CHARGING AMERICA: STREAMLINING ELECTRIC VEHICLE INFRASTRUCTURE IN THE UNITED STATES

*Brendan Magolan**

INTRODUCTION

Electric vehicles ("EVs") have become increasingly popular in the United States over the past decade.[1] The Bureau of Labor Statistics reported that EVs accounted for 4.6% of total vehicle sales in 2021—a substantial increase from just 0.2% in 2011.[2] In 2023, Americans purchased a record-breaking one million EVs.[3] Analysts now predict EVs could command half the total vehicle sales by 2030.[4]

Unlike traditional internal-combustion engine ("ICE") vehicles, EVs do not use gasoline or diesel to accelerate.[5] Instead, EVs rely entirely on electricity to power the vehicle's motors.[6] This electricity is stored in the vehicle's rechargeable battery.[7] The average yearly fuel cost for an EV is significantly less than that of an ICE vehicle: $485 compared to $1,117.[8] This lower fuel cost can be attributed to

* J.D. Candidate, University of Toledo College of Law (2025) and Seat Complete Engineer at the Ford Motor Company. I want to thank my Faculty Advisor, Benjamin R. Syroka, and my Note & Comment Editor, Ben Reeve. I would also like to thank my family and friends for their support.

1. Melissa Lynes & Michael Dwyer, *The United States Surpassed Two Million On-Road Light-Duty Electric Vehicles in 2021*, U.S. ENERGY INFO. ADMIN. (Sept. 20, 2023), https://www.eia.gov/todayinenergy/detail.php?id=60422.

2. Javier Colato & Lindsey Ice, *Charging into the Future: The Transition to Electric Vehicles*, U.S. BUREAU OF LAB. STAT. (Feb. 16, 2023), https://www.bls.gov/opub/btn/volume-12/charging-into-the-future-the-transition-to-electric-vehicles.htm.

3. Heather Boushey, *Full Charge: The Economics of Building a National EV Charging Network*, WHITE HOUSE (Dec. 11, 2023), https://www.whitehouse.gov/briefing-room/blog/2023/12/11/full-charge-the-economics-of-building-a-national-ev-charging-network/?utm_source=link; *see also* Peter Valdes-Dapena, *Americans Bought More Than a Million Electric Vehicles This Year*, CNN (Dec. 6, 2023, 10:43 AM), https://www.cnn.com/2023/12/06/business/americans-bought-1-million-electric-this-year/index.html.

4. Ed Garsten, *EV Sales Pace Is Running Short of Power Going into 2024*, FORBES (Dec. 14, 2023, 11:44 PM), https://www.forbes.com/sites/edgarsten/2023/12/14/ev-sales-pace-is-running-short-of-power-going-into-2024/.

5. Columbia Motor Car Co. v. C.A. Duerr & Co., 184 F. 893, 898 (2d Cir. 1911); *see also* Joey Capparella, *Electric Cars vs. Gas Cars: Everything You Need to Know*, CAR & DRIVER (Aug. 8, 2022), https://www.caranddriver.com/research/a32781943/electric-cars-vs-gas-cars/.

6. Lynes & Dwyer, *supra* note 1; *see also* United States v. Wis. Pub. Serv. Corp., 2013 U.S. Dist. LEXIS 127604, at *114 (E.D. Wis. 2013).

7. *Battery-Electric Cars*, CAL. AIR RES. BD., https://driveclean.ca.gov/battery-electric (last visited Oct. 31, 2024).

8. Courtney Lindwall, *Electric vs. Gas Cars: Is It Cheaper to Drive an EV?*, NAT. RES. DEF. COUNCIL (Mar. 21, 2024), https://www.nrdc.org/stories/electric-vs-gas-cars-it-cheaper-drive-ev.

the efficiency of the electric motors.[9] This efficiency means the average EV can travel approximately 300 miles on a single charge.[10] An EV's travel distance is affected by many factors, including weather, terrain, and speed.[11] For example, EVs suffer a loss in range when driving at increased elevation, lower temperatures, and higher speeds.[12] After depleting the battery, the owner must recharge the EV using a charging connector.[13] A charging connector "plugs into [an EV]… to charge [it]," similar to refueling an ICE vehicle.[14] Owners can charge at home or by using public chargers,[15] eliminating the need to stop at a gasoline station and use a pump. Many EVs can be charged using alternative power sources, such as wind and solar.[16] EVs powered from these renewable sources are "essentially emissions-free" and considered more environmentally friendly.[17]

According to market research, consumers are highly satisfied with EVs.[18] A recent survey found that 82% of EV drivers will likely purchase one again.[19] These owners have praised EVs' safety, technology, and lower ownership costs.[20] However, many prospective customers still hesitate to buy an EV due to the lack of public-charging infrastructure.[21]

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9. *Id.*

10. Tom Randall, *US Electric Cars Set Record with Almost 300-Mile Average Range*, BLOOMBERG (Mar. 9, 2023, 8:00 AM), https://www.bloomberg.com/news/articles/2023-03-09/average-range-for-us-electric-cars-reached-a-record-291-miles.

11. Bart Ziegler, *Electric Cars and Driving Range: Here's What to Know*, WALL ST. J. (Nov. 27, 2023, 9:00 PM), https://www.wsj.com/lifestyle/cars/electric-cars-driving-range-d9839e5d.

12. Warren Clarke, *How Does EV Range Vary in Different Conditions?*, U.S. NEWS (Aug. 5, 2024, 10:50 AM), https://cars.usnews.com/cars-trucks/advice/how-does-ev-range-vary-in-different-conditions; *see also* Hurst v. BMW of N. Am. LLC, 2023 WL 4760442, at *1-2 (D.N.J. 2023).

13. ChargePoint, Inc. v. SemaConnect, Inc., 920 F.3d 759, 763 (Fed. Cir. 2019).

14. *SAE J3400 Charging Connector*, JOINT OFF. OF ENERGY & TRANSP., https://driveelectric.gov/charging-connector (last visited Oct. 19, 2024).

15. *Charging Electric Vehicles in Public*, ALT. FUELS DATA CTR., https://afdc.energy.gov/fuels/electricity_charging_public.html (last visited Oct. 31, 2024).

16. Robert Rapier, *Could the U.S. Automobile Fleet Run on Wind and Solar Power?*, FORBES (Aug. 30, 2020, 6:00 PM), https://www.forbes.com/sites/rrapier/2020/08/30/could-the-us-automobile-fleet-run-on-wind-and-solar-power/?sh=3765abde2646; *see also* Martin Distrib. Co. v. Matkovich, 794 S.E.2d 21, 25-26 (W. Va. 2016).

17. Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie, 508 F. Supp. 2d 295, 376 (D. Vt. 2007).

18. Boushey, *supra* note 3.

19. *Id.*; *see also Majority of Electric Vehicle Owners Are Intent on Purchasing Another One in the Future, J.D. Power Finds*, J.D. POWER (Jan. 21, 2021), https://www.jdpower.com/business/press-releases/2021-us-electric-vehicle-experience-evx-ownership-study [hereinafter *Majority EV Owners Purchasing Future*].

20. *Majority EV Owners Purchasing Future*, *supra* note 19; *see also* Jessica Shea Choksey, *J.D. Power Study: Traditional Buying Factors Boost Overall EV Owner Satisfaction*, J.D. POWER (Feb. 28, 2023), https://www.jdpower.com/cars/shopping-guides/j-d-power-study-traditional-buying-factors-boost-overall-ev-owner-satisfaction.

21. Mark Hillsdon, *Charging Infrastructure 'Biggest Bump in the Road' for Electric Vehicle Take-Up*, REUTERS (Aug. 1, 2023), https://www.reuters.com/sustainability/climate-energy/charging-infrastructure-biggest-bump-road-electric-vehicle-take-up-2023-08-01/.

Infrastructure is a nation's lifeblood. A country that lacks adequate infrastructure struggles to thrive and grow.[22] Consequently, developing a robust EV charging infrastructure is essential for facilitating travel and connecting communities.[23]

A report found that 20.8% of EV drivers had difficulties charging at public chargers.[24] The two most common issues were connectivity problems and hardware failures.[25] Because EV chargers are not widespread in the United States, potential buyers have "range" and "charging" anxiety.[26] Range anxiety is "the fear that an EV battery will deplete and there will be no nearby [chargers]…."[27] Similarly, charging anxiety is the fear that available chargers will be inoperable or unreliable.[28] Economic research suggests that investing in a national EV charging network is the most cost-effective way to eliminate barriers hindering EV growth.[29] Therefore, it is imperative that the federal government fund and support public-charging infrastructure development.[30]

I. THE BIPARTISAN INFRASTRUCTURE LAW

President Biden adamantly pursued policies on "transportation dicarbonization," making it a top priority for his administration.[31] In November 2021, President Biden signed the most prolific infrastructure investment act into law.[32]

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22. Robert Puentes, *Why Infrastructure Matters: Rotten Roads, Bum Economy*, BROOKINGS INST. (Jan. 20, 2015), https://www.brookings.edu/articles/why-infrastructure-matters-rotten-roads-bum-economy/.

23. Camila Domonoske, *Electric Cars Have a Road Trip Problem, Even for the Secretary of Energy*, NPR (Sept. 10, 2023, 6:00 AM), https://www.npr.org/2023/09/10/1187224861/electric-vehicles-evs-cars-chargers-charging-energy-secretary-jennifer-granholm.

24. *EV Leasing Volumes Poised to Surge as Tax Rule Makes It Cheaper to Lease Than Buy*, J.D. POWER (May 25, 2023), https://www.jdpower.com/business/resources/ev-leasing-volumes-poised-surge-tax-rule-makes-it-cheaper-lease-buy.

25. John Voelcker, *What Makes EV Charging Stations Fail?*, CAR & DRIVER (Sept. 26, 2023), https://www.caranddriver.com/news/a45309960/ev-charging-stations-problems/.

26. *What Is EV Charging Anxiety – and Is Range Anxiety a Thing of the Past?*, NAT'L GRID, https://www.nationalgrid.com/stories/energy-explained/ev-charging-anxiety-and-range-anxiety (Oct. 11, 2022) [hereinafter *What Is EV Charging Anxiety*].

27. In re Xcel Energy's Petition for Approval of Elec. Vehicle Pilot Programs, 2020 WL 5626040, at *3 (Minn. Ct. App. 2020).

28. *What Is EV Charging Anxiety*, *supra* note 26.

29. Boushey, *supra* note 3; *see also* Cassandra Cole et al., *Policies for Electrifying the Light-Duty Vehicle Fleet in the United States*, AEA PAPERS & PROC., May 2023, at 316, 317; *see also* Shanjun Li et al., *The Market for Electric Vehicles: Indirect Network Effects and Policy Design*, 4 J. ASS'N ENV'T & RES. ECONOMISTS 89, 125-26 (2017).

