

**PUBLIC
ACCESS**

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This focus area provides strategies to increase public access to electric vehicle (EV) charging by addressing topics that support the installation and use of EV infrastructure for all community members and the resulting impact on local economy. While most EV charging occurs at home or at work, access to and knowledge of available public charging stations can help residents feel more comfortable purchasing an EV. Range anxiety, or the fear of an EV running out of battery power before reaching a charging station or desired destination, is noted as one of the top barriers preventing people from purchasing EVs. As battery technologies continue to advance to support longer travel, and as public charging stations become more prevalent, range anxiety should become less of a concern.

Topics and strategies in this focus area can be important tools to ensure all residents are able to take advantage of the direct and indirect benefits of EV adoption. While the strategies in this section are aimed at municipalities installing public EV charging stations, many of the same considerations would apply to local businesses interested in installing charging stations for customer use.

Who Are the Target Audiences for Strategies Included in This Focus Area?

- Community residents who own or lease a light-duty vehicle for personal use
- Businesses that may install charging stations for customer use
- Local or regional transportation planning groups
- Municipal facilities, parking, transit and other administrators

Key Messaging

- Ensure appropriate access to charging for residents and visitors to the community
- Reduce number of households with lack of adequate transportation options
- Improve community air quality
- Attract customers and showcase the community's or business' sustainability commitment
- Capitalize on the economic opportunities of widespread EV conversation
- Engage the utility early in planning

Typical Barriers

- Lack of knowledge of charging station benefits
- Prioritized location identification for charging infrastructure
- Policy and legislation lagging behind technology advancements
- Limited examples of tested business models for charging station operations
- Infrastructure costs

What Are the Most Effective Outreach Channels for These Strategies?

- Peer learning opportunities such as conferences
- One-on-one meetings with managers of parking facilities
- Chamber or other business organizations

CHARGING

Awareness of and access to EV charging stations is a major factor in encouraging residents to purchase an EV, according to a nationwide survey conducted by the National Renewable Energy Laboratory (National Renewable Energy Laboratory, 2017). Strategies in this topic area focus on ways communities can install charging infrastructure to ensure availability for residents and visitors. Local code and zoning ordinances can provide substantial benefits and support in increasing public access to charging stations. For more information on these strategies, see the section on [Policy](#).

Basic information

When choosing to install EV charging infrastructure in public spaces, a community should consider the following criteria:

1. **Charging Station Type:** In most cases, Level 2 charging is appropriate for public charging — especially at shopping centers, parking garages, public parking areas, or other locations where customers are likely to spend a few hours. DC fast chargers may be considered along transportation corridors to allow EV owners to extend their range with only a quick stop. For more information on charging station types, see [Appendix A: Electric Vehicles 101](#).
2. **Proximity to Amenities:** Often, an EV user will need to stop to recharge for several hours, so it is helpful to install public chargers next to restaurants, entertainment venues or shopping amenities.
3. **Location of Electrical Service:** The cost of installing a charging station is significantly impacted by the proximity to an existing electrical service such as a feeder or a substation that already has the capacity to add more load. It is essential to work with your local utility to understand the service available as well as the upgrade requirements at selected sites.
4. **Accessibility:** Make sure the parking spot and charging infrastructure are accessible to drivers with disabilities, to ensure access for all residents. ADA 2010 guidelines, including drawings and specifications, have been adapted for EV charging stations in the [EV readiness workbook](#) created by the [City of Atlanta](#).
5. **Public Access:** Though 80% of charging occurs at home, lack of public access is often cited as a barrier to EV adoption (U.S. Department of Energy, 2019). Furthermore, residents in multi-family developments and low-income households may rely solely on public charging stations due to factors that may prevent them from owning personal EV chargers, such as communal parking lots and shared electric meters or an inability to take on the high up-front costs of EV charging infrastructure.
6. **High-Traffic Location:** To ensure the charging station is available to the highest number of EV users, it should be located in a high-traffic area. Locations where drivers are likely to park for extended period of time, such as park-and-rides or downtown parking garages, are good options.
7. **Network Accessibility:** For many Level 2 charging stations, access to a wireless or cellular network is required to enable payment options. This interconnectivity also allows additional functionality such as mapping of vacant versus in-use stations via manufacturer mobile apps.
8. **Impact on Electricity Bill:** Hosting Level 2 charging stations can noticeably impact demand charges. Separating out the charging station services from the main building services may be a beneficial way to receive different use rates or to identify costs specifically from the charger.

First Steps and Quick Wins

Supporting public charging through municipal resources can provide strategies that can be readily implemented with limited financial investment. These strategies can create a solid foundation for future charging infrastructure integration.

Evaluate Use Patterns of Existing Charging Stations

Understand the use patterns of existing charging stations to inform decision-making on future infrastructure investments. This can be as simple as interviewing or surveying residents who live or work near existing stations to get a qualitative assessment of how often they see the charging station being used. These interviews should include general awareness of the station and any recollections of how often and at what time of day the charging station is typically in use.

Some Level 2 charging stations have built-in submetering or other data logging that could be used to evaluate station use (if the station owner is willing to share the data). With this data, a more sophisticated and quantitative analysis of use patterns may be possible; however, this level of detail is often not necessary.

Promote Existing Charging Stations

List or map all charging stations on appropriate public websites or charging locator apps and include them in any community EV collateral or web content. Use standard signage at all charging stations and make sure it is visible from the main thoroughfares. Raising public awareness of public charging stations is a critical step in easing range anxiety among potential EV adopters.

Examples of tools and apps that allow EV users to search for public EV charging stations include:

- [Google Maps](#)
- [Open Charge Map](#)
- [PlugShare](#)

Create an EV Charger Siting Guide

Establish rules for public charging stations, which could be in the form of recommended guidelines or required standards. Like many other capital expenditures projects run by a community, siting guides can be important to encourage developers and partners to follow consistent practices to meet project and municipal goals. For privately owned and operated charging stations, these guidelines would not be required but might still be helpful as a model or starting point. When creating guidelines, consider the following (not exhaustive) list of factors:

- Parking space dimensions
- Parking configurations (including charging station location in relation to the parking space as well as wheel stops, guard posts, and signage)
- Applicable technical standards
- Standardized signage
- Area lighting
- Vehicle and pedestrian clearances, including strategies for keeping charging cord clear of the pedestrian right-of-way and clear of plowing operations
- Additional considerations in flood zones
- Accessibility standards

Examples:

- The [U.S. Department of Energy Clean Cities Coalition](#) developed [siting and design guidelines for charging stations](#).
- The [Michigan Clean Energy Coalition](#) published a siting checklist on pages 114–116 of its [EV preparedness plan](#).
- The [Tahoe Regional Planning Agency](#) in the Lake Tahoe, CA, area provides information for charging infrastructure on page 56 of its [Plug-In Plan](#).
- For more examples of siting regulations see the [Great Plains Institute](#) report [Summary of Best Practices in Electric Vehicle Ordinances](#)

Explore Grant Opportunities for Cost Sharing

Look for organizations promoting EV charging, and leverage grants and other funding from federal and state governmental agencies or local nonprofit groups. Charging infrastructure can cost between \$500 and \$50,000 depending on the type of charger, the amount of retrofitting and electric supply upgrades needed, and the desired software amenities for using and managing the charger. Find out more about the different types of chargers available in [Appendix A: Electric Vehicles 101](#). Often, grants and other cost-sharing programs can be used to help offset some of the up-front costs and to increase the ease of EV use within the community. Further, grants can help fill gaps in funding and help existing partners and funds do more and go further. See [Appendix D: Funding Resources](#) for more information and suggested outlets for funding. Check with Xcel Energy about potential funding assistance as well.

Develop Guidelines for Installing Level 2 or DC Fast Chargers

Establish guidelines for determining where to install Level 2 versus DC fast chargers in the community. These guidelines should include considerations such as:

- **Length of the trip.** The number of miles per hour of charge that a charging station can provide vary greatly. Level 2 chargers often offer 10–25 miles per hour of charge, while DC fast chargers can provide up to 180 miles per hour of charge.
- **Type of destination.** The length of time an EV owner will spend at the location will define the appropriate amount of time for charging to take. For instance, grocery stores are good candidates for DC fast chargers, while movie theaters could host Level 2 chargers.
- **Regional partnerships.** DC fast chargers are needed to facilitate regional use of EVs across travel corridors. Ideal locations for these chargers can be identified through regional planning and collaboration. See [Develop Charging Corridors](#) for more information regarding national efforts to link major thoroughfares across the country.

Example:

- The [U.S. Department of Energy](#) developed a [handbook](#) for hosting public charging stations with suggested guidelines for installing Level 2 or DC fast chargers.

Larger Efforts and In-Depth Studies

Long-term efforts to ensure ideal public access to the appropriate types of chargers for specific locations within the community will require additional planning, budget requests, and in-depth studies. These strategies will create a stable foundation for EV integration into the community.

Explore DC Fast-Charging Options

Identify potential locations for different types of charging infrastructure. Level 2 charging stations serve a significant role in public access at lower installation costs; however, the strategic installation of DC fast charging stations can facilitate long distance EV travel through major travel corridors. DC fast chargers offer a convenient option by providing at least an 80% battery recharge in less than 30 minutes, which allows travelers to substantially recharge their vehicle while they stop for a short break at local restaurants or shopping centers. However, DC fast chargers can be detrimental to vehicle battery life if used too frequently. In many places, state and regional agencies are working together to ensure that there will be a complete charging network along regional interstates or other travel corridors.

Examples:

- The [Marengo Charging Plaza](#) in Pasadena, CA offers drivers 44 charging plugs with 24 Superchargers installed by Tesla, as well as 20 additional fast chargers installed by the City of Pasadena.
- [National Renewable Energy Laboratory](#) developed the [a report](#) that outlines opportunities for DC fast chargers under a variety of EV adoption scenarios.
- The [State of Colorado](#) developed [an EV plan](#) that describes the Regional EV West Memorandum of Understanding, where eight western states are working together to install EV charging stations along established heavily traveled routes.
- The [State of Minnesota](#) developed [an EV vision report](#) that describes in detail the strategies that are key to reaching Minnesota's transportation goal of powering 20% of passenger vehicles with electricity by 2030.
- The [U.S. Department of Energy](#) conducted an [EV infrastructure analysis](#) that outlines scenarios to develop a complete DC fast charging network across the nation.

Charging Plazas: DC fast-charging plazas offer “banks” of multiple charging stations in centralized locations to accommodate charging of numerous electric vehicles quickly. Plazas can be especially beneficial for providing access to EV owners who have limited at-home charging options. For instance, DC fast-charging plazas can serve Transportation Network Company (TNC) fleets like Uber and Lyft. Lyft recently [committed to 100% EVs](#) in their fleet by 2030. According to the [Colorado EV Plan 2020](#), the Colorado Energy Office will launch a grant program to support the buildout of DC Plazas in high-traffic areas in Colorado.

Map Ideal Public Charging Station Locations

Review community demographics and travel corridors to identify locations where public charging would be most used. The produced maps can then be used in outreach to local businesses or in finding community-owned parking garages where public charging stations could be installed in the identified areas. Two main groups of EV drivers rely on public charging infrastructure: long-distance travelers and multi-family housing residents. See [Develop Charging Corridors](#) for more information regarding how to support long-distance EV travelers.

The second group of drivers who can benefit the most from public EV charging stations are residents living in multi-family housing. According to a study conducted by the International Council on Clean Transportation, 30%–80% of EV owners living in apartment buildings rely on public charging for vehicle use (Nicholas, Hall, & Lutsey, 2019). In areas where there is a high concentration of apartments and other multi-family housing, installation of public EV charging stations could have a higher impact than in other areas. Another option is to reach out to building owners about installing EV charging stations at their buildings. See the [Outreach and Education](#) focus area for more information on this strategy.

Examples:

- [Advancing Iowa's Electric Vehicle Market](#) developed through the [Iowa Economic Development Department](#) identifies (on pages 23 to 32) top priority zip codes for public EV infrastructure based on traffic patterns, EV registration, existing charging stations, and destination attractions.
- The [Michigan Energy Office](#) funded a [study](#) by [Michigan State University](#) to determine ideal locations for EV charging stations in communities across Michigan. The [first phase of the study](#) was completed in 2019.

Offer Charging Station Rebates and Incentives

Establish a rebate or grant program for companies that choose to install publicly accessible EV charging stations. A survey that reviewed various community strategies for promoting EVs found that the availability of rebates for EV charging infrastructure correlated with significantly higher rates of EV market shares (Cattaneo, 2018). Contact your Xcel Energy community facilitator to find out what financial support the utility may offer for charging infrastructure.

Examples:

- [Fresno County in California](#) offers up to [\\$7,000 rebate](#) to install Level 2 charging stations.
- The [Regional Air Quality Council](#) and [Colorado Energy Office](#) are offering [financial support](#) including: a rebate for up to 80% of the cost of a charging station; up to \$9,000 for a Level 2 dual-port station; and up to \$30,000 for a Level 3 DC fast charging station.
- The [Yellowstone-Teton Clean Cities Coalition](#) offers a [rebate of \\$5,000](#) for public charging stations in communities surrounding Yellowstone and Teton National Parks.

