CHARGING FORWARD

A TOOLKIT FOR PLANNING AND FUNDING RURAL ELECTRIC MOBILITY INFRASTRUCTURE

VERSION 2 MAY 2023

U.S. Department of Transportation

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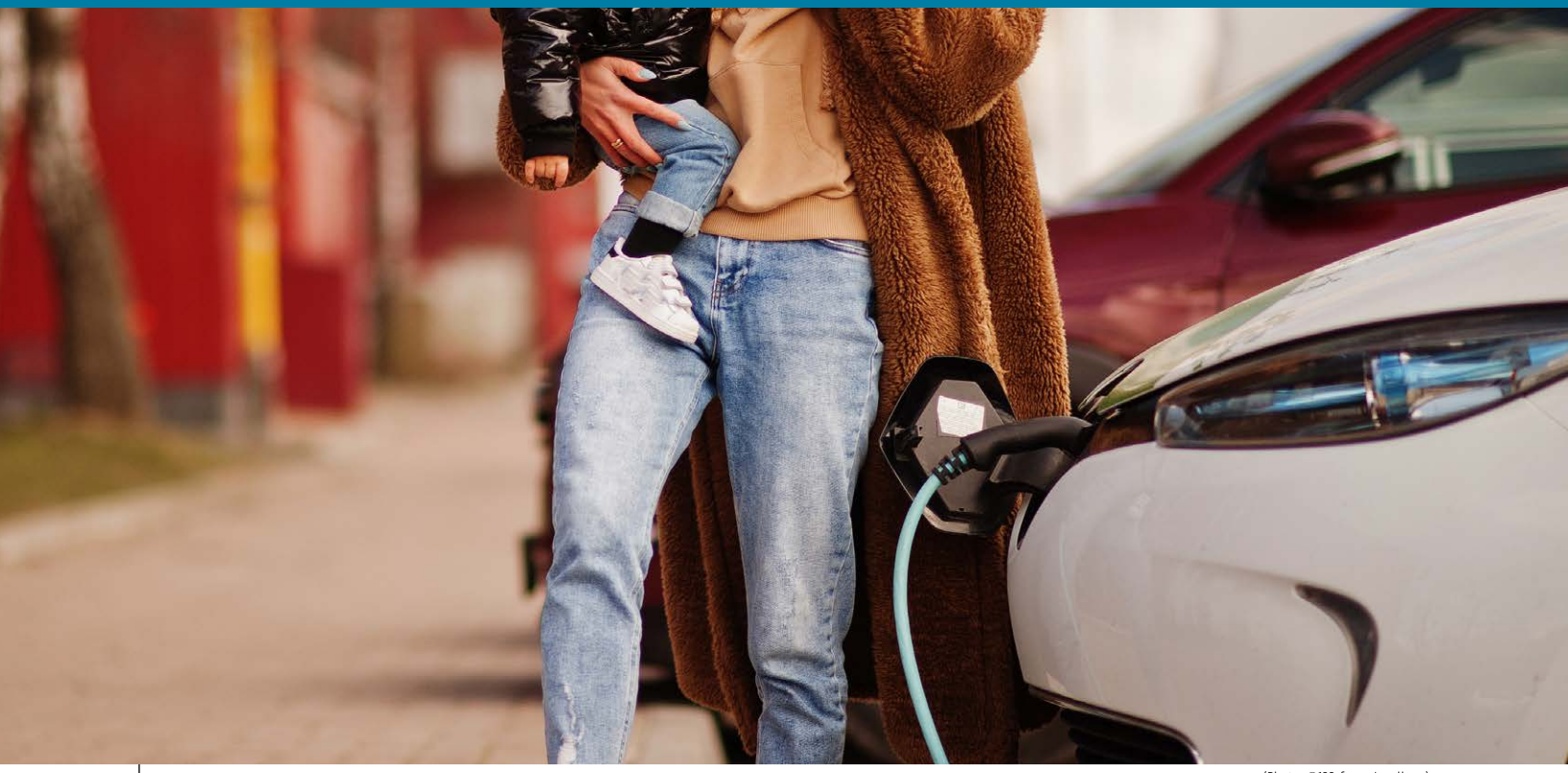
(Cover photo: USDOT)

SECTION ONE

INTRODUCTION



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The rapid growth in electric vehicles (EVs) today is part of a fundamental shift in consumer preference toward cleaner and more affordable mobility options, a change that promises substantial economic, public health, and environmental benefits to individuals, businesses, communities, and the entire Nation. All Americans, regardless of where they live, should have the opportunity to benefit from the lower operating costs, reduced maintenance needs, and improved performance that EVs provide. All communities—including communities of color, Tribal

communities, underserved communities, and environmental justice communities—should have access to the economic opportunities and improved mobility and air quality that EVs offer. The entire Nation will benefit from the successful nationwide adoption of EVs as one important element in the Federal Government's strategy to eliminate climate-related emissions from transportation, including through investments in electric transit and micromobility as well as pedestrian networks to give Americans real choices in how to travel.

EVs WILL HELP RESIDENTS OF RURAL AREAS REDUCE COSTS AND MINIMIZE THE ENVIRONMENTAL IMPACT OF TRANSPORTATION

In rural parts of the country—home to 20 percent of Americans and almost 70 percent of America's road miles—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.

The Federal Government has set a goal to make half of all new vehicles sold in the U.S. in 2030 zero-emissions vehicles, and to build a convenient and equitable network of 500,000 EV charging stations to help make EVs accessible to all Americans for both local and long-distance trips. On November 15, 2021, President Biden signed the Bipartisan Infrastructure Law (BIL), also referred to as the Infrastructure Investment and Jobs Act, which contains $7.5 billion in new funding for EV charging stations, makes EV charging infrastructure eligible for additional Federal funding programs, and provides funding for numerous other EV-related initiatives. This funding will benefit rural communities across the country by providing a ready source of capital for EV infrastructure projects. More recently, on August 16, 2022, President Biden signed the Inflation Reduction Act (IRA), which will be the largest investment in addressing climate change U.S. history and includes several funding programs and tax credits for EVs and EV charging infrastructure.

Publicly accessible charging stations will play a key role in achieving a large-scale national transition to EVs. While most drivers of personal EVs will primarily charge their vehicles at home and at work, many individuals and businesses will also depend on public charging, micromobility, and transit. Various electric mobility solutions are needed to better serve renters, residents of multifamily housing, visitors, individuals without personal vehicles, and EV drivers without access to chargers at home. For EV users, increasing the availability of affordable public charging, including at community and cultural sites, will help give rural Americans—and anyone who travels in rural America—the confidence that they will be able to recharge when and where they need to, just as reliably as they can refuel a conventional vehicle today.

While there is significant information available on how to plan and develop EV charging stations, these resources are spread across Federal agencies and do not specifically address the unique needs of rural communities. Similarly, funding programs for EV infrastructure are distributed across numerous Federal and State agencies, making it difficult for rural stakeholders to determine which programs they are eligible for.

This toolkit is meant to be a one-stop resource to help rural communities scope, plan, and identify ways to fund EV charging infrastructure. A rural organization or individual—such as a property owner, business, town, Tribe, or planning or transit agency—can use the toolkit to identify key partners for a project, take advantage of relevant planning tools, and identify available funding or financing to help make that project a reality.

Armed with the resources in this toolkit, rural communities will have the tools and information they need to start planning and implementing EV infrastructure projects and ultimately realize the benefits of electric transportation.

PROGRESS TOWARD EV READINESS

To prepare for the growing number of EVs on the road, State, Tribal, and local leaders can advance their communities' EV readiness by developing EV-related infrastructure, policies, and services. While the path to installing and operating EV chargers varies across States, Tribal Lands, and utilities, to date, several organizations and initiatives have made strides in advancing EV readiness in rural communities across the United States. In addition, the Federal Highway Administration (FHWA) has approved formal plans submitted by all States, the District of Columbia, and Puerto Rico for their use of allocated National Electric Vehicle Infrastructure (NEVI) funds, created under BIL, to build out EV charging infrastructure along major corridors. Other organizations have developed related tools and guidance, like the U.S. Department of Energy's (DOE) compilation of readiness planning resources for communities.

States are also collaborating to improve regional EV readiness, as seen in the revised 2019 Regional Electric Vehicle (REV) West memorandum of understanding. More recently, in 2021, the Western Governors' Association released its *Special Report of the Electric Vehicles Roadmap Initiative* to improve the planning and implementation of EV infrastructure projects in Western States.

Still, as concluded in the 2021 National Association of State Energy Officials (NASEO) *Electric Vehicle Charging Needs Assessment* for the intermountain west region, further EV readiness in rural communities requires ongoing coordination among local governments, transportation planning agencies, electric service providers, and other stakeholders. For instance, State, Tribal, and local governments may need to work together to further develop the rural EV workforce for EV maintenance and charging installation.

Funding and innovative financing opportunities for EV-related initiatives also continue to develop. Many States and utilities offer funding and financial incentives for EV infrastructure, showing a continued commitment to EV readiness. There is also growing support at the Federal level: the White House formally affirmed its support in April 2021 for accelerated deployment of EVs and charging stations. Additionally, the 2021 BIL contains significant new Federal funding for EV charging stations as well as provisions for a new interagency Joint Office of Energy and Transportation, which combines resources and expertise from USDOT and DOE to provide guidance and technical assistance to States, Tribes, and localities in the planning and implementation of a national EV charging network and the deployment of electric school buses. Funding and financing opportunities from several U.S. government agencies, including programs created through the BIL, are discussed in *Section 6: EV Infrastructure Funding and Financing for Rural Areas*.

TOOLKIT OVERVIEW

This toolkit is intended for a variety of rural entities, including States, local communities, Tribes, transportation providers, nonprofits, businesses, and individuals. While the toolkit includes some resources

for individuals interested in charging their personal EVs at home, the majority of information in this toolkit is most relevant to rural entities seeking to install charging stations for broader public or private use.[1] The toolkit focuses on infrastructure for light-duty electric passenger vehicles (such as sedans, sport utility vehicles, and pickup trucks), but also addresses funding opportunities and planning considerations for other types of electric vehicles and devices, including micromobility, transit and school buses, medium- and heavy-duty vehicles, and agricultural equipment such as tractors. As such, this toolkit generally uses the term "EV" to refer to light-duty electric passenger vehicles and clarifies where applicable when "EV" refers to other types of electric vehicles (e.g., electric buses).

1 Public charging stations allow the general public to charge their EVs. In contrast, private charging stations have restricted access. For example, a charging station installed at a workplace is private if only employees can charge but public if it is available for visitors, community members, and other EV drivers to use as well.

This toolkit covers the stages of EV infrastructure development in the following sections:

- **Section 2: Electric Mobility Basics** provides a brief overview of types of EVs; the three levels, or speeds, of charging stations; and an overview of electric micromobility and electric transit.
- **Section 3: Benefits and Implementation Challenges of Rural Vehicle Electrification** introduces the benefits to rural communities and individuals associated with EVs and EV charging infrastructure, as well as some of the challenges and evolving strategies for rural communities to be able to realize those benefits.
- **Section 4: Partnership Opportunities** discusses key partners and stakeholders for rural EV infrastructure projects, including regional and local coalitions, planning and transit agencies, utilities, Tribal Governments, and site hosts.

(Photo: ©123rf.com/audreywang5)

- **Section 5: EV Infrastructure Planning for Rural Areas** summarizes the different scales of EV infrastructure planning, provides a walk-through of the key technical considerations in planning a new charging installation, including for transit and micromobility, and discusses methods to support an equitable planning process.
- **Section 6: EV Infrastructure Funding and Financing for Rural Areas** provides information on Federal funding programs and other funding-related resources that may reduce the financial burden of implementing EV infrastructure. At the end of this section, a **Rural EV Infrastructure Funding Table** provides a comprehensive list of Federal funding programs applicable to different types of rural EV charging projects.
- **Appendix A: Resources for EV Infrastructure Planning** provides an annotated list of planning support tools and other resources, and **Appendix B: Environmental Statutes and Executive Orders** discusses regulations relevant to EV infrastructure planning.

Sidebars throughout the document provide relevant examples and highlight key concepts.

Many of the activities described in this toolkit can—and often do—happen in parallel, so the user can expect to jump between sections as needed. Toolkit users are encouraged to treat this document not as a sequential list of instructions, but as a constant companion in the process of completing a project.

SECTION TWO

ELECTRIC MOBILITY BASICS

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Electric mobility includes light-duty automobiles, medium- and heavy-duty electric vehicles, electric micromobility devices, and transit vehicles. The EV market is evolving rapidly, with models available in a range of vehicle types, from compact cars and sedans to sport utility vehicles (SUVs) and pickup trucks. Some EVs operate solely on batteries, while others are plug-in hybrid models with both an electric motor and an internal combustion engine. This section provides an overview of the various types of EVs and types of charging infrastructure, with information pertaining to

light-, medium-, and heavy-duty electric vehicles, including battery electric buses (BEBs) used in transit applications, electric school buses (ESBs), and electric micromobility such as electric bicycles (e-bikes).

VEHICLE TYPES

There are three types of electric vehicles available on the market:

- **Battery electric vehicles (BEVs)**—also referred to as "all-electric vehicles"—run on electricity only and are recharged from an external power source. They are propelled by one or more electric motors powered by rechargeable battery packs. Almost all new BEVs can travel at least 100 miles on a charge, and many new vehicles coming on the market offer an all-electric range of 200-300 miles or more. Included among BEVs are battery-powered buses, such as BEBs and ESBs.
- **Plug-in hybrid electric vehicles (PHEVs)** also use batteries to power an electric motor and can be recharged from an external power source, but they incorporate a smaller internal combustion engine that can recharge the battery (or in some models, directly power the wheels) to allow for longer driving ranges. PHEVs can usually drive moderate distances in "EV mode" using only the battery, typically from 20 to 50 miles in current models. This significantly reduces their gasoline use and emissions for shorter trips. PHEVs use 14 to 47 percent less fuel than conventional vehicles if their batteries are fully charged. When electricity is unavailable, PHEVs can run on conventional fuel (i.e., gasoline or diesel).
- **Fuel cell electric vehicles (FCEVs)** use a highly efficient electrochemical process to convert hydrogen into electricity, which powers an electric motor. FCEVs on the market today are not designed for recharging their battery from an external source. Rather, they are fueled with compressed hydrogen gas that is stored in a tank on the vehicle.

This toolkit uses the term "EV" to refer to both BEVs and PHEVs,[2] since these vehicles can be recharged from external sources and are capable of operating with zero tailpipe emissions. This toolkit focuses primarily on EVs that are BEVs and PHEVs; it does not address FCEVs unless otherwise noted.

THE EV MARKET IS EVOLVING RAPIDLY, WITH MODELS AVAILABLE IN A RANGE OF VEHICLE TYPES, FROM COMPACT CARS AND SEDANS TO PICKUP TRUCKS. THIS SECTION PROVIDES AN OVERVIEW OF THE VARIOUS TYPES OF EVS AND TYPES OF EV CHARGING INFRASTRUCTURE.

CHARGER TYPES AND SPEEDS

EVs can be charged using electric vehicle service equipment (EVSE) operating at different charging speeds. **Level 1** equipment provides charging through a common residential 120-volt (120V) AC outlet. Level 1 chargers can take 40-50+ hours to charge a BEV to 80 percent from empty and 5-6 hours for a PHEV. **Level 2** equipment offers higher-rate AC charging

2 Hybrid electric vehicles (HEVs), powered by a combination of an internal combustion engine with electric motors running off a battery pack for greater efficiency, have batteries that cannot be recharged from an external source, and are not considered EVs.

Figure 2.1. Level 2 chargers (left) are common in home, workplace, and public settings and can charge a BEV from empty in 4-10 hours. DCFC chargers (right) are common as public chargers and along highway corridors, and can charge a BEV to 80 percent in under an hour. (Photos: ©123rf.com/ flippo [left]; Washington State Dept of Transportation [top])

through 240V (in residential applications) or 208V (in commercial applications) electrical service, and is common for home, workplace, and public charging. Level 2 chargers can charge a BEV to 80 percent from empty in 4-10 hours and a PHEV in 1-2 hours. **Direct current fast charging** (DCFC) equipment offers rapid charging along heavy-traffic corridors at installed stations. DCFC equipment can charge a BEV to 80 percent in just 20 minutes to 1 hour. Most PHEVs currently on the market do not work with fast chargers. Level 2 and DCFC equipment has been deployed at various public locations including, for example, at grocery stores, theaters, or coffee shops. When selecting a charger type, consider its voltages, resulting charging and vehicle dwell times, and estimated upfront and ongoing costs. Figure 2.1 shows typical Level 2 and DCFC charging stations.[3]

Table 2-1 summarizes the typical power outputs, charging times, and locations for PHEVs and BEVs based on the different connector or charger types.[4] For more information on the power requirements of different chargers, see the *Utility Planning* section.

ELECTRIC MICROMOBILITY BASICS

Electric micromobility includes any small, low-speed, electric-powered transportation device, including electric-assist bicycles (e-bikes), electric scooters (e-scooters), and other small, lightweight, wheeled electric-powered conveyances.

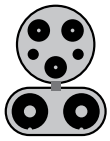
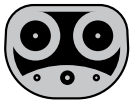
Electric micromobility devices are typically charged using common residential 120V AC outlets. Depending on micromobility device battery capacity and charger (cable or dock) specifications, charging times can range from 2.5 to 9 hours.[5]

3 Note that charging speed is affected by many factors, including the charger manufacturer, condition, and age; air temperature; vehicle battery capacity; and vehicle age and condition.

4 Because the last 10 percent of charging an EV battery can take as long as the first 90 percent, for longer trips, it can save time to charge part-way (e.g., 20 to 60 percent) and drive fewer miles between charges rather than recharge fully and drive more miles between charges.

5 An e-bike charging time calculator allows users to estimate charge duration based on battery capacity, level of discharge, and charger specification inputs.

Table 2-1. Overview of EV chargers: power output, plug type, and charge time for light-duty vehicles. (Adapted from Alternative Fuels Data Center)

	Level 1	Level 2	DC Fast Charging
Connector Type*	J1772 connector 	J1772 connector 	CCS connector  CHAdeMO connector  Tesla connector 
Voltage[6]	120 V AC	208 – 240 V AC	400 – 1000 V DC
Typical Power Output	1 kW	7 kW – 19 kW	50 – 350 kW
Estimated PHEV Charge Time from Empty[7]	5 – 6 hours	1 – 2 hours	N/A
Estimated BEV Charge Time from Empty[8]	40 – 50 hours	4 – 10 hours	20 minutes - 1 hour[9]
Estimated Electric Range per Hour of Charging	2 – 5 miles	10 – 20 miles	180 – 240 miles
Typical Locations	Home	Home, Workplace, and Public	Public

* Different vehicles have different charge ports. For DCFC, the Combined Charging System (CCS) connector is based on an open international standard and is common on vehicles manufactured in North America and Europe; the CHArge de Move (CHAdeMO) connector was a previous standard for Japanese manufactured vehicles. Tesla vehicles have a unique connector that works for all charging speeds, including at Tesla's "Supercharger" DCFC stations, while non-Tesla vehicles require adapters at these stations.

6 AC = alternating current; DC = direct current

7 Assuming an 8-kWh battery; most plug-in hybrids do not work with fast chargers.

8 Assuming a 60-kWh battery.

9 To 80 percent charge. Charging speed slows as the battery gets closer to full to prevent damage to the battery. Therefore, it is more cost- and time-efficient for EV drivers to use direct current (DC) fast charging until the battery reaches 80 percent, and then continue on their trip. It can take about as long to charge the last 10 percent of an EV battery as the first 90 percent.

Figure 2.2. Plug-in charging (left) charges at a low power (40 – 125 kW) (Source: NREL/DOE, Brian Foulds/Concord-Carlisle Regional School District). Overhead conductive charging (right) charges at a higher power level (165 – 600 kW). (Source: NREL/DOE, Margaret Smith/Akimeka

EV CHARGING MINIMUM STANDARDS RULE

FHWA, with support from the Joint Office of Energy & Transportation, unveiled new national standards for federally funded EV chargers in February 2023. These new standards aim to ensure that charging is a predictable and reliable experience for EV drivers. This includes ensuring that drivers can easily find a charger, do not need multiple apps and/or accounts to charge, chargers work when drivers need them to, and are designed to be compatible in the future with forward-looking charging capabilities.

The rule establishes minimum technical standards for charging stations, including required number of charging ports, connector types, power level, availability, payment methods, uptime/reliability, EV charger infrastructure network connectivity, and interoperability, among other standards and requirements.

ELECTRIC BUS BASICS

Similar to the BEVs discussed above, BEBs and ESBs run on electricity only and require recharging their onboard battery packs from an external power source.[10] BEBs are categorized as long-/extended-range or fast-charge depending on the size of their battery packs. Long-/extended-range BEBs have larger battery packs (250 – 660 kWh) and are meant to only be charged once or twice per day, whereas fast-charge BEBs have smaller battery packs (50 – 250 kWh) that can receive more frequent high-powered charges; ESBs generally fit into this category, as they tend to have shorter routes with a midday break for charging. The average range for BEBs and ESBs varies based on the battery pack capacity and is significantly impacted by weather, driving behavior of the operators, topography, and ridership load.

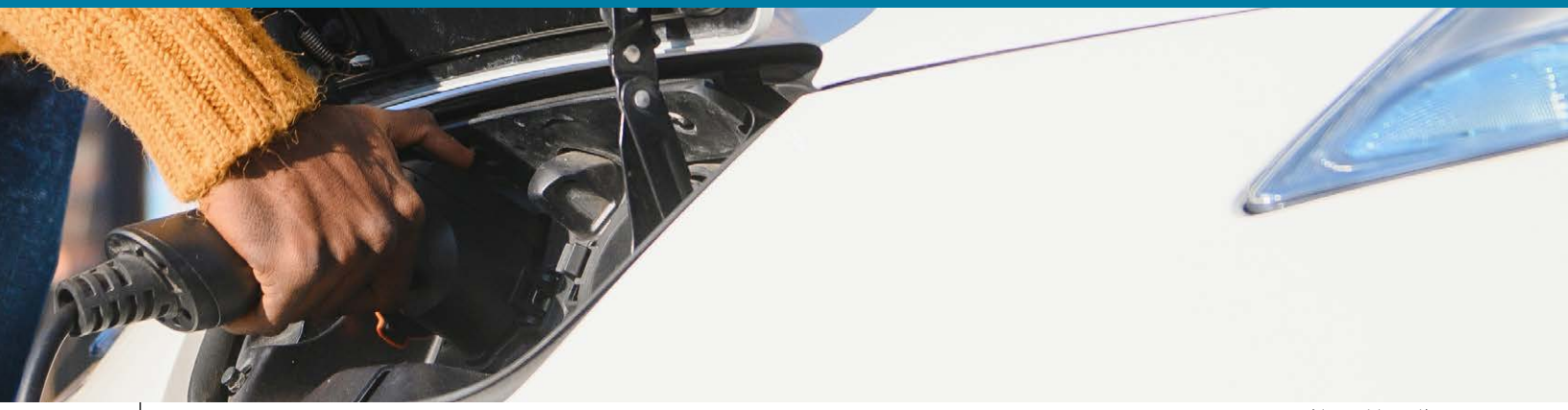
10 For more detailed information on BEBs, ESBs, and their charging infrastructure, see the Transit Cooperative Research Program's "Guidebook for Deploying Zero-Emission Transit Buses," the National Renewable Energy Laboratory's "Electrifying Transit: A Guidebook for Implementing Battery Electric Buses," and DOE's "Flipping the Switch on Electric School Buses" series.

There are three types of charging infrastructure for BEBs, all of which can be installed at the maintenance or storage facility (depot) or on-route:

- **Plug-in charging** has both AC and DC options to charge at a low power (40 – 125 kW). The number of buses accommodated will depend on the configuration of chargers and ports, which are often installed in depots as buses are generally charged for multiple hours or overnight. In rural areas where school buses are sometimes parked at drivers' homes, Level 2 chargers may be installed to allow for overnight charging. Larger batteries typical of BEBs (250 – 660 kWh) require long charging time at low power. There are a number of faster (up to 350 kW) plug-in charging solutions available for transit vehicles. Faster still plug-in charging options are under development, with a 1 MW standard introduced in summer 2022.
- **Overhead conductive charging,** also known as pantograph charging, requires physical contact with flow of current between an overhead charger and the onboard battery. Transit buses can be recharged in 5 – 20 minutes at a higher power level (165 – 600 kW). Currently, ESBs do not use this method of charging.
- **Wireless inductive charging** uses floor-mounted charging pads that are charged using a magnetic field passed through two coils and an onboard battery. This system uses a lower power level than conductive charging (50 – 250 kW), thus requiring a longer charge time.

SECTION THREE

BENEFITS AND IMPLEMENTATION CHALLENGES OF RURAL VEHICLE ELECTRIFICATION



(Photo: Adobe Stock)

Today, the rate of EV adoption in rural areas is roughly 40 percent lower than it is in urban areas, and EV charging infrastructure expansion has mostly been concentrated in cities and along major highways. Lower density and longer trips have resulted in urban-rural disparities in micromobility adoption as well. Closing these gaps will help rural residents, businesses, and communities more quickly realize the significant economic, environmental, and health benefits from EVs. This section

describes the benefits that EVs can provide to individual vehicle owners and to rural communities as a whole. It also discusses key challenges in implementing EV charging infrastructure in rural areas along with emerging solutions for overcoming these challenges. As emphasized in *Section 5: EV Infrastructure Planning for Rural Areas*, rural planners should work to ensure these benefits are equitably distributed across the community.

BENEFITS TO INDIVIDUALS

EVs offer numerous benefits to individual vehicle owners and businesses, including lower operating and maintenance costs, the ability to charge vehicles in a variety of locations, increasing range of vehicle options available, and the ability to provide a backup power source during outages or natural disasters.

LOWER VEHICLE FUEL AND MAINTENANCE COSTS

Although EVs can have a higher purchase price than similar gasoline- or diesel-fueled vehicles, their lower maintenance and fuel costs can yield significant savings for as long as an EV is owned. For most vehicle owners, these fuel and maintenance savings will more than make up for the higher purchase price and result in a lower total cost of ownership. Moreover, some automakers project the upfront costs of EVs will continue to decrease, reaching purchase price parity with conventional vehicles around 2025 to 2030.

EVs take advantage of the inherent high efficiency of electric motors, making the average EV 3.6 times more energy efficient than a similar conventional vehicle. EVs also use regenerative braking, which allows the vehicle to recapture energy when braking. Because EVs are more efficient than conventional vehicles, they use far less energy and, considering the lower cost of electricity compared to gasoline, have substantially lower operating costs. Efficiency for EVs is typically measured in **miles per gallon of gasoline equivalent (MPGe)**, which represents the number of miles a vehicle can travel using a quantity of electricity with the same energy content as a gallon of gasoline (33 kilowatt-hours [kWh]).[11] Most light-duty BEVs and PHEVs in electric mode can exceed 130 MPGe and can drive 100 miles consuming only 25–40 kWh. At the same time, EVs generally perform better than their conventional counterparts, with quicker and smoother acceleration, and better towing capacity, due to the fact that electric motors generate full torque at all revolutions per minute (RPMs) and EVs do not need a transmission.

EVs GENERALLY HAVE BETTER PERFORMANCE THAN THEIR CONVENTIONAL COUNTERPARTS, WITH HIGHER ACCELERATION, BETTER TOWING CAPACITY, AND SMOOTHER SPEED TRANSITIONS

While the cost of charging will depend on the cost of electricity in particular areas, the high fuel economy of EVs leads to lower fueling costs compared to gasoline or diesel vehicles. For example, the electricity required to drive an EV 15,000 miles in a year costs an average of $600, while the gasoline required to drive the same distance averages $2,700, representing a savings of over $2,100 per year.[12] Argonne National Laboratory's EVolution tool allows users to compare the expected fuel usage and costs of specific EVs and conventional

11 Electric vehicle efficiency can also be expressed as kilowatt-hours per 100 miles or miles per kilowatt-hour. This calculator enables easy conversion between these units of measure.

12 The analysis assumes 55% city driving and 45% highway driving, and fuel costs of $3.999/gallon.

gasoline vehicles based on gas and electricity prices in a given area. Lower fuel costs are especially beneficial in rural areas, where residents drive on average ten more miles per day than urban residents in vehicles that are, on average, larger and less fuel efficient. Largely due to these factors, rural drivers ultimately spend 44 percent more on gasoline and motor oil than urban drivers.

In addition to fuel savings, average maintenance and repair costs for an EV are up to 50 percent lower than a conventional vehicle, as EVs are free of many vehicle components that require regular maintenance (e.g., engine oil, spark plugs, air filter, transmission fluid). The use of regenerative braking also reduces brake maintenance costs. Altogether, these cost savings are particularly important for rural households for which transportation is a larger part of the household budget, as seen in Table 3-1. Rural drivers who switch to an EV could potentially save thousands of dollars in maintenance costs over the vehicle's lifetime.

Table 3-1. Average annual transportation expenditures of urban and rural households, 2020. (Source: Bureau of Labor Statistics)

	Urban	Rural
Mean annual household transportation expenditure	$9,822	$9,866
Transportation share of all annual household expenditures	15.7%	20.0%

READILY AVAILABLE FUELING INFRASTRUCTURE

EVs can be charged at home, as well as at workplaces, public facilities, grocery stores, businesses, and other locations that offer parking with EV chargers. While EV charging takes longer than refueling a vehicle with gasoline, convenient at-home, public facility, and workplace charging is sufficient to support most rural travel and eliminates the need to drive to a gas station that may be far away, saving time and money. In fact, more than 80 percent of EV drivers rely on home charging. Detached single-family residences with off-street parking and readily available standard power outlet access are common in rural areas and can easily accommodate EV charging. Micromobility devices frequently do not require dedicated charging infrastructure and may also be charged at home or at work. For longer trips, the growing number of publicly available fast-charging stations can provide a near-full charge (80 percent) in under an hour. Additionally, owners of public or private vehicle fleets can establish EV charging infrastructure for business use at their own office locations or fleet depots. Charging stations will become even more accessible to drivers in all parts of the country as BIL funding becomes available.

VEHICLE OPTIONS

The number of EV models for sale in the United States is growing at a rapid pace. In 2010, there was only one EV model on the market, while by 2022, that number had grown to 129 models (see Figure 3.1). The expanding EV marketplace includes a wide array of vehicle types and styles, including cars, SUVs, and light-duty trucks, at price points ranging from entry level to luxury models. This is in addition to a steeply growing number of options for electric motorcycles, micromobility, and transit buses. Full-size pickup trucks are the top-selling vehicles in States and Tribal Lands with large rural populations, whereas smaller cars and compact SUVs are most popular in highly urban States. Increased availability of full-size BEV pickup trucks starting in 2022 will provide rural drivers with EV technology in familiar and favored vehicle platforms. About 30 models of BEBs and 15 models of ESBs are available in the U.S. market as of summer 2022. For information on available EV models, see the DOE Alternative Fuel and Advanced Vehicle Search tool as well as the car finder page at Fueleconomy.gov.

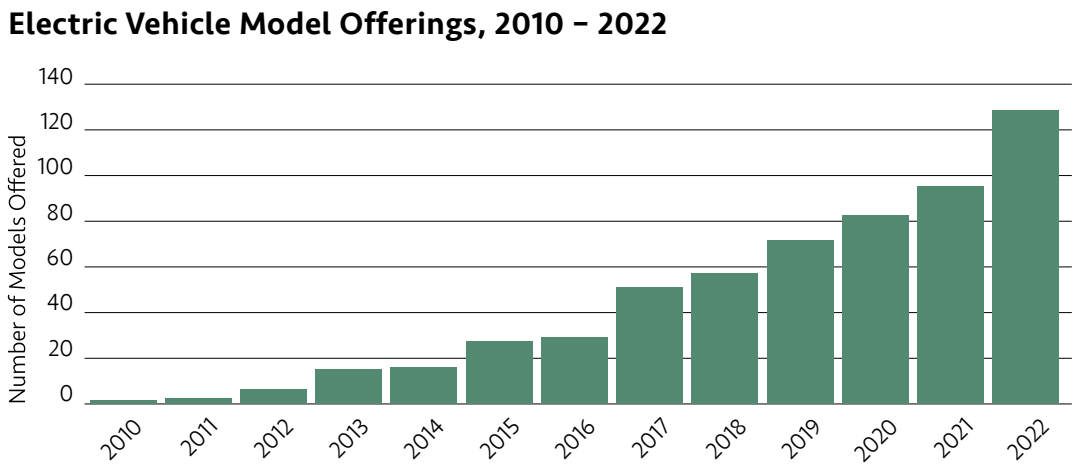


Figure 3.1. Light-duty electric vehicle models by year. EVs include BEVs and PHEVs. (Source: DOE Alternative Fuels Data Center)

RESILIENCE AND POWER ON THE GO

Some EVs can themselves serve as a power source for electrical tools, equipment, and lighting for commercial and recreational purposes. When coupled with bidirectional chargers, EV batteries can even power homes during blackouts and extreme weather events in place of diesel generators. While the amount of time that an EV could offer backup power depends on the size of the battery, at least one new model could power a house for up to three days based on daily average usage of 30 kWh. Several automakers are planning to release EVs with bidirectional charging capability beginning in 2022. EVs can be complementary to residential renewable energy generation like rooftop solar by providing battery storage capacity, acting as a backup power source for homes, and potentially selling energy back to the grid at high-demand times.

Shared micromobility such as bikeshare systems can also support resilience by providing redundancy and filling service gaps during unplanned infrastructure failures and planned repairs (e.g., during extreme weather- or pandemic-related transit closures).

BENEFITS TO COMMUNITIES

Electric vehicles—and the charging infrastructure that supports them—also offer benefits to rural communities. This includes economic development opportunities from offering people a place to charge their vehicles, workforce development, health benefits from improved air quality, and lower greenhouse gas (GHG) emissions.

ECONOMIC DEVELOPMENT

Given current limits on the range of EVs, those drivers may be especially attuned to the availability of charging stations along their routes and will plan their stops accordingly. Given the significant time required even when using fast charging infrastructure, EV drivers may also be inclined to combine their refueling stops with other activities, including visits to local stores, restaurants, casinos, parks, and attractions in the vicinity. Providing EV charging stations can thus enable rural communities to draw regional travelers driving EVs and to stay connected to the broader EV charging network, benefiting both local residents and outside visitors, as well as bringing in revenue for local businesses.

While it may require substantial investment in charging infrastructure to realize these outcomes, much of those costs can be covered by a variety of funding opportunities. Many public and private organizations offer grants, loans, or financial incentives to help individuals, businesses, and communities purchase both EVs and EV chargers. See *Section 6: EV Infrastructure Funding and Financing for Rural Areas* for

(Photo: Adobe Stock)

E-BIKES: ELECTRIC MOBILITY FOR SHORT TRIPS IN SMALL TOWNS AND ADJOINING RURAL AREAS

"Electric micromobility" refers to small, low-speed personal vehicles such as e-bikes and electric scooters, typically with an electric range of dozens rather than hundreds of miles. Since many trips in small towns and adjoining rural areas are short trips, and since e-bikes can plug into any 120V outlet (Level 1 charging), rural communities can immediately benefit from e-bikes even before they significantly invest in EVSE for electric passenger cars and trucks.

E-bikes can play a role in giving rural residents and visitors a new, fun, realistic choice for short trips, including trips on unpaved roads and, depending on local regulations, paths, and trails. E-bikes or scooters can also provide first- and last-mile connections to transit or intermodal transportation facilities for longer trips. Simple Level 1 chargers can be provided next to secure parking and bike repair tools at these facilities so that e-bikes are charged and ready for riders to use on their return trip. Depending on the community, bikeshare stations like those in rural Ohio, Kansas, or Alabama could also be rolled out to help residents, especially those unable to afford an e-bike, to make short trips between retail, school, medical, and other destinations.

information on Federal funding programs that could support entities in planning for and purchasing EV charging infrastructure.

HEALTH BENEFITS

The tailpipe emissions from internal combustion engine vehicles cause air pollution, which leads to adverse health impacts. BEVs run with zero tailpipe emissions, while HEVs and PHEVs produce some emissions when they operate on gasoline, but less than comparable conventional vehicles. As a result, EVs can reduce air pollution around rural homes and businesses and provide health benefits. According to the American Lung Association, transitioning to a nationwide electric transportation system by 2050 would save approximately 6,300 lives every year and avoid 93,000 asthma attacks and 416,000 lost work days annually. Due to regenerative braking, EVs also have less brake dust pollution than conventional vehicles. Micromobility—specifically e-bikes—like other forms of active transportation, can improve individual and community health. For example, the Fire Mountain Trails System operated by the Eastern Band of Cherokee Indians allows e-bike access, and has realized public health benefits for Tribal members. These health benefits are particularly important from an environmental justice perspective for communities overburdened by pollution, which are predominantly communities of color and low-income communities.