30. *In re Xcel Energy's Petition*, 2020 WL 5626040, at *8.

31. Alexa St. John, *White House Backs Industry Effort to Standardize Tesla's EV Charging Plugs*, ASSOCIATED PRESS (Dec. 19, 2023, 4:02 PM), https://apnews.com/article/electric-vehicles-charging-stations-tesla-evs-standard-af724b489aa08388bbacec1735f8588e.

32. *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429, 429-1467 (2021); *see also Bipartisan Infrastructure Law Key Programs Under the Federal Highway Administration Office of Operations*, FED. HIGHWAY ADMIN. (Oct. 16, 2024), https://ops.fhwa.dot.gov/bipartisan-infrastructure-law/ [hereinafter *Bipartisan Infrastructure Law*].

Commonly referred to as the "Bipartisan Infrastructure Law" ("BIL"),[33] the law provides $550 billion in funding to construct new, and improve existing, infrastructure through the 2026 fiscal year.[34] The BIL furthers the Biden Administration's "Investing in America" agenda by constructing over 500,000 public EV chargers nationwide.[35] To accomplish this goal, the BIL created a special committee and allocated critical funding for EV infrastructure.[36]

A. The Joint Office of Energy and Transportation

First, the BIL established the Joint Office of Energy and Transportation ("Joint Office") to plan, coordinate, and install EV chargers across the United States.[37] The Joint Office combines assets from the Department of Transportation ("DOT") and the Department of Energy ("DOE").[38] The DOT identifies strategic EV charging sites along major national highways,[39] while the DOE connects these sites to the electrical grid and works on efforts to implement renewable energy.[40] Former Energy Secretary Jennifer Granholm and former Transportation Secretary Pete Buttigieg commemorated this alliance by signing a historic Memorandum of Agreement between the two agencies.[41] These agencies have worked together to bypass administrative hurdles that have delayed EV charging projects.

For example, one administrative hurdle is the National Environmental Policy Act ("NEPA"), which "establishes procedures that a federal agency must follow before taking any action."[42] NEPA requires federal agencies to perform an environmental assessment and prepare a comprehensive report detailing a project's impact.[43] The DOT, however, has circumvented this requirement through the

33. The act's official title is the "Infrastructure Investment and Jobs Act"; however, the Department of Transportation more commonly refers to it as the "Bipartisan Infrastructure Law." *See Q2. What is the Difference Between the Bipartisan Infrastructure Law (BIL) and the Infrastructure Investment and Jobs Act (IIJA)?*, U.S. DEP'T OF TRANSP., https://www.transportation.gov/bipartisan-infrastructure-law/q2-what-difference-between-bipartisan-infrastructure-law-bil-and (last visited Oct. 19, 2024).

34. *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58; *see also Bipartisan Infrastructure Law*, *supra* note 32.

35. Boushey, *supra* note 3.

36. *Fact Sheet: National Electric Vehicle Infrastructure Formula Program*, FED. HIGHWAY ADMIN. (Feb. 10, 2022), https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi_formula_program.cfm [hereinafter *Fact Sheet*].

37. *Id.*

38. *Id.*

39. *Id.*

40. *Electricity Laws and Incentives in Federal*, ALT. FUELS DATA CTR., https://afdc.energy.gov/fuels/laws/ELEC?state=US (last visited Oct. 19, 2024).

41. *DOE and DOT Launch Joint Effort to Build Out Nationwide Electric Vehicle Charging Network*, U.S. DEP'T OF ENERGY (Dec. 14, 2021), https://www.energy.gov/articles/doe-and-dot-launch-joint-effort-build-out-nationwide-electric-vehicle-charging-network.

42. Sierra Club v. Van Antwerp, 526 F.3d 1353, 1360 (11th Cir. 2008); *see also* 42 U.S.C. § 4332(C) (2023).

43. 42 U.S.C. § 4332(C) (2023).

DOE's Categorical Exclusion ("CE") for EV chargers.[44] A CE is "a category of action that the agency has determined does not have significant effects on the environment."[45] Federal agencies can use another agency's CE for faster project reviews through the Fiscal Responsibility Act.[46] In *Wise v. Department of Transportation*, for instance, the Eighth Circuit held that the Arkansas Department of Transportation correctly used a CE in compliance with NEPA to expand a highway and, thus, did not have to complete an environmental assessment.[47] By using the DOE's EV charging CE to mitigate administrative delays associated with statutes like NEPA, the Joint Office, via the DOT, can efficiently build EV chargers and effectively utilize federal funds.

B. Federal Funding

Second, the BIL appropriates necessary federal funding for building EV charging infrastructure. Tax credits are available to make EV chargers more affordable for individuals and businesses to install, whether for communal or commercial use.[48] The BIL also sets aside $7.5 billion to build a strategic nationwide EV charging network.[49] These funds are distributed between the National Electric Vehicle Infrastructure ("NEVI") program and the Charging and Fueling Infrastructure Discretionary Grant ("CFI") program.[50]

1. National Electric Vehicle Infrastructure Program

The NEVI program provides $5 billion to states for EV charger development along the Interstate Highway System.[51] Congress apportions these funds each fiscal year using a predetermined formula.[52] The federal government covers up to

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44. *DOT Accelerating EV Charging Project Delivery*, JOINT OFF. OF ENERGY & TRANSP. (Sept. 20, 2023), https://driveelectric.gov/news/dot-accelerating-ev-charging; *see also* DEP'T OF TRANSP., NOTICE OF ADOPTION OF ELEC. VEHICLE CHARGING STATIONS CATEGORICAL EXCLUSION UNDER THE NAT'L ENV'T POL'Y ACT (2023).

45. Earth Island Inst. v. Elliott, 290 F. Supp. 3d 1102, 1109 (E.D. Cal. 2017) (citing 36 C.F.R. § 220.6).

46. Fiscal Responsibility Act of 2023, Pub. L. No. 118-5, 137 Stat. 10, 10-49; *see also Biden-Harris Administration Announces First Actions Under New Permitting Efficiencies to Accelerate American Manufacturing and Clean Energy Future*, WHITE HOUSE (Sept. 19, 2023), https://www.whitehouse.gov/ceq/news-updates/2023/09/19/biden-harris-administration-announces-first-actions-under-new-permitting-efficiencies-to-accelerate-american-manufacturing-and-clean-energy-future/.

47. Wise v. Dep't of Transp., 943 F.3d 1161, 1166 (8th Cir. 2019).

48. Boushey, *supra* note 3.

49. *Fact Sheet*, *supra* note 36.

50. Boushey, *supra* note 3.

51. *Joint Office Releases NEVI Formula Program Annual Report*, JOINT OFF. OF ENERGY & TRANSP. (July 11, 2023), https://driveelectric.gov/news/nevi-annual-report-2022-2023.

52. *National Electric Vehicle Infrastructure Formula Program: Annual Report*, JOINT OFF. OF ENERGY & TRANSP. 13-14 (July 2023), https://driveelectric.gov/files/nevi-annual-report-2022-2023.pdf.

80% of eligible project costs, with the remaining amount falling on the state.[53] This significant investment reduces the financial burden on states to construct EV chargers individually. To receive funds, states must submit yearly plans for review and approval.[54] In December 2023, the first NEVI-funded charger opened outside Columbus, Ohio.[55] Additional NEVI-funded chargers are expected to open in more states within the coming months.[56] The CFI program complements the NEVI program by offering more targeted funds for EV chargers.[57]

2. Charging and Fueling Infrastructure Discretionary Grant Program

The remaining $2.5 billion falls into the CFI program.[58] This program gives grants for convenient and accessible EV chargers in urban and rural communities.[59] The program offers two types of grants: Community Charging and Fueling Grants ("Community Grants") and Alternative Fuel Corridor Grants ("Corridor Grants").[60] Community Grants specifically benefit local neighborhood projects, while Corridor Grants are available for designated "Alternative Fuel Corridors."[61] In January 2024, an additional $623 million in EV charging grants were announced.[62] All funding under the BIL, however, is "subject to… minimum standards and requirements[.]"[63]

C. Funding Requirements and 23 CFR § 680

In February 2023, the Federal Highway Administration ("FHWA"), an agency within the DOT,[64] published the minimum standards and requirements for EV charging projects to receive federal funding under the BIL.[65] These chargers

53. *National Electric Vehicle Infrastructure (NEVI) Formula Program*, ALT. FUELS DATA CTR., https://afdc.energy.gov/laws/12744 (last visited Oct. 19, 2024).

54. *Id.*

55. *First Public EV Charging Station Funded by NEVI Open in America*, JOINT OFF. OF ENERGY & TRANSP. (Dec. 13, 2023), https://driveelectric.gov/news/first-nevi-funded-stations-open.

56. *Id.*

57. *Id.*

58. Boushey, *supra* note 3.

59. *Charging and Fueling Infrastructure (CFI) Program Top Ten Takeaways*, ELECTRIFICATION COAL. (Mar. 14, 2023, 3:55 PM), https://electrificationcoalition.org/resource/cfi-top-ten-takeaways/.

60. *Charging and Fueling Infrastructure Discretionary Grant Program*, FED. HIGHWAY ADMIN. (Aug. 26, 2024), https://www.fhwa.dot.gov/environment/cfi/.

61. *Id.*; *see also Alternative Fuel Corridors*, FED. HIGHWAY ADMIN. (Oct. 2, 2024), https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/.

62. *Biden-Harris Administration Announces $623 Million in Grants to Continue Building Out Electric Vehicle Charging Network*, U.S. DEP'T OF TRANSP. (Jan. 11, 2024), https://www.transportation.gov/briefing-room/biden-harris-administration-announces-623-million-grants-continue-building-out.

63. Infrastructure Investment and Jobs Act, Pub. L. 117-58, 135 Stat. 429, 1424 (2021).

64. 49 U.S.C. § 104(a) (2000).

65. *Biden-Harris Administration, U.S. Joint Office of Energy and Transportation Applaud Critical Milestone for SAE J3400 EV Charging Connector Standard*, JOINT OFF. OF ENERGY &

must be spaced less than fifty miles apart and placed along major roads, freeways, and interstates.[66] Each charger must be able to accommodate four EVs simultaneously.[67] The requirements also specify a minimum charging level depending on the charger's power supply: alternating current ("AC") or direct current ("DC").[68] Because AC alternates, it must be converted to DC through the EV's onboard converter.[69] In contrast, DC delivers power directly to the battery.[70] More importantly, the FHWA requires a specific charging connector for both AC and DC charging.[71] But there's a problem—there are four competing charging connector styles.

