Charged for Change: Legal Frameworks and Policy Tools for U.S. Electric Vehicle Adoption in the Fight Against Climate Change

A thesis submitted by

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Abstract

As the world embarks on a race against time to stave off the worst effects of anthropogenic climate change, decarbonizing transportation has proven to be an expensive, controversial, and crucial area of public policy and environmental law. Electric vehicles present the simplest and most cost-effective route to decarbonizing transportation for millions of Americans. But with electric vehicles now plying the roads in every town in the United States, environmental justice concerns and a change in administration place the country's path toward electrification squarely at a crossroads. Through a review of peer-reviewed scientific studies, an analysis of caselaw, and scrutiny of public policy in the U.S. and abroad, this thesis will answer the questions: (1) are electric vehicles truly sustainable enough to justify commitments to introduce them on a mass scale?; (2) What is the legal landscape for promoting electric vehicles in the United States in the context of the second Trump Administration?; and (3) Without federal support, can states and local governments continue to push forward vehicle electrification to meet the United States' commitments under the Paris Agreement?

Acknowledgements

I am deeply grateful for the advice, time, and effort that my thesis committee members took to review and advise the direction of this thesis—my advisor, Jon Witten, Distinguished Senior Lecturer in UEP, and my reader, Dr. Douglas Gollin, Professor of Economics. I also must acknowledge the guidance I received from my law school mentor, who encouraged me to continue exploring the legal landscape for vehicle electrification—Zygmunt Plater, Professor Emeritus of Law, Boston College Law School. Similarly, I appreciate my law school colleagues from Advanced Topics in Environmental Law who provided feedback on my research that would ultimately form the backbone of this thesis—attorneys Haley Rowlands and Shane Sullivan. I would also like to thank my colleagues in the Environmental Protection Division of the Massachusetts Attorney General's Office who shared their knowledge and experience in federal vehicle emissions law with me—Assistant Attorneys General Matthew Ireland and Seth Schofield. Finally, I must thank my parents for their unwavering support of my quest to leave the world a better place than I found it.

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Chapter 1: Introduction

Overview

In the United States today, transportation accounts for the largest source of greenhouse gas emissions. On-road vehicles account for 83 percent of transportation-associated emissions—with the remainder attributed to rail, ships & boats, and aircraft (Popovich and Lu 2019). Rapidly decarbonizing on-road vehicles is a prerequisite for the United States to meet its targets under the Paris Agreement[1] and for the world to head off some of the worst impacts of climate change. Although the IPCC reports that keeping global warming below 1.5°C is already impossible, a transformational societal shift could allow humanity to stay below at least 2°C of warming.

[1] Although President Trump announced that the U.S. would be pulling out of the Paris Agreement on the first day of his second term, the exit process is lengthy, and the United States remains a party bound to the Paris Agreement for the time being (The White House 2025b).

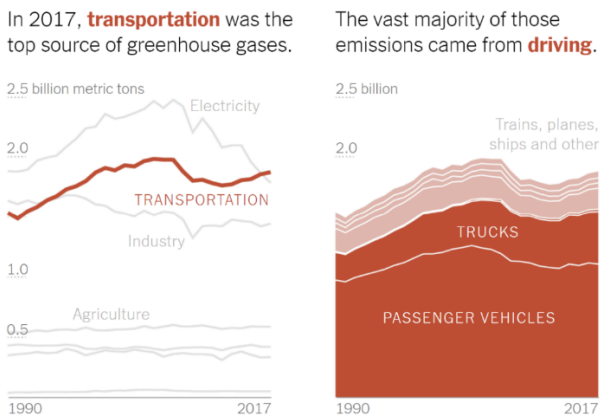

Figure 1: Transportation now accounts for the largest share of GHG emissions in the United States. Within transportation, passenger vehicles and trucks are disproportionately responsible for GHG emissions (Popovich and Lu 2019).

Every sector of our modern economy currently contributes to anthropogenic climate change, and each sector faces its own challenges. The transportation sector faces several seemingly insurmountable challenges: there is no technically feasible route to decarbonizing aviation or maritime shipping currently. On-road transportation, however, can overcome this technical challenge. The last fifty years have seen astounding developments in zero-emission vehicle technology, a significant accomplishment being the release of General Motors' EV1 in 1996, the world's first commercially viable and mass-produced electric vehicle. Today, battery electric vehicles come in every shape and size and have seen incredible price reductions. And hydrogen fuel cell electric vehicles are being deployed in buses, trucks, and even some passenger cars. The development of these electric vehicles didn't come about by the "invisible hand of the free market," however. The electric vehicles on the road today can be traced back to a crucial decision made in Congress over a half-century ago to engage in cooperative federalism and empower the State of California to set its own

vehicle emissions rules. That decision is still being used to this day to help drag the auto industry out of its obsession with the internal combustion engine. Still, it faces new and novel challenges that threaten to upend our steady path toward transportation decarbonization.

Research Question

Given the short window of time that humanity must combat climate change, the outsized role that transportation plays in American greenhouse gas emissions, and the fossil fuel-friendly policies of the Trump Administration, understanding the role that electric vehicles play in all of this is of paramount importance. My research question is thus, *how sustainable are electric vehicles, what is the future of electric vehicle policy on the federal level, and what steps can state and local governments take to encourage their adoption?*

Relevance and Worthiness of Subject

This thesis' subject areas of transportation, sustainability, and equity are deeply intertwined with UEP's mission of planning, policy, and social justice. While a thesis encouraging the development and deployment of any kind of personal automobile, even a zero emissions one, seems to fly in the face of the sustainable and just communities that students, faculty, and alumni in the Department work toward, I would argue that we mustn't let perfect be the enemy of good. This thesis will not argue that electric vehicles are a panacea for climate change or livable communities.

Nor will this thesis attempt to portray electric vehicles as any sort of solution to traffic, roadway fatalities, economic inequality, or autocentric community design.

Instead, the IPCC tells us that we as a species have a rapidly closing window to stave off the worst effects of climate change. With little time and a national environment where practically everything is being politicized, rebuilding every neighborhood and community in the country to be walkable, bikeable, and transit-friendly is impossible in the miniscule timeline we have to decarbonize transportation.

Furthermore, an ongoing conservative backlash threatens to undermine efforts to get Americans out of their cars and into public transport or bicycles. With the personal automobile (especially the pickup truck) engrained in the American psyche of individualism and freedom, it will require a long-term shift in national preferences to get people out of their cars. While such a shift likely will be ultimately necessary for the planet, relying solely on a future large-scale modal shift, to the detriment of electric vehicles, is unwise.

Numerous other “sustainable” technologies have been described as “bridge technologies” toward a more decarbonized future, such as natural gas replacing coal, sustainable aviation fuel replacing kerosene-based jet fuel, and methanol replacing cargo ship bunker fuel. A common throughline among all these technologies is only a reduction (not elimination) of greenhouse gas emissions, and a continued reliance on fossil fuel infrastructure. Electric vehicles, however, cannot truly be described as a bridge technology. With zero point-source greenhouse gas emissions, and no reliance

on fossil fuel infrastructure for their operation, electric vehicles are likely the most sustainable form of long-range personal transportation that humanity will develop in the near future.

With few short-term prospects of switching much of the American populace to non-personal automobiles for transportation, and a non-insignificant portion ever able to ditch their cars because of rural locations, work requirements, and disabilities, vehicle electrification is the best solution for quickly decarbonizing our transportation sector. Yet, drivetrain technology has somehow become ultra-politicized in the U.S., with the right shunning EVs. On the flip side, with Elon Musk's actions within the federal government, progressive Americans have abandoned Tesla completely.[2] Nevertheless, electric vehicles deserve broad support. We can't solve climate change with only electric vehicles; but we certainly can't solve it without them either.

Personal Goals

I was drawn to UEP three years ago not for my passion for electric cars, but for my love of public transportation, walkable communities, and concern over the environmental justice impacts of climate change. I use public transit to commute to work and take Amtrak for any trips I can. But as someone who grew up on suburban Long Island, NY, and now live in the streetcar suburb of Newton, I have also been driving electric vehicles for over half a decade.

[2] It must be noted that while Tesla is perhaps the most well-known electric vehicle manufacturer, every major automaker on Earth now sells comparatively priced and spec'd electric vehicles.

Figure 2: Your author's electric vehicle, the "great grandchild" of General Motors' original EV1, at sunset.

In the last five years, I have seen exponential growth in interest and frequency of electric vehicles on the roads. In the early days of driving electric, my car was often the very first electric vehicle that friends and family had ever ridden in. Now, electric vehicles ply the streets of Massachusetts, more than half a dozen live on my block alone, and even many Ubers are electric vehicles. But despite this explosion in adoption, electric vehicles still make up only a small fraction of vehicles on the road. And politicization and disinformation threaten to halt further, necessary progress. Well-meaning friends and family have questioned how a "real" environmentalist could drive electric with mining human rights abuses or how it feels to drive a car that's

“impossible to road trip.” Yet personal vindication for my choice of drivetrain technology is not my goal for this thesis.

Largescale vehicle electrification is necessary to effectively combat the worst effects of anthropogenic climate change in a timely manner. The roadblocks to facilitating such a future, however, are myriad and complicated. There exist little to no resources that integrate a review of (1) the environmental and social impacts of electric vehicles, (2) the legal landscape in the United State, and (3) the policy solutions available to state and local governments to further electrification. My goals for this thesis project include:

- Increasing my own understanding of electric vehicles, as I work to further climate policy as an environmental lawyer and Assistant Attorney General for the Commonwealth of Massachusetts;
- Providing a roadmap for state and local policymakers and activists to follow for pushing transportation decarbonization in their communities; and
- Reviewing the science behind electric vehicle sustainability for planners, policymakers, academics, and laypeople to reference.