LOWER GREENHOUSE GAS EMISSIONS

The effects of climate change are felt in different ways in different communities, but examples in rural areas include increased frequency and severity of wildfires, increased frequency and severity of storms and flooding, and increased heat and droughts. The transportation sector is responsible for 29 percent of all U.S. GHG emissions, more than any other U.S. sector, and approximately 60 percent of these

EV MANUFACTURING AND EMPLOYMENT IN RURAL AMERICA

As a young and rapidly growing industry, the manufacturing and supply chains for EVs, their components, and charging equipment present an opportunity to expand investment in the American workforce and local communities. While the motor vehicle sector as a whole shed 9 percent of its jobs in 2020, the electric vehicle sector added 6,000 jobs (8 percent growth). Recent announcements promise further strong investment—for example, in late 2021, a major automotive company announced plans for three plants for EVs and batteries in Kentucky and Tennessee, investing more than $10 billion and creating more than 10,000 jobs. More recently, in February 2022, an EV charger manufacturer announced it will break ground on a new facility in Lebanon, Tennessee that will produce up to 30,000 DC fast chargers per year and create 500 local jobs.

The growth of EV manufacturing also offers the opportunity to increase employment in ways that ensure the economic benefits of EVs are equitably distributed, across both urban and rural populations, as well as among communities of color, Tribal communities, and disadvantaged and underserved communities. Several studies (e.g., see here) have examined potential policies to help guarantee that communities can get the most benefit from EV investment and employment gains.

Federal action to support the EV manufacturing base: The BIL signed in November 2021 provides extensive funding to support domestic manufacturing for EVs and related equipment, including more than $6 billion for programs to support a domestic supply chain for battery production and $750 million for "advanced energy" manufacturing facilities (including those for EVs and charging infrastructure).

In addition, DOE has launched several initiatives to support the domestic EV industry, including a National Blueprint for Lithium Batteries 2021-2030; the "Li-Bridge," a public-private consortium for lithium battery manufacturing; and a multi-agency Federal consortium to support a domestic industrial base for lithium batteries. DOE is also pursuing additional actions and plans to "bolster the domestic supply chain of advanced batteries." In November 2021, DOE awarded funding for "Electric Vehicle Community Partner Projects" focused on building an EV ecosystem in underserved communities, with one award specifically focused on economically distressed Appalachia and another focused on rural Tribal communities in the Upper Midwest.

(Photo: ATVM Nissan)

DEVELOPING TOMORROW'S EV WORKFORCE

As the American workforce adapts to the growing needs of the EV industry, researchers are working to understand the potential workforce impacts of a large-scale transition to EVs. As with any new industry, many new jobs will be created while others may be eliminated. Some studies have pointed to the uncertainties around net job creation from EV manufacturing. It is expected that most automotive-parts manufacturing jobs will not change significantly, although this will vary based on job type.

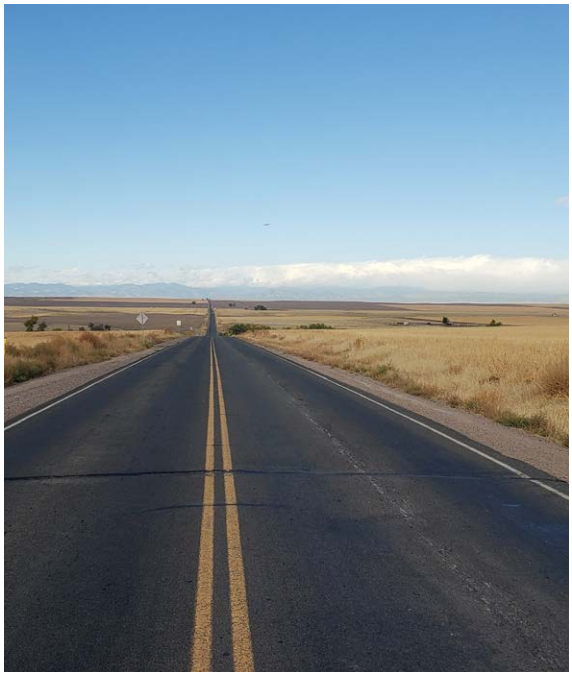
In terms of overall impact, a 2021 report by Energy and Environmental Research found that the Biden Administration's plan for 500,000 fast chargers by 2030 would "generate workforce needs of around 28,950 job-years from 2021 to 2030." That report also analyzed California's workforce needs and found that the greatest needs for light-duty EV charging infrastructure would be for electricians and electrical contractors, general contractors, and planning and design consultants.

Federal action in EV workforce development is spearheaded by DOE, which supports relevant programs for EVs and other kinds of alternative fuels and alternative fuel vehicles—including efforts to train technicians, first responders, and code and safety officials. A major expansion of DOE's efforts will focus on building a clean mobility workforce to support the decarbonization of the transportation sector by 2050.

DOE-funded activities in EV workforce development include the Clean Cities University Workforce Development Program, which places interns at Clean Cities coalitions around the United States, where they work on infrastructure deployment, data collection, outreach and education, and marketing. This program works extensively in rural areas and includes a specific focus on representing diverse populations. Additional advanced mobility workforce education programs are in development to enable upskilling and reskilling of the workforce to support the decarbonization of the transportation sector and fill future clean energy jobs.

Other examples of activity in EV workforce development include:

- Electric Vehicle Infrastructure Training Program (EVITP) provides training and certification for electricians installing EVSE.
- National Auto Dealers' Association is partnering with Chargeway to develop a program to improve knowledge of EVs among sales staff.
- ChargerHelp! provides maintenance and repair services for EVSE and has a workforce development program focused on training workers from the local service area.



(Photo: Kyle Doy)

emissions come from passenger vehicles. Compared to conventional vehicles, EVs have significantly lower GHG emissions, especially if electricity is generated with renewable energy sources like hydroelectric, solar, or wind. According to the National Renewable Energy Laboratory (NREL), high adoption of shared micromobility can save 2.3 billion gasoline-equivalent gallons per year nationwide. Transitioning from conventional vehicles to EVs, including electric micromobility, can contribute to climate change mitigation and national emission reduction goals.

IMPLEMENTATION CHALLENGES AND EVOLVING SOLUTIONS FOR RURAL COMMUNITIES

While the EV market has accelerated substantially and charging infrastructure continues to grow, several key challenges remain. This section outlines these challenges, with a particular focus on concerns for rural areas. It also discusses emerging solutions for addressing these challenges and references sections of the toolkit where these solutions are described in more detail.

UPFRONT VEHICLE AND CHARGING INFRASTRUCTURE COSTS

While the cost of EVs continues to decrease, the initial expense of EV charging infrastructure and the higher cost of most EVs available today still pose a barrier to EV purchases. In 2022, the average cost of a new non-luxury light-duty vehicle overall was nearly $44,600, while comparable EVs available cost over $65,000 on average before applicable tax credits (9 percent higher than the average EV price in 2021). New EV models have recently trended toward larger platforms (SUVs and trucks) and more luxurious trims, which has driven up average EV pricing, along with increased consumer demand and supply chain constraints. EV prices span a wide range, with some models starting as low as $25,600 and others costing over $90,000. Medium- and heavy-duty EVs are also comparatively more expensive to purchase than their diesel counterparts.

As noted previously, EVs have a lower total cost of ownership than conventional vehicles due to lower fuel and maintenance costs, and therefore have the potential to yield significant savings for rural households. However, the upfront purchase price can be a barrier for many, particularly for low-income individuals. In addition, many people are not accustomed to considering total cost of ownership when purchasing a vehicle, so they may perceive the cost of owning an EV over time to be higher than it really is.

The cost of purchasing or leasing an EV is expected to continue to fall due to increased EV production volumes, innovations in battery storage, wider availability of mid-priced EV models, and increased competition among automakers producing non-luxury EVs as well as emerging government tax credits such as those created under the Inflation Reduction Act. For example, the DOE is investing in reducing battery costs through public-private partnerships that aim to reduce battery costs from more than $120/kWh today to $60/kWh by 2030; this would bring EVs to near cost parity with internal combustion engine vehicles. While replacing batteries can be costly, batteries may last 8 to 15 years depending on climate, with several manufacturers offering 8-year or 100,000-mile battery warranties and some also offering extended warranty programs.

Investments in charging infrastructure can also be analyzed on a total-cost-of-ownership basis, based on operational needs and the constraints and cost structure of available (or feasible) utility service. Upfront costs in rural areas can be higher, especially for DCFC stations since installations in rural areas are more likely to require expensive electrical service upgrades. Accurately assessing the total cost of ownership of such investments will lead to better long-term

(Photo: ©123rf.com/welcomia)

decisions and may make investments in charging infrastructure more appealing (see *Lower Vehicle Fuel and Maintenance Costs* for a discussion of total cost of ownership).

A higher volume of EVs on the road will increase the demand for public charging stations and improve the return on investments in these chargers. In addition, innovations in EV charging technologies and designs are expected to further reduce DCFC station costs. At the same time, Federal and State grants, loans, and other incentives continue to play a substantial role in driving down costs and spurring the EV market. For details on funding options, see *Section 6: EV Infrastructure Funding and Financing for Rural Areas.*

LIMITED INFRASTRUCTURE AVAILABILITY AND GEOGRAPHIC DISTRIBUTION

While home-, business-, and fleet-based charging are expected to remain the primary ways EV drivers charge their vehicles, the need for expanded public fast charging continues to rise with the growth of EVs—especially for rural drivers, who typically drive longer distances than urban drivers and for whom existing DCFC stations are spaced much farther apart.

Consumers are also concerned about the length of time it takes to charge an EV, the user-friendliness of chargers, the need to plan charging stops on long trips, and the relative convenience and safety of charging locations. An added challenge is that identified nearby chargers may be out of-order or experiencing technical difficulties. Reduced battery performance and EV range during winter months, as well as protection from the elements while waiting for a vehicle to charge, are a further concern for rural communities in cold climates, particularly to those that do not have access to reliable electric service. Placing public DCFC and Level 2 charging along rural travel corridors and at key destinations in rural areas can help to address these concerns and provide drivers with the confidence that they will be able to charge their vehicles when and where they need to.

Electric micromobility users are considered "vulnerable road users," who face potential conflict with other road users and increased safety risks when using unprotected or discontinuous bicycle and pedestrian infrastructure. Micromobility users rely on safe and connected bicycle and pedestrian facilities for travel.

Because of their lower speeds, micromobility devices are less suited for longer distances associated with some rural trips and may not be authorized for use on all roadways.

UTILITY UPGRADES AND ELECTRICITY RATES

To meet the demands of larger or faster charging installations—such as DCFC stations, medium- and heavy-duty EV charging sites, and commercial EV fleet charging depots—it will be necessary to upgrade the electrical-service wiring running to a facility, or even upgrade certain components of the local power distribution infrastructure. Such upgrades are more likely to be needed in rural areas, where the grid infrastructure may be less robust. Local distribution network upgrades, such as the addition of three-phase power service and the installation of transformers at DCFC sites, can add substantial costs and time to EV charging projects. For more information on assessing the local grid infrastructure, including an explanation of three-phase power, see the *Utility Planning* section.

Utility pricing can also be a challenge for EV charging installations. Without outside incentive programs, the revenue from DCFC stations typically covers only about one-third of their operating costs. This is largely due to utility demand charges, which are premiums charged by some utilities for using large amounts of electricity during peak hours or when high power is drawn at high rates that exceed certain thresholds. Since rate and demand charge structures vary greatly between utilities and across States, these costs could have substantial effects on the business case for deploying fast-charging EV infrastructure on rural corridors and in rural communities.

Ultimately, both affordable charging rates and high station utilization are essential for station operators to earn sufficient revenue to offset the costs of purchasing, installing, and operating charging stations within a reasonable payback period (five years or less).

See the *Utility Planning* section for more information on rate and demand charge structures as well as an explanation of three-phase power.

CHARGING STATION PERMITTING AND INSTALLATION COORDINATION

As the EV sector develops, many rural localities have limited experience with permitting and installing EV charging infrastructure. Prior to seeking permits, charging station developers and utilities should conduct thorough planning and analyses of several factors, including projected local EV adoption and the associated demand for public charging, the presence of existing infrastructure, local electric grid capacity, right-of-way access, and easement issues impacting the siting of charging stations. The exact processes and timeframes for reviewing and approving permit applications can vary widely between local and Tribal jurisdictions, which can lead to confusion and frustration for project developers.

Local and Tribal Governments may also find they need to update existing ordinances to enable the installation of charging stations. Researching and coordinating the installation of EV charging infrastructure can be challenging for small Tribal or small rural governments with constrained staff, time, and resources. In addition, given the different geographies, technical expertise, and existing policies across local and Tribal jurisdictions, the planning process for each rural community may be different. For discussion of general EV infrastructure planning considerations, see *Section 5: EV Infrastructure Planning for Rural Areas*.

LIMITED EXPOSURE TO EVS

Initial EV education, readiness, and deployment efforts were primarily focused on urban areas, where early-market EVs with small battery capacities and shorter ranges were better suited. As a result, levels of exposure to EV technology have typically been

lower in rural areas. However, with improvements to battery technology and range, combined with aggressive EV production goals by vehicle manufacturers and expanded funding opportunities for EV charging infrastructure in rural communities, rural drivers are beginning to have more opportunities to test, drive, and charge EVs.

Still, without continued outreach on the benefits of EVs and higher visibility of EVs on the road, consumers, businesses, and public fleets are likely to continue investing in conventionally fueled vehicles. Poor or lacking infrastructure signage along roadway corridors, along with generally insufficient information on the availability of charging infrastructure, also stymies the EV market. For these reasons, public outreach efforts by entities such as the DOE-designated national network of Clean Cities coalitions are critically important for bolstering EV awareness, equitable access, and adoption among rural and Tribal entities. Such outreach efforts can include public education workshops and awareness campaigns, ride-and-drive events, fleet outreach and trainings, and highway corridor signage.

THE MARTHA'S VINEYARD TRANSIT AUTHORITY PARATRANSIT SERVICE

The Martha's Vineyard Transit Authority (VTA) provides year-round public transit and paratransit service for residents and tourists between the six towns and the Wampanoag Tribe on the Island, which is located off the coast of mainland Massachusetts. In 2021, to support their electric bus fleet, VTA unveiled solar canopies connected to EVSE that have the capacity to charge 40 buses, seven vans, and six cars. The VTA has already found that their electric bus fleet reduces energy costs and emissions. They expect the buses also to have lower operational and maintenance costs. Additionally, the EVSE has the added benefit of providing backup power off the main grid during natural disasters. VTA's The Island's 2020-2040 Regional Transportation Plan describes economic and infrastructure challenges posed by the Island's seasonal, tourism-based economy and notes the importance of the VTA bus system in serving minority and low-income populations.

BENEFITS AND IMPLEMENTATION CHALLENGES OF BUS ELECTRIFICATION

The number of transit BEBs currently on order or operating in the U.S. grew 112 percent from 2018 to 2021. As of 2021, more than 1,300 zero-emission transit buses were delivered or awarded to U.S. transit agencies, although this encompasses only 2 percent of the U.S. transit bus fleet. Similarly, only 1,800 ESBs are operating or have been ordered by school districts, meaning that around 95 percent of the approximately 500,000 school buses nationwide run on diesel fuels.

BEBs have benefits for transit agencies, as well as the surrounding communities in which the vehicles operate. BEBs are more energy efficient than diesel buses and have fewer moving parts, potentially decreasing fuel and maintenance costs for transit agencies. At the same time, the surrounding communities will experience the same environmental benefits as they do for EVs in general, as described above. BEBs operate more quietly, producing less noise pollution, and have zero harmful tailpipe emissions, which will improve local air quality. Studies on school buses have shown the air quality can be worse inside the bus than outside of it, which is particularly harmful for children, as research shows that childhood asthma and related health issues are made worse by air pollution and vehicle emissions. The environmental benefits from BEBs and ESBs are especially important for communities overburdened by pollution.

Planning for electric buses and charging infrastructure is complex and requires different decision-making than diesel bus deployment, so transit agencies, school districts, and other bus fleet operators need to invest resources upfront to plan appropriately. Adopting BEBs and ESBs requires an updated fleet design, planning for upfront costs, and development of staff capabilities to operate and maintain the electric buses. Additionally, operational challenges include variability of battery range and electricity rate structures. Finally, school bus and transit bus fleets planning the adoption of electrified buses need to begin conversations with their local electric utility very early in the planning process to ensure adequate availability of power. For more information, see *Planning for Electric Buses*.

SECTION FOUR

PARTNERSHIP OPPORTUNITIES

(Photo: ©123rf.com/tomwang)

From providing technical expertise to convening local stakeholders to hosting charging stations, partners play a key role in most EV charging projects. This section describes the following key partners that can assist rural entities in planning, funding, and implementing EV charging projects, as well as those partners specific to micromobility- and transit-related charging infrastructure:

- **Statewide and multistate partners**—including organizations planning for EV corridors, State, and Tribal environmental, energy, and transportation agencies, and multistate initiatives working on climate change and electric vehicles—can help identify key stakeholders and provide technical assistance or funding.
- **Tribes and Tribal organizations** working on climate change and transportation can identify stakeholders who are working to improve their infrastructure and provide technical assistance or funding.

THIS SECTION DESCRIBES KEY PARTNERS THAT CAN ASSIST RURAL ENTITIES IN PLANNING, FUNDING, AND IMPLEMENTING ELECTRIC VEHICLE SUPPLY EQUIPMENT

- **Local and regional planning partners** include Clean Cities coalitions that can help rural entities get started on an EV infrastructure project and transportation planning agencies, including Tribal planning and development offices or departments, that can help align EV charging projects with broader transportation planning efforts and available funding.
- **Electric utilities,** including Tribal utilities, are a critical partner in planning for EV infrastructure. In addition to providing technical advice on connecting EV chargers to the local electric grid, they are often active long-term partners, taking ownership of some or all aspects of EV charging installations. For larger installations, the electric utility is an essential partner to ensure an adequate supply of electricity to these sites through transmission and distribution analysis and upgrades.
- **Charging networks** can own, operate, and maintain charging stations and provide technical expertise on charger technologies.
- **Site hosts**—including tourism destinations, local businesses, transportation facilities, workplaces, and Tribal, municipal and community sites—can lead EV infrastructure projects or be important partners for entities that wish to install EV chargers but lack dedicated space.

STATEWIDE AND MULTISTATE PARTNERS AND INITIATIVES

Statewide, multistate, and inter-tribal agencies and groups can play a key role in connecting stakeholders, identifying available funding opportunities, and providing technical expertise. Some of these partners are specific to a particular State, Tribe, or region of the country, while others are national initiatives with affiliated local, State, Tribal, or regional stakeholder groups.

FHWA'S ALTERNATIVE FUEL CORRIDOR DESIGNATIONS

At the national level, since 2016, the Federal Highway Administration's (FHWA) Alternative Fuel Corridor (AFC) Designations 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 DC and Puerto Rico have one or more designated EV corridors (see Figure 4.1).

FHWA works with other Federal, State, Tribal, and local officials and with private industry to facilitate an interstate and major road network of alternative clean fuel stations (EV charging, hydrogen, natural gas, and

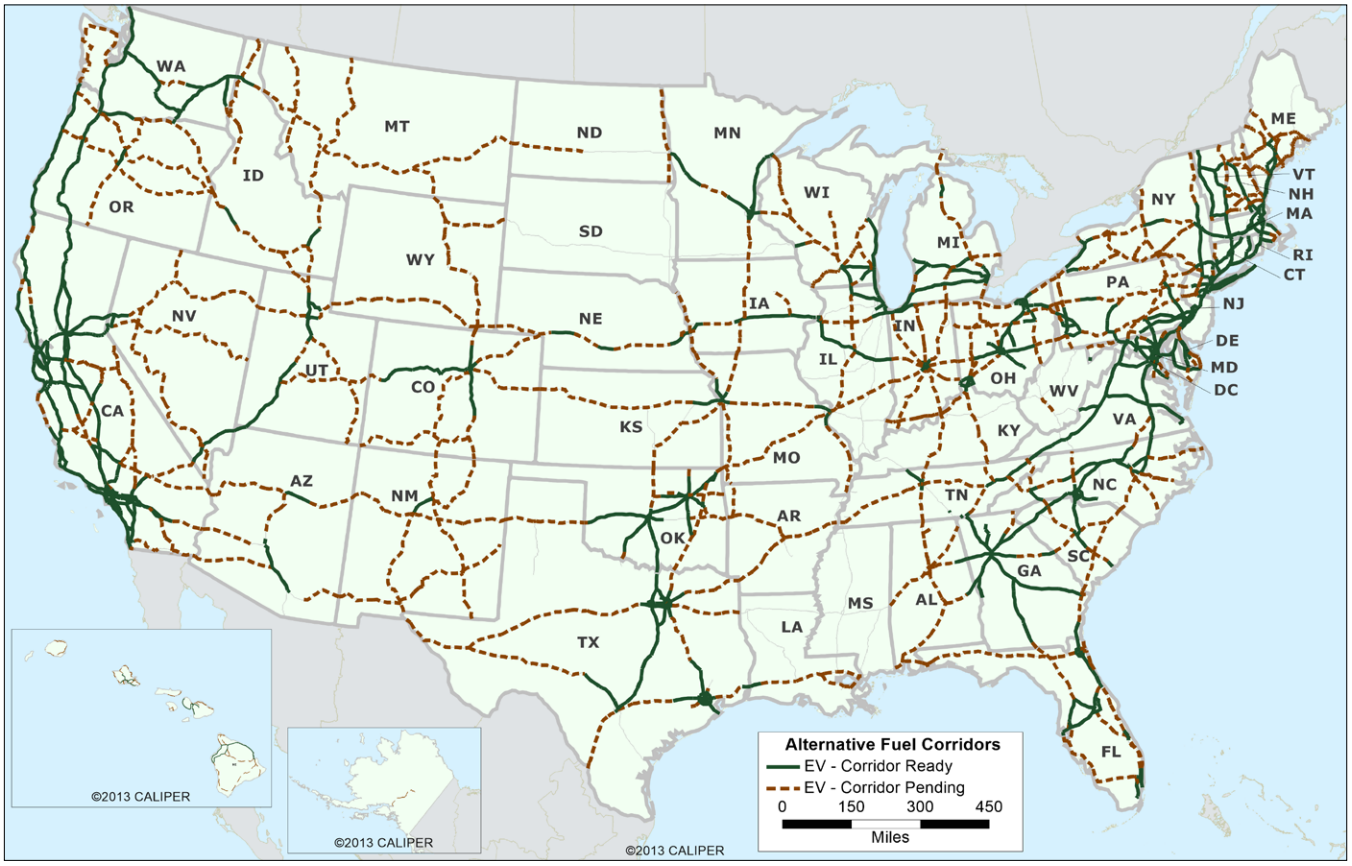


Figure 4.1. Map of EV corridors under FHWA's Alternative Fuel Corridors Program. (Source: FHWA)

PARTNERSHIP SUCCESS STORY: EVSE AT TRUCK STOPS

The National Association of Truck Stop Operators, which represents America's travel plazas and truck stops, and a charging network company partnered to build a network of EV charging stations at truck stops and travel plazas across the United States. They aim to install 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.

propane) so commercial and passenger vehicles can reliably travel between cities and regions and across the Nation.

The AFC program engages State, Tribal, and local officials, including State departments of transportation (DOTs) and Tribal transportation planning agencies, and frequently collaborates with local Clean Cities coalitions to identify candidate highway segments for this national network. The program also encourages multistate, inter-tribal and regional cooperation and collaboration on planning and developing alternative fueling and charging locations along corridors, and provides guidance to States and Tribes on implementing EV charging and other alternative fueling highway signage. Rural entities can participate in the AFC designation process or refer to existing AFC

designations to determine where EV infrastructure exists or is being planned in a particular area.

In addition, NEVI formula funding under BIL is required to be spent along EV corridors designated by the AFC program. The Joint Office of Energy and Transportation provides support and expertise to States building out their EV corridors with NEVI funding and will continue to evolve as a partner to potential applicants for other funding programs created under BIL.

To learn about AFC designations and plans for a particular State or Tribal Land, see the AFC State Points of Contact list.

EPA REGIONAL DIESEL COLLABORATIVES

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. Regional collaborative partners typically include State environmental agencies, Tribal and local governments, EPA regional offices, energy agencies or coalitions, nonprofits, and private-sector companies.

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. For example, the mission of the West Coast Collaborative Alternative Fuel Infrastructure Corridor Coalition is to accelerate the modernization of West Coast transportation corridors by deploying alternative fuel infrastructure for medium- and heavy-duty vehicles and equipment.

STATE AND TRIBAL ENVIRONMENTAL AND ENERGY AGENCIES

State and Tribal agencies often conduct planning specific to transportation, including 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. They may identify funding or other resources available from State and Tribal agencies or other stakeholders within a State or Tribal Land. For more information on State- and Tribal-level EV readiness planning, see *Progress toward EV Readiness*.

State environmental and energy agencies (e.g., a State department of natural resources or State energy office) may also offer programs and funding to support EV infrastructure. State energy offices generally operate under the direction of governors or legislatures and are funded by both State and Federal appropriations. Many State energy offices offer funding or technical assistance programs for EV infrastructure. They may also conduct EV readiness planning or implement State policies related to EVs. The National Association of State Energy Officials (NASEO) Interactive State Energy Offices Map provides contact information for each State energy office.

State agencies, typically the environmental or air quality agency, also administer settlement funds from the 2016 Volkswagen decision. The U.S. government and Volkswagen (VW) have resolved allegations that VW violated the Clean Air Act, and the enforcement settlement provides nearly $3 billion to States through an Environmental Mitigation Trust. The settlement also commits VW to invest $2 billion in zero emission vehicle infrastructure. VW created a subsidiary company, Electrify America, to manage the $2 billion zero emission vehicle investment. Each State designated a lead agency that manages the State's allocated funding from the Environmental Mitigation Trust, which can be spent on projects including EVs and EV charging stations. See the VW Mitigation Trust website for

information on the State Trust and Indian Tribe Trust. See also the National Association of Clean Air Agencies' contact information for each State's lead agency.

Tribal environmental protection agencies, Tribal utility authorities, and Tribal Energy Development Organizations (TEDOs) may also offer programs and coordinate initiatives to secure funding to support EV infrastructure on Tribal Lands. These entities operate under the direction of Tribal Governments and enforce tribal law on Tribal Lands. They may also conduct EV readiness planning or implement Tribal policies related to EVs.

STATE AND TRIBAL DEPARTMENTS OF TRANSPORTATION

State DOTs and Tribal departments or divisions of transportation can offer technical and funding resources to support electric vehicle charging infrastructure as well as construction contracting oversight or other partnering roles. For example, 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. These CMAQ funds may also be transferred to the Federal Transit Administration (FTA) to manage eligible transit projects. Electric vehicle projects, including fleet conversions, charging infrastructure, and shared micromobility, are one of the eligible project categories under CMAQ. 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. In addition, BIL provides formula funding to State DOTs for a national electric vehicle formula program, which is also meant to support EV infrastructure on Tribal Lands (see *Federal Funding Programs* for more information on BIL).

Some State DOTs, such as Iowa DOT, Maine DOT, and Kansas DOT, among others, administer or co-administer with sister State agencies the Volkswagen Environmental Mitigation Trust funds allocated for EV charging infrastructure investment. Several State DOTs also administer State-developed grant programs for EV and other alternative fuel infrastructure. Such examples include Washington State DOT's Zero Emission Vehicle Infrastructure Grant Program.

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 Alternative Fuels Corridor program. They conduct planning for building out and deploying EV infrastructure along the NHS, and they coordinate with other State and Tribal agencies to help ensure EV readiness through strategic infrastructure planning that focuses on corridors, workplaces,

PENNDOT CORRIDOR EV INFRASTRUCTURE DEPLOYMENT PLAN

In 2021, Pennsylvania DOT (PennDOT) published its Alternative Fuels Deployment Plan for EV charging and natural gas refueling infrastructure along the I-81/I-78 corridor in Pennsylvania. The plan identifies a data-driven approach for identifying and prioritizing locations for new DCFC infrastructure, engaging deployment partners including EV network companies and site hosts, and leveraging existing State funding opportunities. PennDOT developed this approach in collaboration with the Pennsylvania Department of Environmental Protection with a shared goal of developing priority EV station locations eligible for State grant funding.

Arizona DOT, Tennessee DOT, Illinois DOT, and the North Central Texas Council of Governments have or are in the process of developing similar plans.

and communities. State and Tribal DOTs also operate and oversee road and highway signage, and State and Tribal DOT traffic engineers are responsible for approving and installing EV infrastructure wayfinding signage along NHS corridors.

ADDITIONAL MULTISTATE AND INTER-TRIBAL INITIATIVES

Many States, Tribes, and regions of the country have partnerships and initiatives around EVs. These groups may focus on improving air quality generally (e.g., Northeast States for Coordinated Air Use Management), developing or advocating for State-level, inter-tribal or regional policies to encourage EVs (e.g., REV West and the Transportation and Climate Initiative), or partnering on EV charging infrastructure (e.g., Northeast Electric Vehicle Network, West Coast Electric Highway). Entities interested in pursuing EV projects can connect with these types of groups for technical assistance, connections to project partners, or funding. For more information on multistate climate initiatives, see the Center for Climate and Energy Solutions. The Alternative Fuels Data Center's (AFDC) State Information tool also has details on potential partners in each State, including contact information for relevant State agencies and information on completed or ongoing EV charging projects.

EV READINESS THROUGH AN INTER-TRIBAL INITIATIVE

Native-led nonprofit organizations such as Native Sun Community Development are leading the way on EV readiness. Native Sun Community Development brought together more than a dozen collaborators including the Standing Rock Renewable Energy Power Authority, Red Lake Fishery, and two utilities to build an Inter-tribal Electric Vehicle Charging Network that will connect Minneapolis with the Standing Rock Tribal Nation, Red Lake Nation, White Earth, and Leech Lake, as well as another 17 Tribal Nations located in Minnesota, South Dakota, and North Dakota. The project partners plan to install 63 Level 2 charging stations and 59 fast-charging hubs after they were awarded $6.67 million from the Department of Energy.

LOCAL AND REGIONAL PLANNING PARTNERS

Like statewide and multistate partners, local, Tribal, and regional planning organizations can play a key role in connecting stakeholders and identifying available funding, as well as in providing technical expertise. Clean Cities coalitions comprise a national initiative with 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 partner on coordination of EV infrastructure projects throughout a region or State and for programming funding that flows through these planning agencies to such projects.

CLEAN CITIES COALITIONS

Through DOE's national network of Clean Cities coalitions, more than 75 coalitions create networks of local stakeholders that advance alternative fuels through public-private partnerships. These coalitions have extensive experience promoting alternative fuel vehicle adoption and alternative fuel infrastructure deployment. Each coalition is led by on-the-ground Clean Cities coalition staff who tailor projects and activities for local communities.

Clean Cities coalitions are well positioned to help connect rural entities with local partners for developing

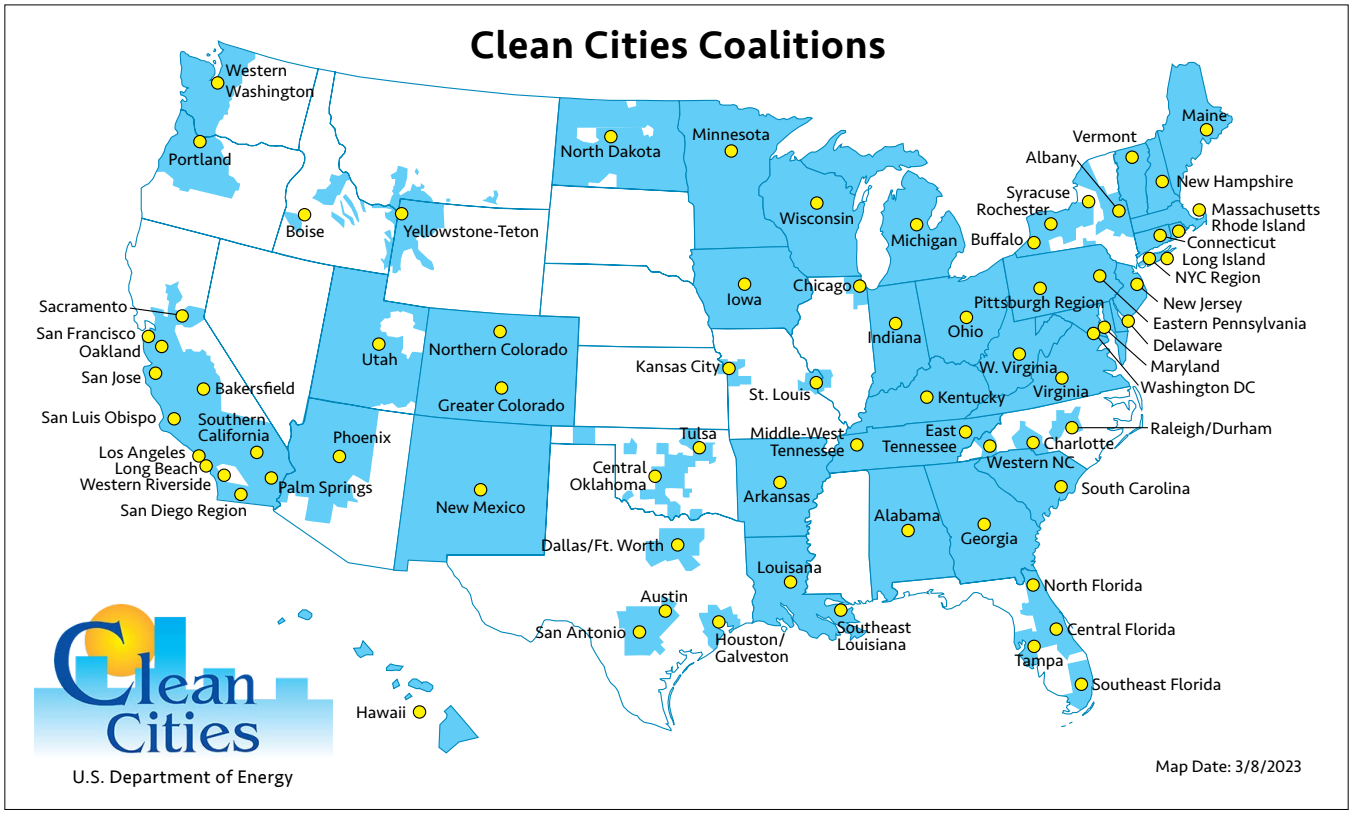


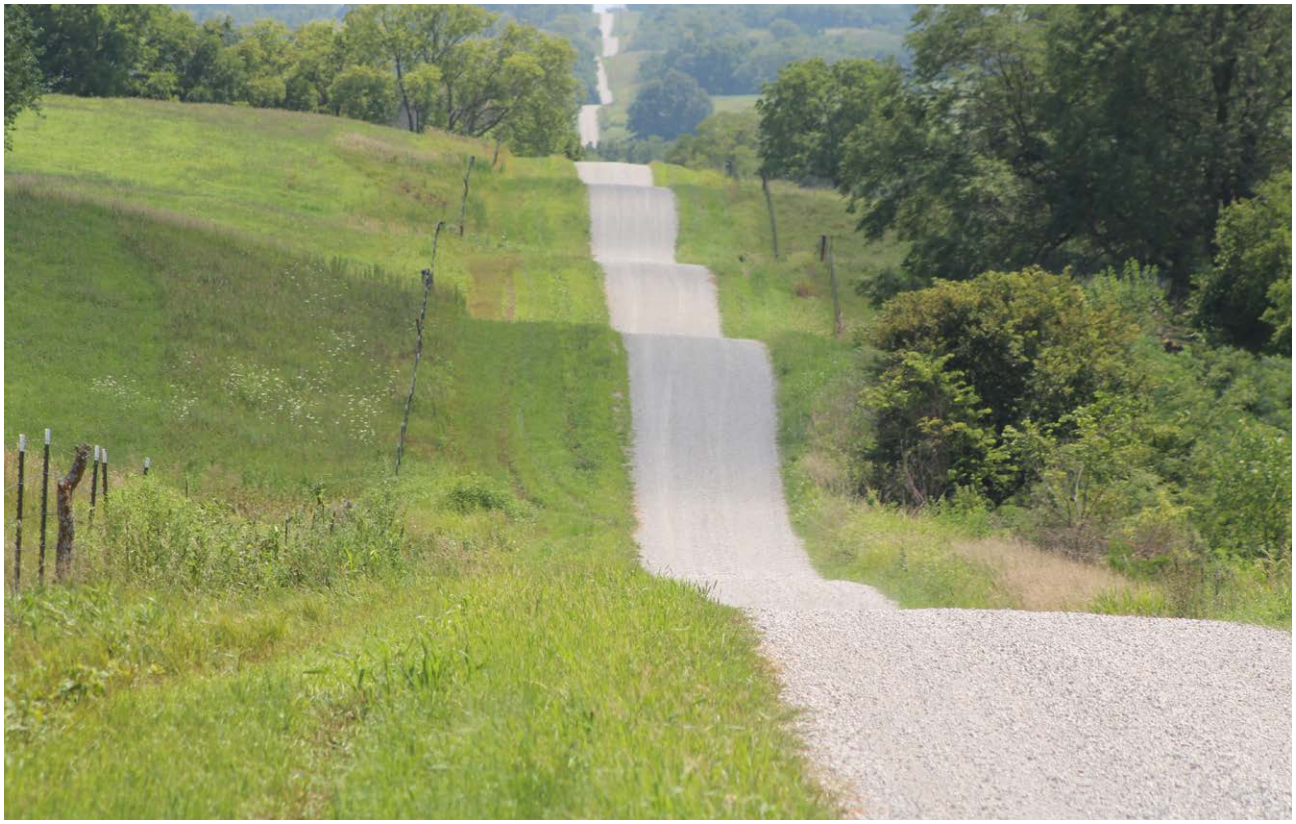
Figure 4.2. Map of Clean Cities coalition locations. (Source: DOE, 2023)

and executing EVSE projects. These coalitions engage with more than 20,000 stakeholders across the United States. Typical coalition members include:

- Automotive businesses and dealerships;
- Utility, fuel, and charging systems providers;
- Vehicle fleet owners and operators;
- State and local government agencies (e.g., environmental, energy, transportation, planning, and public health agencies); and
- Community organizations and nonprofits.

