DRIVING TRANSFORMATION: TAX STRATEGIES FOR ELECTRIFYING LIGHT-DUTY TRANSPORTATION

by Roberta F. Mann

Roberta F. Mann is Professor Emerita at the University of Oregon School of Law.

SUMMARY

As noted by the International Energy Agency, taxation is a necessary component of strategies to increase adoption of electric vehicle (EV) technology. In the United States, taxation has supported the energy policy of increased uptake of EVs. This Article focuses on the evolving U.S. tax policy, highlighting the 2022 Inflation Reduction Act. It addresses continuing challenges and ways to meet those challenges, including examining some European policies for encouraging EVs. The author concludes by recommending policies that may be consistent with existing U.S. tax law, and that might have potential for increasing EV uptake mechanisms.

We will not stop until every car on the road is electric.

—Elon Musk[1]

There is broad scientific consensus on human-made climate change, caused by greenhouse gas (GHG) emissions from using fossil fuels to generate electricity, to power industrial processes, and for transportation uses.[2] There is also a growing scientific consensus that climate change plays a role in the highly destructive wildfires and intense weather events suffered around the world in recent years.[3] The Paris Agreement, under which 196 nations agreed to voluntary carbon reductions, aims to limit global warming to well below 1.5 to 2 degrees Celsius compared to pre-industrial levels.[4]

In 2021, the United Nations Climate Change Conference in Glasgow (26th Conference of the Parties (COP26)) focused on the global transition to zero emission vehicles (ZEVs or electric vehicles (EVs)), with a full day of the conference devoted to the topic.[5] Working to accelerate the transition to EVs in line with the goals of the Paris Agreement, governments, manufacturers, businesses, and other stakeholders in leading markets agreed to eliminating sales of polluting cars and vans by no later than 2035.[6]

At the 2022 COP27 in Egypt, more than 200 stakeholders joined a new coalition, called the Accelerating to Zero Coalition (A2Z).[7] As noted by the ZEV Transition Council in its 2023 Action Plan, an accelerated transition

Author's Note: The author would like to thank the participants who attended the following presentations for their helpful comments: the Fourth Annual Denney L. Wright International Energy Conference (University of Houston), the Global Conference on Environmental Taxation (GCET) in Parma, Italy, and the Environmental Law Section at the 2023 American Association of Law Schools meeting. Thanks are especially due to Prof. Heather Field, who invited me to speak to her Tax Policy class; Professor Field's students, who submitted excellent questions; Marta Villar Ezcurra, who moderated the GCET panel in Parma; and my research assistant Juliet Hayden, for her expert research assistance.

1. @ElonMuskNewsOrg, Twitter (Nov. 28, 2016, 11:30 PM), https://twitter.com/elonmusknewsorg/status/803456008802668545.
2. Timothy E. Wirth, *The Challenge of Building Consensus Beyond the Scientific Community*, United Nations (June 2007), https://www.un.org/en/chronicle/article/challenge-building-consensus-beyond-scientific-community.
3. Marina Romanello et al., *The 2022 Report of the Lancet Countdown on Health and Climate Change: Health at the Mercy of Fossil Fuels*, 400 Lancet 1619, 1624 (2022).
4. United Nations Climate Change, *The Paris Agreement*, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement (last visited Feb. 21, 2023).
5. United Nations Climate Change Conference UK 2021, *Presidency Programme*, https://ukcop26.org/the-conference/presidency-programme/ (last visited Feb. 21, 2023).
6. United Nations Climate Change Conference UK 2021, *Accelerating the Transition to Zero Emission Vehicles*, https://ukcop26.org/transport/ (last visited Mar. 2, 2023); United Nations Climate Change, *supra* note 4 (explaining the Paris Agreement).
7. Press Release, A2Z, Accelerating to Zero (A2Z) Coalition Launches at COP27 (Nov. 17, 2022), https://acceleratingtozero.org/accelerating-to-zero-a2z-coalition-launches-at-cop27-to-drive-global-transition-to-zero-emission-vehicles/.

to EVs is vital because road transport is the "single biggest source of oil consumption globally," and the transition "will reduce dependence on oil, an insecure, expensive and volatile commodity, thereby boosting energy security."[8] The International Energy Agency (IEA) notes in a recent report that "[r]apid and continuing progress in the electrification of road transport has been one of the bright spots of the clean energy transition."[9]

Switching light-duty transportation from internal combustion engine (ICE) vehicles to EVs will be a critical source of emissions reductions. In 2020, there were 1.31 billion light-duty vehicles (LDVs) worldwide.[10] Only 0.7% of those vehicles were powered by electricity—99.3% were directly powered by fossil fuels, resulting in climate-changing carbon emissions.[11] The IEA also noted that government support, including from tax incentives, has been "instrumental to the progress made thus far."[12]

This Article focuses on the evolving U.S. tax policy for EVs. As noted by the IEA, taxation is a necessary component of strategies to increase adoption of EV technology.[13] In the United States, taxation has supported the U.S. energy policy of increased uptake of EVs. Recent tax changes will continue that support, but the switch to EVs still faces challenges.

The Article will first set out why light-duty transportation in the United States must be transformed to accomplish climate goals. Next, it will explore tax incentives for energy generation, which are inextricably linked to carbon emissions from electrified transportation. The following section focuses on tax policies for clean vehicles, highlighting the evolving tax policy after the Inflation Reduction Act (IRA) was enacted in August 2022. The Article then addresses continuing challenges and ways to meet those challenges, including examining some European policies for encouraging EVs that have met with considerable success. Finally, recognizing that the structure of European tax policies are significantly different from U.S. tax policies, it will consider some policies more consistent with existing U.S. tax law that might have potential for increasing EV uptake.

I. Introduction

The United States is among the top GHG-emitting nations. According to the World Bank, the United States in 2019 emitted 14.7 metric tons per person in the country.[14] These emission figures were exceeded in 2020, when it emitted more than 18 tons of GHG emissions per capita.[15] People in the United States also drive a lot: in 2017, drivers exceeded an average 20,000 kilometers per year.[16] LDVs are what most residents use to get to work.[17] The U.S. Environmental Protection Agency (EPA) defines "light-duty vehicle" as a passenger vehicle weighing less than 8,500 pounds.[18]

The United States features low-density cities with urban sprawl, which makes public transportation less efficient.[19] According to the Organisation for Economic Co-operation and Development (OECD), "[l]ow population density and dispersion of key points of economic activity tend to promote car dependency."[20] While the United States has increased population density since 2000, it continues to experience urban sprawl.[21] According to United Nations data, in 2020, the United States had a population density of 36.4 persons per kilometer.[22] In contrast, the average population density in the European Union (EU) in 2019 was 109 persons per kilometer.[23]

In 2017, for the first time, U.S. transportation emissions exceeded electricity generation emissions.[24] In 2020, the United States had the highest emissions in the global transportation sector at 1,558 million metric tons (MMT, or 1,000,000,000 kilograms) of carbon dioxide (CO_2).[25] The European country with the next highest carbon emissions was Germany, at 142 MMT.[26] The recent change of administration in the United States from a fossil fuel-friendly administration to a more progressive and climate-aware administration is good news for transforming transportation.[27]

8. ZEV Transition Council, *2023 Action Plan*, https://zevtc.org/action-plan-2023/ (last visited Feb. 21, 2023).
9. Jacob Teter, *Transport*, IEA (Sept. 2022), https://www.iea.org/reports/transport.
10. Michael Dwyer, *EIA Projects Global Conventional Vehicle Fleet Will Peak in 2038*, U.S. Energy Info. Admin. (Oct. 26, 2021), https://www.eia.gov/todayinenergy/detail.php?id=50096.
11. *Id.*
12. Teter, *supra* note 9. "In 2021 electric cars made up more than 8.5% of global car sales, up from almost none only a little over a decade ago."
13. IEA, Global EV Outlook 2021 (2021), https://iea.blob.core.windows.net/assets/ed5f4484-f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf.
14. World Bank, *CO_2 Emissions (Metric Tons Per Capita)*, https://data.worldbank.org/indicator/EN.ATM.CO2E.PC (last visited Feb. 21, 2023).
15. Ian Tiseo, *Per Capita Greenhouse Gas Emissions in 2020, by Select Country*, Statista (Feb. 6, 2023), https://www.statista.com/statistics/478783/leading-countries-based-on-per-capita-greenhouse-gas-emissions/.
16. Organisation for Economic Co-operation and Development (OECD), *Passenger Transport*, https://data.oecd.org/transport/passenger-transport.htm (last visited Feb. 21, 2023).
17. In the United States, 84.8% of workers drove to work. Bureau of Transportation Statistics, U.S. Department of Transportation, National Transportation Statistics 2021: 50th Anniversary Edition 56 (2021), https://www.bts.dot.gov/sites/bts.dot.gov/files/2021-12/NTS-50th-complete-11-30-2021.pdf.
18. U.S. Department of Energy (DOE), Alternative Fuels Data Center, *Vehicle Weight Classes & Categories*, https://afdc.energy.gov/data/10380 (last visited Feb. 21, 2023).
19. OECD, Rethinking Urban Sprawl: Moving Towards Sustainable Cities 109 (2018).
20. *Id.*
21. *Id.* at 55.
22. Statista, *European Union: Population Density From 2010 to 2020 (in Inhabitants Per Square Kilometer)*, https://www.statista.com/statistics/253445/population-density-in-the-european-union-eu/ (last visited Feb. 21, 2023).
23. European Commission, *A Growing Population Until 2020*, https://ec.europa.eu/eurostat/cache/digpub/demography/bloc-1a.html?lang=en (last visited Feb. 21, 2023).
24. Cara Marcy & Bill Sanchez, *Power Sector Carbon Dioxide Emissions Fall Below Transportation Sector Emissions*, U.S. Energy Info. Admin. (Jan. 19, 2017), https://www.eia.gov/todayinenergy/detail.php?id=29612.
25. Tiseo, *supra* note 15.
26. *Id.*
27. Gayathri Vaidyanathan, *Biden Signs Historic Climate Bill as Scientists Applaud*, Nature Mag. (Aug. 17, 2022), https://www.scientificamerican.com/article/biden-signs-historic-climate-bill-as-scientists-applaud/.

In the United States, tax credits have been used to encourage purchase of EVs since 2009.[28] The vast majority of LDVs in the United States are owned or leased by individuals, with only about 3% owned by fleets.[29] However, adoption of EVs by fleets can have policy benefits even in the United States, by setting an example for individuals as well as providing a ready source for more affordable used EVs.[30]

II. U.S. Climate Change Policy

A. Carbon Emissions

As noted above, the transportation sector produces the largest portion of U.S. CO_2 emissions. This statistic has a silver lining—electricity-sector CO_2 emissions declined by 33% between 2005 and 2019.[31] The electricity sector was the highest-emitting sector until transportation surpassed it in 2017.[32] Therefore, electrifying the transportation sector could reduce climate-warming emissions. Although GHG emissions include several types of gases, CO_2 emissions constitute 79% of GHG emissions in the United States.[33]

Transportation-sector emissions include emissions from cars, trucks, ships, trains, and planes.[34] More than 90% of the fuel used in transport is petroleum-based.[35] "[GHG emissions] from the transportation sector increased 22.9% from 1990 to 2019, increasing from 23.7% of total emissions to 28.6%, the largest percentage increase of any sector. Since emissions peaked in 2007, the emissions from electricity generation decreased 33%, transportation decreased 5%, and industry decreased 2%."[36]

In 2020, the transportation sector contributed 33% of U.S. CO_2 emissions.[37] In 2021, the transportation sector's CO_2 emissions continued to increase, amounting to 38% of the U.S. total.[38] LDVs are responsible for 58% of U.S. transportation CO_2 emissions.[39]

Switching from gasoline-fueled vehicles to EVs reduces emissions from the transportation sector.[40] A 2021 report from the Massachusetts Institute of Technology (MIT) notes that "replacing conventional internal combustion engine (ICE) vehicles with EVs appears to be the most promising pathway for decarbonizing LDVs in the near future."[41] A report from the American Council for an Energy-Efficient Economy (ACEEE) cites literature findings that "electrification can lead to reductions in light-duty GHG emissions of 36 to 50% by 2050."[42]

While the level of GHG reductions from switching to an EV from a gasoline-powered vehicle depends on the mix of electricity generation where the vehicle is charged, driving an EV charged from any grid in the United States is cleaner than driving a gas-powered vehicle.[43] Because the composition of the electricity grid is inextricably linked with the GHG emissions from EVs, the next section begins with a discussion of tax incentives for "greening" the grid. As noted, adoption of EVs by fleets can help introduce drivers to EVs and encourage adoption, so the next section presents several fleet case studies. Political barriers to widespread adoption of EVs still exist, and the next section presents a brief history of how the IRA was enacted and future challenges that may come from international trade rules.

B. Tax Incentives

1. Clean Electricity Generation Incentives

Current U.S. fiscal policy provides some tax incentives to achieve the goal of reduced CO_2 emissions, including federal tax credits for electricity produced from renewable sources.[44] A report written for the U.S. Department of Energy (DOE) estimated that the federal government spent $51.2 billion on solar and wind incentives from 2005 to 2015, with tax incentives accounting for 90% of the total.[45]

28. 26 U.S.C. §30D (added by the Energy Improvement and Extension Act of 2008, Pub. L. No. 110-343, §205(a), 122 Stat. 3765, effective for tax years beginning after December 31, 2008).
29. Author calculations from Bureau of Transportation Statistics, *supra* note 17, at 18, 371 (108,547,710 total automobiles registered; 3,632,000/108,547,710 = 0.0034 = 3% of total automobiles registered in the United States in 2019 were in fleets); Bureau of Transportation Statistics, *U.S. Automobile and Truck Fleets by Use*, https://www.bts.gov/content/us-automobile-and-truck-fleets-use-thousands (last visited Feb. 21, 2023) (3,632,000 in 2019).
30. *See infra* Section II.D.
31. Center for Climate and Energy Solutions, *Energy/Emissions Data: U.S. Emissions*, https://www.c2es.org/content/u-s-emissions/ (last visited Feb. 21, 2023).
32. *See* Marcy & Sanchez, *supra* note 24.
33. U.S. EPA, *Overview of Greenhouse Gases*, https://www.epa.gov/ghgemissions/overview-greenhouse-gases (last updated May 16, 2022).
34. U.S. EPA, *Sources of Greenhouse Gas Emissions*, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (last updated Aug. 5, 2022).
35. *Id.*
36. DOE, Alternative Fuels Data Center, *Greenhouse Gas Emissions by Economic Sector*, https://afdc.energy.gov/data/10802 (last visited Feb. 21, 2023).
37. U.S. EPA, *supra* note 33.
38. Congressional Budget Office, Emissions of Carbon Dioxide in the Transportation Sector 2 (2022), https://www.cbo.gov/system/files/2022-12/58566-co2-emissions-transportation.pdf.
39. Cassandra Cole et al., MIT Center for Energy and Environmental Policy Research, Policies for Electrifying the Light-Duty Vehicle Fleet in the United States 2 (2021).
40. DOE, Alternative Fuels Data Center, *supra* note 36.
41. Cole et al., *supra* note 39, at 2.
42. Bryan Howard et al., ACEEE, The State Transportation Electrification Scorecard 1 (2021).
43. David Reichmuth, Union of Concerned Scientists, Electric Vehicles Are Cleaner Than Gasoline—And Getting Better 3 (2020), https://www.ucsusa.org/sites/default/files/2020-05/evs-cleaner-than-gasoline.pdf.
44. Molly F. Sherlock, Congressional Research Service, R43453, The Renewable Electricity Production Tax Credit: In Brief 1 (2020), https://crsreports.congress.gov/product/pdf/R/R43453/19.
45. Seth Kirshenberg et al., DOE, Examination of Federal Interventions in the Renewable Energy Market 28 (2018).