Develop Charging Corridors

Work with regional partners to develop EV travel corridors, Fixing America's Surface Transportation (FAST) Act established a framework for designating cross-country travel corridors that are alternative fuel friendly. For a highway to be classified as an EV corridor, EV charging facilities must be installed at least every 50 miles. Between 2016 and 2018, more than 135,000 miles of national highway were designated as alternative fuel corridors. For more information about this program, visit the Federal Highway Administration's [Alternative Fuel Corridor website](#).

Example:

- [Northern Colorado Clean Cities](#) supports EV charging infrastructure along [rural corridor in the intermountain west](#) with the intention of improving access to EV infrastructure for underserved and secluded areas of Colorado.

Leverage Public–Private Partnerships

Establish a public–private partnership to help build out early infrastructure required for public EV charging station deployment. A study by the International Council on Clean Transportation found that public–private partnerships were a successful mechanism to support national infrastructure programs in China and Japan. These strategies were found to be most successful when used to fund programs that addressed charging infrastructure in difficult market segments such as curbside charging stations, multi-unit dwellings, and inter-city fast charging (Hall & Lutsey, 2017).

Examples:

- The [State of Washington](#) describes the criteria for which public–private partnerships are considered to be the lowest cost option in its [Transportation Resource Manual](#), which includes the [West Coast Electric Highway](#) as an example of a successful partnership.
- The [Eversource](#) utility in New England connected with the EV charging station manufacturer, [Greenspot](#), to provide the Massachusetts cities of [Newton](#) and [Brookline](#) EV charging stations through public–private partnerships in 2019.
- The [State of Florida](#) changed its [legislation](#) in 2019 to support and encourage [public–private partnerships](#) for developing public EV charging stations around the state.

Mobility Hubs: Low-income residents and communities of color often have the least access to clean and affordable mobility options. When identifying EV charging locations, consider partnering with transit agencies, car-sharing companies, and other mobility providers to develop mobility hubs in low-income neighborhoods and communities of color. Mobility hubs can include transit stops, bikeshare systems, EV carshare services, EV charging stations, bike parking, and ride-share drop offs. As an example, the California non-profit [TransForm](#) is partnering with public agencies to develop mobility hubs that include EV carshare services, e-bikes, free transit passes, and other transportation benefits to low-income residents based at three affordable housing sites.

Establish Budget for EV Charging Station Installation and Upkeep

Designate an annual line-item in the community budget for the installation and maintenance of public charging stations. Based on 2019 cost estimates from RSMeans, installation costs of Level 2 charging stations are between \$2,000 and \$8,500. These costs do not include any required electrical upgrades or conduit, which can double the cost. Additional budget should be allotted annually for regulation enforcement and management of payment systems (if the community will own and operate the charging stations). Many communities have found that it is more efficient and cost effective to contract with a third party to operate and manage charging stations. In this case, the charging station manufacturer retains ownership of the station, with the terms of the agreement determined on a case-by-case basis. This may include the manufacturer renting the spot from the community, splitting the profits received from the station, or allowing use of the location in exchange for handling all planning, setup, and operations. For more information and examples, see the [Economics](#) topic area section.

Provide Charging Infrastructure for Shared Mobility Fleets

Shared mobility fleets, such as ride-hailing companies like Uber and Lyft, represent an opportunity to transition high-mileage fleets to EVs. However, many drivers may not have access to at-home charging or may need to charge on the road. Providing public charging infrastructure in key locations can accelerate the adoption of EVs in shared mobility applications. The Seattle Department of Transportation mapped key locations by prioritizing those 1) with less-established networks of EV chargers, 2) in areas of historical underinvestment and disproportionate air pollution burden, 3) at shared mobility hubs, and 4) in areas with poorly-connecting transit service. This mapping effort was part of the [EV Shared Mobility project](#) which provides case studies and other resources from cities who are testing electric and shared mobility interventions.

Pair the development of charging infrastructure with an outreach campaign to encourage rideshare drivers to transition to EVs. This outreach should be conducted in partnership with rideshare companies and at locations where drivers frequently gather, such as safety inspection sites and airport waiting lots. Work with ridesharing companies to organize group buys, set up low-interest loans, and provide promotions or incentives for EV drivers.



ELECTRIC SUPPLY

This topic area identifies key municipal, country, or state strategies to ensure appropriate short-term and long-term electrical supply for planned charging stations. Charging station planning should include electricity generation source, infrastructure planning, and utility coordination efforts.

Basic Information

As outlined in Figure 1, there are six steps in transporting the electricity produced at a utility scale to provide power to an EV.



Figure 1: Steps in Electricity Transportation and Delivery

Important factors to consider when reviewing the electrical supply for your charging stations at each step are:

1. **Utility Distribution Network:** The network transports electricity from the generation source to local transformers. Understanding the fuel generation mix of electricity supplied on your local electric grid can help you identify GHG emissions reductions from converting ICE vehicles to EVs. The U.S. Environmental Protection Agency estimates that the average ICE passenger vehicle emits 4.6 metric tons of GHG emissions per year (U.S. Environmental Protection Agency, 2018). Annual GHG emissions for EVs in 2017 and the associated reduction percentages compared to ICE passenger vehicles are shown in Table 2, based on Xcel Energy's CO₂e intensity factors listed in the [Energy and Carbon Emissions Reporting 2017 Summary](#). GHG savings will continue to increase as Xcel Energy works towards its goal of being 100% carbon free by 2050.

Table 2. 2017 Annual EV GHG emissions and percent reduction per Xcel Energy service area

| | Upper Midwest (MI, MN, ND, SD, WI) | Colorado | Southwest (TX, NM) |
|--|---------------------------------------|----------|-----------------------|
| Annual Emissions per EV (MT CO ₂ e) | 0.94 | 1.49 | 1.42 |
| Percent Reduction from Typical ICE vehicle | 80% | 68% | 69% |

The equation below can be used to estimate GHG emissions associated with EVs in your community. The estimation is based on average energy use by EVs, average annual vehicle miles traveled (VMT) per resident, and Xcel Energy's CO₂e emissions intensity factor. Currently, the average EV uses about 34 kilowatt-hours (kWh) per 100 miles (U.S. Department of Energy, 2019).