In addition to connecting local stakeholders and partners working on EVs, coalitions can provide technical assistance on specific EV infrastructure projects and connect rural entities with available funding opportunities and incentives. The network of Clean Cities coalitions also enables rural entities to tap into national expertise, including research from DOE's National Laboratories and the recently established DOE/USDOT Joint Office of Energy and Transportation. DOE's Vehicle Technologies Office designates Clean Cities coalitions working locally to foster the Nation's economic, environmental, and energy security. DOE provides coalitions resources and information to help transportation stakeholders evaluate options and achieve goals around electrification and alternative fuels, advanced vehicles, mobility solutions, and other fuel-saving strategies. DOE also often encourages project teams to partner with Clean Cities coalitions on applications to competitive funding opportunities for demonstrating and deploying electric vehicles and charging infrastructure.

While some coalitions are based in urban areas, participation and collective knowledge of opportunities and needs also extends to less-populated surrounding areas. To determine if a coalition is active in an area



(Photo: USDOT)

and to identify contacts, see Figure 4.2 and the Clean Cities coalition contact directory.

Areas that do not have an active Clean Cities coalition can still benefit from the program. The national program provides technical assistance, resources, and information on electric vehicles that is relevant nationwide. For areas not directly served by a Clean Cities coalition, contact the appropriate Clean Cities Regional Manager for assistance in getting started. In addition, many coalitions provide technical assistance to stakeholders in the vicinity and outside of their geographic areas. They may be able to connect rural entities with regional contacts, such as EV chargers and service providers.

TRANSPORTATION PLANNING AGENCIES

Transportation planning agencies are important partners in EV infrastructure projects, so it is beneficial for site-level planners and other rural entities to identify the organization conducting transportation planning in their community. In metropolitan areas with a population over 50,000, the responsibility for transportation planning lies with metropolitan planning organizations (MPOs).[13] For rural areas and small communities, no single official body is consistently designated for transportation planning. In some States, the State DOT conducts transportation planning in rural areas, while in other States, a regional transportation planning organization (RTPO), regional planning council, or local government is designated as the planning agency. On Tribal Lands, a Tribal Planning and Development Department (e.g., the Southern Ute Indian Tribe Department of Tribal Planning, Leech Lake Reservation Tribal Development Division), a Department of Transportation (e.g., Seneca Nation Department of Transportation), or a

13 MPOs are located in Census-designated areas over 50,000 in population and have Federal requirements to plan for the transportation needs of the metropolitan planning area.

COORDINATION WITH EMERGENCY RESPONSE AGENCIES

Some States are exploring opportunities to coordinate with emergency response planners, such as a State emergency management agency, to strategically locate EVSE along evacuation routes. This could include permanent EV charging stations along these routes, as well as mobile charging that can be deployed in preparation of an evacuation. For example, Florida's Electric Vehicle Roadmap includes information about planning for emergency evacuations of EVs and identifies recommended locations for installing temporary charging, largely in rural areas.

Division of Transportation (e.g., Navajo Nation Division of Transportation) can be designated as the planning agency for a particular Tribal Land.

Rural entities can engage with transportation planning agencies around electric vehicles in several ways. First, it is important to identify the relevant transportation planning organization(s) within an area, whether it is an MPO, an RTPO, a State DOT, or a Tribal planning agency. For more information on RTPOs and to identify RTPOs operating in a particular area, see the National Association of Development Organization's website. For more information about Tribal planning agencies, consult the website of the Tribal Government with jurisdiction over a specific Tribal Land.

Rural entities can visit transportation planning agency websites to view existing planning documents and identify information relevant to EV infrastructure planning. Typical transportation planning products include:

- **Work Programs:** The Unified Planning Work Program (UPWP) for MPOs, or the State Planning and Research Work Program for State DOTs, is an annual funding document that identifies transportation studies, tasks, or research that the agency will perform. These could include studies related to EV charging networks and gaps in a region.
- **Transportation Improvement Programs:** MPOs and RTPOs develop four-year, fiscally constrained Transportation Improvement Programs (TIPs), which outline specific transportation projects and strategies with committed funding. State DOTs develop a similar Statewide TIP (STIP), which incorporates MPO, Tribal, and RTPO TIPs but also identifies projects in rural areas and small urban areas not covered by MPOs or RTPOs. TIPs could include specific, funded projects to install EV charging stations. They could also identify when major transportation projects are occurring in their area to better coordinate EVSE installations with these projects.
- **Long-Range Transportation Plans:** Regional, Metropolitan, Tribal, or Statewide Long-Range Transportation Plans cover a minimum of 20 years and identify goals and strategies for how the agency plans to invest in the transportation system. Long-range plans may include goals that facilitate investments in EVs and EV charging infrastructure, such as improving air quality in a region, supporting growing demand for charging stations, and meeting climate resilience goals. They may also include more specific strategies like installing EV corridors along State highways. State DOTs may also wish to consider the availability of AFCs when creating their State Freight Plans and planning for future freight infrastructure needs.

The development of UPWPs, TIPs, and Long-Range Transportation Plans all provide an opportunity for rural entities to work with planning agencies to consider EVSE and the EV infrastructure needs of rural areas in their goals, programs, and funding decisions. Transportation planning agencies are required to get

(Photo: ©123rf.com/cboswell)

PARTNERSHIPS FOR AN AFFORDABLE ELECTRIC VEHICLE CARSHARING SERVICE

Tulare and Kern Counties in California have an EV carsharing service with vehicles that can be rented on an hourly or daily basis. The vehicles are priced affordably at $4 per hour or $35 per day ($45 per day on weekends) with insurance and car maintenance included in the rates. The vehicles are parked at charging stations installed at Self-Help Enterprises residential housing complexes and are available 24/7, providing a significant service to bridge transportation gaps for rural residents in the San Joaquin Valley. The California Vanpool Authority is providing fleet management, repairs and maintenance, and vehicle cleaning. This program is made possible through grant funding from the California Climate Initiative.

public and stakeholder input in the development of these transportation planning products. Most State DOTs, MPOs, Tribal Governments, and RTPOs have information on their websites listing opportunities to attend public meetings and to provide comments on draft plans.

MPO AND CLEAN CITIES COALITION PARTNER ON ALTERNATIVE FUELS CORRIDOR NOMINATION FOR OHIO

In 2021, the Mid-Ohio Regional Planning Commission (MORPC) and Clean Fuels Ohio (CFO), a Clean Cities coalition, submitted a detailed application to FHWA nominating several highway corridor segments in Ohio as EV signage-ready and EV-signage pending alternative fuel corridors. This built on MORPC's and CFO's prior efforts to designate EV, natural gas, and propane corridors. To date, FHWA has approved 11 Interstate and five U.S. and State highway EV corridors in Ohio.

OTHER LOCAL AND REGIONAL PARTNERS

Regional planning organizations, planning commissions, and councils of governments serving multiple towns, counties and/or Tribal Lands can help integrate EV charging and transportation needs with other regional priorities around energy, environment, housing, and economic and workforce development. These organizations can also connect and provide

resources to communities that are newly navigating the planning and funding process. For example, in 2020 the Southern New Hampshire Planning Commission hosted an online training with Granite State Clean Cities on streamlining permitting for EV charging stations.

Institutions of higher education like colleges and universities—including Tribal Colleges, historically Black colleges and universities, and Hispanic-serving institutions—and 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 and emergency response and EVSE installation and servicing. The National Alternative Fuels Training Consortium (NAFTC) hosted at West Virginia University maintains a national training center network offering these and other EV-focused technical programs at schools across the country. Other programs such as the NC Clean Energy Technology Center at North Carolina State University offer in-person and virtual education and outreach to the general public on EVs and EV charging, as well as services to help rural organizations analyze their fleets to determine how to best approach EV adoption and EVSE planning. Numerous other institutions are carrying out grant-funded rural area EV demonstration projects and EVSE planning and analysis. Tennessee Technological University is leading a US DOE-funded rural EV testbed project to demonstrate and evaluate the practical use and real-world application of EVs among fleets and individuals in rural Cumberland County, TN. Lastly, colleges and universities serve as excellent EVSE site hosts for students and visitors in addition to institutional EV fleets.

EV advocacy organizations can also be valuable partners in raising awareness around EVs, facilitating demonstration projects, and guiding equitable deployment. For example, the nonprofit Forth (based in Oregon) operates a mobile EV technology showcase that visits rural and underserved communities. Forth also procured two electric tractors that are being rotated across farms in Oregon for demonstration and evaluation. Another nonprofit, the Electric Vehicle Infrastructure Training Program (EVITP), trains electricians to become EVITP certified for the installation of charging equipment in their State through a training class and exam.

UTILITIES

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 considered for 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 and high-capacity EVSE installations are more likely to require upgrades to electrical service. With all EV infrastructure projects, it is important to engage with the local utility from the beginning—even in the conceptual stage. This can avoid costly and time-consuming changes later in the process.

Utilities have a strong interest in the deployment of EVSE, and they have been investing heavily in both the deployment of EVs and the rollout of charging infrastructure. In the first seven months of 2020, State regulators approved more than $760 million in proposed utility investments in transportation electrification. The majority of these programs involve either direct utility ownership of EVSE installations or "make-ready" programs in which utilities pay for necessary site upgrades.[14] See Figure 4.3 for an overview of roles a utility can play in an EVSE project.

14 See *Project Development and Scoping* for more information on different ownership models.

Furthermore, the Electric Highway Coalition—which comprises 14 major utilities representing more than 60 million residential customers across 29 States and the District of Columbia—announced in March 2021 a plan to build "one seamless network of chargers from West Texas to the Gulf of Mexico and all the way up the Eastern Seaboard."

	Key Roles in EVSE Installations			
Potential Partners	**Electricity Provider**	**EVSE Operator**	**EVSE Owner**	**Site Host**
Utility	x	x	x	
Charging Network Provider		x	x	
Property Owner		x	x	x
Tenant		x	x	x

Figure 4.3. Key roles involved in EVSE installations (electricity provider, EVSE owner, EVSE operator, site host) and the various combinations of potential partners that fill those roles (utility, property owner, tenant, charging network provider). (Source: USDOT Volpe Center)

Partnering with a utility can be useful or necessary for:

- Addressing grid-level constraints that may arise in larger-scale project planning. A utility can also help with site-selection by providing valuable information about the limitations and costs related to electricity supply at each potential site.
- Working through multiple stages of the project-planning process—for example, to understand local grid limitations or needs for upgrades, to determine the best ownership model, to determine electricity rates and pricing structures, and to provide technical and programmatic support for EV charging installations.
- Identifying financial opportunities, such as rebates and other forms of financial support directly from the utility, or potentially partnering with utilities on proposals. See *Funding Resource Clearinghouses* for resources to help identify local utility funding programs.

Tribal utilities can also be a liaison to other Tribal Government entities needed to collaborate for EV infrastructure deployment on Tribal Lands.

TYPES OF UTILITIES

The nearly 3,000 electric utilities in the United States fall into four categories:

- **Investor-owned utilities (IOUs)** are the most prevalent, serving nearly 75 percent of customers nationwide. They are owned by shareholders, and their rate structures and other operational aspects are highly regulated. While IOUs originally began in larger cities—where the higher density of demand made a stronger business case for investing in electricity distribution infrastructure—today, they have a presence in most parts of rural America and operate in almost every State.
- **Publicly owned utilities (POUs)** are utilities run by Federal, State, or municipal entities and, in some cases, political subdivisions. Historically, POUs began in smaller cities and towns that did not initially attract interest or investment from IOUs. While POUs are generally smaller (serving an average of about 12,000 customers each) and may lack the resources of a large IOU, they are not subject to the same stringent regulations as IOUs and may have more flexibility in terms of ownership models and other partnering opportunities.

- **Cooperatives (co-ops)** are not-for-profit member-owned utilities that are usually located in rural areas and have a presence in 47 States. Distribution co-ops deliver electricity to their members (customers) while generation and transmission co-ops produce or purchase power that can in turn be provided wholesale to distribution co-ops. Co-ops expanded rapidly after the 1936 Rural Electrification Act to bring electricity to communities not served by IOUs or municipal utilities. Distribution co-ops tend to be smaller (serving an average of about 24,000 customers each), but like POUs, they are not subject to the same stringent rate structure and operational regulations as IOUs.
- **Tribal Utility Authorities (TUAs)** are entities formed by Tribal Governments to regulate energy activities or to assume responsibility for and control of delivering power to customers on Tribal Lands. Tribes have formed TUAs to address power outages and poor service from existing electric utilities, to offset limited or poor interaction with State and Federal entities to resolve energy challenges on Tribal Lands, to ensure that electric service reaches remote areas of a reservation, and to expand economic opportunity and improve the health and well-being of residents of Tribal Lands, among other reasons.

PARTNERSHIP SUCCESS STORY: CHARGER INSTALLATION WITH RURAL ELECTRIC COOPERATIVES

An electric cooperative serving the Roaring Fork and Eagle River Valleys in Colorado, partnered with a charging network to install and maintain Level 2 home and workplace chargers for participating members at low or no upfront cost. In exchange, members pay an additional fixed charge on their utility bill over three years. The co-op is also working with community partners to invest funding from the Colorado Energy Office into DCFC stations.

In 2019, the co-op partnered with the Roaring Fork Transportation Authority to deploy eight electric buses by installing bus charging infrastructure, developing a new electricity rates, and providing renewable energy options for charging. In 2020, seven additional BEBs were added to were brought into the co-op's service area through investments by Eagle County Transit, Town of Avon, Town of Vail, and Aspen School Districts.

(Photo: Adobe Stock)

IDENTIFYING OPPORTUNITIES AND MAKING CONTACT

Given that individual counties may have multiple utilities and potentially multiple types of utilities operating within their boundaries, prospective EV infrastructure site planners should become familiar with all the utilities in their region and determine which utility serves their prospective EV charging site. This will let site planners identify all options for potential partnering, which could be important given the wide range of EV programs and varying levels of interest and involvement among utilities. For information on the territory served by each utility in the United States, including basic information about each utility, see this map of electric utility service territories.[15] Local county or city governments may also provide maps and online tools to help identify which utility providers serve a particular address.

There are also State-level resources for identifying utilities, including maps or directories, such as:

- Virginia: Electric Service Territories
- Illinois: Electric Utilities in Illinois Map

To contact a utility, it may be best to first work through a larger coalition, Tribal Government, or regional partnership. For site planners not working with a coalition, the next best approach may be to work with charging network providers, who often have well-established relationships with local utilities (see the *Charging Networks* section).

Another option is to contact the utility directly. As noted earlier, utilities may have widely varying interest in—and resources devoted to—EV infrastructure. Many utilities have prominent information on their websites about electric vehicles and EV infrastructure, and often this information targets entities looking to invest in charging infrastructure.

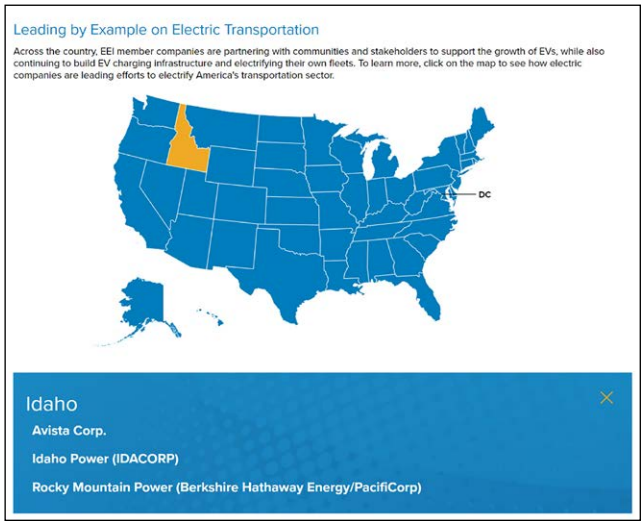


Figure 4.4. Example of information on utility programs for EVs, from a portal provided by Edison Electric Institute. (Source: Edison Electric Institute)

Lastly, in areas with smaller utilities, or where EV rollout has been slower and information is sparse, it may be worthwhile to contact one of the national organizations representing utilities. These larger national resources can provide EV infrastructure site planners with ideas about the types of opportunities available. Even if the local utility does not have a well-developed program, knowing what type of utility it is and how to get information at the national level might help with understanding the available partnership options. National resources might also open the door for larger EV infrastructure developers to propose new partnership programs with their utilities.

The three main national organizations representing utilities are the Edison Electric Institute, which represents IOUs (see Figure 4.4 for a portal for all EV-related programs of any IOU in any State); the American Public Power Association, which represents POUs; and the National Rural Electric Cooperative Association, which represents co-ops. Smaller regional associations such as the Arizona Tribal Energy Association and the Midwest Tribal Energy Resources Association serve Tribal electric-sector interests.

15 To view this map, filter out (un-select) all layers except for "Electric Retail Service Territories."

CHARGING NETWORKS

Many public charging stations are owned or operated by private charging network companies, which can be identified through resources such as the Go Electric Drive "EVSE Products, Charging Network and Service Providers" tool or through one of the main industry associations, such as Electric Drive Transportation Association, Plug In America, or Zero Emission Transportation Association. The DOE AFDC's Alternative Fueling Station Locator also identifies the private charging network companies for the stations in its database. These charging networks may commonly require a membership to recharge an EV at their stations, although some States do not allow membership requirements if the charging network uses public subsidies. If membership is required, users may need a physical membership card or they may be able to log in with their phone. Like cellular networks, some charging networks partner with one another to allow users to "roam" and charge across different networks' stations. Charging network companies also provide users with station information to locate and get directions to their charging stations.

For site planners pursuing a networked charging station—a charging station that is connected to the Internet through cellular or wired broadband service to enable payment, access management, and usage monitoring—a charging network can be a logical partner to engage early in the site-level planning process. As partners, charging networks can bring technical expertise and facilitate connections to other important project stakeholders, such as architects, engineers, and contractors. They also develop training resources, such as specifications and installation guides, for EV installers.

Once charging stations are installed and activated, the network can help a site owner or tenant set up the charging station policies, including pricing, access control, administration rights, and advertisements. In addition, a charging network can provide advice to the EV infrastructure site planner on best practices for running the charging station based on experience with other sites, including those in similar contexts or geographic locations.

As discussed in Section 5 under *Decide on Ownership Model* both utilities and utility customers can own and operate charging stations. In addition to utilities, it is also common for charging network companies to own and operate EV charging infrastructure on property owned or leased by the site host. For example, several charging network companies partner with retail locations such as fast food chains and shopping malls to provide network-owned and -operated DCFC stations. Alternatively, site hosts can pursue business models in which they own the equipment while the charging network company maintains and operates the equipment. The exact options for these roles depend on the network and equipment provider chosen.[16]

Several resources are available to help locate charging network companies and the business models and partnering roles they offer, as summarized in the *Select Equipment and Network Provider* section.

SITE HOSTS

A **site host** is the owner or occupant of land on which an EV charging station is built. Site hosts represent a variety of industries and land use types, including:

- Tourist destinations and public lands;
- Businesses and institutions, such as hotels, shops, universities, and restaurants;
- Transportation facilities, such as airports and fleet depots; and
- Community sites, such as a public library or town hall.

16 For example, see the "EV Charging Station Business Models" section (page 14) in Pennsylvania DOT's AFC Deployment Plan.

(Photo: USDOT/Volpe Center/Kirby Ledvina)

Additionally, site hosts have different reasons to provide EV charging services, including:

- Attracting or retaining EV-driving visitors or customers;
- Attracting or retaining EV-driving employees;
- Earning revenue from user fees for EV charging;
- Providing micromobility connections to transit;
- Supporting a new fleet of EVs or electric buses; and
- Encouraging more widespread adoption of EVs for the environmental and public health benefits.

Site hosts can provide public or private EV charging stations. For example, municipal and Tribal Governments may choose to let anybody access the EV chargers and plug in their vehicles at publicly accessible community sites. Retail centers may also opt to install public chargers with the intent of attracting customers. In contrast, some companies offering workplace charging at an office location may choose to restrict EV charger access to just their employees. Similarly, hotels and casinos may install EV chargers in a private parking lot as a service only to customers.

Of the approximately 13,000 privately-owned Level 2 and DCFC stations nationwide, about 14 percent restrict access to select groups, such as site tenants, employees, visitors, and fleet drivers. Across all 53,100 privately, publicly, and utility-owned Level 2 and DCFC stations, just 2.5 percent are private access only.

While site hosts can initiate EV infrastructure planning and installation, they can also be key partners for other entities looking to install and operate EV charging stations. **Public-private partnerships** (P3s) involve partnerships between public agencies (such as local and Tribal Governments and transportation authorities) and private companies to produce publicly accessible infrastructure. Benefits of using a P3 project delivery method can include leveraging private funding or financing for a project, accelerating project delivery, and minimizing risk for a public agency.

Legislation enabling P3s varies across States and Tribal Lands, producing a variety of contracting options. Check FHWA's Innovative Program Delivery Listing of State Legislation to determine which statutory framework can be used for a local project.

The following subsections discuss different types of site hosts to help rural entities identify possible partners.

PARTNERSHIP SUCCESS STORY: CHARGING AT STATE PARK LODGES IN WEST VIRGINIA

In West Virginia, EV charging stations are available at 9 of the 10 State park lodges in the State. Drivers can charge their vehicles for free, but lodge owners noted that while people are charging their vehicles, they spend money at the lodges, including in gift shops and restaurants and for overnight stays.

TOURIST DESTINATIONS

Tourist destinations include any sites of natural, cultural, or historical interest for visitors, as well as nearby gateway communities that provide services to these visitors. Often, popular tourist destinations provide transportation services such as parking, shuttles, and bicycle rentals to improve the visitor experience and attract future visitors. As EVs become more commonplace, tourist destinations could provide EV charging as another transportation service, allowing visitors to park and charge their EVs while visiting other site amenities, such as gift shops, restaurants, and attractions.

At rural tourist sites in particular, EV charging stations could alleviate range anxiety, or the fear experienced by EV drivers of not being able to find a place to charge their vehicle. Charging stations in these locations could help maintain or even increase the number of EV-driving visitors from far away locations, and in turn, increase revenues for the site hosts and surrounding businesses.

Common tourist destinations in rural areas and potential partners for rural EV infrastructure projects include public lands such as national and State parks, national forests, wildlife refuges, and monuments. Publicly available charging infrastructure at public lands, Tribal Lands, and in gateway communities helps to encourage visitors with electric vehicles to visit and to support the local economy. In addition, encouraging the use of electric vehicles in parks, public lands, and tourist sites on Tribal Lands helps to reduce air pollution and noise, protecting sensitive resources and improving the experience for visitors.

In recent years, Federal land management agencies, such as the National Park Service and Fish and Wildlife Service, and State park departments in several States have installed EV infrastructure. For example, the National Park Service has partnered with DOE, the California Energy Commission, and a major automobile manufacturer to implement EV infrastructure projects. There are currently more than 140 chargers in national parks and gateway communities across the country. Colorado has partnered with an electric SUV and truck company to implement EV charging stations at all 42 State parks.

For Federal land management agencies, the General Services Administration's Blanket Purchasing Agreement for EV charging stations is available to assist in acquiring EVSE.

For more information on considerations for partnering with national parks and public lands, see NREL's report *Best Practices for Electric Vehicle Supply Equipment Installations in the National Parks.*

LOCAL BUSINESSES AND INSTITUTIONS

Many types of local businesses—such as grocery stores, restaurants, and casinos—can serve as site hosts to public EV charging stations. According to the U.S. Department of Energy's AFDC, as of November 2022, there were more than 11,000 privately owned but publicly accessible Level 2 charging stations in the United

PARTNERSHIPS SUCCESS STORY: CUSTOMER SPENDING AT A CALIFORNIA RETAIL STORE

As part of a pilot study, a charging network and a major retail chain installed six free-to-use Level 2 charging stations at the retail chain's new California location. After nine months, based on the charging session lengths, the retailer saw that the average EV-driver was spending 72 minutes at the retail site, which was 50 minutes longer than the average customer. Additionally, the chain saw increased revenue of $56,000 while spending only $430 on electricity. On average, the shoppers spent about $1 for every minute they were in the store.

States, with chargers hosted by hotels, restaurants, gas stations, car dealerships, shopping centers, casinos, airports, parking lots, banks, and other site hosts.

Like tourist destinations, local businesses can see economic benefits from hosting a charging station. As discussed in the toolkit sections on *Project Development and Scoping* and *Operational Planning*, local businesses may own or operate the EV infrastructure and charge users a fee to plug in. Alternatively, local businesses may provide free charging or otherwise allow the utility, network company, or other third-party to own or operate the EV infrastructure. In these latter arrangements, the business owner may attract more customers and customer spending.

TRANSPORTATION FACILITIES

Transportation facilities, such as airports and park-and-rides, also serve as important site hosts. Airports are ideal hosts for a range of EV charger types. DCFC stations in short-term parking lots could serve EV drivers who are waiting to pick people up at the airport, while Level 1 charging is sufficient for long-term parking lots to serve travelers leaving for multiday trips. See Electric Vehicle Charging Stations at Airport Parking Facilities for additional information on the relevant policy, planning, and implementation considerations for partnering with an airport facility manager.

Though not necessarily publicly accessible, fleet depots are crucial site hosts for fleet owners to transition to EVs. In most cases, transit agencies and privately owned truck and bus fleets will want dedicated EV charging infrastructure that is not open to the public. However, some types of fleet charging, like EV chargers serving municipal fleets or vehicles operated by community-based organizations, could also serve the public during set hours.

Rural entities can work with fleet owners to help identify demand for charging stations. In some cases, collaborating with fleet owners can support rural entities' larger strategic initiatives, such as long-term transportation and environmental plans. For example, in 2021, Link Transit in rural Washington unveiled four wireless rapid charging stations to support its fleet of ten 35-foot battery-electric buses. Link Transit, which serves the towns and rural areas of Chelan County and Douglas County, has found that its electric buses are quiet and reliable, with less maintenance and lower operating costs than the agency's diesel and gasoline powered vehicles. The wireless chargers allow the buses to charge periodically throughout the day, with a few minutes at the end of each route, so the buses can cover more than 350 miles without coming out of service for a full recharge.

COMMUNITY SITES

Municipal, county, and Tribal Governments are crucial partners as community site owners. Community sites such as libraries, schools, business districts, and even public facilities like curbside parking spaces play an important role in ensuring widespread access to EV charging. For example, renters may not have options for home-based charging unless their landlords choose to install EV infrastructure. Residents who have only Level 1 charging capabilities at home may find they need to travel long distances on single trips, not have sufficient downtime at home for charging, or experience financial burden from home charging, particularly during peak times for electricity use. EV chargers that are publicly available, especially those with unrestricted access, can fill the gaps in EV charging to make an electric vehicle a feasible option for more residents of rural areas.

MICROMOBILITY PARTNERS

Deploying micromobility charging infrastructure, shown in Figure 4.5, involves a smaller ecosystem of partners including shared micromobility providers, micromobility charging infrastructure providers, and site hosts. Shared micromobility providers are public or

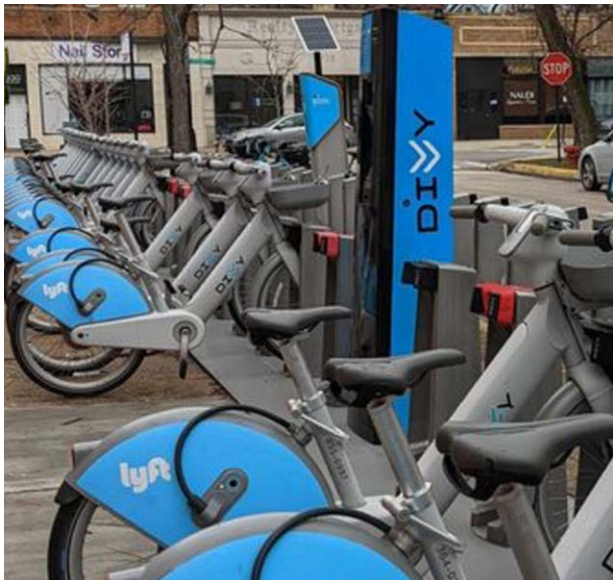


Figure 4.5. Examples of shared micromobility charging infrastructure for e-bikes and e-scooters. (Source: Smart Cities Dive and TechCrunch)

private entities that own, manage, and operate shared micromobility fleets (e.g., bikeshare and scooter share). Partnerships with these providers are critical to bringing shared micromobility to rural communities. Providers' operations vary, and they may charge micro mobility devices through on-street charging at docking stations, swapping removable batteries and charging them offsite, or charging the entire device remotely. On-site charging for shared and/or privately owned micromobility devices may be deployed in partnership with the site hosts identified in the previous section of this toolkit.

PARTNERSHIPS SUCCESS STORY: LOW-SPEED ELECTRIC VEHICLES IN TEXAS

As an alternative to BEBs, the Lone Star Clean Fuels Alliance has facilitated coordination among several stakeholders and project partners to bring low-speed electric shuttles to the rural community of Bastrop, Texas. Public transportation service Capital Area Rural Transportation System (CARTS) worked in partnership with a private, electric cab provider to provide this on-demand microtransit service. Additional partners include the City and County of Bastrop, as well as Wheels & Water and NREL that will help with data analysis and monitoring.

ELECTRIC BUS PARTNERS

The deployment of charging infrastructure for BEBs by transit agencies requires coordination with many of the same partners described above for light-duty EV chargers. Relationships and coordination with Tribal, State, and Federal agencies can provide access to information, resources, and funding to assist in the planning for and development of infrastructure. Local and Tribal Governments are a key partner to ensure that the installation of infrastructure follows local and Tribal laws and regulations.

Additionally, electric utilities are investing in transit and school bus electrification programs. Utilities are partnering with school districts to lower their elec-

tricity costs through smart charging programs or by financing upfront costs for charging infrastructure. As discussed above, early and continuous coordination with the utility is critical to ensure that the utility can meet the needs of the transit agency. Depending on the size of the infrastructure investment, the transit agency could be a large, new customer for the utility, which will require early planning on both sides. This early coordination can also allow the transit agency to discuss their infrastructure needs, existing or planned rate schedules, and opportunities to plan charging sessions to minimize costs. Transit agencies may also want to reach out to their local or Tribal Government agencies to discuss alternatives for electricity purchase or generation, such as on-site energy generation and storage, power purchase agreements, or community microgrids.

Other partners for transit agencies include bus manufacturers, which help agencies understand their vehicle options and infrastructure needs, and plan for each deployment. Labor unions are another key partner, as the usage of BEBs requires employees to take on new job tasks to test, operate, and maintain the buses. Early communication with these partners will help transit agencies address any concerns during the planning process and prior to implementation. Other sources of bus electrification support include the Zero Emission Bus Resource Alliance, a professional association for transit agencies that began in 2015 to bring together transit leaders to share information and research on zero emission buses, and the World Resources Institute's Electric School Bus Initiative, which provides guides, tools, and other resources.

CHAPTER FIVE

EV INFRASTRUCTURE PLANNING FOR RURAL AREAS

(Photo: ©123rf.com/oleg0)

This section describes best practices for planning EV infrastructure, emphasizing key issues that often arise in rural areas. Many of these issues are based on the challenges identified in *Section 3: Benefits and Challenges of Rural Vehicle Electrification*. In addition, EV infrastructure planning and priorities in rural areas significantly differ from planning in urban areas. For example, EV drivers in rural areas will likely have

access to home charging to meet their day-to-day charging needs. Therefore, enhancing public charging infrastructure to support longer trips, such as through DCFC stations along highways, may be a higher priority among rural communities. Local businesses and institutions, as well as community sites can also serve as a secondary priority for a rural community's local economy and EV adoption.

To support EV infrastructure planning in rural areas, this section walks through a project planning checklist and identifies specific resources to support the planning process. For a list of planning tools and resources, see *Appendix A: Resources for EV Infrastructure Planning*.

GUIDING PRINCIPLES FOR PLANNING AND IMPLEMENTATION

As EV-related technology evolves, so does the process for EV infrastructure planning and implementation. Furthermore, each region, community, and charging site host faces unique needs and constraints. Therefore, the following guiding principles—rather than hard-and-fast rules—can help site hosts and other stakeholders find their own (potentially unique) path through the EV planning and implementation process:

- **There is no one-size-fits-all approach.** The needs and goals for each project and region will vary greatly. This is especially true in rural areas, which can have extreme variation in factors like charging demand and infrastructure readiness. The investment required for some EV charging installations can be complicated, but not every installation needs to be large, costly, or overly complex. For instance, even a few Level 2 public chargers can be enough to mitigate range anxiety for visitors and residents of a rural area at a low cost.
- **Many planning processes may be executed in parallel** rather than strictly sequential order. The path to project completion is often not linear. Planners and stakeholders may gain new information throughout the many stages of a project and may need to revisit and revise earlier steps of the process. For example, project budgets often need to be revised based on information gathered in the site-selection process. Parallel execution of some planning processes may also facilitate faster completion of an EV infrastructure project.

EACH REGION, COMMUNITY, AND CHARGING SITE HOST FACES UNIQUE NEEDS AND CONSTRAINTS

- **Coordinate early and often with key stakeholders.** Stakeholder engagement is a crucial component of successful transportation infrastructure projects. For EV infrastructure specifically, the local or Tribal electric utility can provide essential information and technical support throughout the life of a project, from site-selection to final installation. Additionally, EV charger manufacturers, charging networks, and installers often offer a wealth of technical expertise and vital connections to utilities and other stakeholders. Early coordination with entities considering electric fleets, such as transit agencies, can help facilitate co-location or shared use of charging infrastructure. Depending on the region, technical assistance from a local Clean Cities coalition may also be available to provide a manufacturer-independent technology overview and assistance in making the best use of planning tools. This kind of coordination is important in rural areas, where technical information may be in short supply and where it may be challenging to connect with the right stakeholders. Good technical partners will

often have more up-to-date information than what's available online. See *Section 4: Partnership Opportunities* for more in-depth discussion of potential partners.

- **Stakeholders may have different needs and perspectives.** The goals of EV infrastructure planners, owners, and operators do not always align with the needs of the rural communities that host the installations. It is important to consider the diverse populations impacted by infrastructure projects, engage these community members in the planning process, and address their needs and concerns in project siting and design. See the *Equity Considerations in Planning* section for guidance and resources to help ensure that a project's benefits and costs are fairly distributed throughout the community.
- **Invest in planning and build for flexibility.** Large, complex EV infrastructure installations may require expensive upgrades to the site's electrical service or even to the nearby power grid and extensive site preparation. To avoid the need for even more upgrades in the future, consider both the current charging needs and expected future needs and ensure that planning is done in a careful and coordinated fashion. Designing infrastructure to accommodate future growth in demand—for example, through modular charging stations that allow for incremental increases in power—may be worth the extra installation costs. This approach can also reduce site preparation costs, as it may be cheaper and easier in the long run to lay electrical conduit for all potential EV chargers at once instead of cutting concrete multiple times during future projects.

TYPES OF EV INFRASTRUCTURE PLANNING

This section discusses three different levels of EV infrastructure planning:

- **Corridor-level planning** supports infrastructure along roads and highways that facilitate interregional travel.
- **Community-level planning** considers infrastructure solutions to meet the diverse needs within a particular region or town.

