SUPPORTING THE EV CHARGING NETWORK OF THE FUTURE

A review of policy interventions to spur increased electric vehicle charging buildout at lower cost

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Executive Summary

The transition to electric vehicles (EVs) is expected to bring a range of benefits to the United States. Americans emit greenhouse gas emissions at a rate of almost three times the global per-capita national average,[2] with transportation being the highest-emitting sector.[3] Shifting to cleaner transportation can help avert the worst impacts of a climate crisis that has already begun.[4] The health benefits are also expected to be huge: the American Lung Association (ALA) projects that switching to electric cars and trucks and clean electricity could save 110,000 lives and bring $1.2 trillion in public health benefits across the U.S. over the next 30 years.

The economics of EVs reveal further benefits to all: in many segments, EVs already beat out internal combustion vehicles on lifetime cost,[5] and that math is only expected to improve.[6] The ALA's study projects more than $1.7 trillion in climate benefits over the next 30 years. And EVs are expected to put downward pressure on electric rates for all households and businesses by enabling increased use of existing utility assets.[7] EVs will also make America more energy secure, allowing for reduced petroleum imports and less vulnerability to price gouging by foreign nations.[8] In place of supporting overseas economies, a transportation sector fueled by electricity would create new, accessible local jobs for America's electricians, electrical line workers, and construction laborers.[9]

Unlocking these many benefits will require significant additional investments in EV charging infrastructure. The U.S. has made great strides in charger buildout, but an all-hands-on-deck approach from government agencies, utilities, charging networks, fleets, and other private sector actors is needed to continue and build momentum. The charging landscape of the future will need to serve many different vehicle segments in many locations – homes,

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[2] World Resources Institute, May 2023, 9 Charts Explain Per Capita Greenhouse Gas Emissions by Country
[3] Environmental Protection Agency, 2023, Fast Facts on Transportation Greenhouse Gas Emissions
[4] Union of Concerned Scientists, July 2022, Cleaner Now Than Ever: Driving Electric Cars and Trucks Cuts Global Warming Emissions
[5] Atlas Public Policy, 2024, "Comparing the Total Cost of Ownership of the Most Popular Vehicles in the United States" National Renewable Energy Laboratory, September 2021, Breakthrough Analysis Finds Electrified Heavy-Duty Vehicle Powertrains Could Provide Lower Total Cost of Ownership
[6] Goldman Sachs, November 2023, Electric Vehicle Battery Prices are Falling Faster than Expected
[7] A recent Synapse Energy analysis found that "across all regions in the United States, EVs have increased utility revenues more than they have increased utility costs, leading to downward pressure on electric rates for EV-owners and non-EV owners alike." The authors further estimate that between 2011 and 2020, "EV drivers across the 50 states have contributed $1.7 billion more than associated costs (in 2020 dollars)." Synapse Energy, 2023, Electric Vehicles are Driving Rates Down
[8] U.S. Energy Information Administration, Oil and petroleum products explained
[9] Anh Bui, Logan Pierce, Pierre-Louis Ragon, Arijit Sen, and Peter Slowik (ICCT), Taylor Waites (IBEW), Charging up America: The Growth of United States Electric Vehicle Charging Infrastructure Jobs

workplaces, fleet depots, street parking, destinations, freight corridors and highways – and will need to be built out with equity and reliability in mind.

To assist in this effort, Atlas Public Policy has developed this overview of policy interventions that can help get the U.S. from the charging ecosystem of today to the one that is needed in the coming decades. These interventions assist in propelling charging infrastructure development by:

a) Reducing costs and installation barriers, and/or
b) Attracting and leveraging private sector investment.

Table 1 provides a summary of charging infrastructure policy interventions and the United States entities with the primary authority to pass, fund and implement them. The remainder of the document provides additional description and examples of each.

We note that in addition to the infrastructure-focused policy interventions discussed herein, vehicle-focused policies are also available that can indirectly create demand for charging investments by first spurring EV adoption. While the effects of these kinds of vehicle-focused policies on charging infrastructure can be large, they are not included here.

We note that this is a high-level overview of beneficial policies, rather than a complete 'how-to' guide for design and implementation of each. The details of program design, eligibility, community engagement, and implementation are critically important to ensuring benefits, avoiding disbenefits, and supporting equitable outcomes. We point policymakers to the many published reports that seek to guide equitable implementation and outcomes from charging infrastructure policies and programs.[10]

Finally, we acknowledge that a variety of regulatory and legal structures exist across the United States. The actions that utilities, utility commissions, and legislatures may bring about on transportation electrification vary by state, county and city, as does authority for permitting and building codes. Similarly, ownership structures vary among the approximately 3,000 electric utilities in the United States. Individual jurisdictions may therefore face a variety of pathways to passing the policies included herein.

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[10] Examples include: Evergreen Collaborative & Atlas Public Policy, 2023, Charging Toward Justice: How States Can Lead on Racial and Economic Equity through the National Electric Vehicle Infrastructure (NEVI) Program;
EVHybridNoire, 2024, Advancing Transportation Electrification In Diverse Communities;
Lawrence Berkeley Lab, 2023, Electric Vehicle Program Designs and Strategies to Enhance Equitable Deployment;
Forth, 2023, Best Practices for Workplace Charging Programs;
BlueGreen Alliance, Electric Vehicle Charging Infrastructure Implementation Guide: How States Can Maximize Benefits for Workers and Communities;
Joint Office of Energy and Transportation, Public Electric Vehicle Charging Infrastructure Playbook
Berkeley Law Center for Law, 2024, Energy & the Environment, Policy Strategies to Promote Equitable EV Charging Access for Multi-Family Housing Residents
Resources for the Future, 2024, Equity in Electric Vehicles Charging Infrastructure

Table 1: Policy interventions that can help accelerate deployment and reduce the costs of charging infrastructure for EVs

