Electric Vehicle Infrastructure in Rural Areas

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Contents

Introduction....4

Benefits of EVs....5

EV 101....5

Policy Framework and Partnership Opportunities....6

National Electric Vehicle Infrastructure Plans....9

Tax Incentives....10

Case Studies....11

- Case Study #1: EV infrastructure focused tasks, First Tennessee Rural Planning Organization (FTRPO), Tennessee....11
- Case Study #2: Mid-Columbia Economic Development District (MCEDD), Oregon....12
- Case Study #3: Regional Charging & Fueling Infrastructure Proposal, Michiana Area Council of Governments (MACOG), Indiana....12

Summary....13

Resources....13

List of Acronyms....14

References....15

About the NADO Research Foundation

Founded in 1988, the NADO Research Foundation is the nonprofit research affiliate of the National Association of Development Organizations (NADO). The NADO Research Foundation identifies, studies, and promotes regional solutions and approaches to improving local prosperity and services through the nationwide network of regional development organizations (RDOs). The Research Foundation shares best practices, offers professional development training, analyzes the impact of federal policies and programs on RDOs, and examines the latest developments and trends in small metropolitan and rural America. Most importantly, the Research Foundation is helping bridge the communications gap among practitioners, researchers, and policymakers. Learn more at www.NADO.org and www.RuralTransportation.org.

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Introduction

As the world steadily shifts towards clean energy, electric vehicles (EVs) have emerged as a sustainable alternative to traditional fuel-powered cars.

An Electric Vehicle (EV) is defined as a vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source. An EV includes both a vehicle that can only be powered by an electric motor that draws electricity from a battery (all-electric vehicle) and a vehicle that can be powered by an electric motor that draws electricity from a battery and by an internal combustion engine (plug-in hybrid electric vehicle)

[1]

EVs are becoming a viable option for rural areas, driven by advancements in technology, expanding infrastructure, and various benefits they offer. The future of EVs holds immense potential for rural infrastructure development.

In rural parts of the country—home to 20 percent of Americans and almost 70 percent of America's road miles—Electric Vehicles (EVs) can be an especially attractive alternative to conventional vehicles. Rural residents drive more than their urban counterparts, spend more on vehicle fuel and maintenance, and often have fewer alternatives to driving to meet their transportation needs. In the long run, adoption of EVs—integrated with holistic regional land use and transportation planning—can help residents of rural areas reduce those costs, minimize the environmental impact of transportation, and improve accessibility and quality of life in their communities.[2]

What is an RTPO/RPO?

Regional Transportation Planning Organizations (RTPOs) generally operate in non-metropolitan areas to conduct outreach to the public and local officials and provide transportation planning support under contract to state departments of transportation (DOTs). A Governor may establish and designate federally recognized RTPOs to enhance the planning, coordination, and implementation of the long-range statewide transportation plan and STIP, with an emphasis on addressing the needs of nonmetropolitan areas of the State. Whether formally designated or not, regional rural planning partners can benefit state and local stakeholders. Sometimes, such organizations are also called Rural Planning Organizations (RPOs), and some states may refer to them as Regional Planning Affiliations, Regional Transportation Planning Agencies, or simply as general-purpose Councils of Governments or Regional Planning Commissions who have a rural transportation planning program. They generally exist to assist state DOTs with completing their requirements for statewide planning in rural areas and to enhance the outreach conducted to local officials and the public.

This issue brief will discuss benefits of EVs, policy framework, and case studies on coordination between States DOTs and RTPOs/RPOs.

To prepare this brief, NADO Research Foundation staff reviewed United States Department of Transportation website, Transportation Research Board publications, and several state

departments of transportation (DOT) electric vehicle infrastructure plans and regional agency documents.

