ORAL ARGUMENT NOT YET SCHEDULED
No. 22-1031 (and consolidated cases)

IN THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

STATE OF TEXAS et al.,
Petitioners,

v.

ENVIRONMENTAL PROTECTION AGENCY and MICHAEL S. REGAN, ADMINISTRATOR OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY,
Respondents,

ADVANCED ENERGY UNITED et al.,
Intervenors.

On Petition for Review of Final Agency Action of the U.S. Environmental Protection Agency (No. EPA-HQ-OAR-2021-0208)

BRIEF OF AMICI CURIAE MARGO OGE AND JOHN HANNON IN SUPPORT OF RESPONDENTS

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GLOSSARY

EPA	United States Environmental Protection Agency
2021 Rule or Rule	Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards

CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

As required by D.C. Circuit Rule 28(a)(1), amici curiae certifies:

I. Parties and Amici

All parties and amici appearing before this Court are listed in the opening briefs of Petitioners.

In addition, amici for Petitioners are the following: American Royalty Council, American Trucking Associations, California Asphalt Pavement Association, California Business Roundtable, California Manufacturers & Technology Association, Commonwealth of Virginia, ConservAmerica, Louisiana Mid-Continent Oil & Gas Association, National Federation of Independent Business, Pacific Legal Foundation, Petroleum Alliance of Oklahoma, State of Kansas, State of South Dakota, State of Tennessee, State of West Virginia, State of Virginia, State of Wyoming, Texas Association of Manufacturers, Texas Independent Producers & Royalty Owners Association, Texas Oil & Gas Association, Texas Royalty Council, The Buckeye Institute, The Sulphur Institute, The Two Hundred for Housing Equity, Truck Renting & Leasing Association, and Western States Petroleum Association.

As of the date of this certification, amici for Respondents are the following: The American Thoracic Society, American Medical Association, American Public Health Association, American College of Occupational and Environmental Medicine, American Academy of Pediatrics, American Association for Respiratory Care, Climate Psychiatry Alliance, American College of Physicians, American College of Chest Physicians, Academic Pediatric Association, and American Academy of Allergy, Asthma and Immunology, Consumer Reports, John Hannon, Margo Oge, The National League of Cities, Representative Frank Pallone, Jr., Senator Thomas R. Carper, and The U.S. Conference of Mayors.

Amici for Respondents who have expressed intent to file are the following: The Institute for Policy Integrity at New York University School of Law and the International Council on Clean Transportation.

II. Rulings Under Review

Under review is the action "Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards," 86 Fed. Reg. 74434 (Dec. 30, 2021) ("2021 Rule" or "Rule").

III. Related Cases

There are no related cases within the meaning of D.C. Circuit Rule 28(a)(1)(C). These consolidated cases have been designated for argument on the same day and before the same panel as *NRDC v. National Highway Traffic Safety Administration*, Case No. 22-1080 and consolidated cases. Order (Sept. 22, 2022).

/s/Matthew D. Zinn
MATTHEW D. ZINN

STATEMENT OF IDENTITY, INTEREST, AND SOURCE OF AUTHORITY TO FILE

Amici curiae are former Environmental Protection Agency ("EPA") managers with direct experience in regulating air pollution in the United States transportation sector:

- **Margo T. Oge** is the former Director of the EPA Office of Transportation and Air Quality. Serving as Director for 18 years and working at EPA for a total of 32 years, Ms. Oge led the development of the first national greenhouse-gas emissions standards for highway vehicles, as well as countless other key standards for on- and off-highway vehicles and equipment. She is currently the Chair of the International Council on Clean Transportation. Ms. Oge received her M.S. in Engineering from the University of Massachusetts at Lowell.

- **John Hannon** is a former Assistant General Counsel of the EPA Office of General Counsel. Serving as Assistant General Counsel for 19 years as part of a 29-year career, Mr. Hannon was involved with all of EPA's major rulemakings and actions to control mobile source emissions under Title II of the Clean Air Act, including regulation of criteria pollutants such as oxides of nitrogen and particulate matter and EPA's 2009 Endangerment Finding covering greenhouse-gas emissions. Mr. Hannon received his J.D. from Georgetown University Law Center.

Amici have extensive expertise with the historical evolution of emissions standards for motor vehicles under the Clean Air Act and the development of electric vehicle technology in response to these standards. Pursuant to D.C. Circuit Rule 29(d), a separate brief is necessary to correct the misimpression that reliance on electric vehicle technology represents a new development in the evolution of motor vehicle emission standards. Amici seek to provide the Court with a historical perspective on the market developments and technological innovations in the automobile industry and EPA's role in driving or following each of those changes.

All parties have consented to the filing of this brief. *See* Fed. R. App. P. 29(a).

RULE 29(a)(4)(E) STATEMENT

No party's counsel authored this brief in whole or in part. Neither any party nor any party's counsel contributed any money that was intended to fund preparing or submitting this brief. No person other than the amici curiae or their counsel contributed money that was intended to fund preparing or submitting this brief.

INTRODUCTION

The role played by electric vehicle technology in preventing harmful vehicle emissions is a central issue in this case. Electric vehicle technology is well understood and has been a part of the motor vehicle market for well over 100 years. It gradually improved over many decades, but experienced dramatic acceleration in the last decade. These improvements have reduced and even eliminated the competitive differences between electric and internal combustion vehicles. The United States and the global market for new motor vehicles, and its industry suppliers, are now aligned for ever greater use of vehicles powered by electricity. The role of electrification in transportation will only increase over time.

Technological change in reducing motor vehicle emissions has a long, dynamic history, resulting in tremendous reductions of harmful pollutants since initial efforts in the 1960s. The history of electric vehicle technology is an integral part of this long-standing trend of technical progress.