Policy Intervention	Most common authorities for policy passage and implementation				
	Federal government	State governments	Local governments	Public utility commissions	Utilities
Reduce the cost of grid connection					
Reduce grid connection bottlenecks		✓		✓	✓
Hosting capacity maps				✓	✓
Load management strategies				✓	✓
Long-term grid planning		✓		✓	✓
Reduce other costs					
Transparent zoning and permitting		✓	✓		
EV-supportive building codes	✓	✓	✓		
Providing info on charging solutions & vendors	✓	✓	✓	✓	✓
Incentivizing multi-use charging	✓	✓	✓	✓	✓
Incentivizing right-sizing	✓	✓	✓	✓	✓
Workforce development programs	✓	✓	✓	✓	✓
Attract private sector investment					
Commercial EV rates		✓		✓	✓
Utility make-ready tariffs		✓		✓	✓
Utility transportation electrification programs		✓		✓	✓
Low carbon fuel standards	✓	✓			
Right to Charge legislation	✓	✓	✓		
Loan guarantees, loan-loss reserves, subsidized finance	✓	✓			
Other local, state and federal incentives	✓	✓	✓		

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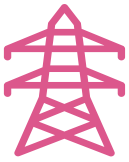
Policies that can Reduce the Cost of Connecting Charging to the Grid

A number of policies are available to reduce the cost of energizing the charging network of the future while speeding deployment. These policies act in one or more of the following ways:

Reducing utility delays

Increasing transparency in utility processes



Minimizing needed grid upgrades

Planning distribution systems for future demand

Reduce Utility Grid Connection Bottlenecks

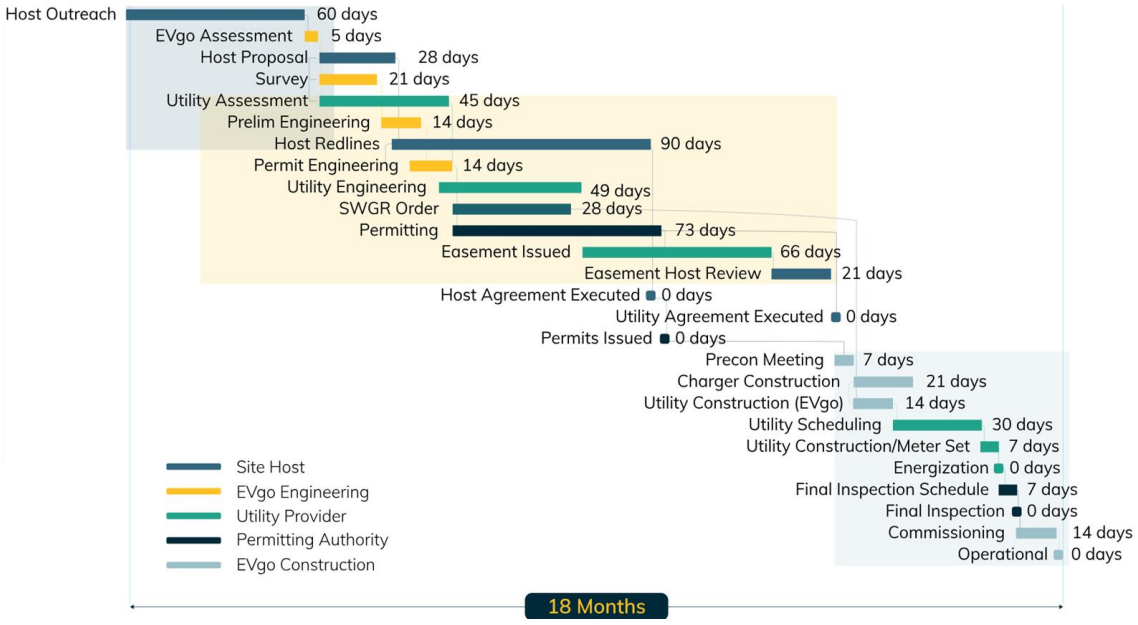
Primary authorities: State governments, Public utility commissions, Utilities

While charging station construction can be completed in just a few months, project timelines from initial engagement with utilities to energized chargers can stretch up to two years.[11] Figure 1 provides EVgo's 18-month estimate of current timelines from host outreach to operational public charging. Utility delays add substantial cost to charger

[11] Atlas Public Policy, 2022, New York and New Jersey MHDV Fleet Workshop

deployment projects and may even render projects unviable. While some of the delays that lead to long utility timelines are difficult to control, such as supply chain issues or inclement weather, many arise from utility processes or capacity shortfalls. For example, projects might be delayed because of long response times from utilities or long waits for utility engineering resources. Moreover, utility processes such as easement agreements and design approvals can be onerous and time consuming. These processes can engender further delay when they are not allowed to occur in parallel to other time-intensive project tasks such as pulling building permits.

Figure 1: EVgo Estimate of Public Charging Infrastructure Build Timeline



Source: EVgo Connect the Watts initiative

Some utilities have already been focused on improving EV charging grid connection timelines. For example, Con Edison in April 2024 released a Straw Proposal for Streamlined Queue Management[12] and Hawaiian Electric called out plans to improve its connection timelines for EV charging in its 2024 Electrification of Transportation Strategic Roadmap.[13] A number of utilities have also designated and communicated a clear point of contact for EV charging. Legislators and utility regulators can further improve timelines and reduce complexity by developing requirements for simplified, standardized, and prioritized design

[12] Summary of Con Edison Straw Proposal for Streamlined Queue Management
[13] Hawaiian Electric Electrification of Transportation Strategic Roadmap 2.0

and installation processes at utilities.[14] To reduce delays, they can employ rules governing maximum wait times for responding to charger project requests. Regulators can also use grid connection timelines in utility cost recovery calculations, require utilities to set up transportation electrification teams that focus on those projects, and require utilities to hold stocks of key equipment. As an example, California's SB 410, passed in 2023, requires the California Public Utilities Commission (CPUC) to establish reasonable average and maximum target grid connection time periods. Colorado's SB 218, passed in 2024, similarly holds utilities to transparent grid connection deadlines, and also establishes these timelines as a performance metric in utility cost recovery.[15]

