



Clean Cars, Clean Air, Consumer Savings:
100% New Zero Emission Vehicle Sales by 2035
Will Deliver Extensive Economic, Health and Environmental
Benefits to all Americans

January 2021

Introduction

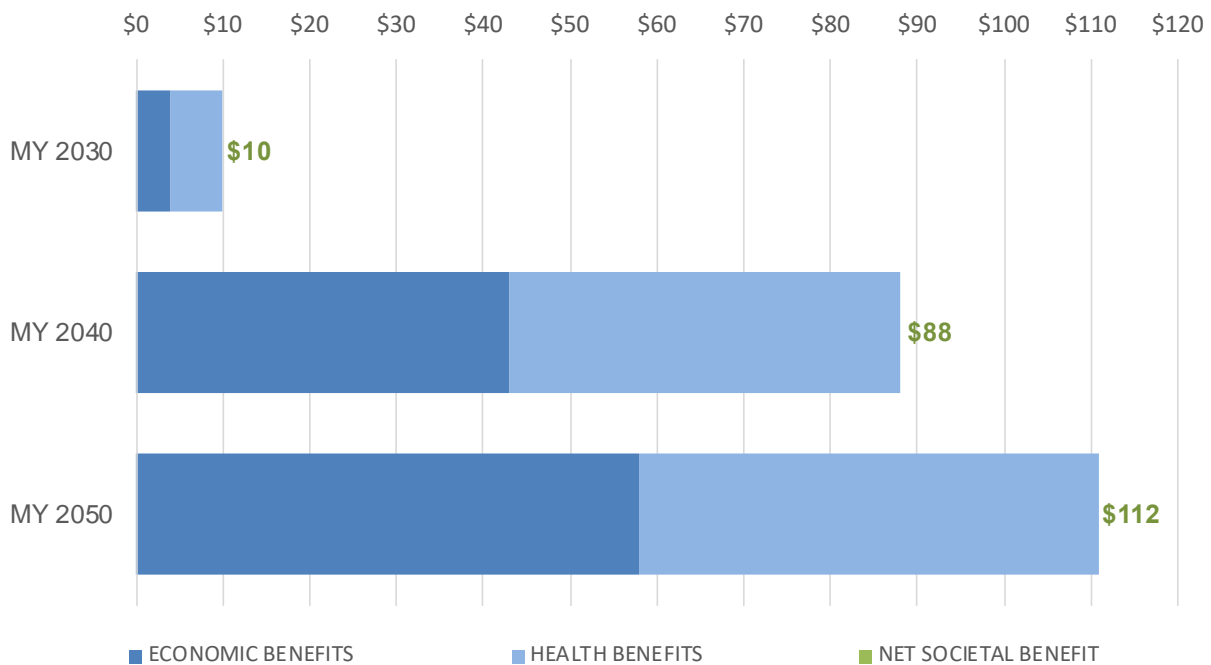
The Biden-Harris Administration has committed to achieving a 100% clean energy economy and net-zero emissions no later than 2050 and, as part of that goal, ensuring that 100% of new sales for light and medium-duty vehicles will be electrified.ⁱ Rapidly ensuring all light, medium- and heavy-duty vehicles are zero-emitting is one of the most important actions that the United States can take to reduce climate pollution and provide healthier and longer lives for millions of Americans, especially communities of color that are more likely to be harmed by pollution from the transportation sector as a result of discriminatory policies and practices. Adopting transformative, multipollutant standards will also provide important consumer and economic benefits, saving Americans money through avoided fuel costs and delivering high-quality jobs.

Ensuring that all new sales of passenger vehicles are zero emission vehicles (ZEV) by 2035 and new medium- and heavy-duty trucks are ZEVs by 2040 is a transformational change that will require a whole of government approach. Multipollutant standards must be paired with societal investments in infrastructure and American manufacturing, vehicle purchase incentives and other policies that will ensure the transition is both rapid and durable and that the benefits of electrification are shared equitably by all Americans. This report focuses on the important role that multipollutant standards for passenger vehicles that ensure all vehicles sold in 2035 are zero-emitting would play in that landscape and the substantial benefits they would deliver.ⁱⁱ Figure ES-1 sets forth these considerable net benefits, which include:

- Saving buyers of a new 2027 battery electric vehicle (BEV) more than \$5,300 over the life of the vehicle. In 2035, buyers of new BEVs will save more than \$8,200 compared to a gasoline vehicle.
- Avoiding more than 600 million metric tons of greenhouse gas (GHG) emissions in 2040 – roughly the annual climate emissions from Canada – and eliminating more than 11.5 billion tons cumulatively by 2050 – far more than the carbon emissions from China last year, which is responsible for more than a quarter of the world’s climate pollution.
- Significantly reducing ozone forming pollution and harmful particulate pollution that disproportionately burdens people of color. These pollution reductions would avoid as many as 5,000 premature deaths and 281,000 lost workdays each year by 2040 and prevent as many as 98,000 premature deaths cumulatively by 2050.
- Saving Americans \$88 billion annually by 2040 in economic and pollution benefits and nearly \$1.6 trillion cumulatively by 2050, almost 10% of current U.S. GDP.

FIGURE ES-1—100% NEW ZEV SALES YIELD SUBSTANTIAL NET ECONOMIC AND HEALTH BENEFITS TO THE U.S.

(BILLION \$2019)



America's clean car standards are among our most effective policies for reducing pollution exposure, cutting climate emissions, and creating good jobs.