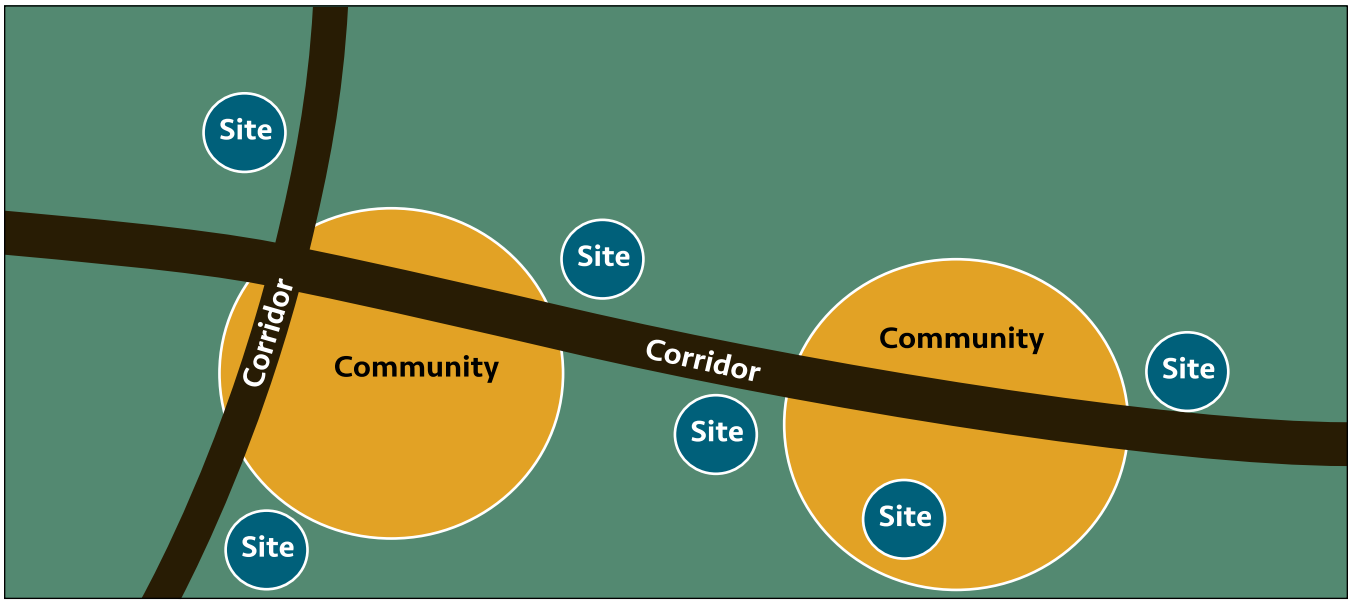


Figure 5.1. Three levels of EVSE planning: community, corridor, and site. (Source: USDOT Volpe Center)

- **Site-level planning** focuses on the procurement and installation of EV chargers for a predetermined location.

Figure 5.1 illustrates the spatial relationship among these three types of planning. The relevant level of planning likely depends on the planning lead and the project stage. For example, local and regional leaders and Tribal organizations may initially engage in community-level planning, while State DOTs and Tribal Governments are well-positioned to pursue corridor-level planning. Both entity types, however, may transition to site-specific planning after identifying preferred locations for new EV charging infrastructure. In contrast, independent charging site hosts—such as owners of businesses, workplaces, multi-unit dwellings, and single-family homes—will likely conduct site-level planning only.

The sections that follow identify useful resources for each type of planning and list planning considerations unique to rural areas.

CORRIDOR-LEVEL PLANNING

Corridor-level planning addresses the needs of interregional and interstate travelers and freight operators. Therefore, State DOTs, Tribal Governments and their transportation and planning departments, regional planning agencies, and county governments are best positioned to conduct this type of planning. Below are a few key considerations for corridor-level planning in rural areas:

- Since alternative fuel corridors will ultimately provide nationwide coverage, they will be highly relevant to rural areas.
- The corridor-based approach may be especially fitting for certain rural areas without a sufficient base of local EV adopters to support installations. A corridor-based approach offers rural entities the opportunity to tap into broader regional—or even national—bases of travelers and freight operators that may use a corridor in that rural area with station locations that are still relatively convenient for local users.
- To meet the needs of EV drivers, corridor charging typically needs to be fast, providing as close a refueling experience to filling up with gasoline as possible. Therefore, corridors generally need DCFCs, which are more expensive and require more electric grid infrastructure. However, if travelers make longer stops at certain attractions along corridors, Level 2 chargers at those locations may be adequate.

The following resources provide useful information on corridor-level planning:

- **FHWA's Alternative Fuels Corridors program website:** This website provides resources on building out infrastructure and includes several State and regional corridor-level planning documents, including a series of Alternative Fuels Corridor Deployment Plans documenting strategies for filling fast-charge infrastructure gaps along interstate corridors.
- **FHWA's Regional Convenings webpage:** This resource compiles meeting materials and summary reports from a series of five regional meetings with alternative fuel corridor partners. Meetings occurred in 2018 and 2019 throughout the United States. An example meeting output and corridor-planning resource is the stakeholder responsibility matrix from the Intermountain Western Alternative Fuels Corridor Convening.
- **The DOE Alternative Fuels Data Center's Corridor Measurement Tool:** This tool enables users to measure the driving distance between EV charging stations.
- **FHWA Alternative Fuel Corridors interactive map:** This online application allows users to explore potential new corridors for EV charging stations.

- **FHWA State EV Infrastructure Deployment Plans webpage:** Provides links to plans submitted to FHWA by each State describing how the State intends to use its apportioned National Electric Vehicle Infrastructure (NEVI) formula program funds to build out EV charging infrastructure along major corridors.

COMMUNITY-LEVEL PLANNING

State, Tribal, and local governments; transportation planning agencies; transit agencies; and community and Tribal organizations may all engage in community-level planning for EV charging infrastructure. In contrast to corridor-level planning, which seeks to meet the needs of those "passing through," community-level planning engages local stakeholders to serve a particular neighborhood, town, or region. Below are a few key considerations for community-level planning in rural areas:

- Rural entities can tap into regional coalitions and look to national-level organizations to help establish partnerships for community level planning. Regional transportation planning organizations and metropolitan planning organizations can also help with community-level planning for EV charging infrastructure.
- In general, rural EV charging projects may face more technical constraints due to less-developed electric-grid and telecommunications infrastructure.
- Communities are made up of diverse stakeholders with different needs and perspectives which should be considered in the planning process.
- Tourism may generate a high percentage of traffic in some rural areas. Since tourists may have different travel patterns (e.g., higher traffic and charging station utilization during holidays and weekends), they are likely to place different demands on the types of EV charging installations needed and the locations of these installations.

The following resources from AFDC provide useful information on community-level planning:

- **Plug-In Electric Vehicle Readiness:** This is AFDC's primary portal for information to help communities and regions assess existing conditions, identify opportunities, develop partnerships, and conduct education and outreach.
- **A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects:** This is a comprehensive summary of lessons learned from DOE's 16 Clean Cities EV Readiness projects with coverage of 24 States across the country.
- **Electric Vehicle Infrastructure Projection Tool:** This online tool helps communities and regions estimate the overall quantity and type of EVSE infrastructure needed.

SITE-LEVEL PLANNING

Site-level planning can occur as a top-down, coordinated approach among regional leaders and stakeholders (including community- and corridor-level planners) or as a bottom-up, individual approach initiated by site hosts, such as local business owners. Below are a few key considerations for site-level planning in rural areas:

- As in community-level planning, rural entities can look to regional and inter-tribal coalitions and national-level organizations to help establish partnerships.
- Lack of three-phase power, wired broadband, or cellular service in some rural areas may make it more challenging and expensive to install certain types of chargers, including DCFC and networked charging stations.
- A lower concentration of EV owners in rural areas, combined with the needs of travelers passing through, may affect the charging needs and economics in rural areas.

- Rural drivers may need unique accommodations for their vehicles. For example, drivers arriving with trailers may seek out EV chargers alongside pull-through parking spots where drivers would not need to back up their vehicles.

AFDC provides a general overview of the site-level planning process in addition to the following more detailed resources for specific types of sites and fleets:

- Home charging
- Charging for multi-unit dwellings
- Workplace charging
- Public charging
- Fleet charging
- School bus charging

PROJECT PLANNING CHECKLIST

This section walks through a general checklist for EV infrastructure project planning. Figure 5.2 provides an overview of the checklist, with the following subsections discussing each checklist item in more detail. Most of these checklist items apply to site-level planners, such as charging site hosts or other entities tasked with identifying a project's size, cost, and plan for execution. However, some points—such as site selection and electric grid planning—are also relevant to community or corridor planners, especially since high-level planning may affect the set of candidate charging sites.

Also, as noted in the *Guiding Principles for Planning and Implementation*, the planning checklist is not

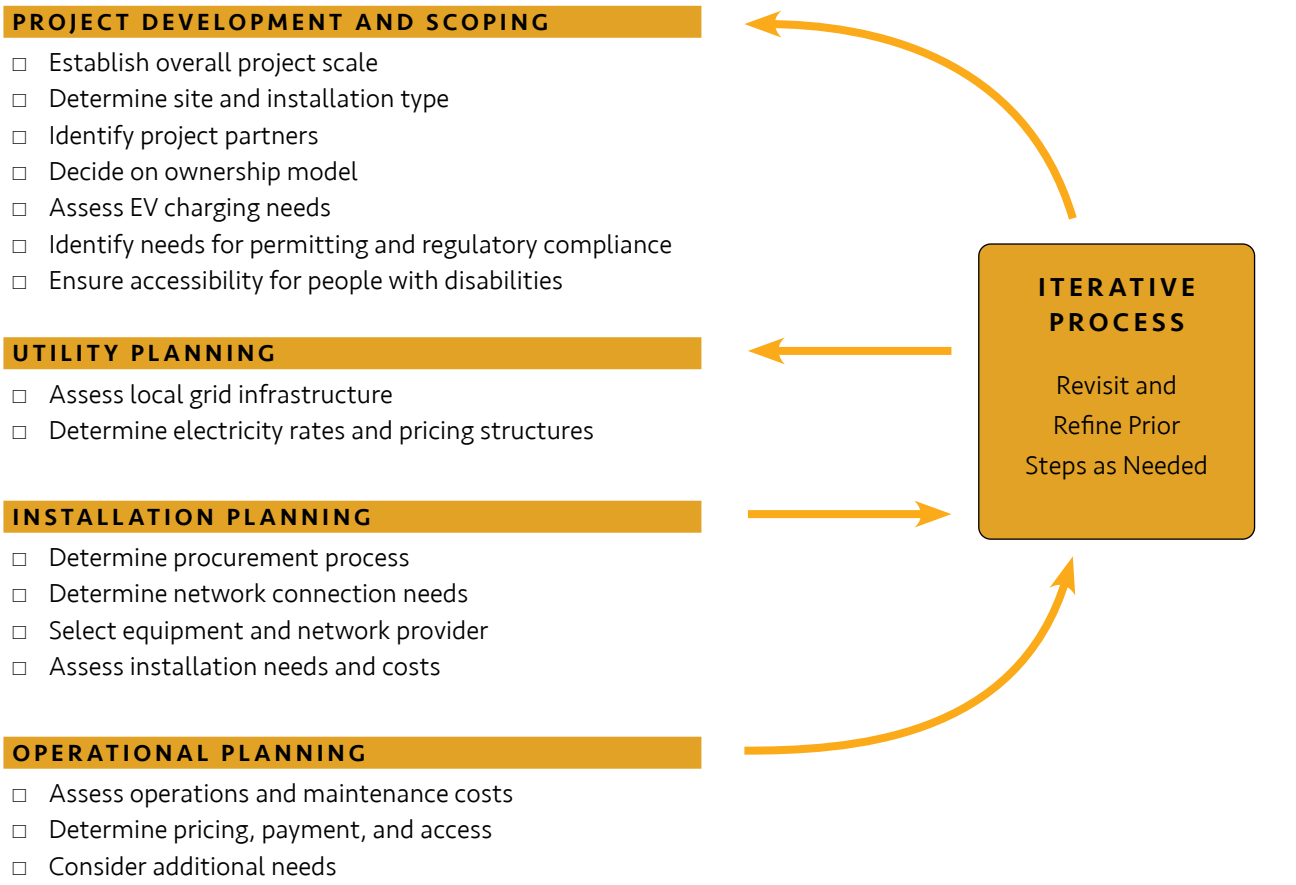


Figure 5.2. Key steps in planning EVSE projects. (Adapted from AFDC's "Infrastructure Development Checklist")

necessarily a series of sequential steps. Instead, site-level planners may need to think about multiple issues simultaneously and possibly revisit individual checklist items throughout the planning process.

PROJECT DEVELOPMENT AND SCOPING

ESTABLISH OVERALL PROJECT SCALE

Determine the project's scope, preliminary budget, timeline, and funding mechanism. Site-level planners may need to continually revise the project scale as they learn more about costs and other constraints specific to their site. To prepare for initial project scoping conversations, planners should develop a sense of expected interest or demand for EV charging, whether present or in the future, and should begin to familiarize themselves with the types of EV chargers; their approximate costs; and available funding opportunities. *Assess EV Charging Needs* provides technical guidance on estimating demand while *Equity Considerations in Planning* suggests methods to engage community members early in the planning process.

For fleet managers specifically, Rocky Mountain Institute (RMI) has prepared a summary of what to expect (e.g., number of chargers needed, costs, challenges) when electrifying fleets of different sizes.

DETERMINE SITE AND INSTALLATION TYPE

In a top-down approach to planning, site-level planners work closely with a regional coalition to identify the best location for an EV charging station. Higher-level coordination can help integrate EV infrastructure planning with other community-level or corridor-level planning efforts, including goals to more equitably meet community needs. For example, charging solutions like curbside charging—currently being piloted in urban areas like New York City and Kansas City—could serve multifamily housing residents or others in rural towns who may not have EV charging spaces at home. For a deeper discussion on pursuing an equitable planning process, see *Equity Considerations in Planning*.

In addition, site-specific technical, economic, and regulatory factors will also need to be considered in initial site selection. Some of the planning steps presented later in this section may present obstacles that limit site selection, so it may be beneficial to conduct initial feasibility assessments based on these steps before committing to a specific site. For example, initial consultation with a local utility will help avoid particularly problematic or costly sites for an EV charging installation.

DOING MORE WITH EVSE: COMPLEMENTARY TECHNOLOGIES AND REVENUE STREAMS

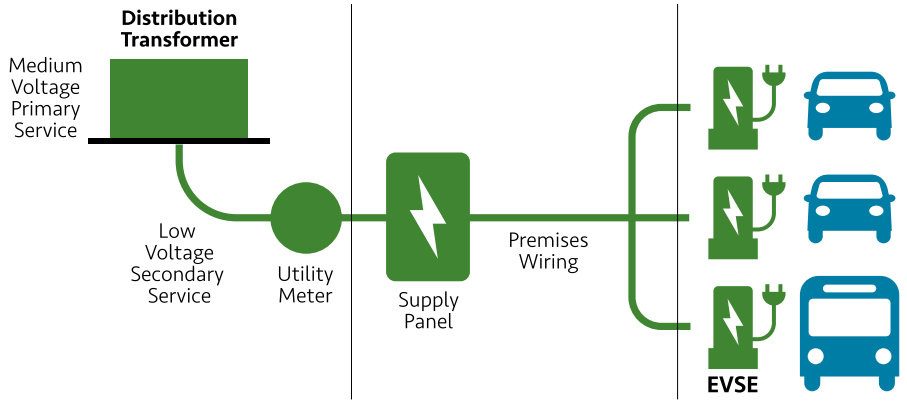
In areas where the demand for light-duty vehicle (LDV) charging is too low to implement chargers exclusively for LDVs, consider charging infrastructure that can serve multiple purposes. For example, in the Cherokee Nation, located in Oklahoma, the Tribal Government and regional Clean Cities coalition installed a solar canopy with free EV charging ports. Excess electricity generated by the canopy is used to augment grid power for the connected public buildings. As another example, in an agricultural area, chargers could be used for EV farming equipment during the night and for LDVs for locals or tourists during the day. LDV charging could even bring in some revenue for the site operator. Finding creative dual uses for EV infrastructure can make projects more feasible for rural areas.

In a bottom-up approach, individual charging site hosts may already understand their unique site-specific constraints and choose to install charging stations on their own property. Still, site hosts could potentially benefit from partnering with utility coalitions and other stakeholders to achieve cost reductions (by leveraging other purchases of equipment and services) or to increase charging station utilization.

IDENTIFY PROJECT PARTNERS

Identify project partners, such as electric utilities and local, Tribal, or regional coalitions. Working with the local utility is especially important for rural entities, given the limited electric grid capacity in many rural areas. Connect with the different regional utilities early in the planning process to learn about their different EV-related policies and programs and to understand any project constraints. Also, ensure that candidate installation sites fall within the utility's service area.

Regional, Tribal, and local utility coalitions may also make valuable partners and can provide technical expertise in rural EV infrastructure projects. For example, the Electric Highway Coalition, a group of electric companies collectively serving more than half of U.S. States, aims to coordinate on EV charging solutions for major corridors. Individual utility members also support EV adoption within their respective service areas. In addition, other local entities may have experience implementing EV charging projects and can share insights and lessons learned. Local Clean Cities



	UTILITY SERVICE	PREMISES WIRING	EVSE
1. Traditional	**Electric Company**	**Customer**	
2. Make Ready	**Electric Company**		**Customer**
3. EVSE Only	**Electric Company**	**Customer**	**Electric Company**
4. Full Ownership	**Electric Company**		

Figure 5.3. Various approaches to ownership of EVSE and related site-wiring. (Source: AVISTA, 2020)

coordinators can help facilitate these connections. See the section on *Partnership Opportunities* for a more in-depth discussion of potential project partners.

DECIDE ON OWNERSHIP MODEL

Site-level planners need to determine who will own, operate, and maintain the EVSE and related electrical infrastructure. In general, either the utility or the utility customer can own and operate the EV charging infrastructure. The utility customer can be the site host—a property owner, Tribal or local government, or tenant—or a third party, such as a charging network company. With third-party ownership and operation, the site host does not directly profit from the charging station revenue but may see an increased number of visitors. For example, visiting EV drivers may purchase items from a retailer's business while charging their vehicles.

As illustrated in Figure 5.3, there are also several possible ownership arrangements between a site host or third party and the utility:

- In the **Traditional** approach, the utility provides all equipment and wiring needed from the public power lines to the facility, including the meter, and the customer pays for, owns, and maintains all additional wiring needed and the EV charger. Most simple EV charger rebate programs follow this model. While this provides the site host or third party with full ownership and control over all premises wiring and charging station, it also requires the most upfront investment.
- In the **Make Ready** model, the utility installs, owns, and maintains all the wiring needed up to the interface with the EV charging station, including any service or meter upgrades needed. This is usually a good option for sites that do not want to (or are unable to) invest in premises wiring upgrades, as it allows the utility to absorb and recover those costs.
- In the **EVSE Only** model, the utility installs and owns only the EV chargers. This provides a very low-cost option for both the site host and the utility when the site already has all or most of the needed wiring.
- In the **Full Ownership** model, transformers, meters, all wiring, and the EV charger itself are all owned and maintained by the utility. The utility would charge and collect user fees. For large investments like DCFC installations, this may be the preferred approach, as it will help ensure long-term operability and public access.

State and Tribal regulations may impact how utilities own and manage EV charging infrastructure. These regulations vary widely[17] and therefore pose different considerations for potential business models and arrangements among site hosts, electric utilities, and charging station network operators. AFDC's Laws and Incentives database contains information on State-level utility regulations regarding how electricity is sold and potentially re-sold by EVSE operators. In addition to regulations on who can sell power, States have different taxes and fees on electricity sold by EV charging hosts, which may affect the financial bottom line and discourage potential hosts. If a site-level planner wants to pursue a model involving utility ownership or operation of the EV chargers, it may be best to inquire upfront with the local or Tribal utility about the available options. For additional discussion on the pricing-related decisions for different business models, see *Determine Pricing, Payment, and Access*.

ASSESS EV CHARGING NEEDS

When determining the number and types of chargers needed at a location, it is important to assess:

- **The expected total demand for charging** (e.g., number of vehicles per day, types of vehicles).

17 For example, see the definition of a public utility in Virginia.

Reducing Costs through *Peak Shaving*

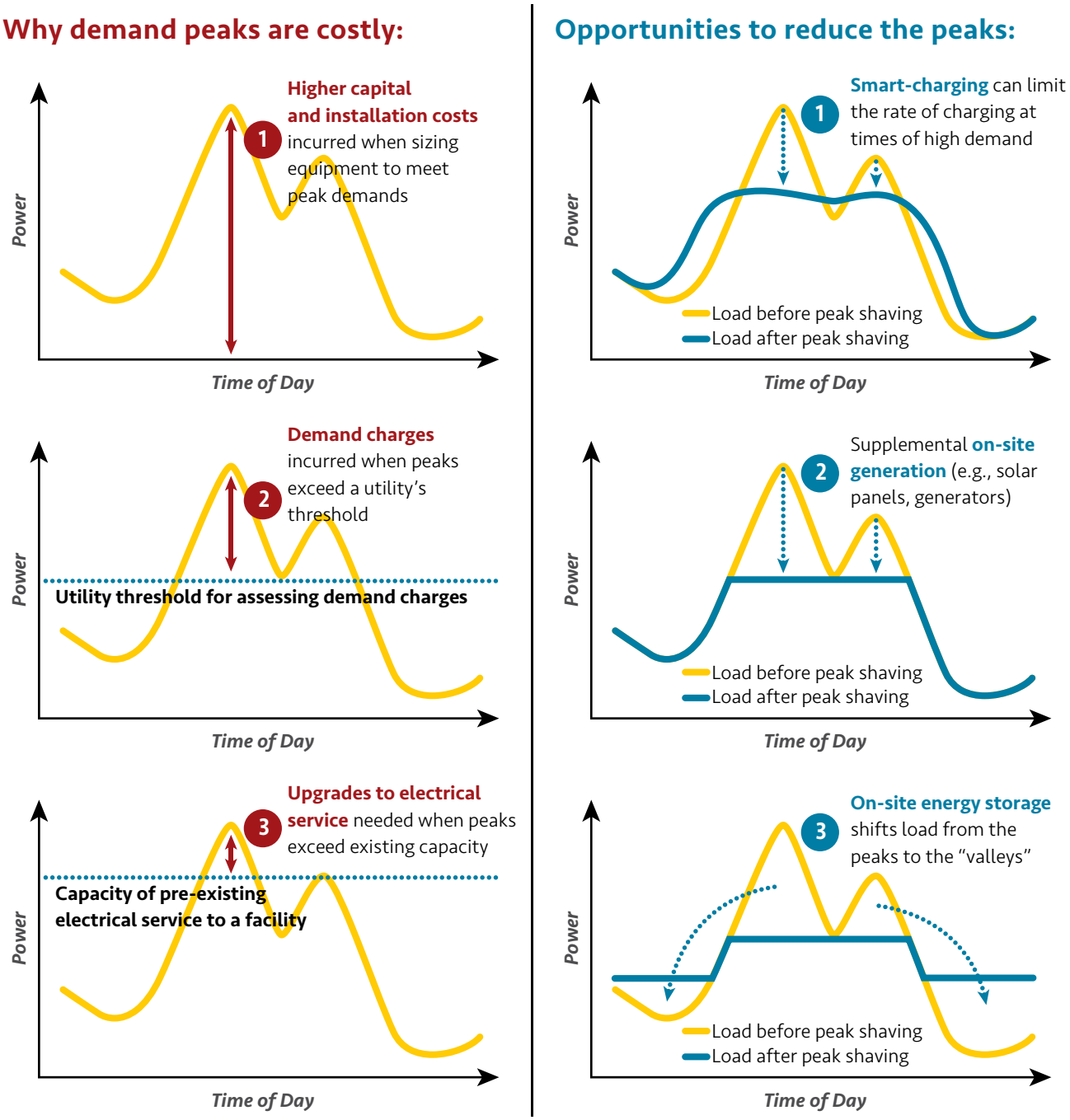


Figure 5.4. Reducing an installation's peak demands through processes known as "peak shaving" can save significant costs, both initially and over the life of an installation. Of these options, only smart charging can reduce the necessary capacity of the installation. On-site generation and energy storage only reduce demand on the grid electricity supply—they do not reduce demand for charging power from the EVSE. (Graphics adapted from Peak Shaving Control Method for Energy Storage)

Does the expected demand support the overall business case for the installation?

- **The expected demand profile.** Will demand be steady throughout the day, or will there be peaks in demand at certain times of day?

Installations should be sized to handle peak demand periods. Site-level planners should consider how the installation size and project scope accommodates peak demand, as well as ways to limit those peaks (e.g., shifting charging demand from higher-demand times to less-busy times) (see Figure 5.4). The local or Tribal utility may have additional recommendations on how to reduce peak demand. Options may include integrating energy storage technologies into the charging installation (e.g., on-site batteries) and utilizing "smart charging" strategies, such as automatically adjusting charging speeds and times to meet demand at a lower cost.

IDENTIFY NEEDS FOR PERMITTING AND REGULATORY COMPLIANCE

To ensure a project's viability, it is important to identify regulatory requirements and necessary permits. For example, for projects that receive Federal funding, it is important to consider requirements to purchase certain products from American manufacturers (Buy America provisions), and requirements for contractors to pay locally prevailing wages on construction projects (Davis-Bacon and Related Acts). The *Federal Funding Application Process* section provides more information on considerations for projects receiving Federal grants and loans. Additionally, it is important to observe Tribal laws and applicable requirements when building EV charging infrastructure on Tribal Lands.

EV infrastructure projects must also comply with applicable environmental laws and regulations. The National Environmental Policy Act (NEPA) requires all Federal agencies to consider their actions' impacts to the environment as part of their decision-making process. Compliance with NEPA and any other applicable environmental laws, such as the Endangered Species Act or the Clean Water Act, is required for EV infrastructure projects that receive Federal funding or require Federal approval. The Federal agency taking primary responsibility for the environmental review process will work with the applicant for Federal funding or approval to identify which environmental statutes and executive orders will apply to the project. Many EV infrastructure projects will require only a minimal environmental review due to their small footprint, minimal ground disturbance, and lack of potential to cause significant environmental impacts to wildlife habitats, wetlands and/or cultural and historical resources. In addition, it is important to observe the National Historic Preservation Act and partner with Tribal Historic Preservation Offices early to obtain the necessary approvals for protection of sacred sites. *Appendix B* contains brief overviews of the environmental statutes and executive orders that USDOT anticipates will most commonly apply to EV infrastructure projects, though each project will be individually evaluated. Check with the partnering Federal agency for more detailed guidance on the environmental review process.[18] In addition, it is important to observe the National Historic Preservation Act and partnering with Tribal Historic Preservation Offices early to obtain the necessary approvals for protection of sacred sites.

Beyond Federal laws, regulations, and permitting, the project sponsor will also need to meet relevant State, Tribal, and local requirements. As specific requirements vary by community or even type of site, it is important to check with local and Tribal officials to confirm all applicable requirements and to ensure compliance throughout the project's lifespan. At the same time, local governments may wish to evaluate and update existing ordinances and building codes to prepare for future EV charger installations.

18 For example, see FHWA's Environmental Review Toolkit and FTA's Environmental Review Process webpage.

Figure 5.5. Examples of accessible parking with EVSE. (Sources: North Carolina Plug-In Electric Vehicle Task Force, U.S. Access Board)

ENSURE ACCESSIBILITY FOR PEOPLE WITH DISABILITIES

The Americans with Disabilities Act (ADA) requires that public spaces (such as public parks, street parking and the public right-of-way, public EV charging stations provided by a private entity, and rest stops along the Interstate Highway System) are readily accessible to and usable by people with disabilities, including wheelchair users. The U.S. Department of Justice has issued regulations establishing general requirements for accessible parking spaces. Public entities must also ensure that their services, programs, and activities are reasonably accessible, even in the absence of specific regulations or standards.[19] ADA-compliant EV charging installations must provide unobstructed access to equipment with easy-to-use controls, enough space for the driver with a disability to exit or enter the vehicle, and free movement around the EV charger and connection point on the vehicle.

The U.S. Access Board provides design recommendations for accessible electric vehicle charging stations. The Access Board guide differentiates between accessible parking spaces and EV charging spaces because of differences in how people with disabilities may need to maneuver their vehicle to access EVSE and the vehicle's charging inlet. Design recommendations cover both accessible mobility features and accessible communication features of EV charging stations. Additionally, under the ADA and Architectural Barriers Act (ABA) Accessibility Standards, EV charging stations must comply with the technical requirements for floor and ground surfaces (§302), clear floor or ground space (§305), reach ranges (§308), operable parts (§309), and accessible routes (§402). EV chargers developed, procured, maintained, or used by Federal agencies must also comply with the revised Section 508 Standards, which requires that the EV charger user interface be accessible. Because EV charging inlet locations vary across vehicle makes and models, a larger vehicle charging space is needed to maneuver around all sides of the electric vehicle. As of August 2022, the ADA and ABA Guidelines do not expressly identify a minimum number of chargers that must be accessible at an EV charging station though a "reasonable number" must be accessible to and usable by people with disabilities.

EVSE should also be located so that people with disabilities may safely and comfortably use adjacent sidewalks, consistent with the Access Board's proposed Public Rights-of-Way Accessibility Guidelines.

19 Per Fortyune v. City of Lomita

Many States have developed their own standards or guidelines[20] for accessible design, so site-level planners should consult their local governing bodies for additional guidance in ensuring ADA-compliant parking and charging stations. These design standards and guidelines highlight additional accessibility considerations such as ensuring that protective bollards, wheel stops, and curbs do not block access to EVSE; designing site layout to mitigate EVSE cable tripping hazards; and providing assistance to drivers with disabilities for heavier DCFC cables and connectors requiring more force to insert into EV inlets.

20 For example, see North Carolina's Accessibility for Public Charging Stations factsheet, and Ohio and Virginia's EV Charging for Persons with Disabilities.

UTILITY PLANNING

ASSESS LOCAL GRID INFRASTRUCTURE

As noted earlier, coordinating with the local utility can be beneficial throughout the life of a project, but this coordination becomes essential at this stage of the planning process. Project planners can coordinate either directly or through a coalition (for more information on the different types of utilities and how to engage with them, see the *Utilities* section). Compared with urban areas, the grid infrastructure in rural areas is more likely to require upgrades to support charging needs. For example, sites with many Level 2 chargers are more likely to strain elements of the existing local grid than sites with a single Level 1 or Level 2 charger.

ELECTRICITY SUPPLY REQUIREMENTS

What ultimately determines the speed of EV charging is the electric power (measured in watts or kilowatts) delivered to the vehicle. **Power** is a function of the **voltage** (in Volts) of the electrical supply and the **current** (in amps) flowing through the circuit (Power = Voltage x Current).

However, the power delivered to a battery may be limited by internal components on each vehicle, so not all vehicles will be able to charge at the highest rate of the EV charging equipment. Furthermore, three-phase electricity supply is needed for DC fast charging, so a lack of access to three-phase power will limit options for some EVSE installations.

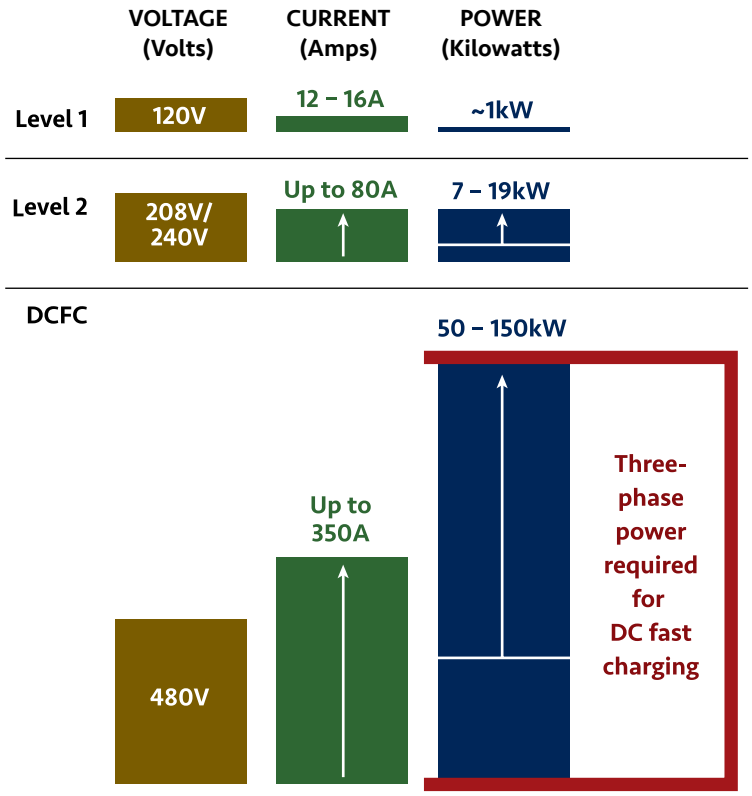


Figure 5.6. Electricity supply needs of different charging speeds, including the importance of three-phase power for fast charging. (Source: USDOT Volpe Center)

Also, lack of three-phase power may limit DC fast charging capabilities (see Figure 5.6). Unlike single-phase circuits which have a single "live" wire and a neutral wire, three-phase circuits have three live wires, each with its own alternating current signal, and are capable of delivering substantially more power to the charging system.

While the EVSE installer can make on-site modifications, any necessary electrical supply upgrades (e.g., higher-capacity supply wires, transformers) may need to involve the local or Tribal electric utility. Coordinating with the utility early on is important to ensure that major infrastructure upgrades, such as the installation of substations, do not incur avoidable costs and project delays during the implementation process.

For more remote rural areas, installations using off-grid power sources may provide an appealing option for avoiding expensive grid upgrades. There are some emerging resources for planning installations with off-grid charging, through distributed (on-site) electricity generation and on-site energy storage. Some companies are pursuing large-scale EV charging using distributed renewable power. Solar-based solutions may be particularly effective in the rural West, where the natural potential for solar-power generation is strong.

Potential hybrid approaches use both grid-power and off-grid power—for example, using batteries or generators to supplement grid power to meet peak-demands, which would enable higher-power charging without electricity infrastructure upgrades and could help avoid demand charges. Other companies provide charging systems that fully integrate batteries with a site's low-power electricity supply to provide fast charging in places where it may not otherwise be possible. Furthermore, as discussed earlier in *Assess EV Charging Needs*, options for advanced charging may also reduce the need for electric grid upgrades.

DETERMINE ELECTRICITY RATES AND PRICING STRUCTURES

It is essential to coordinate with utilities early in the planning process to understand aspects of electricity pricing that may significantly impact the financial viability of an EV charging installation. This includes basic electricity pricing (e.g., different rates for residential and commercial customers) as well as demand charges and time-of-use rates.

Demand charges are extra fees that many utilities charge to commercial and industrial customers to

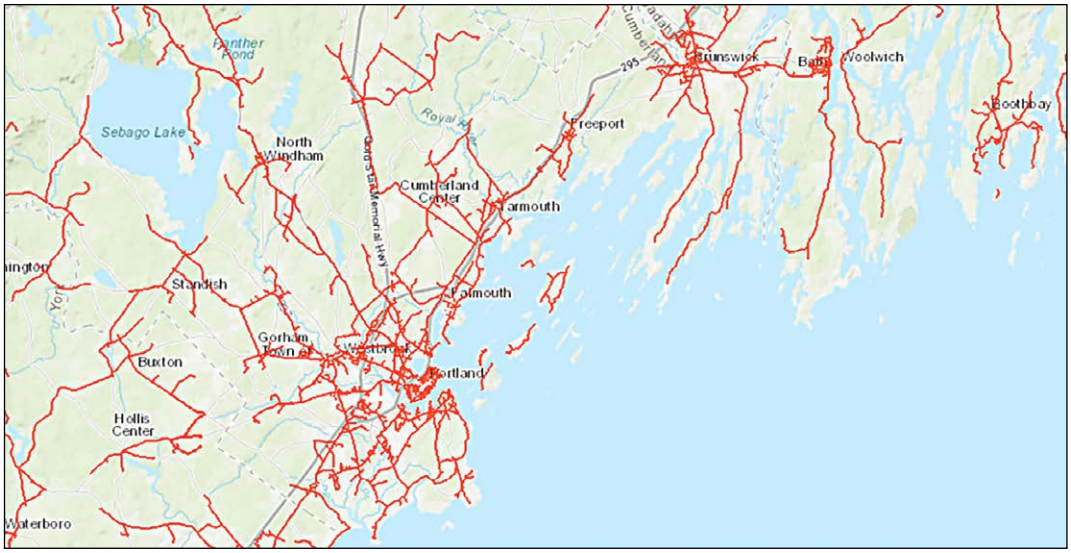


Figure 5.7. Map of three-phase electricity distribution infrastructure in mid-coastal Maine. (Source: ArcGIS Interactive Maps)

SUCCESS STORY: OFF-PEAK CHARGING IN VERMONT

An electric utility in Vermont offers EV charging customers different electricity rates (in dollars per kWh) for charging during peak versus off-peak hours. In addition, customers can choose from one of two pricing systems that incentivize off-peak charging. The utility has also partnered with the Vermont Economic Development Authority (VEDA) on a workplace charging program in which the utility provides the Level 2 charger, installation, software, project management, and maintenance, all funded through a low-interest VEDA loan, which business customers pay off through an additional fixed charge (starting at $45 per month) on their monthly utility bills.

help cover their costs of investing in infrastructure to meet peak demands. They are charged by utilities when a customer's peak demand exceeds a certain threshold, usually in the 20 kW to 50 kW range. The fees, usually ranging from $3 to $40 per kW, are determined by the highest amount of power drawn during any interval (typically 15 minutes) during a billing period and are added to a customer's monthly bill. For example, if EV charger use on a site causes peak demands to exceed the utility's threshold for just 15 minutes of a given month, the facility operator may be charged up to $2,000 extra for that month. Utilities may also vary their demand charges based on the season and time of day.