Hosting Capacity Maps

Primary authorities: Public utility commissions, Utilities

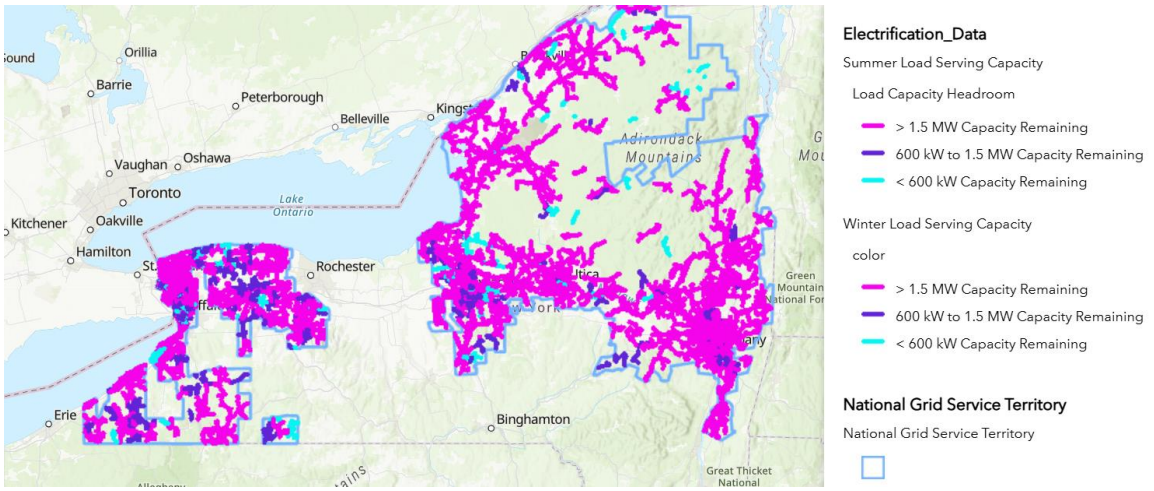
A similar and common issue cited by developers of public and depot charging is a lack of transparency from utilities about grid capacity at desired deployment locations. This makes selecting locations difficult, as developers often have little information on whether the distribution grid might support needed additional charging capacity until they have already started the (often lengthy) process of requesting new service. While hosting capacity maps will generally not fully replace a utility assessment, they can serve as a valuable first filter for developers to quickly identify where grid capacity constraints are likely to interfere with their projects. This can reduce overall project development costs and utility timelines by allowing developers to pursue projects where they stand the most likelihood of success at lowest upgrade costs.

Ideally, the hosting capacity maps produced by utilities should include load data on existing grid assets (particularly for medium and high voltage feeders). For example, New York's National Grid hosts an EV Load-Serving capacity map (see Figure 2) that indicates annual peak load on its 3-phase feeders as well as total capacity and remaining headroom. In another example, Dominion Energy publishes a map of grid capacity availability for 3-phase feeders within one mile of major interstates and highways. [16] While headroom at peak is useful information for siting public fast charging where load will likely coincide with the local feeder peak, hourly data that shows overnight peak load would be helpful for siting high-power charger deployments for fleets that charge overnight.

[14] See, for example: EPRI, RMI, IREC, ATE, and Clean Cities Coalitions, "DOE *Streamlining EV Charging Service Connections* project (ongoing)"
[15] Colorado Senate Bill 218
[16] Dominion Energy Hosting Capacity Tool

Some proactive utilities have already developed these maps.[17] State legislatures should consider requiring utilities to develop and maintain these resources for their customers using best practices.[18] California's legislature directed utilities to undergo a similar exercise to produce distributed energy resource hosting capacity maps, and the CPUC is currently evaluating ways to improve them.[19]

Figure 2: National Grid Electrification Capacity



Source: National Grid

Load Management Strategies

Primary authorities: Public utility commissions, Utilities

Load management strategies are used to avoid vehicles charging during peak times. This can help avoid costly upgrades to utilities' distribution systems and reduce the need for increased electricity generation capacity. For regulators and utilities, such strategies can include time-of-use pricing, managed charging, and/or demand response programs that incentivize vehicle owners to charge their EVs during off-peak hours or allow utilities to

[17] For a list of available maps, see U.S. Office of Energy Efficiency and Renewable Energy's U.S. Atlas of Electric Distribution System Hosting Capacity Maps

[18] For best practices on provision of this data, see Nagarajan, A. and Zakai, Y. 2022, Data Validation for Hosting Capacity Analyses
For grid data sharing guidelines, see National Association of Regulatory Utility Commissioners, 2023, NARUC Grid Data Sharing Playbook

[19] Trabish, H. 2017, How California's Utilities are Mapping their Grids for Distributed Resources
CPUC Energy Division, April 2024, Staff Proposal for the High DER Proceeding

directly control charging subject to driver constraints. Many utilities have already implemented such strategies.[20]

For fleets and other charging developers, automated load management (ALM) software is becoming increasingly important as EV adoption grows. ALM, sometimes in combination with battery systems, dynamically adjusts charging power and charging schedules based on factors like customers' building loads, electricity rates, vehicle schedules, and grid demand. By shifting EV loads to off-peak periods, ALM can ease grid congestion and reduce the need for expensive infrastructure upgrades. Looking ahead, vehicle-to-grid (V2G) ALM capabilities are expected to become more prevalent, allowing bi-directional power flow from EV batteries to support the grid. Utility commissions, cities and states can encourage or require use of ALM software as part of incentive eligibility and utility programs.