Under 23 CFR § 680.106(c), AC chargers must have the J1772 connector, and DC chargers must have the Combined Charging System ("CCS") connector. Specifically, the federal requirement states:

> Connector type. All charging connectors must meet applicable industry standards. Each DCFC charging port must be capable of charging any CCS-compliant vehicle and each DCFC charging port *must have at least one permanently attached CCS Type 1 connector*. In addition, permanently attached CHAdeMO (www.chademo.com) connectors can be provided using only FY2022 NEVI Funds. Each AC Level 2 charging port *must have a permanently attached J1772 connector* and must charge any J1772-compliant vehicle.[72]

The Biden Administration's goal was "for every [vehicle] to be able to use every publicly funded charger."[73] The FHWA selected J1772 and CCS because the Society of Automotive Engineers ("SAE") initially standardized these connectors.[74] The SAE is an independent "association of engineers and technical experts that… pursues voluntary consensus standards development."[75] The group is the "leading authority in mobility standards development."[76] Because J1772 and CCS were independently certified by the SAE, most automotive brands used these

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TRANSP. (Dec. 19, 2023), https://driveelectric.gov/news/j3400-ev-charging-connector-standard [hereinafter *Biden Administration Applaud Critical Milestone*]; *see also* 23 C.F.R. § 680.100 (2023).

66. Boushey, *supra* note 3.

67. 23 C.F.R. § 680.106(b) (2023).

68. *Id.* § 680.106(d).

69. Jaynesh Patel, *How to Navigate DC Rapid Charging: Everything EV Drivers Need to Know*, OPEN ACCESS GOV'T (Aug. 10, 2023), https://www.openaccessgovernment.org/how-to-navigate-dc-rapid-charging-everything-ev-drivers-need-to-know/164921/.

70. *Id.*

71. 23 C.F.R. § 680.106(c) (2023).

72. *Id.* (emphasis added).

73. Jarrett Renshaw & Abhirup Roy, *White House Welcomes Tesla to Take Advantage of Federal Dollars for Chargers*, REUTERS (June 9, 2023, 7:33 PM), https://www.reuters.com/world/us/white-house-says-tesla-chargers-available-federal-dollars-long-they-include-ccs-2023-06-09/.

74. *Charger Types and Speeds*, U.S. DEP'T OF TRANSP. (June 22, 2023), https://www.transportation.gov/rural/ev/toolkit/ev-basics/charging-speeds.

75. *SAE J3400 Charging Connector*, *supra* note 14.

76. *SAE Standards*, SAE INT'L, https://www.sae.org/standards (last visited Oct. 19, 2023).

connector styles on their EVs.[77] Companies like Volvo had even pushed for CCS to become the global standard.[78] However, J1772 and CCS are becoming obsolete due to the rapid adoption of the new North American Charging Standard ("NACS") connector.[79]

Tesla, the largest EV manufacturer in the United States,[80] initially developed and patented a proprietary connector, which would later become known as NACS.[81] The company used NACS for its private "Supercharger" network.[82] This charging network remained exclusive to Tesla EVs due to this connector style.[83] In 2012, the company opened its patents and stated it would "not initiate patent lawsuits against anyone who, in good faith, [wanted] to use [its] technology."[84] Further, Tesla released their connector's full design specifications and renamed it NACS in late 2022.[85] This step was likely an attempt to receive federal funding from the BIL to build more chargers.[86] As a result, the FHWA decided to allow NACS on NEVI chargers—so long as a J1772 or CCS connector is also installed.[87] However, before federally-funded chargers can implement NACS, it must be independently standardized and properly certified.[88]

In June 2023, the SAE announced a NACS Task Force would be formed to standardize the connector.[89] The Task Force, comprised of 120 public and private sector experts, certified NACS under a new industry standard: the J3400 connect-

77. Hyunjoo Jin & Paul Lienert, *CCS? CHAdeMO? EV Charger Terms You Need to Know*, REUTERS (Feb. 15, 2023, 10:24 AM), https://www.reuters.com/business/autos-transportation/ccs-chademo-ev-charger-terms-you-need-know-2023-02-10/.

78. *Volvo Cars Calls on Automotive Industry to Standardise Electric Car Charging*, VOLVO (Mar. 9, 2016), https://www.media.volvocars.com/global/en-gb/media/pressreleases/188163/volvo-cars-calls-on-automotive-industry-to-standardise-electric-car-charging.

79. Eric Tingwall, *Tesla's Genius New Home Charger Works with Any EV*, MOTORTREND (Mar. 6, 2024), https://www.motortrend.com/features/tesla-universal-wall-connector-first-look-nacs-j1772-home-charger/.

80. Zaheer Kachwala, *US Electric-Vehicle Sales Hit Record High, Tesla Loses Market Share, Report Says*, REUTERS (Oct. 12, 2023, 5:52 PM), https://www.reuters.com/business/autos-transportation/us-electric-vehicle-sales-hit-record-high-tesla-loses-market-share-report-2023-10-12/.

81. U.S. Patent No. D694,188S (issued Nov. 26, 2013); *see also* Hermant Bhargava et al., *How Tesla's Charging Stations Left Other Manufacturers in the Dust*, HARV. BUS. REV. (Jan. 27, 2021), https://hbr.org/2021/01/how-teslas-charging-stations-left-other-manufacturers-in-the-dust.

82. Cherise Threewitt, *All You Need to Know About the Tesla Supercharger*, U.S. NEWS (Sept. 25, 2024, 2:49 PM), https://cars.usnews.com/cars-trucks/advice/tesla-supercharger-guide.

83. Justin Banner, *Tesla Opens Bespoke Charge Connector and Inlet Design to Other OEMs*, MOTORTREND (Nov. 15, 2022), https://www.motortrend.com/news/tesla-opens-charging-connector-inlet-design-standards-nacs/.

84. Chris Isidore, *Tesla: All Our Patents Belong to You*, CNN BUS. (June 12, 2014, 4:15 PM), https://money.cnn.com/2014/06/12/news/companies/musk-tesla-patents/ ("In a blog post Thursday, Musk vowed 'Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.'").

85. Banner, *supra* note 83.

86. Jaelyn Campbell, *The White House Encourages Tesla to Use Federal Funds for Its Chargers*, CBT NEWS (June 12, 2023), https://www.cbtnews.com/the-white-house-encourages-tesla-to-use-federal-funds-for-its-chargers/.

87. *SAE J3400 Charging Connector*, *supra* note 14.

88. *Id.*

89. *Id.*

or.[90] The SAE published an official Technical Information Report ("TIR") on NACS in December 2023.[91] The TIR guarantees that "any supplier or manufacturer will be able to use, manufacture, or deploy the J3400 connector on [EVs] and at [chargers] across North America."[92] The Joint Office and the Biden Administration applauded the SAE's independent and swift work in standardizing NACS.[93] However, standardizing NACS is only the first step in making it available at federally-funded chargers.

NACS must next be certified by Underwriters Laboratories ("UL") for safety.[94] UL is classified as a Nationally Recognized Testing Laboratory and is "audited by [the Occupational Safety and Health Administration] to ensure it remains independent[.]"[95] Being UL-certified signifies a product complies with the applicable safety standards.[96] Using UL's mark without proper approval is a safety concern and can result in penalties. For example, in *UL v. American Energy Products*, the defendant's unauthorized use of the UL certification marks on its butane canisters was dangerous and violated federal law.[97] Electrical devices, including charging connectors, undergo mandatory UL tests to be certified for the United States market.[98] The UL 2251 standard encompasses plugs, receptacles, inlet ports, and connectors specifically designed for EV use.[99] The Joint Office expects NACS to be UL 2251 certified by the end of 2024.[100] Once standardized and certified, NACS can be installed alongside J1772 and CCS at NEVI chargers.

However, there are consequences to having multiple connectors on chargers. Using four different connector styles is costly, complicated, and inconvenient.[101] Repairing multiple outdated chargers is expensive.[102] The DOT has already spent

90. *Id.* For consistency and clarity, this Article will continue to use "NACS" over the technical name "J3400."

91. *Id.*

92. *Id.*

93. *Biden Administration Applaud Critical Milestone*, *supra* note 65.

94. *Electric Vehicle (EV) Charging Infrastructure Services*, UL LLC, https://www.ul.com/services/electric-vehicle-ev-charging-infrastructure-services (last visited Oct. 31, 2024).

95. Warren Tech. v. UL LLC, 962 F.3d 1324, 1328 n.1 (11th Cir. 2020); *see also* 29 C.F.R. § 1910.7(b)(1)(i) (2024).

96. F:A J Kikson v. Underwriters Laboratories, Inc., 492 F.3d 794, 796 (7th Cir. 2007); *see also* ICCS USA Corp. v. United States, 952 F.3d 1325, 1328-29 (Fed. Cir. 2020).

97. UL LLC v. Am. Energy Prods., 358 F. Supp. 3d 753, 760 (N.D. Ill. 2019).

98. *SAE J3400 Charging Connector*, *supra* note 14.

99. *UL 2251*, ENERGYVILLE, https://batterystandards.info/standard/ul-2251 (last visited Oct. 19, 2024).

100. *SAE J3400 Charging Connector*, *supra* note 14.

101. Umar Shakir, *Tesla Is About to Pull the Plug on Its Main EV Charging Rival*, THE VERGE (June 9, 2023, 3:52 PM), https://www.theverge.com/2023/6/9/23755184/tesla-ev-charging-standard-nacs-ccs-gm-ford.

102. Todd Feurer, *U.S. Spending $150 Million to Upgrade Electric Vehicle Charging Stations*, CBS NEWS (Jan. 18, 2024, 10:54 AM), https://www.cbsnews.com/chicago/news/u-s-spending-150-million-to-upgrade-electric-vehicle-charging-stations/; *see also* Joe Wituschek, *EV Chargers Are So Bad, the U.S. Government Is Spending $150 Million to Fix Them*, BGR (Jan. 18, 2024, 1:54 PM), https://bgr.com/lifestyle/ev-chargers-are-so-bad-the-u-s-government-is-spending-150-million-to-fix-them/.

$150 million on upgrading old, broken CCS chargers.[103] One analysis found "consumers suffered a loss valued at $400 million due to the lack of a common charging standard."[104] The incompatibility between EV charging connectors only continues to expand, causing this loss to grow.[105] Supporting different connector styles will inhibit charging infrastructure deployment.[106] Because there are multiple connectors, confused consumers have delayed purchasing an EV.[107] Attempting to accommodate every connector has stymied EV ownership goals.[108] It is more convenient and cost-effective to have a single connector.[109]

The automotive industry must embrace a single connector style to create a better charging experience and increase EV ownership.[110] Tesla's CEO, Elon Musk, has said that if the industry could "'focus on one standard—it'[ll]… be great for consumers'" and that "'[consumers] won't have to worry about which plug, which socket, which [charger]—it'll just work seamlessly.'"[111] Former Federal Highway Administrator Shailen Bhatt stated that charging an EV "'should be as easy and convenient as filling up a gas tank.'"[112] The Joint Office's executive director, Gabe Klein, is investigating each charging connector design to establish an industry standard.[113] Further, the FHWA published a Request for Information ("RFI") in March 2024 requesting feedback on updating the national charging standard.[114]

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103. Feurer, *supra* note 102; *see also* Wituschek, *supra* note 102.