(Average energy use per EV)x(average annual VMT)x(CO₂ emissions intensity factor)

$$= \frac{34 \text{ kWh}}{100 \text{ mi}} \times \frac{X \text{ VMT}}{\text{avg resident}} \times \frac{X \text{ MT CO}_2\text{e}}{1000 \text{ kWh}}$$

2. **Utility Pad Mounted Transformer:** The size of the transformer serving the area determines the power available. EV charging stations with larger capacity than a Level 1 charger can have significant electrical demands. It is important to understand whether the electrical service serving the proposed site can support the extra load. If the service must be upgraded, then the costs of installation will increase substantially. Your Xcel Energy representative can help you understand the capacity of your existing service.
3. **Meter:** When installing an EV charging station, consider whether you would like to install a new meter to provide separate service to the charging stations or use the meter for the building. A separate meter will allow the EV charging stations to be on a different electric rate from the building. Be sure to consider the potential energy demand charges as well as the energy use rates. Such price adjustments could increase energy costs by 45% to 89% if not properly managed (Fathy & Carmichael, 2019). Your Xcel Energy representative can help you understand the most cost-effective scenario.
4. **Panel:** A panel is the beginning of the customer-owned equipment in a traditional utility model. If an existing meter is used, then you may be able to tie into the existing electrical panel. However, if the panel is at or near capacity, it may need to be upgraded. Work with an electrician to understand the available capacity on your existing panel.
5. **Conductor:** This is used to transmit electricity from the panel to the charging station and can be a significant variable in the cost of installing an EV charging station. The cost for installing the conductor will depend on the distance from the transformer to the charging station as well as the substrate through which the conductor must pass. For example, an installation requiring a trench to the conductor a few feet through a grassy lawn will be much cheaper than an installation that travels six stories through a concrete parking garage. This is a very important factor to consider when choosing locations for public charging stations.
6. **Charger:** The type of charger to be installed will determine the electrical capacity required. See [Appendix A: Electrics Vehicle 101](#) for more information on charger types.

First Steps and Quick Wins

Strategies in this section explain initial actions that you could take to ensure appropriate electric supply stability for EV integration. These strategies can be quickly implemented with limited financial or time investment and will establish the groundwork for success.

Develop Utility Notification Protocol

Collaborate with Xcel Energy to develop protocols to communicate and share information about when and where EV chargers are being deployed as well as basic specification information such as if the charger is a Level 1, 2, or 3. This coordination would most likely require engaging your community's permitting and inspection division and will allow Xcel Energy to manage the potential grid impacts of charging EVs, ensuring a positive experience for all EV owners. It is a best practice to inform Xcel Energy about electrical upgrades planned to support public EV charging stations as soon as possible. Refer to [Working with Xcel Energy](#) to determine who to contact at Xcel Energy for support in your EV planning. If you are unsure or have questions, talk to your account representative.

Design for Future Charging Capacity

Consider projected demand for EV charging stations when installing public EV infrastructure. Installation might include expanded electrical panel capacity and raceways to facilitate additional stations in the future as demand increases. Depending on the location, upgrading or retrofitting the electrical panel and conduit that serve the charging station can cost significantly more than the charging station itself. The incremental cost of sizing the panel for future growth and installing additional conduit for future charging stations is relatively small, and it will save the community money in the long term and avoid significant construction activity, such as trenching for future charging stations. If near-term demand is expected to grow, initially installing multiple chargers may be more economical than adding in more chargers in the future. According to some hardware and installation companies, installing more than five chargers at a time can be economically beneficial because of the lower average pricing for the hardware in bulk and in terms of operations and maintenance support, especially if sourced through a third-party EVSE manufacturer. Two portions of the electrical service should be considered:

1. **Before the Meter:** This includes the transition and distribution infrastructure owned and operated by Xcel Energy. This equipment determines the total amount of power that can be delivered to a site. Work with your Xcel Energy representative to understand the available capacity at your site and the potential costs of any required upgrades.
2. **After the Meter:** This equipment includes the electrical panel and raceway owned and installed by the property owner. An electrician can help you understand if electrical panel upgrades are required and the associated costs of installing additional electrical conduit for future EV charging stations.

Ensure New Construction is EV-Ready

Install additional capacity in electrical panels as well as the required conduit to facilitate future installation of EV charging stations for new construction projects or major renovations. Projects of special interest include parking garages or public access buildings such as the courthouse. Making these investments at the time of new construction or renovation will save costs as it is easier to install wiring during other construction and material costs can be shared across multiple purposes (e.g., wiring for EV chargers as well as on-site solar or HVAC equipment). This can save charging infrastructure projects as much as 75% compared to rewiring (Pike, Steuben, & Kamei, Plug-in Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco, 2016). The community can also choose to require installation of EV-ready infrastructure in new construction through codes or zoning standards (see the [Policy](#) focus area section) or to establish an outreach campaign for businesses installing EV charging stations encouraging them to prepare for future demand (see [Outreach and Education](#) focus area section).

Larger Efforts and In-Depth Studies

Strategies for long-term planning for the impacts EVs will have on the electric supply may require larger efforts, additional planning, and in-depth studies.

Determine Impacts on Electric Grid

Collaborate with Xcel Energy to understand the grid impacts of personal and public transport electrification. Communities that have aggressive transport electrification goals should reach out to us and start coordinating early on required service. This will allow the community to roll out electrification strategies on a timeline that is realistic and reliable for residents. It will also permit Xcel Energy to coordinate internally across other demand changes, development, and infrastructure projects in the community.

Example:

- The [City of Seattle](#) developed a [transportation electrification strategy](#) in collaboration with the [Rocky Mountain Institute](#) that evaluates the projected EV market expansion and associated impacts on the utility grid and proposes interventions to allow the utility to effectively manage the anticipated new loads.

Support Smart Grid Operations for EVs

Explore control features of available charging station models and make recommendations of features to include with installation of public charging infrastructure. The opportunity to adjust the timing of vehicle charging to help balance electric production and demand could be a powerful tool as EVs become more popular. Xcel Energy may provide competitive rates or other incentives to manage times for EV charging. This strategy will have the most impact when coordinating with Xcel Energy to ensure the recommended technology is compatible with existing or planned EV charging stations. As EVs become more prevalent, the controls technology and utility pricing structures will likely evolve. The community should be prepared to revise or update their recommendations and technology based on new information.

Examples:

- The [Regulatory Assistance Project](#) published a [report](#) that reviews the opportunities presented by smart charging technology.
- The [UCLA Smart Grid Energy Research Center](#) developed [WinSmart EV™](#), which is an example of a complete controls energy network.