Background

America's clean car standards are among our most effective policies for reducing pollution exposure, cutting climate emissions, and creating good jobs. Building on these past successes, the Biden-Harris campaign committed to establishing new ambitious emissions standards based on the increasing availability of zero emitting vehicles, with the ultimate goal of ensuring 100 percent of new passenger vehicles sold are ZEVs.ⁱⁱⁱ

In addition to the important health and air pollution benefits these standards will deliver, the Biden-Harris campaign vowed to create one million new jobs in auto manufacturing, auto supply chains, and auto infrastructure.^{iv} Specific plans include increasing demand for and production of American-made electric vehicles (EVs), incentives for car buyers to switch to EVs, a commitment to build 500,000 charging stations and accelerating battery research and development.^v

There is broad support for this vision. Automakers representing nearly half of the U.S. market have committed to working with the Biden-Harris administration to enact ambitious policies that will create high-quality domestic jobs, protect our health, and confront the climate crisis. GM and Nissan recently withdrew their support of the Trump administration's attack on state clean car authority,^{vi} and GM has expressed its support for President



Price parity
between electric
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conventional
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around 2025.



Automakers are
investing **\$247
billion** worldwide
on electrification
through 2030.

Biden’s vision of a zero emission transportation future.^{vii} Ford has gone a step farther, recently applauding California’s bold commitment to make all new cars sold in the state zero-emitting by 2035.^{viii} Over 200 state and local officials from 26 states, and over 285,000 people, have called on Toyota and Fiat Chrysler to change course and invest in clean transport innovation, not litigation trying to support the Trump administration’s rollback.^{ix}

Automakers are also embracing electrification by investing billions of dollars in ZEV development. As a result, the cost of battery packs has fallen dramatically and is projected to continue to decline. Most analysts agree that price parity between electric vehicles and conventional vehicles will occur around 2025.^x A recent analysis by the International Council on Clean Transportation (ICCT) projects that purchase cost parity will occur between 2024-2028 depending on vehicle range and that the total cost of ownership parity will occur one to two years earlier, due to high fuel cost savings.^{xi} A recent M. J. Bradley report on the status of the electric vehicle market found that automakers are investing \$247 billion worldwide on electrification through 2030, increasing EV model offerings from 60 to 76 between 2021 and 2023 in the United States, and that by 2021 there will be at least four EV models available in the U.S. for under \$30,000 (MSRP) with a range of at least 250 miles.^{xii} GM announced that it is committing \$27 billion to EVs and autonomous vehicles (AVs) by 2025 and 50 percent of its product development will go toward EV and AV development.^{xiii}

The growing demand for ZEVs and related increase in manufacturing and infrastructure is creating jobs. In 2019, there were more than 240,000 people employed in jobs related to hybrid and electric vehicles, and nearly 500,000 working in jobs focused on fuel efficient components.^{xiv} Ford and GM recently announced plans to hire thousands more workers over the next year alone to support their EV line ups.^{xv}

States are also helping drive the shift to ZEVs. Last year, California Governor Gavin Newsom signed an executive order directing the Air Resources Board (ARB) to develop regulations that require 100 percent of in-state sales of new passenger cars and trucks to be zero emission by 2035.^{xvi} Massachusetts recently announced that it will follow California’s lead and also ensure 100 percent new ZEV sales by 2035.^{xvii} Federal multipollutant standards that build on these state requirements would extend the massive health and economic benefits across the country.



More than
20,000
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Protecting the health of all Americans

Nearly half of all Americans live in counties with unhealthy levels of ozone or particle pollution.^{xviii} And more than 20,000 Americans die prematurely every year as a result of the motor vehicle pollution on our roads and highways.^{xix}

The transportation sector is the largest source of climate pollution in the U.S. and one of the biggest sources of harmful tailpipe pollutants, including ozone-forming oxides of nitrogen (NOx), fine particulate matter (PM_{2.5}), and hundreds of toxic contaminants. Hundreds of studies over multiple decades



A transformative shift to electrification and zero emitting vehicles is one of the most important steps our nation can take.

have found that exposure to vehicle pollution causes adverse health impacts in utero, in infants and children, and in adults, and those that live closest to our nation's roads and highways face the greatest harms.^{xx}

As a result of housing discrimination and other unjust policies, communities of color suffer disproportionately from this harmful pollution.^{xxi} The American Lung Association's 2020 State of the Air report found significant disparities in terms of people of color residing in counties with failing grades for ozone and/or particle pollution – people of color were 1.5 times more likely to live in a county with at least one failing grade, and 3.2 times more likely to live in a county with a failing grade for unhealthy ozone days, particle pollution days and annual particle levels.^{xxii}

A transformative shift to electrification and zero emitting vehicles is one of the most important steps our nation can take to help alleviate the health burden on Americans due to air pollution.

National pollution standards that achieve 100% new ZEV sales by 2035

This report examines the vehicle cost, fuel savings, pollution reductions, economic benefits and health-related benefits of pollution standards that achieve 100 percent new light-duty ZEV sales nationwide in 2035. The analysis estimates these impacts against a baseline that assumes national ZEV sales will reach a level of 3.7 percent of new vehicle sales in 2026^{xxiii} and that new gasoline vehicles will comply with greenhouse gas and fuel economy standards consistent with agreements between California and five major automakers by 2027. It also assumes that the electricity grid will be 100 percent renewable by 2035 consistent with commitments by the Biden administration.^{xxiv}

The methodologies underpinning this analysis are consistent with previous analyses conducted by the U.S. Environmental Protection Agency (EPA) in these areas, such as those used in its original Proposed and Final Determinations regarding the 2022-2025 GHG standards for cars and light trucks.^{xxv} The report uses the most up-to-date projections of the cost of electric vehicles, as well as the most recent projections of future gasoline prices.^{xxvi}