The use of DCFC chargers or the simultaneous use of several Level 2 chargers can increase a facility's peak electricity demand and trigger expensive demand charges. Though some EV manufacturers offer complimentary charging, for example, with a partnering private charging network company for up to 30 minutes a session for the first few years of EV ownership, these demand charges can increase the price of individual charging sessions and deter drivers from using the EV chargers. While some utilities offer programs and other solutions to reduce the initial impacts of demand charges, [21] these pricing factors could be especially impactful in rural areas, where initial EV charging station utilization may be low, and small additional charges can significantly impact the business case for owning and operating EV infrastructure. Beyond the commercial impacts, demand charges could also make EV charging prohibitively expensive to low-income populations and thus hinder equitable access to the energy, environmental, and economic benefits of EV ownership.

Time-of-use rates provide reduced electricity costs at certain times of the day to encourage EV charging when overall demand on the grid is low (e.g., at nighttime), helping the utility smooth out its overall demand profile.

INSTALLATION PLANNING

DETERMINE PROCUREMENT PROCESS

Some entities (e.g., public agencies) may need to follow formal procurement processes or other guidelines to obtain the necessary equipment and services for EV charging installations. Importantly, these procurement rules or guidelines could affect other aspects of the planning process. For example, the Northeast States for Coordinated Air Use Management (NESCAUM) has developed model language for State EV infrastructure grant and procurement contracts to establish a baseline for important aspects of EV charging operations, such as charging station access, uptime (or availability), pricing transparency, and payment options. Additionally, many localities have the

21 See the utility case studies in the 2021 Western Governors Association report for example programs.

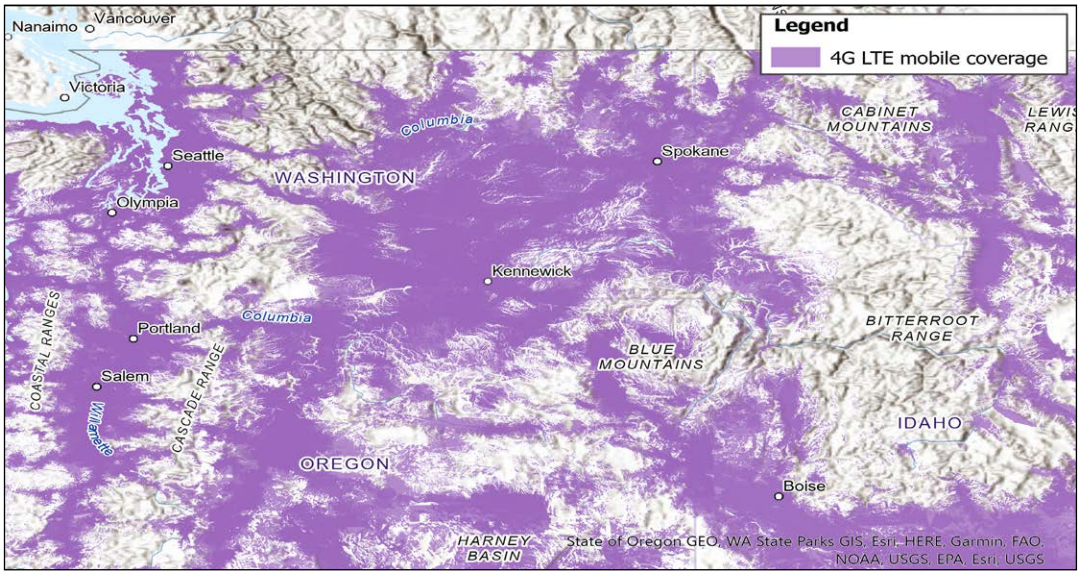


Figure 5.8. Extent of 4G LTE mobile coverage in Washington, Oregon, and Idaho as of May 15, 2021. (Source: Derived with data from Federal Communications Commission. Displays data from AT&T Mobility, T-Mobile, UScellular, and Verizon.)

option of purchasing EV chargers through established State contracts, which can provide savings over bidding per contract.

The timing of EVSE procurement may also be an important factor. For example, in cases where fleets are transitioning to EVs, EVSE procurement should be done well in advance of vehicle procurement, to ensure that EV charging infrastructure is installed and ready for use in advance of the transition.

DETERMINE COMMUNICATIONS NETWORK CONNECTION NEEDS

The installing entity will need to decide if the stations will be networked or non-networked. Networked chargers connect to the Internet or cellular service to collect payment by credit card or smart phone, transmit utilization data, including current charger availability, and support remote customer service and firmware updates. They also introduce a range of opportunities related to vehicle-to-grid integration (VGI), including unidirectional control from the grid to the vehicle (often referred to as "V1G"), which allows the grid operator to control the rate of charging to reduce demand peaks, and vehicle-to-grid capabilities (or "V2G"), which allow bi-directional communication and bi-directional flow of electricity between vehicles and the grid, allowing vehicles to provide additional grid services.

Non-networked chargers provide basic charging capabilities without an Internet connection or any advanced monitoring or payment capabilities. As a result, non-networked chargers must either collect payment through a different means (e.g., through an attendant or at a nearby establishment) or provide complimentary EV charging.

For remote areas, broadband or cellular access could present obstacles to installing networked stations (see Figure 5.8 for an example of the extent of cellular coverage). If lack of cellular or broadband availability prevents the installation of a networked station, and therefore a site host cannot monitor charging use and participate in demand response programs, the utility may be able to offer a special subscription rate to help the site hosts avoid unexpected and unwanted demand charges.

SELECT EQUIPMENT AND NETWORK PROVIDER

Equipment and network providers can fill important gaps in knowledge on EV charger types, needs, and

capabilities. For equipment and network selection, resources such as the Go Electric Drive "EVSE Products, Charging Network and Service Providers" tool can help facilitate comparison between current choices on the market.[22] The ENERGY STAR certified EVSE list helps with selecting the most energy-efficient models. One method of locating providers is to contact a major industry association, such as Electric Drive Transportation Association, Plug-In America, or Zero Emission Transportation Association.

ASSESS INSTALLATION NEEDS AND COSTS

Information on EV charging demand, siting, and electrical capacity can inform which types of EV chargers are selected and how many to install. Refer to the section on *Charger Types and Speeds* for information on available charger types, namely Level 1, Level 2, and DCFC. When selecting a charger type, consider its voltages, resulting charging and vehicle dwell times, and estimated upfront and ongoing costs.

While local costs can vary significantly from the national average, a 2019 report by the International Council on Clean Transportation estimates that hardware and installation costs for networked Level 2 chargers is around $6,000 for a single-port pedestal capable of charging one vehicle and $11,000 for a dual-port pedestal that can charge two vehicles at once. Costs for non-networked chargers are significantly less at around $4,000 for a single-port and $8,000 for a dual-port charger. For DCFC units, typical costs range from $70,000 to $120,000. See the decision tree in Figure 5.9 for additional guidance in selecting a charger type.

As described in DOE's 2015 EVSE cost report and in a 2019 report by RMI, site- and project-specific factors that may affect the cost estimate include the trenching distance to lay the electric conduit and local labor

22 Alternatively for equipment: https://pluginamerica.org/get-equipped/

SUCCESS STORY: PROVIDING FREE PUBLIC CHARGING IN COLORADO

Since 2013, the Colorado Energy Office and Regional Air Quality Council have jointly supported the installation of more than 1,000 EV charging stations across the State through the Charge Ahead Colorado grant program. Some early grant recipients like Eagle County and the Town of Carbondale installed Level 2 chargers and provided free public charging in their communities.

Eagle County, Colorado

In 2014, Eagle County installed one of its first public EV charging stations at the county office building in Eagle, Colorado. The Level 2 station is free to the public and serves EV drivers traveling along the I-70 and U.S. 6 corridors or visiting the restaurants and shops in downtown Eagle. In 2014, fully charging an EV cost around $1.50, which Eagle County estimated would increase the county's electric bill by $500 per year. The project cost $8,700, of which $6,260 came from grant funds. Eagle County's Facilities and Engineering departments helped complete the installation.

Carbondale, Colorado

In 2013, the Town of Carbondale installed its first Level 2 charging station along parking spaces in front of the town hall. The project cost $6,050, of which more than $4,800 was reimbursed through grant funding. The town decided to initially provide free charging services, since enabling payment capabilities would cost more than just paying for the electricity while use was low. Since then, Carbondale has expanded to 16 charging stations, of which 15 are free Level 2 charging stations.

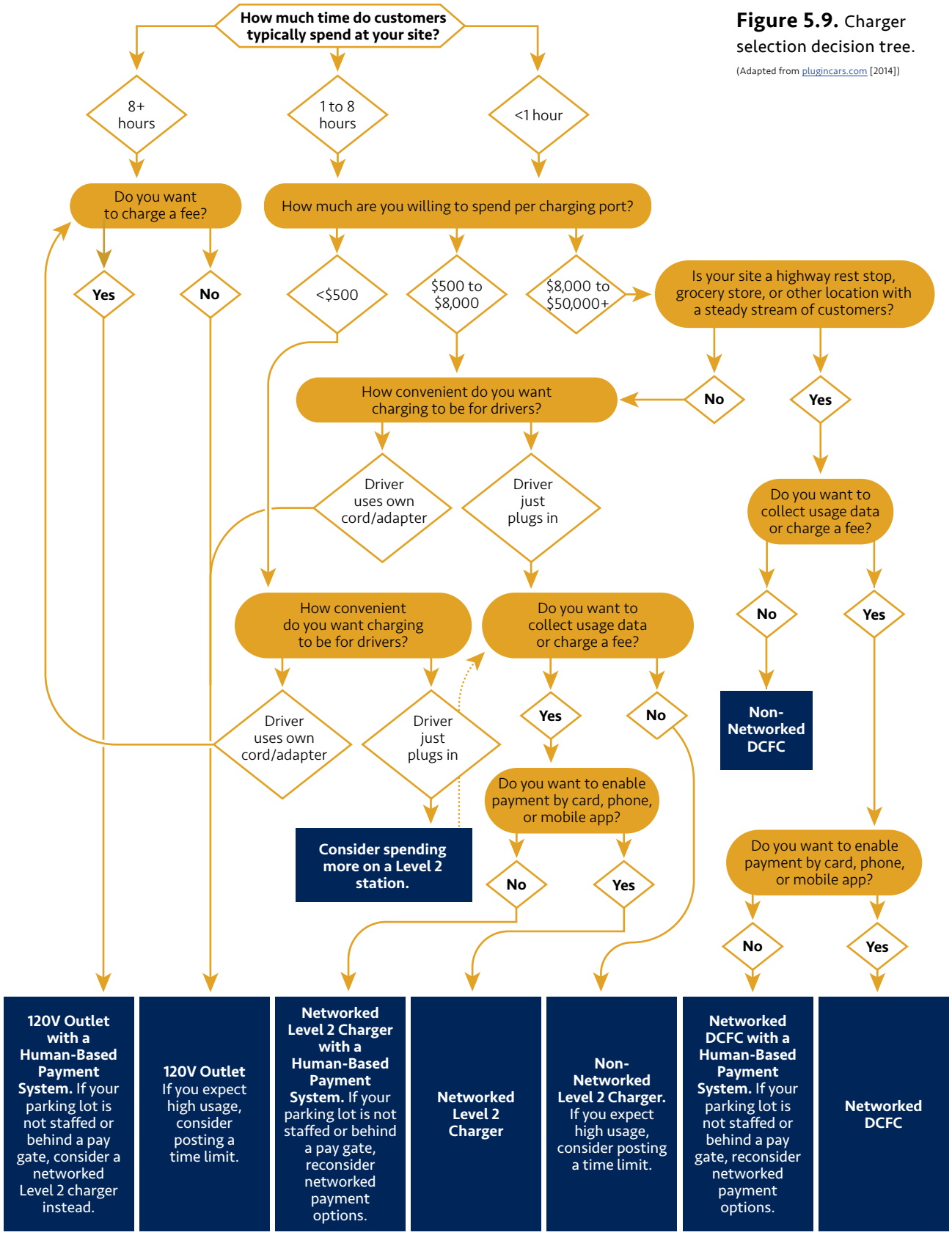


Figure 5.9. Charger selection decision tree.

(Adapted from plugincars.com [2014])

costs. Also, per-charger installation costs typically decrease significantly when additional chargers are installed on the same site and at the same time. Similarly, overall installation costs can be lower if a site completes all trenching for EVSE conduit at once, even if the charging units themselves aren't planned for installation until a later date. An EVSE installer can perform a site assessment to provide more tailored cost estimates for the types of chargers that meet project needs.

Additionally, a thorough assessment of installation needs and costs should include any upgrades needed to on-site electrical wiring (which is in addition to upgrades that the utility may need to do on their side of the meter). This step should also include consulting with a certified electrical contractor. The EVITP provides a State-by-State listing of available certified contractors. Electricians in rural communities can become EVITP certified for the installation of charging equipment in their State through a training class and exam. States vary widely in terms of the availability of certified contractors. The equipment or network provider can also be a source of information for locating qualified EVSE installers.

OPERATIONAL PLANNING

ASSESS OPERATIONS AND MAINTENANCE (O&M) COSTS

While early estimates of O&M costs may not be very precise, they will be essential to overall financial planning and ensuring that the project scope and business model are viable. Charging stations require ongoing maintenance in the form of general inspections, repairs, cleaning equipment, and ensuring cables are securely stored. Repairing broken chargers can be costly if the chargers are no longer under warranty, so it is important to determine whether the site host, charging network, or EVSE installer will be responsible for the costs and to specify expectations (e.g., around response time) in maintenance contracts. For preliminary planning, however, AFDC suggests that station owners plan for annual maintenance costs of $400 per charger while a 2014 RMI report points to maintenance costs of $300 for a public Level 2 station and $1,000 to $2,000 for a Level 3 station. Additionally, as discussed in the *Utility Planning* section, total spending on electricity depends on the utility's pricing structure, demand charges, and time-of-use rates and should be discussed with the local utility. AFDC provides additional information on O&M costs as well as other considerations for operating an EV charging station.

Beyond the cost of electricity and maintenance, some EV charging station operators may also pay a fee to the network company to facilitate or manage pricing, charger access, and data collection and analysis. While subscription and networking fees vary based on the capabilities of the software, these fees could be as high as $250 to $300 per charging port per year according to the California Energy Commission's EVSE Selection Guide. The guide also mentions that site owners may be subject to paying credit card fees, which are typically a small percentage of total transactions. However, these fees may be included in the network company's service bundle.

DETERMINE PRICING, PAYMENT, AND ACCESS

EV infrastructure owners and operators will have to decide among a range of options for pricing (e.g., per kWh, per unit time); payment (e.g., at the charging unit, over the phone, at a nearby establishment); and access (membership-based or open access). For example, as illustrated by Shift2Electric's metering and payment table, employers offering workplace EV charging should think about whether or how to request payment for charger use and how to bill for use. Employers should also consider whether to allow the public to access their chargers.

The possible pricing models depend on who owns and operates the EV chargers. Generally, site hosts who own and operate their own EV chargers can set their own prices. Some site hosts may opt to offer free charging to EV drivers. Free charging is more common for Level 1 and Level 2 chargers, which cost less to own and operate than DC fast chargers. For example, hotels, casinos, or workplaces may wish to provide Level 1 or Level 2 EV charging as a complimentary service to their customers or employees.

Site hosts can alternatively decide to require payment from EV charging customers. Lower prices could attract customers while still offsetting electricity costs, including demand charges incurred through DC fast charging. Higher prices, on the other hand, could help the site host make a direct profit from EV charging. When setting prices, keep in mind that potential customers may be able to use mobile apps to locate other nearby networked chargers and to review ratings and comments from other customers.

Note that for non-networked chargers, which do not have payment collection capabilities, site hosts can alternatively collect fees through radio-frequency identification (RFID) capabilities, mobile applications, or in-person payments, such as with an attendant or at a nearby establishment.

For chargers owned by network companies, particularly DCFC, different network companies adopt different pricing models. As described in Pennsylvania's AFC Deployment Planning Report, some companies adopt a hybrid pricing model in which the site host and partner network agree to split the costs and revenues. In another hybrid approach with a subscription-based agreement, the site host may pay an annual fee to the network company, which installs and maintains the chargers while the site host operates and collects revenue from the EV chargers.

When setting prices, note that States have differing regulations. Some States classify charging station operators as public utilities, which can affect how they

(Photo: USDOT)

STATION AND WAYFINDING SIGNAGE

Station and wayfinding signage help make EV users aware of available charging stations. Station signage, painted parking spots, and other ways to differentiate the charging area improve station visibility. Station signage also helps communicate station policies such as vehicle restrictions and charging time limits. Wayfinding signage, on the other hand, assists EV users in navigating to charging stations from other locations, such as freeway exits. For stations located along designated AFCs, FHWA has released guidance on sign design and installation. Contact the State DOT and FHWA division office to confirm current requirements on highway signage.

are allowed to charge for usage. For applicable regulations on Tribal Lands, consult the Tribal Government.

CONSIDER ADDITIONAL NEEDS

Additional factors to consider in planning include station security, visibility, and signage. Adequate on-site lighting makes charging stations safer and more accessible for users. A report by the City of Houston mentions that installing motion sensing security lights or cameras and placing EV charging stations in or within sight of heavily trafficked areas may discourage vandalism. If vandalism does occur, the exterior materials used for EV charging stations can often be easily cleaned, and while the copper in charging cables can be stolen and resold, cord replacement is sometimes covered by insurance. Site owners should check insurance and warranty policies for coverage on theft and vandalism.

Rural entities can promote available charging services by adding station data to EV charging station search tools, including the AFDC Station Locator. Tourism boards and departments can also be valuable partners in advertising locations of charging stations—for example, the New Mexico Tourism Department published a travel planning tool that includes the locations of EV charging stations across the State. To support ease of use, consider options for communicating station information and policies (such as restrictions on time of day or duration for public charging) through on-site signage, on the site host's website, and in languages other than English.

While some of these factors are not likely to present a major hurdle to project implementation, it is a good idea to identify any additional needs early and factor them into the overall planning process.

PROVIDING MICROMOBILITY CHARGING INFRASTRUCTURE IN PUBLIC PLACES

The Oregon Department of Transportation has added micromobility charging outlets to EV chargers along the West Coast Electric Highway. The standard 110 volt outlets provide electricity at no cost to users and are available at 44 EV charging stations spaced about 25-50 miles apart mainly near I-5, I-84, and U.S. Highway 101, providing service to more rural areas. The stations are not directly on highways, but are instead located on frontage roads or other nearby facilities, supporting micromobility access.

PLANNING FOR MICROMOBILITY

Given the shorter distance of many trips taken with micromobility devices, micromobility charging infrastructure planning typically occurs at the community- or site-level.

Charging of micromobility devices may take place at home, at work, or in public places. For example, Oregon has integrated micromobility charging infrastructure with standard EV charging stations as part of the West Coast Electric Highway.

One challenge of micromobility infrastructure planning is the lack of standardization and universal/interoperable charging equipment. Micromobility devices use proprietary charging cables (which may or may not be affixed to the devices) or docks that connect to standard wall outlets. Some advocates suggest USB-C technology could serve as an interoperable standard for micromobility charging.

Micromobility devices may have removeable or fixed batteries, with implications for charging infrastructure.[23] E-bikes with removeable batteries can be

23 Both removeable and fixed batteries have implications for the transportation of micromobility via other modes because the battery is classified as a hazardous material and would fall purview to the Hazardous Materials Regulations when transported in commerce, to include aboard a U.S. aircraft.

serviced at indoor charging stations. For example, lockers that contain proprietary charging cables where riders can charge their e-bike batteries for free are currently deployed in select tourism locations in the United Kingdom. E-bikes with fixed batteries can be charged at fast-charging stations located outdoors. Integrated parking and charging stations that are designed to work across multiple e-bike and battery brands offer another option for outdoor charging. State, Tribal, and local governments may partner with micromobility charging equipment companies to create charging sites in public locations.

Different operational models for charging shared micromobility devices are discussed in the *Partnership Opportunities* section.

PLANNING FOR ELECTRIC BUSES

Planning for the adoption of electric buses and the installation of charging infrastructure will likely be driven by the transit agency, in coordination with the many partners previously discussed. Many existing resources provide guidance on incorporating BEBs into service, such as the Transit Cooperative Research Program's (TCRP) Guidebook for Deploying Zero-Emission Transit Buses, NREL's Electrifying Transit: A Guidebook for Implementing Battery Electric Buses, and DOE's Flipping the Switch on Electric School Buses series. These resources provide step-by-step considerations through all the phases of planning, purchase and deployment of buses and infrastructure, operations and maintenance, and performance monitoring.

Usage of BEBs requires the purchase not only of the vehicles, but also the upfront costs of purchasing and installing the charging infrastructure, which may require utility upgrades and/or maintenance facility modifications. The charging infrastructure for BEBs will need to be carefully considered as it does not scale linearly with fleet size, meaning that there will be incremental costs and space requirements as fleet size increases. The operation of BEBs will require hiring new staff and/or training existing staff in the operation and maintenance of BEBs to ensure the efficient use and maintenance of the vehicles. Due to these complexities, it is important that transit agencies plan effectively for the purchase of BEBs and charging infrastructure to ensure a system that best fits their needs and constraints.

In addition to the planning required to incorporate BEBs into a fleet, the transit agency will need additional planning to guide the operation of BEBs. Each BEB purchased will have an expected range, but weather (with a lower range in cold and hot temperatures), driving behavior of the operators, topography, and ridership load will impact that range. These external factors mean that transit agencies will experience variability in range projections; however, tracking of range over time can help to predict this variability and mitigate any impacts to service. If electricity rates are high, this will have a significant impact on operational costs. To minimize this uncertainty, transit agencies can discuss rate structures with their utility company to identify opportunities to lessen costs.

Transit agencies will need to consider their objectives, resources, and constraints prior to purchasing and deploying buses and charging infrastructure. Data collected through fleet and route assessments can help agencies understand their transportation and energy needs. For example, TCRP recommends designing smaller deployment projects to test implementation and then planning iteratively, with internal and external stakeholder engagement, to build out the BEB fleet. Each phase of deployment can be discussed with bus manufacturers to help plan for the needs of each acquisition. The needs assessment phase should consider the various factors that will influence decisions in bus and charging infrastructure purchasing, including route structure and length (to understand energy requirements), bus schedules and demand, bus depot capacity, utility rate schedule and costs,

and local climate and topography. Tools that may assist with this needs assessment include the FTA's Transit Greenhouse Gas Emissions Estimator, which estimates annual GHG emissions of transit projects based on the construction, operation, and/or maintenance phases of transit facilities and vehicles, and their Transit Bus Electrification Tool, which estimates the partial lifecycle GHG emission savings associated with replacing standard bus fleets with low-emission or zero-emission transit buses. DOE also has a GHG and cost estimator for transit buses, the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool.

EQUITY CONSIDERATIONS IN PLANNING

An equitable planning process helps ensure that a project's benefits and costs are fairly distributed throughout the community, including to low-income communities, communities of color, Tribal communities, and the disability community. Example equity considerations for an EV infrastructure project include an EV charging station's affordability, accessibility, reliability, location, and safety, as well as equal access to employment and economic opportunities. Specific issues could include the following:

- Financial accessibility of EV ownership and thus access to the benefits of EV charging infrastructure;
- Geographic coverage of EV charging infrastructure; e.g., EV "charging deserts" with gaps in coverage;[24]
- Variations in at-home charging capabilities; e.g., for renters, residents in multi-unit dwellings, or residents without dedicated parking;
- Variations in transportation conditions and balancing local and regional needs; e.g., managing traffic congestion, parking, and access to services in towns with high levels of tourism;
- Resilience to fluctuations in energy prices or disruptions in fuel supply;
- Accessibility of EV charging equipment for people with disabilities, and the reliability and coverage of transportation services for people with limited mobility;
- The emergence of State, Tribal, and utility commission-level requirements that utilities plan EV infrastructure in underserved areas, low-income neighborhoods, and communities of color;[25]
- Eligibility for and access to investment opportunities for EV infrastructure; and
- Access to EV-related training and employment opportunities through EV charging station installation and maintenance.

During project planning, consider how benefits and burdens vary and are distributed across specific populations, including users of differing race and ethnicity, gender, physical and cognitive ability, age, education, income level, and language proficiency.[26] Key recommendations from the American Council for an Energy-Efficient Economy (ACEEE) on siting for equity include supporting meaningful community engagement, conducting an outcomes-focused community needs assessment, investing in transit and affordable mobility services, and dedicating funding specifically to address the needs of traditionally underserved populations. Electric mobility advocacy organizations could also serve as important partners and resources. For example, the national organization EVHybridNoire launched a certificate and professional development program for students at Historically Black College and University institutions expanding access to careers in the e-mobility industry.

The sections below elaborate on the importance of community engagement and the value of equity

24 See, for example, maps by the Bureau of Indian Affairs illustrating EV charging deserts for Tribes, particularly locations that provide essential health and education services but lack access via EV charging corridors as of early 2022.

25 For examples, see Table 2 in the ACEEE's white paper on siting for equity.

26 Note that Title VI of the Civil Rights Act of 1964 prohibits discrimination based on race, color, or national origin in any program or activity that receives Federal financial assistance.

data in infrastructure development. See also *Appendix A* for a more complete compilation of tools and resources to help guide and inform the planning process.

ENGAGEMENT AND OUTREACH METHODS

Community engagement helps ensure that a project meets diverse community needs, that community members can influence the direction of their community's development, and that access to EV charging infrastructure and associated benefits is fairly distributed. Stakeholder outreach as a continual process in transportation decision-making is an important method of engagement that invites the input of individuals and groups impacted by a proposed project. This outreach should be focused and meaningful, based on the needs, culture, and characteristics of the relevant neighborhood or community. It is important to identify and leverage the best opportunities to reach a particular community so that all community members' feedback can be collected. Accessing and incorporating stakeholder feedback in project planning and implementation helps ensure a project meets impacted individuals' needs and addresses their concerns.[27]

Planners can also collaborate and coordinate with local organizations that represent impacted or traditionally underserved populations. Resources like the University of Kansas' Community Tool Box and the FHWA's 2015 report on public involvement in transportation decision-making include guidance and techniques for engagement. Possible strategies include conducting stakeholder interviews, deploying needs assessment surveys, and organizing public comment sessions. For virtual engagement, FHWA's Virtual Public Involvement website includes video case studies, fact sheets, and tips for success in using digital technology to involve the public in project planning.

(Photo: Adobe Stock)

Regardless of outreach method, reflecting back how input has been incorporated into planning decisions is also important to demonstrate that the project team has meaningfully considered the community's contributions to the process.

USING EQUITY DATA

Analysis of socioeconomic data and equity-related metrics—such as measures of income distribution and social vulnerability, number of renters, rates of vehicle ownership, different modes of commute, and measures of transportation energy affordability—can help rural entities understand how resources are currently distributed in their communities, as well as where new EV infrastructure may be most beneficial. Entities can also monitor equity outcomes to evaluate the impact of projects over time. Datasets and interactive maps such as the White House Climate and Economic Justice Screening Tool, FHWA's HEPGIS, EPA's EJScreen, DOE's Low-Income Energy Affordability Data (LEAD) Tool, DOE's Energy Zones Mapping Tool, and Argonne National Laboratory's EV Charging Justice40 Map Tool are several resources available to help rural entities understand and visualize different population characteristics in their communities.

27 Public involvement is also a critical component of the Federal environmental review process. See USDOT FHWA's Public Involvement/Public Participation website for more information.

SECTION SIX

EV Infrastructure Funding and Financing for Rural Areas

(Photo: ©123rf.com/daisydaisy)

Since EV charging infrastructure can require significant capital investment, grants and loans may be necessary to make EV infrastructure projects feasible for many rural entities. A variety of Federal, State, and local funding and financing options can be used for EV charging infrastructure. Navigating funding programs can present barriers for applicants that have fewer staff or resources to devote to grant writing and other funding and financing related activities. The programs identified in this toolkit can serve as a starting point for this research.

This section focuses on Federal programs and provides tips and guidance for navigating the Federal funding process in the following subsections

- *Overview of Federal Funding and Financing Programs* describes the types of programs available through Federal agencies.
- *Federal Funding Application Process* gives an overview of how to apply for grants, loans, and other financial assistance through a Federal program.
- *Funding Eligibility Definitions* provides definitions to help guide rural entities through determining their eligibility for funding programs.
- *Federal Funding Programs* lists major programs available for EV charging in rural areas.
- *Additional Funding Resources* describes resources for identifying funding sources administered by States, local governments, and utilities.

In addition, the *Rural EV Infrastructure Funding Table* includes a comprehensive list of relevant Federal programs. Many of the programs referenced in this section are specific to EV infrastructure, while others have broader eligibility but are still applicable for certain EV-related activities.

THIS SECTION PROVIDES TIPS AND GUIDANCE FOR NAVIGATING THE FEDERAL FUNDING PROCESS

Identifying funding options can happen concurrently to other activities described in this toolkit, such as researching sites and planning infrastructure. Rural entities need not (and usually should not) wait until completing other steps before beginning the funding search. After using this toolkit to identify potential funding sources, contact the applicable department or office with questions about program requirements and timing. See *Initial Points of Contact* for field staff contact information for Federal agencies discussed in this toolkit.

OVERVIEW OF FEDERAL FUNDING AND FINANCING PROGRAMS

Federal funding for EV infrastructure can be drawn from several sources, including discretionary and formula grant programs, loan financing programs, and tax incentives. Table 6-1 provides an overview of these funding types.

Three agencies administer most Federal funding programs applicable to rural EV infrastructure: the USDOT, the US Department of Agriculture, and the US DOE. Other agencies provide or oversee some potential funding sources for rural EV infrastructure. The following sections provide a description of each relevant agency and how its mission relates to rural EV infrastructure.

U.S. DEPARTMENT OF TRANSPORTATION (USDOT)

USDOT programs focus on a wide range of rural EV activities and support infrastructure development, energy efficiency, and rural equity. USDOT is separated into 11 operating administrations and bureaus, and many of these have programs related to rural EV activities.

The Office of the Secretary of Transportation (OST) provides policy development, oversight, and coordination for the overall planning and direction of USDOT. OST administers some discretionary grant programs.

The Build America Bureau (the Bureau), within OST, provides credit assistance and loans to States, municipalities, and other project sponsors. The

Table 6-1. Types of Federal funding and financing programs. (Source: USDOT Volpe Center)

PROGRAM TYPE	DESCRIPTION
Discretionary Grant Funding Programs	For discretionary grant programs, the Federal agency solicits applications and **competitively selects projects** based on eligibility, evaluation criteria, and departmental or program priorities. Most programs described in this toolkit are discretionary grant programs.
Formula Grant Funding Programs	Formula grant programs **apportion funding based on formulas** in statute. The recipients of these funds can be States, federally recognized Tribal recipients, cities and counties, or transit agencies. Recipients are responsible for determining how the funds are used according to program guidelines. Entities that do not receive formula funding directly (e.g., nonprofits or transportation providers) may be eligible to receive funding from agencies that initially receive the formula grants; this toolkit refers to these entities as "ultimate recipients." In some cases, these recipients may be eligible to use the grant funds to reimburse eligible, past project costs.
Loan Financing Programs	Credit assistance programs **leverage Federal funds to accelerate project delivery** when direct funding programs are not readily available or applicable. Public credit assistance programs may also attract private and other non-Federal co-investment for projects. This can take the form of secured (direct) loans, loan guarantees, and lines of credit.
Tax Incentives (e.g., credits, exemptions, deductions)	The U.S. **tax code contains potential funding sources** for individuals, non-governmental organizations, and private organizations in the form of tax incentives. Specifically, exemptions, exclusions, and deductions all reduce an entity's taxable income, while credits, preferential tax rates, and deferrals decrease tax liability or even generate cash payments from the government to the taxpayer. The Internal Revenue Service (IRS) is responsible for administering these policies.

Bureau operates multiple funding programs. It also helps borrowers leverage available USDOT credit and funding programs, explore innovative project delivery approaches like public-private partnerships (P3s), and navigate project development processes like permitting.

The Federal Aviation Administration (FAA) oversees the safety of civil aviation and operates a network of airport towers, air route traffic control centers, and flight service stations. FAA's relevant grant programs fund zero-emission land vehicles and charging infrastructure for use at airports.

The Federal Highway Administration (FHWA) is responsible for ensuring that the Nation's roads and highways are safe and technologically up to date. Its relevant funding programs focus on reducing emissions from road vehicles and increasing access to EV infrastructure. FHWA is also responsible for administering formula and discretionary grant programs for EV charging infrastructure established under the 2021 Bipartisan Infrastructure Law. FHWA can also provide project-specific financing techniques and tools through its Center for Innovative Finance Support.

The Federal Transit Administration (FTA) helps improve public transportation systems for communities nationwide. FTA's funding programs are largely focused on providing capital and operating assistance to transit systems. Electrifying transit fleets and related infrastructure are eligible expenses for many FTA programs; the Bipartisan Infrastructure Law allows eligibility for electric vehicle charging infrastructure as part of a joint development project, subject to certain conditions.

The Maritime Administration (MARAD) supports the waterborne transportation system and the Nation's maritime infrastructure. MARAD's relevant grant program funds low-emission land vehicles and charging infrastructure for use at marine ports.

DEPARTMENT OF ENERGY (DOE)

DOE offers a wide range of programs focused on advancing clean energy technologies, decarbonizing the economy, and making energy more affordable, secure, and resilient. DOE's Vehicle Technologies Office (VTO) administers most of the DOE programs identified in this toolkit. VTO, which is within the Office of Energy Efficiency and Renewable Energy (EERE), supports the research, development, and deployment of efficient and sustainable transportation technologies, including EVs and related infrastructure. EERE's Weatherization and Intergovernmental Programs Office and the DOE Loan Programs Office also administer programs relevant to rural EV infrastructure.

JOINT OFFICE OF ENERGY AND TRANSPORTATION

Created under the Bipartisan Infrastructure Law (BIL), the Joint Office of Energy and Transportation facilitates collaboration between USDOT and DOE. The Joint Office focuses on supporting the planning

(Photo: USDOT)

and deployment of electric vehicle technologies, such as charging stations, electric school bus fleets, and zero-emission transit. The Joint Office also provides guidance and technical support to potential applicants for BIL-related funding programs. For example, in 2022, the Joint Office assisted States in developing and submitting their plans to FHWA for the use of NEVI Formula Program funds to build out DCFC on designated alternative fuel corridors. The Joint Office will also support applicants pursuing BIL discretionary funds for community charging projects, provide technical assistance to school districts to plan for and deploy clean school buses, and offer technical assistance to transit agencies applying for and/or receiving FTA funding for transit bus electrification projects.

U.S. DEPARTMENT OF AGRICULTURE (USDA)

USDA provides leadership on agriculture, natural resources, and rural development, among other topics. Relevant USDA funding programs are primarily aimed at helping rural and agricultural communities bolster their economies and realize the benefits of the shift toward electric vehicles. Most USDA programs in this toolkit are administered by USDA's Rural Development (RD) mission area, which is comprised of three agencies: Rural Housing Service, Rural Business-Cooperative Service, and Rural Utilities Service (RUS)—or the Natural Resources Conservation Service (NRCS).

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

The mission of the EPA is to protect human health and the environment. Programs relevant to EV infrastructure primarily focus on reducing the emissions impacts of the transportation sector, including funding via the Diesel Emissions Reduction Act (DERA) and Clean School Bus programs. EPA, through its ENERGY STAR Program, develops energy efficiency specifications for Level 1, 2, and DCFC charging equipment and forms partnerships with electric utilities and States to facilitate purchasing of ENERGY STAR certified chargers. EPA also offers programs to fund the replacement of older gasoline and diesel vehicles with zero-emission and low emission alternatives.