Increase Renewable Electricity for EV Charging

Encourage charging station operators to pair their equipment with renewable energy sources. Although some EVs already offer zero tailpipe emissions as well as reduced lifecycle emissions compared to ICE vehicles, the magnitude of emissions reduction is dependent on the generation fuel mix of your local grid. Commercial, municipal, and residential customers can increase the benefits of their EVs by installing renewable energy on-site, such as solar to charge the vehicle, or purchasing renewable energy through Xcel Energy programs.

Examples:

- [Xcel Energy](#) offers several renewable energy options for [commercial](#) and [residential](#) customers.
- The [Minnesota Solar Energy Industries Association](#) (MnSEIA) joined the [National Renewable Energy Laboratory](#) (NREL) Solar Energy Innovation Network (SEIN) team in 2018 to research methods for improving the nation's electric grid and pairing EVs with PVs. The [solar potential analysis report](#) was completed in 2018.

Collaborate on Long-Term EV Infrastructure Plan

Work with Xcel Energy to detail planned infrastructure installations over the next 5 – 10 years. The community leaders can provide tentative charging station locations based on a needs analysis or other strategies, and Xcel Energy representatives can help the community understand the electrical supply at each location. Using this information, the team can work together to outline a plan to install EV charging infrastructure that will be efficient, effective, and economical.

ECONOMICS

Strategies in this topic area address the financial considerations of installing public charging stations, including rate structure considerations, demand charge considerations, and payment infrastructure. These strategies are focused on communities looking to install public charging stations, but many of the same considerations would apply for private businesses looking to install stations for their customers.

Basic Information

There are two basic models of ownership for public charging stations:

1. Community or property owner management
2. Third-party management

In the first scenario, the community or property owner owns the station and is responsible for operations and maintenance, but also retains 100% of the revenue generated at the site. Many communities find that it takes more time and effort than they had anticipate to own and operate public charging, which is encouraging them to opt for the third-party management model.

The third-party management option means that the EVSE manufacturer retains ownership of the charging station. The terms of the agreement are determined on a case-by-case basis but may include the manufacturer renting the parking spot (or a broader area of land) from the community or property owner, splitting the profits from the station, or using the location in exchange of handling all planning, setup, and operations. For example, [EVgo](#) offers commercial, retail, and residential property owners the opportunity to host EV charging stations on their properties without any of the installation, maintenance, or operational responsibilities.

Additionally, EVgo works with local utilities to secure electricity for the site, promotes the location, and monitors energy use and station popularity.

Regardless of the ownership structure, there are generally fees associated with the use of public charging stations. An owner can opt for any of the following fee structures:

- **Fixed Fee:** A flat rate for using the charging station regardless of how long it is used or how much energy is used. This is most appropriate in situations where vehicles have reserved parking spots, which allows the owner to disregard vehicle turnover rate.
- **Hourly Fee:** Under this model, the vehicle is billed for how long it is parked in the spot. This is most appropriate in areas with high vehicle turnover or hourly parking fees already established. This structure can be adjusted to a per-minute fee for DC fast charging stations.
- **Energy Fee:** In this case, the user is billed for the energy used to charge the vehicle. This model is the easiest for building owners or station operators to match charging income with their operating expenses. Note: In some states, it is not legal for entities other than electric utilities to sell electricity. In those states, this fee structure is not an option.
- **No-Fee Pass Thru:** In some cases, communities and businesses allow users to charge for free or for certain hours. This trend may change as more people use chargers and the potential for demand fees goes up. While it may not be a long-term option, offers drivers an incentive to purchase or use an EV and promotes early adoption.

Owners may also choose to provide a membership or frequent user pass that provides a discounted rate for regular visitors. Be sure you understand your electric rate and the impacts of EV charging before setting rates. Contact your Xcel Energy representative for help understanding the available rates.

First Steps and Quick Wins

Initial steps for improving the economic benefits of integrating EVs into the community include some strategies that can be implemented quickly with limited financial investment. The strategies in this section offer suggested methods for tracking and billing EV charging at public charging stations.

Educate Consumers about Public Charging Fees

Create outreach materials or a simple website where residents can learn about public charging stations and associated fees, as well as regulations including locations, use rates, time limits, or others. Having uniform fees and regulations at all charging structures across the community will help consumers feel more confident in finding and using public charging stations. See the [Policy](#) focus area section for more information.

Examples:

- The [City of Seattle](#) published a [public charging informational handout](#) addressing the basics of EV charging as well as how to find chargers and what to expect.
- [EVgo](#) has a [dedicated webpage](#) regarding what to expect when charging on their network, which includes EV fast charging etiquette.

Integrate EV Payment with Existing Payment System

Many communities have electronic, app-based public parking payment systems. This is common for on-street parking as well as in parking lots and ramps. Communities can also use these existing parking payment systems to collect fees for EV charging stations they own and operate. This allows customers to use a system that they are already familiar with and reduces the overhead burden for the community to manage charging stations. Work with your IT department to understand the capabilities of the current system.

One example of a payment app used by many communities is [ParkMobile app](#), which has an integrated feature allowing users to pay for EV charging.

Conduct a Rate Study

Review existing utility rates available for planned EV charging station installations and determine the most beneficial billing method based on the projected charging patterns. As the charging stations are being installed, Xcel Energy customers can contact their account manager to review the electricity rates available and the best option given the expected loads. Electric rates may be affected by the following factors:

1. **Time-of-Day:** Some electric rates provide cheaper electricity overnight when there is less electricity use on the grid.
2. **Electric Demand:** Electric demand is a function of the number and size of loads plugged in at any given time.
3. **Electricity Use:** This measures the amount of energy used during the billing period.

The rate study can be used by municipal staff to set rates for charging stations. Most municipalities choose to set the rates to recuperate the costs of owning and operating the charging station but without the expectation of profiting from their use. This evaluation should be reviewed after the equipment is installed to ensure the use patterns match what was predicted and that the most appropriate rate was chosen. It will be important to periodically reevaluate the use patterns and available electric rates especially if new EV charging electric rates become available in your area.

Larger Efforts and In-Depth Studies

Larger efforts and in-depth studies can maximize the economic benefits of EVs in the community. However, these strategies may require additional planning, budget, and resources.

Conduct a Long-term Cost and Revenue Study

Review the cost and revenue by installing and studying some pilot charging stations. This data can be used along with vehicle projections and other community planning efforts to make long-term estimates of the costs of owning and operating charging stations. Many communities are providing charging to residents at low costs to encourage adoption of EVs. However, the community should consider the long-term vision of EV charging. Does the community own the infrastructure? Is it owned and managed by a third party? Do the charging fees cover expenses or are they a source of revenue? As EVs become more popular in the community, charging station pricing structures should be revisited. The community may also choose to transition public charging stations to third-party management to reduce time and expenses.