100% new ZEVs by 2035 will deliver substantial consumer savings

Our analysis of the economic impacts of 100% new ZEV sales by 2035 for consumers assesses all major variables that affect the aggregate costs of owning and operating a passenger vehicle: vehicle purchase, insurance, fuel, home-charging and maintenance costs.^{xxvii} Purchasers of new ZEVs (BEVs and plug-in hybrid electric vehicles (PHEVs)) will quickly see significant

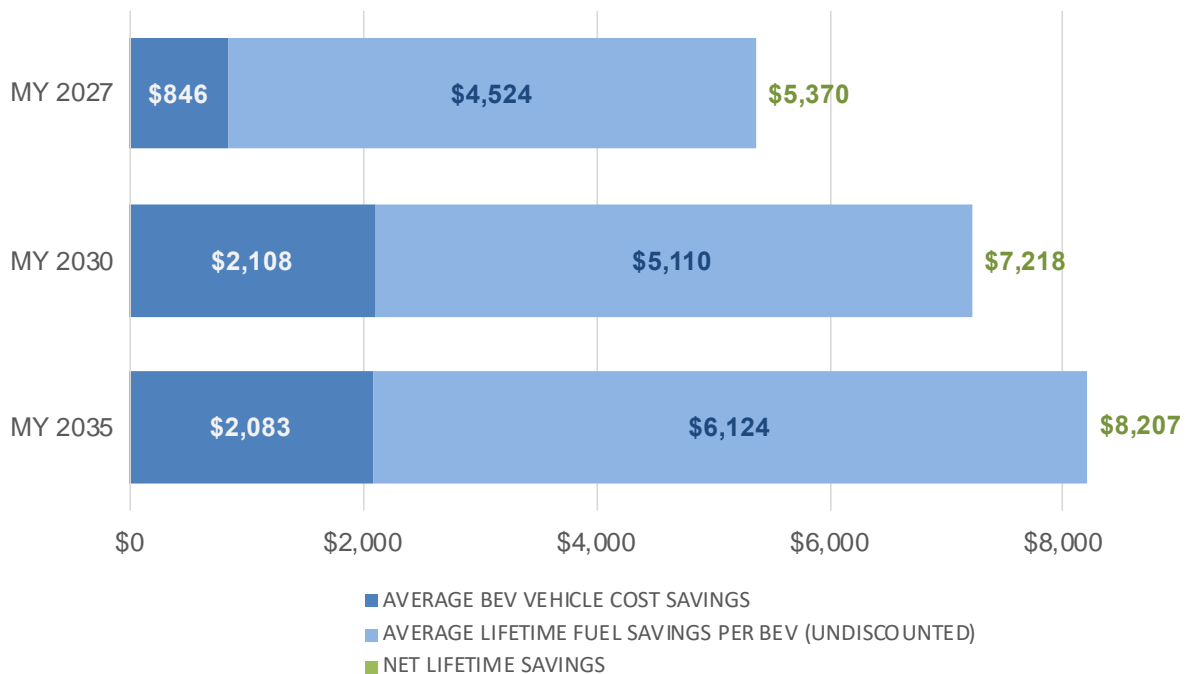


The buyer of a model year 2027 BEV will see immediate savings.

vehicle and fuel cost savings, well before 2035, and the savings will continue to increase over time.^{xxviii}

As shown in Figure 1, the buyer of a model year 2027 BEV will see immediate savings of \$846 on the purchase cost of the BEV compared to a gasoline vehicle and over \$4,500 in fuel costs over the life of the vehicle for a cumulative savings of over \$5,300. The buyer of a model year 2030 BEV will see a cumulative savings of more than \$7,200 over the life of the BEV. These savings to buyers of new BEVs continue to increase in 2035 and beyond. In addition to these consumer benefits, the per-vehicle pollution reductions and associated health benefits are substantial. For example, just one 2030 BEV will deliver nearly \$8,000 in additional societal benefits as a result of reduced carbon and particulate pollution which increase the total net benefits to more than \$15,000 per vehicle.

FIGURE 1—BUYERS OF NEW BEVS WILL REALIZE LARGE NET LIFETIME SAVINGS
(COMPARED TO GASOLINE VEHICLE)
(\$ SAVED PER VEHICLE)



100% new ZEV by 2035 will reduce greenhouse gases by billions of tons

In addition to the economic benefits, national pollution standards that eliminate pollution from new light duty vehicles by 2035 will deliver significant climate and health benefits by reducing greenhouse gas and other