The IRA, enacted in August 2022, extended the clean energy tax incentives through the end of 2024.[46] In addition to extending the existing clean energy tax incentives, the IRA added new clean energy tax incentives and included bonus credits for facilities located in low-income communities.[47] The new provisions also incentivized domestic production, allowing a "bonus credit" of 10% of the credit amount for projects that certify that certain steel, iron, and manufactured products used in the facility were domestically produced.[48]

The two historic tax incentives are the production tax credit (PTC)[49] and the investment tax credit (ITC).[50] The PTC is determined by multiplying the credit rate by the kilowatt hours (kWh) generated by the qualifying renewable energy production facility.[51] The PTC can be received for the first 10 years of production.[52] Before the enactment of the IRA, the PTC for wind would not apply to facilities placed in service after the end of 2021.[53] As noted, the IRA extends the PTC to facilities placed in service through the end of 2024.[54]

Facilities that pay prevailing wages during the construction phase and first 10 years of operation and meet registered apprenticeship requirements qualify for a credit rate that is five times the base rate (i.e., $0.025 versus $0.005 per kWh).[55] The ITC is determined when the qualifying renewable energy production facility is placed in service by multiplying the credit rate by the investment in the facility.[56] Under the IRA, like the PTC, the ITC credit amount may be increased for facilities paying prevailing wages during construction and for the first five years of operation.[57]

The two new tax credits created by the IRA are the clean electricity production tax credit (CPTC)[58] and the clean electricity investment tax credit (CITC).[59] The CPTC would apply to the sale of GHG-free domestically produced electricity produced at a qualifying facility placed in service after December 31, 2024.[60] The CITC would apply to investment in qualifying zero emissions electricity generation facilities or energy storage technology.[61] The new tax credits would phase out at the later of the end of 2032 or when emissions reduction target levels are achieved.[62] Taxpayers cannot combine the four credits (PTC, ITC, CPTC, or CITC) but must choose one.[63]

The last significant change from the IRA that will be discussed here is the availability of "direct pay." The historic renewable energy tax credits are not refundable—that is, the tax credit can only reduce tax liability but not provide a refund or direct payment. This feature has limited the effectiveness of the tax credit in two ways. First, as renewable energy developers frequently operate at a loss during the early years of a project, using the tax credit requires complex transactions with so-called tax equity investors who reap the benefits of the credits.[64]

Second, in times of economic downturns, tax equity investors are hard to find.[65] During the recession of 2009, the U.S. Congress provided for "grants in lieu" of renewable energy tax credits.[66] The IRA uses a different and more targeted provision. Section 13801 of the IRA would allow certain organizations, generally tax-exempt entities including state and local governments and Indian tribal governments, to treat certain tax credit amounts as payments of tax that can be refunded to these organizations, allowing the credits to be received as "direct pay."[67] The direct payment option is available for the tax credits discussed above.[68]

The cost of tax incentives is generally calculated based on revenue that the federal government would have received absent the tax incentive.[69] The Joint Committee on Taxation estimates the cost of the extended, modified, and new electricity generation credits at $1.26 trillion over the next 10 years.[70] DOE estimates that the IRA's clean energy

46. IRA, Pub. L. No. 117-169, §13101, 136 Stat. 1818, 1906-13 (2022) (note that the IRA's clean energy tax credits are tremendously complex, and this discussion will provide only a brief and incomplete overview).
47. Molly F. Sherlock et al., Congressional Research Service, R47202, Tax Provisions in the Inflation Reduction Act of 2022 (H.R. 5376) (2022), https://crsreports.congress.gov/product/pdf/R/R47202.
48. *See* IRA, Pub. L. No. 117-169, §§13101, 13102, 13701, 13702, 136 Stat. 1818 (2022).
49. 26 U.S.C. §45.
50. *Id.* §48.
51. *Id.* §45(a).
52. *Id.* §45(a)(2)(ii).
53. *Id.* §45(a)(5) (2020).
54. *Id.* §45(d)(1) (2022).
55. *Id.* §45(b)(7), (8) (2022).
56. *Id.* §48(a).
57. *Id.* §48(a)(10), (11) (2022).
58. *Id.* §45Y.
59. *Id.* §48E.
60. *Id.* §45Y.
61. *Id.* §48E. Economics Prof. Roberton Williams noted that it would be more efficient to give the same incentive for equivalent GHG reductions across different technologies, rather than giving the same incentive per dollar invested (for the ITC) or megawatt-hour of electricity generated (for the PTC), which is not the same thing. Tax Policy Center, *The Future of Business Taxation Post-Inflation Reduction Act*, YouTube (Nov. 2, 2022), https://www.youtube.com/watch?v=G3pO5Hprb7w; *see also* e-mail from Roberton Williams (Nov. 2, 2022) (on file with author).
62. 26 U.S.C. §45Y(d)(3); *id.* §48E(e)(3).
63. *Id.* §45Y(b)(1)(D); *id.* §48E(b)(3)(C).
64. *See* Jonathan Barry Forman & Roberta F. Mann, *Making the Internal Revenue Service Work*, 17 Fla. Tax Rev. 725, 776-77 (2015) (explaining the partnership flip and ITC sale-leaseback transactions).
65. *See* Roberta F. Mann, *Back to the Future: Recommendations and Predictions for Greener Tax Policies*, 88 Or. L. Rev. 355, 387-88 (2010). *See also* Mark Bolinger et al., Lawrence Berkeley National Laboratory & National Renewable Energy Laboratory, PTC, ITC, or Cash Grant?: An Analysis of the Choice Facing Renewable Power Projects in the United States 1 (2009), https://eta-publications.lbl.gov/sites/default/files/lbnl-1642e.pdf.
66. The "grant-in-lieu" program was administered by the U.S. Treasury Department pursuant to §1603 of the American Recovery and Reinvestment Act of 2009 (Pub. L. No. 111-5, 12 Stat. 115). U.S. Department of the Treasury, *1603 Program: Payments for Specified Energy Property in Lieu of Tax Credits*, https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/1603-program-payments-for-specified-energy-property-in-lieu-of-tax-credits (last visited Feb. 21, 2023).
67. 26 U.S.C. §6417.
68. *Id.* §6417(b)(2), (8), (10), (12).
69. Joint Committee on Taxation, *Revenue Estimating*, https://www.jct.gov/operations/revenue-estimating/ (last visited Feb. 21, 2023).
70. Joint Committee on Taxation, Estimated Budget Effects of the Revenue Provisions of Title I—Committee on Finance (2022), https://www.jct.gov/publications/2022/jcx-18-22.

provisions will reduce GHG emissions by more than 600 MMT by 2030.[71]

2. Clean Vehicle Incentives

Purchasers of new plug-in electric vehicles (PEVs) have been eligible to receive a federal tax credit of up to $7,500 since 2009, although the credit was phased out once the manufacturer had sold 200,000 qualifying vehicles.[72] This credit applied to individual purchases as well as fleet purchases, although it was treated a bit differently for businesses.[73] The use of the credit was about evenly split between individuals and corporations.[74] For individuals, the credit could only be used to offset a taxpayer's tax liability in the current tax year.[75] For businesses, the tax credit was treated as part of the general business credit, which can be carried back one year or carried forward for up to 20 years.[76] Total forgone revenue from the PEV tax credit was estimated to be about $10 billion from 2011 to 2022.[77]

The IRA extended and refined the availability of EV tax credits. Effective January 2023, the tax credits are no longer limited by manufacturer, although other limitations, including restrictions on vehicle assembly and battery components, have been added. The new "clean vehicle credit" does not expire until December 31, 2032.[78] DOE estimates that the IRA's clean vehicle provisions will reduce GHG emissions by around 100 MMT by 2030.[79] The IRA's full suite of EV tax credits, including the clean vehicle tax credit, the previously owned clean vehicle tax credit,[80] the commercial clean vehicle tax credit,[81] and the alternative fuel refueling tax credit,[82] are estimated to reduce federal tax revenues by $14.2 billion through 2031.[83]

It remains to be seen whether the provisions added by the IRA will increase EV adoption in the United States. Some commentators are concerned that the limitations on vehicle assembly and battery components will restrict the ability of Americans to purchase affordable EVs.[84] While data are not yet available regarding whether the new IRA provisions will increase uptake of EVs, challenges have already emerged.

C. *U.S. Policies to Increase EV Penetration and Challenges*

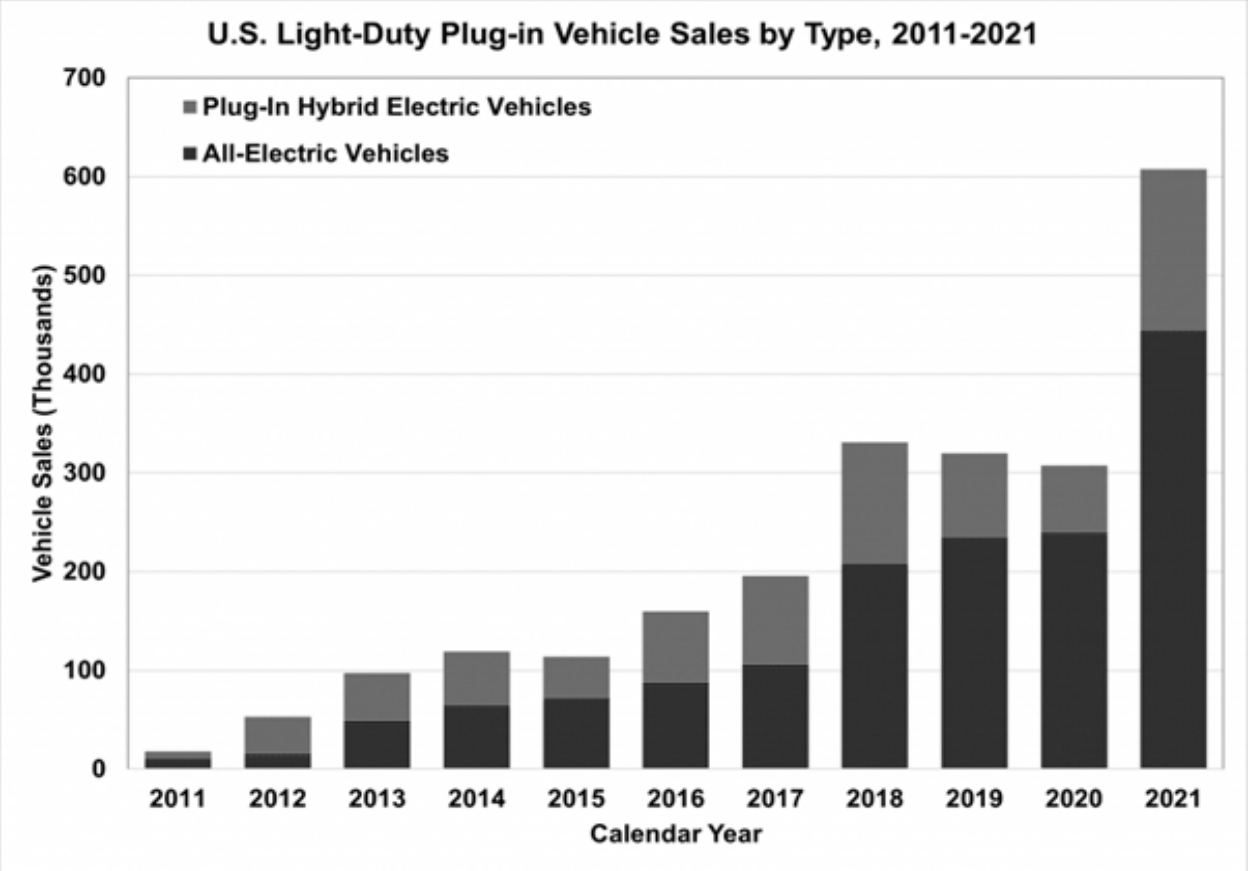
The Joseph Biden Administration declared a new vehicle sales target for 2030 of 50% EVs, including battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell electric vehicles (FCEVs).[85] EV sales grew by 85% from 2020 to 2021, approaching 5% of the total light-duty market, as illustrated by Figure 1 below.[86] In the third quarter of 2022, EV sales exceeded 6% of new car sales.[87]

In addition to federal policies, all states except for North Dakota, Kentucky, and Kansas provide some policy support for EVs, ranging from tax credits or rebates to fleet acquisition goals, exemptions from emissions testing, or utility time-of-use rate reductions.[88] California is the leading state for EV policies, using tax incentives for EV deployment, transportation system efficiency, electricity grid optimization, and directing state and local investment toward programs for low-income or economically distressed communities.[89] California Gov. Gavin Newsom announced a ban on the sale of new ICE vehicles by 2035.[90] New York followed.[91]

Pre-IRA forecasts predicted that EVs would constitute one-third of U.S. LDV sales by 2030.[92] Sounds encouraging, but that would be about the same percentage of EVs operating in the United States in the early 1900s.[93] One