This thesis fits neatly into my work at UEP so far, including my field project report on decarbonizing hard-to-reach Massachusetts households, embodying the idea of “electrify everything” as a solution to climate change.

Chapter 2: Methodology

Analysis of Scientific Reports

My first research method will be to analyze and synthesize relevant scientific studies. This research method will be primarily deployed to answer the question of how sustainable electric vehicles are. Researchers in various fields, around the world, have studied discrete impacts of electric vehicles ad nauseum. And while some scientific reviews have attempted to synthesize the greenhouse gas effects, or social effects of vehicle electrification, I will be including a wider array of studies to holistically examine the greenhouse gas, local air pollution, asthma, noise pollution, microplastic pollution, end of life reuse, and mining impacts of these vehicles.

Legal Analysis

The current regulatory regime in the U.S. for mandating electric vehicle adoption is two-pronged and consists of an interplay between multiple federal statutes, federal and state regulations, and court decisions. I will use my legal knowledge to explain the current standing of electric vehicle mandates, the proposed changes by the Trump Administration, and the legality of those changes. I will analyze statutes, regulations, court decisions, and law review articles as part of this analysis.

Review of Local Laws, State Statutes, and News Coverage

Finally, I plan on reviewing local laws, state statutes, and news coverage related to policies that sub-national governments can implement to speed electric vehicle adoption. This review will be global in nature, as the United States currently lags its G20 peers in electric vehicles adoption. Although not a primary focus of this review, I will also strive to include only policies that can statutorily and constitutionally be enacted by states and local governments—policies preempted by federal law are not worthwhile for inclusion.

Chapter 3: Literature Review of Electric Vehicle Sustainability

The question of "how sustainable are electric vehicles" is inherently challenging to answer with certitude because it's a question informed by perspective and priorities. So, the best way to answer the sustainability question is to break it up into two sub questions: (1) do electric vehicles have reduced greenhouse gas emissions compared to internal combustion engine cars; and (2) what are the other environmental impacts of electric vehicles?

Answering the first question is much easier, as we know that the transportation sector significantly contributes to global carbon emissions, with road transportation accounting for 25% of all global greenhouse gas emissions. (Gao et al. 2023). Analysis of EVs lifecycle greenhouse gas emissions proves that they are not necessarily a panacea for climate change, as manufacturing and charging batteries can account for significant emissions. (Gao et al. 2023). While 84% of lifetime internal combustion engine vehicle emissions come from vehicle usage (i.e. filling the tank and burning gas) and 15% of emissions come from material production (Gao et al. 2023), electric vehicles have a tighter ratio. 62% of lifetime electric vehicle emissions come from vehicle usage (i.e. charging the battery) and 36% of emissions come from material production (Gao et al. 2023). That electric vehicles have higher greenhouse gas emissions associated with material production than internal combustion engines

likely account for disinformation relating to electric vehicle sustainability. Yet, even with higher material production emissions, and even with our current electricity sources, the average electric vehicle produces 43.4% fewer greenhouse gas emissions over its lifetime than an internal combustion engine vehicle (Gao et al. 2023). By improving battery manufacturing processes, refining onboard battery management systems, decarbonizing our power grid, and ensuring that electric vehicle batteries are adequately recycled at their end of life, electric vehicles will become even greener over time, widening the greenhouse gas emissions gap between electric vehicles and internal combustion engine vehicles (Gao et al. 2023).

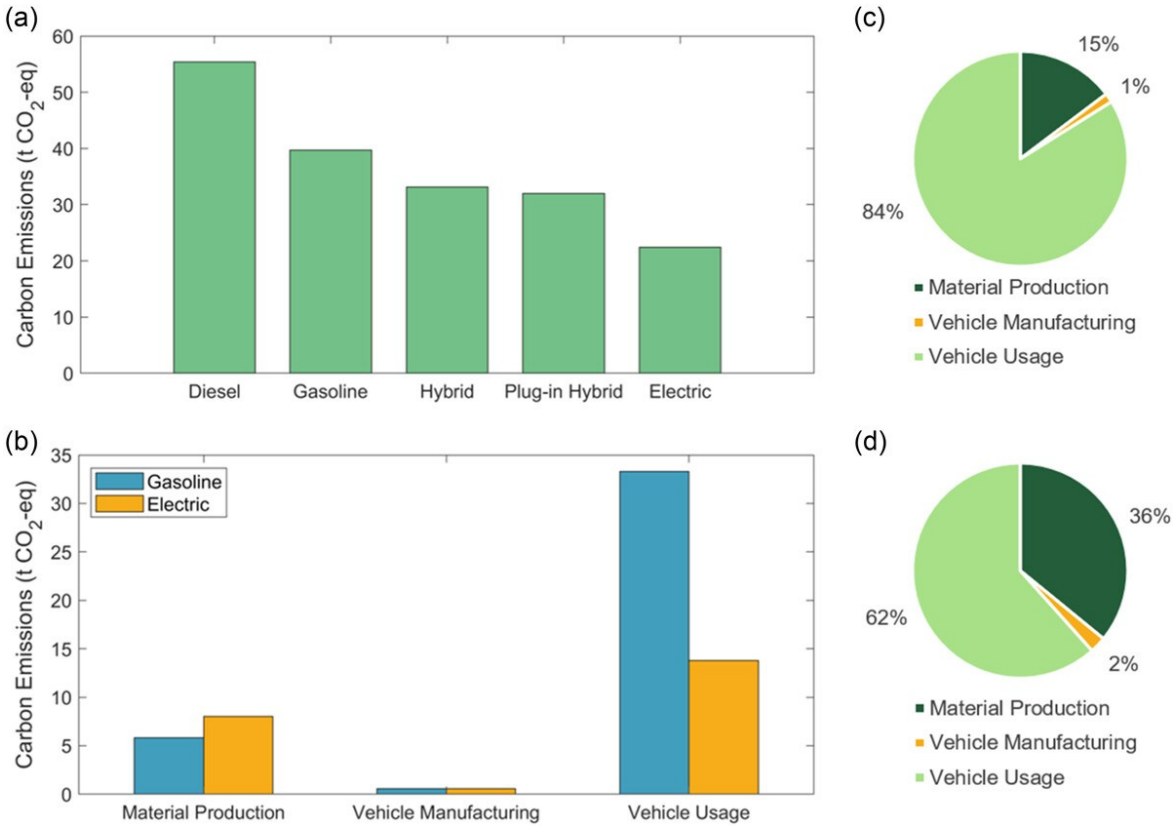

Figure 3: "Lifecycle carbon footprint data of passenger cars. (a) Lifecycle carbon emissions of different energy types of vehicles. (b) Comparison of carbon emissions at different stages. (c) Proportion of carbon emissions at each stage of gasoline passenger cars. (d) Proportion of carbon emissions at each stage of pure electric passenger cars" (Gao et al. 2023).

The science tells us very clearly that, even with our current supply chains and dirty electric grids, there is an immediate climate benefit to switching from an internal combustion engine car to an electric vehicle. And if we cared about no metrics other than greenhouse gases, the analysis could stop. But UEP teaches us to be practical visionaries, and the impacts of electrifying America's fleet of private automobiles has implications far beyond merely greenhouse gas emissions. We must begin with the batteries.

Electric vehicles are powered by lithium-ion batteries, the same ubiquitous technology in our phones, laptops, smart watches, and robot vacuum cleaners (Rajaeifar et al. 2022). Creating lithium-ion batteries involves mining critical rare-earth minerals like Nickel, Cobalt, and Lithium, which are often sourced from politically unstable regions with frequent human rights abuses (Rajaeifar et al. 2022). One of the most infamous places where lithium-ion battery minerals are sourced from is the Democratic Republic of the Congo. The Democratic Republic of the Congo supplies practically all the world's cobalt, and mining companies there routinely utilize child labor (Agusdinata and Liu 2023). Mining communities are often exploited, and multinational companies exert state control over developing countries like the Democratic Republic of the Congo, mimicking almost a modern form of colonialism (Agusdinata and Liu 2023). This sustainability of use of conflict, rare earth minerals in electric vehicle batteries is a "wicked problem" (Lehtimäki et al. 2024). Although electric vehicle batteries use no more conflict minerals than any other battery-powered devices in our lives, it's a logical fallacy to conclude that we should thus

discount the atrocious human rights abuses happening in the production process of electric vehicles. Electric vehicle manufacturers are working to resolve this dilemma by developing new battery chemistries that use fewer, if any, conflict minerals. Although most lithium-ion batteries contain a battery chemistry consisting of nickel, manganese, and cobalt (NMC batteries), automakers have already developed, and are beginning to deploy LFP batteries, which contain iron phosphate instead of nickel, manganese, and cobalt (Lehtimäki et al. 2024). These batteries eliminate conflict minerals and have a more sustainable production process—creating 27-39% fewer greenhouse gas emissions than older NMC batteries (Lai et al. 2022). Provided these LFP batteries largely replace NMC batteries, not only will electric vehicle batteries be conflict mineral-free, but it will push the elimination of conflict minerals in all lithium-ion batteries, including the ones in our electronics.

A growing environmental concern is what happens to electric vehicle batteries at the end of life. As of now, recycling technology is in its infancy and remains cost prohibitive (Rajaeifar et al. 2022). Nevertheless, electric vehicle batteries are seeing second lives in less demanding tasks like electric grid storage (Rajaeifar et al. 2022). The lithium-ion batteries installed in electric vehicles are designed to outlast the life of the automobile itself—so much so that after the average car is retired ten years after production, the lithium-ion battery is expected to still contain 70-80% of its original energy capacity (Hua et al. 2020). Instead of creating unrecyclable waste, reusing these batteries as energy storage for the power grid creates the additional benefit of

replacing dirty peaker plants, and cleaning up the electricity grid…thus further increasing the sustainability of electric vehicles (Hua et al. 2020).