104. Boushey, *supra* note 3; *see also* Jing Li, *Compatibility and Investment in the U.S. Electric Vehicle Market*, MIT SLOAN SCH. OF MGMT. (Aug. 2, 2023), https://www.mit.edu/~lijing/documents/papers/li_evcompatibility.pdf.

105. Boushey*, supra* note 3.

106. James Bikales, *Musk Strikes Again: Tesla's Win on EV Charging Could Split the Industry*, POLITICO (June 16, 2023, 4:30 AM), https://www.politico.com/news/2023/06/16/tesla-musk-ev-chargers-00101437.

107. *Id.*

108. *Id.*

109. Logan Pierce & Peter Slowik, *Public EV Charging in the United States Is About to Get a Whole Lot Easier*, INT'L COUNCIL ON CLEAN TRANSP. (Feb. 12, 2024), https://theicct.org/public-ev-charging-in-the-us-get-easier-feb24/.

110. *Biden Administration Applaud Critical Milestone*, *supra* note 65.

111. Bikales, *supra* note 106.

112. *Biden-Harris Administration Announces Grants to Upgrade Almost 4,500 Public Electric Vehicle Chargers*, FED. HIGHWAY ADMIN. (Jan. 18, 2024), https://highways.dot.gov/newsroom/biden-harris-administration-announces-grants-upgrade-almost-4500-public-electric-vehicle.

113. *Joint Office Supports Charging Standardization to Enhance EV Charging Experience*, JOINT OFF. OF ENERGY & TRANSP. (Sept. 14, 2023), https://driveelectric.gov/news/NACS-CCS-Interview.

114. *On the Heels of New Industry Standard for EV Charging, Biden-Harris Administration Takes Key Step Toward Updating Federal Standards to Promote Innovation*, FED. HIGHWAY ADMIN. (Dec. 19, 2023), https://highways.dot.gov/newsroom/heels-new-industry-standard-ev-charging-biden-harris-administration-takes-key-step-toward [hereinafter *Key Step Toward Updating Federal Standards*].

II. PROPOSAL: AMEND THE NATIONAL CHARGING STANDARD

The FHWA should amend 23 CFR § 680.106 and establish NACS as the national standard. Additionally, the government should develop a method for selecting future charging criteria to prevent similar challenges.

Product standards benefit manufacturers, consumers, and society by improving safety, establishing consistency, and reducing costs.[115] Generally, the law provides strong support for standards.[116] Standard connectors are not new to the automotive industry; Congress has long mandated a standardized "digital communications connector" for onboard diagnostic ("OBD").[117] While OBD sensors differ from EV chargers, they provide valuable insight into why standardized connectors are beneficial.

OBD sensors monitor emission controls and other engine components on ICE vehicles.[118] Congress's mandate states that "any connectors through which the emission control diagnostics system is accessed for… shall be standard and uniform on all motor vehicles[.]"[119] A consistent OBD sensor standard allows every mechanic and technician to identify issues quickly and easily in any ICE vehicle.[120] A single standard for EV connectors would give manufacturers and consumers similar consistency benefits to OBD sensors.

Further, the FHWA has signaled its willingness to change EV charging guidelines. The administration already modified its initial requirements.[121] These new requirements included "an updated EV infrastructure deployment plan template" for faster funding approval.[122] The FHWA's FRI is the perfect opportunity for the administration to reevaluate and update its requirements again.[123]

As the industry consensus between charging networks, automakers, and states move toward NACS, establishing it as the national standard would streamline infrastructure development and enhance the EV charging experience.[124] To understand the rationale behind this proposal, it is essential to examine charging technology first.

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115. 1 HUGH K. WEBSTER, THE LAW OF ASSOCIATIONS § 12.01[1] (Matthew Bender & Co., Inc. 2024).

116. *Id.*

117. Motor & Equip. Mfrs. Ass'n v. Nichols, 142 F.3d 449, 453 (D.C. Cir. 1998); *see also* 42 U.S.C. § 7521(m) (2011).

118. *On-Board Diagnostic (OBD) Regulations and Requirements: Questions and Answers*, ENV'T PROT. AGENCY 2-5 (Dec. 2003), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100LW9G.PDF?Dockey=P100LW9G.PDF.

119. 42 U.S.C. § 7521(m)(4)(A) (2011).

120. *On-Board Diagnostics (OBD) – Introduction to the Modes of Operation (Diagnostic Services)*, X-ENGINEERING.ORG, https://x-engineer.org/on-board-diagnostics-obd-modes-operation-diagnostic-services/ (last visited Oct. 31, 2024).

121. *FHWA Releases Updated NEVI Formula Program Guidance and Requests AFC Round 7 Nominations*, JOINT OFF. OF ENERGY & TRANSP. (June 8, 2023), https://driveelectric.gov/news/corridors-nevi-news.

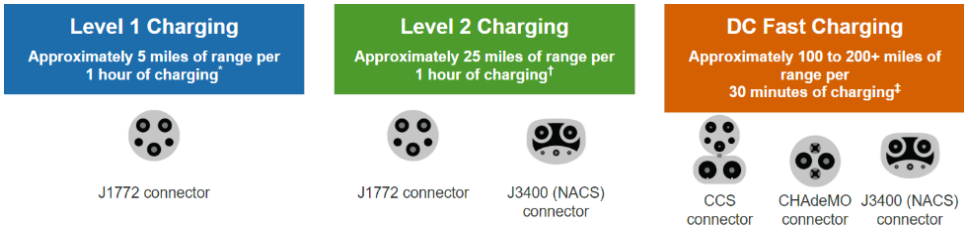
122. *Id.*

123. *Key Step Toward Updating Federal Standards*, *supra* note 114.

124. *Joint Office Supports Charging Standardization to Enhance EV Charging Experience*, *supra* note 113.

III. EXAMINING ELECTRIC VEHICLE CHARGING TECHNOLOGY

EV charging relies on two factors: charging level and connector style.[125] The Alternative Fuels Data Center, a group under the DOE, published three diagrams[126] depicting the differences in charging levels and connector styles:



A. Charging Levels

EV chargers are classified based on "the rate at which the batteries are charged."[127] Charging time depends on the EV's battery type, state of charge, internal charger capacity, and charging equipment.[128] EV batteries have different properties depending on their chemical makeup, such as lithium, nickel, or lead.[129] These chemicals dramatically affect how fast the battery charges.[130] There are three different charging rates: Level 1, Level 2, and Level 3 (or DC Fast Charging).[131] Generally, "the higher the Level, the higher the power output from the charger and the faster [the EV] can charge."[132]

1. Level 1

Level 1 is the slowest charging rate because it uses a common AC household outlet.[133] Less than 1% of public chargers use this rate since it only adds three-to-five miles of range per hour of charge.[134] Because EVs have large batteries,

125. Nick Kurczewski, *Different Levels of EV Charging*, CAR & DRIVER (Sept. 3, 2024), https://www.caranddriver.com/research/a41803552/ev-charging-levels/.

126. *Electric Vehicle Charging Stations*, ALT. FUELS DATA CTR., https://afdc.energy.gov/fuels/electricity_stations.html (last visited Oct. 19, 2024).

127. *Id.*

128. *Id.*

129. *Batteries for Electric Vehicles*, ALT. FUELS DATA CTR., https://afdc.energy.gov/vehicles/electric_batteries.html (last visited Oct. 31, 2024); *see also* Universal Battery Co. v. United States, 3 F. Supp. 878, 884 (Ct. Cl. 1933).

130. *Batteries for Electric Vehicles*, *supra* note 129.

131. *Electric Vehicle Charging Stations*, *supra* note 126; *see also* Tom Moloughney, *What Are the Different Levels of Electric Vehicle Charging?*, FORBES (Oct. 4, 2021), https://www.forbes.com/wheels/advice/ev-charging-levels/.

132. *Levels of EV Charging*, EVESCO, https://www.power-sonic.com/blog/levels-of-ev-charging/ (last visited Oct. 31, 2024).

133. *Electric Vehicle Charging Stations*, *supra* note 126; *see also* Moloughney, *supra* note 131.

134. *Electric Vehicle Charging Stations*, *supra* note 126; *see also* Moloughney, *supra* note 131.

charging at Level 1 can take over forty hours.[135] As a result, the federal government only provides funds for Level 2 and Level 3 chargers.[136]

2. Level 2

The most common charging rate is Level 2; it accounts for nearly 80% of all public chargers.[137] This Level is faster than Level 1, adding approximately twenty-five miles of range per hour of charge. It requires a larger AC circuit, like the one used by an electric clothes dryer.[138] Typically, Level 2 can fully charge an EV overnight.[139] Even though Level 2 is the most popular, it is not the most powerful.[140]

3. Level 3 (DC Fast Charging)

Level 3 is the fastest charging rate. Because Level 3 uses DC to provide more power,[141] it is sometimes called "DC fast charging."[142] Level 3 chargers are particularly beneficial for long trips, as this charging speed adds 180 to 240 miles of range per hour of charge.[143] Tesla's private Supercharger network specifically uses Level 3 charging for this reason.[144] However, DC fast chargers are more expensive to operate and maintain than Level 1 and Level 2 chargers.[145] Each charging level uses different connector types. [146]

B. Charging Connectors

Charging connectors facilitate the power transfer between the EV and charger.[147] When plugged into an EV, the connector transfers electricity through the connector's electrical pins.[148] There are four primary charging connector styles in the United States: (1) J1772, (2) CHAdeMO, (3) CCS, and (4) NACS.[149]

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135. *Charger Types and Speeds*, *supra* note 74.

136. Camila Domonoske & Brittany Cronin, *Federal Money Is Now Headed to States for Building Up Fast EV Chargers on Highways*, NPR (Sept. 27, 2022, 4:06 PM), https://www.npr.org/2022/09/27/1125375419/federal-money-is-now-headed-to-states-for-building-up-fast-ev-chargers-on-highway.

137. *Electric Vehicle Charging Stations*, *supra* note 126.

138. Moloughney, *supra* note 131.

139. *Electric Vehicle Charging Stations*, *supra* note 126.

140. *Id.*

141. *Id.*; *see also* Patel, *supra* note 69.

142. Kurczewski, *supra* note 125.

143. *Charger Types and Speeds*, *supra* note 74.

144. Kurczewski, *supra* note 125.

145. Patel, *supra* note 69.

146. Kurczewski, *supra* note 125.

147. *The J1772 Connector Explained: A Complete Guide to Electric Vehicle Charging*, CABLE MATTERS (Dec. 12, 2023), https://www.cablematters.com/Blog/Power/what-is-j1772.