71. Office of Policy, DOE, The Inflation Reduction Act Drives Significant Emissions Reductions and Positions America to Reach Our Climate Goals (2022), https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf.
72. 26 U.S.C. §30D.
73. Molly F. Sherlock, Congressional Research Service, IF11017, The Plug-In Electric Vehicle Tax Credit (2019), https://crsreports.congress.gov/product/pdf/IF/IF11017.
74. *Id.*
75. 26 U.S.C. §30D(c)(2).
76. *Id.* §§30D(c)(1), 38(b)(30).
77. Sherlock, *supra* note 73.
78. IRA, Pub. L. No. 117-169, §13401, 123 Stat. 1818, 1954-62 (2022).
79. *See* Office of Policy, DOE, *supra* note 71, at 3.
80. *See infra* note 106.
81. *See infra* notes 141-43.
82. *See infra* notes 112-16.
83. Joint Committee on Taxation, *supra* note 69.
84. Press Release, Office of Senator Warnock, Senator Reverend Warnock Introduces Bill to Ensure Georgia Car Buyers, Automakers Fully Benefit From Cost-Cutting Tax Credits (Sept. 29, 2022), https://www.warnock.senate.gov/newsroom/press-releases/senator-reverend-warnock-introduces-bill-to-ensure-georgia-car-buyers-automakers-fully-benefit-from-cost-cutting-tax-credits/.
85. Joseph R. Biden Jr., *Executive Order on Strengthening American Leadership in Clean Cars and Trucks*, White House (Aug. 5, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/08/05/executive-order-on-strengthening-american-leadership-in-clean-cars-and-trucks/.
86. Vehicle Technologies Office, *FOTW #1227: Light-Duty Plug-In Electric Vehicle Sales in the United States Nearly Doubled From 2020 to 2021*, Off. Energy Efficiency & Renewable Energy (Feb. 28, 2022), https://www.energy.gov/eere/vehicles/articles/fotw-1227-february-28-2022-light-duty-plug-electric-vehicle-sales-united.
87. Chris Rosales, *Electric Vehicles Topped 6 Percent of All U.S. Car Sales in Q3*, Drive (Oct. 16, 2022), https://www.thedrive.com/news/electric-vehicles-topped-6-percent-of-all-us-car-sales-in-q3. For more information on FCEVs, see DOE, Alternative Fuels Data Center, *Fuel Cell Electric Vehicles*, https://afdc.energy.gov/vehicles/fuel_cell.html (last visited Feb. 21, 2023).
88. Austin Igleheart, *State Policies Promoting Hybrid and Electric Vehicles*, Nat'l Conf. State Legislatures (Apr. 26, 2022), https://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx.
89. *Id.*
90. Russ Mitchell, *California Bans Sales of New Gas-Powered Cars by 2035*, L.A. Times (Aug. 25, 2022, 1:45 PM), https://www.latimes.com/business/story/2022-08-25/california-ban-gasoline-mandate-zero-emission-2035.
91. Joseph Pisani, *New York State to Ban Sale of Gasoline-Powered Vehicles by 2035*, Wall St. J. (Sept. 29, 2022, 5:52 PM), https://www.wsj.com/articles/new-york-state-to-ban-sale-of-gasoline-powered-vehicles-by-2035-11664487387.
92. Press Release, Edison Electric Institute, EEI Projects 26.4 Million Electric Vehicles Will Be on U.S. Roads in 2030 (June 30, 2022), https://www.eei.org/News/news/All/eei-projects-26-million-electric-vehicles-will-be-on-us-roads-in-2030.
93. As explained in a Congressional Research Service report:
> The electric car was first created in the early 1800s as a simple electrified buggy. It was considered to be quiet, easy to drive, and did not emit exhaust like its gasoline- and steam-powered counterparts. According to the U.S. Department of Energy, by the early 1900s, electric cars had enjoyed a brief popularity, accounting for one-

Figure 1. U.S. Light-Duty EV Sales



Source: Vehicle Technologies Office, *FOTW #1227: Light-Duty Plug-In Electric Vehicle Sales in the United States Nearly Doubled From 2020 to 2021*, Off. Energy Efficiency & Renewable Energy (Feb. 28, 2022), https://www.energy.gov/eere/vehicles/articles/fotw-1227-february-28-2022-light-duty-plug-electric-vehicle-sales-united.

can wonder what the world would be like today if we had continued on that trajectory. Lest one think that no one knew about climate change then, note that in 1896, Swedish chemist Svante Arrhenius discovered that a buildup of atmospheric CO_2 resulting from fossil fuel combustion could lead to planetary warming.[94] Perhaps not coincidentally, the Swedish climate activist Greta Thunberg is distantly related to Arrhenius.[95]

After enactment of the IRA, EVs are now projected to exceed 50% of U.S. LDV sales.[96] This increase in new EV sales is a positive development for mitigating climate change, but achieving significant GHG reductions by switching to EVs will be challenging, for several reasons described below.

1. Vehicle Turnover

First, U.S. drivers are keeping their existing vehicles longer—the average age of a vehicle is 12 years, as compared to nine years in 2009.[97] There are about 279 million LDVs operating in the United States as of 2021.[98] Just over 600,000 EVs were sold in 2021,[99] out of 15 million total vehicle sales.[100] In 2009, to accelerate the use of more efficient vehicles, the federal government instituted the Car Allowance Rebate System, or "Cash for Clunkers" pro-

third of cars on the road. Within a few decades, however, electric cars were practically obsolete.

Melissa N. Diaz, Congressional Research Service, R46231, Electric Vehicles: A Primer on Selected Policy Issues 1 (2020), https://crsreports.congress.gov/product/pdf/R/R46231 (citing Rebecca Matulka, *The History of the Electric Car*, U.S. Dep't Energy (Sept. 15, 2014), https://www.energy.gov/articles/history-electric-car).

94. Ross Gelbspan, The Heat Is On: The High Stakes Battle Over Earth's Threatened Climate 176 (1997). Arrhenius later won the Nobel Prize for chemistry for his work on how electrical current is conducted in chemical solution. Nobel Prize Outreach, *Svante Arrhenius—Facts*, https://www.nobelprize.org/prizes/chemistry/1903/arrhenius/facts/ (last visited Feb. 21, 2023).

95. Brenda Ekwurzel, *I'm a Scientist and Greta Thunberg's Speech to Congress Inspires Me*, Union Concerned Scientists (Sept. 20, 2019, 9:18 AM), https://blog.ucsusa.org/brenda-ekwurzel/im-a-scientist-greta-thunbergs-speech-to-congress-inspires-me/.

96. Ira Boudway, *More Than Half of US Car Sales Will Be Electric by 2030*, Bloomberg (Sept. 20, 2022), https://www.bloomberg.com/news/articles/2022-09-20/more-than-half-of-us-car-sales-will-be-electric-by-2030#xj4y7vzkg.

97. Mike Colias, *Americans Are Keeping Their Cars Longer, as Vehicle Age Hits 12 Years*, Wall St. J. (June 14, 2021, 11:27 AM), https://www.wsj.com/articles/average-u-s-vehicle-age-hits-record-12-years-11623680640.

98. *Id.*

99. Mathilde Carlier, *Plug-In Electric Light Vehicle Sales in the U.S. 2016-2021*, Statista (Mar. 30, 2022), https://www.statista.com/statistics/665823/sales-of-plug-in-light-vehicles-in-the-us/.

100. Tom Krisher, *New Auto Sales Up in 2021, but a Long Way Before Full Recovery*, U.S. News & World Rep. (Jan. 4, 2022, 6:50 PM), https://www.usnews.com/news/business/articles/2022-01-04/new-auto-sales-up-in-2021-but-long-way-before-full-recovery.

gram.[101] It provided government vouchers for up to $4,500 to car owners who traded in their older, less fuel-efficient vehicles for new vehicles that got better gas mileage. More than 677,000 "clunkers" were turned in and destroyed, resulting in an average improvement in mileage of 9.6 miles per gallon per exchanged vehicle.

The government spent $2.85 billion on the program.[102] The program was estimated to reduce CO_2 emissions by between 8.58 and 28.28 million tons, which would amount to a cost per ton of CO_2 of $91 to $301. In comparison, the Congressional Budget Office found that using the EV tax credits to reduce emissions from ICE vehicles could "range from $300 to $1,200 per metric ton of CO_2 emissions reduced, depending on the battery size of the electric vehicle that is substituting for an average-fuel-economy conventional vehicle."[103] Vermont has adopted a "Replace Your Ride" program, similar to Cash for Clunkers, which provides $3,000 to eligible applicants who turn in a 2012 model year or earlier vehicle to be scrapped and purchase a new or used eligible vehicle.[104]

2. Range Anxiety

Second, drivers have a number of concerns about switching to EVs, including the initial cost of purchase and "range anxiety." The concern about cost of purchase can be ameliorated by the availability of federal and state purchase incentives, such as the tax credits available in many states and via the federal legislation described above. Commentators have observed that EVs are disproportionately purchased by high-income persons.[105]

The IRA solves this distributional issue by limiting the availability of the new EV tax credit to vehicles that have a retail price of $55,000 or less, and to purchasers who have an adjusted gross income of $150,000 for married individuals ($75,000 for single individuals). The new EV tax credit applies to the purchase of trucks and sport utility vehicles (SUVs) with a retail price of $80,000 or less. The IRA also includes a tax credit for the purchase of a used EV costing $25,000 or less. The new EV tax credit may be up to $7,500; the used EV tax credit may be up to $4,000.[106]

The concern about range anxiety—a driver's worry about being able to recharge a vehicle on a long trip—can be ameliorated by additional government investment in public charging infrastructure.[107] The Infrastructure Investment and Jobs Act (IIJA) of 2021 provided $7.5 billion in funding for public charging infrastructure.[108] A study by MIT researchers found that funding charging infrastructure was the most effective government policy for encouraging shifting to EVs and thereby reducing GHG emissions from the transportation sector.[109] The Biden Administration recently announced proposed regulations, providing that "[e]lectric vehicle charging stations built with Federal dollars should be positioned along Interstates every 50 miles, be able to recharge cars quickly and be located no more than a mile from a major highway."[110]

Concerns about reliability of public charging continue. While Tesla's proprietary charging network gets good marks for reliability, Electrify America and ChargePoint have struggled with broken chargers, with investigations showing between 23% and 39% of their public chargers not working.[111] The IRA includes extended tax credits for private charging, which will help individuals charge vehicles at home and businesses charge vehicles at their business locations. For individuals, the alternative fuel refueling property credit provides a maximum $300 tax credit for installation of charging equipment.[112] For businesses, the credit is up to $6,000,[113] increased to $30,000 if certain labor requirements are met.[114] The credits are in effect until 2032,[115] and also apply to bidirectional chargers.[116]

3. Supply Chain Issues

Third, there are concerns about supply chains for materials used in EV manufacturing and charging infrastructure.[117] Batteries constitute about 40% of the value of an EV. Tesla Chief Executive Officer Elon Musk stated that battery availability is "the fundamental limit on electric vehicles right now."[118] While car manufacturers like Tesla are building their own batteries, the raw materials can still

101. Roberta F. Mann, *Sustainably Funding Transportation Infrastructure: Tax Fuel or Miles?*, 31 Australian Tax F. 609, 628 (2016).
102. Ted Gayer & Emily Parker, Brookings, Cash for Clunkers: An Evaluation of the Car Allowance Rebate System 4 (2013).
103. Congressional Budget Office, Effects of Federal Tax Credits for the Purchase of Electric Vehicles 18 (2012).
104. State of Vermont, Replace Your Ride Program: Program Guidelines v1.1 (2022), https://www.driveelectricvt.com/Media/Default/docs/ryr/vermont-replace-your-ride-program-guidelines.pdf; Drive Electric Vermont, *State of Vermont Incentives*, https://www.driveelectricvt.com/incentives/vermont-state-incentives (last visited Feb. 21, 2023).
105. Scott Hardman et al., *A Perspective on Equity in the Transition to Electric Vehicles*, MIT Sci. Pol'y Rev., Aug. 30, 2021, at 46, 47.
106. IRA, Pub. L. No. 117-169, §13402, 136 Stat. 1818, 1962-64 (2022) (adding I.R.C. §25E).
107. *But see* Lance Noel et al., *Fear and Loathing of Electric Vehicles: The Reactionary Rhetoric of Range Anxiety*, 48 Energy Rsch. & Soc. Sci. 96 (2019) (examining psychological, technological, and rhetorical aspects of range anxiety).
108. IIJA, Pub. L. No. 117-58, §11401, 135 Stat. 429, 547 (2021).
109. Cole et al., *supra* note 39, at 10.
110. Lisa Friedman, *Biden Administration to Set Rules of the Road for Charging Electric Vehicles*, N.Y. Times (June 9, 2022), https://www.nytimes.com/2022/06/09/climate/electric-vehicles-charging-stations.html.
111. Niraj Chokshi, *A Frustrating Hassle Holding Electric Cars Back: Broken Chargers*, N.Y. Times (Aug. 16, 2022), https://www.nytimes.com/2022/08/16/business/energy-environment/electric-vehicles-broken-chargers.html.
112. I.R.C. §30C(a), (b)(2) (30% credit for up to $1,000 = $300. Added by §13404 of the IRA).
113. *Id.* §30C(a), (b)(1) (6% credit for up to $100,000 = $6,000).
114. *Id.* §30C(g) (credit multiplied by 5 for meeting wage and apprenticeship requirements).
115. *Id.* §30C(i).
116. *Id.* §30C(c)(2). Bidirectional chargers use the grid to add electricity to the vehicle and allow the vehicle to be used as battery storage for the grid. Office of Energy Efficiency and Renewable Energy, DOE, *Bidirectional Charging and Electric Vehicles for Mobile Storage*, https://www.energy.gov/eere/femp/bidirectional-charging-and-electric-vehicles-mobile-storage (last visited Feb. 21, 2023).
117. Aaron Perryman, *A Growing Appetite for EVs Tasks the Supply Chain to Scale*, Supply Chain Dive (Mar. 4, 2021), https://www.supplychaindive.com/news/electric-vehicle-battery-sourcing-material-manufacturing/596148/.
118. *Id.*

be difficult to obtain. EV batteries need raw materials that are in short supply in the United States: lithium, nickel, and cobalt.[119]

Solutions include battery recycling, which reduces mining pressure. Lithium and nickel supplies face only economic shortages—the materials are available in the United States, but are more cheaply processed elsewhere.[120] Cobalt is primarily found in the Democratic Republic of the Congo, which raises human rights concerns[121] as well as economic concerns, but emerging battery technology reduces the need for cobalt.