Additional temporary solutions are available to assist in quickly integrating loads onto the electric grid. In the CPUC's High Distributed Energy Resources Proceeding, CPUC staff proposed that utilities develop plans that use load management technologies to place temporary constraints on the power that certain customers are allowed to draw during peak hours until a distribution capacity project is complete, with the goal of speeding up grid connection while additional distribution capacity is built (an example of "flexible interconnection"). They also suggest that utilities could temporarily deploy battery storage solutions at substations to reduce peak loads and resolve capacity constraints while a substation bank upgrade is executed.[21] As an example, utility ComEd in Illinois has committed to developing a plan to deploy flexible interconnection approaches.[22]

Long-Term Grid Planning

Primary authorities: State governments, Public utility commissions, Utilities

Building out a sufficient charging network to support widespread transportation electrification across light-, medium-, and heavy-duty vehicles will require substantial upgrades to the electric grid, such as new substations and other grid infrastructure. In some cases, these upgrades can take years to complete, so it is important for utilities to begin planning for and making those upgrades years ahead of when charging will be needed. Legislation like AB 2700 in California enables pro-active, long-term utility planning by directing utilities to conduct strategic planning and investment to ensure the grid is

[20] See, for example, National Grid docket 21-91, Duke Energy Carolinas filing E-7, Sub 1266, Potomac Edison Docket 9478
[21] CPUC Energy Division, April 2024, Staff Proposal for the High DER Proceeding
[22] ComEd and Joint Non-Governmental Organizations Memorandum of Understanding

prepared to accommodate all the new electric cars and trucks coming over the next decade. Under this planning regime, California utilities are directed to account for fleet electrification plans as well as state goals and regulations when proposing distribution plans, and the CPUC is required to consider those factors when reviewing proposals. Absent policies like this, utilities can only plan for incremental grid upgrades based on known (rather than anticipated) power needs, which can result in significant delays to installing and activating charging stations. Returning to a site multiple times to implement marginal upgrades can also lead to higher costs and greater interruptions versus 'pre-building' once to facilitate fleet and developer plans. Moving from the short (e.g. 5-year) planning horizons that are often used by utilities and utility commissions to 10- or 15-year horizons can help avoid these costs and delays. Doing so will require utility commissions to implement accountability measures to ensure appropriate use of ratepayer funds.[23]

Policies that can Reduce Other Charging Infrastructure Costs

Policies are also available that can reduce remaining charging infrastructure costs by:

Transparent, Predictable Zoning and Permitting

Primary authorities: Local and State governments

Permitting processes and zoning issues can significantly increase EV charging project timelines, and result in challenges with securing site hosts as well as increased legal fees and other costs. Issues can arise with processes that were designed prior to widespread EV

[23] For further discussion of how regulators and utilities can strategically plan for rapid EV load growth, see RMI, 2024, Transportation Electrification Building Blocks

charging installations. For example, designations of charging stations as 'fueling stations' and issues with how 'site hosts' are defined in processes that were not written with EV charging in mind can lead to additional reviews that do not add value.

Several states and cities have implemented or introduced policies to streamline permitting and zoning processes for EV charging infrastructure. For example: [24]

California

- AB 1236 requires all cities and counties to develop an expedited, streamlined permitting process for EV charging stations by creating an ordinance and official checklist
- AB 970 works in tandem by setting specific and binding timelines to the permit review period based on the size of the project and clarifying parking requirements

Colorado

- HB 1173 established an expedited permitting process for the approval of EV charging stations for counties and municipalities
- Municipal agencies must approve, conditionally approve, or deny EV charger permits:
  - Within 30 days for applications proposing fewer than 13 charging stations on a parcel where EV charging is considered an accessory land use; or
  - Within 60 days for applications with13+ charging stations or where the EV charging system complies with the primary land use on that parcel
- If the agency does not take action within those time periods, the application is approved
- The bill also instructs the Colorado Energy Office to develop a model code regarding the approval of charger permits and provide counties and municipalities technical assistance

Delaware

- Delaware's Administrative Code (Title 22, Ch. 1, Sec. 119) and SB 187 (2022) jointly established that municipalities with populations over 30,000 must have an ordinance that requires the municipality to apply/deny a permit within 90 days of recieving a permit application

New Jersey

- New Jersey's S3223 established a model statewide EV ordinance which considers applications for installation of EVSE or make-ready parking as a permitted accessory use within a given municipality

Local governments also often have jurisdiction over permits that are relevant to EV charging. A number of resources have been published to assist jurisdictions of all sizes to streamline their processes.[25]

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[24] California Assembly Bills 1236 and 970; Colorado HB24-1173; Delaware Administrative Code and SB 187; New Jersey S3223

[25] See, for example:

EV-Supportive Building Codes

Primary authorities: Local, State and Federal governments

Installing supporting infrastructure for charging during construction of a building is significantly less expensive than doing so post-construction. Therefore, policies that encourage or require EV charging infrastructure to be built during construction can significantly reduce the overall cost of building out a sufficient charging network to support EV adoption targets. At present, several states and local jurisdictions have incorporated into their building codes for new residential and/or commercial construction requirements to build EV charging-supportive infrastructure. As an example, California's proposed 2025 updates to the CALGreen building code include a requirement that 100% of parking spaces at multifamily homes be EV-ready.[26] Other states with EV-supportive building requirements of some kind include Colorado, Connecticut, the District of Columbia, Massachusetts, New Jersey, Oregon, Rhode Island, Vermont, and Washington. Building codes can also help ensure charger accessibility by requiring a certain number or percent of installations be made disability-accessible (such provisions are included in California, Washington, and New Jersey codes), and by providing clear requirements for installations at curbsides.