Benefits of EVs

Electric cars offer a number of environmental benefits compared to traditional gasoline-powered vehicles. These benefits are important in the context of climate change and air pollution, both of which have significant negative impacts on human health and the environment. The most significant benefits of electric cars are their ability to reduce greenhouse gas emissions. Unlike gasoline-powered cars, which emit carbon dioxide and other harmful pollutants, electric cars produce zero emissions while driving. Even when taking into account the emissions from power plants generating the electricity used to charge electric cars, studies have shown that electric cars emit significantly less greenhouse gases than their gasoline-powered counterparts.[3]

One of the touted benefits of electric vehicles is that they reduce local air pollution. They're not just better for the climate, they clean up our air too. Electric cars produce no tailpipe emissions, which can reduce levels of harmful pollutants like nitrogen oxides, particulate matter, and volatile organic compounds. This can have significant health benefits for people including reduced rates of respiratory illness and cardiovascular disease. Electric cars can also help to reduce reliance on fossil fuels, which are a finite resource and a major contributor to climate change. By using electricity as a fuel source, electric cars can tap into renewable energy sources like wind and solar power, reducing the need for non-renewable sources like oil and natural gas. This can help to create a more sustainable energy system and reduce the environmental impact of transportation.[4]

EV 101

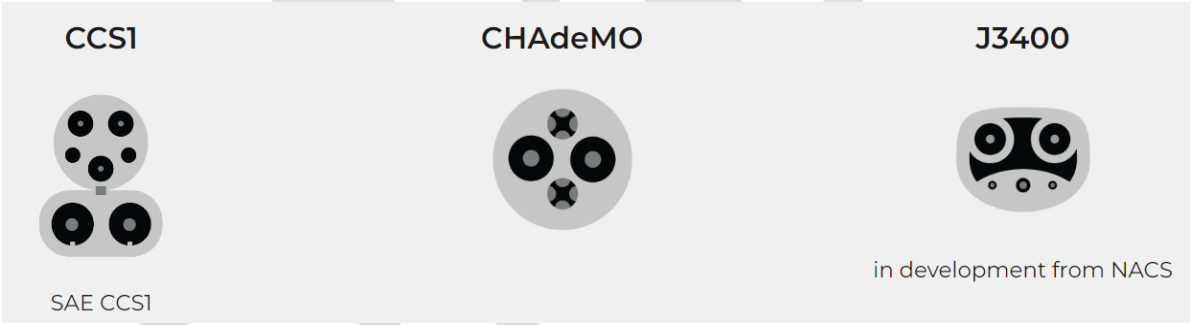
There are three types of Electric Vehicles: Hybrid Electric Vehicles (HEVs); Plug-In Hybrid Electric Vehicles (PHEVs); and Battery Electric Vehicles (BEVs) also referred to as All-Electric Vehicles (EVs). PHEVs and BEVs are known as Plug-In Electric Vehicles (PEVs) and are reliant on the electric charging network. Charging equipment for PEVs is classified by the rate at which the batteries are charged, as described in the table below. Charging times vary based on how depleted the battery is, how much energy it holds, the type of battery, and the type of charging equipment (e.g., charging level and power output).[5]

Charging Infrastructure Levels	Description of Charging Infrastructure
Level 1 Charging	This is the standard wall outlet of 120 volts. It is the slowest charge level and requires tens of hours to fully charge an all-electric vehicle

Charging Infrastructure Levels	Description of Charging Infrastructure
	and several hours for a plug-in hybrid.
Level 2 Charging	Level 2 is the typical EV plug found in homes, garages, and most public charging stations. Recreational vehicle (RV) plugs are also considered level 2 chargers. Level 1 and 2 charging stations should typically be located where vehicle owners are highly concentrated and parked for long periods of time.
Level 3 Charging	Direct-Current Fast Charging are ideal for highway corridors and town centers as they can charge a car in about 30-60 minutes.

Source: State of Michigan Community EV Toolkit
Description of three types of charging infrastructure

The connector types are not standardized in the U.S., and currently there are three types available in the market: Combined charging station or CCS, CHAdeMO (an abbreviation for *charge de move* meaning "charge for moving"), and North American Charging System or NACS (developed by Tesla and available for use by other vehicles beginning in 2022). CCS is the most used type.



Source: Joint Office of Energy and Transportation; https://driveelectric.gov/charging-connector
SAE J3400 Charging Connector

Policy Framework and Partnership Opportunities

The Infrastructure Investment and Jobs Act (IIJA, also known as the Bipartisan Infrastructure Law, or BIL) includes a total of up to $7.5 billion in dedicated funding to help make electric vehicle (EV) charging stations accessible to all Americans for local and long-distance trips. That funding includes a $5 billion National Electric Vehicle Infrastructure (NEVI) Formula Program that helps states create a network of EV charging stations. The NEVI grant provides states formula funding to support the installation of publicly accessible chargers, with the aim of building out a network of corridors with consistent highway access to EV charging.[6]

