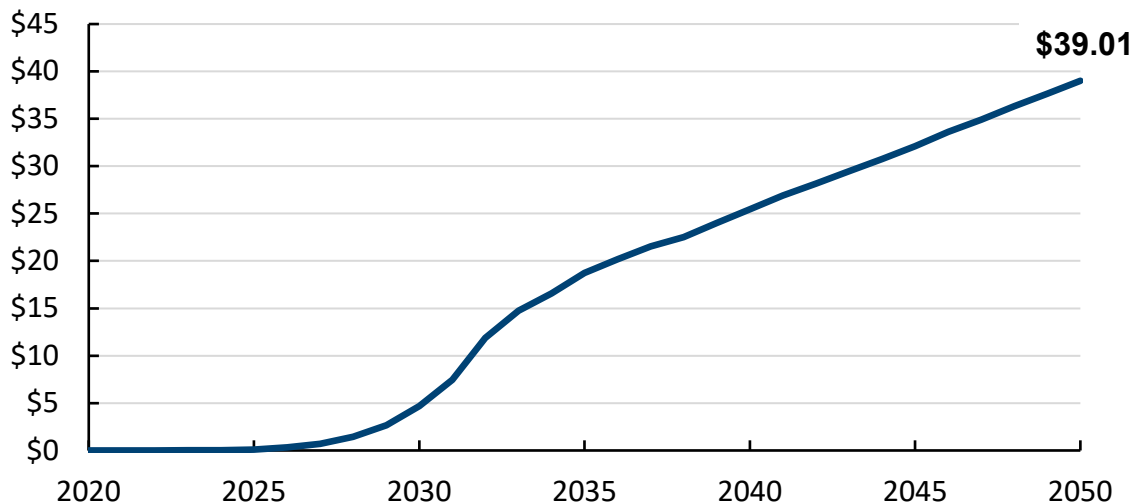
There are also benefits to fleet electrification for the people who build HDVs. Research [suggests](#) that it takes more labor hours to build the powertrain—the system responsible for a vehicle’s movement—for electric vehicles than for a standard internal combustion engine vehicle. This more labor-intensive production means that companies need more employees to build these electric vehicles, not fewer. Continuing battery [manufacturing](#) in the United States while ensuring fair wages and benefits will lead to better and more sustainable jobs for Americans in the truck manufacturing sector.

Scaling up effective state regulations of heavy-duty vehicles would generate billions of dollars in nationwide benefits.

Both originating in California, the [Advanced Clean Trucks \(ACT\)](#) rule sets sales [goals](#) to increase the uptake of zero-emission trucks while the [Advanced Clean Fleets \(ACF\)](#) rule similarly requires a phases-in of zero-emission vehicles for certain fleets and requires manufacturers to only manufacture zero-emission vehicles starting in the 2036 model year. Ten other states, including New Mexico, have currently [adopted](#) the ACT framework for future model years to further accelerate the clean energy transition while EPA [finalized](#) its national standards. Application of the ACT rule nationwide would produce billions of dollars in benefits, especially when applied to the high-polluting Class 7-8 vehicles with gross vehicle weight ratings greater than 26,000 [pounds](#). These vehicles [account](#) for 28 percent of greenhouse gas emissions, 45 percent of nitrogen oxide emissions, and 57 percent of particulate matter emissions from HDVs.

HDEV Uptake Can Yield Billions of Dollars in Benefits

Annual monetized avoided deaths and climate benefits from ACT regulation on Class 7-8 vehicles, billions of 2020 dollars.



Source: Energy Innovation

Note: Data does not account for IRA and BIL investments.



New Mexico's [adoption](#) of the ACT rule and Heavy-Duty Low NOx Standards, for example, are projected to yield over three billion dollars in net societal benefits through 2050. If these same standards were to be implemented [nationwide](#), the United States would save close to \$500 billion in net societal benefits compared to a baseline scenario without these policies through 2050. These benefits include reductions in pollution, vehicular ownership costs, health complications, and premature deaths.

The newly announced HDV emissions standards from the EPA will support HDEV uptake, improve public health, and lead to significant economic benefits.

Building on this state-level progress, the EPA has finalized regulations on HDVs that will reduce [greenhouse gas emissions](#) and [pollution](#). EPA's most recent "Phase 3" [standards](#) are [projected](#) to significantly reduce carbon dioxide emissions and subsequently yield \$13 billion in net benefits each year through 2055, even after accounting for associated equipment costs.