148. *Id.*

149. *Electric Vehicle Charging Stations*, *supra* note 126.

1. J1772

J1772 is the most basic connector style.[150] It is a simple round connector with a five-pin layout.[151] Most EVs include a portable Level 1 charging cord with a J1772 connector.[152] J1772 can only be used with Level 1 or Level 2 chargers.[153]

2. CHAdeMO

CHAdeMO is the least popular connector—very few vehicles are designed for this charger.[154] This connector was designed in 2010 by the CHAdeMO Association.[155] It generally charges slower than other connectors despite only working with Level 3 chargers.[156] It uses four electrical pins, making it smaller than CCS but larger than NACS.[157] CHAdeMO has been "officially discontinued" in the United States for several years.[158]

3. Combined Charging System

CCS has been the predominant connector for most non-Tesla EVs in the United States.[159] It was first proposed in 2011 by the SAE and the European Automobile Manufacturing Association.[160] Currently, there are over one million EVs with CCS in the United States.[161] This connector is called the "combined" system because it incorporates the J1772 connector into its design.[162] The main

150. *Glossary: Combined Charging System (CCS) Standard*, DRIIVZ, https://driivz.com/glossary/combined-charging-system-ccs/ (last visited Oct. 31, 2024).

151. *The J1772 Connector Explained: A Complete Guide to Electric Vehicle Charging*, *supra* note 147.

152. *Electric Vehicle Charging Stations*, *supra* note 126.

153. Kurczewski, *supra* note 125.

154. Warren Clarke, *NACS vs. CCS: What's the Difference?*, U.S. NEWS (Sept. 28, 2023, 5:12 PM), https://cars.usnews.com/cars-trucks/advice/nacs-vs-ccs.

155. George Armitage, *What Is CHAdeMO Charging?*, DRIVING ELEC. (May 13, 2024), https://www.drivingelectric.com/your-questions-answered/114/what-chademo-charging.

156. Jake Sundstorm, *A Look at EV Charger Plug Types and Compatibility*, CARMAX (Oct. 24, 2023), https://www.carmax.com/articles/electric-vehicle-charger-types.

157. *Id.*

158. Brad Templeton, *You Want Tesla's CHAdeMO Adapter for EV Roadtrips—Form a Club*, FORBES (Aug. 28, 2022, 5:00 PM), https://www.forbes.com/sites/bradtempleton/2021/09/07/you-want-teslas-chademo-adapter-for-ev-roadtrips---form-a-club/?sh=3992b7682d0b.

159. *Glossary: Combined Charging System (CCS) Standard*, *supra* note 150.

160. *Id.*

161. *Id.*

162. *Glossary*, ELECTRIFY AM., https://www.electrifyamerica.com/glossary/ (last visited Oct. 31, 2024).

difference between CCS and J1772 is that CCS has two additional pins at its bottom.[163] These pins only allow CCS to be used with Level 3 charging.[164]

4. North American Charging Standard

Tesla proudly declares that "NACS is the most common charging standard in North America: NACS vehicles outnumber CCS two-to-one, and Tesla's Supercharging network has 60% more NACS [chargers] than all the CCS-equipped networks combined."[165] This is the smallest connector; it was explicitly designed for convenience and reliability.[166] NACS is compatible with Level 2 and Level 3 chargers, making it the perfect candidate to be the public charging standard.[167] To understand the rationale behind this proposal, the differences between CCS and NACS must be examined.

C. Connector Differences

There are four main differences between CCS and NACS: (1) thermodynamics, (2) charging levels, (3) physical size, and (4) reliability. First, CCS uses a liquid cooling system because it can get very hot; averaging temperatures above 100 degrees Fahrenheit.[168] NACS does not need a liquid cooling system because it has a better thermal-management system.[169] Second, CCS can only work on Level 3 chargers, while NACS uses the same pins for Level 2 and Level 3.[170] Third, NACS is more compact and lightweight than CCS, which can be cumbersome to handle.[171] Finally, CCS's complex thermal and electrical management system make it less reliable than NACS.[172] To mitigate these differences, some customers have relied on charging adapters.

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163. *J1772 vs CCS: What's the Difference?*, CABLE MATTERS INC. (Dec. 27, 2023), https://www.cablematters.com/Blog/Power/j1772-vs-ccs?srsltid=AfmBOoq1xS7QI3Lqkf24kJl1JU7JbKsZWDtD3QAQZnWrkY8l8WzRShnT.

164. *Id.*

165. *Opening the North American Charging Standard*, TESLA (Nov. 11, 2022), https://www.tesla.com/blog/opening-north-american-charging-standard.

166. Joel Manansala, *NACS vs CCS - Which One is Better?*, LECTRON (Apr. 11, 2024), https://ev-lectron.com/blogs/blog/nacs-vs-ccs-which-one-is-better.

167. *Electric Vehicle Charging Stations*, *supra* note 126.

168. Banner, *supra* note 83.

169. *Id.*

170. Stacy Noblet, *NACS Versus CCS: It's More Than a Connector*, FORBES (June 27, 2023, 1:43 PM), https://www.forbes.com/sites/stacynoblet/2023/06/23/nacs-versus-ccs-its-more-than-a-connector/.

171. Clarke, *supra* note 154; *see also* Banner, *supra* note 83.

172. Banner, *supra* note 83.

D. Adapters

A charging adapter enables an EV to connect to a charger "regardless of the connector type of the vehicle."[173] These can either be portable or affixed to the charger.[174] Different adapters exist for each connector type.[175] However, adapters can often cause confusion or reliability issues.[176] Some adapters have major safety flaws, such as the locking mechanism failing to work.[177] These design flaws create dangerous charging conditions as the connector can be accidentally unplugged at any time.[178] Loren McDonald, an independent charging analyst, explained that "the next few years may be an 'adapter hell' as everyone—drivers, automakers, charging equipment providers, the federal government and states—navigate a confusing straddle between [CCS] and the new [NACS] standard."[179]

Tesla developed the "Magic Dock," a self-locking adaptor for its Supercharger network that accommodates EVs with either CCS or NACS.[180] While a clever solution, the Magic Dock requires additional costs to include both connectors.[181] Additionally, CCS vehicles may have a slower charge rate due to the differing technology between the connectors.[182] Eliminating the need for adapters would increase customer satisfaction and decrease charging chaos. The responsibility also falls on charging networks to provide customers with consistent and reliable charging connectors.

IV. CHARGING NETWORKS

Charging networks are companies that operate and maintain private and public chargers for EV customers.[183] Volkswagen created the largest North American EV charging network, Electrify America, following its "Dieselgate" scandal.[184] Dieselgate was a highly-publicized scandal in which Volkswagen

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173. *SAE J3400 Charging Connector*, *supra* note 14 (information located under the "What about adapters?" tab at the bottom of the webpage).

174. *Id.*

175. *Id.*

176. *Id.*

177. Wade Malone, *Tesla's NACS to CCS1 Adapter Works Great, but Has One Flaw (Updated)*, INSIDEEVS (Apr. 15, 2024, 4:06 PM), https://insideevs.com/news/715983/tesla-nacs-ccs1-supercharger-adapter/.

178. *Id.*

179. David Ferris, *US Faces 'Adapter Hell' on Way to a Tesla Charging Future*, POLITICO (Dec. 20, 2023, 6:50 AM), https://www.eenews.net/articles/us-faces-adapter-hell-on-way-to-a-tesla-charging-future.

180. Alan Lau, *Tesla Opening Up Supercharger Network to Non-Tesla EVs with Magic Dock Tech*, MOTORTREND (Mar. 6, 2024), https://www.motortrend.com/news/tesla-magic-dock-supercharger-network/.

181. *Id.*

182. Manansala, *supra* note 166.

183. Will Kaufman, *Largest EV Charging Companies in 2023*, EDMUNDS (Aug. 11, 2023), https://www.edmunds.com/electric-car/articles/largest-ev-charging-companies.html.

184. Shannon Osaka, *VW Spent $2B to Build America a Charging Network. It's Ranked Dead Last*, WASH. POST (Dec. 14, 2023, 5:49 PM), https://www.washingtonpost.com/climate-environment

"[pled] guilty… to three felony counts for designing and intentionally installing parts and software to circumvent federal emissions standards by altering the way motor vehicles sold in the United States operated during emissions testing."[185] In its settlement with the federal government, Volkswagen spent almost $2 billion to establish Electrify America.[186] In June 2023, Electrify America announced it would add NACS to its chargers while continuing to support CCS.[187] Other charging networks, like ChargePoint, FLO, Blink Charging, and EVgo, have also agreed to offer NACS on their chargers.[188] More importantly, automotive manufacturers are switching from CCS to NACS on their EVs.

V. AUTOMAKER AGREEMENTS

Almost every major automaker has announced NACS compatibility with their future EVs. Aptera, a start-up company, was the first to adopt NACS after Tesla made it public in 2022.[189] The Ford Motor Company sent shockwaves throughout the entire automotive industry when it became the first of the "Big Three"[190] automakers to agree to use NACS.[191] The agreement provided that, starting in early 2024, current Ford EVs could charge at Tesla Superchargers.[192] Tesla will allow Ford EV owners to access Superchargers using Ford's phone application.[193] Ford's CEO, Jim Farley, announced that Ford EV owners could reserve a complimentary NACS adapter starting Spring 2024.[194] The agreement

/2023/12/13/electrify-america-ev-charger-broken/; *see also* Paul A. Eisenstein, *VW's $2 Billion Penalty for Diesel Scam, Electrify America, Builds Electric Charging Network Across US to Boost EV Market*, CNBC (May 10, 2019, 2:46 PM), https://www.cnbc.com/2019/05/10/vws-2-billion-penalty-for-diesel-scam-builds-ev-charging-network-across-us.html.

185. State v. Volkswagen Aktiengesellschaft, 669 S.W.3d 399, 406 (Tex. 2023); *see also* In re Volkswagen AG Sec. Litig., 661 F. Supp. 3d 494, 505 (E.D. Va. 2023).

186. Eisenstein, *supra* note 184.

187. *Electrify America to Add North American Charging Standard (NACS) Connector by 2025*, ELECTRIFY AM. (June 29, 2023), https://media.electrifyamerica.com/en-us/releases/223.

188. Nora Manthey, *Blink Charging Goes NACS Across the Board*, ELECTRIVE, https://www.electrive.com/2023/06/29/blink-charging-goes-nacs-across-the-board/ (Aug. 15, 2023).

189. *Aptera Motors Is First EV Maker to Integrate Tesla Charging Built by Lectron*, APTERA (Nov. 30, 2022), https://aptera.us/tesla-charging/.