Federal Highway Administration's (FHWA) Alternative Fuel Corridor (AFC) designations that started in 2016 have catalyzed the expansion of a national corridor network of EV charging stations along over 75,000 miles (or 33 percent) of the National Highway System (NHS), including nearly 45,000 miles of the Nation's Interstate System (92 percent). All 50 States plus Washington, DC, and Puerto Rico have one or more designated EV corridors. The designation of AFCs has grown in importance because it is now tied to funding provisions under BIL. The BIL established the NEVI Formula Program and the Charging and Fueling Infrastructure (CFI) Discretionary Grant Program, both of which provide eligibility based on AFC designations.[7]

The Clean Cities and Communities Coalition is a U.S. Department of Energy (DOE) partnership to advance clean transportation nationwide. More than 75 DOE-designated Clean Cities and Communities coalitions work locally in urban, suburban, and rural communities to strengthen the nation's environment, energy security, and economic prosperity. As partners with DOE's Vehicle Technologies Office (VTO), coalitions deploy affordable, efficient, and clean transportation fuels; energy efficient mobility systems; and other fuel-saving technologies and practices. Clean Cities and Communities coalitions are composed of businesses, fuel providers, vehicle fleets, state and local government agencies, and community organizations. Each coalition is led by an on-the-ground coalition director who tailors projects and activities to capitalize on the unique opportunities within their communities. Nationwide, nearly 20,000 stakeholders are part of Clean Cities and Communities coalitions, and through their collective efforts they are transforming local and regional transportation markets.[8]

The National Association of Truck Stop Operators, which represents America's travel plazas and truck stops, and ChargePoint have partnered to build a network of EV charging stations at truck stops and travel plazas across the United States. They aim to install electric vehicle supply equipment (EVSE) at 4,000 truck stops, travel plazas, and fuel retailers by 2030. FHWA's Alternative Fuel Corridor network serves as a roadmap for these partners to identify gaps in EV infrastructure along corridors and to target EV infrastructure installations in those locations.[9]

The U.S. Environmental Protection Agency's (EPA) Regional Diesel Collaboratives work to reduce diesel emissions through strategies like fuel efficiency, alternative fuels, and electrification. These collaboratives involve public-private collaboration to share information, plan projects, leverage funding, and promote the use of vehicles, vessels, and equipment that can use alternative fuels. The five Regional Diesel Collaboratives cover much of the United States and may be able to connect rural entities with partners to pursue EV infrastructure projects, particularly around medium- and heavy-duty vehicles.[10]

Some states, tribal, environmental, and energy agencies are conducting planning specific to transportation, including planning for electric vehicles. State- and Tribal-level EV implementation plans can be an important source of information on planned locations for EV infrastructure or gaps in an existing charging network. Also, Atlas Public Policy is planning to launch the NEVI dashboard showing locations of the planned and operating NEVI stations soon.[11]

State DOTs and Tribal departments or divisions of transportation are offering some technical and funding resources to support electric vehicle charging infrastructure as well as construction contracting oversight or other partnering roles. FHWA's Congestion Mitigation and Air Quality Improvement (CMAQ) Program apportions funding to State DOTs by statutory formula for projects that improve air quality and provide congestion relief. FHWA's Tribal Transportation Program has direct funding agreements with 135 federally recognized Tribes to provide safe and adequate transportation and public road access to and within Tribal lands in the United States. State and Tribal DOTs also play a central role in planning and supporting EV infrastructure deployment. Many either lead or support the process in their State or Tribal Lands for nominating NHS corridors for designation under the FHWA AFC program.[12]

Many Tribes, States, and regions of the country are participating in partnerships and initiatives concentrated on EVs. These groups may focus on improving air quality generally, developing or advocating for State-level, inter-tribal or regional policies to encourage adoption, or partnering on the deployment of EV charging infrastructure.[13]

Source: IStock.com/JOHN_M_CHASE

Like their statewide and multistate partners, Tribal, local, and regional planning organizations play a key role in connecting stakeholders, identifying available funding, and providing technical assistance. Clean Cities coalition organizations comprise a national network of affiliated local, State, or regional stakeholder groups that provide both technical assistance at all project stages and access to local partners for EV infrastructure projects. Planning agencies accept input from stakeholders to develop transportation plans for the coming years, providing opportunities to

coordinate potential EV infrastructure projects throughout a region or State. Frequently programmatic funding flows through these planning agencies to such projects. These organizations also provide critical guidance to communities who are new to navigating the planning and funding process.