Since the 1970s, EPA has implemented Clean Air Act section 202's mandate to set emission standards by constantly evaluating current and projected advances in vehicle technology. For over 20 years, EPA's evaluation has included electric vehicles, and manufacturers have included this technology in their compliance strategies. Setting emissions standards based on a careful projection of growth in the use of electric vehicles reflects EPA's long history of evaluating advances in vehicle technology and the long history of this technology. The Rule accordingly is not the sort of extraordinary and unprecedented agency action that can trigger application of the major questions doctrine.

SUMMARY OF ARGUMENT

I. Innovation in motor vehicle technology has a long, dynamic history and has resulted in tremendous emission reductions.

The motor vehicle industry constantly updates its technology, providing more reliable, safe, and effective transportation and helping to improve air quality. This dynamic history is driven by market demand, competition within the industry, the global nature of the industry, and governmental requirements here and abroad for reductions in harmful air pollution. Since the 1960s, this industry has produced near-constant improvement in technologies that reduce air pollution from vehicles.[1]

This history of innovation has generated massive reductions in pollutant emissions.[2] Reductions have come from significant progress in emissions control technology, such as catalytic converters to control emissions from spark-ignition engines, sophisticated computer and electronic technology to control the fuel combustion process, and devices such as particulate traps and selective catalytic reduction to reduce emissions from diesel vehicles.[3] Ongoing incremental improvement in emission

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[1] The industry includes manufacturers of new vehicles and parts and equipment for these vehicles, as well as research and development organizations. *See* EPA, *History of Reducing Air Pollution from Transportation in the United States,* https://www.epa.gov/transportation-air-pollution-and-climate-change/history-reducing-air-pollution-transportation (last updated Jan. 31, 2023) [hereinafter "*History of Reducing Air Pollution*"].

[2] *History of Reducing Air Pollution*; Nat'l Research Council, *State and Federal Standards for Mobile-Source Emissions* 17, 36-37 (2006), https://doi.org/10.17226/11586 [hereinafter "*NRC 2006 Report*"].

[3] *History of Reducing Air Pollution*; *Int'l Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 624-25 (D.C. Cir. 1973) (description of early catalyst technology); 66 Fed. Reg. 5,002, 5,035-36, 5,053 (Jan. 18, 2001) (particulate traps and selective catalytic reduction); 55 Fed. Reg. 30,584, 30,596-30,597 (July 26, 1990).

control technology has also been a constant factor in emissions reductions.[4] In addition to reducing emissions of historically regulated air pollutants, known as "criteria pollutants," more recently greenhouse-gas emission reductions have been achieved by focusing on the whole vehicle—for internal combustion vehicles, the engine, transmission, tires, aerodynamics, accessories that use energy, and reducing vehicle mass, and by facilitating adoption of electric vehicles.[5]

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[4] *See, e.g.,* 65 Fed. Reg. 6,698, 6,724-25 (Feb. 10, 2000) (projecting incremental improvements in catalyst and related technology); 55 Fed. Reg. at 30,596-97.

[5] EPA, EPA-420-R-22-029, *The 2022 EPA Automotive Trends Report – Greenhouse Gas Emissions, Fuel Economy, and Technology Since 1975* 5-7 (2022) [hereinafter "*2022 EPA Report*"]; 76 Fed. Reg. 57,106, 57,114, 57,199 (Sept. 15, 2011) (heavy-duty vehicles); 75 Fed. Reg. 25,324, 25,328, 25,332, 25,373-75 (May 7, 2010) (light duty vehicles).

II. Vehicles powered by electricity have long been a part of this history.

Using electricity to power vehicles is not a novel way to reduce emissions.[6] Electric vehicles have been produced for well over 100 years.[7] Production and use have waxed and waned over time based on competitive differences, such as cost, battery range, and limitations on recharging.

The industry and EPA have long recognized the benefits of electric-vehicle technology in reducing emissions. California's 1990 Low Emissions Vehicle program and EPA's 1997 National Low Emissions Vehicle

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[6] Electric vehicles may be powered in whole or in part by electricity, including gasoline-electric hybrid, plug-in hybrid, battery-electric, and fuel-cell-electric vehicles. Hybrid vehicles use a battery to power the vehicle as a supplement to the internal combustion engine, which is partially recharged by energy from braking. Plug-in hybrids can be recharged from an external source, allowing greater use of electricity to power the vehicle. Battery electric vehicles use the battery to power the vehicle, with external recharging. Fuel cell vehicles chemically convert a fuel (usually hydrogen) into electrical energy to power the vehicle. Battery electric and fuel cell vehicles are zero emission vehicles. *See* EPA, EPA-420-R-21-023, *The 2021 EPA Automotive Trends Report – Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975* 51, 54-55 (2021) [hereinafter "*2021 EPA Report*"].

[7] U.S. Dep't of Energy, *History of the Electric Car*, https://www.energy.gov/articles/history-electric-car (last updated Sept. 15, 2014) [hereinafter "*History of the Electric Car*"].

program for criteria pollutants were based in part on projected use of electric vehicle technology.[8] More recently this technology has been evaluated and used to achieve greenhouse-gas reductions.[9]

Optimal control of emissions is just one advantage of this technology. Electric vehicle technology is simpler overall than internal combustion technology, doing away with the multitude of parts and equipment that must work smoothly over thousands of miles to reduce emissions from internal combustion vehicles.[10] The combination of optimal broad-spectrum emissions reduction, simplified production and

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[8] *See* Cal. Air Res. Bd., *Low-Emissions Vehicle Program – About*, https://ww2.arb.ca.gov/our-work/programs/low-emission-vehicle-program/about (2023); 62 Fed. Reg. 31,192, 31,212-13, 31,221 (June 6, 1997).

[9] 75 Fed. Reg. 25324, 25,341, 25,382, 25,401, 25,434, 25,436, 25,456 (May 7, 2010); 77 Fed. Reg. 62,624, 62,627, 62,635, 62,679, 62,702-06, 62,852-61, 62,877-80 (Oct. 15, 2012).