A final concern with lithium-ion batteries is the supposed prevalence and danger of fires (Rajaeifar et al. 2022). Because of the extreme energy density of batteries, electric vehicle fires are fast, furious, and very hard to put out (Sun et al. 2020). Electric vehicle fires start when a phenomenon known as thermal runaway occurs. Electric vehicle battery management systems are adept at keeping battery cell temperatures within safe ranges and have numerous methods for keeping temperatures in check (Sun et al. 2020). Thermal runaway refers to rapidly increasing temperatures, beyond what the battery management system can reign in, resulting in sudden and unavoidable combustion (Sun et al. 2020). These sorts of fires often make headlines because of how challenging it is for firefighters to extinguish them. It can take hours and thousands of gallons of water to extinguish an electric vehicle fire (Sun et al. 2020). And even after extinguishing, electric vehicles can spontaneously reignite for up to 22 hours after extinguishing, further compounding the risk (Sun et al. 2020). Although electric vehicle fires are dangerous, the risk relative to internal combustion engine cars remains minute. Although more research is needed, preliminary data suggests that electric vehicles catch fire at only a fraction of the percentage of internal combustion engine vehicles. Based on NHTSA data, the U.S. experiences 1,530 fires per 100,000 internal combustion engine vehicles sold and only 25 fires per 100,000 electric vehicles sold (Kuhl and Stauffer 2024). More research is necessary to help firefighters better respond to electric vehicle fires, but large-scale adoption of electric

vehicles would undoubtedly have the effect of reducing the risk of vehicle fires, not increasing them.

Turning away from the battery technology, and towards the vehicles themselves, a problem inherent with all road-based vehicles is microplastic pollution from tires. A study of microplastics found in the waters off China found that over 53% of the microplastic fibers could be attributed to tire dust (Wang et al. 2019). For every 1,000 pounds a vehicle has, tire wear and microplastic emissions increase by 20% (Carey 2023). The concern related to electric vehicles is that they traditionally weigh more than their equivalent gas counterparts (an electric Ford F-150 weighs 20% more than its internal combustion engine predecessor, for instance) (Carey 2023). The weight discrepancy, however, is a moot point as of late, with Europe's most popular electric vehicle being 200 pounds lighter than a Toyota Corolla, and Tesla's Model X SUV weighing the same as a gas Range Rover of the same size (Carey 2023). Microplastic pollution from tire wear remains a real problem that must be addressed, and the mass adoption of electric vehicles will not help the problem—it won't necessarily make things worse, however.

The remaining impacts of electric vehicles on the planet and human health are incontrovertibly positive. By replacing all internal combustion engine vehicles in a city with electric vehicles, we can reduce the urban heat island effect by nearly 1°C (Li et al. 2015). Electric vehicles also emit no $PM_{2.5}$ emissions—a carcinogenic air pollutant linked to heart disease, lung disease, cancer, and premature deaths (Pan et al. 2023). By shifting to electric vehicles, we can prevent over 1163 deaths and save $12.61

billion in health costs annually…in just the city of Los Angeles alone! (Pan et al. 2023). These numbers aren't just guesses either. In Norway, where nearly all cars sold are electric, $PM_{2.5}$ levels have decreased by 75% in the country from before EVs were on the roads (Carey 2023). Electric vehicles also produce no hazardous Nitrogen Oxides (or NO_x). Because NO_x emissions are elevated in black and brown communities located near highways, vehicle electrification would thus have an outsized positive impact on the health of environmental justice communities (Carey 2023).

In the realm of economic sustainability, the lifetime positive financial impacts of a single electric vehicle are $16,403 (Malmgren 2016). This valuation includes $4,130 in fuel savings, $1,488 in maintenance savings, $866 in environmental benefits applying a social cost to carbon, $1,686 in public health benefits, $3,268 in national security value by reducing dependence on foreign oil, $965 in economic development value by spurring green jobs growth, and $4,000 in grid resource value by helping to reduce peak electrical grid loads (Malmgren 2016).

More research is needed to help firefighters respond to rare, yet ferocious, EV fires, and on how to reduce tire pollution generally. But with new battery chemistries in EVs now available, electric vehicles have a wide range of positive benefits on our planet, our health, and our cities. While electric vehicles will not solve car dependency, and the myriad of economic and social costs associated with it, they are a realistic and widely implementable response to the climate crisis that can be deployed in years, not decades.

Chapter 4: Literature Review of Federal Law and Electric Vehicles

Regulatory History—Clean Air Act

The 1970 Amendments to the Clean Air Act (CAA) represented a significant sea change in how the U.S. responded to air pollution by authorizing the federal government to promulgate and enforce rules regulating air pollution from both stationary and mobile sources (US EPA 2015). Title II Part A of the Clean Air Act directly relates to the regulation of pollution from on-road motor vehicles and empowers the Administrator of the EPA to: "prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare" (42 U.S.C. § 7521).

EPA incorporated this statutory language into its *Emission standards for light-duty vehicles, light-duty trucks and medium-duty passenger vehicles*. This regulation imposes testing, reporting, and exhaust emission standards for the following air pollutants: carbon monoxide (CO), nitrogen oxides (NO_x), particulate matter (PM), formaldehyde (HCHO), and non-methane organic gases (NMOG) (40 C.F.R. § 86.1811-04). This list of air pollutants is notable because it includes pollutants beyond the six criteria pollutants for the National Ambient Air Quality Standards (NAAQS) designated

by Congress (EPA 2019). EPA was able to add standards for HCHO and NMOG based on the authority prescribed to it in the Clean Air Act, namely, that "The Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare" (42 U.S.C. § 7521(a)(1)).

Forty years after the passage of the CAA Amendments, EPA finally began the process of adding CO_2 to the list of pollutants it regulates from automobile tailpipes (EPA 2023). Colloquially known as the *Clean Cars Rule*, this regulation came about specifically in response to the landmark Supreme Court case, *Massachusetts v. EPA*. In that case, Massachusetts and eleven other states sued the EPA under the CAA for failing to regulate CO_2 emissions. Massachusetts' case relied on the very same language above, which instructed that the Administrator "shall" regulate air pollutants that "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare" (*Massachusetts v. E.P.A.*, 549 U.S. 497, 506 (2007)). Although the court did not require EPA to regulate CO_2 emissions, it did remand the issue back to the EPA, as it found that the agency's reasoning for not regulating CO_2 emissions was arbitrary and capricious. (*Massachusetts v. E.P.A.*, 549 U.S. 497, 534 (2007)). Justice Stevens, in writing for the majority, held that, "EPA can avoid promulgating regulations only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or

will not exercise its discretion to determine whether they do." (*Massachusetts v. E.P.A.*, 549 U.S. 497, 501 (2007)).

Less than two years after the court's ruling, in 2009, EPA issued a finding that the greenhouse gases carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (1) endanger public health and welfare, and (2) the emissions of these pollutants from motor vehicles contribute to that endangerment (US EPA 2021). Today, EPA's GHG auto emissions rule is codified in 40 C.F.R. § 86.1818-12. Unlike its original air pollution standards for CO, NO_x, PM, HCHO, and NMOG, which apply to each individual vehicle sold, EPA's GHG emissions standards apply to a fleetwide average (40 C.F.R. § 8618-12(c)). This means that the amount of CO_2 emitted in grams per mile cannot exceed a specific limit for the fleetwide average of an auto manufacturer's class of cars and light-duty trucks. EPA's CAA emissions standards are not the only source of federal regulation of automobile emissions. In fact, the National Highway Traffic Safety Administration (NHTSA) has concurrent authority to regulate the fuel economy of vehicles under the Energy Policy and Conservation Act, or EPCA.

Regulatory history—Energy Policy and Conservation Act

Signed by Gerald Ford in 1975, EPCA was passed as a response to the 1973 oil crisis, which temporarily led to a tripling of oil prices in the United States (CBC News Online 2006). Unlike the Clean Air Act passed before it, EPCA is crucially not a piece of environmental legislation. This fact becomes clear in reading the legislation's

'statement of purposes.' A sampling of the legislative purposes includes "to provide for the creation of a Strategic Petroleum Reserve capable of reducing the impact of severe energy supply interruptions," "to conserve energy supplies through energy conservation programs, and, where necessary, the regulation of certain energy uses," and "to provide for improved energy efficiency of motor vehicles, major appliances, and certain other consumer products" (P.L. 94-163, 5). Environmental protection makes no appearance in the statement of purposes, which helps to explain why authority for automobile regulation lies not with EPA, but with NHTSA, a tiny agency within the U.S. Department of Transportation most noteworthy for creating vehicle safety standards and performing crash tests (National Highway Traffic Safety Administration 2019).

Although NHTSA's mission is "to save lives, prevent injuries, and reduce economic costs due to road traffic crashes, through education, research, safety standards, and enforcement," it has found itself in the position of managing one of the most consequential climate regulatory schemes in America: CAFE Standards (NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION 2023). CAFE—or 'Corporate Average Fuel Economy Standards'—are the United States government's fuel efficiency standards for cars and light trucks. Unlike EPA's emissions standards, which impose limits on tailpipe emissions, CAFE Standards work to increase the number of miles motor vehicles can travel on a single gallon of fuel (U.S. Department of Transportation 2014). Like EPA's GHG standards, CAFE Standards for vehicles do not apply to individual car models and instead require the overall fleet of each car

manufacturer to meet a minimum miles per gallon rating (U.S. Department of Transportation 2014). Since 2010, EPA and NHTSA have issued joint rules for Corporate Average Fuel Economy and Greenhouse Gas emissions regulations (U.S. Department of Transportation 2014).