Institutions of higher education like colleges and universities—including Tribal Colleges, historically Black colleges and universities, and Hispanic-serving institutions—as well as technical and vocational schools can also serve as valuable resources and potential project partners. Many have developed next generation training curriculums providing workforce education on EV repair, emergency response, and EVSE installation and servicing.[14]

Electric utilities are responsible for the delivery of electricity to homes and businesses, including metering, billing, and customer service. Accordingly, utilities play an essential part in the rollout of EV charging infrastructure, and they are among the first partners that should be contacted when considering any EVSE installations. Some coordination with the local utility, including Tribal utilities, is necessary in almost all charging station installations, and a need for deeper coordination is even more likely in rural areas, where the infrastructure may be less robust. High-capacity EVSE installations are more likely to require coordinated upgrades to existing electrical services.[15]

National Electric Vehicle Infrastructure Plans

The National Electric Vehicle Infrastructure (NEVI) Formula Program created under BIL apportions a total of $5 billion to States over five years, from Fiscal Years 2022-2026, to strategically deploy EV charging infrastructure and to establish an interconnected national network to facilitate station data collection, access, and reliability. Program funds can be used for the acquisition, installation, network connection, operation, and maintenance of EV charging stations, as well as long-term EV charging station data sharing.[16]

> *23 CFR 680.112- States must include in the State EV Infrastructure Deployment Plan a description of the community engagement activities conducted as part of the development and approval of their most recently submitted State EV Infrastructure Deployment Plan, including engagement with Disadvantaged Communities (DACs).*

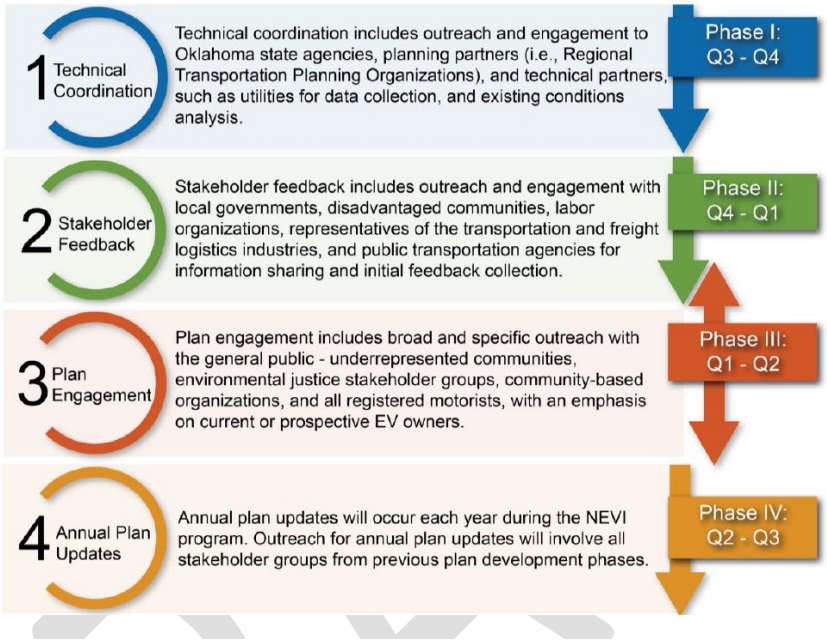
[17]

Initially, funding under this program is directed to previously designated AFCs where EV charging will be built out into a national network, with DC fast chargers every 50 miles along the AFC and within a 1-mile travel distance of the corridor itself. Once a State's AFC network is fully built out with charging, funding may be used on any public road or in other publicly accessible locations as identified through local planning.

To qualify for NEVI funding, each State is required to develop and submit a State EV Infrastructure Deployment Plan describing how the State intends to use its apportioned NEVI Formula Program funds in accordance with program guidance. No State may obligate its

apportioned NEVI Formula Funds for EV charging infrastructure projects until that State's Plan has been submitted to the Joint Office and approved by FHWA. Because NEVI Formula Program funds are directed to designated Alternative Fuel Corridors to build out a convenient, affordable, reliable, and equitable public charging network, States should first prioritize investments along the Interstate Highway System.

Figure 3: Annual Public Engagement Process



Source: Oklahoma NEVI Plan, August 2023 Plan Update
ODOT's public engagement process includes four key phases – Technical Coordination, Stakeholder Feedback, Plan Engagement, and Annual Plan Updates.