Providing Information on Charging Solutions, Processes and Vendors

Primary authorities: Local, State, Federal governments; Public utility commissions; Utilities

A major barrier to the decision to install charging and a challenge to the speed and success of installations is the lack of straightforward, compiled information on EV charging solutions, processes and vendors. This has been a particular challenge for multi-family housing units, workplaces, and fleet depots. Building owners are often unaware of the benefits of offering EV charging for residents or employees. Even after a building owner or fleet is interested, there is a large time investment involved in researching charging technologies, finding and selecting vendors, seeking permits, finding and accessing

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NASEO, AASHTO, and NESCAUM, 2023, "Improving Permitting and Zoning for EV Fast Charging Stations"
SEAC, RMI and IREC, 2023, Planning and Zoning for Electric Vehicle Charger Deployment
U.S. Department of Energy Alternative Fuels Data Center, Permitting Processes for Electric Vehicle Charging Infrastructure
California Governors' Office of Business and Economic Development, 2023, Electric Vehicle Charging Station Permitting Guidebook

[26] California Energy Codes and Standards

available financial incentives, coordinating with electric utilities, and other logistical and informational hurdles.

Informational campaigns and resources funded by federal, state and local authorities and utilities can lower this informational barrier and show the payoffs to charging installations. Some examples are as follows:

- The Vehicle Charging Innovations for Multi-Unit Dwellings project,[27] funded by the U.S. Department of Energy (DOE), provides resources for those interested in installing charging at multi-family housing
- The Clean Cities and Communities U.S. DOE partnership provides a Workplace Charging Employer Workship Toolkit to support outreach and education events at workplaces[28]
- The North American Council for Freight Efficiency and RMI provided a series of virtual trainings focused on supporting electrification of small fleets[29]
- California's investor-owned utilities provide advisory services for medium- and heavy-duty vehicle electrification planning[30]
- EPRI's Vetted Products List is a resource to assist all stakeholders in selecting EV charging equipment[31]
- Resources like the New York State Energy Research and Development Authority's Electric School Bus Guidebook[32] and Atlas Public Policy's best practices guide to Deploying Charging Infrastructure for Electric Transit Buses[33] provide guidance for bus charging

Sleek, user-friendly tools that can further simplify and customize information to ease the process of selecting and installing equipment can significantly reduce hurdles to getting EV charging in the ground.

Incentivizing Multi-Use Charging

Primary authorities: Local, State, Federal governments; Public utility commissions; Utilities

[27] Vehicle Charging Innovations for Multi-Unit Dwellings Project Multi-Unit Dwelling EV Charging
[28] Clean Cities and Communities Workplace Charging Employer Workshop Toolkit
[29] NACFE Run on Less Electric Depot Education Bootcamp Training
[30] CPUC's Transportation Electrification Efforts
[31] EPRI Vetted Product List
[32] NYSERDA Electric School Bus Guidebook
[33] Atlas Public Policy Deploying Charging Infrastructure for Electric Transit Buses

Building en-route EV charging that can be shared by multiple vehicle types will enable higher utilization of charging stations, decreasing the cost of developing the charging ecosystem of the future. It will not often make sense to build charging that can serve both passenger cars and tractor trailers. However, Class 2b and 3 commercial vehicles can share charging with light-duty vehicles if infrastructure is designed with these multiple uses in mind. For this to work, developers must allow some portion of chargers to be in a pull-through configuration to handle vehicles that may be towing a trailer, and allow a larger parking footprint and longer connectors. Governments, utility commissions and utilities can encourage these features by requiring them, or by offering higher incentives or scoring values for chargers that are configured in these ways.

As an example, a December 2023 review by Atlas Public Policy revealed that nearly half of the states that had released requests for proposals under the NEVI program required applicants to describe if and how they would accommodate medium- and heavy-duty charging, or explicitly gave prioritization in scoring to those who did.[34] Programs should account for the fact that these elements can add upfront cost to sites. These added upfront costs will yield longer-term savings by avoiding duplicate buildout. They will also reduce frustration among drivers who are faced with charging that is not built for various vehicle types (see Figure 3), improving customer sentiment and supporting EV adoption.

Figure 3: Example of Electric Truck Pulling Trailer at Non-Pull-Through Charging

Source: Reddit

[34] Khatib, M. December 2023, "States award $130 million to build hundreds of EV charging stations along U.S. highway corridors"

Incentivizing Right-Sizing

Primary authorities: Local, State, Federal governments; Public utility commissions; Utilities

Right-sizing the power levels of charging equipment installed at each facility can reduce costs in a number of ways:

- Avoiding over-powered sites can minimize the cost of installed charging equipment and reduce needed distribution grid infrastructure upgrades
- Avoiding under-powered sites can avert costly retrofits and avoid the cost of any vehicle downtime resulting from insufficient charging availability

Thoughtful planning by site and fleet owners is therefore essential to minimizing costs. Policymakers should ensure that incentives and programs are designed to encourage rightsizing of charging equipment for each use case. For example, for charging at vehicle depots, policymakers should ensure that incentives don't disproportionally increase by power level in ways that encourage fleets and developers to purchase larger vehicles or install higher powered charging than is needed. For fast charging along travel corridors, policymakers should incentivize the kinds of higher-powered charging that best meets driver convenience and ultimately requires fewer chargers by focusing scoring rubrics on lowest cost per installed kW rather than lowest cost per charging connector.

Workforce Development for Charging Station Installers

Primary authorities: Local, State, Federal governments; Public utility commissions; Utilities

Workforce training programs for EV charging station installers play a crucial role in accelerating the deployment of EV charging infrastructure and keeping costs down. As the demand for EVs continues to grow, there is an increasing need for skilled technicians who can properly install and maintain charging stations. The International Council on Clean Transportation estimates that the growth of charging infrastructure could create more than 78,000 electrical installation, maintenance and repair jobs by 2032.[35] By providing comprehensive training to workers, these programs ensure that the installation process is efficient, safe, and up to code, thereby reducing delays and costs associated with the

[35] Anh Bui, Logan Pierce, Pierre-Louis Ragon, Arijit Sen, and Peter Slowik (ICCT), Taylor Waites (IBEW), Charging up America: The Growth of United States Electric Vehicle Charging Infrastructure Jobs

deployment of charging infrastructure. Creating a sufficient supply of qualified technicians will also help to ensure that labor shortages and associated cost increases do not occur.