These concerns are being addressed by the federal government. In May 2022, the Biden Administration announced that $3.1 billion would be invested by DOE in domestic battery manufacturing and supply chains.[122] The announcement notes:

> As of the end of March 2022, more than 2.5 million plug-in electric vehicles have been sold in America, with more than 800,000 of those having been sold since President Biden took office. Battery costs have fallen more than 90% and since 2008, and energy density and performance have increased rapidly, paving the way for an accelerated transition to zero-emission vehicles. Responsible and sustainable domestic sourcing of the critical materials used to make lithium-ion batteries—such as lithium, cobalt, nickel, and graphite—will help avoid or mitigate supply chain disruptions and accelerate battery production in America to meet this demand and support the adoption of electric vehicles.[123]

The recently enacted IRA also provides incentives for battery manufacturing, and excludes vehicles from credit eligibility if their batteries contain critical minerals or components "extracted, processed, or recycled by a foreign entity of concern."[124] While this limitation eases human rights concerns, some commentators worry about the ability of EVs to meet the restrictions on credit availability.[125]

In response to comments about the battery and critical mineral component requirements,[126] the U.S. Treasury Department announced that it would be issuing proposed guidance no earlier than March 2023 and, until then, vehicles could be eligible for the full $7,500 credit without regard to the battery and critical mineral components.[127] Sen. Joe Manchin (D-W. Va.) disagreed with the temporary relaxation of the regulatory requirements, stating that "the information released today from the Treasury Department outlining how they will be implementing the commercial and consumer EV tax credits bends to the desires of the companies looking for loopholes and is clearly inconsistent with the intent of the law."[128]

This controversy highlights the challenges of implementing legislation that has many goals, further discussed in Section II.F below. The Joint Committee on Taxation's revenue estimate reflects a gradual growth in the use of the credit, from a cost of $85 million in 2023 to an aggregate cost of $7.5 billion from 2022-2031.[129] This gradual increase presumably reflects the ability of vehicle manufacturers to adjust supply chains to conform to the credit's requirements.

4. Manufacturing and Charging Emissions

Some commentators argue that the GHG emissions of EVs exceed the GHG emissions of ICE vehicles, due to emissions from manufacturing and fueling with coal-fired electricity.[130] A recent study from the University of Michigan noted that based on the average vehicle miles traveled (VMT) in the United States, EV sedans' GHG emissions become equivalent to that of an ICE sedan at between 1.4 and 1.6 years.[131] Over the lifetime of the vehicle, EVs produce between 35% (for sedans) and 37% (for SUVs) of the GHG emissions of an ICE vehicle.[132] This result obtains at the average GHG emissions for electricity generation in the United States, and will only improve as more renewable energy is added to the grid.[133]

119. J. Peter Pham, Purdue University, Securing Supply Chains of Critical Minerals and Materials for America's Tech Future (2022), https://techdiplomacy.org/wp-content/uploads/2022/03/Securing-Supply-Chains-of-Critical-Minerals-and-Materials-for-Americas-Tech-Future.pdf.
120. *Id*. at 17.
121. U.S. Department of State, Republic of the Congo 2021 Human Rights Report (2022), https://www.state.gov/wp-content/uploads/2022/02/313615_CONGO-REP-2021-HUMAN-RIGHTS-REPORT.pdf.
122. Press Release, DOE, Biden Administration Announces $3.16 Billion From Bipartisan Infrastructure Law to Boost Domestic Battery Manufacturing and Supply Chains (May 2, 2022), https://www.energy.gov/articles/biden-administration-announces-316-billion-bipartisan-infrastructure-law-boost-domestic.
123. *Id*.
124. IRA, Pub. L. No. 117-169, §§13401, 13502, 136 Stat. 1818, 1957 (2022).
125. Keith Barry, *More SUVs, Teslas Now Qualify for the New Electric Vehicle Tax Credit*, Consumer Reps. (Feb. 9, 2023), https://www.consumerreports.org/cars/hybrids-evs/electric-vehicles-that-qualify-for-new-ev-tax-credit-a9310530660/.
126. Marie Sapirie, *Supercharging EV Guidance, Maybe*, 177 Tax Notes Fed. 1500 (2022).
127. I.R.S. Notice 2023-1, Certain Definitions of Terms in Section 30D Clean Vehicle Credit; *EV Credit Guidance Buys Time for Automakers on Battery Rules*, Tax Notes Today Fed. (Dec. 30, 2022), https://www.taxnotes.com/tax-notes-today-federal/credits/ev-credit-guidance-buys-time-automakers-battery-rules/2022/12/30/7fhzv; U.S. Department of the Treasury, Anticipated Direction of Forthcoming Proposed Guidance on Critical Mineral and Battery Component Value Calculations for the New Clean Vehicle Credit (2022), https://home.treasury.gov/system/files/136/30DWhite-Paper.pdf.
128. Press Release, Office of Senator Manchin, Manchin Urges Treasury to Pause Implementation of EV Tax Credits (Dec. 29, 2022), https://www.manchin.senate.gov/newsroom/press-releases/manchin-urges-treasury-to-pause-implementation-of-ev-tax-credits.
129. Joint Committee on Taxation, *supra* note 69.
130. Eric A. Taub, *E.V.s Start With a Bigger Carbon Footprint. But That Doesn't Last*, N.Y. Times (Nov. 7, 2022), https://www.nytimes.com/2022/10/19/business/electric-vehicles-carbon-footprint-batteries.html.
131. Maxwell Woody et al., *The Role of Pickup Truck Electrification in the Decarbonization of Light-Duty Vehicles*, 17 Env't Rsch. Letters 034031, at 1, 1 (2022).
132. Taub, *supra* note 130.
133. Woody et al., *supra* note 131. The article notes that there are regional difference in emissions from electricity generation, but based on average GHG emissions from electricity generation, EVs produce fewer GHG emissions than ICE vehicles. For an estimate of the IRA's impact on GHG emissions from electricity generation, see Office of Policy, DOE, *supra* note 71.

5. Emotions

Finally, some drivers show an emotional attachment to ICE vehicles.[134] In one study, participants found that EVs "are boring and not fun compared to conventional ICE technology."[135] These participants valued the "exhaust note" sound and stated that this sound gives them aural pleasure, which cannot be replaced with any other factor.[136] On the other hand, the World Health Organization (WHO) estimates that the noise impact of road traffic is second only to pollution as the biggest environmental impact of vehicles.[137]

D. U.S. Fleet Vehicle Case Studies

The emotional attachment to private vehicles can be discounted for drivers of business fleet vehicles. Of the 279 million LDVs on the road in the United States today, more than 3.4 million are owned in government or business fleets.[138] The Corporate Electric Vehicle Alliance (CEVA), whose members include Amazon, Best Buy, DHL, Hertz, Schindler Elevator, T-Mobile, and United Natural Foods Inc., owns, leases, or operates more than 1.3 million on-road fleet vehicles in the United States, although only a portion of those vehicles qualify as LDVs.[139] A 2021 survey of the CEVA indicates that 71% of respondents plan to procure nearly 269,000 zero emission LDVs—sedans, SUVs, and pickups—over the next five years.[140]

Fleet vehicles also qualify for federal tax credits, with some significant differences from the individual clean vehicle tax credits. To qualify for the new qualified commercial clean vehicle tax credit,[141] the vehicle must be eligible for the depreciation deduction, which is only allowed for vehicles used in a trade or business.[142] The vehicle must be acquired for use or lease by the taxpayer and not for resale.[143] The qualifying EV's battery capacity must be not less than 7 kWh, and must be capable of being recharged from an external source of electricity.[144] Unlike the individual clean vehicle credit, there is no limitation on the price of the vehicle, where the vehicle is assembled, the composition of the battery components, or the income of the purchaser.

Because of these differences, some commentators believe that obtaining a tax credit for an EV purchase will be easier for businesses.[145] For a fully electric vehicle, the amount of the credit is the lesser of the two following amounts: 30% of the cost of the vehicle or the incremental cost of the vehicle over a comparable gasoline- or diesel-powered vehicle.[146] The maximum amount of the credit is $7,500 in the case of a vehicle with a gross vehicle weight of less than 14,000 pounds.[147] Pending permanent guidance, the Internal Revenue Service (IRS) allows the credit to be calculated based on 30% of the cost of the vehicle, because analysis from DOE shows that the incremental cost of EVs will be greater than $7,500 in 2023.[148]

Hertz, one of the largest car rental companies in the United States, announced in October 2021 that it would purchase 100,000 Tesla EVs by the end of 2022, making its fleet 20% electric.[149] In April 2022, Hertz announced that it would purchase an additional 65,000 EVs from Swedish company Polestar.[150] Car rentals provide potential vehicle consumers with exposure to EVs, which can enhance the likelihood of EV purchase. Another car rental company, Enterprise, participated in a pilot program to add EVs to its rental fleets in Orlando, Florida.[151] Ninety-two percent of the customers who rented EVs as part of this program reported that they had purchased an EV or intended to purchase one in the next five years.[152]

Other fleet purchasers, both state and local governments and private companies, are increasingly turning to EVs. The California Department of Transportation placed an order for 399 Tesla Model 3 EVs in furtherance of its effort to fully electrify its vehicle fleet. Police departments across the country have been adding EVs to their fleets.[153] Cities including Columbus, Ohio; Atlanta, Georgia; and Philadelphia, Pennsylvania, have added EVs to city-owned vehicle fleets.[154] In the private sector, Domino's Pizza purchased

134. Krishna Gnanasekaran, *Understanding and Identifying Barriers to Electric Vehicle Adoption Through Thematic Analysis*, 10 Transp. Rsch. Interdisc. Persps. 100364, at 1, 5 (2021).
135. *Id.* at 6.
136. *Id.*
137. Media Release, WHO, New Evidence From WHO on Health Effects of Traffic-Related Noise in Europe (Mar. 30, 2011), https://www.who.int/europe/news/item/30-03-2011-new-evidence-from-who-on-health-effects-of-traffic-related-noise-in-europe.
138. Bureau of Transportation Statistics, *supra* note 17, at 56.
139. Ceres, Zero-Emission Vehicle Demand Aggregation Analysis 1 (2022), https://www.ceres.org/sites/default/files/reports/2022-01/Ceres%20Analysis%20New%20Corporate%20Electric%20Vehicle%20Alliance%20survey.pdf.
140. David Gohlke & Yan Zhou, DOE, Assessment of Light-Duty Plug-In Electric Vehicles in the United States, 2010-2020 (2021).
141. IRA §13403 (adding I.R.C. §45W).
142. I.R.C. §§45W(c)(2)(4), 167 (defining eligibility for the deprecation deduction).
143. *Id.* §45W(c)(1).
144. *Id.* §45W(c)(3)(A).
145. Greg Iacurci, *Here's Why a New $40,000 Electric Vehicle Tax Credit for Business Owners May Be Relatively Easy to Get*, CNBC (Oct. 21, 2022, 3:26 PM), https://www.cnbc.com/2022/10/21/why-an-electric-vehicle-tax-credit-for-business-owners-may-be-relatively-easy-to-get.html.
146. I.R.C. §45W(b).
147. *Id.* §45W(b)(4).
148. I.R.S. Notice 2023-9, Section 45W Commercial Clean Vehicles and Incremental Cost for 2023.
149. Joseph Winters, *Hertz Just Made the Biggest Electric Vehicle Purchase Ever*, Grist (Oct. 26, 2021), https://grist.org/transportation/hertz-just-made-the-biggest-electric-vehicle-purchase-ever/.
150. Andrew J. Hawkins, *Hertz Says It Will Purchase 65,000 Electric Vehicles From Polestar*, Verge (Apr. 4, 2022, 10:12 AM), https://www.theverge.com/2022/4/4/23009781/hertz-polestar-ev-purchase-car-rental-deal.
151. Electrification Coalition, Drive Electric Orlando Final Report 3 (2022).
152. *Id.* at 20.
153. Faye C. Elkins, *The Pros and Cons of Electrifying Your Fleet*, 15 Cmty. Policing Dispatch (June 2022), https://cops.usdoj.gov/html/dispatch/06-2022/Electric_Vehicles.html; Darryn John, *New York Gets Green Light to Purchase Up to 250 Tesla Model 3s for NYPD*, Drive Tesla Can. (Dec. 29, 2021), https://driveteslacanada.ca/model-3/new-york-city-gets-green-light-to-purchase-up-to-250-tesla-model-3s-for-nypd/.
154. Donna Marbury, *Public Fleet EV Adoption: Six Things to Consider*, Smart Columbus (Sept. 8, 2022), https://smart.columbus.gov/playbook-assets/electric-vehicle-fleet-adoption/public-ev-adoption-6-things-to-consider; *Atlanta Department of Watershed's Fleet Sharing and Automation Project Saves Taxpayer Dollars, Improves Efficiency, and Greens the Fleet*, Municipal (Mar. 2, 2020), https://www.themunicipal.com/2020/03/atlanta-department-of-

800 Chevy Bolt EVs for its delivery fleet and began deploying them in November 2022.[155] The company announced that it plans to purchase more EVs after this initial round.