Tax Incentives

Tax incentives for EVs play a vital role in promoting their adoption by reducing the overall financial burden on customers, promoting environmental sustainability, stimulating economic growth, and enabling more equitable access to new technologies. There are several federal, state and local incentives available for consumers to consider as they calculate the potential benefits of purchasing an EV.[18]

IRS Federal tax incentive: EV charging infrastructure installed through December 31, 2032, is eligible for a tax credit of 30 percent of the cost, not to exceed $100,000. Eligible fueling equipment must be installed in census tracts where the poverty rate is at least 20 percent, or the median family income is less than 80 percent of the State median family income level (https://www.anl.gov/esia/refueling-infrastructure-tax-credit). Consumers who purchased qualified residential charging equipment prior to December 31, 2032, may receive a tax credit of up to $1,000.[19]

Clean vehicle tax credits: Taxpayers who purchase an eligible vehicle may qualify for a tax credit of up to $7,500 for qualified new vehicles and up to $4,000 for qualified pre-owned vehicles. Eligibility for the clean vehicle tax credit is based on a number of requirements for new and pre-owned vehicles including income and vehicle requirements.[20]

Alternative Fuel Vehicle Refueling Property Credit (Charging infrastructure): With the purchase of EV charging equipment for a principal residence, there is a tax credit available for the costs of charging equipment. This credit is generally 30% of the item's cost, up to $1,000. Eligibility is based on the installation location being in an eligible census tract.

Individual state-level tax incentives vary, but some include California's clean vehicle rebate supporting clean vehicle adoption in California by offering rebates from $1,000 to $7,500 for the purchase or lease of new, eligible zero-emission vehicles, including electric, plug-in hybrid electric, and fuel cell vehicles[21]; and New York's drive clean rebate offers electric car buyers a rebate of up to $2,000 for new car purchases or leases.[22]

Examples of local incentives could include utility rebates, charging station grants, and utility partnerships.

Case Studies

Case Study #1: EV infrastructure focused tasks, First Tennessee Rural Planning Organization (FTRPO), Tennessee

The First Tennessee Rural Planning Organization (RPO) is housed within the First Tennessee Development District, which is one of nine Development Districts in Tennessee. FTRPO was formed in 2005 to enhance state and regional-level partnerships in rural areas for transportation planning purposes. The FTRPO scope of work included a new task for FY2023-FY2024 focused on EV infrastructure under the TDOT/RPO work program.[23]

As part of this, FTRPO has been continuing EVSE deployment partnerships with Tennessee Technical University as part of their Rural Reimagined program which works to connect science and technology for the benefit of rural regions. As part of this initiative a project entitled 'Building an EV Ecosystem and Green Economy for Transforming Lives in Economically Distressed Appalachia' was created.[24]

Through this partnership, FTRPO is working on the following regional initiatives: 1) Multi-layer Charging Infrastructure Development 2) EV Acquisition and Demonstration 3) Data Collection and Analysis 4) Information Exchange, Outreach and Education 5) Workforce Training and Economic Development.

FTRPO administered funding for the Town of Mountain City to host an EV level 2 charging: JuiceBox at both City Hall, and also in rural Johnson County at the Doe Mountain Recreation Authority. First Tennessee Development District is currently in development efforts to install level 2 electric vehicle chargers to establish an electric vehicle fleet at their workplace through Rural Reimagined[25], along with EMPOWER[26], a workplace charging program offered through East Tennessee Clean Fuels. RPO staff

remain actively involved with education and outreach on behalf of TDOT's TEVI (Tennessee Electric Vehicle Infrastructure) Plan.[27]

Case Study #2: Mid-Columbia Economic Development District (MCEDD), Oregon

MCEDD serves 5-counties in the bi-state region of Oregon and Washington. MCEDD assisted Grass Valley Country Market in Sherman County, which is a high-use corridor along Highway 97, in receiving funding for the design and installation of a Level 2 electric vehicle charging station at the Market.[28]