One example of a successful charging installation workforce training program is the Electric Vehicle Infrastructure Training Program (EVITP),[36] which was developed by a collaboration of industry stakeholders, automakers, utility companies, and educational institutions. EVITP offers a comprehensive curriculum that covers all aspects of EV charging station installation, including electrical systems, safety protocols, and customer service. The program has an array of utility partners and has been adopted by several states, such as California, New York, and Oregon, to train and certify EV charging station installers.[37] Colorado's SB 218 provides grant funding to train electrical workers and directs utilities to ensure that Colorado has a qualified and adequate workforce to build the grid it needs to meet its goals.

A related effort is SAE's EVSE Technician Certification program.[38] This program certifies technicians in the maintenance, repair, and operation of EV charging stations -- tasks that do not necessarily require an electrician. Certifying such technicians can lower operations and maintenance costs by reducing the need to hire electricians to complete these tasks, while also creating a less arduous pathway for those transitioning from other careers.

Policies that can Attract & Leverage Private Sector Investment

Attracting private sector capital is also critical to accelerating and achieving needed charger buildout. Policies available for attracting private sector investment work by:

Enabling utility 'make-ready' investments & EV-specific rates that attract other capital

Requiring utility investments that reduce market failures and inequities

Passing 'Right to Charge' laws that reduce obstacles from building owners

De-risking investments

Providing public funding with private sector match funding requirements

[36] Electric Vehicle Infrastructure Training Program
[37] Electrification Coalition, 2023, "Preparing the Workforce for EV Charging"; EVITP Partner Advisors
[38] SAE's EVSE Technician Certification program

Commercial EV Rates

Primary authorities: State governments, Public utility commissions, Utilities

State legislatures and utility commissions can direct utilities to develop EV-specific electricity rates for commercial utility customers. EV rates can reduce electricity costs for multifamily, commute, depot, and public fast charging projects. This can improve overall project financials and, in turn, attract additional private sector investment.

Electricity rates charged to commercial utility customers often include demand charges, which can substantially increase average electricity costs for EV charging and also render them unpredictable from month to month.[39] EV-specific rates can reduce or change demand charges to reduce EV charging energy costs and enable charging providers and site hosts to more reliably forecast expenses, while still ensuring that they pay a fair share for electricity services. Alternatives to traditional commercial demand charges can be especially valuable in early stages of public, en-route or depot fast charger buildout when chargers are expected to have lower levels of utilization. EV rates can also include time-varying charges that take advantage of the flexible nature of EV charging and encourage off-peak charging when electricity grids have more spare capacity.

In a 2022 report, the National Association of Regulatory Utility Commissioners (NARUC) explored best practices for designing sustainable commercial EV rates, focusing on real-world examples from four utilities: Southern California Edison (SCE), Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), and Alabama Power:[40]

The NARUC report argues that marginal cost[41] rates (like utilities have used in the past to spur economic development) can be used to incentivize greater EV adoption. By only charging EV charging customers the amount necessary to cover the incremental cost of adding chargers to the grid, these rates reduce costs for new EV charging loads without increasing costs for existing customers. The report recommends that rates should gradually transition to recovering embedded costs over time, at which point existing customers should benefit from having the overall costs of supplying electricity shared across more electricity users.

[39] Demand charges add a fee to electricity bills based on the most power (kilowatts) that a customer uses at one time. These charges can increase average energy costs for some types of EV charging that use a lot of power for short periods of time.
[40] Ryan, N. et al, 2022, Best Practices for Sustainable Commercial EV Rates and PURPA 111(d) Implementation

SCE established a rate that temporarily eliminates demand charges for EV charging through 2024 and instead recovers costs through a time-of-use energy charge and a small fixed charge. This encourages charging during low-cost hours and avoids penalizing customers with "spikey" loads.

PG&E designed new commercial EV rates that combine a subscription charge based on peak demand with a time-varying energy charge. Only marginal distribution costs (those caused by the new load) are recovered through the subscription charge initially. Early data shows customers save 25% to 60% on monthly bills under the new rate.

SDG&E proposed rates that are similar to PG&E's model but go further by initially only charging customers for the marginal costs. The utility phases back in embeded costs (debt service on past grid investments) over a 10 year period. SDG&E estimates customers could save 20% to 50% compared to previous rates.

Alabama Power offers an Economic Development Incentive Rate Rider for customers on their Business EV Rate. The rider discounts the base rate to 110% of estimated marginal costs (which is less than prevailing rates for other customers). That discount is then reduced over time—increasing base rates to greater than 110% of the marginal cost.

Utility Make-Ready Tariffs

Primary authorities: State governments, Public utility commissions, Utilities

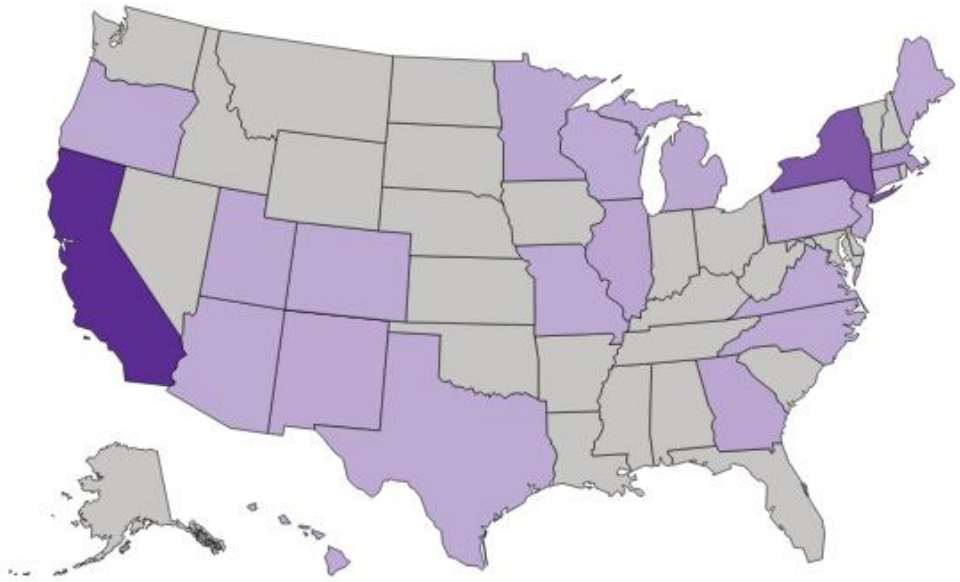
Utility make-ready tariffs ensure that utilities will cover the cost of electrical distribution infrastructure upgrades associated with the construction of new EV charging stations for typical customers. This significantly lowers the cost to charging site hosts and/or charging network providers of installing EV chargers. These tariffs provide a predictable foundation of support upon which charging developers can depend and plan, attracting additional capital from the private sector. As an example, in October 2021 the CPUC approved 'EV Infrastructure Rules' as directed by California Assembly Bill 841.[42] These rules specify that ratepayers cover the costs of service line extensions and electrical distribution infrastructure associated with EV charging. This signaled a major policy shift at the CPUC, as the new approach incorporates utility-side transportation electrification investments into the investor-owned utilities' (IOUs') general rate case proceedings rather than individual program applications.