190. General Motors, Ford, and Daimler Chrysler (now Stellantis) were collectively referred to as the "Big Three" automakers. Ed Gordon, *The Decline of the 'Big Three' U.S. Auto Makers*, NPR (May 4, 2005, 12:00 AM), https://www.npr.org/templates/story/story.php?storyId=4630187.

191. *Ford EV Customers to Gain Access to 12,000 Tesla Superchargers; Company to Add North American Charging Standard Port in Future EVs*, FORD (May 25, 2023), https://media.ford.com/content/fordmedia/fna/us/en/news/2023/05/25/ford-ev-customers-to-gain-access-to-12-000-tesla-superchargers--.html [hereinafter *Ford EV Customers to Gain Access*].

192. *Id.*

193. Mack Hogan, *Ford Owners Won't Need the Tesla App to Supercharge*, INSIDEEVS (Feb. 5, 2024, 3:00 PM), https://insideevs.com/news/707443/do-fords-need-tesla-app/.

194. *Ford to Offer Complimentary Tesla Supercharger Adapter to Eligible EV Customers*, FORD (Jan. 31, 2024), https://media.ford.com/content/fordmedia/fna/us/en/news/2024/01/31/ford-to-offer-complimentary-tesla-supercharger-adapter-to-eligib.html.

further outlined that Ford would incorporate the NACS port on their next-generation EVs the following year.[195]

General Motors ("GM") announced a similar agreement regarding NACS the following month.[196] GM's CEO Mary Barra announced that establishing NACS as the "unified standard for North America" would promote wider EV ownership.[197] This move by Ford and GM received praise from the White House.[198] Former White House spokesperson Robyn Patterson stated that "'[m]ore drivers having access to more high-quality charging—including Tesla Superchargers—is a step forward[.]'"[199] However, critics see it as a self-preservation move to remain competitive against other automotive companies.[200]

Now, almost every major automaker has committed to using NACS, including Acura, Audi, BMW, Fisker, Genesis, Honda, Hyundai, Jaguar, Kia, Lexus, Lucid, Mazda, Mercedes-Benz, Mini, Nissan, Polestar, Porsche, Rivian, Rolls-Royce, Scout Motors, Toyota, Volkswagen, and Volvo.[201] Starting in 2025, these brands will have the NACS port on their EVs.[202] Until then, every non-Tesla EV will continue to be made with CCS.[203] In February 2024, Stellantis became the last major automaker to adopt NACS.[204] This industry shift means that most EV models will use NACS in the future.[205]

In an abrupt move, however, Elon Musk fired Tesla's entire charging team in May 2024.[206] These layoffs have affected communications between Tesla, suppliers, and other automakers.[207] Further, Tesla has delayed access to their Superchargers for General Motors, Polestar, and Volvo.[208] As a result, some automotive

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195. *Ford EV Customers to Gain Access*, *supra* note 191.

196. *General Motors Doubles Down on Commitment to a Unified Charging Standard and Expands Charging Access to Tesla Supercharger Network*, GEN. MOTORS (June 8, 2023), https://investor.gm.com/news-releases/news-release-details/general-motors-doubles-down-commitment-unified-charging-standard.

197. Bikales, *supra* note 106.

198. *Id.*

199. *Id.*

200. *Id.*

201. Eric Stafford, *Tesla Charging Network: All the Upcoming Compatible EVs*, CAR & DRIVER (Sept. 24, 2024), https://www.caranddriver.com/news/a44388939/tesla-nacs-charging-network-compatibility/.

202. Keith Barry, *Which Electric Vehicles Can Charge at a Tesla Supercharger?*, CONSUMER REPS. (Oct. 15, 2024), https://www.consumerreports.org/cars/hybrids-evs/tesla-superchargers-open-to-other-evs-what-to-know-a9262067544/.

203. *SAE J3400 Charging Connector*, *supra* note 14.

204. Andrew J. Hawkins, *Stellantis Becomes the Last Major Automaker to Adopt Tesla's Charging Plug*, THE VERGE (Feb. 12, 2024, 11:56 AM), https://www.theverge.com/2024/2/12/24070654/stellantis-tesla-ev-charging-plus-nacs-adapter.

205. Barry, *supra* note 202.

206. Chris Kirkham et al., *The Inside Story of Elon Musk's Mass Firings of Tesla Supercharger Staff*, REUTERS (May 15, 2024, 6:12 PM), https://www.reuters.com/business/autos-transportation/inside-story-elon-musks-mass-firings-tesla-supercharger-staff-2024-05-15/.

207. *Id.*

208. Joey Klender, *Tesla Supercharger Access for Several Brands Has Been Delayed: Report*, TESLARATI (May 30, 2024), https://www.teslarati.com/tesla-supercharger-access-delayed-layoffs-report/.

journalists question whether these companies will keep their pledge to use NACS.[209] Anticompetitive disputes may arise from automakers who ultimately choose not to adopt NACS.[210]

VI. ANTICOMPETITIVE CONCERNS

The Federal Trade Commission ("FTC") enforces laws preventing unfair business practices, such as those "likely to reduce competition and lead to higher prices, reduced quality or levels of service, or less innovation."[211] The Clayton Act, FTC Act, and Sherman Act are the primary statutes governing the FTC.[212] Anti-competitive practices can include "activities like price fixing, group boycotts, and exclusionary exclusive dealing contracts or trade association rules[.]"[213] Generally, anticompetitive practices are grouped into two types: (1) monopolization (Single Firm Conduct) and (2) agreements between competitors (Horizontal Conduct).[214]

A. Monopolization (Single Firm Conduct)

Under Section 2 of the Sherman Act, it is illegal for a company to engage in monopolistic practices or try to monopolize trade.[215] This means a "firm with market power cannot act to maintain or acquire a dominant position by excluding competitors or preventing new entry."[216] Highly successful companies may not face the same competitive pressures as others in the marketplace.[217] A company violates Section 2 of the Sherman Act only if it uses "unreasonable methods" to maintain or acquire a monopoly.[218] In *Dreamstime.com, LLC v. Google LLC*, the Ninth Circuit articulated the framework for a Section 2 claim, which has "two elements: (1) the defendant has monopoly power in the relevant market, and (2) the defendant has willfully acquired or maintained monopoly power in that market."[219] Additionally, the Ninth Circuit expanded on this market power requirement in *Rebel Oil Co. v. Atlantic Richfield Co.*, stating that plaintiffs must: "(1) define the relevant market, (2) show that the defendant owns a dominant share of

209. Chris Teague, *GM's NACS Transition Still on Track After Tesla Supercharger Turmoil*, THE TRUTH ABOUT CARS (May 31, 2024), https://www.thetruthaboutcars.com/cars/news-blog/gm-s-nacs-transition-still-on-track-after-tesla-supercharger-turmoil-44507260.

210. Paige McKirahan, *How Tesla's NACS and New Regulations Could Shift the EV Charging Market*, WIT (July 19, 2023), https://www.witlegal.com/insights/blog/how-teslas-nacs-and-new-regulations-could-shift-the-ev-charging-market.

211. *Anticompetitive Practices*, FED. TRADE COMM'N, https://www.ftc.gov/enforcement/anticompetitive-practices (last visited Oct. 31, 2024).

212. 15 U.S.C. § 12; *see also* 15 U.S.C. § 41; *see also* 15 U.S.C. § 2.

213. *Anticompetitive Practices*, *supra* note 211.

214. *Id.*

215. *Id.*; *see also* 15 U.S.C. § 2.

216. *Anticompetitive Practices*, *supra* note 211.

217. *Single Firm Conduct*, FED. TRADE COMM'N, https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/single-firm-conduct (last visited Oct. 31, 2024).

218. *Anticompetitive Practices*, *supra* note 211.

219. Dreamstime.com, LLC v. Google LLC, 54 F.4th 1130, 1137 (9th Cir. 2022).

that market, and (3) show that there are significant barriers to entry and show that existing competitors lack the capacity to increase their output…."[220] This framework was used in an anticompetitive case against Tesla.[221] Tesla was accused of monopolizing its parts and repair services.[222] Initially, the California Northern District Court, following the framework established by the Ninth Circuit, found that the plaintiffs failed to establish all three requirements to show that Tesla had monopoly power in the relevant market and, therefore, dismissed the case.[223] After an amended complaint was filed, however, the judge allowed the lawsuit to proceed, with a trial pending.[224]

Here, there may be more of a case against Tesla for single-firm conduct relating to their chargers as the three elements have arguably been met. First, the relevant market is charging networks. Second, Tesla has a dominant market share, owning "more than 60% of U.S. high-speed charging ports".[225] So far, Tesla has been the biggest winner of the $5 billion NEVI funding.[226] Finally, Tesla's lack of communication and delays may be significant enough barriers to entry. Regardless, the FTC has not investigated Tesla's most recent business practices regarding its charging technology.

B. Agreements Between Competitors (Horizontal Conduct)

Competitors must collaborate to remain competitive in modern markets.[227] Companies collaborate to expand into foreign markets, fund innovation initiatives, and reduce production costs.[228] However, it is "illegal for businesses to act together in ways that can limit competition, lead to higher prices, or hinder other businesses from entering the market."[229] Joint ventures "often [create] anticompetitive dangers."[230] In *FTC v. Hackensack Meridian Health, Inc.*, the Third Circuit explained that "Section 7 of the Clayton Act bars mergers whose effect 'may be substantially to lessen competition, or to tend to create a monopoly.'"[231]

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220. Rebel Oil Co. v. Atlantic Richfield Co., 51 F.3d 1421, 1434 (9th Cir. 1995).

221. Jonathan Stempel, *Tesla Beats Lawsuit Claiming It Monopolizes Repairs, Parts*, REUTERS (Nov. 20, 2023, 5:05 AM), https://www.reuters.com/legal/tesla-beats-lawsuit-claiming-it-monopolizes-repairs-parts-2023-11-18/; *see also* Lambrix v. Tesla, Inc., 2024 WL 3403777, at *5-7 (N.D. Cal. 2024).

222. Stempel, *supra* note 221; *see also Lambrix*, 2024 WL 3403777, at *5-7.

223. *Lambrix*, 2024 WL 3403777, at *5-7.

224. Jonathan Stempel, *Tesla Must Face Owners' Lawsuit Claiming It Monopolizes Vehicle Repairs and Parts*, REUTERS (June 18, 2024, 12:08 PM), https://www.reuters.com/legal/tesla-must-face-owners-lawsuit-claiming-it-monopolizes-vehicle-repairs-parts-2024-06-18/.

225. Kirkham et al., *supra* note 206.

226. *Id.*

227. *Dealings with Competitors*, FED. TRADE COMM'N, https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/dealings-competitors (last visited Oct. 31, 2024).

228. *Id.*

229. *Anticompetitive Practices*, *supra* note 211.