This project brings opportunities for Sherman County's rural community to utilize the benefits of EVs both by supporting more widespread adoption of EVs locally and promoting Grass Valley's general economy by drawing travelers to local businesses and attractions while their EV charges up at the market. Funding for this grant was provided by the Oregon Clean Fuels Program, which is administered by the State's Department of Environmental Quality. This is an electric mobility grant provided by the Pacific Power company. This grant program covers costs associated with studying, planning, promoting, or deploying electric transportation technology and funds are intended to support projects that advance electric transportation in underserved communities, including areas without ample access to public charging.[29]

Other groups such as Wy'East Resource Conservation & Development Council and Sustainable Northwest have been involved with clean energy projects. Several 'Electrifying our Farms' (E-Farms) efforts which brought electric tractors to farms to demonstrate and evaluate the new technology have been successful over the years. Through Sustainable Northwest's E-Farms program, several electric tractors, pickup trucks, and other electric equipment for farms, forests, and ranches have been purchased, tested and utilized for demonstration.[30]

Case Study #3: Regional Charging & Fueling Infrastructure Proposal, Michiana Area Council of Governments (MACOG), Indiana

MACOG region is located in Northern Indiana and consists of Elkhart, Kosciusko, Marshall, and St. Joseph counties. Two of the four counties (St. Joseph and Elkhart Counties) border Michigan. There are 35 towns in the Michiana Area. In 2019, MACOG sent out a survey to the cities and counties to gauge interest in EV charging stations. Based on the survey results, MACOG assisted with the submission of an application for Volkswagen Settlement funding. This successful application provided funding for 4 out of 10 Level 2 charging stations to be installed in rural areas of the MACOG region, in Culver, Plymouth, and Warsaw.[31]

During 2023, MACOG solicited interest in applying for the federal Charging and Fueling Infrastructure Discretionary Grant Program (CFI Program). As a result of this application, MACOG received $4.2 million to address gaps in electric vehicle charging infrastructure in rural areas and disadvantaged communities. The project will construct 14 Level 2 stations in rural areas, 18 in urban areas, as well as three Level 3 charging stations at the South Bend International Airport and along US-30 in Plymouth and Warsaw. MACOG and the Clean Cities coalition organization, Drive Clean Indiana, will assist with implementing and tracking the projects to capture lessons learned and best practices for local government fleet electrification projects.[32]

Summary

EVs are becoming increasingly viable in rural areas for both personal and commercial uses. Collective efforts to address concerns about electric vehicle charging at a systematic level are producing benefits for both EV adoption and long-term support for current owners. Several successful pilot programs demonstrating the utility of electrified fleet and farm vehicles show unrealized potential to revolutionize the way goods and produce are transported between farms and marketplaces in the United States. Programs focused on incentivizing the adoption of electrified transportation technologies and the supporting infrastructure needed will assist in the realization of the environmental, financial, and societal benefits these technologies stand to offer.

Resources

https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/contacts/
https://afdc.energy.gov/fuels/electricity-ev-readiness
https://narc.org/state-associations/
https://www.atlasevhub.com/materials/state-ev-registration-data/
https://www.driveelectricusa.org/
https://driveelectricweek.org/
https://www.chargie.com/
https://rmi.org/insight/smarter-modes-calculator-smarter-mobility-options-for-decarbonization-equity-and-safety/
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https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-planning/planning-types
https://www.energy.gov/local-fuel-savings
U.S. DOT Resilience Coalition Summary of Findings
Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT)

List of Acronyms

AFC- Alternative Fuel Corridor
BEVs- Battery Electric Vehicles also referred to as All-Electric Vehicles (EVs).
CCS- Combined charging station
CFI- Charging and Fueling Infrastructure
CHAdeMO- charge de move meaning “charge for moving”
CMAQ- Congestion Mitigation and Air Quality Improvement Program
Connector- Plugs into a corresponding vehicle charging inlet and makes an electrical connection to charge the EV. Connectors are sometimes also called plugs.
DCFC- Direct-Current Fast Charging
DOE- Department of Energy
EPA- Environmental Protection Agency
EV charging station location- A site with one or more charging ports at the same address.
EVSE- electric vehicle supply equipment
FHWA- Federal Highway Administration’s
HEVs- Hybrid Electric Vehicles
Infrastructure Investment and Jobs Act (IIJA, also known as the Bipartisan Infrastructure Law, or BIL
NACS- North American Charging System (developed by Tesla and available for use by other vehicles beginning in 2022)
NEVI- National Electric Vehicle Infrastructure
PHEVs- Plug-In Hybrid Electric Vehicles
PEVs-Plug-In Electric Vehicles

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