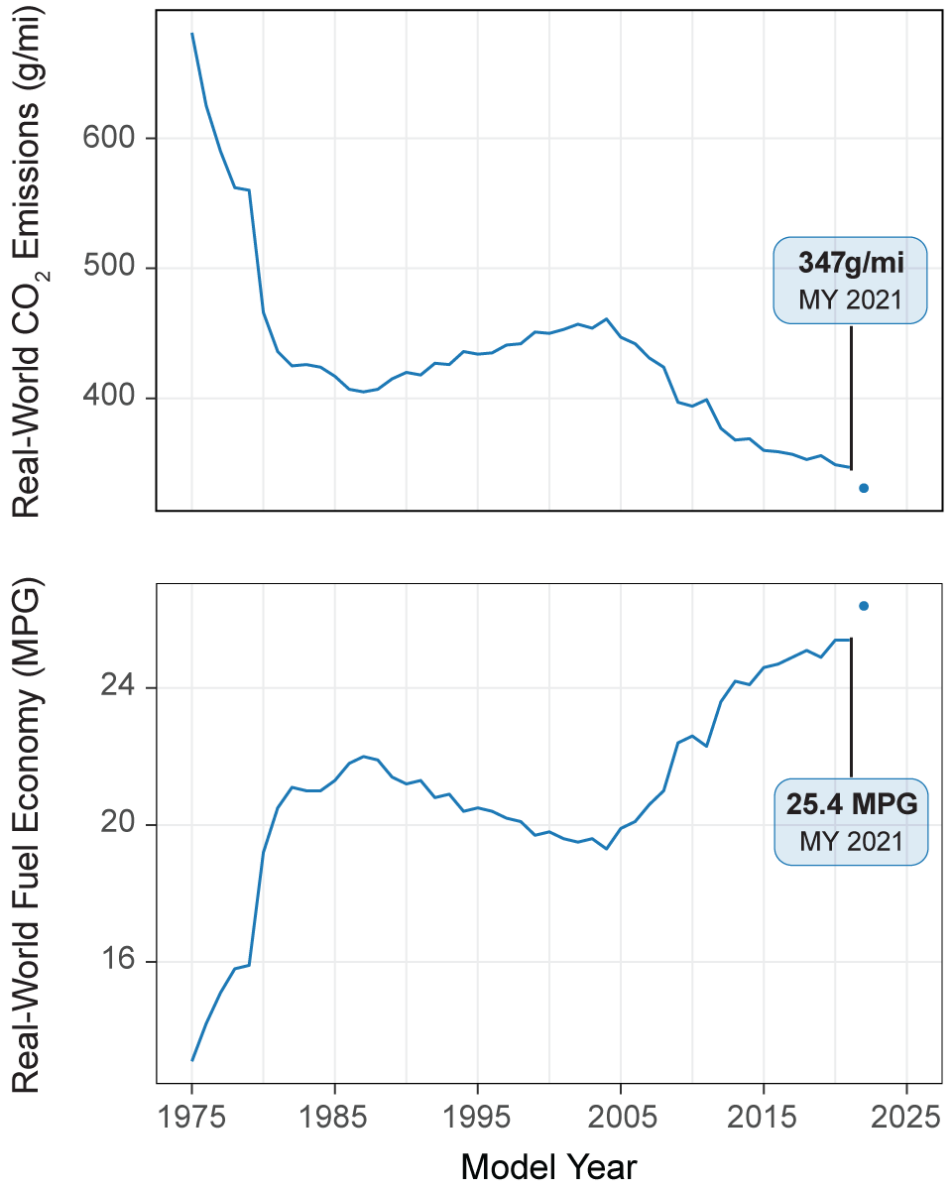

Figure 4: This graph shows a direct correlation between decreasing vehicle GHG emissions and increasing vehicle fuel efficiency, underscoring the decision for EPA and NHTSA to issue joint fuel economy and GHG regulations (U.S. Environmental Protection Agency 2016).

Although EPA and NHTSA technically have different jurisdictions over vehicle emissions and efficiency, there is much overlap between emissions standards and CAFE Standards working toward cleaner, more efficient cars. CO_2 emissions and fleetwide fuel efficiency are directly correlated, so it makes sense for the two agencies to cooperate in developing and promulgating future rules (US EPA 2016).

Regulatory history—California's Special Status

Section 209 of the 1970 Clean Air Act amendments created a federal preemption of all state vehicle emissions standards (42 U.S.C.A. § 7543 (West)). Section 290(b), however, makes an exception for any state that had adopted vehicle emissions standards before March of 1966. (42 U.S.C.A. § 7543 (West)). The only state that had adopted vehicle emissions standards prior to 1966 was California, so this exemption from federal preemption was created especially for the Golden State (Initial Brief of Respondents at 7, Ohio v. EPA, No. 22-1081 (D.C. Cir. Filed May 12, 2022)). Even before the Clean Air Act amendments of 1970, California had been granted an exemption to create its own standards that are "at least as protective of public health and welfare as applicable Federal standards"—going back to the Air Quality Act of 1967 (California Air Resources Board 2019).

Figure 5: An example of the visible air pollution in California in the twentieth century (Snyder 2011).

Congress made such an exception for California due to "compelling and extraordinary circumstances" (California Air Resources Board 2019). By 1970, California was the most populous state in the country (US Census Bureau 2021) and had some of the most polluted air in America (California Air Resources Board 2012). Heavy reliance on automobiles plus geographic factors made places like the Los Angeles Basin and the Central Basin so polluted that an estimated 27% of residents suffered permanent lung damage by 1987 (Dundon 2018). Over the last half-century, California's population has more than doubled, yet ground-level ozone levels in places like Los Angeles have been cut by more than 40% (Dundon 2018). Nevertheless, sixteen out of twenty-nine of the American Lung Association's most polluted counties in America are in California (American Lung Association 2025).

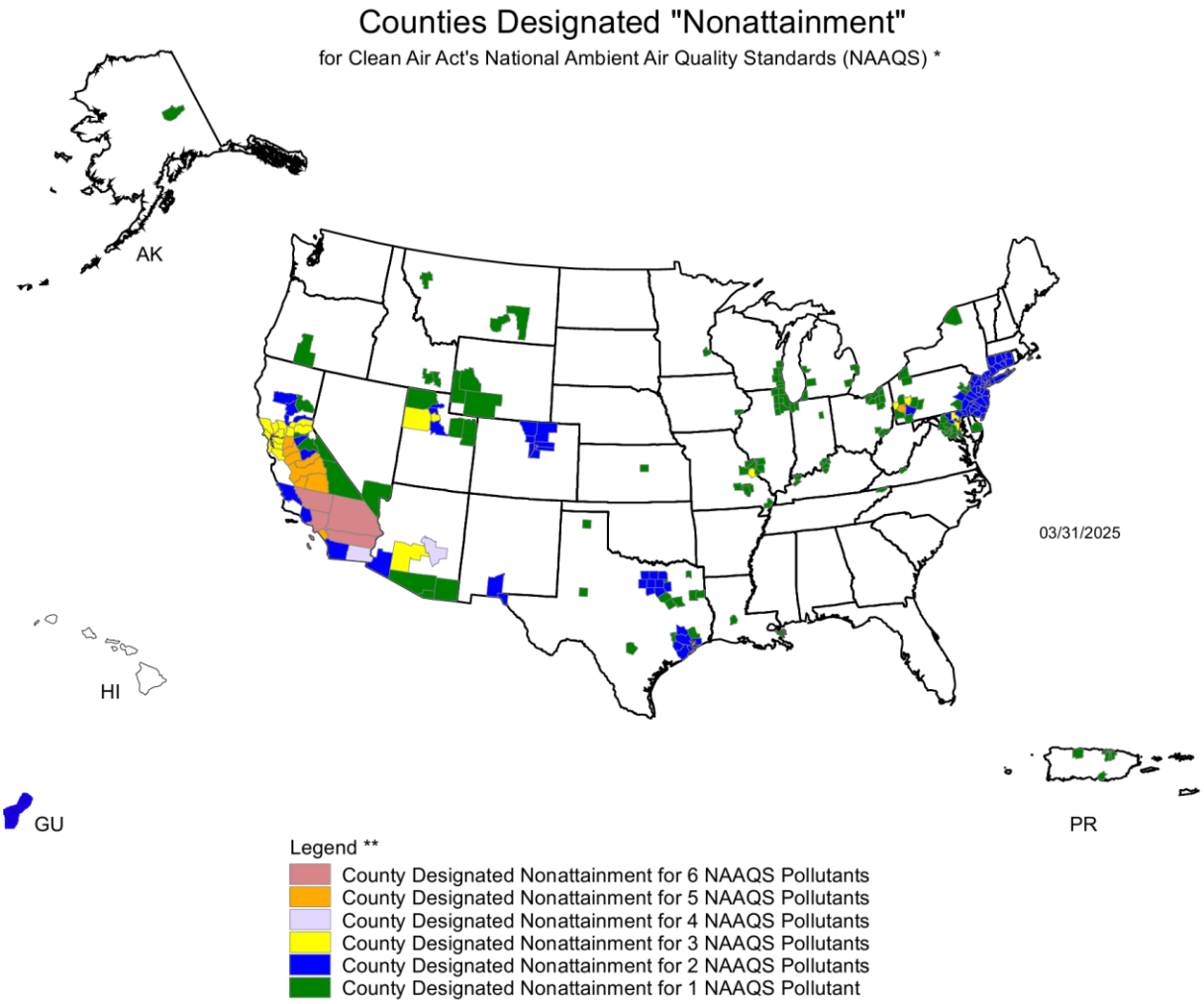

Figure 6: A map of current U.S. counties that are in nonattainment with the National Ambient Air Quality Standards for at least one criteria pollutant (U.S. Environmental Protection Agency 2025).