230. United States v. Penn-Olin Chem. Co., 378 U.S. 158, 169 (1964).

231. FTC v. Hackensack Meridian Health, Inc., 30 F.4th 160, 166 (3d Cir. 2022) (quoting 15 U.S.C. § 18).

Tesla's Supercharger partnerships do not raise any horizontal conduct concerns, as no company has been prevented from using the chargers yet. However, seven other automakers are joining to create their own EV charging network, separate from Tesla Superchargers.[232] This deal, in contrast, could potentially raise anti-competitive concerns.[233] Andre Barlow, a spokesperson for the group, explained a "common concern with joint ventures is that a legal collaboration could potentially lead to illegal coordination, like price fixing or dividing up markets."[234] Because these are initial plans, not enough information is available to understand the full scope of this joint charging network and whether horizontal conduct concerns exist.

VII. STATE STANDARDS

Every state has developed a detailed plan and proposal for building charging infrastructure per NEVI funding requirements.[235] All state NEVI plans were submitted and approved.[236] In total, $1.5 billion was released in fiscal years 2022 and 2023 to implement those plans.[237] States can impose additional requirements before distributing federal funds to localities.[238] States that have not adopted NACS will continue to install J1772 and CCS at chargers according to federal guidelines.[239] Thus far, only three states mandate NACS as a connector: Kentucky, Texas, and Washington.[240]

232. Abhirup Roy & Jarrett Renshaw, *In Challenge to Tesla, Automakers Launch US EV Charging Network*, REUTERS (July 26, 2023, 7:32 PM), https://www.reuters.com/business/autos-transportation/challenge-tesla-major-automakers-launch-ev-charging-network-2023-07-26/.

233. *Id.*

234. *Id.*; *see also Penn-Olin Chem. Co.*, 378 U.S. at 169.

235. Boushey, *supra* note 3; *see also State Plans for Electric Vehicle Charging*, JOINT OFF. OF ENERGY & TRANSP., https://driveelectric.gov/state-plans/ (last visited Oct. 19, 2024).

236. *Joint Office Releases NEVI Formula Program Annual Report*, *supra* note 51.

237. *Id.*

238. Abhirup Roy, *Texas Approves Plan to Mandate Tesla Tech for EV Chargers Despite Opposition*, REUTERS (Aug. 17, 2023, 12:30 PM), https://www.reuters.com/business/autos-transportation/texas-approves-plan-mandate-tesla-tech-ev-chargers-despite-opposition-2023-08-16/.

239. 23 C.F.R. § 680.106(c) (2023).

240. Hyunjoo Jin, *Kentucky Mandates Tesla's Charging Plug for State-Backed Charging Stations*, REUTERS (July 3, 2023, 1:10 PM), https://www.reuters.com/technology/kentucky-mandates-teslas-charging-plug-state-backed-charging-stations-documents-2023-07-03/; *see also* Jarrett Renshaw & Hyunjoo Jin, *Exclusive: Tesla Wins as Texas Requires State-Backed Charging Stations to Include Its Plug*, REUTERS (June 20, 2023, 9:21 PM), https://www.reuters.com/business/autos-transportation/texas-require-state-backed-charging-stations-include-tesla-plug-2023-06-20/.

A. NACS States

In July 2023, Kentucky became the first state to adopt NACS officially.[241] The state included NACS in a Request for Proposal ("RFP").[242] An RFP establishes requirements for government projects and solicits proposals from prospective contractors.[243] These minimum requirements ensure fairness in the governmental procurement process.[244] For example, in *Fortran Corp. v. Commonwealth*, a contract was set aside because a telephone systems vendor failed to comply with an RFP's minimum requirements.[245]

The second state to mandate NACS was Texas.[246] In 2021, Tesla moved its headquarters to Texas.[247] Furthermore, Tesla officially moved its place of incorporation to Texas after a shareholder vote.[248] These investments influenced the Texas Department of Transportation to change its requirements to adopt NACS.[249] However, five EV charging companies wrote to the Texas Transportation Commission demanding more time to test the connector.[250] After two deferred votes, the Texas Transportation Commission unanimously approved its plan to include NACS.[251]

Finally, Washington has adopted NACS, but state officials are conflicted about how to integrate the connector properly.[252] The Washington Department of Transportation's Alternative Fuels Program Manager, Tonia Buell, stated that the agency will soon "require NACS" at state chargers.[253]

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241. Jin, *supra* note 240; *see also Request for Proposal: Kentucky's Electric Vehicle Charging Program Addendum #6*, KY. TRANSP. CABINET 17 (Aug. 17, 2023), https://kyevcharging.com/download_file/view/686b54d8-fbd2-4568-a11c-ff02e7fac245/1.

242. *Request for Proposal: Kentucky's Electric Vehicle Charging Program Addendum #6*, *supra* note 241.

243. *Id.* at 1; *see also* Louisville/Jefferson Cnty. Metro Gov't v. Courier J., Inc., 605 S.W.3d 72, 74 (Ky. Ct. App. 2019).

244. *Procurement Best Practices: Process Integrity Guidelines*, U.S. ENV'T PROT. AGENCY (Apr. 19, 2024), https://www.epa.gov/transforming-waste-tool/procurement-best-practices-process-integrity-guidelines.

245. Fortran Corp. v. Commonwealth, 43 Va. Cir. 111, 117 (1997).

246. Renshaw & Jin, *supra* note 240.

247. James Clayton, *Tesla: Elon Musk Says Company Headquarters Will Move to Texas*, BBC (Oct. 7, 2021), https://www.bbc.com/news/technology-58838874.

248. Madlin Mekelburg, *Musk Shifts Tesla Incorporation to Texas After Investor Vote (1)*, BLOOMBERG L. (June 14, 2024, 9:43 AM), https://news.bloomberglaw.com/esg/musk-shifts-tesla-incorporation-to-texas-after-investor-vote-1; *see generally* Tornetta v. Musk, 310 A.3d 430 (Del. Ch. 2024) (rescinding Musk's compensation plan).

249. Renshaw & Jin, *supra* note 240.

250. Abhirup Roy, *Exclusive: EV Charging Firms Oppose Texas' 'Premature' Plan to Mandate Tesla Standard*, REUTERS (July 3, 2023, 1:11 PM), https://www.reuters.com/business/autos-transportation/ev-charging-firms-oppose-texas-premature-plan-mandate-tesla-standard-letter-2023-06-30/.

251. Roy, *supra* note 238.

252. Jarrett Renshaw, *Washington State Plans to Mandate Tesla's Charging Plug*, REUTERS (June 27, 2023, 12:15 PM), https://www.reuters.com/business/autos-transportation/washington-state-plans-mandate-teslas-charging-plug-official-2023-06-23/.

253. *Id.*

B. Interested States

Four states, Alaska, Arizona, Florida, and Iowa, have expressed interest in mandating NACS. The Alaska Energy Authority, which works closely with the Alaska Department of Transportation, is assessing whether NACS should be added to upcoming state chargers.[254] In an online conference, the Arizona Department of Transportation announced that it was "evaluating the feasibility of" NACS.[255] Florida was expected to mandate NACS in December 2024, exactly one year after the SAE formally recognized it, but no mandate has been made at this time.[256] Lastly, Iowa's Notice of Funding Opportunity referenced NACS as its new state standard.[257]

C. Important Undecided States

Two critical states in the CCS-NACS debate are California and Michigan. The state with the largest population, California, also has the most EV chargers.[258] California still uses CCS as the state charging standard.[259] Because the California Air Resources Board unanimously voted on a rule to ban the sale of ICE vehicles in the state by 2035, there is an increasing demand for even more EV chargers.[260] California should reevaluate its charging standard to meet this demand and adapt to the automotive industry switch to NACS.

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254. *EV Charging Ports: What's Next?*, ALASKA ENERGY AUTH. (July 13, 2023), https://us10.campaign-archive.com/?u=7bde743be4d525a5f52d948ed&id=84079e78e9.

255. Arizona Department of Transportation, *2023 Plan Update Virtual Public Meeting*, VIMEO, at 35:25 (July 20, 2023, 11:40 AM), https://vimeo.com/847031453/f39165c32d.

256. Akash Sriram et al., *More Automakers Plug into Tesla's EV Charging Network*, REUTERS (Sept. 21, 2023, 4:48 PM), https://www.reuters.com/business/autos-transportation/more-automakers-plug-into-teslas-ev-charging-network-2023-09-21/.

257. *National Electric Vehicle Infrastructure Formula Program Notice of Funding Opportunity Attachment 1 – Technical Requirements*, IOWA DEP'T OF TRANSP. 3 (Dec. 2023), https://iowadot.gov/iowaevplan/FAQs-and-Resource-Library (scroll to "How did Iowa determine who received funding?" heading and download "Addendum 1" to access source).

258. *California Leads the United States in Electric Vehicles and Charging Locations*, U.S. ENERGY INFO. ADMIN. (Dec. 14, 2023), https://www.eia.gov/todayinenergy/detail.php?id=61082.

259. Dan Avery, *Which States Have the Most EV Charging Stations?*, CNET (Mar. 17, 2023, 4:00 AM), https://www.cnet.com/roadshow/news/how-many-ev-charging-stations-are-there-in-the-us/; *see also Development of the SAE J1772 Standard of Electric Vehicle Charger*, AG ELEC. TECH. CO., LTD., https://www.ag-elec.com/development-of-the-sae-j1772-standard-of-electric-vehicle-charger.html (last visited Oct. 31, 2024).

260. CAL. CODE REGS. tit. 13, § 1962.4; *see also* Emma Newburger, *California Bans the Sale of New Gas-Powered Cars by 2035*, CNBC (Aug 25, 2022, 8:33 PM), https://www.cnbc.com/2022/08/25/california-bans-the-sale-of-new-gas-powered-cars-by-2035.html.

Michigan, the automotive epicenter,[261] has committed to using CCS in its NEVI-funded plan.[262] While there have been calls to add NACS to Michigan's charging plans, Michigan has yet to change its stance on using CCS as the state standard.[263] Not only would the federal government's adoption of NACS improve interstate travel, but it would also have significant implications for other regions and countries.

VIII. INTERNATIONAL INFLUENCE

A single charging connector would ease travel through North America. Additionally, Europe has set an example by agreeing to a uniform charging standard between countries. China and Japan have also collaborated to design a new global standard for EVs.

A. North America: Canada and Mexico

Like the United States, Canada has programs to fund EV charging infrastructure.[264] Natural Resources Canada ("NRCan"), a department within the Canadian government, developed the Zero Emission Vehicle Infrastructure Program ("ZEVIP"), similar to the United States's NEVI program.[265] ZEVIP supports installling EV chargers throughout Canada.[266] The ZEVIP program allows funding for all four charging connector styles: J1772, CCS, CHAdeMO, and NACS.[267] However, NRCan classifies NACS as a "proprietary charging connector," which means it cannot be the only connector style at public chargers.[268] A spokesperson for NRCan stated that "there is no intention to make NACS mandatory at this time."[269]

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261. Scott Cohn, *States Are Spending Billions on Electric Vehicles in Battle to Replace Automotive Capital Michigan*, CNBC (July 7, 2022, 9:58 AM), https://www.cnbc.com/2022/07/07/states-spend-billions-on-evs-to-replace-automotive-capital-michigan.html.