As fleet vehicles turn over more frequently than private vehicles, fleet EVs will be a vital source for pre-owned EVs, now eligible for the previously owned EV tax credit enacted by the IRA.[156] Moreover, fleet vehicles typically travel more miles than individually owned vehicles, which increases the GHG reductions from the switch to EVs from ICE vehicles.[157]

Government policy should be able to easily influence the makeup of government fleet vehicles. Government fleet vehicles totaled 1.4 million in 2020.[158] State governments own 500,000 vehicles.[159] In December 2021, President Biden issued an Executive Order establishing the goal of acquiring only EVs for the federal fleet, beginning with the acquisition of LDVs in 2027.[160]

The Order affects approximately 380,000 vehicles in federal fleets.[161] A 2021 report estimated that the federal government could save more than $1 billion by replacing nearly all of its LDVs and buses with EVs by the end of the decade.[162] With the recent rise in the cost of petroleum fuels, the savings could be even greater.[163] There is a lot of progress to be made. A U.S. Government Accountability Office (GAO) report published in October 2022 noted that less than 1% of vehicles operated by federal agencies are classified as ZEVs.[164]

The U.S. Postal Service (USPS) has the largest fleet of LDVs in the federal government, with more than 200,000 vehicles.[165] Environmental experts assert that the USPS stop-and-start delivery service is ideal for using EVs.[166] In 2009, USPS' inspector general found that 96% of postal routes were compatible with electric trucks.[167] The USPS originally planned to spend $11.3 billion to replace its aging fleet of delivery vehicles with 90% gas-powered trucks and 10% EVs.[168] This decision would have cost the USPS billions of dollars in additional fuel and maintenance costs over the vehicles' 20-year life-span.[169]

Sixteen states sued the USPS to block the purchase of the gas-powered vehicles, claiming that it had failed to consider the environmental impact of the plan.[170] The USPS modified its plan in July 2022, announcing that 40% of the new vehicles would be EVs.[171] The IRA includes $3 billion in funding for the USPS to purchase EVs and install charging infrastructure.[172] The legislation requires the USPS to spend the funds by the end of 2031. On December 20, 2022, the USPS announced that it will increase its acquisition of EVs, planning to purchase 66,000 EVs, which would constitute more than 62% of its total vehicle purchases by 2028.[173]

E. Political Barriers

The story of the USPS defiance of President Biden's Order highlights the political barriers facing a transition to EVs, but some of those barriers have been overcome. While political barriers defeated the Build Back Better Act (BBBA),[174] passed by the U.S. House of Representatives in November 2021, which would have made significant progress on enhancing financial incentives for EV purchase and EV supply equipment, it has been resurrected under a different name—the Inflation Reduction Act of 2022.

The IRA provides more modest support for EVs and renewable energy than the BBBA. Table 1 provides a comparison of the provisions.

While the provisions in the BBBA passed by the House could have made significant progress toward GHG reductions, the IRA provisions will also assist in the transition to clean energy and clean vehicles. With respect to the BBBA, a report by the World Resources Institute found:

watersheds-fleet-sharing-and-automation-project-saves-taxpayer-dollars-improves-efficiency-and-greens-the-fleet/; Helena Rudoff & Christine Knapp, *City of Philadelphia Announces Municipal Clean Fleet Plan*, City of Phila. (Oct. 14, 2021), https://www.phila.gov/2021-10-14-city-of-philadelphia-announces-municipal-clean-fleet-plan/.

155. Heather Haddon, *Domino's Pizza Invests in Electric-Vehicle Fleet to Help Stores Recruit Drivers*, Wall St. J. (Nov. 21, 2022, 5:05 PM), https://www.wsj.com/articles/dominos-pizza-invests-in-electric-vehicle-fleet-to-help-stores-recruit-drivers-11668990159. Domino's reports that 572 EVs are on the road delivering pizzas as of the beginning of March. *See* Dominos, *Domino's Electric Vehicle Fleet*, Dominos.com/evfleet/ (last visited Mar. 2, 2023).
156. Rebecca Heilweil, *The Secret to Electric Vehicle Dominance Is Buying in Bulk*, Vox Recode (Nov. 9, 2022, 8:30 AM), https://www.vox.com/recode/2022/11/9/23447891/electric-vehicles-evs-buses-rental-cars-hertz-rivian-amazon.
157. *Id.*
158. Bureau of Transportation Statistics, *supra* note 17, at 56.
159. ACEEE, *State and Local Policy Database: Fleets*, https://database.aceee.org/state/fleets (last visited Feb. 21, 2023).
160. Exec. Order No. 14057, §§102(i), 204, 86 Fed. Reg. 70935 (Dec. 8, 2021).
161. U.S. Government Accountability Office, GAO-23-105636, Federal Fleet Transition 1 (2022), https://www.gao.gov/assets/730/723536.pdf.
162. Jason Plautz, *Electrifying 97% of the Federal Fleet by 2030 Could Save Billions: Report*, Smart Cities Dive (Aug. 18, 2021), https://www.smartcitiesdive.com/news/electrifying-97-of-the-federal-fleet-by-2030-could-save-billions-report/605228/.
163. U.S. Energy Information Administration, *Short-Term Energy Outlook*, https://www.eia.gov/outlooks/steo/report/prices.php (last released Feb. 7, 2023).
164. U.S. Government Accountability Office, *supra* note 161, at 1.
165. Jill Naamane, U.S. Government Accountability Office, Fleet Management: Preliminary Observations on Electric Vehicles in the Postal and Federal Fleets 4 (2022), https://www.gao.gov/assets/gao-22-105931.pdf.
166. Jacob Bogage & Anna Phillips, *USPS Finalizes Plans to Buy Mostly Gasoline-Powered Delivery Trucks. Here's What Experts Say Is Wrong With That*, Wash. Post (Feb. 23, 2022, 2:15 PM), https://www.washingtonpost.com/business/2022/02/23/usps-trucks-epa-climate-change/.
167. *Id.*
168. *Id.*
169. *Id.*
170. Andrew J. Hawkins, *16 States Sue to Block USPS Plan to Buy Hundreds of Thousands of Gas-Guzzling Mail Trucks*, Verge (Apr. 29, 2022, 11:50 AM), https://www.theverge.com/2022/4/29/23048478/usps-mail-truck-lawsuit-gas-environment-electric.
171. Jacob Bogage, *USPS Will Make 40% of Its New Trucks Electric, Up From 10%*, Wash. Post (July 20, 2022, 5:09 PM), https://www.washingtonpost.com/business/2022/07/20/usps-electric-trucks/.
172. IRA, Pub. L. No. 117-169, §70002, 136 Stat. 1818, 2086 (2022).
173. Press Release, USPS, USPS Intends to Deploy Over 66,000 Electric Vehicles by 2028, Making One of the Largest Electric Vehicle Fleets in the Nation (Dec. 20, 2022), https://about.usps.com/newsroom/national-releases/2022/1220-usps-intends-to-deploy-over-66000-electric-vehicles-by-2028-2.pdf.
174. H.R. 5376, 117th Cong. (2021).

Table 1. BBBA Versus IRA EV Support

	BBBA	IRA
EV infrastructure grants to the states	$800 million; §30431	$600 million for state eligible infrastructure grants for charging clean heavy-duty vehicles; §60101
Grant funding for domestic production of EVs	$3.5 billion; §30443	EV tax credits include requirements for phased in domestic production; §13401
Procurement of EVs and infrastructure for federal fleets	$6 billion; §80001	$3 billion for USPS EV purchases and infrastructure support; §70002
EV tax credit	Up to $12,500 per vehicle; §136401	Up to $7,500 per vehicle with cost and income caps, §13401
Used EV tax credit	Up to $4,000 per vehicle with income caps; §136402	Up to $4,000 per vehicle with cost and income caps; §13402

> Transitioning to a net-zero economy by 2050 will require a suite of federal policies including tax credits for low-carbon technologies, investments for building out critical infrastructure to support a low-carbon economy, and sector-specific performance standards, especially in the absence of an economy-wide carbon pricing mechanism. The Build Back Better Act offers vital tax credits and investments that can make clean energy and low-carbon technologies more affordable and accessible.[175]

With respect to the IRA EV provisions, Harvard Law Prof. Jody Freeman, former environmental counselor to President Barack Obama, commented:

> [T]he measures to electrify transportation, which produces the largest and fastest-growing share of U.S. greenhouse gas emissions, are likely to be transformational. Auto companies are already spending billions of dollars producing electric cars and trucks. Now their near-term economics will benefit from tax credits that make electric vehicles more affordable. The credits require auto companies to reduce their dependence on countries such as China for critical minerals used in batteries, like cobalt and lithium, and incentivize the recycling of those minerals. Billions of dollars would be directed to boost domestic production of batteries and other electric vehicle components, which will create good American jobs.[176]

Readers may wonder why the IRA succeeded while the BBBA failed. Most bills require a 60-vote majority in the U.S. Senate due to the filibuster rules.[177] Reconciliation bills must only contain provisions that are germane to the budget process and are exempt from the filibuster rules.[178] Therefore, reconciliation bills can pass the Senate with a simple majority vote.

The BBBA qualified as a reconciliation bill.[179] However, in an evenly divided Senate, the objections of a single senator can doom the bill. That is what happened to the BBBA. In December 2021, Democratic Senator Manchin declared that he would not vote for the BBBA.[180] In August 2022, Senator Manchin agreed to support the IRA.[181] The IRA also qualified as a reconciliation bill.[182] The IRA is the largest emissions reduction action ever taken by Congress, providing $370 billion in public funding.[183] The largest portion of the clean energy and climate funding provided by the IRA comes in the form of tax credits.[184]

F. Critiques of U.S. Policies

While the IRA has been praised by many, significant critiques have also emerged. The EV provisions in the IRA try to do many things at once: encourage purchasing EVs to reduce GHG emissions, create a sustainable supply chain for materials, encourage North American manufacturing,

175. Rajat Shrestha et al., *Achieving Net-Zero Emissions: Can the Build Back Better Act Help Get There?*, World Res. Inst. (Dec. 15, 2021), https://www.wri.org/insights/build-back-better-us-net-zero-emissions.

176. Jody Freeman, *The Climate Bill Isn't Perfect, but It's Still a Major Victory*, N.Y. Times (Aug. 11, 2022), https://www.nytimes.com/2022/08/11/opinion/climate-inflation-reduction-act.html.

177. Valerie Heitshusen & Richard S. Beth, Congressional Research Service, RL30360, Filibusters and Cloture in the Senate 9 (2017), https://crsreports.congress.gov/product/pdf/RL/RL30360.

178. Richard Kogan & David Reich, Center on Budget and Policy Priorities, Introduction to Budget "Reconciliation" (2022).

179. House Committee on the Budget, *Build Back Better*, https://democrats-budget.house.gov/issues/build-back-better (last visited Mar. 2, 2023).

180. Emily Cochrane & Catie Edmondson, *Manchin Pulls Support From Biden's Social Policy Bill, Imperiling Its Passage*, N.Y. Times (Mar. 28, 2022), https://www.nytimes.com/2021/12/19/us/politics/manchin-build-back-better.html.

181. Matthew N. Green, *How Did the Democrats' Major Spending Bill Get Off Life Support?*, Wash. Post (Aug. 8, 2022, 1:05 PM), https://www.washingtonpost.com/politics/2022/08/08/manchin-sinema-congress-ira-climate/.

182. Bipartisan Policy Center, Inflation Reduction Act Summary: Energy and Climate Provisions (2022), https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2022/08/Energy-IRA-Brief_R04-9.26.22.pdf.

183. Shannon Osaka, *Why the Climate Bill's Impact Might Not Match What Many Expect*, Wash. Post (Aug. 18, 2022, 7:30 AM), https://www.washingtonpost.com/climate-environment/2022/08/18/ira-inflation-reduction-act-climate-change/.

184. Justin Badlam et al., *The Inflation Reduction Act: Here's What's in It*, McKinsey & Co. (Oct. 24, 2022), https://www.mckinsey.com/industries/public-and-social-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it.

and enable lower income Americans to purchase EVs.[185] The previous EV tax credit appeared to have a simpler goal. It focused on encouraging manufacturers to produce EVs, irrespective of where the vehicles were manufactured, the provenance of the battery components, or the income level of the purchaser.[186]

A 2021 study found that "the top demographic of 2019 EV owners are middle-aged white men earning more than $100,000 annually with a college degree or higher."[187] That EV purchasers have higher incomes than the U.S. median is not surprising, given that the average price for a new EV is about one-third higher than the average price of an ICE car.[188] In September 2022, the average transaction price for a new car (of any powertrain) was $48,094, while the average electric car price was $65,291 (for new cars).[189] Once a manufacturer had sold 200,000 EVs, their vehicles were no longer eligible for the full tax credit. General Motors (GM), Tesla, and Toyota exceeded the 200,000 cap on vehicles sold before the enactment of the IRA.[190]

Trying to accomplish many goals with one legislative instrument leads to complexity and compromise between those goals. Prof. John Graham noted that the requirement for North American manufacturing in the EV tax credit will disqualify several of the most affordable EV models from Hyundai and Kia, which are assembled in Asia.[191] Professor Graham also noted that the critical minerals requirement will necessitate increased mining activity, which will be slow to develop because of permitting requirements.[192]

However, the new EV credit has already spurred plans to build manufacturing capacity for EVs and EV batteries in the United States.[193] A report by the ACEEE listed three government policies "likely to have the greatest impact on EV uptake: zero-emission vehicle (EV) mandates and EV deployment targets; financial incentives for vehicle purchases; and incentives for charging infrastructure installation."[194] As noted previously, federal legislation has provided funding for charging infrastructure.[195] As described above, the IRA will enhance tax credits for EV purchases. At the state level, all but four states provide some sort of incentive for EVs or EV charging.

Another challenge may come from the international side. The World Trade Organization (WTO) administers the General Agreement on Tariffs and Trade (GATT), which promotes free trade by prohibiting domestic subsidies that could create barriers to free trade.[196] Commentators have observed that WTO rules can conflict with environmental goals. Prof. Deepa Badrinarayana noted that "granting subsidies to promote the use of renewable energy under conditions that make such energy competitive with fossil fuels . . . faces WTO challenges that cannot be addressed within the parameters of WTO law."[197]

Similarly, the EV tax credit's requirement for vehicles to be assembled in North America may face WTO challenge. Although GATT does contain exceptions for environmental subsidies in Article XX, those exceptions apply to products and not production methods.[198] Jane Nakano of the Center for Strategic and International Studies noted that Japan raised doubts about the WTO conformity of the IRA EV provisions and "[t]he European Commission has called the IRA 'discriminatory' against non-U.S.-made cars."[199] The Biden Administration has set up a joint task force to negotiate with the EU on the issue.[200]

During his state visit to Washington, D.C., in November 2022, French President Emmanuel Macron discussed his displeasure with the EV tax incentives with President Biden, who "acknowledged 'glitches' in the legislation but

185. Jane Nakano, *IRA and the EV Tax Credits—Can We Kill Multiple Birds With One Stone?*, Ctr. for Strategic & Int'l Stud. (Sept. 15, 2022), https://www.csis.org/analysis/ira-and-ev-tax-credits%E2%80%94can-we-kill-multiple-birds-one-stone-0.

186. Joint Committee on Taxation, JCS-1-09, General Explanation of Tax Legislation Enacted in the 110th Congress 325-26 (2009):

> Tax benefits provided directly to the consumer to lower the cost of new technology and alternative-fuel vehicles can help lower consumer resistance to these technologies by making the vehicles more price competitive with purely petroleum-based fuel vehicles and creating increased demand for manufacturers to produce the technologies. The eventual goal is mass production and mass-market acceptance of new technology vehicles.