Without such rules, utilities in other states have been required to propose specific programs to cover these costs, engaging in long regulatory approval processes and reauthorizations to provide support that often does not extend beyond initial pilots. Still, these programs

[42] California Assembly Bill 841

have provided significant boosts to charging buildout and drawn significant private sector capital. Utilities in 20 states have been approved to provide this kind of support through specific make-ready programs (see Figure 4).

Figure 4: States containing investor-owned utilities with approved make-ready programs for EV charging



Darker states have seen more approved utility make-ready investment.

Source: Atlas EV Hub Utility Filings Dashboard

Legislation Requiring EV-Supportive Utility Programs

Primary authorities: State governments, Public utility commissions, Utilities

State legislatures can direct electric utilities to propose funding programs for EV charging, and direct state utility commissions to approve such programs if they meet criteria to ensure efficient use of ratepayer funds and equitable outcomes. These criteria may include provisions such as:

- Requiring a percentage of deployed chargers be in underserved communities,
- Encouraging charging at times when renewable energy production is high, and/or
- Requiring that utility proposals meet cost-benefit benchmarks

These programs can be especially impactful in drawing out or enabling investment in charging types for which funds are generally less available, or where split incentives exist

between property owners and tenants. This includes, for example, charging benefitting disadvantaged communities, low-income residents, renters, rural areas, and individual owner-operators of medium- and heavy-duty vehicles. It also includes areas critical to geographic network coverage but that face low charger utilization and therefore present less compelling prospects for private sector charging providers.

Legislatures in several states have recognized EV charging support to be within the utility's role, including the examples shown in Table 2.

Table 2: Examples of state legislation requiring or encouraging utility investments in EV charging infrastructure

State & Legislation	EV-promoting elements impacting the utility sector
California SB 350	• Investor-owned utilities must file applications with the CPUC to develop programs and investments to accelerate widespread transportation electrification • Utilities are allowed to recover reasonable costs associated with these transportation electrification programs in rates • The CPUC must approve programs, considering impacts on competition and ratepayers
Colorado SB19-077	• Allows public utilities to recover costs associated with EV charging infrastructure through customer rates, if infrastructure is reasonably expected to provide net customer benefits • Requires public utilities to develop time-of-use rates for commercial and residential EV charging to encourage off-peak charging and minimize grid impacts • Directs the Colorado Public Utilities Commission to consider the benefits of EV adoption when evaluating utility investments in EV charging infrastructure
Nevada SB 448	• Requires the Public Utilities Commission of Nevada (PUCN) to establish regulations authorizing utilities to recover certain costs associated with EV charging infrastructure • Allows utilities to submit plans to the PUCN for installing and operating charging stations • Allows utilities to recover prudent costs associated with EV charging infrastructure through customer rates, subject to PUCN approval
New Mexico HB0521	• Requires public utilities to file with the New Mexico Public Regulation Commission an application to expand transportation electrification. • Applications may include investments or incentives to facilitate deployment of charging infrastructure and associated electrical equipment that support electrification (including of public transit and publicly-owned vehicles), rate designs or programs that encourage charging that supports the operation of the electric grid, and customer education and outreach programs that increase awareness of such programs and of the benefits of transportation electrification

State & Legislation	EV-promoting elements impacting the utility sector
Oregon SB 1547	• IOUs are required to file proposals with the Oregon Public Utility Commission (PUC) to accelerate transportation electrification • Utilities may recover costs associated with investments in transportation electrification through customer rates (subject to certain conditions and limitations) • The PUC must consider whether utility investments in charging infrastructure are reasonable, prudent, and support the state's greenhouse gas reduction goals

Notably, municipal and cooperative utilities often do not have the same ability as IOUs to use ratepayer funds to build EV charging infrastructure and associated grid infrastructure. Policy solutions that can support grid enhancements for transportation electrification in areas served by municipal and cooperative utilities warrant further analysis, especially as medium- and heavy-duty vehicle electrification increases.

Strong Low-Carbon Fuel Standards

Primary authorities: State and Federal governments

The Low Carbon Fuel Standard (LCFS) regulations in California, Oregon, and Washington have been instrumental in promoting the adoption of clean transportation fuels, including electricity for EVs. These programs incentivize the deployment of EV charging infrastructure by allowing charging station owners to generate and sell LCFS credits based on the amount of low-carbon electricity dispensed. These incentives can be particularly valuable by providing ongoing support to the EV charging business model over time (i.e. beyond initial capital injections). Additional states should consider adopting such regulations, using learning from existing programs as a guide. Another possibility is that a strong federal clean fuel standard could be developed, potentially under Clean Air Act Section 211(c). There may also exist opportunities to strengthen existing state programs, for example by extending provisions like the Fast Charging Infrastructure (FCI) Provision within California's LCFS program to further support charging infrastructure deployment in underserved communities and rural communities, and ensuring that maximum capacity limit for FCI credits is high enough to enable megawatt charging for over-the-road vehicles.