[10] United Auto Workers Res. Dept., *Taking the High Road – Strategies for a Fair EV Future* 7, 11-12, 30-31 (2019), https://docs.house.gov/meetings/CN/CN00/20190910/109899/HHRG-116-CN00-20190910-SD002.pdf; Nicole Wakelin, *How Many Parts are in a Car?*, Nat'l Automotive Parts Ass'n: Know How (July 2, 2021), https://knowhow.napaonline.com/how-many-parts-are-in-a-car/#:~:text=Typically%2C%20you%20can%20expect%20that%20there%20are%20about,factor%20isn%E2%80%99t%20always%20the%20size%20of%20the%20vehicle.

maintenance, and excellent performance has made electric vehicles a technology that manufacturers have pursued over many decades.[11]

III. Regardless of regulation, electric vehicles are now at or close to competitive parity with internal combustion vehicles.

Ongoing research and development by industry and the Department of Energy have produced steady, incremental progress in electric vehicle technology, reducing battery cost, increasing battery range, and improving charging capability. The last 20 to 30 years, and especially the last decade, have seen dramatic progress in this technology.[12]

Battery electric vehicles are now at or close to competitive parity with internal combustion vehicles. In the very near future, a broad spectrum of electric-powered light-duty vehicles will have a competitive advantage over internal-combustion vehicles: initially based on lower total cost of ownership—purchase price and cost of operation and

[11] *History of the Electric Car.*

[12] *History of the Electric Car*; Nat'l Acad. of Sci., Eng'g, and Med., *Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy — 2025 – 2035* 72, 75, 76, 79-80, 95, 113, 118 (2021), https://doi.org/10.17226/26092 [hereinafter "*NAS 2021 Report*"].

maintenance—and soon thereafter based on purchase price alone.[13] Various models are already there. The market share of vehicles powered in whole or in part by electricity has increased significantly in the last few years.[14]

Industry and government are devoting substantial resources to expanding production and use of electric vehicles.[15] The likely result is accelerated progress in this technology. These investments and the century-long history of technological change in this industry make further significant improvements in electric-vehicle technology all but inevitable.[16]

IV. EPA's Rule is properly based on a careful projection of the role electric vehicles can play in reducing emissions.

Since the 1970s, EPA has implemented its mandate in Clean Air Act section 202[17] to set emission standards by constantly evaluating

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[13] *See* Peter Slowick et al., The Int'l Council on Clean Transp., *Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022 – 2035 Time Frame* i-iv (2022).

[14] *See infra* Table A and note 101.

[15] *See* Slowick et al. at 28-29.

[16] Various potential improvements are discussed in *NAS 2021 Report*, at 78-79, 83, 97-102, 103, 114-15.

[17] 42 U.S.C. § 7521.

current and projected advances in vehicle technology. EPA bases its emissions standards on a comprehensive evaluation of potential advances in current technology, as well as the potential for entirely new technology to better reduce emissions.[18] EPA evaluates numerous issues associated with these technology options, as well as the need for and benefits from air quality improvement and other societal impacts.[19] EPA balances these factors and determines the appropriate level and effective date of a standard.[20] Crucially, EPA's standards are *performance* standards: EPA does not specify a technological path that manufacturers must follow.[21]

[18] 86 Fed. Reg. 74,434, 74,473, 74,477, 74,479, 74,485-88, 74,493-97 (Dec. 30, 2021); 79 Fed. Reg. 23,414, 23,458-75, 23,489-91, 23,505-06, 23,614-15 (Apr. 28, 2014); 75 Fed. Reg. 25,324, 25,332, 25,372-77, 25,448-51, 25,454-63 (May 7, 2010); 65 Fed. Reg. 6,698, 6,704, 6,724-29, 6,797-99 (Feb. 10, 2000); *see also NRC 2006 Report* at 5-6, 20.

[19] 86 Fed. Reg. at 74,477-79, 74,482-84, 74,488-92, 74,497-99, 74,500-20; 79 Fed. Reg. at 23,425-26, 23,441-49, 23,594-98, 23,605-15, 23,615-17, 23,619-21; 75 Fed. Reg. at 25,332, 25,346-48, 25,377-96, 25,448-45, 25,488-39; 65 Fed. Reg. at 6,704-24, 6,774-80, 6,783-87. *See also NRC 2006 Report* at 5-6, 20.

[20] 86 Fed. Reg. at 74,436-37, 74,451-52, 74,492-93, 74,499-500; 79 Fed. Reg. at 23,416-18, 23,426-27; 75 Fed. Reg. at 25,326-29, 25,403-05; 65 Fed. Reg. at 6,702-03, 6,732-33.

[21] 86 Fed. at 74,484; 75 Fed. Reg. at 25,462.

For the last few decades EPA has set standards based in part on a careful projection of the role electric vehicles can play. This reflects the same evaluation of advances in vehicle technology that EPA has undertaken for decades in establishing vehicle emission standards.

ARGUMENT

I. EPA's long history of setting technology-based emissions standards rebuts the contention that reliance on electric vehicle technology triggers the major questions doctrine.

Contrary to the argument raised in the Opening Brief for the Private Petitioners,[22] the major questions doctrine does not apply to the 2021 Rule. As demonstrated in the following sections, EPA's rule is in line with its reliance on technological innovation throughout the history of its implementation of Section 202 of the Clean Air Act.[23]

The Rule does not present one of the exceptional cases in which the doctrine would apply. The doctrine requires an agency to "point to 'clear congressional authorization' for the power it claims."[24] The Supreme Court has limited its ambit to "extraordinary cases . . . in which the

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[22] Private Pet. Br. 22.

[23] 42 U.S.C. § 7521.