187. Fuels Institute, EV Consumer Behavior 1 (2021).

188. Median U.S. income is around $70,000 per year. Emily A. Shrider et al., U.S. Census Bureau, Income and Poverty in the United States: 2020 (2021), https://www.census.gov/content/dam/Census/library/publications/2021/demo/p60-273.pdf.

189. Justin Fischer, *The Average Price of an Electric Car (Updated Monthly)*, CarEdge (Sept. 22, 2022), https://joinyaa.com/guides/average-price-of-an-electric-car/.

190. I.R.S. News Release IR-2019-57 (Mar. 26, 2019) (re GM). Tesla reached 200,000 vehicles sold in the fourth quarter of 2018. Nick Carey & Sonam Rai, *Tesla Hits 200,000 Cars, Meaning Lower Tax Credit for Buyers*, Reuters (July 12, 2018, 9:59 AM), https://www.reuters.com/article/us-tesla-tax-credit/tesla-hits-200000-cars-meaning-lower-tax-credit-for-buyers-idUSKBN1K222F. Toyota reached that milestone just shortly before the enactment of the IRA. Mark Kane, *US: Toyota Sold Over 200,000 Plug-Ins, Triggering Federal Tax Credit Phaseout*, Inside EVs (July 5, 2022, 4:37 PM), https://insideevs.com/news/596120/toyota-third-manufacturer-200000-plugins/.

191. John D. Graham & Eva Brungard, *Affordable Electric Vehicles: Their Role in Meeting the U.S. Contribution to the Paris Climate Goals*, Frontiers Env't Sci. (Sept. 7, 2022); Penn Program on Regulation, *Cars and Climate: The Electric Vehicle Transformation*, YouTube (Oct. 11, 2022), https://www.youtube.com/watch?v=UlgmggmklMQ.

192. Penn Program on Regulation, *supra* note 191.

193. Jack Ewing & Ivan Penn, *Clean Energy Projects Surge After Climate Bill Passage*, N.Y. Times (Sept. 7, 2022), https://www.nytimes.com/2022/09/07/business/energy-environment/clean-energy-climate-bill.html (reporting Toyota's plans to make additional investments in battery manufacturing in North Carolina). *See also* Chris Randall, *Hyundai to Accelerate Schedule for US Plant*, Electrive.com (Aug. 23, 2022, 11:53 AM), https://www.electrive.com/2022/08/23/hyundai-to-accelerate-schedule-for-us-plant/.

194. Howard et al., *supra* note 42, at 4.

195. IIJA, Pub. L. No. 117-58, §11401, 135 Stat. 429, 547 (2021).

196. GATT, Oct. 30, 1947, 61 Stat. A-11, 55 U.N.T.S. 194, http://www.wto.org/english/docs_e/legal_e/legal_e.htm.

197. Deepa Badrinarayana, *Trading Up Kyoto: A Proposal to Amend the Protocol, Part I*, 47 B.C. Env't Affs. L. Rev. 1, 8 (2014).

198. For a nuanced discussion of the process and production method and the scope of its application under WTO rules, see Steve Charnowitz, *The Law of Environmental "PPMs" in the WTO: Debunking the Myth of Illegality*, 27 Yale J. Int'l L. 59, 75-83, 103-05 (2002) (discussing specific cases in which WTO jurisprudence on processes and production methods (PPMs) limited members' ability to take environmental protection measures).

199. Nakano, *supra* note 185.

200. Stephanie Soong, *EU Hopeful for U.S. Accord to End EV Tax Credit Dispute*, Tax Notes Today Fed. (Nov. 1, 2022), https://www.taxnotes.com/tax-notes-today-federal/trade/eu-hopeful-us-accord-end-ev-tax-credit-dispute/2022/11/01/7f9n2.

said 'there's tweaks we can make' to satisfy allies."[201] South Korea has also expressed concerns about potential violations of the United States-Korea Free Trade Agreement.[202]

Additional international trade challenges will likely follow. However, WTO challenges generally take time to resolve. Asian automakers like Hyundai have accelerated plans to build EVs in the United States.[203] Once these manufacturing facilities are operational, the job creation function of the IRA EV tax credit provisions will have done their job. If the legislation then changes to remove the domestic subsidies, either due to WTO challenges or shifts in U.S. politics, it will not matter too much.

Moreover, many of the new manufacturing facilities for EVs and associated products like batteries will be located in the southern part of the United States. American drivers in the South have been slow to adopt EVs, but the presence of new employment opportunities has increased consumer interest in EVs.[204] Many of the federal legislators from the South declined to support the IRA, but they are fully supportive of the job opportunities.[205]

Despite the challenges, federal legislation continues to make progress in supporting the switch to EVs. The IIJA provided funds for EV infrastructure development. The IRA enhances tax credits for the purchase of new EVs and adds tax credits for used EVs. The problem of low vehicle turnover could be addressed by implementing a second Cash for Clunkers-style program, as Vermont is doing, using tax credits to incentivize drivers to exchange their old gas- or diesel-powered vehicles for clean EVs.

These policies have been shown to effectively increase EV adoption. Of course, the level of emissions reduction from switching to EVs from gas- or diesel-powered vehicles depends on the electricity generation mix. While not directly related to EV adoption, the electricity generation mix is crucial to controlling GHG emissions. Tax policy influences the electricity generation mix, as described in Section II.B.1 above.

The United States has skipped one promising policy for encouraging EVs—increasing fuel taxes to discourage ICE vehicles. As discussed in the following part, countries in Europe both reduce taxes on EVs and impose significant taxes on fuels and vehicles that increase carbon emissions. Compared to Europe, U.S. fuel taxes are low. Moreover, the United States funds its highway system via earmarked taxes on fuel.[206] As vehicle efficiency increased, the loss of revenue caused some states to turn to VMT taxes and to raise registration fees on efficient vehicles, including EVs.[207] Significant structural differences in the tax systems of the United States and most European countries also create difficulty in adopting European solutions, as will be further discussed below.

III. Lessons From Europe

This part will explore specific European policies that could help increase EV uptake in the United States. Europe, unlike the United States, also has comprehensive policies to reduce GHG emissions, covering the electricity generation sector as well as other industrial sources.[208] The United States considered cap-and-trade legislation in 2010, but the measure was defeated.[209]

The EU Emissions Trading System (EU ETS) has been in place since 2005.[210] It is a cap-and-trade system for carbon allowances that relies on market dynamics to reduce GHG emissions. While in its early years the EU ETS was criticized for low allowance prices, carbon leakage, and overly generous application of the Clean Development Mechanism, it has been effective in significantly reducing GHG emissions in the EU, reaching its 2020 target of GHG reductions by 2014 with emissions continuing to decline.[211] Now in its fourth phase, the EU ETS requires covered sectors to reduce GHG emissions by 43% compared to 2005 levels by 2030.[212]

Although Europe has had significant success in reducing GHG emissions, the share of emissions from the transportation sector continues to rise.[213] EVs accounted for

201. Colleen Long et al., *Biden, Macron Vow Unity Against Russia, Discuss Trade Row*, AP News (Dec. 1, 2022), https://apnews.com/article/biden-technology-macron-state-dinners-climate-and-environment-18ac145ec44a24200e0c105584fd20ef. Sen. Ron Wyden (D-Or.), chair of the Senate Finance Committee, "said, 'Congress passed a law to rev up the American electric automobile industry, create good-paying American jobs and tackle climate change at the same time. I have no intention of reopening it.'" *Id.*
202. Soong, *supra* note 200.
203. Peter Johnson, *Hyundai Wants to Build EVs in the US, Looks to Speed Up the Timeline*, Electrek (Aug. 22, 2022, 11:55 AM), https://electrek.co/2022/08/22/hyundai-wants-us-built-evs-speeds-up-timeline/.
204. Peter Johnson, *EV Market Share in Southeast Doubles as Industry Brings Almost $33 Billion to the Region*, Electrek (Sept. 19, 2022, 4:32 PM), https://electrek.co/2022/09/19/ev-market-share-doubled-in-the-southeast-this-year/.
205. *See* Jack Ewing, *E.V. Bonanza Flows to Red States That Denounce Biden Climate Policies*, N.Y. Times (Oct. 19, 2022), https://www.nytimes.com/2022/10/19/business/electric-vehicles-republicans-investment-south.html.
206. Tax Policy Center, *What Is the Highway Trust Fund, and How Is It Financed?*, https://www.taxpolicycenter.org/briefing-book/what-highway-trust-fund-and-how-it-financed (last updated May 2020).
207. For a discussion of the pros and cons of taxing fuel versus taxing VMT, see Mann, *supra* note 101; Oregon Department of Transportation, *OReGO: Oregon's Road Usage Charge Program*, https://www.oregon.gov/odot/programs/pages/orego.aspx (last visited Feb. 21, 2023).
208. European Commission, *EU Emissions Trading System (EU ETS): Delivering Emissions Reductions*, https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en#delivering-emissions-reductions (last visited Feb. 21, 2023); Council Directive 2003/87/EC, 2003 O.J. (L 275) 32, http://data.europa.eu/eli/dir/2003/87/2018-04-08.
209. Ryan Lizza, *As the World Burns*, New Yorker (Oct. 3, 2010), https://www.newyorker.com/magazine/2010/10/11/as-the-world-burns/ (explaining how the federal cap-and-trade bill, commonly known as the Waxman-Markey bill (American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009)) failed to pass Congress).
210. European Commission, *EU Emissions Trading System (EU ETS): About the EU ETS*, https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en#about-the-eu-ets (last visited Feb. 21, 2023).
211. Andrei Marcu et al., European Roundtable on Climate Change and Sustainable Transition et al., 2021 State of the EU ETS Report (2021), https://ercst.org/wp-content/uploads/2021/08/20210414-2021-State-of-the-EU-ETS-Report-vfinal-1.pdf.
212. European Commission, *Revision for Phase 4 (2021-2030)*, https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/revision-phase-4-2021-2030_en (last visited Feb. 21, 2023).
213. Victoria Masterson, *The European Union Has Cut Greenhouse Gas Emissions in Every Sector—Except This One*, World Econ. F. (Sept. 29, 2022), https://www.weforum.org/agenda/2022/09/eu-greenhouse-gas-emissions-transport/. Seventy-seven percent of the transport CO_2 emissions are from road transport. European Environment Agency, *Greenhouse Gas Emissions*

17% of Europe's auto sales in 2021. According to the IEA's Global EV Outlook 2022 report, "the key driver underpinning EV growth in Europe is the tightening CO_2 emissions standards that occurred in 2020 and 2021."[214] The IEA report also notes that "the expansion of purchase subsidies and tax benefits in major markets also contributed to the acceleration of sales."[215]

In this section, we will examine four European countries whose tax policies have spurred growth in the uptake of EVs. Tax policies in the selected European countries—Norway, Germany, the Netherlands, and the United Kingdom (U.K.)—show evidence of successfully lowering CO_2 emissions in light vehicle transport.[216]

A. Norway

Norway's tax policies have had the most positive impact on EV uptake in Europe.[217] Norway leads European EV sales at 64.5% of its automotive market in 2021.[218] EV exemptions for "car registration" tax and value-added tax (VAT) have been particularly successful.[219] Norway plans to ban sales of new ICE vehicles beginning in 2025.[220]

Norway is leading the EV race in Europe due to its long-standing commitment since the 1990s to promoting EVs.[221] It met its original goal of having 100,000 EVs on the road by 2020 four years early, in 2016.[222] Norway's success stems from targeted tax cuts and investment in publicly administered EV charging infrastructure rather than direct subsidies.[223] It does not impose a purchase tax or VAT on the purchase of EVs,[224] it exempted EVs from road tax from 1996-2021,[225] and it imposes a lower "company car" tax on EVs than on ICE vehicles.[226] At the local level, counties and municipalities are required to reduce road and ferry tolls and parking charges by at least 50% for EVs.[227]

B. Germany

Germany leads Europe in the number of newly registered EVs, with close to 400,000 vehicles registered in 2021.[228] It offers some of the most generous EV incentives in Europe, with a goal of having 10 million EVs and one million charging stations by 2030.[229]

German incentives include a €6,000 grant for purchase of an EV priced up to €40,000 (the grant is decreased to €5,000 for vehicles priced between €40,000 and €65,000).[230] Those incentives are scheduled to decrease to €4,500 and €3,000, respectively, in 2023, as the German government believes that EVs' growing popularity makes the subsidies less necessary.[231] EVs registered between 2011 and 2030 receive a 10-year exemption from motor vehicle tax.[232] Germany, like Norway, also discounts "company car" tax for EVs.[233] There are also local purchase grants and charging infrastructure incentives, as well as free parking in some communities.[234]

C. The Netherlands

The Netherlands leads Europe in EV charging availability.[235] As a result, EV drivers there do not experience range anxiety.[236] Due to the Netherlands' incentive structure, which is primarily focused on tax provisions, electric car ownership now costs the same as diesel or gasoline car ownership.[237] One study predicts that Norway and the Netherlands will have close to 100% EVs in new LDV registrations by 2035.[238]

From Transport in Europe, https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-transport (last visited Feb. 21, 2023).