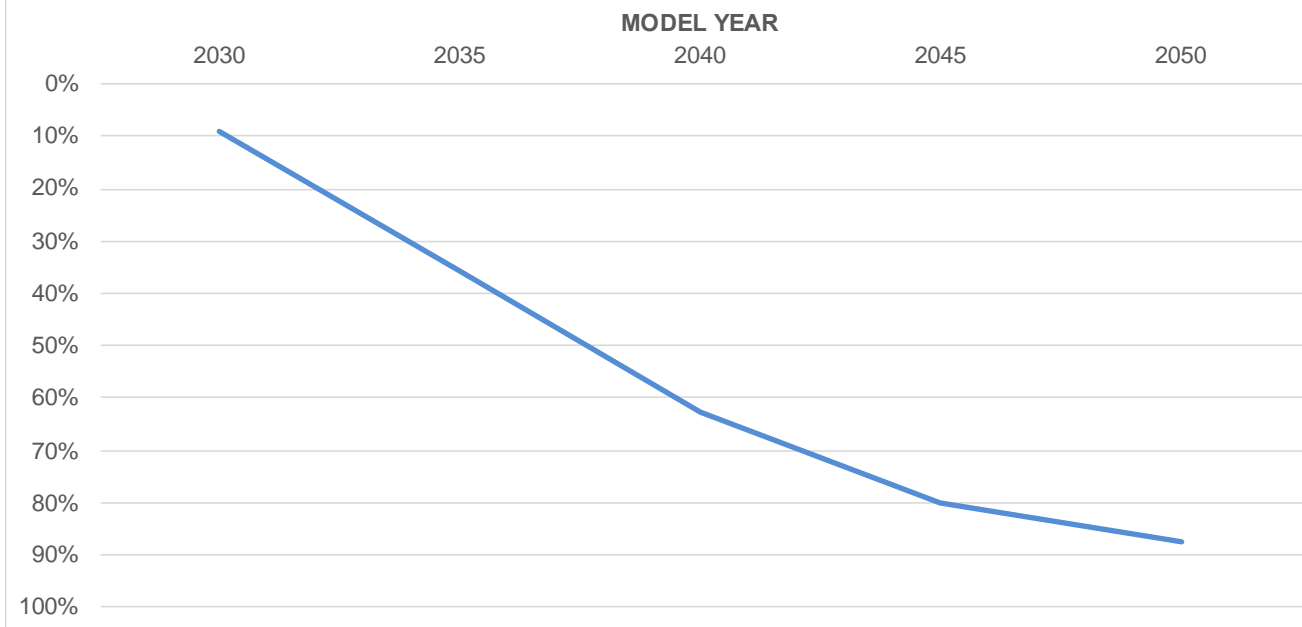


The standards would nearly eliminate all tailpipe CO₂ emissions from the light-duty fleet by **2050**.

harmful air pollutants, including CO₂, NO_x, particulates, air toxics and other health-harming pollutants.

The standards have the potential to reduce more than 285 million metric tons of tailpipe GHG emissions annually in 2035 and more than 700 million tons every year by 2050, relative to no action. Between now and 2050, the standards will eliminate more than 9.5 billion tons of tailpipe GHG emissions in total. They would nearly eliminate all tailpipe CO₂ emissions from the light-duty fleet by 2050 – one of the biggest contributors to the nation’s GHG inventory. As shown in Figure 2a, achieving 100 percent new ZEV sales by 2035 will reduce tailpipe GHG emissions by 36 percent in 2035, 63 percent in 2040 and 87 percent by 2050, relative to no federal standards.

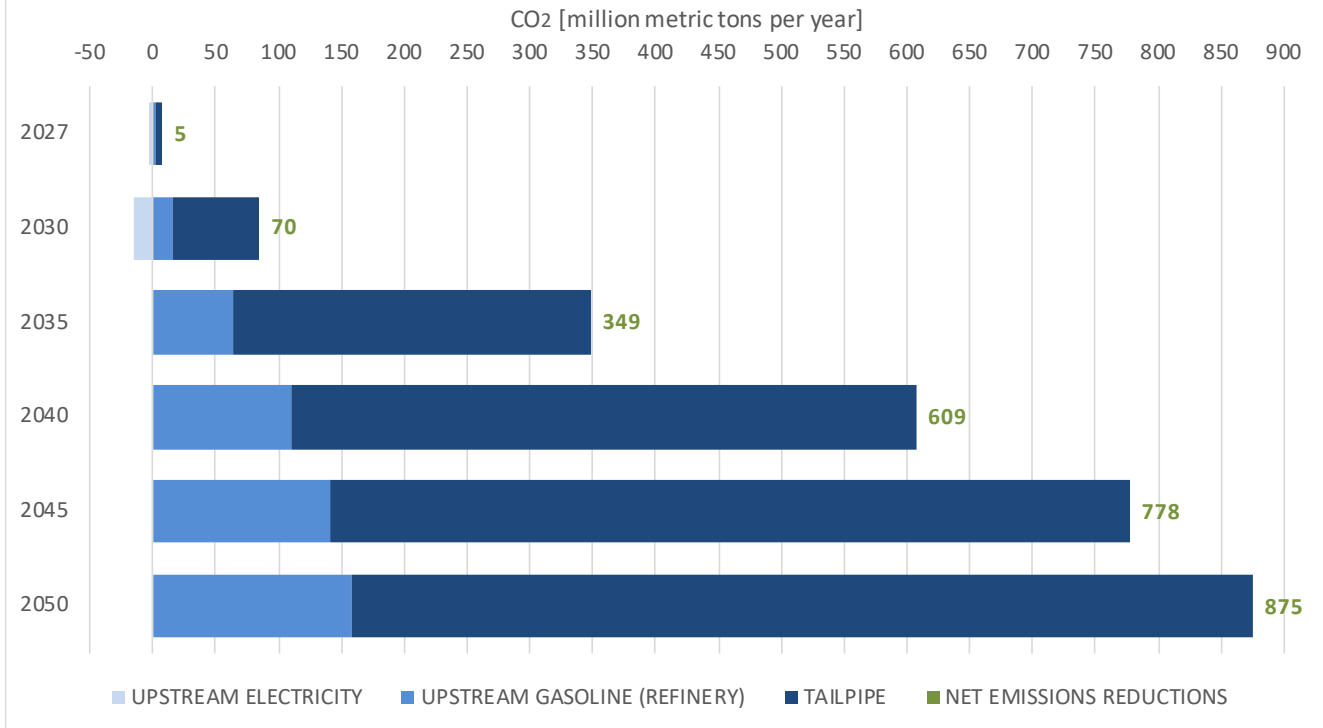
FIGURE 2a—TAILPIPE GREENHOUSE GAS EMISSIONS REDUCTIONS UNDER 100% NEW ZEV SALES (PERCENT)



The standards will secure GHG emissions reduction of more than **11.5 billion tons** in 2050.