[24] *West Virginia v. EPA*, 142 S. Ct. 2587, 2609 (2022).

history and the breadth of the authority that [the agency] has asserted, and the economic and political significance of that assertion, provide a reason to hesitate before concluding that Congress meant to confer such authority."[25]

The Rule involves no "transformative expansion in [EPA's] regulatory authority" of the sort the Supreme Court has found when applying the doctrine.[26] Rather, the Rule is consistent with EPA's longstanding exercise of its Section 202 authority in adopting increasingly stringent technology-based standards for motor vehicles. As demonstrated below, in setting emission standards, EPA has historically relied on a wide variety of technological innovations that reduce motor vehicle emissions. For many years, that history has included standards based on the use of electric vehicles. There is thus nothing "extraordinary" about the Rule that would justify invoking the major questions doctrine.

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[25] *Id.* at 2608 (quoting *FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120, 159 (2000)) (internal quotation marks omitted; alteration in original).

[26] *Id.* at 2610 (quoting *Utility Air Regulatory Group v. EPA*, 573 U.S. 302, 324 (2014)); *see also Nat'l Fed'n of Indep. Bus. v. Dep't of Lab., OSHA*, 142 S. Ct. 661, 666 (2022) (emphasizing the "lack of historical precedent" in the agency's regulatory history for the challenged action).

II. Electric vehicle technology has a long history in the motor vehicle market and in reducing emissions.

A. Early history

Motor vehicles came on the scene in the United States in the late 1800s, typically powered by steam, electricity, or gasoline. The first electric-gasoline hybrid vehicle was invented in the late 1890s.[27]

Electric vehicles had many advantages compared to steam- and gasoline-powered vehicles. By 1900, about a third of all motor vehicles were powered by electricity.[28] They were popular for city driving, and their use increased as electricity became more available.[29] This changed dramatically in the early 1900s.

In 1908, Henry Ford introduced the mass-produced Model T, which was less expensive than electric vehicles.[30] The impediment of hand cranking to start internal combustion vehicles disappeared with the 1912 invention of the electric starter motor.[31] The discovery and growth in

27 *History of the Electric Car*.

28 *Id.*

29 *Id.*

30 *Id.*

31 *Id.*

crude oil production made gasoline lower-cost and more widely available than electricity.[32] An expanding network of roads and the availability of gasoline favored gasoline vehicles, given the limited range of electric batteries and access to electricity.[33] By the mid-1930s, electric vehicles had virtually disappeared from the new vehicle market.[34] The following decades saw improvements in internal combustion vehicles, with little progress in electric vehicle technology.[35]

B. The 1970s to 1990s

The advent of gasoline shortages, especially during the oil embargo of the early 1970s, encouraged development of electric vehicles and non-petroleum fuels.[36] For example, in the 1970s, electric vehicle prototypes were developed, and pilot projects, such as a United States Postal Service program using electric jeeps, were launched.[37] Significantly, in 1976, Congress authorized the Department of Energy to support research and

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[32] *Id.*

[33] *Id.*

[34] *Id.*

[35] *Id.*

[36] *Id.*

[37] *Id.*

development of fully electric and hybrid vehicles.[38] At that point, electric vehicles were at a competitive disadvantage in terms of cost, battery range, and other issues.[39] The ensuing 20 years saw relatively cheap gasoline, and interest in electric vehicle technology waned.[40]

These years were also marked by dramatic advancements in emissions control for internal combustion vehicles. Harmful motor vehicle emissions were causing serious air quality problems across the country,[41] a problem recognized as early as the 1940s.[42] In the early 1970s—in response to regulatory pressure from Congress, EPA, and California—automakers started to use catalytic converters to reduce emissions from gasoline-powered vehicles.[43] Catalytic converters were a revolutionary step in reducing harmful emissions.

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[38] Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976 § 2, 15 U.S.C. § 2501; *see also* EPA Resp. Br. 8-9.

[39] *History of the Electric Car*.

[40] *Id.*

[41] *Int'l Harvester Co. v. Ruckelshaus*, 478 F.2d at 615, 622; *NRC 2006 Report* at 37 fig. 2-10; *History of Reducing Air Pollution*.

[42] *See* James E. Krier and Edmund Ursin, *Pollution and Policy: A Case Essay on California and Federal Experience with Motor Vehicle Air Pollution*, 1940-1975 75-89 (1977).

[43] *Int'l Harvester Co.,* 478 F.2d at 622-26.

The combustion of fossil fuel inherently involves incomplete oxidation of the fuel.[44] Incomplete combustion, along with the heat of combustion, produces hydrocarbons, carbon monoxide, and nitrogen oxides.[45] The catalytic converter, installed downstream of the engine, oxidizes large portions of the hydrocarbons and carbon monoxide in the exhaust.[46] The introduction of three-way catalysts led to great reductions in nitrogen oxides.[47]

These dramatic reductions were just the start. The high level of engine-out emissions and the relatively crude engineering of catalytic converters left considerable room for improvement. The Nation's and

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[44] Karim Nice and Charles W. Bryant, *How Catalytic Converters Work*, https://auto.howstuffworks.com/catalytic-converter.html (last updated Feb. 11, 2021) [hereinafter "*How Catalytic Converters Work*"]; Gerhard Horn, *The Complete Guide to Catalytic Converters*, Car Buzz, https://carbuzz.com/car-advice/the-complete-guide-to-catalytic-converters (last visited Feb. 28, 2023) [hereinafter "*Complete Guide to Catalytic Converters*"].

[45] *Id.*; Delphi Technologies, *The basics of EGRs – what they do, how they work, how to troubleshoot*, https://www.delphiautoparts.com/gbr/en/resource-center/basics-egrs-what-they-do-how-they-work-how-troubleshoot (last visited Feb. 28, 2023) [hereinafter "*The basics of EGRs*"].

[46] *Id.*

[47] *How Catalytic Converters Work*; *NRC Report 2006* at 35-37, 47-50.

Congress' demand for clean air called for further reductions, and EPA responded with more stringent emissions standards.