U.S. SMALL BUSINESS ADMINISTRATION (SBA)

The SBA helps Americans start, build, and grow businesses. Relevant funding programs enable small businesses to conduct technology research related to EV infrastructure.

U.S. DEPARTMENT OF COMMERCE (DOC)

The mission of the DOC is to create the conditions for economic growth and opportunity. All relevant DOC programs are administered by the Economic Development Agency (EDA). The EDA promotes innovation and competitiveness, preparing American regions for economic growth and success. Relevant funding and financing programs are for a variety of EV activities that promote economic growth.

U.S. DEPARTMENT OF LABOR (DOL)

The mission of the DOL is to foster, promote, and develop the welfare of the wage earners, job seekers, and retirees of the United States; improve working conditions; advance opportunities for profitable employment; and assure work-related benefits and rights. Workforce development related to EVs is an activity eligible under DOL's relevant funding program.

INTERNAL REVENUE SERVICE (IRS)

The IRS is the Nation's tax collection agency and administers the Internal Revenue Code enacted by Congress. The IRS administers the tax incentive programs identified in this toolkit.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

The U.S. Department of Housing and Urban Development (HUD) provides housing and community development assistance and works to ensure fair and equal access to housing for all. HUD supports renters and homeowners through numerous funding and financing programs and technical resources. EV charging infrastructure is an eligible expense under several HUD grant programs. Potential applicants should confirm eligibility with the designated program office and agency contact. In addition, some HUD programs incentivize the adoption of energy efficiency and other sustainability measures, which may include EV charger installation. For example, multifamily property owners who receive Federal Housing Administration-insured financing may qualify for reduced mortgage insurance premiums upon achieving green building certification which typically offers incentive points for EV charger installation or readiness.

FEDERAL FUNDING APPLICATION PROCESS

The process of acquiring Federal funding differs by program type (e.g., grants, loans) and by agency. However, competitive funding programs (including competitive grants, loans, and loan guarantees) often follow similar processes.

GRANTS: TIPS AND RESOURCES

The following tips and resources may provide further insight to applicants throughout the discretionary grant funding application process.

Grants.gov

The Office of Management and Budget developed Grants.gov to provide a centralized location for grant seekers to find and apply for Federal funding opportunities. The website houses up-to-date information on over 1,000 grant programs and details on the Federal grant application process. For more information on the grants funding process, visit the Grants.gov Grants 101 page and review the Grant Lifecycle Timeline. For a guide to navigating the Grants.gov interface, visit their Applicant Overview. Note that before applying for Federal funding for the first time, your System for Award Management registration must be fully processed.

DOT Navigator

For funding programs overseen by USDOT, the DOT Navigator provides assistance to find and apply for grants. On the website, developed as part of USDOT's Thriving Communities Initiative, you will find documentation and resources about the variety of funding programs that USDOT offers with a focus on programs recently created by legislative or executive action. You can also browse pages dedicated to specific modes and transportation priorities.

Funding Announcements

Notices of Funding Opportunities (NOFOs) and Funding Opportunity Announcements (FOAs) are formal announcements of Federal funding availability by the awarding office. Announcements provide details on eligible applicants and activities, evaluation criteria, funding priorities, and submission deadlines. Obtain and read the NOFOs or FOAs for funding programs when considering applying.

ROUTES Grant Applicant Toolkit

The USDOT Rural Opportunities to Use Transportation for Economic Success (ROUTES) initiative's Applicant Toolkit for Competitive Funding Programs illustrates key applicant activities when participating in the USDOT discretionary grants process. The Applicant Tool-

kit was developed to support potential applicants in identifying and navigating USDOT discretionary grant funding opportunities for rural transportation projects. The toolkit provides user-friendly information and resources to maximize the potential for award success.

While the Applicant Toolkit was designed for the USDOT discretionary grants process, the information provided is relevant for most awarding agencies.

Match Requirements

Many Federal grant programs require the applicant to provide some of the project funding; this is referred to as either "required match" or "cost share." Applicant match requirements vary widely by program. As an example, a funding opportunity may include the following phrase: "The Federal share of project costs under this program is limited to 80 percent." In this case, if the total project cost is $100,000, the Federal agency will provide no more than $80,000, with at least $20,000 coming from the grant recipient. Most grants with match requirements require the recipient to prove it has the necessary funds to provide the match amount before the grant is awarded. In some cases, recipients are allowed to use other Federal funding or in-kind resources (e.g., staff time) as a project match, and they may occasionally make use of other grant funds to cover the cost share requirements (known as "braiding"). Banks and other financial institutions (including some Federal loan financing programs) may also be able to provide loans to assist with matching requirements, but applicants should refer to the NOFO to determine if this is an option. A close relationship with local financial institutions may otherwise prove helpful as communities seek financial documentation relevant to the application process. Early contact with the Federal agency staff could also be helpful to understand program requirements. Take note of the funding match requirements for programs prior to applying for grants, including programs where projects in rural areas may qualify for reduced or be exempt from match requirements.

(Photo: ©123rf.com/lindsayhelms)

Buy America Provision

The use of Federal funds may trigger domestic preference requirements to purchase certain products from American manufacturers. The specific requirements that apply (typically referred to as Buy America or Buy American) may vary depending on the source of the Federal funds. Federal funding programs will typically include direction on compliance with Buy America in the grant NOFO or in the details of a loan agreement. In February 2023, FHWA issued a Build America, Buy America implementation plan for EV charging equipment. The plan incentivizes companies to invest in domestic production of EV charging components, while providing a transition period for companies to onshore their supply chains. The plan requires that federally funded EV chargers be assembled in the United States and must contain at least 55 percent domestic content (on a cost-basis) by July 2024.

Rural Area Definitions

Many Federal funding programs are specifically offered to rural areas or treat rural areas with funding priority. Federal agencies use many different definitions for what is considered "rural" for the purposes of policy, funding, and research. Therefore, it is important to confirm eligibility by understanding how each program defines "rural" before applying. Some Federal agencies define rural as areas located outside of a U.S. Census-designated urbanized area with a population of 200,000 or more, or simply those outside of a U.S. Census-designated urbanized area. Other Federal agencies define rural as areas with no more than 20,000 or 50,000 residents. It is important to understand the definition of rural used by each specific program to determine eligibility.

Where relevant, the *Federal Funding Programs* section notes the definition of "rural" used by particular agencies or programs. The USDOT Rural Eligibility webpage provides more information on rural definitions used by USDOT programs, as well as an interactive web map that shows rural and urban areas as defined by different funding programs.

(Photo: ©123rf.com/4kclips)

Documentation of Project Commitment and Support

Some grant applications may benefit from including supplementary materials from partners to demonstrate support from the parties who will be involved with the project. A Letter of Commitment identifies the specific financial or in-kind project commitments by the applicant or final recipients. This may include a promise of a cost-share match, staff hours, property, or other resources, depending on the partner and project needs. These may be required by some grant applications, especially those with a match requirement. Letters of Support, on the other hand, are generally optional and reflect interest and enthusiasm from relevant parties without promising specific resources or funding. Depending on the project and partnering institutions, these letters may come from State or local governments, cultural or educational institutions, or even elected officials who wish to express their support for the project; none of the letters are legally binding.

Tribal Transportation Self-Governance

Tribes are eligible for numerous Federal funding programs. USDOT's Tribal Transportation Self-Governance Program provides federally recognized Tribes and Tribal organizations with greater control, flexibility, and decision-making authority over Federal funds used to carry out Tribal transportation programs, functions, services, and activities in Tribal communities. Under the program, Federal funds awarded to a Tribe or Tribal organization will be transferred in advance to the Tribe or Tribal organization in accordance with the terms of a funding agreement to carry out Tribal transportation programs and activities.

In some cases, for programs that are not exclusively available to federally recognized Tribes, Tribes, and Tribal entities may have decreased match requirements or increased flexibility to use otherwise disallowed sources to comprise matching funds. For example, Tribal Transportation Program funds may be used to satisfy the match requirement for transit programs (25 CFR § 170.133). Tribes have successfully applied for and received grants from a variety of Federal discretionary grant programs in the past. Potential applicants are encouraged to use the contacts listed in the Notice of Funding Opportunity (NOFO) to clarify funding obligations and application resources. Resources, grant assistance, and personalized guidance for USDOT programs are available for free through FHWA's Tribal Technical Assistance Program and FTA's National Rural Transit Assistance Program.

LOCAL LOANS: BURLINGTON ELECTRIC AND VERMONT CREDIT UNION PARTNERSHIP

In addition to Federal loan programs, many utilities and credit unions provide low-interest loans for EV activities. For example, in 2018, Burlington Electric in Vermont partnered with three local credit unions to launch a program for financing the purchase of EVs for consumers. The program provides low- or zero-interest loans for $600 to $1,800 to decrease the burden of buying an EV on consumers. Interested buyers can research similar programs in their local area.

SUCCESS STORY: TRIBAL TRANSIT GRANT FOR THE YOCHA DEHE WINTUN NATION

In 2021, the Yocha Dehe Wintun Nation, a federally recognized Tribe in Yolo County, California, received $612,000 to purchase new battery-electric vehicles as replacements for older vehicles that have exceeded their useful life and support charging infrastructure. This project will ensure continued service reliability, help in maintaining a state of good repair and, by improving air quality, advance environmental justice in the Tribal community.

FINANCING PROGRAMS: TIPS AND RESOURCES

The following tips and resources may provide further insight to applicants throughout their exploration of innovative finance techniques and the financing application process.

Financing Options

Applicants may be eligible to take advantage of multiple Federal or State loan programs or other innovative finance tools. Financing options may vary by location depending on State regulations. These options include the following:

- **Loans:** A disbursement of funds by a lender to a borrower under a contract that requires repayment of such funds with or without interest.

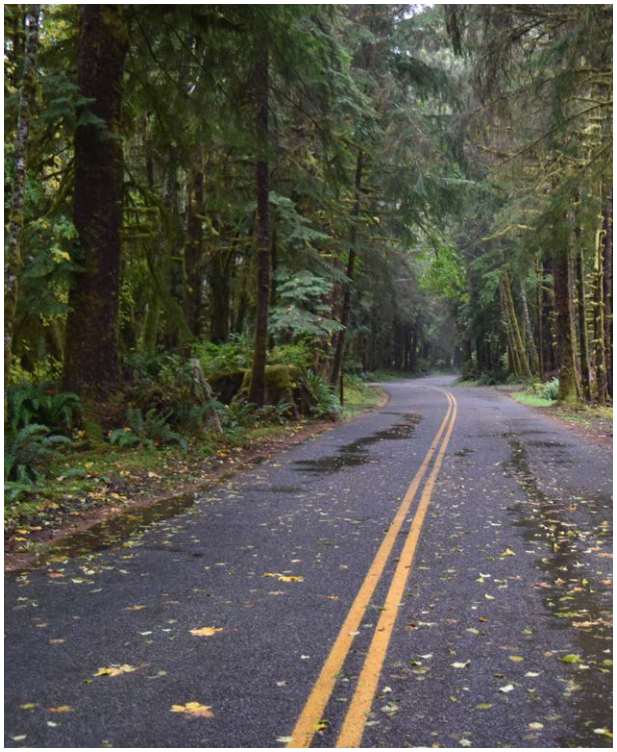
- **Loan Guarantees:** A contingent liability created when the government assures a private lender who has made a commitment to disburse funds to a borrower that the lender will be repaid to the extent of a guarantee in the event of default by the debtor.
- **State Infrastructure Banks:** Revolving loan funds established by States to finance transportation projects. Where established, State Infrastructure Banks may lend to public and private project sponsors.
- **Bonds:** A unit of corporate debt issued by companies or governments to finance projects, including a fixed or variable interest rate paid to bondholders.
- **Community Development Financial Institutions (CDFIs) and Native CDFIs:** Private financial institutions dedicated to delivering responsible, affordable lending to help low-income, low-wealth, Native communities, and other disadvantaged people and communities.
- **Tax Credits:** An amount of money that taxpayers (individuals or businesses) can subtract from taxes owed to their government.
- **Public-Private Partnerships (P3s):** Contractual agreements between a public agency and a private entity that allow for greater private participation in the delivery of projects. In transportation projects, this participation typically involves the private sector taking on additional project risks such as design, construction, finance, long-term operation, and traffic revenue.
- **Grant Anticipation Revenue Vehicles (GARVEEs):** Securities (debt instruments) issued when monies are anticipated from a specific source to advance the upfront funding of a particular need. In the case of transportation finance, the GARVEE repayment source is expected Federal aid grants.
- **Transportation Infrastructure Finance and Innovation Act program (TIFIA):** The TIFIA program offers credit assistance for large-scale infrastructure projects of national significance. Credit assistance can include subordinated loans to fill the gap between existing financing through the private market and total project costs, as well as loan guarantees and lines of credit. The program is designed to leverage private investments in the national transportation system.
- **Value Capture:** Strategy to capture the value property owners realize through transportation and other public improvements through special assessments and taxation on those properties. Refer to the FHWA Center for Accelerating Innovation or the Center for Innovative Finance Support for more information on Value Capture.

Pre-Application Consultation

Contacting a Federal loan or finance program office prior to applying or submitting a letter of inquiry can help applicants better determine their eligibility for the program, any prerequisites to application, and potentially even assist in project scoping. In addition to individual program offices, the FHWA Center for Innovative Finance can help applicants understand a broad range of innovative financing options relevant to their project. Gathering input on financing options early in project scoping can help applicants determine how to structure their projects and any potential barriers to entry in a funding program based on project characteristics or State legislation.

Financing Amount

Some Federal programs allow applicants to finance all or a portion of project costs using loans. The maximum amount of a loan or the proportion of project costs allowed to be financed through each program varies widely. For example, the TIFIA program



(Photo: Adobe Stock)

can provide loans covering up to 33 percent of total anticipated costs for most projects but may provide loans of up to 49 percent of total costs for certain rural projects (see the listing for the Rural Project Initiative). Loan programs may require that the recipient prove it is creditworthy and has other financing for the project in place prior to consideration for a loan. Take note of the maximum funding available through loan programs prior to applying for financing.

Post-Award Reporting and Servicing

Consider the reporting requirements for a loan or other innovative finance tool. General information about a program's reporting requirements can be found on the respective program website. Adhere to the schedule for debt service on loans and other financing mechanisms. Note whether the program takes an ownership interest in any capital equipment which would have to be resolved if the equipment is taken out of service before the end of its useful life.

Comply with relevant local, State, and Federal regulations. Contact the administering agency's program point of contact for additional guidance throughout the post-award phase.

INITIAL POINTS OF CONTACT

The Federal agencies discussed in this toolkit have field-level staff who are available to answer questions about the funding programs they administer. After identifying programs in the *Federal Funding Programs* section, prospective applicants may reach out to field staff for additional help and resources. Below is the contact information for field staff at key agencies:

- FHWA Field Offices
- FTA Regional Offices
- USDA Rural Development State Offices
- USDA Rural Development Electric Programs
- DOE Vehicle Technologies Office/Technology Integration Regional Manager Contacts
- DOE Clean Cities Coalition Contact Directory
- EPA Regional Offices

The grant application process is generally intended to be accessible to the general public, and reviewers are often aware of the need to consider grant applications in the context of the size of the organization and request. In some cases where applicants have little or no experience with grant applications, they may choose to retain the services of private grant consultants for assistance with all or part of the application process, but this is never required.

FUNDING ELIGIBILITY DEFINITIONS

This section provides definitions to help guide rural entities through the funding programs listed in the *Federal Funding Programs* and *Rural EV Infrastructure Funding Table* sections. Table 6-2 lists EV-related activities that Federal programs can be used to fund

and Table 6-3 lists potential applicant types. Before applying, review each program's webpage to understand specific eligibility requirements.

FEDERAL FUNDING PROGRAMS

While the funding table at the end of this section provides a comprehensive list of available programs, the following overview highlights some of the most relevant and widely used programs for rural EV infrastructure. These "key programs" are organized by an administering agency.

USDOT KEY PROGRAMS

National Electric Vehicle Infrastructure Formula Program (FHWA)

The National Electric Vehicle Infrastructure Formula Program (NEVI) created under BIL apportions a total of $5 billion to States, D.C., and Puerto Rico over five years, from Fiscal Year 2022 through 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

Table 6-2. EV-related activities and definitions.

EV ACTIVITY	DESCRIPTION
LDV Charging	Purchase and installation of EV charging infrastructure for light-duty vehicles (LDVs), primarily Level 2 and DCFC charging infrastructure. LDVs include passenger vehicles and light-duty trucks with a gross vehicle rating of 10,000 pounds or less. Cars, SUVs, and pickup trucks are examples of LDVs.
Public Transportation Charging	Purchase and installation of electric transit vehicle charging infrastructure as part of capital projects, most commonly for electric buses.
Commercial Charging	Purchase and installation of EV charging infrastructure to support freight transportation, agricultural activities, and other commercial uses. Infrastructure under this category is specific to vehicles larger than LDVs (medium- and heavy-duty vehicles).
Infrastructure Planning	Planning for EV charging infrastructure and related projects. Certain funding programs specify project planning (e.g., design, budget, engineering) as an eligible activity, separate from the implementation or acquisition activities.
Workforce Development	Workforce development and training related to EV infrastructure.
Vehicle Acquisition	EV acquisition (or replacements) and engine conversion for LDVs, transit vehicles (e.g., electric buses), or commercial EVs (e.g., freight trucks or agricultural equipment). (Note: this toolkit does not include funding programs exclusively intended for buying EVs; rather, this designation identifies which infrastructure-focused programs could **also** be used for buying EVs.)

Table 6-3. Eligible applicant types and definitions.

APPLICANT TYPE	DESCRIPTION
States	State governments, agencies, and authorities (e.g., State departments of transportation, State energy offices, and Interstate compacts), including those of Puerto Rico and U.S. territories.
Localities	Local and regional governments and agencies such as counties, municipalities, local law enforcement, and regional planning organizations.
Tribes	Federally recognized Tribal Governments.
Transportation Providers	Transportation providers and operators such as airports, rail carriers, port authorities, transit providers, and private-sector transportation companies. (Note: Most transportation providers also qualify under another applicant type, since most providers are operated by either the State, local, or Tribal Government or a private-sector provider. This category is used in the matrix for programs that specifically indicate "transportation providers" as an eligible party.)
Nonprofits	Nonprofit organizations.
Private Sector	Any privately owned business or organization that does not qualify as a nonprofit.
Individuals	A person not operating as a representative of any of the stakeholders defined above.

THE BIPARTISAN INFRASTRUCTURE LAW (BIL)

On November 15, 2021, President Biden signed the Bipartisan Infrastructure Law (BIL) which contains significant new funding for EV charging stations. Key new USDOT programs include the National Electric Vehicle Infrastructure (NEVI) Formula Program ($5 billion) and the Discretionary Grant Program for Charging and Fueling Infrastructure ($2.5 billion). The law also makes the installation of EV charging infrastructure an eligible expense under the USDOT Surface Transportation Block Grant formula program. Additionally, BIL provides funding to USDOT, DOE, and EPA for the deployment of electric school buses and ferries, port electrification, a domestic supply chain for battery production, and battery recycling, among other EV-related initiatives.

acquisition, installation, network connection, operation, and maintenance of EV charging stations, as well as long-term EV charging station data sharing. Initially, funding under this program is directed to designated Alternative Fuel Corridors (AFCs) for electric vehicles to build out this national network, with DC fast chargers every 50 miles and within 1 mile of the corridor. FHWA-funded projects must meet the EV Charging Minimum Standards Rule, issued in February 2023. Once a State's AFC network is fully built out, funding may be used on any public road or in other publicly accessible locations.

States are required to submit annual plans on how they will strategically and equitably use their NEVI funds for EV infrastructure deployment. Many States have created websites with information on their plans, and many are soliciting public input, including from Tribal Governments and organizations, to ensure equitable use of NEVI funds. The Joint Office of Energy and Transportation provides key technical assistance

and guidance to States in developing and implementing their plans.

- **Eligible EV activities:** LDV charging, public transportation charging, infrastructure planning, workforce development.
- **Eligible applicants:** States, D.C., Puerto Rico.
- **FY22-FY26 formula grant range (to States, D.C., and P.R.):**[28] $13,600,000 – $407,800,000.
- **Frequency:** Funding is allocated to State DOTs on an annual basis.
- **Match requirement:** The Federal share of eligible project costs is 80 percent. Private and State funds can be used to provide the remaining cost-share.

Charging and Fueling Infrastructure Discretionary Grant Program (FHWA)

The Charging and Fueling Infrastructure (CFI) Discretionary Grant Program created under BIL is a competitive grant program to strategically deploy publicly accessible electric vehicle charging infrastructure as well as hydrogen, propane, and natural gas fueling infrastructure along designated Alternative Fuel Corridors or in other publicly accessible locations. At least 50 percent of CFI funding must be used for a community grant program where priority is given to projects that expand access to EV charging and alternative fueling infrastructure within rural areas, low- and moderate-income neighborhoods, and communities with a low ratio of private parking spaces. The Joint Office of Energy and Transportation created under BIL supports the implementation of this program. Tribal and local governments can use this program to complement State efforts initiated under NEVI. FHWA funded projects must meet the EV Charging Minimum Standards Rule, issued in February 2023.

- **Eligible EV activities:** Light, medium, and heavy-duty vehicle charging, public transportation charging, commercial charging, infrastructure planning.
- **Eligible applicants:** States, Tribes, localities, MPOs, and U.S. Territories (corridor and community projects). Additional eligible entities for community-based projects include housing authorities, parks authorities, public stadium authorities, public development authorities, and other State or local authorities with ownership of publicly accessible transportation facilities.
- **Grant range:**
  - Corridor Program: $1,000,000 – no maximum.
  - Community Program: $500,000 - $15,000,000.
- **Frequency:** Annual.

Congestion Mitigation and Air Quality Improvement Program (FHWA)

The Congestion Mitigation and Air Quality Improvement (CMAQ) program provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. CMAQ funds are apportioned to each State and administered through State DOTs or MPOs. Funding is available for transportation projects that reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards; States without such areas may use CMAQ funds for Surface Transportation Block Grant eligible projects. Funds may be used for a transportation project or program that is likely to achieve these objectives and is included in the region's current transportation plan. EV charging infrastructure is considered eligible under this program. The Bipartisan Infrastructure Law added a new eligibility for shared micromobility, including bikesharing and shared scooter systems. CMAQ

28 This grant range represents the total amount of money distributed to each State over a 5-year period. These funds are distributed at a national level based on a formula. These formulas may use various characteristics of each State to provide variable levels of funding.

funds may be transferred to FTA for administration of eligible transit projects.

- **Eligible EV activities:** LDV charging, commercial charging, public transportation charging, workforce development, vehicle acquisition.
- **Eligible applicants:** States, Tribes, localities, transportation providers, nonprofits.
- **FY20 formula grant range (to States):**[29] $21,000-$31,000,000 (ultimate recipient awards vary by State).
- **Frequency:** Funding is allocated to State DOTs on an annual basis.
- **Match requirement:** Determined at the State level.

Federal Lands Access Program (FHWA)

The Federal Lands Access Program (FLAP) provides funds for projects on Federal Lands Access Transportation Facilities that are located on or adjacent to, or that provide access to, Federal lands (e.g., national parks, national forests). Projects are typically located within 10 miles of the Federal land boundary. Funds are distributed by formula among States that have Federal lands. State DOTs, Tribes, and local governments interested in EV infrastructure can apply through their State for FLAP funding for charging infrastructure and transportation planning.

- **Eligible EV activities:** LDV charging, public transportation charging, commercial charging infrastructure planning, workforce development, vehicle acquisition.
- **Eligible applicants:** States, Tribes, localities.
- **FY22 formula grant range (to States):** $21,000 – $31,000,000 (ultimate recipient awards vary by State).
- **Frequency:** Varies by State.
- **Match requirement:** The Federal share of eligible project costs is 80 percent. A sliding scale provision may apply for States with higher percentages of Federal lands.

Grants for Buses and Bus Facilities Programs (FTA)

FTA offers grant funding for transit agencies and State, local, or Tribal Government agencies to replace, rehabilitate, and purchase buses and related equipment, including vehicles that produce low or no emissions (Low-No) for public transportation services. The program includes both formula and competitive grants. The Grants for Buses and Bus Facilities Formula Program provides funding to States and transit agencies through a statutory formula. The statute also includes two competitive programs through which rural entities can receive funding for EV bus infrastructure and EV fleet acquisition: the Grants for Buses and Bus Facilities Competitive Program and the Low-No Emissions Bus Discretionary Program. Note that rural applicants to both competitive programs must be submitted by a State, either individually or as part of a consolidated statewide application.

- **Eligible EV activities:** Public transportation charging, vehicle acquisition.
- **Eligible applicants:**
  - **Formula Grant:** States, transportation providers.
  - **Grants for Buses and Bus Facilities (Discretionary):** States, local governmental authorities who operate fixed route, designated recipients who allocate funding to fixed route public transportation, Tribes.

29 This grant range represents the amount of money distributed to each State. These funds are distributed at a national level based on a formula. These formulas may use various characteristics of each State to provide variable levels of funding. For State-run programs, this sum represents the total amount of available funding that applicants can apply for, and these funds are then further distributed by the State to the applicants based on a discretionary grant-making process.

(Photo: Adobe Stock)

- **Low-No Bus (Discretionary):** States, Tribes, localities, transportation providers.

- **FY22 grant ranges:**
  - **Grants for Buses and Bus Facilities (Discretionary):** $115,000 – $54,000,000.
  - **Low-No Bus (Discretionary):** $167,257 – $116,000,000.
- **Frequency:** Annual.
- **Match requirement:** The Federal shares of net capital project costs are 80 percent for traditional propulsion projects, 85 percent for bus acquisition for projects that are compliant with the Clean Air Act or ADA, and 90 percent for bus-related equipment and facilities that are compliant with the Clean Air Act or ADA.

Rebuilding American Infrastructure with Sustainability and Equity (OST)

The Rebuilding American Infrastructure with Sustainability and Equity (RAISE, formerly known as BUILD and TIGER) discretionary grant program provides an opportunity for USDOT to invest in road, rail, transit, and port projects that achieve national objectives. The eligibility requirements of RAISE allow project sponsors at the State and local levels to obtain funding for multimodal, multijurisdictional projects that are more difficult to support through traditional USDOT programs. For FY21, RAISE increased its program focus on zero-emission vehicle infrastructure, including EV charging.

- **Eligible EV activities:** LDV charging, infrastructure planning, commercial charging, public transportation charging.
- **Eligible applicants:** States, Tribes, localities, transportation providers.
- **FY22 grant ranges:**
  - **Capital Awards:** $1,100,000 – $25,000,000.
  - **Planning Activities:** $260,000 – $25,000,000.
- **Frequency:** Annual.
- **Match requirement:** The Federal share of net capital project costs is 100 percent for rural projects and projects located in Areas of Persistent Poverty or Historically Disadvantaged Communities, and 80 percent for urban projects.
- **Definition of rural:** Located outside an Urbanized Area (as defined by the U.S. Census Bureau) or any area with a population of less than 200,000.

Transportation Alternatives Set-Aside Program (FHWA)

The Transportation Alternatives (TA) Set-Aside from the Surface Transportation Block Grant (STBG) Program provides funding for a variety of generally smaller-scale transportation projects such as pedestrian and bicycle facilities; construction of turnouts, overlooks, and viewing areas; community improvements such as historic preservation and vegetation management; environmental mitigation related to stormwater and habitat connectivity; recreational trails; safe routes to school projects; and vulnerable road user safety assessments. FHWA considers shared micromobility projects as eligible for the TA Set-Aside.

SUCCESS STORY: LOW-NO BUS DISCRETIONARY PROGRAM

In 2021, the Michigan Department of Transportation received $5.2 million on behalf of Thumb Area Transit (TAT) in rural Huron County to replace an undersized, aging transit facility with a centrally located LEED-certified maintenance, operations, and administrative center to improve transit services and maintain its new battery-electric bus fleet. The facility will include electric bus charging equipment and other infrastructure to allow TAT to provide reliable transportation across its 836-square-mile service area while improving air quality.

SUCCESS STORY: BUILD GRANT IN IDAHO AND WYOMING

In 2020, USDOT's BUILD program awarded $20 million to Wyoming and Idaho for the Teton Mobility Corridor Improvements Project. This rural project will implement a series of multimodal improvements along the Idaho 33/Wyoming 22 corridor. The project includes the purchase of two electric local buses among many other improvements to the corridor.

- **Eligible EV activities:** Shared micromobility.
- **Eligible applicants:** States, Tribes, localities, regional transportation authorities, transit agencies, MPOs, nonprofits.
- **FY22 grant totals (by State):** $5,300,000 – $113,000,000.
- **Frequency:** Annual.
- **Match requirement:** The Federal share of eligible project costs is generally 80 percent. States can use a number of flexibilities, including some new ones under the BIL, to increase the Federal share for specific projects to 100 percent. Specifically, an upward sliding scale adjustment is available to States based on public land area (23 U.S.C. 120). Flexibilities for safety, Federal lands, and Recreational Trails Program projects are described in more detail in the *Federal Share and Flexibilities for Increasing Federal Share* section of the TA Set-Aside Guidance.

DOE KEY PROGRAMS

Funding Opportunity Announcements (Vehicle Technologies Office)

DOE's VTO supports high-impact projects that can significantly advance its mission to reduce petroleum reliance by developing and deploying more energy efficient and sustainable transportation technologies. VTO regularly updates its Funding Opportunity Announcements (FOAs) with information on available VTO funding opportunities. Specific topics and funding amounts for VTO FOAs vary from year to year depending on program priorities and stakeholder needs. Historically, many of these funding opportunities have supported transportation electrification projects, including the planning and installation of EV infrastructure; EV demonstration and deployment; and EV data collection and analysis. Sign up for the VTO Newsletter to receive notifications of future VTO FOAs.

- **Eligible EV activities:** Varies (past FOAs included LDV charging, infrastructure planning, commercial charging, public transportation charging).
- **Eligible applicants:** States, Tribes, localities, transportation providers, nonprofits, private sector, individuals.
- **Grant range:** Varies.
- **Frequency:** Varies.

State Energy Program (Office of State and Community Programs)

The DOE State Energy Program (SEP) provides annual formula funding and technical assistance to all 50 States, five territories, and the District of Columbia to enhance energy security, advance State-led energy initiatives, and increase energy affordability. States may choose to allocate funds for transportation projects, including planning and projects that promote access to EVs and buildout of EV charging infrastructure. Eligible activities include planning support for light-, medium-, and heavy-duty vehicle usage and associated charging needs, equitable charging access, public fleet and transit electrification, grid security and resilience associated with transportation electrification. A State energy office can provide information about program guidance and eligibility for a particular State.

- **Eligible EV activities:** LDV, commercial, fleet, and public transportation charging, EV education and access, and infrastructure and mobility planning.
- **Eligible applicants:** States energy offices.
- **Grant range:** Varies by State based on annual formula allocation.
- **Frequency:** Annual, based on Congressional appropriations.

SUCCESS STORY: VTO'S WESTSMARTEV

As of 2019, the Western Smart PEV Community Partnership project (led by Pacificorp in partnership with several Clean Cities coalitions) installed 879 chargers along Interstates and corridors, among other programs to accelerate the growth rate of EVs in the region. VTO provided $3.5 million for the project and other local organizations provided the remaining $8.0 million as cost share.

SUCCESS STORY: SEP AND VW SETTLEMENT FUNDS IN ALASKA

In June 2021, the Alaska Energy Authority awarded nearly $1 million in grants to support EV charging station deployment throughout the State. The grants will enable the installation of eight Level 2 chargers and 15 DCFCs in nine communities across the State. Funding for the project comes from the Volkswagen Environmental Mitigation Trust Fund and the U.S. Department of Energy's State Energy Program.

Title XVII Innovative Clean Energy Program (Loan Programs Office)

DOE's Loan Programs Office has loan guarantee authority for innovative deployment projects under the Title 17 Innovative Energy Loan Guarantee Program. Projects that support innovative renewable energy and energy efficiency projects (including charging infrastructure) in the United States can be eligible for loan guarantees to support project deployment costs.

- **Eligible electric vehicle charging activities:** Light duty vehicle charging (level 2 or DC fast charging that brings an innovation to market) including equipment procurement and site construction activities.
- **Eligible applicants:** Project developers (State and local governments, private developers), charging companies.
- **Loan amount:** Varies and LPO typically provides a maximum of 50 to 70% of total project cost funding.
- **Frequency:** Applications accepted year-round.

USDA KEY PROGRAMS

Community Facilities Direct Loan and Grant Program (Rural Development)

The Community Facilities Direct Loan and Grant Program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community in a primarily rural area and does not include private or commercial activities. Funds from the program can be used to purchase, construct, or improve essential community facilities, which includes various EV infrastructure.

- **Eligible EV activities:** Purchasing or constructing EV/LDV charging infrastructure, financing the development of municipal infrastructure including for BEBs and ESBs, vehicle acquisition—specifically for supporting essential community facilities (e.g., school programs, police and fire departments) that primarily serve a rural population.
- **Eligible applicants:** Federally recognized Tribes, public bodies, community-based localities, nonprofits.
- **Frequency:** Ongoing.
- **Grant Match requirement:** The Federal share of net capital project costs ranges from 75 percent to 15 percent. Assistance is provided on a graduated scale with smaller communities with the lowest median household income being eligible for a higher proportion of grant funds. Loan and grant combos are also eligible.
- **Definition of rural:** Areas including cities, townships, villages, and other rural communities with no more than 20,000 residents according to the latest U.S. Census Data.

Rural Energy Savings Program (Rural Development)

The Rural Energy Savings Program (RESP) is a relending program that provides loans to energy efficiency service providers to relend for energy efficiency projects, including EV chargers and the infrastructure to supply EV chargers, in rural areas.

- **Eligible EV activities:** EV chargers; reimbursement for the cost of infrastructure installation (electrical and broadband) necessary to construct an EV charging station, renewables, electric storage devices.
- **Eligible applicants:** Electric service providers, Tribes, localities, other energy efficiency service providers.
- **FY22 average loan:** Varies.
- **Match requirement:** None.
- **Definition of rural:** Areas with no more than 50,000 residents according to the latest U.S. Census Data.

EPA KEY PROGRAMS

Diesel Emissions Reduction Act (DERA) Program

The EPA's DERA Program funds grants and rebates that protect human health and improve air quality by reducing harmful emissions from diesel engines. The program can be used to replace heavy-duty diesel vehicles and equipment with electric vehicles and chargers. DERA has multiple grant programs for different types of applicants and projects including National Grants, Tribal and Insular Area Grants, State Grants, and School Bus Rebates. In 2021, EPA additionally offered a $7 million funding opportunity for electric school bus rebates in underserved communities funded by the American Rescue Plan Act of 2021. A list of previously awarded DERA grants with project topics and funding levels is available online.

- **Eligible EV activities:** Commercial charging, public transportation charging, vehicle acquisition—specifically, the replacement or retrofit of heavy-duty diesel vehicles, engines, and equipment with lower emissions technology, such as EVs and their charging infrastructure. Commercial and public transportation charging equipment is only eligible in combination with vehicle acquisition projects.
- **Eligible applicants:**
  - **National:** States, Tribes, localities, transportation providers (public only), nonprofits.
  - **Tribal and Insular Area:** States (U.S. territories only), Tribes.
  - **State:** States.
  - **School Bus Operators:** States, Tribes, localities, private sector. Targeted to underserved communities.
- **FY20 award ranges:**
  - **National:** $44,000 – $300,000.
  - **Tribal and Insular Area:** $155,000 – $520,000.
  - **State:** $81,000 – $680,000.
  - **School Bus Rebates:** $20,000 – $300,000.
- **Frequency:** Annual.

Clean School Bus Program

EPA's Clean School Bus Program (CSB) created under BIL provides $5 billion over 5 years, from FY 2022 to FY 2026, to replace existing school buses with clean and zero-emission models. EPA made available up to $965 million in 2022 for zero-emission and low-emission school bus rebates as the first funding opportunity. Applicants in the 2022 CSB Rebates Program could request funding for the replacement of up to 25 school buses. In addition, 2022 CSB Rebate recipients can use funds for charging infrastructure for up to $20,000 per bus in high-priority school districts and up to $13,000 per bus for all other eligible school districts. The 2022 Clean School Bus Rebates Program was the first of several funding opportunities for the multiyear CSB Program. EPA anticipates running both a grant and rebate competition in FY 2023. Additional information on the Clean School Bus Program is available at: https://www.epa.gov/cleanschoolbus.