214. IEA, Global EV Outlook 2022: Securing Supplies for an Electric Future 17 (2022).
215. *Id.*
216. The selection of these four European countries as leaders in EV adoption was inspired by a study commissioned by the Australian government in their RACE for 2030 initiative. Anna Mortimore et al., RACE for 2030, Business Fleets and EVs: Taxation Changes to Support Home Charging From the Grid, and Affordability 123-32 (2022).
217. European Automobile Manufacturers' Association (ACEA), Vehicles in Use in Europe 2022, at 14 (2022).
218. Mathilde Carlier, *Share of Fuel Types of Passenger Cars in Europe by Country 2022*, Statista (Feb. 24, 2023), https://www.statista.com/statistics/500546/share-of-fuel-types-of-passenger-car-fleet-in-europe-by-country/; *New Registrations of Electric Vehicles in Europe*, Eur. Env't Agency (Oct. 26, 2022), https://www.eea.europa.eu/ims/new-registrations-of-electric-vehicles.
219. Norwegian Ministry of Transport, *Norway Is Electric*, https://www.regjeringen.no/en/topics/transport-and-communications/veg/faktaartikler-vei-og-ts/norway-is-electric/id2677481/ (last updated June 22, 2021).
220. Norwegian Electric Vehicle Association, *Norwegian EV Policy*, https://elbil.no/english/norwegian-ev-policy/ (last visited Feb. 21, 2023).
221. *Id.*
222. *Id.*
223. *Id.*
224. *Id.*
225. *Id.*
226. *Id.*
227. *Id.*
228. *New Registrations of Electric Vehicles in Europe*, *supra* note 218; Mathilde Carlier, *Plug-In Electric Vehicle Registrations in European Countries 2020*, Statista (Apr. 12, 2022), https://www.statista.com/statistics/1195747/volume-electric-car-registrations-europe/.
229. Wallbox, *EV and EV Charger Incentives in Europe: A Complete Guide for Businesses and Individuals*, https://blog.wallbox.com/en/ev-and-ev-charger-incentives-in-europe-a-complete-guide-for-businesses-and-individuals/ (last visited Feb. 21, 2023).
230. German Federal Ministry for Economic Affairs and Climate Action, *Regulatory Environment and Incentives for Using Electric Vehicles and Developing a Charging Infrastructure*, https://www.bmwk.de/Redaktion/EN/Artikel/Industry/regulatory-environment-and-incentives-for-using-electric-vehicles.html (last visited Feb. 21, 2023); Markus Wacket et al., *Germany to Reduce Electric Car Subsidies in 2023*, Reuters (July 26, 2022, 1:54 PM), https://www.reuters.com/technology/german-coalition-parties-agree-reduce-e-car-subsidies-handelsblatt-2022-07-26/.
231. Wacket et al., *supra* note 230.
232. Allianz Autowelt, *Calculate Road Tax: How Much It Will Cost in 2023*, https://www.allianz-autowelt.de/kfz-steuer/rechner/#welche-fahrzeuge-sind-steuerbefreit (last visited Feb. 21, 2023).
233. *E-Car Tax: You Should Know About These Tax Advantages for Your Company Car in 2022!*, Umschalten (Jan. 17, 2022), https://www.umschalten.de/en/e-auto-steuer-vorteile-2022/.
234. *See* German Federal Ministry for Economic Affairs and Climate Action, *supra* note 230.
235. José Pontes, *The Netherlands—Where EV Charging Points Grow Like Tulips*, Autovista24 (Nov. 23, 2021), https://autovista24.autovistagroup.com/news/the-netherlands-where-charging-stations-grow-like-tulips/.
236. *Id.*
237. *Id.*
238. Scooter Doll, *New Study Predicts Which European Countries Will Have the Highest Percentage of New EVs by 2035*, Electrek (Jan. 24, 2022, 7:00 AM), https://electrek.co/2022/01/24/new-study-predicts-which-european-countries-will-have-the-highest-percentage-of-new-evs-by-2035/.

EVs are exempt from purchase tax[239] and ownership tax.[240] The Netherlands also discounts company car tax.[241] Moreover, it imposes increased taxes on vehicles that emit high levels of CO_2.[242] Older diesel vehicles must pay a particulate matter surcharge.[243] After 2030, only EVs may be newly registered in the Netherlands.[244]

D. The U.K.

While the U.K. is no longer part of the EU, it has put in place national laws that mirror EU regulations on GHG emissions.[245] The U.K. has proposed an electrification strategy called the Road to Zero Strategy,[246] which aims to end the sale of fossil-powered vehicles by 2040.

Some of the U.K.'s EV tax benefits include exemption from vehicle excise tax, full deduction against corporate tax for the cost of company cars that emit less than 50 grams per kilometer of CO_2, and reductions in company car tax for EVs.[247] EV purchasers can receive grants up to a maximum of £2,500 for vehicles priced under £35,000.[248] Some localities provide free parking for EVs, and EVs are exempt from London's congestion charge through 2024.[249]

In summary, these four European jurisdictions provide significant fiscal support for EVs. All four provide reductions in VAT for EV purchases; reduced registration fees for EVs, as contrasted with some U.S. states increasing registration fees for EVs; and reduced road taxes and company car taxes based on CO_2 emissions, thus benefiting EVs. Germany, the Netherlands, and the U.K. provide subsidies for individuals' purchase of EVs. Norway, the U.K., and the Netherlands exempt EV purchases from stamp duty. All four countries have announced bans on new gasoline or diesel car sales.

IV. Structural Differences Between U.S. and European Tax Policies for EVs

The summary above highlights the differences between the structure of U.S. tax policy and European tax policies as they relate to the adoption of EVs. Without a VAT, the United States cannot reduce VAT on EV purchases. U.S. states could adopt reduced registration fees for EVs, but as explained in Section II.F above, dependence on fuel taxes to fund highways makes that strategy difficult.[250] The United States does not use "road taxes."

The United States does have a tax concept similar to "company car" taxes—personal use of a company car is taxed to the employee as an economic benefit. The value of the personal use of a company car, based on either personal miles driven or an annual lease value, is added to the employee's taxable compensation and taxed at the employee's marginal rate.[251] The U.S. tax policy does not take into account the CO_2 emissions of the company car.

In Norway, the company car tax is based on a percentage of the cost of the car depending on its level of CO_2 emissions, thereby benefiting drivers of company EVs.[252] Similar rules apply in the Netherlands,[253] Germany,[254] and the U.K.[255] The United States does not have an equivalent policy to "stamp duty" for vehicles.[256] However, there are a number of strategies that could be employed consistent with the U.S. tax structure, in addition to the EV tax credits. After examining fuel taxes, those strategies will be described in the following section.

A. Moderating Fuel Price Volatility

Fuel taxes in the United States are significantly lower than in Europe. High gas taxes make the underlying price of the fuel less significant and less politically salient. "In the U.S., when the price of oil goes up or down 10%, the price of gasoline will change roughly 7%, while it will change just about 3% in Europe, where taxes are a larger portion—and the cost of oil a smaller portion—of the price."[257] The average excise tax on petrol in Europe is $2.47 per gallon. Fuel is also subject to VAT. Taxes make up more than one-half the price of fuel in Europe.[258]

239. Netherlands Electric, *BPM*, https://nederlandelektrisch.nl/subsidies-financiering/bpm (last visited Feb. 21, 2023).
240. Netherlands Electric, *Motor Vehicle Tax (MRB)*, https://nederlandelektrisch.nl/subsidies-financiering/motorrijtuigenbelasting-mrb (last visited Feb. 21, 2023).
241. Netherlands Electric, *Addition*, https://nederlandelektrisch.nl/subsidies-financiering/bijtelling (last visited Feb. 21, 2023).
242. Netherlands Enterprise Agency, *Motor Vehicle Tax (MRB)*, Business.Gov.Nl (Sept. 7, 2022), https://business.gov.nl/regulation/motor-vehicle-tax/.
243. *Id.*
244. Netherlands Enterprise Agency, *Electric Transport in the Netherlands*, https://english.rvo.nl/information/electric-transport (last updated Nov. 2, 2022).
245. Hannah Cooper, House of Lords, Leaving the European Union: UK Climate Change Policy 4 (2017), https://researchbriefings.files.parliament.uk/documents/LLN-2017-0022/LLN-2017-0022.pdf.
246. U.K. Department for Transport, The Road to Zero (2018).
247. HM Government, Transitioning to Zero Emission Cars and Vans: 2035 Delivery Plan 9-10 (2021), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005301/transitioning-to-zero-emission-cars-vans-2035-delivery-plan.pdf.
248. *Id.*
249. *Do Electric Cars Pay the Congestion Charge?*, RAC (Mar. 29, 2022), https://www.rac.co.uk/drive/electric-cars/running/do-electric-cars-pay-the-congestion-charge/.
250. *See supra* note 207 and following text.
251. *Learn the Rules Related to Employees' Use of Vehicles*, Wolters Kluwer (Jan. 6, 2021), https://www.wolterskluwer.com/en/expert-insights/learn-the-rules-related-to-employees-use-of-vehicles.
252. Norwegian Tax Administration, *Private Use of a Company Car*, https://www.skatteetaten.no/en/person/taxes/get-the-taxes-right/property-and-belongings/cars-boats-and-other-vehicles/company-car/private-use-of-a-company-car/ (last visited Feb. 21, 2023).
253. Dutch Tax and Customs Administration, *Private Use of the Car*, https://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelijk/winst/inkomstenbelasting/inkomstenbelasting_voor_ondernemers/privegebruik_auto/privegebruik_auto (last visited Feb. 21, 2023).
254. How-to-Germany.com, *Company Car Tax Calculator for Germany*, https://www.how-to-germany.com/company-car-tax-calculator/ (last visited Feb. 21, 2023).
255. Gov.UK, *Tax on Company Benefits: Tax on Company Cars*, https://www.gov.uk/tax-company-benefits/tax-on-company-cars (last visited Feb. 21, 2023).
256. The closest equivalent to stamp duty in the United States is closing costs charged on the transfer of real estate. PwC, *United States—Corporate—Other Taxes*, https://taxsummaries.pwc.com/united-states/corporate/other-taxes (last reviewed Jan. 20, 2023).
257. David Muhlbaum & Elaine Silvestrini, *Gas Prices Around the World*, Kiplinger (Nov. 28, 2022), https://www.kiplinger.com/personal-finance/shopping/cars/604410/gas-prices-around-the-world.
258. FuelsEurope, *Prices*, https://www.fuelseurope.eu/prices (last visited Feb. 21, 2023).

In comparison, the average total federal, state, and local tax per gallon in the United States is less than $0.50, and the United States has no VAT (although some states do impose state sales taxes).[259] Because fuel taxes are so low, there is little room to provide additional incentive by avoiding those taxes. There appears to be little political will to increase the federal fuel tax rate, which has not been raised since 1993. In fact, the opposite has occurred: in June 2022, President Biden called for a three-month suspension of the federal fuel tax in the face of rising gas prices, but Congress did not agree.[260]

B. Potential Actions Consistent With U.S. Law

Two potential additional tax actions that Congress could take at the federal level to encourage EV adoption are restoring the like-kind exchange rule[261] for rental fleets of EVs, and exempting EVs from the limitation on depreciation for passenger vehicles.[262]

1. Like-Kind Exchanges of EVs in Rental Fleets

In general, whenever there is an exchange of property, any difference between the basis of the property exchanged and the fair market value of the property received in the exchange must be recognized as taxable gain or loss.[263] The like-kind exchange rules are an exception to the general rule. The like-kind exchange rules in Internal Revenue Code (IRC) §1031 allow exchanges of specifically defined "like-kind property" to defer recognition of gain or loss.[264] The Tax Cuts and Jobs Act (TCJA) of 2017 limited the availability of like-kind deferral to exchanges of qualifying real estate.[265] The Joint Committee on Taxation estimated that this change would increase federal revenues by $30.5 billion over the 10-year period between 2018 and 2027.[266]

Before the TCJA, rental fleets and auto leasing companies extensively used the like-kind exchange rules, resulting in considerable tax savings.[267] In 2012, vehicle exchanges constituted a majority by value of like-kind exchanges.[268] While, as described above, fleets are adopting EVs due to the operational cost savings, restoring the like-kind exchange rules for EV rental fleets would likely enhance and accelerate this adoption.

2. Enhancing the Depreciation Deduction for Passenger EVs

Exempting EVs from the limitation on depreciation of passenger vehicles used for business would effectively reduce the cost of EVs by allowing the owners to take deductions for the price of the EV more rapidly, likely fully deducting the cost of the EV during the first year of ownership. Because of the time value of money, an accelerated deduction is worth more than a delayed deduction.[269] At the same time, making this change will allow EVs to achieve parity with a more environmentally damaging vehicle, the ubiquitous SUV. Sens. Charles Grassley (R-Iowa) and Max Baucus (D-Mont.) introduced a similar bill in 2006.[270] The bill amended IRC §280F to "exempt passenger vehicles eligible for the alternative motor vehicle credit and the credit for qualified electric vehicles from the limitation on depreciation for luxury automobiles."[271]

Although involving relatively simple tax concepts, readers not steeped in the tax law who are seeking to understand this proposal need a little background on the depreciation deduction. (Unfortunately, this is not as simple as a tax credit.) In general, owners of property classified as a capital asset used in a trade or business may take an annual depreciation deduction, which reflects the presumed loss in value of the property due to wear and tear.[272] Property that is not eligible for the depreciation deduction, such as land used in farming, must wait until disposition by sale or otherwise before any loss of value may be recognized.[273] The annual depreciation deduction is determined by allocating the cost basis of the asset over the depreciable period using the applicable depreciation method.[274]

While use of a depreciation deduction to reduce taxable income has been allowed since 1913, Congress has regularly changed the eligibility of assets for depreciation, the length of the allowable depreciation period (sometimes known as "useful life"), and the depreciation method.[275] Limiting the assets eligible for depreciation or increasing the length of the depreciation period increases government

259. U.S. Energy Information Administration, *FAQ: How Much Tax Do We Pay on a Gallon of Gasoline and on a Gallon of Diesel Fuel?*, https://www.eia.gov/tools/faqs/faq.php?id=10&t=5 (last updated Aug. 3, 2022); American Petroleum Institute, *Gasoline Tax*, https://www.api.org/oil-and-natural-gas/consumer-information/motor-fuel-taxes/gasoline-tax (last visited Mar. 3, 2023).

260. Cleve R. Wootson Jr. & Tony Romm, *Biden Urges Congress to Suspend Federal Gas Tax for 3 Months*, Wash. Post (June 22, 2022, 2:39 PM), https://www.washingtonpost.com/politics/2022/06/22/biden-gas-tax-holiday/.

261. I.R.C. §1031.

262. *Id.* §280F.

263. *Id.* §1001; Treas. Reg. §1.1001-1(a).

264. I.R.C. §1031.

265. TCJA, Pub. L. No. 115-97, §13303, 131 Stat. 2054, 2123 (2017).

266. Joint Committee on Taxation, JCX-63-17, Estimated Revenue Effects of the "Tax Cuts and Jobs Act" as Passed by the Senate on December 2, 2017, at 4 (2017).

267. Alex Roman, *Like-Kind Exchanges Kind to Business's Pocketbooks*, Auto Rental News (Jan. 1, 2006), https://www.autorentalnews.com/146488/like-kind-exchanges-kind-to-businesss-pocketbooks; Andre Salz, *Hot Topics in Auto Finance: Like-Kind Exchange*, Deloitte, https://www2.deloitte.com/us/en/pages/financial-services/articles/auto-finance-like-kind-exchange.html (last visited Feb. 21, 2023).

268. A total of 58.7% of like-kind exchanges by value in 2012 were vehicle exchanges. Gerald Auten & David Joulfaian, Recent Trends in Like-Kind Exchanges 7 (2014) (author calculations).