Figure 2b shows that the GHG emissions reductions are even greater when considering upstream emissions. While the shift to more ZEVs will result in a marginal increase in upstream emissions from the electricity sector prior to 2035, that increase will be more than offset by the reductions in upstream emissions from crude oil production and gasoline refining and distribution – particularly given the rapid decarbonization of the power sector.^{xxx} In 2035, the GHG emissions reductions (tailpipe and upstream) will reach nearly 350 million tons annually and more than double to 875 million tons reduced every year by 2050. The standards will secure cumulative GHG emissions reduction of more than 11.5 billion tons in 2050, nearly as much as the combined climate emissions from China and India last year.^{xxx}

FIGURE 2b—GREENHOUSE GAS EMISSIONS REDUCTIONS UNDER 100% NEW ZEV SALES



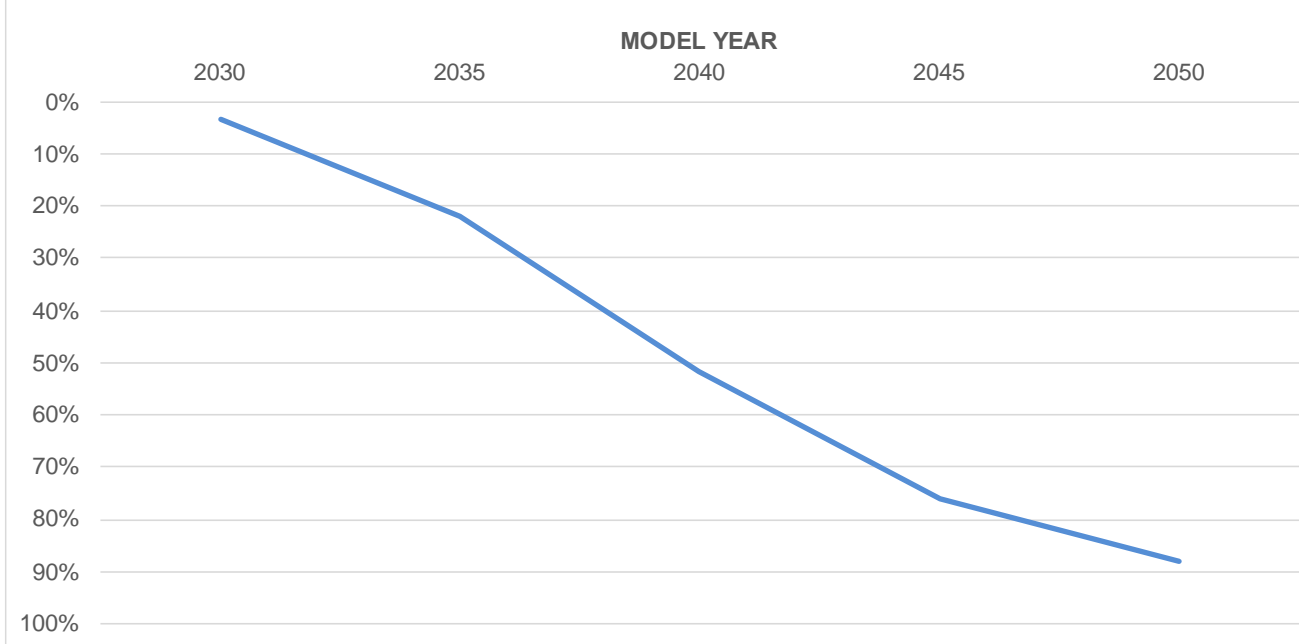
100% new ZEVs by 2035 will significantly reduce health-harming pollution – especially in communities that disproportionately bear the burdens of transportation pollution

The nation will also see a significant reduction in health-harming particulates and ground level ozone-forming pollution, especially in communities near busy roadways. Standards that ensure 100% new ZEV sales would reduce tailpipe NO_x emissions by 42,000 tons per year in 2035 and 150,000 tons annually by 2050. Cumulatively, the standards would reduce more than 1.7 million tons of NO_x by 2050. NO_x contributes to the formation of fine particles (PM_{2.5}) and ground level ozone, both of which are associated with adverse health effects, including premature death.

As Figure 3a shows, the multipollutant standards would reduce total light-duty tailpipe NO_x emissions by 22 percent in 2035, 50 percent in 2040 and nearly 90 percent in 2050, relative to no standards. People of color are disproportionately impacted by the harmful pollution that will be reduced by ensuring 100% new ZEV sales in 2035.

FIGURE 3a—TAILPIPE NO_x EMISSIONS REDUCTIONS UNDER 100% NEW ZEV SALES

(PERCENT)