Examples:

- Research from the [UCLA Anderson School of Management](#) reviews potential EV charging models that will be more financially viable in their [Financial Viability of Non-Residential Electric Vehicle Charging Stations Report](#).
- The [Center for Climate and Energy Solutions](#) reviewed options to increase financial stability of public charging stations in Washington in the [Business Models for Financial Sustainability EV Charging Networks report](#).



EQUITY

Strategies in this topic area work to ensure EVs are accessible to underserved communities including low-income residents, communities of color, residents with disabilities, residents that speak a language other than English, and communities most greatly impacted by poor air quality.

Basic Information

Although the perception is that EVs are not available to low-income consumers due to their significantly higher base prices and historically low availability on the used car market, new and used EVs are becoming more affordable and more common, and, therefore, more accessible. The [Greenlining Institute](#) suggests that promoting EVs in underserved communities should include aspects that are (The Greenlining Institute, 2019):

- **Relatable:** Outreach materials and tactics must target the community in question. It is good practice to partner with community-based nonprofits or other community navigators that have already earned the trust of the community.
- **Accessible:** Accessibility starts with outreach materials. Ensure they are provided in the appropriate languages and the level of technical content and references are appropriate for the community. Next, you must ensure that the cost to purchase, lease, or rent the vehicle is appropriate based on the income level of the community. Finally, ensure that several options are available for providing payment or completing the proper paperwork to avoid technology or banking access barriers.
- **Practical:** Make sure the EV options presented to the community are appropriate for their mobility needs and abilities as well as presented in a safe and convenient location.

As each community is unique, there is no one solution for increasing EV transportation accessibility in underserved communities. Be sure to identify the unique barriers of the target communities before developing strategies.

First Steps and Quick Wins

Initial strategies for incorporating equity into EV integration discussed in this section can be quickly implemented with limited financial or time investment. These strategies will help ensure all community members are being considered throughout the planning process.

Set an Equity Goal

Work with local stakeholders to set an EV equity goal. The first step to improving equal access to EVs and charging infrastructure is to identify neighborhoods or populations that may not typically consider EVs (such as low-income communities) or have been excluded from previous outreach efforts (such as communities that speak English as a second language). A community may also choose to reach out to populations that have carried a disproportionate burden of air quality impacts from ICE vehicles.



Equitable Electrification:

Providing equitable access to public charging stations continues to challenge communities across the nation. The Greenlining Institute developed [Electric Vehicles for All: An Equity Toolkit](#) to provide clear guidance for making an equitable transition toward transportation electrification. The toolkit includes a section on “Making EVs Practical and Accessible” which covers addressing specific mobility needs and equitable charging infrastructure.

Once you have identified the target population, you can set outreach goals and strategies. It is important to include key community navigators in the target population that are respected leaders or voices in the development of plans, messaging, and outreach. It may make sense to incorporate these outreach efforts in with other broader programs and efforts. It often takes concerted efforts at the municipal and stakeholder level to counteract institutional barriers, implicit biases, and language or knowledge barriers that prevent many of these underserved communities from considering or using EVs. Messaging platforms, communication strategies, key locations, and important leverage points are all different in underserved populations and usually must be addressed with different strategies than traditional outreach and education. The key messaging will also vary between underserved communities, so it is important to work with each identified community navigator to understand how to best reach a specific community.

Example:

- The [Puget Sound Clean Air Agency](#) conducted a [feasibility study](#) to evaluate options for encouraging EV use among low-income residents.

Establish an Equity Checklist

Create a checklist of criteria to consider as strategies are developed to ensure equity in projects. The checklist could be for initiatives specific to EVs or a more general checklist that can be used for broader sustainability initiatives. The checklist should be designed to help ensure that strategies to promote EVs do not exclude underserved populations. Some considerations include:

- **Language:** Ensure that the language used to communicate the strategies is easily understood by all. This may include translating for populations where English is not the primary language and using common words and phrases.
- **Accountability:** What data or metrics will be used to identify disparities among populations and track progress removing those disparities?
- **Inclusive Engagement:** How have community members participated in the development of strategies or implementation plans in the past? Are there opportunities to expand this engagement to underserved populations such as low-income residents or communities of color?
- **Economic Opportunity:** If there is economic opportunity available through the implementation of the strategies, are there opportunities to support low-income populations or communities of color through workforce development?
- **Disproportionate Impacts:** What populations will benefit from the identified strategy? Does this promote equity within your community?

These criteria are adapted from the [racial equity tool](#) developed by the [City of Cleveland](#) in conjunction with their climate action plan to evaluate identified strategies. The [Adaptation Clearinghouse](#) also provides an [equity checklist](#) for all projects.

Adopt an EV Driver Bill of Rights

Establish an EV driver bill of rights outlining the rights of drivers related to EV purchasing, charging, and ownership to help ensure a positive experience for all residents choosing to transition to EVs. This document can be drafted by community staff with specific local consideration, or more general versions can be provided by groups promoting EV adoption.

Examples:

- The [Sierra Club](#) includes a [sample bill of rights](#) as part of their [policy toolkit](#).
- [California House Resolution No. 117](#) is an example of an EV driver bill of rights that has been adopted.

Encourage or Establish an EV Car-Share Program

Communities can collaborate with ride-hailing companies, such as Uber and Lyft, and car-sharing companies, such as Zipcar, to provide exposure of EVs to residents that might not be able to afford an EV. Car-sharing programs are growing in popularity as a way for more people to be comfortably car-free by allowing people to rent a vehicle for a short period of time to run errands or other intermediate needs. Often, these cars are parked on a campus or at a community center where residents can check them out using a cell phone app or other method. EVs are a good fit for this context since such vehicles have designated parking spots and could be charged in those spots. Selected EVs should have the appropriate battery range for typical use. Additionally, renters should be provided the appropriate information about how to operate the vehicle and find charging stations as needed. PHEVs may be a better fit for these services to avoid range anxiety.

Examples:

- The [Greenlining Institute](#) compiled [considerations for EV car sharing](#) in underserved communities with recommendations for incorporating EVs into ridesharing programs in low-income communities.
- [Forth Mobility](#) published a [report](#) describing their pilot for affordable EV car sharing in a neighborhood in northeast Portland.
- [HourCar](#), a car sharing service based in Saint Paul, MN, is beginning to [transition their fleet to EVs](#) and plans to be fully electric in 2020.
- [BlueLA](#): The partnership between the BlueLA car-sharing service and the Los Angeles Department of Transportation allows members to use EVs for a monthly fee and a fee per minute of use from self-service kiosks throughout the city. Income-qualified members can receive discounts.