262. Stephen Campbell, *Michigan Releases Its Plan for Federally Funded Electric Vehicle Infrastructure Deployment*, JD SUPRA (Aug. 5, 2022), https://www.jdsupra.com/legalnews/michigan-releases-its-plan-for-7785282/.

263. Eric Paul Dennis, *Michigan's Electric Vehicle Charging Subsidy Programs Should Include the New North American Charging Standard*, CITIZENS RSCH. COUNCIL OF MICH. (Aug. 2, 2023), https://crcmich.org/dennis_nevi_nacs_electricvehiclecharging.

264. *See generally Zero Emission Vehicle Infrastructure Program*, NAT. RES. CAN., https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/zero-emission-vehicle-infrastructure-program/21876 (discussing three funding opportunities for "owners/operators of ZEV infrastructure," "delivery organizations," and "Indigenous organizations") (Nov. 25, 2024).

265. *Id.*

266. *Id.*; *see also* Mehanaz Yakub, *Uncertainties Still Hover over the EV Industry's Response to NACS*, ELEC. AUTONOMY CAN. (Oct. 19, 2023), https://electricautonomy.ca/2023/10/19/uncertainties-over-ev-industry-response-to-nacs/.

267. Yakub, *supra* note 266.

268. *Id.*

269. *Id.*

Mexico does not have a standardized charging connector for EVs.[270] In early 2024, however, Mexico's Energy Regulatory Commission ("CRE") expressed interest in adopting a rule requiring multiple connector styles.[271] Tesla Mexico has already voiced concern with this potential decision as it increases technical complexity.[272] Further, Tesla plans to invest $130 million in building a new factory in Nuevo Leon, Mexico, near the Mexico-United States border.[273] This investment will likely influence the charging standard the Mexican government decides on. Other American automakers who operate in Mexico may also impact the country's decision to standardize NACS. Unlike North America, however, the European Union ("EU") has a consistent standard across its countries.

B. Europe

CCS is the standard between European countries.[274] However, due to Europe's different electricity standards, a more advanced CCS Type-2 connector must be used.[275] While similar to the CCS connector found in North America, it differs slightly.[276] The EU also implemented a law requiring EV chargers to be installed every thirty-seven miles.[277] This ensures that reliable and consistent EV charging is available between EU countries.

Moreover, the EU resolved a similar charging issue related to mobile-device connectors.[278] The EU mandated the Universal Serial Bus Type-C ("USB-C"[279])

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270. Reneé Lerma, *Elon Musk's Vision for EV Charging in Mexico: Tesla's NACS*, MEX. BUS. NEWS (Oct. 13, 2023, 1:43 PM), https://mexicobusiness.news/automotive/news/elon-musks-vision-ev-charging-mexico-teslas-nacs.

271. Simon Alvarez, *Tesla Exec Explains Objection to Mexico's Proposed EV Charging Rules*, TESLARATI (Mar. 27, 2024), https://www.teslarati.com/tesla-exec-explains-objections-mexico-ev-charging-rules/.

272. *Id.*

273. Daina Beth Solomon, *Mexico Says Tesla Factory Still Coming, Vows Infrastructure Spending*, REUTERS (Oct. 19, 2023, 7:34 PM), https://www.reuters.com/business/autos-transportation/mexico-says-tesla-factory-still-coming-vows-infrastructure-spending-2023-10-19/.

274. This standard is referred to as either "CCS" or "mennekes" after the German charging manufacturer; however, this Article will use "CCS" for clarity. *Different Types of EV Charging Connectors*, BESTEVCHARGERS, https://bestchargers.eu/blog/different-types-of-ev-charging-connectors/ (last visited Feb. 5, 2025).

275. *Id.*

276. *Id.*

277. *Alternative Fuels Infrastructure: Council Adopts New Law for More Recharging and Refuelling Stations Across Europe*, COUNCIL OF THE EUR. UNION (July 25, 2023, 10:20 AM), https://europa.eu/!N8bWTk.

278. *Common Charger: EU Ministers Give Final Approval to One-Size-Fits-All Charging Port*, COUNCIL OF THE EUR. UNION (Oct. 24, 2022, 10:28 AM), https://www.consilium.europa.eu/en/press/press-releases/2022/10/24/common-charger-eu-ministers-give-final-approval-to-one-size-fits-all-charging-port/ [hereinafter *Common Charger*].

279. *See generally Universal Serial Bus Type-C Cable and Connector Specification*, USB 3.0 PROMOTER GRP. (Aug. 2019), https://www.usb.org/sites/default/files/USB%20Type-C%20Spec%20R2.0%20-%20August%202019.pdf (discussing USB-C technology and benefits).

charging port be equipped on smaller electronic devices starting in late 2024.[280] Like NACS, USB-C is technologically superior to other connectors.[281] This mandate eliminates electronic waste and provides a consistent charging experience across all devices.[282]

C. Asia

The Asian EV market has played a critical role in the connector debate. China, the largest automotive market,[283] and Japan have collaborated on a global EV charging standard.[284] The China Electricity Council ("CEC") and the Japanese CHAdeMO group partnered to co-develop this new standard, called the "Chaoji" project.[285] Chaoji improves upon the CHAdeMO design and aims to be safe, backward compatible, and future-proof.[286] However, China will continue recognizing its current national standard, GB/T 27930, until this new connector comes to market.[287] Developed by the CEC, GB/T 27930 works with both Level 2 and Level 3 charging.[288] Japan uses J1772 for Level 2 charging and CHAdeMO for Level 3 charging.[289] The growing global focus on EVs indicates a promising future for charging technology.

IX. FUTURE FRAMEWORK

Developing standards early can help combat technological obsolescence. Both CCS and NACS are over a decade old.[290] The federal government has not established EV-specific standards for future technology, such as wireless or dynamic charging. Working closely with companies conducting research and

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280. *Pulling the Plug on Consumer Frustration and E-Waste: Commission Proposes a Common Charger for Electronic Devices*, EUR. COMM'N (Sept. 23, 2021), https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_21_4613/IP_21_4613_EN.pdf.

281. Tom Brant, *What Is USB-C? An Explainer*, PCMAG (Sept. 12, 2023), https://www.pcmag.com/how-to/what-is-usb-c-an-explainer.

282. *Common Charger*, *supra* note 278.

283. *See* Mathilde Carlier, *Largest Automobile Markets Based on New Car Registrations 2023*, STATISTA (May 22, 2024), https://www.statista.com/statistics/269872/largest-automobile-markets-worldwide-based-on-new-car-registrations/.

284. John Boyd, *China and Japan Push for a Global Charging Standard for EVs*, IEEE SPECTRUM (Dec. 17, 2018), https://spectrum.ieee.org/a-global-charging-standard-for-evs.

285. *Id.*

286. *High Power (ChaoJi)*, CHADEMO, https://www.chademo.com/technology/high-power (last visited Oct. 31, 2024).

287. *GB/T 27930: Chinese Protocol for Communication Between Chargers and Electric Vehicles*, VECTOR, https://www.vector.com/us/en/know-how/protocols/gbt-27930/ (last visited Oct. 31, 2024).

288. *Id.* Because this standard remains exclusive to China, only the four connectors available in North America were discussed at length in this Article.

289. Brad Templeton, *Competing Electric Car Charging Standards Can Be Easily Fixed*, FORBES (Dec. 19, 2019, 2:02 PM), https://www.forbes.com/sites/bradtempleton/2019/12/19/competing-electric-car-charging-standards-can-be-easily-fixed/.

290. *The History of EV Charging Connectors*, ONT. CHARGING NETWORK LP (Oct. 7, 2024), https://ivycharge.com/blog/the-history-of-ev-charging-connectors/.

development is one way the government can keep up with ever-changing technology.

The SAE already independently standardized wireless charging for EVs.[291] Multiple wireless charger patents, such as the one disputed in *WiTricity Corp. v. Momentum Dynamics Corp.*, have also been granted.[292] Wireless and dynamic charging eliminates the need for a physical connector or to upgrade old chargers. Wireless charging allows an electronic device to receive power from a battery pad on the ground.[293] Dynamic EV charging expands on this by enabling an EV to be charged while in motion.[294] The Michigan Department of Transportation recently used this technology to develop and install the first wireless-charging road in the United States.[295] Coils beneath the quarter-mile roadway activate when an EV with a particular electrical receiver drives over it.[296] The road remains safe for pedestrians and animals despite electricity being transferred through a magnetic field to recharge the EV's battery.[297] This pilot program shows how many unexplored solutions there are to charging challenges.

CONCLUSION

As more charging networks, automakers, and states move towards the new NACS standard, the federal government must update its guidelines to ensure the United States continues its transition toward EVs and sustainable energy. While the federal government has taken significant steps to a clean-energy future, more must be done. The FHWA should adopt NACS as the national charging standard to ensure the proper use of funds and strategic deployment of chargers. NACS is the technologically superior connector, able to charge across Level 2 and Level 3. By adopting NACS as the national charging standard, the federal government can charge the United States into the future.

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291. Jennifer Shuttleworth, *New SAE Wireless Charging Standard Is EV Game-Changer*, SAE INT'L (Oct. 22, 2020), https://www.sae.org/news/2020/10/new-sae-wireless-charging-standard-is-ev-game-changer.

292. WiTricity Corp. v. Momentum Dynamics Corp., 563 F. Supp. 3d 309, 313 (D. Del. 2021).

293. *Id.*; *see also* Powermat Techs. v. Belkin Int'l, 2020 WL 2892385, at *2 (S.D.N.Y. 2020).

294. Duc Minh Nguyen et al., *Dynamic Charging as a Complementary Approach in Modern EV Charging Infrastructure*, SCI. REPS. (Mar. 9, 2024), https://www.nature.com/articles/s41598-024-55863-3.

295. *Wireless Charging Roadway*, MICH. DEP'T OF TRANSP., https://www.michigan.gov/mdot/travel/mobility/initiatives/wireless-charging-roadway (last visited Oct. 20, 2024).

296. Corey Williams, *New Technology Installed Beneath Detroit Street Can Charge Electric Vehicles as They Drive*, ASSOCIATED PRESS (Nov. 29, 2023, 5:33 PM), https://apnews.com/article/wireless-roadway-electric-vehicle-charging-detroit-22fcdeabd026d81712a0c1a12b190d9a.

297. *Id.*