Most California's counties remain nonattainment areas for multiple National Ambient Air Quality Standards criteria pollutants, and 10,000 people continue to die prematurely each year from air pollution (Dundon 2018). Nonattainment means that a county is in violation of the Clean Air Act due to elevated air pollution levels (United States Environmental Protection Agency 2025). Because of the enduring "compelling

and extraordinary circumstances," no administration attempted to rescind California's CAA waiver…until Trump came along (California Air Resources Board 2019).

The Clean Air Act only grants a vehicle emissions waiver to the state of California. Section 177 of the Clean Air Act amendments of 1977, however, permits other states to adopt their own vehicle emissions standards so long as "such standards are identical to the California standards for which a waiver has been granted for such model year" (42 U.S.C.A. § 7507 (West)). In effect, the potential climate-saving impacts of California's vehicle emissions standards (to be discussed below) can be extended far beyond its borders. As of 2022, seventeen other states have adopted California's standards (California Air Resources Board 2024). These states collectively account for 40 percent of all vehicle sales in the United States (California Air Resources Board 2024).

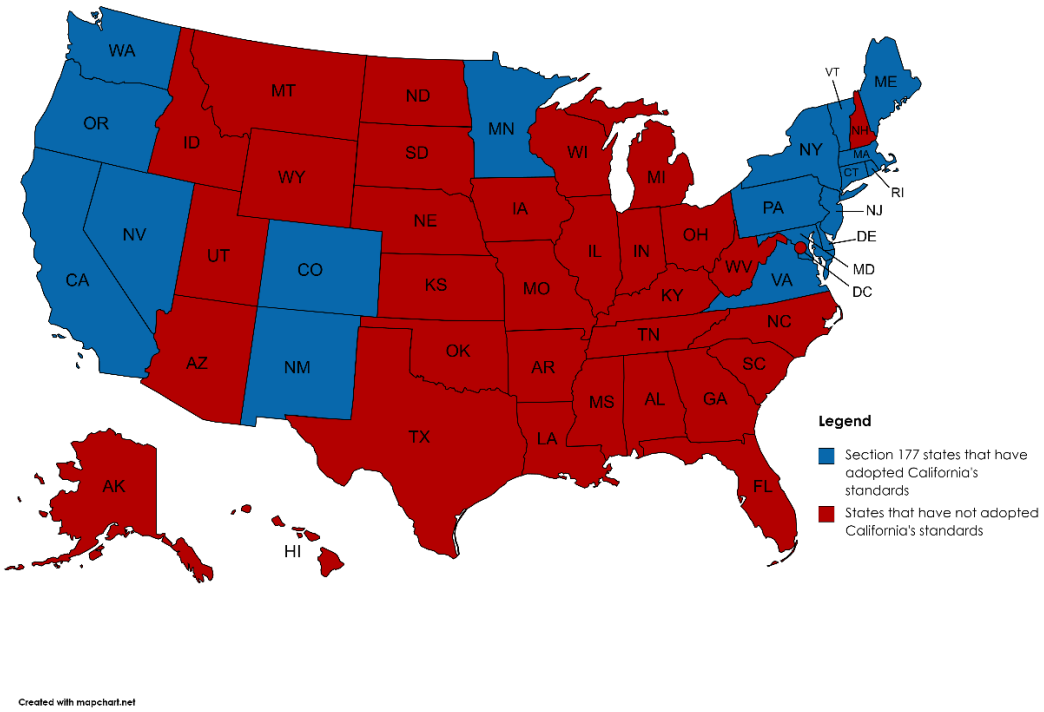

Figure 7: A map showing the states that have and have not adopted California's emissions standards (California Air Resources Board 2022b).

California's standards over the years have been consistently more aggressive than federal ones in reducing air pollution, increasing efficiency, and cutting GHG emissions. California was the first to require catalytic converters[3], fuel injection oxygen sensors[4], and ultra-low emissions vehicles (California Air Resources Board 2019). As seen in Figure 8, California's actions had a direct, real-world impact on the polluting potential of automobiles. And Figure 9 shows how real-world fuel economy

[3] Catalytic converters reduce the discharge of noxious and polluting gases from internal-combustion engine vehicles, and are found on all modern vehicles with internal combustion engines (Curley 2025).
[4] Fuel injection oxygen sensors measure the level of oxygen in a vehicle's exhaust to calibrate the most efficient combustion (Tomorrow's Technician 2025).

has increased dramatically over the quarter-century despite an ever-increasing average weight and footprint of vehicles.

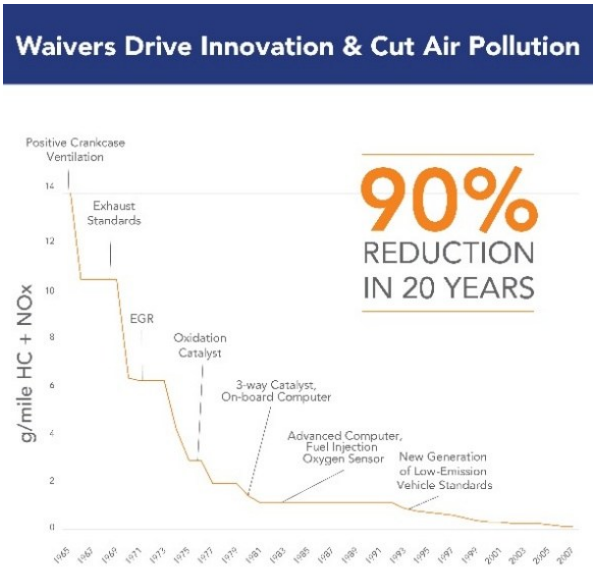

Figure 8: A chart showing the decreasing average emissions in vehicles overlayed with specific standards introduced by California (California Air Resources Board 2019).

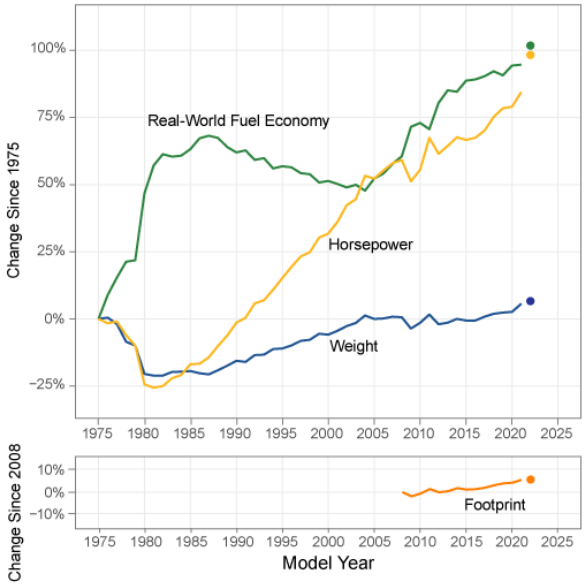

Figure 9: A chart highlighting increases in real-world fuel economy coupled with increases in vehicle size and power (U.S. Environmental Protection Agency 2016).

One of California's most successful programs has been its Advanced Clean Cars (ACC) regulations, initially introduced in 2012, which included provisions for increasing the competitiveness of ZEVs and led to a 40 percent reduction in GHG emissions from new cars (California Air Resources Board 2019). In 2022, California adopted its Advanced Clean Cars II regulations, which will gradually phase out traditional internal combustion engine (ICE) vehicles over the next decade and require,

beginning in 2035, that all new vehicles sold be zero emissions (Cal. Code Regs. tit. 13, § 1962.4).

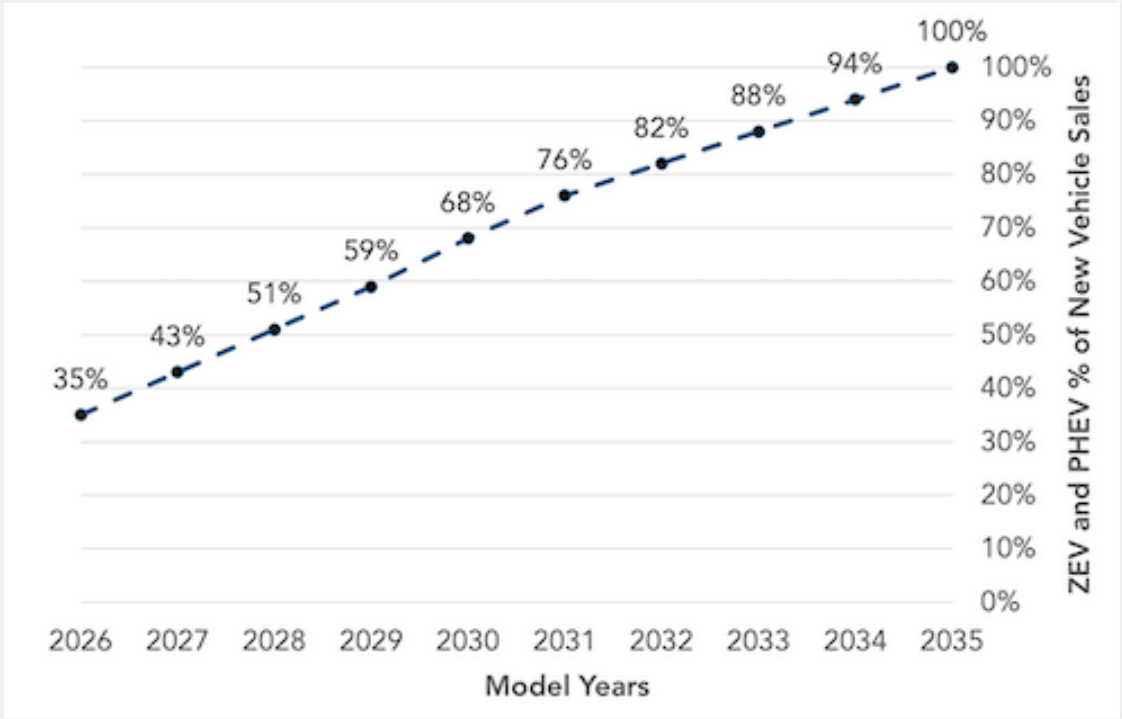

Figure 10: Percentage of vehicles sold each year by automakers in California and Section 177 states that must be zero emissions under Advanced Clean Cars II regulations (California Air Resources Board 2022a).