EPA's standards are based on a comprehensive evaluation of the capabilities of emissions control technology.[48] EPA evaluates performance of current technology over the multiple years of operation when vehicles must meet the standards.[49] It evaluates the potential for advances in existing technology and for additional or different technology to better reduce emissions.[50] It considers many issues for these technologies, including cost, durability over time, impacts on performance, safety, and time for development and application of the technology.[51] EPA carefully evaluates the need for air quality improvement to protect public

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[48] 86 Fed. Reg. 74,434, 74,473, 74,477, 74,479, 74,485-88, 74,493-97 (Dec. 30, 2021); 79 Fed. Reg. 23,414, 23,458-75, 23,489-91, 23,505-06, 23,614-15 (Apr. 28, 2014); 75 Fed. Reg. 25,324, 25,332, 25,372-77, 25,448-51, 25,454-63 (May 7, 2010); 65 Fed. Reg. 6,698, 6,704, 6,724-29, 6,797-99 (Feb. 10, 2000); *see also NRC 2006 Report* at 5-6, 20.

[49] *Id.*

[50] 86 Fed. Reg. at 74,477-79, 74,482-84, 74,488-92, 74,497-99, 74,500-20; 79 Fed. Reg. at 23,425-26, 23,441-49, 23,594-98, 23,605-15, 23,615-17, 23,619-21; 75 Fed. Reg. at 25,332, 25,346-48, 25,377-96, 25,448-45, 25,488-39; 65 Fed. Reg. at 6,704-24, 6,774-80, 6,783-87; *see also NRC 2006 Report* at 5-6, 20.

[51] *Id.*

health and welfare.[52] To the extent feasible, EPA compares the quantifiable costs and benefits for the different standards and technologies under consideration.[53] EPA balances these factors and determines the appropriate standard.[54]

EPA sets *performance* standards.[55] In setting the standard EPA often models one or more potential technology paths, but manufacturers need not follow them. They use their resources and innovation to determine the most cost-effective approach to meet the required emissions level.[56]

In response to EPA's standards, industry's engineering research and creativity have produced ongoing technological changes and related greater emissions reductions. The 1980s and 1990s saw the widespread

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[52] *Id.*

[53] *Id.*

[54] 86 Fed. Reg. at 74,436-37, 74,451-52, 74,492-93, 74,499-500; 79 Fed. Reg. at 23,416-18, 23,426-27; 75 Fed. Reg. at 25,326-29, 25,403-05; 65 Fed. Reg. at 6,702-03, 6,732-33.

[55] 86 Fed. Reg. at 74,484; 75 Fed. Reg. at 25,462.

[56] *Id.*; 75 Fed. Reg. at 25,446, 25,452-54.

development of computers and electronic controls in motor vehicles.[57] Manufacturers transformed the combustion process from a mechanical one to a sophisticated system with feedback loops, run by computers with electronic sensors and controls.[58] These tools improved and more precisely controlled the timing and air-fuel ratio of the combustion process.[59] Industry improved the efficiency and durability of the catalytic converter and the range of conditions in which it was highly effective. Electronic controls were developed to optimize the converter's efficiency.[60] Emissions control for diesel vehicles largely followed the same process.[61]

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[57] *History of Reducing Air Pollution*; 49 Fed. Reg. 3,010, 3,012 (Jan. 24, 1984); 55 Fed. Reg. 30,584, 30,596-97 (July 26, 1990); 74 Fed. Reg. 8,310, 8,312 (Feb. 24, 2009).

[58] For example, starting in the 1980s, electronically controlled fuel injection replaced carburetors, which mechanically mixed air and fuel and metered it into the combustion chamber. Electronically controlled timing of engine valves similarly replaced mechanically operating valves. *2021 EPA Report* at 41-42; *see also* Andrew York, Royal Soc'y of Chemistry, *The evolution of catalytic converters,* Education in Chemistry (May 31, 2011), https://edu.rsc.org/feature/the-evolution-of-catalytic-converters/2020252.article; 77 Fed. Reg. 62,624, 62,672 (Oct. 15, 2012).

[59] *How Catalytic Converters Work*; *Complete Guide to Catalytic Converters*; 49 Fed. Reg. at 3,012; 65 Fed. Reg. 6,698, 6,724-25 (Feb. 10, 2000); 77 Fed. Reg. at 62,672.

[60] *How Catalytic Converters Work*.

[61] 49 Fed. Reg. 3,010, 3,012 (Jan. 24, 1984); 55 Fed. Reg. 30,584, 30,596-97 (July 26, 1990); 74 Fed. Reg. 8,310, 8,312 (Feb. 24, 2009).

C. The 1990s to 2020s

In 1990, Congress recognized the need for greater control of harmful emissions from mobile sources and substantially amended the Clean Air Act to mandate further reduction in motor vehicle emissions.[62]

State action also continued to provide impetus for further reductions. In 1990, California adopted its first Low Emissions Vehicle program.[63] It applied to light-duty vehicles and included a fleet average standard for certain criteria pollutants, with the fleet average becoming more stringent over time.[64] California's program included the first zero emission vehicle mandate, setting percentage requirements for production of vehicles that met a zero or near-zero emissions level.[65] California projected that its mandate would provide an important push for further

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[62] EPA, *Motor Vehicles and the 1990 Clean Air Act* (Aug. 1994), https://nepis.epa.gov/Exe/ZyPdf.cgi?Dockey=900L1M00.pdf.

[63] 58 Fed. Reg. 4,166 (Jan. 13, 1993); EPA, 11-A-14, *Waiver of Federal Preemption – California Low-Emission Vehicle Standards, EPA Air Docket A-91-71, Doc. No. 8* 65 (Jan. 7, 1993) [hereinafter "*EPA Air Docket A-91-71, Doc. No. 8*"].

[64] *EPA Air Docket A-91-71, Doc. No. 8* at 11-15.