Incorporate ADA Compliance into Siting Requirements

Establish [ADA](#) requirements for all charging station installation. While there are not currently ADA requirements governing the installation of charging stations, there are several aspects of ADA specifications that can be applied to EV charging infrastructure to make it more accessible for drivers with disabilities. Existing standards in [Section 308.2.1 of the 2010 ADA](#) state that forward reach range for an adult shall be between 15 and 48 inches above the floor. If installed on a curb, the maximum height is permitted to be 54 inches. Additional requirements are included for situations where the wheelchair is obstructed from approaching the charger. The community should also consider whether to require EV charging stations to be installed in parking spaces with appropriate clearance and near entrances.

Examples:

- The [City of Atlanta](#) outlines accessibility requirements for EV charging on page 18 of its [EV Readiness Workbook](#).
- The [Clean Energy Coalition in Michigan](#) defines guidelines for the number of accessible spots and the recommended layout in the Siting and Installation Section on pages 113–120 of [Plug-In Ready Michigan](#).
- The [California Building Officials](#) supported a compilation of [recommendations](#) regarding accessibility to EVs and appropriate signage for charging infrastructure.

Larger Efforts and In-Depth Studies

Including equity in EV integration will involve some strategies that require additional planning, budget, and in-depth research. These larger efforts will promote long-term success and involvement throughout the community.

Conduct a Community Mobility Needs Assessment

Conduct a mobility needs assessment to evaluate the daily travel needs and transportation modes of target populations to identify opportunities to incorporate EVs. This evaluation can be conducted through focus groups, interviews with community navigators, or community surveys. Be sure to understand the residents' mode(s) of transportation, typical trip lengths and timing, as well as any barriers to EV use, such as lack of driver's licenses. This assessment could be included in a larger community needs assessment, which would save time and money.

Examples:

- [Community Tool Box](#) provides [a guide](#) for developing a local needs assessment that could be applied to mobility needs.
- [Boulder County in Colorado](#) developed [a comprehensive mobility needs assessment and action plan](#). One EV strategy identified in the assessment is [eGo CarShare](#).

Enact Low-Income Financing Mechanisms

Create a grant or special financing for EV purchases to help spur EV adoption in low-income neighborhoods. Since cost is often the most substantial barrier to EV adoption, especially in low-income communities, this is an important strategy. Low-income neighborhoods are likely to be most greatly impacted by air pollution and stand to benefit significantly from cleaner vehicles. Additionally, public charging infrastructure should be implemented in parallel to support those low-income neighborhoods.

Examples:

- The [California Air Resources Board](#) has established a rebate for income-qualified residents that lease or buy EVs through the [Clean Vehicle Rebate Project](#).
- The [State of Oregon](#) offers a [clean vehicle rebate program](#) with an additional incentive for income-qualified individuals.

ECONOMIC DEVELOPMENT

A community's transition to EVs has the potential to spur significant economic development. Strategies in this topic area focus on capitalizing on the benefits of the transition.

Basic Information

The potential macroeconomic benefits from the transition to EVs include:

- **Alleviation of Transportation Burden:** An average American household spends about 20% of its income on transportation, while low-income households spend up to 30% (Vaidyanathan, 2016). By reducing the operations and maintenance costs through transition to EVs, funds are freed up to spend on food and medical expenses, improving the health and well-being of the household.
- **Reinvestment of Fuel Savings:** Studies have found that EV drivers save “hundreds to thousands of dollars per vehicle annually” compared to ICE vehicles through fuel savings (Energy and Environmental Research Associates, LLC, 2017). This allows residents to reinvest in the local economy and quality of life.
- **Vehicle Manufacturing Jobs:** While the lifetime costs of EVs are less than ICE vehicles, the up-front costs associated with EVs are currently higher. However, studies have shown that more jobs are created in by vehicle manufacturing than by fuel production. A nationwide study found that the transition to EVs between 2015 and 2040 could increase economic output by \$20 billion and generate a net 147,000 jobs (Energy and Environmental Research Associates, LLC, 2017).
- **Mitigating Oil Price Shock Effects:** If the transportation sector can largely transition to electricity, it is less likely that there will be significant swings in the impact of fuel prices, as electricity prices are much more stable than those of petroleum.

The economic impacts of transitioning to EVs are likely to vary by community, but understanding the opportunities early, a community can plan to take advantage of them by pursuing key strategies.

Create an EV Industry Cluster Map

New businesses may capitalize on the significant opportunities presented by the emerging EV market. To help your community benefit from these emerging businesses, you can build an industry cluster map showing the relationship of businesses to increased EV use. A sample of this kind of mapping is shown in Figure 1 (ICF International, 2014). This map can be used by the community's economic development department to attract businesses or industry that support the EV transition as well as promote general community economic development.