A Period of Deregulation (Attempts)—The First Trump Administration

In 2018, the Trump Administration's EPA and NHTSA jointly proposed new fuel economy and emissions standards for automobiles, which would heavily roll back the Obama Administration's work on the national level and rescind California's CAA waiver (US EPA 2018).

The Trump Administration used a two-prong approach to curb California's ability to set its own emissions standards. The first relates to EPCA. Although Section 209 of the CAA contains an explicit exemption for California, EPCA contains no such

exemption. NHTSA argued in the joint proposal that allowing a single state actor to regulate fuel efficiency frustrates "Congress's intent to provide for uniform national fuel economy standards" (The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program, 84 Fed. Reg. 51313 (Sept. 27, 2019) (to be codified at 40 C.F.R. pts. 85, 86; 49 C.F.R. pts. 531, 533)). For its authority, NHTSA cited 49 U.S.C. § 32919(a), which spells out preemption in EPCA: "When an average fuel economy standard prescribed under this chapter is in effect, a State or a political subdivision of a State may not adopt or enforce a law or regulation related to fuel economy standards or average fuel economy standards for automobiles covered by an average fuel economy standard under this chapter" (49 U.S.C.A. § 32919 (West)). Ironically, while NHTSA acknowledged two federal court cases where the issue of EPCA preemption arose, both district courts unambiguously ruled that EPCA does not preempt California's regulation of GHGs from automobiles (*Cent. Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F. Supp. 2d 1151 (E.D. Cal. 2007), as corrected (Mar. 26, 2008)) (*Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F. Supp. 2d 295 (D. Vt. 2007)). NHTSA doesn't explain why both courts were incorrect but instead rests its argument on the fact that it disagreed with both rulings at the time (Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015, 73 FR 24352-01).

The Trump Administration's second approach to curtailing California's ability to regulate vehicle emissions was to propose to rescind the state's waiver under Section 209 of the Clean Air Act. Section 209 requires the Administrator of the EPA to waive federal preemption for California unless the "State does not need such State standards

to meet compelling and extraordinary conditions" (42 U.S.C.A. § 7543 (West)). EPA had never before claimed that California did not have compelling and extraordinary conditions, but now EPA argued that because California's GHG emissions target climate change, that issue is not unique to the State of California, meaning California failed to meet compelling and extraordinary conditions (The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program, 84 Fed. Reg. 51339). EPA also argued that California's standards would not provide any specific remedy to the state (US EPA 2019).

The Trump Administration was immediately mired in a barrage of lawsuits from California, Section 177 states, environmental organizations, and even automakers themselves (Harvard Law School Environment and Energy Law Program 2019) (*State of California v. Chao*, No. 1:19-cv-02826-KBJ (D.D.C.); *EDF v. Chao*, No. 1:19-cv-2907 (D.D.C.); *Union of Concerned Scientists v. NHTSA*, No. 19-1230 (D.C. Cir.)). Final decisions about the SAFE Rule were never made by the time the Biden Administration took over in 2021 (Harvard Law School Environment and Energy Law Program 2019).

The Fight For Reregulation—The Biden Administration

On his very first day in office, President Biden signed an executive order directing EPA and NHTSA to rescind the Trump Administration's SAFE Rules, among many other actions taken during the prior administration (The White House 2021). President Biden's executive order demonstrated his determination to address climate change specifically, as he ordered federal agencies to, "immediately review and, as

appropriate and consistent with applicable law, take action to address the promulgation of Federal regulations and other actions during the last 4 years that conflict with these important national objectives, and to immediately commence work to confront the climate crisis" (The White House 2021).

EPA and NHTSA complied, and by April 2021, the agencies began soliciting comments for reconsidering the Trump Administration's revocation of California Section 209 CAA waiver (US EPA 2021a). NHTSA acted first in repealing the SAFE Rules in their entirety on December 29, 2021, including the preemption rule for California. According to NHTSA, Section 32919 (which sets the scope of EPCA's preemption) is self-executing and "does not mention any role for NHTSA in codifying binding preemption requirements, nor does it state that the Agency is conferred with preemption rulemaking authority" (Corporate Average Fuel Economy Preemption, 86 Fed. Reg. 74236 (Dec. 29, 2021) (to be codified at 49 C.F.R. pts. 531, 533)). NHTSA explained that repealing the preemption rule was not only appropriate but was "a necessary measure to ensure that NHTSA is acting within the appropriate scope of its authority under EPCA" (Corporate Average Fuel Economy Preemption, 86 Fed. Reg. 74236 (Dec. 29, 2021) (to be codified at 49 C.F.R. pts. 531, 533)).

EPA finalized its reversal of the withdrawal of California's CAA Section 209 waiver on March 14, 2022, officially re-granting California its longstanding waiver. In its nearly fifty-page notice in the Federal Register, EPA crafted a detailed roadmap justifying its decision (Cattaneo 2022). First, EPA explained that its standard for reviewing previously granted waivers is more restrictive than the statutory criteria in

Section 209: "EPA believes it may only reconsider a previously granted waiver to address a clerical or factual error or mistake, or where information shows that factual circumstances or conditions related to the waiver criteria evaluated when the waiver was granted have changed so significantly that the propriety of the waiver grant is called into doubt" (California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Notice of Decision, 87 Fed. Reg. 14332, 14344 (Mar. 14, 2022)). In applying this standard to the Trump Administration's withdrawal of the waiver, EPA found no clerical or factual errors or mistakes. EPA also found that conditions had not changed significantly in California since the most recent waiver's issuance in 2013 (California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Notice of Decision, 87 Fed. Reg. 14332, 14344 (Mar. 14, 2022)).

EPA rejected the Trump Administration's argument that California did not have compelling or extraordinary conditions that would allow it to address GHG emissions. EPA didn't dispute the Trump Administration's finding, per se, but instead contended that by assessing only one pollutant individually (GHGs) instead of all air pollutants together, the Trump Administration misinterpreted Section 209 and reneged on EPA's historical practices of holistically evaluating the combined impact of all air pollutants. (California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Notice of Decision, 87 Fed. Reg. 14332, 14355 (Mar. 14, 2022)).

EPA also rejected the Trump Administration's contention that climate change does not have particularized impacts on California. Even if applying Trump's flawed analysis considering only climate change, EPA found that: "California is particularly impacted by climate change, including increasing risks from record-setting fires, heat waves, storm surges, sea-level rise, water supply shortages and extreme heat, and…climate-change impacts in California are therefore 'compelling and extraordinary conditions' for which California needs the GHG standards and ZEV sales mandate" (California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Notice of Decision, 87 Fed. Reg. 14332, 14363 (Mar. 14, 2022)).

Finally, EPA chided the Trump Administration for using NHTSA's discredited EPCA preemption determination to justify rescinding California Section 209 waiver. EPA found that it should not have left the bounds of Section 209 and used non-statutory agency reasoning (that has since been reversed) (California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Notice of Decision, 87 Fed. Reg. 14332, 14368-70 (Mar. 14, 2022)).

Red State Challenges to The Biden Administration

Less than two months after finalizing its reversal of the Trump Administration's withdrawal of California's Section 209 waiver, seventeen states led by the Attorney General of Ohio filed suit against EPA over its decision. (Corrected Proof Brief of

Petitioners, Ohio v. EPA, No. 22-1081 (D.C. Cir. Filed May 12, 2022)). Despite not following, nor being required to follow California's GHG emissions and ZEV standards, these states still took issue with California's very ability to exercise its own power in setting vehicle standards.

Ohio adopted a two-part argument for why California should not be granted a CAA Section 209 waiver: (1) doing so violates the constitutional principle of equal sovereignty, and (2) doing so violates the Administrative Procedures Act (APA) because it is not in accordance with Section 32919 of EPCA (Corrected Proof Brief of Petitioners, Ohio v. EPA, No. 22-1081 (D.C. Cir. Filed May 12, 2022)).

Equal Sovereignty

Until now, the constitutional doctrine of equal sovereignty has been applied exclusively to voting rights issues (Cornell Law School 2016). It was cast into the spotlight with the Supreme Court's 2013 decision in *Shelby County v. Holder*, where the court struck down parts of the Voting Rights Act that required certain states and counties to receive federal preclearance before changing voting procedures (*Shelby County v. Holder*, 570 U.S. 529 (2013)). The majority held that "not only do States retain sovereignty under the Constitution, there is also a 'fundamental principle of equal sovereignty' among the States" (*Shelby County v. Holder*, 570 U.S. 529, 544 (2013)). Citing a case from the early days of the State of Oklahoma, the majority further found that,

"The constitutional equality of the States is essential to the harmonious operation of the scheme upon which the Republic was organized" (*Shelby County v. Holder*, 570 U.S. 529, 544 (2013) citing *Coyle v. Smith*, 221 U.S. 559, 580 (1911)).