- **Eligible electric mobility activities:** Vehicle acquisition, charging infrastructure.
- **Eligible applicants:** State or local governmental entities that are responsible for providing school bus service to one or more public school systems, or the purchase of school buses; Indian Tribes, Tribal organizations, or Tribally controlled schools responsible for providing school bus service to one or more schools funded by the Bureau of Indian Affairs, or the purchase of school buses; eligible contractors; nonprofit school transportation associations.
- **FY22 award ranges (for zero-emission buses):**
  - **Serving high-priority school districts:** Maximum of $285,000 – $375,000 per bus.
  - **Serving other eligible school districts:** Maximum of $190,000 – $250,000 per bus.
- **Frequency:** EPA anticipates offering multiple funding opportunities through FY 2026; see https://www.epa.gov/cleanschoolbus for more information.

IRS FEDERAL TAX INCENTIVES

Alternative Fuel Vehicle Refueling Property Credit (IRS)

As expanded by the Inflation Reduction Act (IRA), 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.

THE INFLATION REDUCTION ACT (IRA)

Signed into law on August 16, 2022, the Inflation Reduction Act (IRA) will be the largest climate investment in U.S. history. The IRA includes provisions to revitalize American manufacturing and create clean energy jobs, and provides additional resources to improve access to EVs and EV charging infrastructure. The IRA will enable several EV-related programs across multiple Federal agencies, including USDOT, DOE, EPA, HUD, and the Department of the Treasury.

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. Consumers who purchased qualified residential charging equipment prior to December 31, 2032, may receive a tax credit of up to $1,000.

- **Eligible EV activities:** LDV charging.
- **Eligible applicants:** Nonprofits, private sector, individuals.
- **Maximum credit amount:** 30 percent of eligible project costs, maximum $100,000 (or $1,000 for consumer EV users).
- **Frequency:** Ongoing, through 2032.

ADDITIONAL FUNDING RESOURCES

The programs described thus far are Federal funding programs to which entities apply or receive funding directly through a Federal agency. However, additional funding programs are administered by States, local governments, and utilities. Many of these programs are specific to a particular region. This section contains resources with databases and contact information to help rural entities identify region-specific funding programs and incentives for rural EV infrastructure.

FUNDING RESOURCE CLEARINGHOUSES

The following resources can help rural entities find local, State, and utility funding and financing programs for EV infrastructure projects. They contain filterable lists of funding programs, contact information for a regional agent who can identify relevant funding and financing programs, or both.

Alternative Fuels Data Center (AFDC)

The AFDC Laws & Incentives page contains a filterable search tool that provides lists of programs and regulations from DOE and State governments (see Figure 6.1). AFDC also has a State Laws and Incentives interactive map that can further help entities find region-specific resources as well as a summary matrix sorted by user type and State, though this is not the focus of the Rural EV Toolkit.

Clean Cities Coalitions

As discussed in the *Clean Cities Coalitions* section, Clean Cities coalitions can be an important partner for conceptualizing potential projects as well as identifying stakeholders, funding programs, and resources for EV infrastructure projects in a specific region. Rural entities can connect with their regional Clean Cities coalition to learn about funding programs specific to their area (see the Clean Cities Coalition Network contact directory).

Database of State Incentives for Renewables & Efficiency (DSIRE)

DSIRE is a comprehensive source of information on incentives and policies that support renewable energy and energy efficiency in the United States. Established in 1995, DSIRE is operated by the North

Carolina Clean Energy Technology Center at N.C. State University. Users can select their State in the database to reveal various incentive programs for which they could qualify; users can filter and search within these programs to identify potential funding for rural EV infrastructure projects.

STATE-LEVEL FUNDING PROGRAMS FOR EV INFRASTRUCTURE

A number of grant and financing programs for EV infrastructure are administered at the State level. Refer to the links to learn about applying to a State's programs or contacting a State administering office. There may be additional incentives for home charging available in certain States and localities.

State Energy Offices

Each State and U.S. territory has its own energy office that advances energy policies, informs regulatory processes, and supports energy technology research, demonstration, and deployment. State energy offices generally operate under the direction of governors or legislatures and are funded by both State and Federal appropriations. EV infrastructure is eligible for funding through many State energy offices.

The National Association of State Energy Offices (NASEO) is comprised of the 56 State and territory energy offices. NASEO's Interactive State Energy Offices Map provides contact information for each State energy office, which can provide information on funding opportunities for EV infrastructure.

State Infrastructure Banks (SIBs)

SIBs provide an alternative financing option for applicants that is managed at the State level. A SIB is a revolving infrastructure investment fund capitalized using Federal and State appropriations and providing loans or credit enhancement to individual projects to accelerate project delivery. SIB loans can finance up to the entire project cost, dependent on individual SIB structures and project characteristics. Thirty-three States have established SIBs with varying bank structures. For more information on SIBs and to determine whether a particular State has an SIB, visit the FHWA Center for Innovative Finance Support's website.

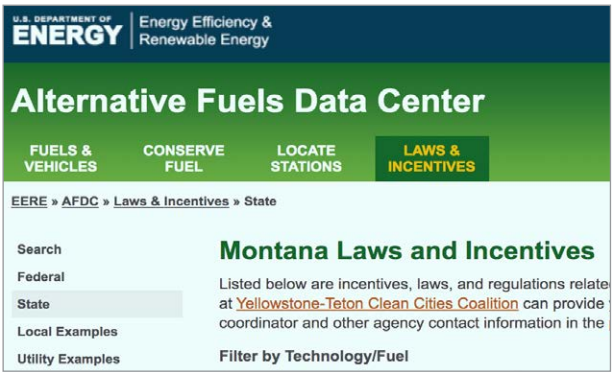


Figure 6.1. AFDC State-specific resources page for Montana.

VW Settlement Funds

Volkswagen (VW) provided approximately $3 billion to an Environmental Mitigation Trust as a part of an enforcement settlement between the U.S. government and VW to resolve allegations that VW violated the Clean Air Act. States, the District of Columbia, Puerto Rico, and federally recognized Tribes may be beneficiaries. Beneficiaries have a defined list of actions for which they may use the funds; EV infrastructure and acquisition activities are included in the list of eligible actions, but States determine the specific projects to fund. Each State has a lead agency that can help identify potential VW Settlement funding opportunities. The National Association of Clean Air Agencies provides contact information for each State's lead agency.

RURAL EV INFRASTRUCTURE FUNDING TABLE

Below is a list of Federal programs that can fund rural EV infrastructure, sorted alphabetically by agency. The table notes the type of EV activities that are eligible for funding under different programs, as well as the eligible entities.

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
DOC EDA	Build to Scale Program Grant (Discretionary)	Provides funds for organizations to aid companies in developing the next generation of tech-based economic development initiatives, including commercial EV technology implementation.	States, Tribes, Localities, Nonprofits			•			•	
	FY2020 EDA Public Works and Economic Adjustment Assistance Program Grant (Discretionary)	Provides investments that support construction, non-construction, technical assistance, and revolving loan fund projects designed to leverage existing regional assets and support the implementation of economic development strategies that advance new ideas and creative approaches to advance economic prosperity in distressed communities.	States, Tribes, Localities, Nonprofits	•		•		•	•	
	Planning and Local Technical Assistance Program Grant (Discretionary)	Awards funding to eligible recipients (within Economic Development Districts) to create and implement regional economic development plans designed to build capacity and guide the economic prosperity and resiliency of an area or region.	States, Tribes, Localities, Nonprofits					•	•	
	Research and National Technical Assistance Grant (Discretionary)	Supports research and technical assistance projects designed to leverage existing regional assets and support the implementation of economic development strategies that advance new ideas and creative approaches to advance economic prosperity in distressed communities.	States, Tribes, Localities, Nonprofits					•		
DOE	Property Assessed Clean Energy Programs Loan (Innovative Finance)	Allows a commercial or residential property owner to finance the upfront cost of energy or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment. The assessment is attached to the property instead of the individual.	Nonprofits, Private Sector, Individuals	•						

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
DOE Loan Programs Office	Advanced Technology Vehicles Manufacturing (ATVM) Loan Program Loan (Innovative Finance)	Supports the manufacture of eligible light-duty vehicles and qualifying components under the ATVM Loan Program.	States, Localities, Private Sector	•						•
	Title XVII Innovative Clean Energy Loan Guarantees Loan Guarantee (Innovative Finance)	Provides loan guarantees for innovative renewable energy and energy efficiency projects. Only projects that bring an innovation to market—specifically innovations that have been deployed three or fewer times in last five years—are eligible. For example, the addition of grid services or new software and hardware components to a charging site deployment may support eligibility.	States, Tribes, Localities, Transportation Providers, Nonprofits, Private Sector	•				•		
DOE Office of Clean Energy Demonstrations	Energy Improvement in Rural and Remote Areas Cooperative Agreement, Discretionary	Provide financial assistance to Industry Partners, Utilities, National Laboratories, Universities, State and Localities, Community Based Organizations, Tribal, and Environmental Groups to increase environmental protection from the impacts of energy use and improve resilience, reliability, safety, and availability of energy in rural or remote areas, including "siting or upgrading transmission and distribution lines," "providing or modernizing electric generation facilities," "developing microgrids."	Localities					•		
DOE VTO	Vehicle Technologies Office Funding Opportunities Various	Supports high-impact projects that can significantly advance its mission to reduce petroleum reliance by developing and deploying more energy efficient and sustainable transportation technologies. VTO regularly updates its FOAs with information on available VTO grant opportunities.	States, Tribes, Localities, Transportation Providers, Nonprofits, Private Sector, Individuals	•	•	•		•	•	•
DOE Office of State and Community Programs	State Energy Program Grant (Formula)	Provides funding and technical assistance to States, territories, and the District of Columbia to enhance energy security, advance State-led energy initiatives, and increase energy affordability. Some States allocate funds to projects that promote the buildout of EV infrastructure in rural areas. Contact the State energy office for more information about program guidance and eligibility for a particular State.	States	•	•	•		•		

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
DOL	Workforce Opportunity for Rural Communities Grant (Discretionary)	Funds projects that demonstrate alignment of regionally driven, comprehensive approaches to addressing economic distress and the necessary workforce development activities to ensure dislocated and other workers in the regions are capable of succeeding in current and future job opportunities.	States, Tribes, Localities, Nonprofits, Individuals						•	
DOT FAA	Airport Zero Emission Vehicle and Infrastructure Pilot Program Grant (Discretionary)	Improves airport air quality and facilitates use of zero emissions technologies at airports by funding the purchase of Zero Emission Vehicles (ZEV) and to construct or modify infrastructure needed to use ZEVs. Eligible parties must be airport sponsors that are in the National Plan of Integrated Airport Systems (NPIAS).	States, Tribes, Localities, Transportation Providers	•	•			•		•
	Voluntary Airport Low Emissions Program Grant (Discretionary)	Improves airport air quality and provides air quality credits for future airport development, airport sponsors can use funds to finance low emission vehicles, refueling and recharging stations, gate electrification, and other airport air quality improvements. Eligible parties must be commercial airport sponsors that are in the NPIAS and located in areas that do not meet National Ambient Air Quality Standards.	States, Tribes, Localities, Transportation Providers	•	•			•		•
DOT FHWA	Charging and Fueling Infrastructure Grant Program Grant (Discretionary)	This program will strategically deploy publicly accessible EV charging infrastructure and hydrogen, propane, and natural gas fueling infrastructure in along Alternative Fuel corridors and in community locations such as parking facilities, public schools, public parks, or along public roads.	States, Tribes, Metropolitan Planning Organizations, Localities, Political Subdivisions	•	•	•	•	•		
	Reduction of Truck Emissions at Port Facilities Grant (Discretionary)	The Reduction of Truck Emissions at Port Facilities Program provides discretionary grants to fund projects that reduce emissions at ports, including through the advancement of port electrification, with projects subject to requirements as if on a Federal-aid highway.	State DOTs, Localities, MPOs, Research or academic institutions, Multijurisdictional groups made of up eligible applicants			•				
	Carbon Reduction Program Grant (Formula)	This formula grant program provides funding to States for projects designed to reduce transportation emissions.	States	•	•	•		•	•	•

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
(continued) DOT FHWA	National Electric Vehicle Infrastructure (NEVI) Formula Program Grant (Formula)	The NEVI formula program will provide funding to States to strategically deploy electric vehicle (EV) charging stations and to establish an interconnected network to facilitate data collection, access, and reliability. The program may fund the acquisition, installation, network connection, operation and maintenance of EV charging stations, as well as long-term EV charging station data sharing.	States (including the District of Columbia and Puerto Rico)	•	•			•	•	
	Transportation Alternatives (set aside of Surface Transportation Block Grant program) Grant (Formula)	The Transportation Alternatives (TA) Set-Aside from the Surface Transportation Block Grant (STBG) Program provides funding for a variety of generally smaller-scale transportation projects such as pedestrian and bicycle facilities, construction of turnouts, overlooks, and viewing areas, community improvements such as historic preservation and vegetation management, environmental mitigation related to stormwater and habitat connectivity, recreational trails, safe routes to school projects, and vulnerable road user safety assessments.	States, Localities, Regional Transportation Authorities, Transit Agencies, Public Lands, School Districts and Schools, Tribes, MPOs				•			
	Advanced Transportation and Congestion Management Technologies Deployment Grant (Discretionary)	This program provides grants to eligible entities to develop model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment. Demonstration projects could include EV charging infrastructure integrated with intelligent transportation systems with the Smart Grid and other energy distribution and charging systems or associated with advanced mobility and access technologies such as dynamic ridesharing.	States, Localities, Transportation Providers, Research or Academic Institutions	•	•					
	Congestion Mitigation & Air Quality Improvement Grant (Formula)	Provides a flexible funding source to State and Localities for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards.	States	•	•	•	•		•	•
	Federal Land Access Program Grant (Formula)	Aims to improve transportation to and within Federal lands by improving transportation facilities that provide access to, are adjacent to, or are located within Federal lands.	States, Tribes, Localities	•	•	•		•	•	•
	Federal Lands Transportation Program Grant (Formula)	The program focuses on improving Federal lands transportation facilities that are located on, adjacent to, or provide access to Federal lands and which are owned and maintained by Federal land management agencies. Funds are distributed to Federal land management agencies.	Federal Land Management Agencies	•	•	•		•	•	•

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
(continued) DOT FHWA	National Highway Freight Program Grant (Formula)	Funds projects that improve the efficient movement of freight on the National Highway Freight Network.	States			•		•		•
	National Highway Performance Program Grant (Formula)	Provides support for the condition and performance of the national highway system (NHS), for the construction of new facilities on the NHS, and to ensure that Federal funds are directed to support progress toward the achievement of performance targets established in a State's asset management plan for the NHS.	States	•	•				•	
	Nationally Significant Federal Lands and Tribal Projects Program: Tribal High Priority Projects Program Grant (Discretionary)	Electric vehicle charging infrastructure installed using funds provided under this title shall provide, at a minimum— (A) non-proprietary charging connectors that meet applicable industry safety standards, and (B) open access to payment methods that are available to all members of the public to ensure secure, convenient, and equal access to the electric vehicle charging infrastructure that shall not be limited by membership to a particular payment provider	Federal Land Management Agencies, Tribal Governments, Localities, Transit Agencies, Multijurisdictional group made of up eligible applicants	•						
	Puerto Rico Highway Program Grant (Formula)	Carries out priorities of the highway program in the Commonwealth of Puerto Rico.	Puerto Rico	•	•	•		•	•	•
	State Planning and Research Grant (Formula)	Provides funding for making transportation investment decisions throughout the State. The goals of the funding are to develop cooperative planning efforts that support transportation investment decisions statewide.	States					•		
	Surface Transportation Block Grant Program Grant (Formula)	Provides flexible funding that may be used by States and Localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.	States	•	•	•		•	•	
	Territorial Highway Program Grant (Formula)	Assists each U.S. territory in the construction and improvement of a system of arterial and collector highways and necessary inter-island connectors.	U.S. Territories (other than Puerto Rico)	•	•	•		•	•	

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
DOT FTA	Electric or Low-Emitting Ferry Grant Program Grant (Discretionary)	The Bipartisan Infrastructure Law establishes an Electric or Low-Emitting Ferry Pilot Program that makes Federal funding available to support the transition of passenger ferries to low or zero emission technologies.	States, Tribes, Localities, Transportation Providers							•
	Accelerating Innovative Mobility Grant (Discretionary)	Promotes forward-thinking approaches to improve transit financing, planning, system design, and service. Program also supports innovative approaches to advance strategies that promote accessibility, including equitable and equivalent accessibility for all travelers.	States, Tribes, Localities, Transportation Providers, Nonprofits, Private Sector	•	•			•		
	Area of Persistent Poverty Program Grant (Discretionary)	Supports planning, engineering and technical studies, or financial planning to improve transit services in areas experiencing long-term economic distress.	States, Localities, Transportation Providers, Nonprofits					•		
	Enhanced Mobility of Seniors & Individuals with Disabilities Grant (Formula)	Provides formula funding to States for the purpose of assisting private nonprofit groups in meeting the transportation needs of older adults and people with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs. Subrecipients: private nonprofit groups providing transportation to these groups.	States		•			•		•
	Formula Grants for Rural Areas Grant (Formula)	Provides capital, planning, and operating assistance to States to support public transportation in rural areas with populations of less than 50,000, where many residents often rely on public transit to reach their destinations. State and Tribes receive formula funding, then redistribute funds to projects in rural areas.	States, Tribes		•			•	•	•
	Grants for Buses and Bus Facilities Discretionary Program Grant (Discretionary)	Makes Federal resources available to States and direct recipients to replace, rehabilitate, and purchase buses and related equipment and to construct bus-related facilities, including technological changes or innovations to modify low- or no-emission vehicles or facilities.	States, Tribes, Localities, Transportation Providers		•				•	•
	Grants for Buses and Bus Facilities Formula Program Grant (Formula)	Provides funding to States and transit agencies through a statutory formula to replace, rehabilitate, and purchase buses and related equipment and to construct bus-related facilities. Subrecipients: public agencies or private nonprofit organizations engaged in public transportation.	States, Tribes, Localities, Transportation Providers		•				•	•

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
(continued) DOT FTA	Integrated Mobility Innovation Grant (Discretionary)	Supports the transit industry's ability to leverage and integrate mobility innovations with existing services, while examining the impact of innovations on agency operations and the traveler experience.	States, Localities, Tribes, Transportation Providers		•		•	•		
	Low- or No-Emission Vehicle Program Grant (Discretionary)	Provides funding to State and Local authorities for the purchase or lease of zero-emission and low-emission transit buses, as well as acquisition, construction, and leasing of required supporting facilities.	States, Tribes, Localities, Transportation Providers		•				•	•
	Metropolitan Planning Grant (Formula)	Provides funding and procedural requirements to State DOTs for multimodal transportation planning in metropolitan areas and States.	States					•		
	Public Transportation Innovation Grant (Discretionary)	Provides funding to develop innovative products and services assisting transit agencies in better meeting the needs of their customers.	States, Localities, Transportation Providers, Nonprofits, Private Sector					•		
	Public Transportation on Indian Reservations Program; Tribal Transit Program Grant (Discretionary)	Aims to improve transportation to and within Tribal Lands by funding capital, operating, planning, and administrative expenses for public transit projects that meet the growing needs of rural Tribal communities.	Tribes		•			•		•
	Rural Transportation Assistance Program Grant (Formula)	Provides a source of funding to assist in the design and implementation of training and technical assistance projects and other support services tailored to meet the needs of transit operators in nonurbanized areas.	States, Localities, Transportation Providers					•	•	
	Tribal Transit Formula Grants Grant (Formula)	Aims to improve transportation to and within Tribal Lands by funding capital, operating, planning, and administrative expenses for public transit projects that meet the growing needs of rural Tribal communities.	Tribes		•			•		•
	Urbanized Area Formula Funding Grant (Formula)	Provides capital, planning, and operating assistance to urbanized areas and to governors for transit capital and operating assistance in urbanized areas and for transportation-related planning. An urbanized area is an incorporated area with a population of 50,000 or more that is designated as such by the U.S. Department of Commerce, Bureau of the Census. Funding can support rural areas if the service provided also impacts a rural area.	States, Tribes, Localities, Transportation Providers		•			•	•	•

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
DOT MARAD	America's Marine Highway Program Grant (Discretionary)	Funds previously designated Marine Highway Projects that support the development and expansion of documented vessels or port and landside infrastructure.	States, Tribes, Localities, Transportation Providers, Private Sector	•		•		•		•
	Port Infrastructure Development Program Grant (Discretionary)	Makes grants to improve facilities related to coastal seaports or Great Lakes ports. Funds are to be awarded as discretionary grants on a competitive basis for projects that will improve the safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port.	States, Tribes, Localities, Transportation Providers	•				•		•
DOT OST	National Infrastructure Project Assistance Program Grant (Discretionary)	Also known as "Mega Grants," the program supports large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility, or safety benefits.	States, Tribes, Localities, Transportation Providers	•		•		•		
	Rural Surface Transportation Grant Program Grant (Discretionary)	The Rural Surface Transportation Grant Program funds competitive grants to improve and expand the surface transportation infrastructure in rural areas by increasing connectivity, improving the safety and reliability of the movement of people and freight, and generating regional economic growth and improving quality of life.	State DOTs, Tribal Governments, Localities	•	•	•		•	•	
	Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Grant (Discretionary)	The Office of the Secretary's Strengthening Mobility and Revolutionizing Transportation Grant program provides supplemental funding grants to rural, midsized, and large communities to conduct demonstration projects focused on advanced smart city or community technologies and systems in a variety of communities to improve transportation efficiency and safety.	States, Tribes, Localities, Transportation Providers, Toll Authorities, MPOs	•	•	•		•		
	Rebuilding American Infrastructure with Sustainability and Equity Grant (Discretionary)	Provides a unique opportunity for the USDOT to invest in road, rail, transit, and port projects that achieve national objectives. Starting in FY21, RAISE has substantially increased program focus on ZEV infrastructure, including EV charging.	States, Tribes, Localities, Transportation Providers	•	•	•		•		
DOT OST Build America Bureau	Infrastructure for Rebuilding America Grant (Discretionary)	Advances the Administration's priorities of rebuilding America's infrastructure and creating jobs by funding highway and rail projects of regional and national economic significance that position America to win the 21st century.	States, Tribes, Localities, Transportation Providers	•		•		•		

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
EPA	Clean School Bus Program Rebates and Grants (Discretionary)	Fifty percent of the funds are authorized for zero-emission school buses and 50 percent of the funds are authorized for alternative fuels and clean school buses. Funds may be prioritized for high-need local educational agencies, rural or low-income areas, or Tribal schools, as well as entities that have matching funds available. The EPA is authorized to provide funds to cover up to 100 percent of the costs of the replacement bus, as well as provide funding for charging infrastructure for electric school buses.	State or local governmental entities that are responsible for providing school bus service to one or more public school systems, or the purchase of school buses; Indian Tribes, Tribal organizations, or Tribally controlled schools responsible for providing school bus service to one or more schools funded by the Bureau of Indian Affairs, or the purchase of school buses; Eligible Contractors; Nonprofit School Transportation Associations		•				•	•
	National Grants: Diesel Emissions Reduction Act Grant (Discretionary)	Awards funding to eligible government agencies and nonprofits for eligible diesel emissions reduction solutions, including the replacement of heavy-duty diesel vehicles with EVs.	States, Tribes, Localities, Transportation Providers, Nonprofits		•	•				•
	School Bus Rebates: Diesel Emissions Reduction Act Grant (Discretionary)	Awards funding to public and private fleet owners for the replacement of old diesel school buses with cleaner buses, including EVs. Anticipated: rebates for electric school bus replacements in underserved communities.	States, Tribes, Localities, Private Sector		•					•

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
(continued) EPA	State Grants: Diesel Emissions Reduction Act Grant (Formula)	Allocates DERA funds to eligible U.S. States and territories for the establishment of diesel emissions reduction programs. States can prioritize specific eligible diesel emissions reduction solutions under DERA, including the replacement of heavy-duty diesel vehicles with EVs.	States		•	•				•
	Tribal and Insular Area Grants: Diesel Emissions Reduction Act Grant (Discretionary)	Awards funding to eligible Tribes and Insular Areas for eligible diesel emissions reduction solutions, including the replacement of heavy-duty diesel vehicles with EVs.	States, Tribes		•	•				•
IRS	Alternative Fuel Vehicle Refueling Property Credit Tax Credit	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% or the median family income is less than 80% of the state median family income level. Consumers who purchase qualified residential charging equipment prior to December 31, 2032 may receive a tax credit of up to $1,000.	Nonprofits, Private Sector, Individuals	•						
SBA	Small Business Innovation Research Grant (Discretionary)	Enables small businesses to explore their technological potential and provides the incentive to profit from its commercialization.	Private Sector, Individuals					•		
	Small Business Technology Transfer Grant (Discretionary)	Enables small businesses to explore their technological potential and provides the incentive to profit from its commercialization.	Private Sector, Individuals					•		

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
USDA NRCS	Conservation Innovation Grants Grant (Discretionary)	Supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private lands.	States, Tribes, Localities, Nonprofits, Private Sector, Individuals	•		•				
	Environmental Quality Incentives Program Grant (Discretionary)	Provides agricultural producers and non-industrial forest managers with financial resources and one-on-one help to plan and implement improvements or conservation practices.	Tribes, Private Sector, Individuals	•		•			•	
	Urban Agriculture and Innovative Production Grant (Discretionary)	Assists eligible entities with projects that support the development of urban agriculture and innovative production.	Tribes, Localities, Nonprofits	•		•		•		
USDA RD	Community Facilities Direct Loans and Grants Discretionary Grants, Loans, Loan Guarantees	This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings.	Public agencies, nonprofits, Tribes	•	•		•			•
	Business & Industry Loan Guarantees Loan Guarantee (Innovative Finance)	Offers loan guarantees to lenders for their loans to rural businesses.	Tribes, Localities, Transportation Providers, Nonprofits, Private Sector, Individuals	•				•	•	
	Community Facilities Direct Loan Program Loan	Provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the locality's community for the orderly development of the community in a primarily rural area.	States, Tribes, Localities, Transportation Providers, Nonprofits	•	•			•	•	
	Community Facilities Grant Program Grant (Discretionary)	Provides affordable funding to develop essential community facilities in rural areas. Essential community facility: a facility that provides an essential service to the locality's community for the orderly development of the community in a primarily rural area.	Tribes, Localities, Nonprofits	•				•		•

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
(continued) USDA RD	Intermediary Relending Program Loan (Revolving Fund)	Provides 1 percent low-interest loans to Localities lenders or "intermediaries" that re-lend to businesses to improve economic conditions and create jobs in rural communities. Intermediaries relending the capital to other parties with a maximum loan of $250k or 75 percent of total project.	States, Tribes, Localities, Nonprofits	•		•		•	•	
	Renewable Energy Development Assistance Grant (Discretionary)	Assists rural small businesses and agricultural producers by conducting and promoting energy audits and providing Renewable Energy Development Assistance.	States, Tribes, Localities, Nonprofits, Private Sector, Individuals					•		
	Rural Business Development Grants Grant (Discretionary)	Provides technical assistance and training for small rural businesses for activities related to rural transportation improvement, technology-based economic development, and more.	States, Tribes, Localities, Transportation Providers, Nonprofits	•		•		•	•	
	Rural Economic Development Grant Program Grant (Discretionary)	Provides zero-interest loans to Localities' utilities, which they use to establish a revolving loan fund to pass funding through to local businesses (i.e., the ultimate recipients) for projects that create and retain employment in rural areas.	Localities, Nonprofits	•		•		•	•	
	Rural Economic Development Loan Program Loan	Provides zero interest loans to local utilities, which they, in turn, pass through to local businesses (ultimate recipients), for projects that will create and retain employment in rural areas. The ultimate recipients repay the lending utility directly. The utility is responsible for repayment to the USDA.	Localities, Nonprofits	•		•		•	•	
	Rural Energy for America Program – Guaranteed Loans Loan	Provides guaranteed loan financing to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements, switching from diesel to electric irrigation motors qualifies.	Private sector, Individuals			•				•
	Rural Placemaking Innovation Challenge Cooperative Agreement	Helps rural communities create plans to enhance capacity for broadband access, preserve cultural and historic structures, and support the development of transportation, housing, and recreational spaces.	Tribes, Localities, Transportation Providers, Nonprofits, Private Sector	•	•			•	•	

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
USDA RD RUS	Denali Commission High Energy Cost Grants Grant (Discretionary)	Assists the Denali Commission in lowering the cost of energy for families and Individuals in areas with extremely high per-household energy costs. Eligible projects improve energy facilities serving communities with extremely high energy costs, partly by implementing energy efficient technology and practices.	States, Tribes, Localities, Non-profits, Private Sector, Individuals	•				•		
	Distributed Generation Energy Project Financing Loan/Loan Guarantee (Innovative Finance)	Provides loans and loan guarantees to energy project developers for distributed energy projects including renewables that provide wholesale or retail electricity to existing Electric Program borrowers or to rural communities served by other utilities. Applicants must be utilities and/or energy distributors.	States, Tribes, Localities, Non-profits, Private Sector	•				•		
	Electric Infrastructure Loan & Loan Guarantee Program Loan/Loan Guarantee (Innovative Finance)	Makes insured loans and loan guarantees to finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Applicants must be retail or power supply providers.	States, Tribes, Localities, Nonprofits, Private Sector	•				•		
	Energy Efficiency and Conservation Loan Program Loan	Provides loans to finance energy efficiency and conservation projects for commercial, industrial, and residential consumers. Applicants must be utilities and/or energy distributors.	Localities, Tribes, Private Sector	•				•		
	High Energy Cost Grants Grant (Discretionary)	Assists energy providers and other eligible entities in lowering energy costs for families and Individuals in areas with extremely high per-household energy costs.	States, Tribes, Localities, Nonprofits, Private Sector, Individuals	•				•		

Agency/Office	Program Name Program Type	Program Description	Eligible Parties	LDV Charging	Transit Charging	Commercial Charging	Micromobility	Infrastructure Planning	Workforce Development	Vehicle Acquisition
(continued) USDA RD RUS	Rural Energy Savings Program Loan	Provides loans to energy efficiency service providers to relend for energy efficiency projects, including EV chargers and the infrastructure to supply EV chargers, in rural areas.	Localities, Tribes, Private Sector	•				•		
	Electric Infrastructure Loans and Loan Guarantees Loan/Loan Guarantee (Innovative Finance)	The electric program makes insured loans and loan guarantees to nonprofit and cooperative associations, public bodies, and other utilities. Insured loans primarily finance the construction of electric distribution facilities in rural areas. The guaranteed loan program has been expanded and is now available to finance generation, transmission, and distribution facilities. The loans and loan guarantees finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacement required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems.	States, Localities, Tribes, Nonprofits and Cooperatives, For-Profit Businesses							•

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CONTACTING ROUTES

The USDOT ROUTES Initiative welcomes any feedback on this toolkit. Stakeholders can get in contact by either email (rural@dot.gov) or phone (202-366-4544 or TTY / Assistive Device 800-877-8339).

APPENDICES

(Photo: ©123rf.com/tomwang)

APPENDIX A

RESOURCES FOR EV INFRASTRUCTURE PLANNING

This section compiles resources and tools for EV infrastructure planning and implementation. Resources are organized by subject area and are labeled with resource type, namely (i) calculators and software, (ii) datasets and maps, and (iii) additional guidance and reference.

A.1: CHARGING AND ENERGY NEEDS

- **Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite,** DOE – *Calculator/Software*

  Web app to help estimate the amount of EV charging a State (or alternatively, a specific urban/suburban area) needs to support a user-supplied number of plug-in EVs. Reports the number of Level 2 and DCFC plugs needed and (for urban/suburban areas) graphs a weekday electric load profile. Provides statistics on the current amount of charging plugs and EVs in the State or region as reference numbers. This tool is a part of the VI-X Modeling Suite of Electric Vehicle Charging Infrastructure Analysis Tools, which has tools for network planning, site design, and financial analysis. *Note: May be most useful for State-level planning.*

  Links:

  - EVI-Pro Lite: https://afdc.energy.gov/evi-pro-lite
  - EVI-X Modeling Suite: https://www.nrel.gov/transportation/evi-x.html

- **Alternative Fueling Station Locator,** DOE – *Dataset/Map*

  Interactive web map containing all alternative vehicle fueling stations in the United States and Canada, including EV charging stations. Users can filter by charger and connector type, public or private access, owner type, and possible payment methods and can download the underlying data.

  Link: https://afdc.energy.gov/stations/#/find/nearest

- **Electric Vehicle Charging Needs Assessment,** NASEO – *Guidance/Reference*

  A report on key barriers and opportunities for investment in EV infrastructure in the Intermountain West. Includes analysis and findings based on a questionnaire issued to EV stakeholders in eight States. The appendix summarizes current EV infrastructure gaps, the questionnaire responses, and opportunities for each individual State.

  Link: https://www.naseo.org/data/sites/1/documents/publications/EVWest_NeedsAssessment_Final.pdf

- **National Park Service EV Charger Gap Analysis Tool,** USDOT Volpe Center – *Calculator/Software*

  Python script that identifies and visualizes gaps in EV charging coverage along a route between a user-specified origin and destination. Developed to identify gaps between national parks and key population centers but can be adapted to other contexts. Contact Andrew Breck (andrew.breck@dot.gov) to request the script. *Note: This tool requires ArcGIS Pro and purchasable ESRI credits.*

  Link: https://rosap.ntl.bts.gov/view/dot/42561

- **Regional EV Charging Infrastructure Location Identification Toolkit (ILIT),** M.J. Bradley & Associates – *Calculator/Software*

  A collection of tools to assess the suitability of potential DCFC sites in the Northeast, Mid-Atlantic, and Southeast States from North Carolina to Maine. The tools include the Excel-based ILIT Model to identify and rank candidate locations based on user priorities, the online Results Mapper to analyze and visualize the candidate locations,

and the online Data Viewer to overlay and explore geographic information system data layers with different economic, demographic, and environmental metrics.

Link: https://www.sustainability.com/thinking/regional-ev-charging-infrastructure-location-identification/

- **Southeast Regional Electric Vehicle Information Exchange (SE REVI)** *Planning and Deployment Map, National Association of State Energy Officials – Dataset/Map*

  Interactive web map with information on EV infrastructure planning, policy development, and program implementation in the Southeastern region of the U.S. (Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, and the U.S. Virgin Islands). This map was designed to help coordinate EV infrastructure planning and identify charging station gaps. Users can turn layers on or off as needed.

  Link: https://tdec.maps.arcgis.com/apps/Viewer/index.html?appid=565b9fbfd245418d8958562ec8661e3c

- **UC Davis GIS EV Planning Toolbox for MPOs,** *UC Davis Electric Vehicle Research Center – Dataset/Map*

  Interactive map designed to help plan the location of EV charging infrastructure. *Note: Datasets are only provided for California. Users are also required to have ArcView or ArcGIS to run the tools.*

  Link: https://ev.ucdavis.edu/project/uc-davis-gis-ev-planning-toolbox-mpos

A.2: COST ANALYSIS

- **EV Charging Financial Analysis Tool,** Atlas Public Policy – *Calculator/Software*

  A sophisticated Microsoft Excel-based tool that performs a detailed financial analysis of owning and operating EV charging stations. Allows users to evaluate various business arrangements including P3s. Generates a summary dashboard as well as sensitivity analyses and financial accounting statements.

  Link: https://atlaspolicy.com/rand/ev-charging-financial-analysis-tool/

- **Dashboard for Rapid Vehicle Electrification (DRVE) Tool,** Electrification Coalition – *Calculator/Software*

  Microsoft Excel-based tool that helps users compare their existing conventional fleet vehicles with EV alternatives. Outputs include cost of ownership and emissions based on the regional electric grid. Users can customize the market, charging, and procurement settings to explore different scenarios.

  Link: https://www.electrificationcoalition.org/drve/

- **Vehicle and Infrastructure Cash-Flow Evaluation (VICE) Battery Electric Bus Model,** NREL – *Calculator/Software*

  Microsoft Excel-based tool to help bus fleet operators determine the cost and payback period of battery electric buses (BEB) and charging infrastructure. Considers the acquisition, fuel, maintenance, and operation costs of a baseline diesel bus fleet and an alternative BEB fleet with EV infrastructure. Provides default input values that users can further customize.

  Link: https://afdc.energy.gov/vice_model/

- **Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool,** Argonne National Laboratory – *Calculator/Software*

  A tool to calculate the economic and environmental costs and benefits of alternative fuel vehicles including EVs. Estimates petroleum use, emissions of greenhouse gases and air pollutants, and cost of ownership for a variety of vehicle types. Includes a function to calculate payback on EV infrastructure and incorporates EV charging infrastructure into

calculations of total cost of ownership for fleets. AFLEET is available as both an online tool and a Microsoft Excel file.