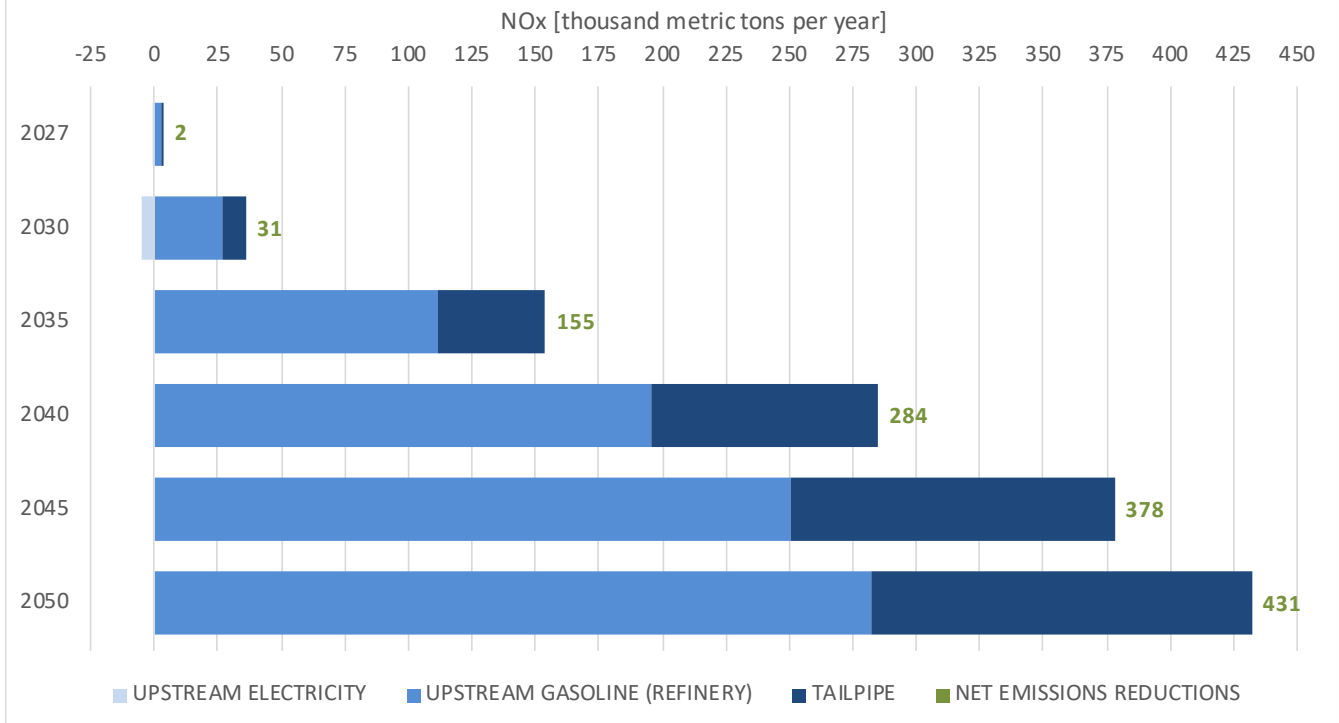


Cumulative reduction in 2050 of more than **5.5 million tons** – roughly equivalent to eliminating the NO_x emissions from the entire power sector for the next 6 years.

Figure 3b shows that, like GHG emissions, the NO_x emissions reductions are far greater when also accounting for upstream emissions. The total NO_x emissions reductions (tailpipe and upstream) as a result of 100% new ZEV sales will be 155,000 tons annually in 2035, nearly tripling to more than 430,000 tons annually in 2050 and reaching a cumulative reduction in 2050 of more than 5.5 million tons – roughly equivalent to eliminating the NO_x emissions from the entire power sector for the next 6 years.^{xxxii}

The standards would also reduce volatile organic compounds (VOCs), another precursor to ozone, by more than 270,000 tons annually in 2040 and a total of nearly 5.3 million tons between now and 2050. Harmful PM_{2.5} emissions would be reduced by 20,000 tons annually in 2040 and by more than 390,000 tons in total by 2050. Sulfur dioxides (SO₂) and toxic benzene would also be significantly reduced.

FIGURE 3b—NO_x EMISSIONS REDUCTIONS UNDER 100% NEW ZEV SALES



We translated these pollution reductions into health benefits using EPA’s Benefit per Ton screening and mapping tool. The pollution standards would result in an estimated 2,238 – 5,131 fewer premature deaths and more than 280,000 fewer lost workdays each year by 2040. By 2050, a total of up to 98,578 fewer Americans will have died prematurely.

TABLE 1: 100% NEW ZEV SALES YIELD SIGNIFICANT REDUCTIONS IN HEALTH IMPACTS

INCIDENCES	2030	2040	2050	TOTAL THRU 2050
PREMATURE MORTALITY	209 – 488	2,238 – 5,131	3,309 – 7,587	42,973 – 98,578
WORK LOSS DAYS	28,108	281,014	414,868	5,402,845
RESPIRATORY SYMPTOMS	10,155	101,204	149,382	1,945,828
ASTHMA EXACERBATION	6,872	68,759	101,499	1,321,912
ACUTE BRONCHITIS	708	6,002	8,757	115,526
HEART ATTACKS	240	2,577	3,810	49,479
EMERGENCY ROOM VISITS OR HOSPITAL ADMISSIONS	224	2,355	3,480	45,236

All of these health impacts are due to changes in ambient fine particulate matter levels and do not include the substantial additional benefits that would result from reduced ozone or GHGs, which would further enhance the program’s health benefits.

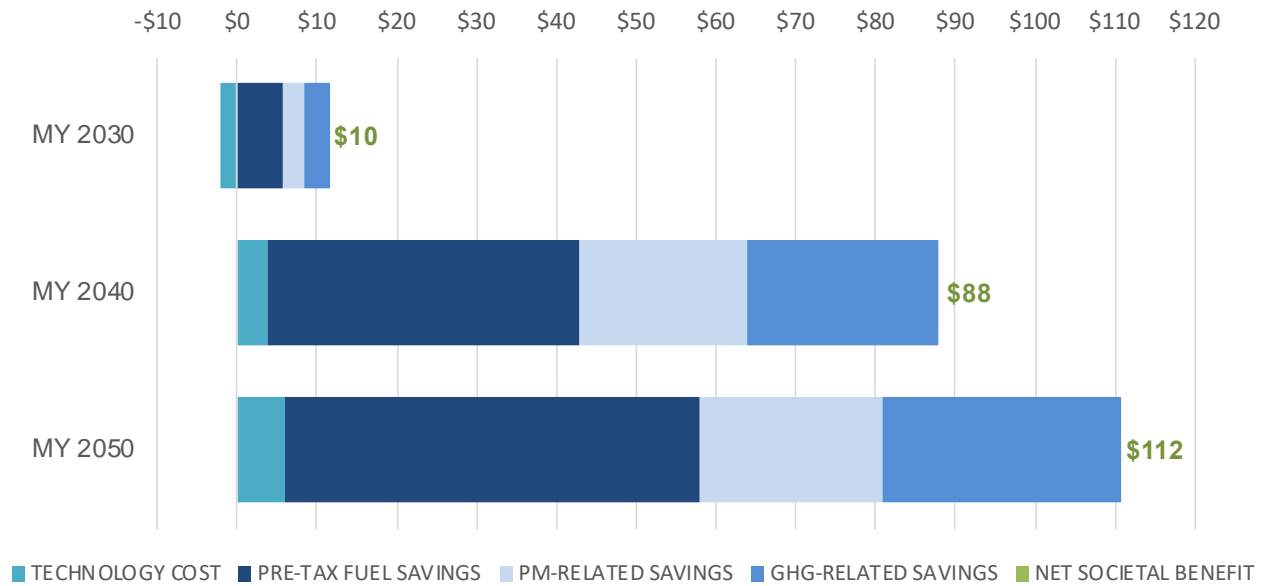
100% new ZEVs by 2035 will deliver massive net economic and pollution benefits