[65] *Id.*

development of electric vehicle technology, laying the groundwork for greater emission reductions in the future.[66]

California's Low Emission Vehicle program established different emission categories in which a manufacturer could certify compliance by their vehicles, including a zero emission vehicle category for fully electric vehicles.[67] Manufacturers could produce any number of vehicles they wanted in the different categories, as long as the fleet average met the maximum emission level and manufacturers met the required percentage of zero emission vehicles.[68] In 1993, EPA waived preemption under the Clean Air Act for California's Low Emission Vehicle program, including its zero emission vehicle mandate.[69]

In 1997, EPA adopted the voluntary National Low Emission Vehicle program. The standards included a fleet average for criteria pollutants, with various emissions categories in which manufacturers

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[66] *Id.* at 11 n.20, 141.

[67] *Id.* at 11, 14, 142-146.

[68] *Id.* at 12-13.

[69] 58 Fed. Reg. 4,166 (Jan. 13, 1993); *EPA Air Docket A-91-71, Doc. No. 8* at 1-2, 186-88.

could certify their vehicles' compliance. This included a category for zero emission electric vehicles.[70]

In 2000, EPA issued its "Tier 2" standards, covering light-duty vehicles and medium-duty passenger vehicles.[71] Tier 2 established several "bins" of standards, as well as a fleet average requirement.[72] Bin 1 was used to certify electric vehicles with zero emissions of all criteria pollutants.[73]

Manufacturers designated which bins their various vehicle models complied with, with the weighted average of production across the bins required to meet the fleet average standard. EPA included use of electric vehicles to help achieve the fleet average standard, and encouraged their production by providing a multiplier: each zero emission vehicle counted as two vehicles when calculating the manufacturer's fleet average.[74]

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[70] 62 Fed. Reg. 31,192, 31, 194-95, 31,200-01, 31,208-09 (June 6, 1997).

[71] 65 Fed. Reg. 6,698 (Feb. 10, 2000).

[72] *Id.* at 6,734-35.

[73] *Id.* at 6,734 tbl. IV.B.–2A (emissions standards for Bin 1).

[74] *Id.* at 6,746. EPA also accounted for hybrid electric vehicles. *Id.* at 6,793. EPA required a reduction in gasoline sulfur, facilitating the more efficient and durable converters needed to achieve the Tier 2 standards and reducing additional harmful emissions. *Id.* at 6,698. EPA previously required unleaded gasoline, to avoid damaging catalytic converters, and

During this period industry also made significant advances in reducing emissions from diesel-powered vehicles. In 1997, EPA adopted more stringent standards for heavy-duty engines.[75] After a comprehensive review of emissions control technology, EPA projected manufacturers could develop more effective engine design and control of the combustion process, combined with expanded and more sophisticated use of exhaust gas recirculation, which recirculates some of the exhaust back into the engine for further combustion.[76] In 2001, EPA adopted more stringent standards, based on the projected use of active particulate traps to reduce particulate matter, and projected use of adsorber technology to reduce nitrogen oxides.[77]

Industry addressed the challenge of controlling nitrogen oxides by the innovative development of selective catalytic reduction for heavy-duty trucks, a technology they determined better optimized durability

reduced lead in leaded gasoline. 38 Fed. Reg. 1,254 (Jan. 10, 1973) (unleaded gasoline); 38 Fed. Reg. 33,734 (Dec. 6, 1973) (leaded gasoline).

[75] 62 Fed. Reg. 54,694 (Oct. 21, 1997).

[76] *Id.* at 54,711-12; *The basics of EGRs*.

[77] 66 Fed. Reg. 5,002, 5,035-36 (Jan. 18, 2001).

and customer experience, compared to nitrogen oxide adsorbers.[78] EPA's performance standards provided industry the flexibility to determine the best technological solution for their market.[79]

Progress also continued in emissions control for light-duty vehicles. In 2014, EPA issued Tier 3 standards for light-duty vehicles, calling for further incremental improvement in controlling nitrogen oxides, based on greater reductions in engine-out emissions and increased catalytic converter efficiency.[80] EPA continued its use of a bin set at 0.0 grams per mile for criteria pollutants, for certification of zero emission vehicles.[81]

During this time industry continued to innovate with hybrid and battery electric vehicles. In the 1990s, General Motors introduced the EV1, a fully electric vehicle.[82] Its range was eighty miles with high acceleration performance.[83] However, high production costs led to its

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[78] *Id.* at 5,053; 77 Fed. Reg. 34,149, 158-159, 164 (June 8, 2012)

[79] *See* 79 Fed. Reg. 23,414 (Apr. 18, 2014).

[80] *Id.* at 23,414. As with Tier 2, EPA further reduced sulfur in gasoline.

[81] *Id.* at 23,714 tbl. 2 of § 86.1811-17(b)(4)(i).

[82] *History of the Electric Car*.

[83] *Id.*

cancellation in 2001.[84] In 1997, Toyota released its bestselling Prius electric-gasoline hybrid vehicle in Japan, and worldwide in 2000.[85] The Honda Insight was the first hybrid introduced in the United States, in 1999.[86] In 2006, Tesla Motors, a new company, announced production of a luxury electric vehicle that could go 200 miles on a single charge, releasing the Model S in 2012.[87] In 2010, Nissan released the fully electric Leaf into the United States market.[88] In the same year, General Motors released the Chevy Volt, the first commercially available plug-in hybrid.[89] Other manufacturers and other models were also introduced during this time. This reflected industry's growing interest in the development of electric powered vehicles for a widespread commercial market.