Compliance with this rule can [save](#) purchasers \$250 billion through 2055 because HDEVs require less fuel and have lower vehicle maintenance costs. Despite claims by some trucking manufacturers, independent [research](#) shows that strong truck emission standards do not disrupt sales or employment in the trucking industry. Additionally, removing or reducing the 12% federal excise [tax](#) would reduce up-front investment costs for HDEVs. Together these policies can promote economic prosperity, advance the United States' commitment to its climate goals, and protect populations vulnerable to the climate crisis and pollution.

The EPA is also considering approval of a [rule](#) to cut pollution in localities across Southern California, where nearly half of the state's residents reside. The rule, proposed by the South Coast Air Quality Management District, seeks to reduce harmful pollutants in and around warehouses that disproportionately burden communities of color. Compliance with the rule will promote the utilization of zero emission technologies in warehouse operations and transportation.

The Biden administration has already begun implementing legislation that invests in heavy-duty EVs and will expand the required charging infrastructure.

These regulatory efforts will build on the landmark investments in HDV electrification included in the IRA and BIL. The IRA [invests](#) billions of dollars in funding through tax rebates, tax credits, grants, and [loans](#) to make it cheaper to manufacture and buy HDEVs. For example, the IRA provides a tax credit capped at \$40,000 for purchasing heavy-duty electric vehicles. Over time, these investments will help close the [price](#) gap between electric and internal combustion vehicles by 2030 across a range of vehicle sizes. Six percent of the purchase costs of commercial charging infrastructure for governments and businesses—which can take up to \$100,000 off the purchase price—are covered by the IRA, making fleet electrification much easier.

The BIL also provides \$18.1 billion to [build](#) out the electric charging network and increase the adoption of electric trucks and buses. The law targets its investments in commercial charging infrastructure where it is needed most, as one percent of counties are [projected](#) to account for fifteen percent of medium and heavy duty vehicle charging needs in 2030. The BIL's Discretionary Grant [Program](#) for Charging and Fueling Infrastructure and National Electric Vehicle Charging Formula Program will help build 500,000 electric vehicle chargers along major vehicle corridors and in many disadvantaged communities. New Mexico recently [received](#) \$64 million from the former program to build two HDEV pull-through [charging stations](#) along the heavily-trafficked Interstate 10. These and other investments are key to the Joint Office of Energy and Transportation's recent plan for achieving zero-emission freight [corridors](#).

The BIL is also investing in hydrogen fuel, which is another viable alternative to traditional diesel- and gasoline-powered heavy-duty vehicles; however, the technology currently [lags](#) behind battery-electric vehicles. The law helps address this technology gap by committing more than \$90 million for [hydrogen](#) infrastructure in some western states. In 2023, the Biden administration also awarded seven billion dollars in BIL funding for clean hydrogen-related research and [development](#).

Historically burdened communities are being prioritized under President Biden's environmental justice initiatives.

Because communities adjacent to warehouses, highways, and ports of entry often bear the [brunt](#) of pollution from HDVs, transitioning to HDEVs can deliver public health and economic benefits for historically overburdened communities. 72 million Americans are [estimated](#) to live near truck freight routes, [45%](#) of whom are people of color. This [disparity](#) is in part caused by warehouse developers seeking locations with low land rents, low-wage labor pools, and weak political power. Simultaneously, the persistent legacies of systemically racist policies such as [redlining](#), [blockbusting](#), restrictive zoning laws, and land use regulations impede integration and relegate people of color to communities heavily impacted by pollution. Increased exposure to nitrogen oxides and particulate matter prevalent in the emissions from HDVs can [cause](#) asthma and other illnesses. This contributes to stark population health disparities, with Black people [40%](#) more likely to have asthma, and [three](#) times more likely to die from asthma relative to white people.

Within days of taking office, President Biden instituted the [Justice40](#) initiative, which seeks to provide underserved communities with forty percent of the benefits associated with federal investments across a wide range of sectors, including clean energy and transportation. The EPA has several Justice40 covered [programs](#) specifically intending to combat HDV pollution, such as the Clean Heavy-Duty Vehicle [Program](#) and the Diesel Emissions Reduction [Program](#). The former provides one billion dollars in grants and rebates to prioritize the health of those living near freight routes, while the latter offers grants to modernize older diesel engines.

Conclusion

Investment in HDEVs, charging infrastructure, and electric grids will provide a number of substantial climate, economic, and health benefits. The combination of EPA's robust Phase 3 standards, effective state policies, and reducing or removing the federal excise tax for HDEVs can accelerate the transition to a clean energy economy that supports working families and protects our health and the environment.