269. For an example, see *infra* Appendix.

270. S. 2345, 109th Cong. (2006).

271. *Id.*

272. I.R.C. §167(a)(1).

273. Treas. Reg. §1.167(a)-2 ("The [depreciation] allowance does not apply to . . . land apart from the improvements or physical developments added to it.").

274. Boris Bittker et al., Federal Income Taxation of Individuals §14.10 (2022).

275. David W. Brazell et al., Office of Tax Analysis, OTA Paper 64, A History of Federal Tax Depreciation Policy 4 (1989), https://home.treasury.gov/system/files/131/WP-64.pdf.

revenue.[276] Shortening the depreciation period and allowing acceleration of depreciation deductions reduces government revenue, but is thought to stimulate economic growth.[277] In 1954, Congress first adopted legislation permitting accelerated depreciation—higher deductions taken in early years of asset ownership—rather than straight-line depreciation.[278]

In 1984, Congress enacted §280F, limiting otherwise available depreciation deductions for "listed property."[279] Listed property includes assets whose nature or purpose makes it possible to use them for both business and personal purposes, such as "luxury" passenger automobiles and private aircraft.[280] Congress' original intent in limiting the depreciation deduction for passenger cars was to discourage the purchase of expensive cars for business use.[281] Over time, however, this legislation no longer effectively served that purpose because it did not keep pace with increases in the price of passenger cars.

For example, any passenger car placed in service in 2005 whose purchase price was $13,860 or more was deemed a luxury car and subject to the depreciation limitations.[282] From 2002 to 2006, §280F(a)(1)(C) tripled the depreciation deduction limits for EVs, but that temporary provision expired on January 1, 2007.[283] For passenger vehicles purchased in 2022, the first year's depreciation may not exceed $19,200.[284] If the tripling of the deduction limit for EVs had not expired, a business purchaser could deduct $57,600 of the purchase price in the first year. Restoring that provision would help adoption of EVs, but the story does not end there.

Notably, SUVs with a gross vehicle weight of more than 6,000 pounds are exempt from the depreciation limits of IRC §280F.[285] In 1981, Congress added §179 to the IRC, allowing for 100% of the cost of an eligible capital asset to be deducted in the year it was acquired, up to a dollar cap.[286] By 2003, Congress had increased the dollar cap for the §179 deduction to $100,000.[287] In a parallel development unanticipated in 1984 when Congress exempted vehicles over 6,000 pounds from the limitation on the depreciation deduction, Americans began to use SUVs as personal vehicles. SUV dealers took advantage of this unintentional convergence of tax law and driver preference to market SUVs to business buyers.[288]

This anomaly did not go unnoticed by tax scholars and environmentalists. On the environmental side, in 2006, a Congressional Research Service report noted that "SUVs have accounted for an increasing share of total fuel consumption and emissions by motor vehicles in the past decade or so. On average, their gas mileage has been lower [and] their emissions of carbon monoxide and nitrogen oxides higher."[289] SUVs' share of the new car market increased from less than 1% in 1975 to more than 10% in 2006.[290]

To illustrate the magnitude of the tax savings, consider the comparative tax savings from the purchase of a new SUV in 2004 versus the purchase of a passenger car for the same price, as shown in Table 2.[291]

In present value terms, the SUV created an additional $10,713 in tax savings. This example shows the high point of the SUV loophole under the Jobs and Growth Tax Relief Reconciliation Act of 2003. Subsequently, Congress capped the ability to fully expense SUVs at $25,000, but retained the SUV exemption from the depreciation limits in IRC §280F.[292] This change lowered the present value of the tax savings advantage of the SUV over the passenger car from 45% greater to 35% greater.[293]

However, effective in 2017, Congress amended IRC §168(k), allowing for 100% bonus depreciation for eligible property placed in service before the end of 2022.[294] Prop-

276. *Id.* at 8 ("By 1933, Congress was concerned with a need for more revenue and looked at depreciation allowances as a ready source.").
277. *Id.* at 13 (quoting the Senate Finance Committee in 1954 ("[L]iberalized depreciation policies should assist modernization and expansion of industrial capacity, with resulting economic growth, increased production, and a higher standard of living.")). This view is still held by some economists today. *See*, *e.g.*, Garrett Watson & Huaqun Li, *Permanent 100 Percent Bonus Depreciation Even More Important When Inflation Is Elevated*, Tax Found. (Oct. 27, 2022), https://taxfoundation.org/permanent-bonus-depreciation-inflation/. *But see* Americans for Tax Fairness, "Bonus Depreciation" Offers Corporations an Extra Chance to Dodge Their Taxes (2015), https://americansfortaxfairness.org/files/ATF-Bonus-Depreciation-Fact-Sheet-2015-FINAL.pdf.
278. Brazell et al., *supra* note 275, at 13.
279. I.R.C. §280F; Deficit Reduction Act of 1984, Pub. L. No. 98-369, §179(a), 98 Stat. 494, 713.
280. *See* I.R.C. §280F(d)(4).
281. *See* Joint Committee on Taxation, JCS-41-84, General Explanation of the Revenue Provisions of the Deficit Reduction Act of 1984, at 559-60 (1985).
282. Gary Guenther, Congressional Research Service, RL32173, Tax Preferences for Sport Utility Vehicles (SUVs): Current Law and Legislative Initiatives in the 109th Congress 7 (2006) [hereinafter Guenther, SUVs]. In 2005, the cost of a new Chevrolet Impala was $25,000. Levi Leidy, *What an Average Car Cost in the Year You Were Born*, Go Banking Rates (Aug. 24, 2021), https://www.gobankingrates.com/saving-money/car/heres-much-car-today-would-cost-year-were-born/; *Average Price of New and Used Passenger Cars Sold and Leased in the United States From 1990 to 2010*, Statista (Feb. 4, 2013), https://www.statista.com/statistics/183745/average-price-of-us-new-and-used-vehicle-sales-and-leases-since-1990/ (average price close to $25,000).
283. Job Creation and Worker Assistance Act of 2002, Pub. L. No. 107-147, §602(b)(1), 116 Stat. 21, 59; Rev. Proc. 2005-13, §2.03; Rev. Proc. 2007-30, §1.03.
284. Rev. Proc. 2022-17, tbl.1.
285. I.R.C. §280F(d)(5)(A) (defining "passenger automobile" as any four-wheeled vehicle weighing 6,000 pounds or less).
286. *Id.* §179(a), as amended by the Economic Recovery Tax Act of 1981, Pub. L. No. 97-34, §13(a), 95 Stat. 172. The dollar cap phased in from $5,000 in 1983 to $10,000 in 1990. Pub. L. No. 97-34, §13. Subsequent legislation increased the dollar cap to $25,000. Small Business Job Protection Act of 1996, Pub. L. No. 104-188, §1111(a), 110 Stat. 1755, 1758.
287. Jobs and Growth Tax Relief Reconciliation Act of 2003, Pub. L. No. 108-27, §202(a), 117 Stat. 752, 757. *See* Gary Guenther, Congressional Research Service, RL31852, The Section 179 and Bonus Depreciation Expensing Allowances: Current Law and Issues for the 114th Congress 5-7 (2015).
288. *See* Lawrence Zelenak, *The Loophole That Would Not Die: A Case Study in the Difficulty of Greening the Internal Revenue Code*, 15 Lewis & Clark L. Rev. 469, 479 (2011).
289. Guenther, SUVs, *supra* note 282, at 5.
290. Zelenak, *supra* note 288, at 473-74.
291. Example derived from Guenther, SUVs, *supra* note 282, at 9.
292. American Jobs Creation Act of 2004, Pub. L. No. 108-57, §910(a), 118 Stat. 1418, 1659, effective for property placed in service after October 22, 2004.
293. Guenther, SUVs, *supra* note 282, at 10.
294. TCJA, Pub. L. No. 115-97, §13201, 131 Stat. 2054, 2105 (2017) (amending I.R.C. §168(k)).

Table 2. Comparative Tax Savings From Depreciation Deductions of SUVs and Passenger Cars Pre-2004

Vehicle	SUV	Passenger car
Curb weight (pounds)	6,400	3,200
Purchase price	$40,000	$40,000
Maximum first-year deduction	$40,000 (full expensing available under §179)	$2,960 (limited by §280F)
Years required to fully depreciate vehicle (recover costs)	1	21
Present value of total tax savings	$38,351	$27,638

Table 3. Depreciation of Passenger Cars Versus SUVs After TCJA

Vehicle	SUV*	Passenger car**
Curb weight (pounds)	6,230	4,696
Purchase price	$80,000	$80,000
Maximum first-year deduction	$80,000	$19,200***
Years required to fully depreciate vehicle (recover costs)	1	8
Present value of total tax savings	$29,600****	26,506*****

* Based on 2022 Jeep Wagoneer.

** Based on 2022 Lexus LS.

*** Rev. Proc. 2022-17 (maximum first-year deduction for passenger car eligible for bonus depreciation).

**** $80,000 x maximum individual income tax rate of 37%.

***** Number derived from multiplying each year's tax savings by 37%, then applying a present value factor assuming a 3% yield. See Appendix for detailed calculations.

erty eligible for 100% bonus depreciation is not subject to the limitations in IRC §179. The limitations on the depreciation of passenger automobiles also increased, but the SUV advantage remains, as illustrated in Table 3.

Accordingly, to make it more attractive for businesses to purchase EVs rather than SUVs, EVs should be exempt from the depreciation limits of IRC §280F. This change would reduce GHG emissions without affecting the basic structure of U.S. tax policy.

V. Conclusion and Recommendations

There are many pathways to GHG reductions. The international community has identified electrification of light-duty transport as a promising pathway. As this Article illustrates, the United States has taken impactful steps to encourage adoption of EVs at both the federal and state levels of government. The IRA has incentivized EV adoption with tax credits for individuals and businesses to purchase EVs and install private charging equipment. The IIJA provides funding for public charging infrastructure.

Most states provide support, ranging from tax credits or rebates to fleet acquisition goals, exemptions from emissions testing, or utility time-of-use rate reductions. California and New York have announced bans on sales of new ICE cars from 2035. Following Vermont, the United States could adopt a new "Cash for Clunkers" at the federal level to get older ICE vehicles off the road.

Although fleet vehicles make up a relatively small portion of the overall LDVs on the road in the United States, fleet EVs may prove to be a beneficial way of increasing familiarity with EVs in the wider community, as well as providing a source of more affordable used EVs. Hertz's purchase of 165,000 EVs will enable car rental customers to experience the pleasures of EV driving. The commercial clean car tax credit will facilitate fleet adoption of EVs. Allowing EV fleets to qualify for the like-kind exchange rules would add additional cost savings for fleet operators. Government fleets may be particularly susceptible to policy direction. As noted in Section II.D, the U.S. federal government could save at least $1 billion by replacing its LDV fleet with EVs.[295]

Europe has adopted policies that have encouraged transitioning ICE vehicles to equivalent EVs and helped reduce CO_2 emissions. While European policies can provide the United States with inspiration for additional changes, absent a significant change in U.S. tax structure, more modest changes could be more quickly adopted, as suggested in Section IV.B. above. The United States could make EV exchanges eligible for like-kind exchange rules. EVs could be exempted from the limits on passenger vehicle depreciation.

It should be noted that EVs are not a total panacea for removing GHG emissions from the surface transportation sector.[296] The U.S. government must also strengthen support for public transportation, which suffered significant

295. *See supra* note 162 and accompanying text.

296. Stefen Samarripas, *Low-Carbon Transportation Means More Than Electric Vehicles Alone*, ACEEE (Nov. 1, 2022), https://www.aceee.org/blog-post/2022/11/low-carbon-transportation-means-more-electric-vehicles-alone.

downturns during the global pandemic.[297] Personal vehicles accounted for 81% of all passenger-miles traveled in the United States in 2019.[298] Per passenger-mile, the average emissions from personal vehicles exceeded all other modes of passenger transportation in 2019.[299] As stated in an ACEEE blog post:

> Though emissions decreased substantially at the onset of the COVID-19 pandemic, they have since rebounded. The increase is largely due to increased car travel, which has returned to or even surpassed pre-pandemic levels in many states as large numbers of white-collar workers exchanged their urban apartments, transit cards, and bikes for larger homes, remote work schedules, and car keys in sprawling suburbs. Moves out of central cities jumped 17% during the first year of the pandemic.[300]

While increasing EVs in the personal vehicle mix will improve emissions, traffic congestion can also increase emissions—an EV takes up as much space on the road as an ICE vehicle.[301] In addition, the federal government should consider removing subsidies for fossil fuels and increasing taxes on polluting fuels.[302] Finally, many economists recommend a carbon tax as the best way of reducing GHG emissions.[303]

Even if not a total panacea, encouraging Americans to adopt EVs for their personal and business use will have significant environmental and economic benefits. The steps already taken will drive policy down the road to a brighter future.

Appendix. Present Value of $80,000 Passenger Car Depreciation Deductions Under Current Law (With Bonus Depreciation)

Year	Annual depreciation	Nominal tax savings at 37%	Present value of tax saving at 3%	Remaining basis
1	$19,200	$7,104	$7,104	$60,800
2	$18,000	$6,660	$6,407.77	$42,800
3	$10,800	$3,996	$3,766.61	$32,000
4	$6,460	$2,390.2	$2,187.37	$25,540
5	$6,460	$2,390.2	$2,123.66	$19,080
6	$6,460	$2,390.2	$2,061.81	$12,620
7	$6,460	$2,390.2	$2001.75	$6,160
8	$6,160	$2,279.2	$1,853.2	0
Total	$80,000	$29,600	$26,506	0

297. *Id.*
298. Congressional Budget Office, *supra* note 38, at 6.
299. *Id.* at 7.
300. Samarripas, *supra* note 296.
301. Congressional Budget Office, *supra* note 38, at 7.
302. *See* Mann, *supra* note 101, at 646.
303. Carbon Tax Center, *Economists*, https://www.carbontax.org/economists/ (last visited Feb. 21, 2023). One report estimated that a $21.22 tax (in 2013 dollars) per ton of CO_2 emitted by fossil fuel combustion could meet the U.S. GHG emission reduction targets under the 2015 Paris Agreement. Yunguang Chen & Marc A.C. Hafstead, *Using a Carbon Tax to Meet US International Climate Pledges* 2-3 (Resources for the Future, Discussion Paper RFF DP 16-48, 2018).