Crucially, the court in *Shelby* didn't completely close the door to disparate treatment between states, holding that,

"A departure from the fundamental principle of equal sovereignty requires a showing that a statute's disparate geographic coverage is sufficiently related to the problem that it targets" (*Shelby County v. Holder*, 570 U.S. 529, 542 (2013) citing *Northwest Austin Mun. Util. Dist. No. One v. Holder*, 557 U.S. 193, 203 (2009)).

It appears that Section 209 of the Clean Air Act, by requiring California to show "compelling and extraordinary conditions," meets the *Shelby* requirements (42 U.S.C.A. § 7543 (West)). Was the *Shelby* court's adoption of the doctrine of equal sovereignty for voting rights issues merely a convenient solution for the court to come to a conclusion without any other basis? Leah Litman, writing in the Michigan Law Review, explains that,

"The principle of equal sovereignty, as initially articulated by courts and subsequently explained by Shelby County, is an invented tradition that courts have used to justify independent determinations about federalism. Equal sovereignty was initially invented to address the constitutional challenges posed by the admission of new states" (Litman 2016).

It is possible that, for a court already happy to toss aside historical precedent and interpretation[5], the Supreme Court could find that CAA Section 209 does violate the equal sovereignty doctrine despite its seeming compliance with its own ruling in *Shelby*. Ohio argues that Section 209 effectively creates winners and losers by empowering California to set rules that other states are preempted from setting (Corrected Proof Brief of Petitioners, Ohio v. EPA, No. 22-1081 (D.C. Cir. Filed May 12, 2022)). This argument ignores a crucial aspect of Section 209: that state standards must be "at least as protective of public health and welfare as applicable Federal standards" (42 U.S.C.A. § 7543 (West)). Ohio cannot articulate precisely what "benefit" California is receiving by being allowed to create its own stricter rules other than the ambiguous notion of "retained sovereignty" (Corrected Proof Brief of Petitioners at 28, Ohio v. EPA, No. 22-1081 (D.C. Cir. Filed May 12, 2022)).

EPA responded by pointing out that equal sovereignty, as articulated in *Shelby*, is applied exclusively to voting rights issues and does not limit Congress' power under the Commerce Clause (Initial Brief of Respondents at 36, Ohio v. EPA, No. 22-1081 (D.C. Cir. Filed May 12, 2022)). I believe EPA has the winning legal argument, but it is hard to predict how a highly partisan supreme court would rule on this issue.

[5] One needn't look further than the Supreme Court overturning *Roe v. Wade* (*Dobbs v. Jackson Women's Health Organization*, 597 U.S. 215 (2022)).

Reconciling CAA Section 209 with EPCA Section 32919

Ohio's second legal argument is that because the waiver permits California to regulate an area preempted by EPCA, it is "not in accordance with the law" and thus violates the Administrative Procedure Act (Corrected Proof Brief of Petitioners at 33, *Ohio*, citing 5 U.S.C. § 706(2)(A)).

Unlike the Trump Administration, which brushed off adverse previous court rulings, Biden's EPA vigorously defended the waiver by highlighting how both federal court jurisdictions that tackled this question ruled that EPCA does not preempt California from setting GHG standards (*Cent. Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F. Supp. 2d 1151 (E.D. Cal. 2007), as corrected (Mar. 26, 2008)) (*Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F. Supp. 2d 295 (D. Vt. 2007)). Furthermore, EPA argues that "because Section 209(b) instructs that the Administrator "shall" issue the waiver unless one of the three criteria specified by Congress is met, the Administrator does not err in focusing solely on those criteria" (Initial Brief of Respondents at 93, *Ohio*). The "shall" instruction means that EPA has no discretion in issuing a waiver to California if it meets all the criteria in Section 209. EPA has a strong argument here, as the Supreme Court has consistently held that "the word 'shall' usually connotes a requirement, unlike the word 'may,' which implies discretion" (*Kingdomware Techs., Inc. v. United States*, 579 U.S. 162, 163 (2016)).

Finally, in the interplay between EPCA and CAA, it is important to note that Section 209 was passed by Congress years before EPCA. EPA and NHTSA have an imperative for rational administrative decision-making; since NHTSA rescinded its Trump-era preemption rule, and all previous court cases have ruled that EPCA does not preempt California's GHG emissions standards, it would be incongruous for EPA (or the Supreme Court, for that matter) to overrule the clear intent of Congress waive CAA preemption for California.

This case presented a real threat to the current electric vehicle regulatory regime; fortunately, the D.C. Circuit rejected Ohio's argument, and ruled resolutely in EPA's favor (*Ohio v. Env't Prot. Agency*, 98 F.4th 288 (D.C. Cir. 2024)). The Supreme Court denied certiorari in December of 2024 to review the decision. This means that the Circuit's decision stands, and the Supreme Court declined to rule on the merits of the case at this time. For the time being, and unless the Supreme Court takes up a future challenge, the legality and constitutionality of the California Waiver is settled law (*Ohio v. EPA*, No. 24-13, 2024 WL 5112340 (U.S. Dec. 16, 2024)).

Dismantling the Administrative State—The Second Trump Administration

When Trump was inaugurated for his second term in January of this year, he wasted little time fulfilling his promise to begin dismantling the administrative state as we know it. On day one, he signed an executive order rescinding what he called "harmful executive orders and actions" of the Biden Administration. These "harmful" executive orders that were repealed include one tackling the climate crisis at home

and abroad, another creating a climate change support office, and a third that restored the role of science in agency decision-making (The White House 2025a) (Friedman 2025a). Just one day later, President Trump signed his "Unleashing American Energy" executive order that directed agencies to "end the EV mandate" (The White House 2025c). In fact, there is not any federal "EV mandate" for Trump to end. Ultimately, the current Department of Transportation, the parent agency to NHTSA, interpreted his executive order to mean rolling back CAFE standards (U.S. Department of Transportation 2025). Sadly, the very first act of the new Secretary of Transportation was to make America's cars dirtier and less efficient and doing away with "the radical Green New Deal agenda"[6] by ordering the rescission of all CAFE standards (U.S. Department of Transportation 2025).

Considering that CAFE standards have been in operation since the Carter Administration and strengthened over time by Democrat and Republican administrations alike (U.S. Department of Transportation 2014), scrapping these standards is a radical move. Nevertheless, with 40% of the American population living in states with the far more stringent California standards, it ultimately should make little difference what the federal government does…as long as the California standards continue to exist.

So too at the legislative level. Congressional Republicans are embarking on their own mission to kill the California CAA waiver once and for all (Brugger 2025). Using a

[6] This is an actual line from the Secretary of Transportation's memorandum (U.S. Department of Transportation 2025).

rarely-used statute called the Congressional Review Act (National Conference of State Legislatures 2025), Congress is permitted to overrule any executive branch regulation within 60 days with a simple majority and presidential signature (Friedman 2025). This law is hardly ever used because what President would sign an overruling of their own agency's regulation? Instead, the Congressional Review Act finds its usefulness in the first few months of a new President's term, when they can easily undo their predecessor's recent work (National Conference of State Legislatures 2025). In this case, EPA promulgated its waiver for California, as required by the CAA, and Congressional Republicans want to use the Congressional Review Act to undo the waiver (Nieves 2025). Without the Congressional Review Act, repealing California's waiver would require the normal 60 votes in the Senate to overcome the filibuster as any other legislation—60 votes that Republicans do not have (Friedman 2025).

The Senate Parliamentarian (the independent arbiter of Senate rules) recently determined that using the Congressional Review Act was not proper in this case, as EPA was not so much promulgating a regulation as it was merely complying with the unambiguous terms of the Clean Air Act (Friedman 2025). Furthermore, although the California emissions standards that result from the waiver are regulations, they are state regulations, which Congress has no constitutional right to overrule through the Congressional Review Act. Never a simple day in Congress, as of writing, Congressional Republicans are considering overruling the Senate Parliamentarian and voting anyway to strip California of its waiver with the Congressional Review Act

(Frazin 2025). This action would surely lead to protracted court battles, the result of is impossible to predict.

President Trump has further muddied the water by directed his Attorney General to "prioritize the identification of any…State laws purporting to address "climate change" or involving "environmental, social, and governance" initiatives, "environmental justice," carbon or "greenhouse gas" emissions, and funds to collect carbon penalties or carbon taxes, [and] expeditiously take all appropriate action to stop the enforcement of [such] State laws and continuation of civil actions" (The White House 2025d). The 10th Amendment likely makes this "Protecting American Energy from State Overreach" executive order—which infringes upon a state's right to take climate action in areas not preempted by federal law—unconstitutional. The 10th Amendment holds that "the powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people" and limits the powers of the federal government over the states (Cornell Law School 2025). Questions of the constitutionality of this order is far beyond the scope of this thesis, but states should be aware that any electric vehicles policies (like those proposed below) may be hampered or at least slowed down by a federal government overtly hostile to any policies unfriendly to the fossil fuel industry. Vermont, for instance, has paused a number of EV infrastructure projects, like high-speed charging stations, in response to the federal government's efforts (Robinson 2025).

Chapter 5: Literature Review of State and Local Government Steps to Encourage Electric Vehicle Adoption

Assuming *arguendo* that the current administration and Congress were to roll back federal vehicle emissions standards and rescind California's Clean Air Act waiver, state and local governments are not without options to continue pushing vehicle electrification. Through innovative policies, like purchase incentives and tax rebates, charging infrastructure development, low-emission zones, fleet electrification, building codes, public awareness campaigns, manufacturing subsidies, and road privileges, state and local governments can take up the mantle where the federal government left off (International Energy Agency 2021).