In 2010, EPA issued its first standards to control emissions of greenhouse gases from light-duty vehicles and medium-duty passenger

[84] *Id.*

[85] *Id.*

[86] *Id.*

[87] *Id.*

[88] *Id.*

[89] *Id.*

vehicles.[90] EPA's standards set fleet averages that became increasingly stringent from model years 2012 through 2016.[91] Electric vehicle technology was considered one of many technological approaches to reducing greenhouse gases.[92]

EPA's greenhouse-gas standards, like its earlier standards for criteria pollutants, accounted for zero emission vehicles by assigning 0.0 gram per mile emissions for purposes of calculating a manufacturer's fleet average.[93] Hybrids are assigned a value based on the greenhouse-gas emissions when using fossil fuel and the percentage of operation on fossil fuel.[94] As with prior criteria pollutant standards, EPA provided incentives for electric vehicles by assigning them a multiplier, giving them more weight in the fleet averaging process.[95]

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[90] 75 Fed. Reg. 25,324 (May 7, 2010). This followed the Supreme Court's determination that greenhouse gases are air pollutants under the Clean Air Act. *Massachusetts v. EPA*, 549 U.S. 497 (2007).

[91] 75 Fed. Reg. at 25,328, 25,330, 25,333, 25,336-37.

[92] *See id.* at 25,341, 25,382, 25,401, 25,434, 25,436, 25,456; 77 Fed. Reg. 62,624, 62,627, 62,635, 62,679, 62,702-06, 62,852-61, 62,877-80 (Oct. 15, 2012).

[93] 75 Fed. Reg. at 25,341.

[94] *Id.*at 25,401, 25,436.

[95] *Id.* at 25,341, 25,401, 25,434.

EPA built on this program when it adopted more stringent standards for model years 2017 through 2025.[96] EPA based the standards on its technical analysis and projections of further incremental advances in a wide variety of technologies, including incremental increases in production of various kinds of electric vehicles.[97]

In 2011 and 2016, EPA issued greenhouse-gas standards for heavy-duty vehicles. These standards followed the same approach as for light-duty vehicles—analyzing projected technological improvements in multiple vehicle systems, along with cost, time for development, and many other factors.[98] In this sector, the development of electric vehicles initially progressed at a slower pace, given the many types of vehicles with varied functions and needs. For example, electric vehicles initially are more readily used by fleets of urban buses, school buses, and delivery vehicles than other types of heavy-duty vehicles.[99]

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[96] 77 Fed. Reg. 62,624, 62,627 (Oct. 15, 2012).

[97] *Id.* at 62,635, 62,679, 62,702-06, 62,852-61, 62,877-80.

[98] 76 Fed. Reg. 57,106 (Sept. 15, 2011) (Phase 1); 81 Fed. Reg. 73,478 (Oct. 25, 2016) (Phase 2).

[99] ERM Int'l Grp. Ltd., *Electric Vehicle Market Update - Manufacturer Commitments and Public Policy Initiatives Supporting Electric Mobility in the U.S. and Worldwide* 37, 44-45, 51-52, 75-76 (Sept. 2022).

The benefits of electric vehicles for reducing multiple pollutants are obvious. Electric vehicle technology produces none of the array of harmful pollutants generated by fuel combustion or evaporation, including greenhouse gases, nitrogen oxides, particulate matter, hydrocarbons, and air toxics.[100]

The last five years have shown a dramatic increase in market share for electric vehicles. Table A shows the type and percent of production of new electric light-duty cars and trucks since 2000. This covers sedans, wagons, SUVs, vans, minivans, and pickup trucks.[101]

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[100] 75 Fed. Reg. 25,324, 25,497, 25,524 (May 7, 2010).

[101] *2022 EPA Report* at 74 tbl. 4.1. *See* EPA, *About the Automotive Trends Data*, https://www.epa.gov/automotive-trends/about-automotive-trends-data (last updated Dec. 12, 2022); EPA, *Highlights of the Automotive Trends Report*, https://www.epa.gov/automotive-trends/highlights-automotive-trends-report#Highlight5 (last updated Dec. 12, 2022).

Table A
Electric Vehicle Sales as a Percentage of All New Vehicle Sales

	Hybrid	Plug-in Hybrid	Battery Electric	Total
2000	0.0	0.0	0.0	0.0
2005	1.1	0.0	0.0	1.1
2010	3.8	0.0	0.0	3.8
2015	2.4	0.3	0.5	3.2
2016	1.8	0.3	0.5	2.6
2017	2.3	0.8	0.6	3.7
2018	2.3	0.8	1.4	4.5
2019	3.8	0.5	1.2	5.5
2020	4.9	0.5	1.8	7.2
2021	9.3	1.2	3.2	13.7
2022 (preliminary)	10.1	1.2	7.2	18.5

D. The 2020s

Electric vehicles are poised to provide an increasingly greater share of the domestic and global markets for new motor vehicles. Industry and governments are making large investments in this technology and related infrastructure. EPA can and should continue to set emissions standards based on a careful projection of the role vehicles powered by electricity can play in emission reduction.

In 2021, the National Academy of Sciences projected future increases in market share for electric vehicles, based on battery electric vehicle costs likely falling and reaching parity with internal-combustion vehicles. The Academy recommended that

> [EPA and the National Highway Traffic Safety Administration] should use all their delegated authority to drive the development and deployment of zero-emission vehicles [], because they represent the long-term future of energy efficiency, petroleum reduction, and greenhouse gas emissions reduction in the light-duty vehicle fleet.[102]

The chair of the Academy Committee "found a remarkable convergence across everyone we spoke to," including industry, academics and non-governmental organizations, battery developers, and automakers.[103]

This results from ongoing advancements in battery technology and accompanying reduction in cost, which are producing cost parity for battery electric and internal combustion light-duty vehicles.[104] Although their programs often differ significantly from EPA's in structure and aim, regulators around the world are increasingly focused on protecting public

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[102] *NAS 2021 Report* at 1, 5-6, 366-67.