Link: https://greet.es.anl.gov/afleet

- **JOBS Model, Argonne National Laboratory** – *Calculator/Software*

  Spreadsheet-based tools to estimate the economic impacts of deploying alternative fuel equipment and infrastructure, including EV charging stations. Users can estimate economic impacts at the state, multistate, or national level. The tools provide default input values but users are encouraged to supply their own project-specific data for more accurate results.

  Link: https://www.anl.gov/esia/jobs-models

- **Costs and Emissions Appraisal Tool for Transit Buses,** World Resources Institute – *Calculator/Software*

  Microsoft Excel-based tool to help bus operators assess the costs and emissions reductions from a transition to alternative fuel fleets. Considers financing, capital, infrastructure, overhaul, maintenance, fuel, and operations costs as well as several greenhouse gases and EPA criteria pollutants. Users can input their own fuel and fleet data or use the built-in defaults.

  Link: https://www.wri.org/research/costs-and-emissions-appraisal-tool-transit-buses

- **Financial Analysis of Battery Electric Transit Buses (2020),** NREL – *Guidance/Reference*

  Report and example analysis to help transit bus fleet managers perform an initial screen to determine which fleets may be most suitable for battery-electric bus (BEB) investment. The report walks through a model and baseline scenario to determine the net present value and the payback period for investment in BEBs and charging infrastructure.

  Link: https://afdc.energy.gov/files/u/publication/financial_analysis_be_transit_buses.pdf

A.3: ENVIRONMENTAL AND SOCIAL IMPACT

- **CMAQ Emissions Calculator Toolkit,** USDOT FHWA – *Calculator/Software*

  Series of tools to generate estimates of a project's air quality benefits. FHWA developed these tools to help project sponsors with both project justification and annual reporting for the Congestion Mitigation and Air Quality Improvement (CMAQ) Program. The Alternative Fuels Tool within this suite of tools calculates emissions benefits for projects purchasing EVs and related charging infrastructure.

  Link: https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/

- **Transit Greenhouse Gas Emissions Estimator,** USDOT FTA – *Calculator/Software*

  A Microsoft Excel-based tool that estimates annual GHG emissions of transit projects based on the construction, operation, and/or maintenance phases of transit facilities and vehicles. Provides coarse but informative estimates for a broad range of transit projects.

  Link: https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/ftas-transit-greenhouse-gas-emissions-estimator

- **Transit Bus Electrification Tool,** USDOT FTA – *Calculator/Software*

  A Microsoft Excel-based spreadsheet tool that allows users to estimate the partial lifecycle of GHG emission savings associated with replacing standard bus fleets with low-emission or zero-emission transit buses.

Link: https://www.transit.dot.gov/regulations-and-programs/environmental-programs/fta-transit-bus-electrification-tool

- **Green Vehicle Guide: Electric Vehicle Myths,** EPA – *Guidance/Reference*

  A list of five common myths around light-duty EVs regarding their impact on the climate and technological capabilities.

  Link: https://www.epa.gov/greenvehicles/electric-vehicle-myths

- **Co-Benefits Risk Assessment (COBRA),** EPA – *Calculator/Software*

  Screening tool that enables State, local, and Tribal Government staff and others interested in the effects of air pollution to estimate the air quality and health benefits of different emissions scenarios.

  Link: https://cobra.epa.gov/

- **Toolfinder: Tools and Resources for Measuring Electrification Impacts,** EPA – *Guidance/Reference*

  Sortable collection of tools and resources to evaluate the environmental and economic impacts of electrification initiatives. Users answer eight screening questions to receive a list of tools and resources appropriate for assessing their programs.

  Link: https://www.epa.gov/statelocalenergy/tools-and-resources-help-measure-electrification-impacts-find-your-tool

A.4: EQUITABLE PLANNING

- **Promising Practices for Meaningful Public Involvement in Transportation Decision-Making,** USDOT – *Guidance/Reference*

  A resource to help funding recipients meaningfully involve the public in various stages of transportation decision-making. The guide walks through the important components of a comprehensive and constructive public involvement process and introduces methods and metrics to help ensure effective engagement.

  Link: https://www.transportation.gov/public-involvement

- **HEPGIS,** USDOT FHWA – *Dataset/Map*

  Interactive map enabling users to navigate, view, and print geospatial maps and download the underlying data. Combines several data sources to produce various layers for transportation and equity analyses. Allows users to map FHWA's current and pending alternative fuel corridor designations. Also includes layers for population demographics, economic wellbeing, and commute times as well as for air quality, safety, congestion, and other performance metrics.

  Link: https://hepgis.fhwa.dot.gov/fhwagis/

- **Screening Tool for Equity Analysis of Projects (STEAP),** USDOT FHWA – *Dataset/Map*

  Interactive web map that outputs Title VI and environmental justice population summaries surrounding project locations. Users can either select a highway or a draw a line representing the location of the project and the tool will output a summary report of the populations within a buffer of the project.

  Link: https://hepgis.fhwa.dot.gov/fhwagis/buffer-tool/

- **Low-Income Energy Affordability Data (LEAD) Tool,** DOE – *Dataset/Map*

  Interactive web map that allows users to explore estimated energy characteristics of low- and medium-income households at the national, State, county, city, or census tract level. Users can combine and compare selected geographic areas to better understand the energy burden facing low-income communities.

  Link: https://www.energy.gov/eere/slsc/low-income-energy-affordability-data-lead-tool

- **EJScreen,** EPA – *Dataset/Map*

  Interactive tool that combines environmental and demographic indicators into maps and reports. Helps users identify minority or low-income populations and potential environmental quality burdens.

  Link: https://www.epa.gov/ejscreen

- **Data.census.gov,** U.S. Census Bureau – *Dataset/Map*

  Website to explore Census data and annual American Community Survey and American Housing Survey data. Includes dynamic table and maps generators with extensive filter options including by geography, topic, and year.

  Link: https://data.census.gov/cedsci/

- **Virtual Public Involvement (VPI): Video Case Studies,** USDOT FHWA – *Guidance/Reference*

  A collection of videos featuring conversations with transportation agencies and example strategies for using digital technology to engage the public in transportation decision-making, project development and planning, and environmental review. Videos on virtual engagement tools include accompanying factsheets with additional case studies, considerations, and tips for success.

  Link: https://www.fhwa.dot.gov/planning/public_involvement/vpi/resources/case_studies/

- **Practical Approaches for Involving Traditionally Underserved Populations in Transportation Decisionmaking (2012),** National Academies of Sciences, Engineering, and Medicine – *Guidance/Reference*

  Report that describes effective approaches to engage traditionally underrepresented populations in transportation decision-making. Describes specific methods of outreach and engagement and includes case studies from across the United States. Also lists several data sources and tools for inventorying a community's social and economic characteristics.

  Link: https://doi.org/10.17226/22813

- **EV Charging Justice40 Map Tool,** Argonne National Laboratory – *Dataset/Map*

  Web map designed to inform users if their projects are located in disadvantaged communities (DACs). Users can input the addresses of their projects or navigate to them. Users may also turn map layers on or off if needed.

  Link: https://www.anl.gov/esia/electric-vehicle-charging-equity-considerations

- **Energy Zones Mapping Tool (EZMT),** Argonne National Laboratory – *Dataset/Map*

  Public, web-based system designed for energy infrastructure planning and analysis, especially evaluating the many factors influencing siting decisions. Argonne is expanding the EZMT to include electric vehicle charging station data and siting factors, including a strong emphasis on energy justice and equity metrics. Users can interactively design and query maps from the library of over mapping 340 layers, download data, and run models to map locations best fitting a set of siting criteria.

  Link: https://ezmt.anl.gov/

- **Community Tool Box: Assessing Community Needs and Resources (Chapter 3)**, University of Kansas – *Guidance/Reference*

  Online textbook with guidance and methods to help community leaders and decision makers assess community needs. Chapter 3 of the toolbox provides guidance specifically on identifying and assessing community needs.

  Link: https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources

- **Electric Vehicles for All: An Equity Toolkit,** Greenlining – *Guidance/Reference*

  Guide to making EVs affordable, practical, and accessible to low-income communities and communities of color. This toolkit also includes information on increasing EV awareness and diversifying the EV market. *Note: This toolkit heavily relies on examples in California, but the information can be applied to projects in other locations.*

  Link: https://greenlining.org/resources/electric-vehicles-for-all/

A.5: LAWS, REGULATIONS, AND INCENTIVES

- **AFDC State Information,** DOE – *Dataset/Map*

  State-specific dashboards presenting State laws and incentives, fueling stations, energy data, fuel prices, construction projects, case studies, Clean Cities coalition contacts, and links to other resources. Covers alternative fuels beyond just electricity.

  Link: https://afdc.energy.gov/states/

- **AFDC Laws and Incentives Database,** DOE – *Dataset/Map*

  Searchable database of Federal and State laws, regulations, and incentives related to EVs, EV infrastructure, and other alternative fuel technologies. Includes some State-specific EV-related definitions, policies, and implementation plans.

  Link: https://afdc.energy.gov/laws/search

- **Federal Tax Credits for New All-Electric and Plug-in Hybrid Vehicles,** DOE – *Dataset/Map*

  Searchable database containing information on the EVs and PHEVs that are eligible for federal tax credits. Users may search by manufacturer or filter by EVs or PHEVs.

  Link: https://www.fueleconomy.gov/feg/taxevb.shtml

A.6: IMPLEMENTATION, INSTALLATION, AND MAINTENANCE

- **Clean Cities Coalition Locations,** DOE – *Dataset/Map*

  Region-specific dashboards with contact information and summary data for regional Clean Cities coalitions, which are DOE-supported organizations providing technical assistance to local stakeholders pursuing alternative fuel and fuel-saving technologies.

  Link: https://cleancities.energy.gov/coalitions/locations/

- **EV Utility Finder (EV U-Finder),** DOE – *Dataset/Map*

  Database used to find the contact information of nearby EVSE utility partners. Users are only required to input their ZIP code and are provided with information about local utility partners and incentives.

  Link: https://www.energy.gov/eere/femp/articles/ev-utility-finder-ev-u-finder

- **Find A Contractor,** The Electric Vehicle Infrastructure Training Program (EVITP) – *Dataset/Map*

  Online map and database to identify EVITP-certified EVSE installers. EVITP is an organization of industry stakeholders that provides training and certification for EVSE-installing electricians.

  Link: https://evitp.org/find-a-contractor/

- **Alternative Fuel Toolkit,** USDOT FHWA and Oregon DOT – *Guidance/Reference*

  A compilation of guidance on deploying and supporting alternative fuel vehicles based on a series of in-person stakeholder workshops. Identifies maps and calculators to support alternative fuel planning and provides workshop summaries, facilitation materials, case studies, and webinars on further developing the market for alternative fuel vehicles.

  Link: http://altfueltoolkit.org/

- **Plug-in Electric Vehicle Handbooks,** DOE – *Guidance/Reference*

  Series of DOE Clean Cities resources on EV acquisition, maintenance, and charging infrastructure for different types of users.

  Links by user:

  - Consumers: https://afdc.energy.gov/files/u/publication/pev_consumer_handbook.pdf
  - Fleet managers: https://afdc.energy.gov/files/pdfs/pev_handbook.pdf
  - Workplace charging hosts: https://afdc.energy.gov/files/u/publication/pev_workplace_charging_hosts.pdf
  - Public charging hosts: https://afdc.energy.gov/files/pdfs/51227.pdf

- **Best Practices for EVSE Installations in the National Parks,** NREL – *Guidance/Reference*

  Report on the challenges and lessons learned from EV installation projects in the national parks. Findings are based on interviews with National Park Service employees and stakeholders who participated in efforts to provide EV charging capabilities to park visitors.

  Link: https://www.nrel.gov/docs/fy20osti/74806.pdf

- **Alternative Fuels Corridor Deployment Plans,** USDOT – *Guidance/Reference*

  A list of the deployment plans and contacts for the five 2019 recipients of the Alternative Fuels Corridor Deployment Plans project funding. These deployment plans can serve as examples for other transportation providers interested in EV infrastructure along a corridor.

  Link: https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/deployment_plan/

- **Electric Vehicle Charging Station Permitting Guidebook (2019),** California Governor's Office of Business and Economic Development – *Guidance/Reference*

  Guide to planning and installing EV charging stations in California with best practices from experienced station developers and local jurisdictions. The guidebook covers site selection, permitting, accessibility, connecting to the grid, and construction and operations. Also includes a list of key terms, a zero-emission vehicle readiness score card, and a checklist to streamline EV charging station planning.

  Link: https://static.business.ca.gov/wp-content/uploads/2019/10/GoBIZ-EVCharging-Guidebook.pdf

- **Workplace Charging Planning Tools**, Shift2Electric – *Calculator/Software*

  WorkplaceCharging.com is run by Shift2Electric, an EV market and business consulting and training company. This page provides four tools to help businesses plan and implement charging stations, including a Power and Energy Calculator and a Workplace Charging Survey Tool.

  Link: https://www.workplacecharging.com/tools

- **Guidebook for Deploying Zero-Emission Transit Buses (2021),** TCRP – *Guidance/Reference*

  Guidebook for public transit agencies on best practices, case studies, and lessons learned from deployments of electric buses and related fueling infrastructure, as well as a report on current planning practices and deployment approaches.

  Link: https://www.trb.org/Publications/Blurbs/180811.aspx

- **Electrifying Transit: A Guidebook for Implementing Battery Electric Buses (2021),** NREL – *Guidance/Reference*

  Guidebook on the decisions and considerations required for successful BEB implementation, including introduction to BEBs, benefits and barriers,

charging infrastructure considerations, operation and maintenance, and more.

Link: https://www.nrel.gov/docs/fy21osti/76932.pdf

A.7: TECHNOLOGY OPTIONS

- **ENERGY STAR EV Charger Buying Guidance,** EPA – *Guidance/Reference*

  Webpage that describes the types of EV chargers and the value of EPA's ENERGY STAR product label. Links to a searchable database of ENERGY STAR certified EV chargers. Also links to additional resources for specific users such as property managers, fleet managers, and government agencies.

  Link: https://www.energystar.gov/products/other/ev_chargers

- **SmartWay Technology,** EPA – *Guidance/Reference*

  The EPA SmartWay program offers guidance, benchmarking tools, and resources for improving fuel efficiency and reducing harmful air emissions from freight transportation. Technical resources include information on EPA-verified cleaner, fuel saving technologies and auxiliary power systems including shore power for trucks, locomotives, and oceangoing vessels.

  Links:

  - SmartWay: https://www.epa.gov/smartway
  - Technology: https://www.epa.gov/verified-diesel-tech/smartway-technology
  - For heavy-duty fleets: https://www.epa.gov/smartway/smartway-heavy-duty-truck-electrification-resources

- **Electric Vehicle Charger Selection Guide,** California Energy Commission – *Guidance/Reference*

  This guide is to help site hosts and others learn about, evaluate, and compare the features of EV charging equipment, including both hardware and software.

  Link: https://afdc.energy.gov/files/u/publication/EV_Charger_Selection_Guide_2018-01-112.pdf

- **Get Equipped,** Plug In America – *Guidance/Reference*

  Webpage with filterable lists of Level 2 home chargers, EV-related software, and charger add-ons. Also includes data and results from EV battery user surveys.

  Link: https://pluginamerica.org/get-equipped/

A.8: EDUCATIONAL MATERIALS

- **Workplace Charging Employer Workshop Toolkit,** DOE – *Guidance/Reference*

  Guidance from DOE Clean Cities on hosting informational events with employers to educate them on workplace charging programs. Webpage includes sample materials and templates both for meeting hosts (e.g., a workshop agenda template) and for the employers/potential workplace charging hosts who attend the events (e.g., employee interest surveys and outreach materials).

  Link: https://cleancities.energy.gov/technical-assistance/workplace-charging/

- **Building Partnerships to Meet Plug In Electric Vehicle Goals,** DOE – *Guidance/Reference*

  Webinar by DOE Clean Cities featuring rural electric cooperatives and coordinators sharing ways to build partnerships to meet EV goals.

  Video: https://www.youtube.com/watch?v=o85hBUPb250

  Slides (scroll to webinar): https://cleancities.energy.gov/webinars#28432

- **Alternative Fuels Corridor Webinars,** USDOT – *Guidance/Reference*

A list of past convenings and webinars on the Alternative Fuels Corridor initiative, with links to the event recordings for reference.

Link: https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/webinars/

- **Electric Truck Bootcamps,** North American Council on Freight Efficiency – *Guidance/Reference*

  An educational series by the North American Council on Freight Efficiency about electric trucks, appropriate for fleet managers, utility planners, policymakers, and other stakeholders.

  Link: https://runonless.com/bootcamp/

- **Northern New England Rural EV Adoption Toolkit,** Vermont Energy Investment Corporation – *Guidance/Reference*

  Guide to the adoption of EVs and charging infrastructure in rural communities in Maine, New Hampshire, and Vermont. Includes information on EVs, charging infrastructure, EV purchase incentives, equitable planning, and education and outreach.

  Link: https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_NNE_Rural_EV_Toolkit_April_2022_Final.pdf

- **Tahoe-Truckee EV Toolkit,** Tahoe Regional Planning Agency – *Guidance/Reference*

  Guide to transportation electrification in the Tahoe-Truckee Region in California. This toolkit includes information on charging destinations and utilities as well as information for residents and visitors, local government, and fleet managers.

  Link: http://tahoealternativefuels.com/

- **Planning for Electric Vehicles,** Municipal Research and Services Center of Washington – *Guidance/Reference*

  Guide to planning for electric vehicles and charging infrastructure for local governments in Washington State. This resource includes information on Washington State statutes for EVs, local codes for EV infrastructure, and local incentives and resources.

  Link: https://mrsc.org/Home/Explore-Topics/Environment/Sustainability/Planning-for-Electric-Vehicles.aspx

- **Flipping the Switch on Electric School Buses (2022),** NREL – *Guidance/Reference*

  Technical assistance video series for K-12 schools interested in implementing electric school buses, including introduction to electric buses, key decision factors, charging infrastructure, and vehicle availability.

  Link: https://afdc.energy.gov/vehicles/electric_school_buses.html

A.9: VEHICLE COMPARISONS

- **EVolution: E-Drive Vehicle Education,** Argonne National Laboratory – *Calculator/Software*

  Web app that allows users to compare the expected fuel usage and costs of specific EVs and conventional gasoline vehicles based on zip code. Generates location-based estimates of gas and electricity prices, daily mileage and travel time, and other travel factors which users can further customize and provides nearby options for public charging. Reports and compares the fuel efficiency, fuel costs, costs of ownership, and GHG emissions of the selected vehicles based on the vehicle operating assumptions.

  Link: https://evolution.es.anl.gov/

- **EV Explorer,** University of California, Davis – *Calculator/Software*

  Online map and calculator that lets users compare annual energy costs for up to four vehicles, including gasoline and electric vehicles. Users input a single origin and destination and can change

commute frequency, update fuel costs, and specify access to EV chargers.

Link: https://phev.ucdavis.edu/project/ev-explorer/

- **FuelEconomy.gov Trip Calculator,** EPA and DOE – *Calculator/Software*

  Includes a tool to find and compare cars as well as a trip calculator. Users can compare fuel costs, GHG emissions, and efficiency across EV and conventional vehicle models, and use the trip calculator to estimate fuel costs for individual trips between an origin and destination.

  Links:

  - Find and compare cars: https://www.fueleconomy.gov/feg/findacar.shtml
  - Trip calculator: https://www.fueleconomy.gov/trip/

APPENDIX B

ENVIRONMENTAL STATUTES AND EXECUTIVE ORDERS

This section describes some environmental statutes and executive orders (EOs) that may commonly be relevant to EV infrastructure.

B.1: NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)[1]

NEPA was signed into law on January 1, 1970, "to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality." NEPA requires all Federal agencies to consider their actions' impacts to the human environment as part of their decision-making process; compliance with NEPA and related environmental laws is required for EV infrastructure projects that receive Federal funding or require Federal approval.

The implementing regulations for NEPA established three levels of analysis (also called "classes of action"):

- **Categorical exclusions (CE):** A CE is a category of actions that the Federal agency has determined, in its agency NEPA procedures, normally do not have a significant effect on the human environment. This category of actions does not require preparation of an environmental assessment or environmental impact statement. Federal agency NEPA procedures identify when documentation of a CE determination is required. Please note that a project's status as a CE does not mean that it is automatically excluded from compliance with other environmental regulations.
- **Environmental assessment (EA):** An EA is a concise public document prepared by a Federal agency to aid an agency's compliance with NEPA and support its determination of whether to prepare an environmental impact statement or a finding of no significant impact. A Federal agency prepares an EA for a proposed action that is not likely to have significant effects or when the significance of the effects is unknown. EAs briefly discuss the purpose and need for the proposed action, alternatives, and the environmental impacts of the proposed action and alternatives, and include a listing of agencies and persons consulted.
- **Environmental Impact Statement (EIS):** An EIS is a detailed written statement prepared to ensure Federal agencies consider the environmental impacts of their actions in decision-making. EISs provide full and fair discussion of significant environmental impacts and inform decision makers and the public of reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. EISs are often prepared by an environmental consultant that is hired by the project sponsor in consultation with the agency. The EIS process follows a specific set of steps with multiple public comment periods. It is concluded when the agency issues a Record of Decision.

Each Federal agency establishes its own procedures that further establish the requirements of NEPA as it applies to their specific actions. For more information, see the Council on Environmental Quality's Agency NEPA Implementing Procedures page and FHWA's Environmental Review Toolkit.

NEPA is an umbrella law, which means that it is used to coordinate and demonstrate compliance with

1 42 U.S.C. §§4321-4370h, 40 CFR Parts 1500-1508

other environmental requirements. Under the NEPA umbrella, reviews under special resource laws are integrated into the NEPA process, to the maximum extent possible, and are incorporated into the resulting NEPA document.

When preparing to conduct an environmental review for an EV infrastructure project, the scope and footprint of the project will need to be accurately determined. This includes identifying the ground that will be impacted by the charger and any supporting utilities, the properties that are in the view of the chargers, and any other projects that are connected to the project.[2] Applicants for Federal funding and approval should seek to minimize the environmental impacts of their projects. In addition to having a smaller impact on the environment, this will maximize the project's ability to fall within a CE, which is, in general, the fastest and least expensive level of NEPA review, and may also affect the applicant's ability to receive approvals from environmental permitting agencies.

B.2: NATIONAL HISTORIC PRESERVATION ACT OF 1966 (NHPA)[3]

Section 106 of the NHPA requires Federal agencies to consider the effects undertakings[4] will have on properties or districts eligible for or listed in the National Register of Historic Places[5] (historic properties) and any properties of traditional religious and cultural importance to Tribes.

A Section 106 review is required when a Federal agency determines that their undertaking has the potential to impact a historic property.

However, on October 26, 2022, the Advisory Council on Historic Preservation (ACHP) approved an exemption that removes the Section 106 review requirements for Federal agencies when installing certain electric vehicle supply equipment. The exemption will apply to the installation of EVSE on Federal lands and facilities as well as non-Federal lands receiving Federal licenses, funds, or approval. For more information about the exemption, see the ACHP website.

For EV infrastructure projects receiving Federal funds that do not meet the criteria for an exemption from the NHPA, the below standard Section 106 process must be followed.

An EV infrastructure project receiving Federal funding or requiring Federal approval will be considered a Federal undertaking. The potential to affect historic properties will primarily depend on the planned location of an EV infrastructure project and their proximity to historic properties or cultural resources. EV projects placed in existing parking lots or structures that are outside of a historic property will have a low probability of impacting a historic property. Most electric powerlines will be buried within 18 to 24 inches below the ground in narrow trenches. In existing parking lots, where grading and placement of substrate occurred during the construction process, the ground impacted by the placement is likely to be previously disturbed and will therefore typically have a low probability of containing subsurface historic properties. Similarly, if the project is not within or immediately adjacent to a property or district, the project is unlikely to impact an above-ground historic property. However, the agency will individually evaluate each project.

For a project with a potential to affect a historic property or cultural resource, agencies are required to consult with State historic preservation offices, Tribal

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2 Proposed actions are connected if they automatically trigger other actions that may require an EIS (the highest level of NEPA review); cannot or will not proceed unless other actions are taken previously or simultaneously, or if the actions are interdependent parts of a larger action and depend upon the larger action for their justification (40 CFR 1501.9(e)(1)).

3 54 U.S.C. §300101-307108, 36 CFR Part 800

4 An "undertaking" is a project, activity, or program funded, permitted, licensed, or approved by a Federal agency.

5 "Historic properties" include prehistoric or historic districts, sites, buildings, structures, or objects that are eligible for or already listed in the National Register of Historic Places (National Register), and any artifacts, records, and remains (surface or subsurface) that are related to and located within historic properties and any properties of traditional religious and cultural importance to Tribes or Native Hawaiian Organizations.

historic preservation offices, Indian Tribes (to include Alaska Natives), and Native Hawaiian organizations. This consultation will help to gather additional information on the presence of a historic property; determine and/or confirm the nature and severity of the potential impact; and, if necessary, determine mitigation measures that will avoid, minimize, or compensate for the impact. Should it become evident during consultation that the EV infrastructure project will disturb ground that may contain archaeological resources, or should a previously unevaluated above-ground property that may be National Register-eligible be within or adjacent to the project site, project sponsors may have to hire a qualified environmental consultant to perform an archaeological or architectural survey to confirm. If an impact to a historic property will occur, public notification and notification of the Advisory Council on Historic Preservation (charged with ensuring Federal agencies properly carry out the applicable requirements of the NHPA) are also required. This is different than Tribal Consultation as directed by Executive Order 13175 and USDOT's Tribal Policy 5301.1A.

B.3: ENDANGERED SPECIES ACT OF 1973 (ESA)[6]

The ESA was signed into law in 1973 and protects threatened and endangered species of plants and animals (referred to as "listed species") and their critical habitat. Section 7(a)(1) of the ESA specifically requires Federal agencies to use their authority to conserve protected resources, and Section 7(a)(2) established a process by which the lead Federal agency consults with the U.S. Fish and Wildlife Service and/or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (collectively called "the Services") to determine if its actions will impact a protected resource. While the ESA applies to private actions as well, Section 7 has established a consultation process for Federal agencies to work with the Services to determine if their actions have the potential to negatively impact listed species or their critical habitat.

If a project has no potential to impact a listed species or critical habitat, or if none are present in the project area, according to a species list obtained by the agency or by contacting a Service's field office, no consultation with the Services is required. If a protected resource may be present, the agency will conduct a consultation process. There are two types of consultation under Section 7 of the ESA: informal and formal.

- **Informal Consultation:** If a proposed action may affect a listed species or critical habitat, the agency and a Service will likely conduct informal consultation. If the agency determines that the proposed project will have no effect on the listed species or critical habitat, the consultation process is complete. If the agency determines the project *may affect, but is not likely to adversely affect* a listed species or critical habitat, and the Service agrees, the Service will provide written concurrence and no further action is necessary.
- **Formal Consultation:** If the agency determines, through an evaluation called a biological assessment or through other type of review, that the proposed project is *likely to adversely affect* a listed species or critical habitat, then formal consultation is required. This consultation is a longer and more complex process that requires close coordination with the Service and may require additional surveys or studies to further evaluate the nature of the adverse effect. Following consultation, the Service will respond to the agency with a biological opinion, which provides its conclusion that a project is or is not likely to *jeopardize the continued existence of a listed species or critical habitat.*

6 54 U.S.C. §§300101-307108, 36 CFR Part 800

B.4: EO 11988, "FLOODPLAIN MANAGEMENT"[7]

In 1977, President Jimmy Carter issued EO 11988, which regulates activities within Federal Emergency Management Agency (FEMA)-designated floodplains. Examples of floodplain-impacting activities include adding fill to a floodplain, changing the grades of slopes, or restricting the movement of water across a floodplain. If a floodplain may be adversely impacted, Federal agencies are required to consider alternatives that may have smaller or no impacts in order to prevent potential loss of property or life. Adverse impacts to floodplains may require a public notice and comment period and may also be regulated and/or prohibited by State or local governments.

Because of their low profiles, Federal agencies usually can fund or approve the placement of parking lots in floodplains because they will not impact the flow of floodwater. For entities looking to place an EV infrastructure project in a new or existing parking lot, applicants will need to determine if the property is located with a floodplain that has been identified by FEMA. Several concerns exist with locating EV infrastructure in a floodplain:

- **Safety:** If a project sponsor seeks to place EV infrastructure in a floodplain, they will need to confirm with the manufacturer that it can be safely inundated with floodwater up to the height of the base flood elevation, or the project sponsor will need to elevate the charger or elevation of the relevant parking lot.
- **Access:** Project sponsors will need to evaluate decreased or fully blocked access if the EV infrastructure location itself or roads leading to the site are within a floodplain and become inundated.

B.5: CLEAN WATER ACT (CWA)[8]

The CWA became law in 1972 and aims to protect "waters of the United States" (WOTUS), which include jurisdictional wetlands and navigable waters that fall within the jurisdiction of U.S. Army Corps of Engineers (USACE) and the Environmental Protection Agency (EPA). WOTUS include territorial seas and traditional navigable waters (e.g., the Mississippi River, the Great Lakes, and the Erie Canal); tributaries, lakes, ponds, and impoundments of jurisdictional waters that contribute surface water flow to the previous category; and adjacent wetlands that physically touch other jurisdictional waters.

Section 404 of the CWA, jointly overseen by the EPA and USACE, regulates "discharges of dredge and fill material" into jurisdictional waters. A Section 404 permit will be needed for EV infrastructure that would require the placement of fill material in a stream, river, or wetland. The project sponsor will need to contact the USACE to determine if jurisdictional waters may be impacted by an EV infrastructure project.

Unlike streams and rivers, wetlands can be hard to identify. If site photos and available online maps indicate that a wetland may be present on or near the project site, the project sponsor may need to hire an environmental consultant to perform a wetland delineation (a study of a site's soil, plant species, and presence of water to determine if a wetland is present, and, if so, the location of its boundaries). USACE will use this information to determine if a Section 404 permit is required.

B.6: SECTION 4(F) OF THE USDOT ACT OF 1966[9]

Section 4(f) of the USDOT Act of 1966 (amended by Section 1301 of the Fixing America's Surface Transportation Act) provides for the consideration of public-

7 3 CFR Part 1977, 42 FR 26951

8 33 U.S.C. 1344, 33 CFR Part 323

9 23 U.S.C. §138, 23 CFR Part 774

ly owned parks and recreation lands, wildlife and waterfowl refuges, and public and private historic sites (Section 4(f) properties) during USDOT transportation project development. Section 4(f) prohibits the approval of a project if there is a "use" of a 4(f) property unless there is no feasible and prudent avoidance alternative to the use of the land, and the action includes all possible planning to minimize harm to the property resulting from the use, or the use of the property, including any measure(s) to minimize harm (such as any avoidance, minimization, mitigation, or enhancement measures) committed to by the project, will have a de minimis impact.

When considering if the project will result in a use of a Section 4(f) property, project sponsors should consider permanent impacts such as land acquisition that incorporates land into a project, and temporary impacts like short-term easements or construction activities that may cross or limit access to a Section 4(f) property. If a project may impact or is adjacent to a Section 4(f) property, project sponsors are encouraged to consult the agency for further guidance.

B.7: EO 12898, "FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS"

EO 12898, signed by President Bill Clinton in 1994, directs Federal agencies to ensure that their actions do not have a disproportionally high and adverse environmental or human health effect on minority populations or low-income populations , referred to as "EJ populations." Federal agencies must also ensure full and fair participation by EJ populations in the transportation decision-making process and that agency actions allow for an equitable distribution of benefits and burdens. USDOT Order 5610.2C sets the overall EJ policy for USDOT, and FHWA has issued additional EJ guidance.

EV infrastructure projects play a critical role in reducing the disproportionate exposure of harmful GHG emissions on EJ communities due to their ability to reduce vehicle-caused emissions. Agencies must ensure that the benefits of EV infrastructure projects are equitably provided to EJ communities. An example of a benefit-related EJ violation for an EV infrastructure project would be the selection of a location alternative that is not accessible to EJ communities in the project's general area. Additionally, agencies cannot allow disproportionate harm to EJ communities caused by an EV infrastructure projects' construction or operation. Negative impacts must be avoided or mitigated, and any alternative project design must be pursued if negative impacts are unavoidable and unable to be mitigated. The agency can help project sponsors work through the EJ analysis process (which may require consultation with potentially impacted EJ communities) and, if necessary, the development of mitigation measures.

LIST OF ABBREVIATIONS

Abbreviation	Term
ACEEE	American Council for an Energy-Efficient Economy
ABA	Architectural Barriers Act
AC	Alternating Current
ADA	Americans with Disabilities Act
AFC	Alternative Fuel Corridor
AFDC	Alternative Fuels Data Center
AFLEET	Alternative Fuel Life-Cycle Environmental and Economic Transportation
ATVM	Advanced Technology Vehicles Manufacturing
AVTC	Advanced Vehicle Technology Competitions
BEB	battery electric bus
BEV	battery electric vehicle
BIL	Bipartisan Infrastructure Law
CCS connector	Combined Charging System connector
CDFI	Community Development Financial Institution
CE	categorical exclusion
CFO	Clean Fuels Ohio
CHAdeMO connector	"CHArge de MOve," equivalent to "charge for moving"
CMAQ	Congestion Mitigation and Air Quality Improvement
Co-ops	Cooperatives
CWA	Clean Water Act
DERA	Diesel Emissions Reduction Act
DC	direct current
DCFC	direct current fast charging
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DOT	department of transportation
DSIRE	Database of State Incentives for Renewables & Efficiency
EA	environmental assessment
EERE	U.S. DOE Office of Energy Efficiency and Renewable Energy
EDA	U.S. Economic Development Agency
EIS	environmental impact statement
EO	executive order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESB	electric school bus
EV	electric vehicle
EVITP	Electric Vehicle Infrastructure Training Program
EVSE	electric vehicle supply equipment
EZMT	Energy Zones Mapping Tool
FAA	USDOT Federal Aviation Administration

FCEV	fuel-cell electric vehicle
FEMA	Federal Emergency Management Agency
FHWA	USDOT Federal Highway Administration
FLAP	Federal Lands Access Program
FOA	Funding Opportunity Announcement
FTA	USDOT Federal Transit Administration
GARVEE	Grant Anticipation Revenue Vehicle
GHG	greenhouse gas
HEV	hybrid electric vehicle
ILIT	Infrastructure Location Identification Toolkit
IOU	investor-owned utilities
IRS	Internal Revenue Service
kW	kilowatt
kWh	kilowatt hour
LDV	light-duty vehicle
LEAD	Low-Income Energy Affordability Data
MARAD	USDOT Maritime Administration
MORPC	Mid-Ohio Regional Planning Commission
MPGe	miles per gallon of gasoline equivalent
MPO	metropolitan planning organization
NAFTC	National Alternative Fuels Training Consortium
NASEO	National Association of State Energy Officials
NEPA	National Environmental Policy Act
NESCAUM	Northeast States for Coordinated Air Use Management
NEVI	National Electric Vehicle Infrastructure
NHPA	National Historic Preservation Act of 1966
NHS	National Highway System
NOFO	Notice of Funding Opportunity
NPIAS	National Plan of Integrated Airport Systems
NRCS	USDA Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
O&M	operations and maintenance
OST	USDOT Office of the Secretary of Transportation
PHEV	plug-in hybrid electric vehicle
POU	publicly owned utility
P3	public-private partnership
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
REV West	Regional Electric Vehicle West
RD	USDA Rural Development
RFID	radio-frequency identification
RPM	revolutions per minute
RTPO	regional transportation planning organization
ROUTES	Rural Opportunities to Use Transportation for Economic Success
RUS	USDA Rural Utilities Service
SBA	U.S. Small Business Administration

SEP	U.S. DOE State Energy Program
SIB	State Infrastructure Bank
STIP	Statewide Transportation Improvement Program
SUV	sport utility vehicle
TAT	Thumb Area Transit
TCRP	Transit Cooperative Research Program
TEDO	Tribal Energy Development Organization
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIP	Transportation Improvement Program
TUA	Tribal Utility Authorities
UPWP	Unified Planning Work Program
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
VEDA	Vermont Economic Development Authority
VGI	vehicle-to-grid integration
VTO	U.S. DOE Vehicle Technologies Office
VW	Volkswagen
V1G	unidirectional vehicle-to-grid
V2G	bidirectional vehicle-to-grid
WOTUS	waters of the United States
ZEV	zero emission vehicle

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CONTACTING ROUTES

The USDOT ROUTES Initiative welcomes any feedback on this toolkit.

Stakeholders can get in contact by email (rural@dot.gov) or phone (202-366-4544 or TTY / Assistive Device 800-877-8339).

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