To evaluate the net economic and pollution impacts of eliminating pollution from new vehicles sold by 2035, we combine the vehicle-related economic benefits to consumers with the monetized benefits of the GHG emissions reductions and monetized ambient PM-related health benefits to society. Figure 4 summarizes the substantial aggregate economic and pollution benefits to the nation, relative to no action. The annual benefits are an estimated \$10 billion in 2030, before the standards are fully in effect, and jump to \$88 billion in 2040 and \$112 billion in 2050. Roughly half the benefits come from technology and fuel savings and the other half from avoided health costs. The cumulative net societal savings to the United States as a result of federal standards that ensure new ZEV sales would reach nearly \$1.6 trillion by 2050, nearly 10% of the U.S. GDP.^{xxxii}



Cumulative net societal savings to the United States would reach nearly **\$1.6 trillion by 2050**, nearly 10% of the U.S. GDP.

FIGURE 4—100% NEW ZEV SALES YIELD SUBSTANTIAL NET ECONOMIC AND POLLUTION BENEFITS TO THE U.S.
(BILLION \$2019)



Conclusion

Ensuring that all new passenger vehicles sold in the United States in 2035 are zero-emitting will have substantial benefits for all Americans. It will save families thousands of dollars in avoided fuel costs and avoid more than 600 million metric tons of greenhouse gas emissions every year by 2040 and a total of more than 11.5 billion tons by 2050. It will likewise significantly reduce ozone forming pollution and harmful particulate pollution that disproportionately burdens people of color, avoiding as many as 5,000 premature deaths and 280,000 lost workdays each year by 2040 and preventing up to 98,000 premature deaths in total by 2050. Adopting national multipollutant standards will save Americans \$88 billion annually by 2040 in economic and pollution benefits and a staggering \$1.6 trillion cumulatively by 2050.

ⁱ <https://joebiden.com/climate-plan/>

ⁱⁱ EDF preliminary analysis suggests that multipollutant standards that ensure 100% of new medium- and heavy-duty truck and bus sales are zero emitting by 2040 would reduce climate pollution by hundreds of millions of tons and harmful nitrogen oxides and particulate matter pollution by hundreds of thousands of tons.

ⁱⁱⁱ <https://joebiden.com/climate-plan/>

^{iv} *Id.*

^v *Id.*

^{vi} David Shepardson, GM hits reverse on Trump effort to bar California emissions rules, Associated Press (Nov. 23, 2020). <https://uk.reuters.com/article/us-autos-emissions-gm/gm-no-longer-backs-trump-effort-to-bar-california-emissions-rules-idUSKBN2832HF>; Keith Laing, Nissan drops out of Trump’s fight against California car rules, Bloomberg (Dec. 4 2020). <https://www.bloomberg.com/news/articles/2020-12-04/nissan-drops-out-of-trump-s-fight-against-california-car-rules?sref=JN1HDH2Z>

^{vii} <http://blogs.edf.org/climate411/files/2020/12/Letter-from-Mary-Barra-to-Environmental-Leaders-11.23.20.pdf>

^{viii} Rachel Becker, “Newsom orders ban of new gas-powered cars by 2035,” Cal Matters (Sept. 25, 2020) <https://calmatters.org/environment/2020/09/california-ban-gasoline-powered-cars-in-2035/>; Office of Governor Gavin Newsom, “Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuel in California’s Fight Against Climate Change,” Press Release (Sept. 23, 2020).

<https://www.gov.ca.gov/2020/09/23/governor-newsom-announces-california-will-phase-out-gasoline-powered-cars-drastically-reduce-demand-for-fossil-fuel-in-californias-fight-against-climate-change/#:~:text=SACRAMENTO%20E2%80%93%20Governor%20Gavin%20Newsom%20Today,passenger%20vehicles%20to%20be%20zero->

^{ix} <https://www.actoncleanair.com/signatories>; <https://cleanairmoms.medium.com/hundreds-of-thousands-call-for-toyota-gm-and-fiat-chrysler-to-support-clean-car-standards-6511f4db8750>

^x Dana Lowell and Alissa Huntington (January 2021 update). Electrical Vehicle Market Status: Manufacturer Commitments to Future Electric Mobility in the U.S. and Worldwide, *MJ Bradley and Associates*. See www.mjbradley.com

^{xi} Nic Lutsey and Michael Nicholas (April 2019). Update on Electric Vehicle Costs in the United States through 2030, *The International Council on Clean Transportation*. See <https://www.theicct.org/publications/update-US-2030-electric-vehicle-cost>

^{xii} Dana Lowell and Alissa Huntington (January 2021 update). Electrical Vehicle Market Status: Manufacturer Commitments to Future Electric Mobility in the U.S. and Worldwide, *MJ Bradley and Associates*. See www.mjbradley.com

^{xiii} <https://investor.gm.com/static-files/f059ac9f-9ad8-4016-938a-5cc664b64e83>

^{xiv} NASEO and EFI. 2020. *2020 U.S. Energy and Employment Report*, Executive Summary. <https://www.usenergyjobs.org/>

^{xv} <https://observer.com/2020/11/ford-gm-electric-vehicle-push-factory-hiring-2021/>

^{xvi} <https://www.gov.ca.gov/2020/09/23/governor-newsom-announces-california-will-phase-out-gasoline-powered-cars-drastically-reduce-demand-for-fossil-fuel-in-californias-fight-against-climate-change/>

^{xvii} <https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download>

^{xviii} American Lung Association. 2020. State of the Air.