[103] Robert Walton, *Zero-emission* vehicles *'are coming very fast now,' says author of Congressionally-mandated report*, Utility Dive (Apr. 1, 2021), https://www.utilitydive.com/news/zero-emission-vehicles-are-coming-very-fast-now-says-author-of-congressi/597711/?%3A+2021-04+01+Utility+Dive+Newsletter+%5Bissue%3A33367%5D=.

[104] Peter Slowick et al. at i-iv; *see also NAS 2021 Report* at 131-133, and ERM Int'l Grp. Ltd. at 10.

health and mitigating climate change by fostering increased use of electric vehicles.[105] In 2022, the European Union agreed on proposed laws requiring that all new light-duty vehicles be zero emitting starting in 2035; the European Parliament recently approved this 2035 target date.[106] Likewise, India and China have set targets of selling only new zero emitting vehicles by 2030 and 2040 respectively.[107] California recently adopted standards that would require all new passenger cars, trucks, and SUVs sold in California to be zero-emission by 2035. Many other states are adopting California's requirements.[108]

The industry's plans for increasing production of electric powered vehicles recognize the global nature of this industry.

> Automakers are global companies that sell their vehicles in multiple countries around the world. … [A]utomakers do use many shared components across their vehicles sold around the world in global platforms and powertrain families. …

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[105] *NAS 2021 Report* at 353-59.

[106] Kate Abnett, *EU lawmakers approve effective 2035 ban on new fossil fuel cars*, Reuters, https://www.reuters.com/business/autos-transportation/eu-lawmakers-approve-effective-2035-ban-new-fossil-fuel-cars-2023-02-14/ (last updated Feb. 17, 2023).

[107] *Id.* at 14.

[108] *Id.* at 15-16.

> The global integration of automotive development means that regulations in international markets can influence an automaker's vehicle production in the United States and their capabilities to implement various vehicle technologies.[109]

This is the domestic and global context for the recent major increase in projected private and public investment in electrification of on-highway vehicles. Automakers are projected to produce significantly more fully electric vehicles in 2025 than required to meet global regulatory requirements.[110] In 2022, even before passage of the Inflation Reduction Act,[111] vehicle and battery manufacturers announced over $51 billion in investments in the United States involving new or renovated electric vehicle manufacturing and assembly and battery production plants.[112]

Automakers' projections of future product lines and sales consistently show a strong commitment to increased production of electric vehicles.

> Honda has a goal of 100% [zero emitting vehicle] sales in North America by 2040 — with interim sales goals of 40 percent by 2030 and 80 percent by 2035. … Ford said that its entire European [light-duty vehicle] line will be [zero emitting

[109] *NAS 2021 Report* at 359-60.

[110] *Id.* at 354 fig. 12.8.

[111] Inflation Reduction Act, Pub. L. No. 117-169, 136 Stat. 1818 (2022).

[112] ERM Int'l Grp. Ltd. at 10; *see also* EPA Resp. Br. 8.

> vehicle] capable, [battery electric vehicle], or [plug-in hybrid vehicle] by mid- 2026, and expects 50 percent of its global vehicle volume to be fully electric by 2030, with an interim goal of producing two million vehicle[s] per year in 2026. Similarly, GM set a goal to produce one million [electric vehicles] in North America by 2025 and plans to exclusively sell [electric vehicles] by 2035. … Honda aims for two-thirds of its sales to be electrified globally and all sales in Europe by 2025; and Volvo anticipates [battery electric vehicles] will make up half of its sales in 2025 (the other half hybrid vehicles) and will move to exclusively sell [fully electric vehicles] by 2030.[113]

The world's top automakers plan to spend nearly $1.2 trillion through 2030 to develop and produce millions of electric vehicles, along with the batteries and raw materials to support that production.[114]

Major public investment is complementing these private investments. The Infrastructure Investment and Jobs Act[115] and the Inflation Reduction Act provide for billions of dollars of public investments over a wide range of programs, including funds for development, installation, and maintenance of a nationwide network of electric vehicle charging

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[113] ERM Int'l Grp. Ltd. at 8, 11, 12.

[114] *See* Paul Lienert, *Exclusive: Automakers to double spending on EVs, batteries to $1.2 trillion by 2030,* Reuters, https://www.reuters.com/technology/exclusive-automakers-double-spending-evs-batteries-12-trillion-by-2030-2022-10-21/ (last updated Nov. 2022).

[115] Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021).

stations; credits for purchase of new and used electric vehicles; funding for electric vehicle and battery manufacturing facilities; and funding to increase reliability of the electricity grid.[116]

CONCLUSION

Electric vehicle technology is well understood, and for many decades has been part of the new vehicle market. Ongoing incremental progress in improving this technology has dramatically accelerated in the last decade. This has reduced and even eliminated competitive disadvantages compared to internal combustion vehicles.

The long history of technological change in this industry laid the groundwork for the current alignment of domestic and global markets for increasing production of electric vehicles. EPA has long set emissions standards based on a careful projection of the role vehicles powered by electricity can play in reducing emissions. The importance of electric vehicle technology will only increase over time.

[116] ERM Int'l Grp. Ltd. at 19-25; *see also* Peter Slowick et al. at 28-29.

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CERTIFICATE OF COMPLIANCE

This brief complies with the type-volume limit of Fed. R. App. P. 29(a)(5) along with the Court's September 22, 2022 order because it contains 5,896 words, excluding the parts of the brief exempted under Rule 32(f).

This brief complies with the typeface and the type-style requirements of Fed. R. App. P. 32(a)(5) and (6) because it has been prepared using Microsoft Word in 14-point New Century Schoolbook, a proportionally spaced typeface.

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MATTHEW D. ZINN

CERTIFICATE OF SERVICE

I hereby certify that on March 3, 2023, I electronically filed the foregoing brief with the Clerk of the Court for the United States Court of Appeals for the District of Columbia Circuit by using the CM/ECF system. I certify that service will be accomplished by the CM/ECF system for all participants in this case who are registered CM/ECF users.

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