The first solution available, purchase incentives and tax rebates, is not uncommon to states in the U.S. In Massachusetts, for example, the Commonwealth's MOR-EV program provides incentives of $3,500 toward the purchase of new and used electric vehicles (Massachusetts Department of Energy Resources 2024). To encourage adoption by low-income families, the Commonwealth provides an additional $1,500 incentive for low-income buyers (Massachusetts Department of Energy Resources 2024). Finally, to ensure that new electric vehicles are replacing internal combustion engine vehicles, there is an additional incentive of $1,000 available to buyers (Massachusetts Department of Energy Resources 2024). These incentives help to

eliminate the persistent cost disparity between electric vehicles and comparable internal combustion engine vehicles (Weldon, Morrissey, and O'Mahony 2018).

Another solution available to states and local governments is the installation of electric vehicle chargers to aid drivers on road trips, rideshare drivers, and those who can't charge at their home or place of work. The Netherlands is an excellent example of this strategy, as the country has installed over 63,000 level 2 chargers (International Energy Agency 2021), which can fully charge an electric vehicle overnight, and has the highest ratio of chargers per 1,000 residents of any country in Europe (McLoughlin 2025). The City of Boston has begun to implement the lessons learned from the Netherlands by installing curbside electric vehicle chargers throughout the city as part of its *Recharge Boston* program (City of Boston 2024). The city's plan is to install enough level 2 stations so that every Boston resident will live within a five-minute walk of a curbside charger (City of Boston 2024). New York State is also embarking on a building spree of level 3 fast charging stations. The state, through its *EVolve NY* program, has installed over 50 high speed charging stations which can fully recharge a car in as little as 15 minutes (New York Power Authority 2025). The Netherlands, Boston, and New York show how local governments can reduce range anxiety associated with electric road trips and take the guesswork out of owning an electric vehicle without a place to charge at home.

Outside the United States, several global cities have introduced low-emission zones to either prohibit or disincentivize internal combustion engine vehicles from polluting city centers. Oslo imposes extra tolls on diesel vehicles, provides a 50% toll

discount for personal electric vehicles, and a 100% toll discount for electric trucks (Cui, Gode, and Wappelhorst 2021). This approach serves to incentivize public transit use over personal automobiles, while also encouraging electric deliveries (International Energy Agency 2021b). Madrid, London, Paris, and Singapore have also successfully implemented similar schemes (International Energy Agency 2021b).

New York City is pushing electrification through taxi and rideshare fleet mandates.[7] Under regulations promulgated by the city' Taxi and Limousine Commission, 15% of all rideshare trips in the city must be either fully electric or wheelchair accessible, with the percentage increasing annually until it reaches 100% in 2030 (New York City Taxi and Limousine Commission 2024). This has the dual benefit of exposing regular rideshare passengers to electric vehicles and normalizing them. Requiring electrification for fleets like rideshare is an effective way to reduce pollution and encourage electric vehicle adoption.

Similarly, ensuring that homes and businesses have the electrical upgrades necessary to support electric vehicle charging can help to further reduce range anxiety and ease the demand for public chargers. California has updated its building codes to require that new constructions are electric vehicle ready (Corelis and McCurdy 2025). These building codes require at least one level 2 charger for every unit in multi-family housing, 65% of parking spaces to have charging in hotel parking, and 50% of parking

[7] City law requires the Taxi and Limousine Commission to "develop and approve a plan to significantly increase the number of clean air and accessible vehicles in New York city" (New York City Administrative Code 5 § 19-534).

spaces in office and retail parking lots to have charging (2022 California Green Building Standards Code, Title 24, Part 11 (CALGreen) with July 2024 Supplement).

Another solution is improving public awareness campaigns that educate the public about the benefits of electric vehicles and dispel myths and misconceptions. In the United Kingdom, the government has launched an AI-integrated smartphone app that answers residents' questions about electric vehicles, as it found that only 26% of people who consider an electric vehicle purchase one (Department for Transport 2020). This "Go Ultra Low" app is also integrated with Alexa and Google Assistant for further accessibility (Department for Transport 2020).

States and local governments can further their adoption by reducing production costs. One of the best examples in the United States is the State of Tennessee, which has invested $40 million into a battery manufacturing plant (Associated Press 2022), $884 million into a Ford electric vehicle factory (Yu 2021), and $35 million into converting an existing General Motors factory to an all-electric one (Associated Press 2020).

Chapter 6: Recommendations

To bolster the adoption of electric vehicles and sustain the momentum of transition already taking place in the United States, states and local governments should begin laying the groundwork for a future without federal government support. Although the obituary for CAFE Standards and the CAA California Waiver has not yet been written, the Trump Administration has shown a level of outright hostility toward vehicle emissions standards. The Trump Administration has further shown a willingness to engage in novel, and legally dubious methods to achieve its goals.

States and local governments should expand tax rebates, update building codes, install chargers en masse, invest in manufacturing, and deploy education campaigns to help residents understand the true possibilities of an electric vehicle. Coincidentally, municipalities and states need to ready themselves to defend their right to determine their own futures, and build quieter, less-polluted, more climate-friendly communities.

Chapter 8: Conclusion

Large-scale deployment of electric vehicles is not just useful, but a critical step for taking on the climate crisis. Although maligned on all sides for different reasons, electric vehicles are better for people and planet than internal combustion counterparts in nearly every metric (Carey 2023), and have genuine, real-world benefits on greenhouse gas emissions (Gao et al. 2023). Every policymaker and planner concerned about climate change should support rolling out electric vehicles to every corner of our country as soon as humanly possible.

The legal history of vehicle emissions regulations in the United States was one of constant improvement for nearly forty years. Donald Trump changed all that. Even though electric vehicles only came to be thanks to government pressure and requirements, America's entire regulatory regime is at risk of falling (and taking California's down with it). And it couldn't come at a worse time. The next decade will determine whether we will have a habitable planet for future generations. The stakes could not be higher.

To be clear, electric vehicles are here to stay regardless of the federal government's disdain. Much of the world already has planned end dates for the sale of internal combustion engine automobiles. This includes the UK (Department for Transport 2024), EU (European Parliament 2023), China (Tabeta 2020), Canada (Transport Canada 2021), India (Plumer and Tabuchi 2021), and more. In response, dozens of major automakers have already committed to phasing out internal

combustion engine vehicles in the next decade. The transition to electric vehicles is already a surety. The risk is not transitioning—the risk is not transitioning fast enough.

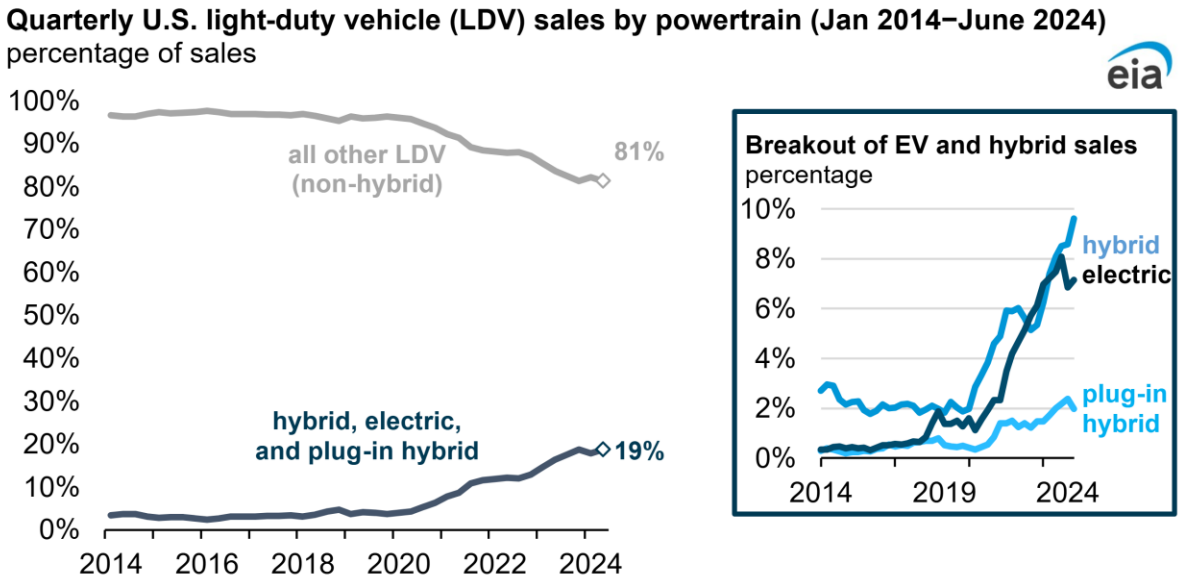

Figure 11: By mid-2024, nearly 1 in 5 vehicles sold in the United States were electrified (U.S. Energy Information Administration 2024).

The United States is well on its way to fully transitioning to electric vehicles, but without federal support, it is up to states and municipalities to speed up the transition and step up in an arena that for so long and for obvious reasons, has been dominated by the federal government.

This thesis is not a panacea to an issue as complex as decarbonizing transportation. In fact, this thesis likely has evoked more questions than answers. On the sustainability side, far more research is needed to understand the risk of electric vehicle fires and to help firefighters safely respond to these rare, yet potentially deadly occurrences. Furthermore, far more research and time is needed to assess the impact of Trump's executive orders and Congressional Republicans' attacks on California's

Clean Air Act waiver. Finally, government and civil society in general, must be prepared to stand up for electric cars on the national stage, and to defend states' rights to push electrification, and create greener, healthier, cleaner communities. The fate of the world depends on it.

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40 C.F.R. § 86.1811-04.

40 C.F.R. § 8618-12(c).

40 C.F.R. § 86.1818-12.

42 U.S.C. § 7521.

42 U.S.C. § 7521(a)(1).

42 U.S.C.A. § 7507 (West).

42 U.S.C.A. § 7543 (West).

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