<http://www.stateoftheair.org/assets/SOTA-2020.pdf>

^{xix} Kenneth F Davidson et al. 2020. The recent and future health burden of the U.S. mobile sector apportioned by source. *Environ. Res. Lett.* 15 (7). <https://doi.org/10.1088/1748-9326/ab83a8>

^{xx} See, e.g., Riley, S., Wallace, J., & Nair, P. 2012. Proximity to Major Roadways is a Risk Factor for Airway Hyper-Responsiveness in Adults. *Can. Respir. J.*, 19(2):89-95. McConnell, R. et al. 2010. Childhood Incident Asthma and Traffic-Related Air Pollution at Home and School. *Envtl. Health Perspect.*, 118(7):1021-6. Huynh, P. et al. 2010. Residential Proximity to Freeways is Associated with Uncontrolled Asthma in Inner-City Hispanic Children and Adolescents. *J. Allergy (Cairo)*. Chang, J. et al. 2009. Repeated Respiratory Hospital Encounters Among Children with Asthma and Residential Proximity to Traffic. *Occup. Envtl. Med.*, 66(2):90-8. Salam, M.T., Islam, T., & Gilliland, F.D. 2008. Recent Evidence for Adverse Effects of Residential Proximity to Traffic Sources on Asthma. *Curr. Opin. Pulm. Med.*, 14(1):3-8.

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- ^{xxi} Gregory M. Rowangould. 2013. A census of the US near-roadway population: Public health and environmental justice considerations. *Transportation Research Part D* 25, 59–67. <https://www.sciencedirect.com/science/article/pii/S1361920913001107>.
- ^{xxii} American Lung Association. 2020. State of the Air. <http://www.stateoftheair.org/assets/SOTA-2020.pdf>
- ^{xxiii} The 3.7% level of baseline ZEV sales assumes 7.4% ZEV sales in California and states that have adopted the California ZEV standards and a continuation of the historical relationship between ZEV sales in these states and non-ZEV states.
- ^{xxiv} Grid emissions through 2025 are based on GREET2020 projections. Emissions after 2025 decline linearly until reaching zero in 2035.
- ^{xxv} U.S. EPA. 2019. Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA-420-R-17-001. U.S. EPA. 2016. Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA-420-R-16-020.
- ^{xxvi} GHG emissions from vehicles with internal combustion engines (ICEs) were reduced by 4% per year until reaching a total reduction of 22.5% at a cost of \$1571 in 2034. This was based on a combination of EPA’s Optimization Model for reducing Emissions of Greenhouse Gases from Automobiles (OMEGA) model used to support EPA’s 2016 Proposed Determination and the more recent version provided in 2020 in response to a FOIA, augmented by more up to date cost and effectiveness projections made by ICCT. See Nic Lutsey, Dan Meszler, Aaron Isenstadt, John German, Josh Miller. 2017. *Efficiency Technology and Cost Assessment for U.S. 2025-2030*, ICCT. The EPA’s Inventory, Costs and Benefits Tool (ICBT) was used to combine technology costs, fuel costs and emissions into national and per vehicle projections of economic and environmental impacts. We based vehicle miles traveled (VMT), vehicle sales, gasoline and electricity prices on the Energy Information Administration’s 2020 Annual Energy Outlook. The cost and electricity consumption levels of ZEVs were taken from ICCT projections. See Nic Lutsey and Michael Nicholas. 2019. *Update on Electric Vehicle Costs in the United States through 2030*, ICCT. We assumed a ZEV mix of 80 percent battery electric vehicles (BEVs) and 20 percent plug-in hybrid electric vehicles (PHEVs), with the latter concentrated in the vehicle classes with significant towing capacity. The first 10% of BEV sales were assumed to have a label range of 200 miles, the next 15% a range of 250 miles and the remainder a range of 300 miles. Upstream emissions associated with the production of gasoline were based on DOE’s GREET model.
- ^{xxvii} Environmental Defense Fund and Energy Innovation recently released a separate report analyzing the environmental and economic benefits of California’s Advanced Clean Trucks Rule, available at https://energyinnovation.org/wp-content/uploads/2020/06/Clean-Trucks-Big-Bucks_June_17_2020.pdf.
- ^{xxviii} We assumed a ZEV mix of 80 percent BEVs and 20 percent PHEVs. Buyers of PHEVs will see a longer payback period whereas the savings to purchasers of BEVs begins immediately and are larger. Because most consumers finance the purchase of new vehicles, any upfront costs of a ZEV would be spread out over the life of the loan and consumers would realize net savings due to reduced fuel expenditures even more quickly.
- ^{xxix} We assume the electricity grid will be 100 percent renewable by 2035 consistent with commitments by the Biden administration. But even if we assume power sector emissions based on AEO 2020 projections, the reductions would be substantial.
- ^{xxx} <http://energyatlas.iea.org/#!/tellmap/1378539487>
- ^{xxxi} <https://www.epa.gov/airmarkets/power-plant-emission-trends>
- ^{xxxii} <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=US>