Right to Charge Legislation

Primary authorities: Local, State and Federal governments

Right to Charge legislation protects building tenants' ability to install charging infrastructure in their designated parking spaces. These laws ensure that authorities such as condominium boards, homeowners associations, and, in certain cases, landlords cannot block individual charger installations. The party seeking to install charging is, however, generally held responsible for any costs or damages related to the charging installation. These costs can often be significant, especially because building owners are not necessarily compelled or incentivized to offer tenants cost-effective solutions. An additional challenge to the effectiveness of Right to Charge laws is the split incentives between a) building owners and b) tenants, who generally do not reap the financial benefits of the installation once they are no longer tenants. The effects of this split incentive may be reduced in the case of commercial tenants, who often hold longer lease agreements than residents. This could mean that Right to Charge laws for commercial buildings could be particularly beneficial to EV charging buildout. Twelve states currently have some form of Right to Charge legislation,[43],and the City of Cambridge has a local policy in Massachusetts. Only California's legislation is applicable to both residential and commercial tenants; the remaining states protect only residential installations.

Loan Guarantees, Loan-loss Reserves, Subsidized Finance

Primary authorities: State and Federal governments

Policies that reduce investment risk and enhance credit can mobilize private capital towards deploying EV charging. These programs can be very efficient, resulting in more private investment per public dollar spent than subsidies alone by requiring private sector companies to significantly invest their own funds. Loan guarantees, loan-loss reserves, and subsidized finance programs are all ways to de-risk private investments. Both the Inflation Reduction Act and Infrastructure Investment and Jobs Act include funding programs that provide subsidized financing for zero-emission projects. Ensuring that charging developers are

[43] These states are California, Colorado, Connecticut, Florida, Hawaii, Illinois, Maryland, New Jersey, New York, Oregon, Virginia, and Washington.

eligible for those and future federal and state programs may unlock private investment that is currently sidelined due to the nascency of this new market.

Other Local, State and Federal Incentives

Primary authorities: Local, State and Federal governments

A number of states have developed incentive programs designed to reduce upfront or ongoing costs sufficiently to enable the business case and charging investment decision for private sector partners. This can be achieved through rebates, grants, loans, tax credits, tax exemptions, and/or advisory services. States that have programs like this include California, Colorado, Delaware, Florida, Illinois, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, North Carolina, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Texas, Washington and the District of Columbia.[44]

Like utility programs, these programs can be especially impactful for charging types for which funds are generally less available, or where split incentives exist between property owners and tenants. This includes, for example, charging benefitting disadvantaged communities, low-income residents, rural areas, renters, residents of multifamily housing, workplaces, and individual owner-operators of medium- and heavy-duty vehicles. State funding can also be especially useful if it is well-coordinated with existing funding sources so that programs complement each other.

Incentives should be designed to include private sector match funding and include proactive outreach and engagement that is culturally competent and centers those with barriers to access. As mentioned under *Incentivizing Right-Sizing* above, policymakers should ensure that incentives are designed to encourage rightsizing of charging equipment for each use case. If programs require that specific equipment be installed, program managers should maintain an up-to-date list of approved equipment to avoid developers wasting time pursuing unapproved technologies or being forced to install outdated equipment. And finally, such funding will be most beneficial if accompanied by enforced reliability and reporting requirements: in addition to instilling the driver confidence needed

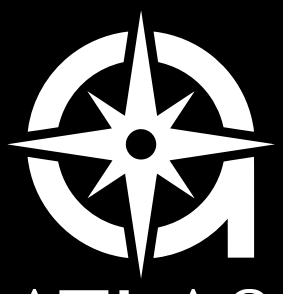
[44] https://afdc.energy.gov/laws/13352; https://afdc.energy.gov/laws/12845; https://afdc.energy.gov/laws/13291; https://afdc.energy.gov/laws/13330; https://afdc.energy.gov/laws/13428; https://afdc.energy.gov/laws/11488; https://afdc.energy.gov/laws/12899; https://afdc.energy.gov/laws/12308; https://afdc.energy.gov/laws/11423; https://afdc.energy.gov/laws/5182; https://afdc.energy.gov/laws/11493; https://afdc.energy.gov/laws/13378; https://afdc.energy.gov/laws/12219; https://afdc.energy.gov/laws/12308

to enable widespread EV adoption, having fewer broken-down chargers will mean that less chargers need to be built to serve driver demand.

A federal example of this kind of incentive is the National Electric Vehicle Infrastructure (NEVI) Formula Program established under the Bipartisan Infrastructure Law of 2021. This federal program allocates $5 billion over five years to help states create a network of EV charging stations for light-duty passenger vehicles along designated Alternative Fuel Corridors, particularly along interstate highways. Similarly, the federal Charging and Fueling Infrastructure (CFI) Discretionary Grant Program provides $2.5 billion in funding over five years for publicly accessible EV charging infrastructure and other zero-emission fueling projects. Priority is given to rural areas, low- and moderate-income neighborhoods, and communities with low rates of private parking. A final federal example is the Inflation Reduction Act's Section 30C tax credits, which provide significant incentives for private capital to mobilize in building out charging infrastructure, especially outside of high-income and urban areas.

Conclusion

Continuing the United States' considerable charging momentum will require a joint effort by project developers, fleets, charging networks, utilities and public agencies. A suite of policy options is available that can align incentives, reduce costs, and speed the proliferation of charging. Some of these policies will require new paradigms and ways of thinking. Many will require cooperation between authorities. And all will require thoughtful design and implementation that engages community stakeholders and carefully considers the challenges faced by the private sector. Luckily, there are existing examples and lessons already learned that can help policymakers set the nation on a path to unlocking the many benefits of an electric vehicle future.



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