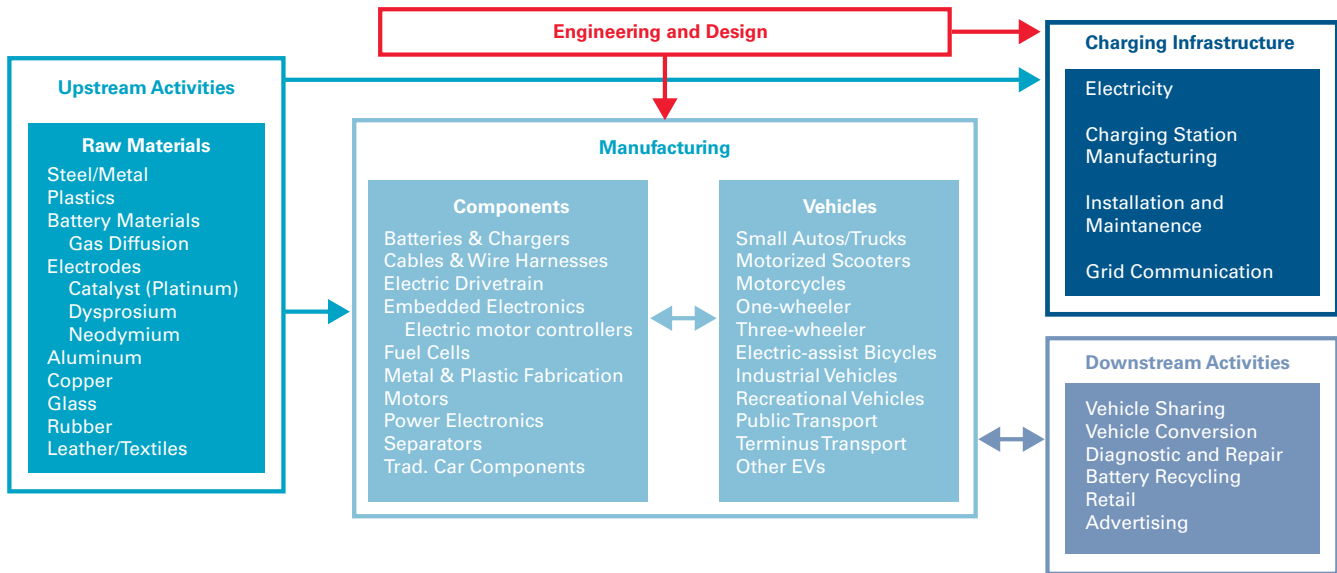


Figure 2: EV Industry Cluster Map

Source: Adapted from NERC 2013

Larger Efforts and In-Depth Studies

Larger efforts in economic development will include in-depth studies and a unified understanding of EVs in the community's workforce. The following strategies could result in long-term success of EVs within the community's economic development and may require additional planning, budget, and resources.

Conduct a Local Economic Development Impact Assessment

Evaluate the anticipated local economic impact of EVs. This assessment will allow the community to make a more informed decision around financial investments to promote EV transitions. Transitioning to EVs will mean that less household income will be spent on gasoline and could be spent instead at local businesses. Money spent on household expenses rather than fossil fuels has been found to create 16 times more jobs in the local economy (Salisbury, 2014). Significant local economic opportunities are also created through the design, manufacturing, and maintenance of EVs.

Examples:

- The [Southwest Energy Efficiency Project](#) completed a study of the [economic and air quality benefits of EVs in Nevada in 2014](#).

Develop Goals and Incentives for New and Existing EV Businesses

Based on an EV industry cluster map, set goals and create a plan to attract and retain new businesses to allow the community to benefit from the EV market growth. This can be

a collaboration between the community's economic development department and local businesses. Once goals are identified, community staff members can work together to identify strategies. The strategies might link economic development zone activities to tax credits or incentives, focus on retention in addition to recruitment, or emphasize subsets of industry clusters to target for expansion and relocation.

Examples:

- [Coachella Valley Association of Governments](#) outlined strategies for economic development on pages 45–48 of their [EV readiness plan](#).
- The [State of California Office of Planning and Research](#) published a [guidebook](#) for communities to become EV-ready that includes details about economic development strategies and goals.

Establish and Promote EV Workforce Pipeline and Training

Develop a plan to promote green-collar jobs that support EVs and the associated infrastructure. These jobs may include mechanics and electricians that specialize in EVs and charging infrastructure. This strategy can be used to help provide job training to underserved communities or workers displaced by the shift away from fossil fuels. A full list of all green-collar jobs associated with EVs can be found at the [Bureau of Labor Statistics](#).

Examples:

- The [Twin Cities Electric Vehicle Mobility Network](#) is a project focused on developing a network of charging hubs throughout the Twin Cities. Additionally, this project will launch an EV car-sharing service to improve EV access to community members in the Twin Cities. The project is a collaboration between the City of Saint Paul, the City of Minneapolis, HOURCAR, and Xcel Energy.
- The [Ella Baker Center for Human Rights](#) developed a [report](#) that recommends steps for developing green-collar job training.
- [Xcel Energy Partners in Energy](#) provides a [workforce development toolkit](#) outlining simple steps to help your community provide underserved and disadvantaged groups with job training and resources.

Equitable Workforce

Development: As new EV-related jobs become available in your community, ensure that these high-quality jobs are accessible to underserved community members.

[The Greenlining Institute](#) recommends targeted and local hiring policies, developing career pathway jobs, and removing barriers to employment (e.g. employer discrimination).

PARKING, SIGNAGE, AND ENFORCEMENT

Strategies in this topic area focus on ensuring EV parking and charging locations are clearly

signed and have consistent parking enforcement to standardize the charging experience across the community. These strategies are important to building community confidence in the public charging station network.

Basic Information

The Federal Highway Administration (FHWA) designs standard signs for public highways and streets. The current [Manual on Uniform Traffic Control Devices \(MUTCD\)](#) was developed in 2009 and does not include EV signage. The FHWA has adopted interim designs for EV charging stations until the next update of the MUTCD. These designs are shown below and can be combined with arrows for wayfinding off major thoroughfares (U.S. Department of Energy, 2019). The guidelines outlined in the Chapter 2A, Part 2 of the MUTCD regarding sign placement and visibility apply to these signs.

Statewide Plans: The [Colorado EV Plan 2020](#) Commits to “develop and provide guidance on HB19-1298 Charging Station Parking Enforcement including signage recommendations and best practices by July 2020” (pg. 21)

[Accelerating Electric Vehicle Adoption: A Vision for Minnesota](#) highlights the importance of regional coordination in developing uniform EV signage and using wayfinding signage as published by the Manual on Uniform Traffic Control Devices (MUTCD).



First Steps and Quick Wins

These strategies are designed to be first steps for communities looking to establish consistent parking regulations for EV charging and can be implemented with minimal investment of capital and time.

Allow Right-Of-Way EV Charging

Allow EV charging and parking in right-of-way locations to increase the opportunities for EV charging station installation. This shows preference for EVs by placing parking spaces in optimal locations and boosts visibility of EV-friendly infrastructure to residents and visitors.

Examples:

- The [Sierra Club](#) developed [sample legislation](#) for allowing EV charging in right-of-way locations.
- The [City of Seattle](#) created [a program](#) for EV charging in the public rights-of-way.

Establish and Enforce Parking Rules

Collaborate with private partners to establish and enforce consistent rules for EV parking spots and develop signage. Having a consistent experience at charging stations across the community will help EV drivers feel more comfortable finding and using public charging

options. Enforcement of these regulations should be paired with public outreach to help drivers understand the regulations. These regulations may include:

- **Time Limit:** How long an EV can use a charging location? Keep in mind the charging rate for the charging station when establishing time limits. Level 2 chargers will need at least two hours to provide a substantial charge, while Level 3 chargers only need about 30 minutes.
- **Charging Requirement:** Does an EV need to be actively charging to use the parking space or can any EV use the parking spot without using the charger?
- **Penalty:** What are the penalties for vehicles that are in violation of the regulations?

Examples:

- The [U.S. Department of Energy](#) provides interim standards for EV signage that have been approved by the Federal Highway Administration on the [Alternative Fuels Data Center](#).
- The [City of Atlanta](#) specifies EV charging space designs in its [EV readiness workbook](#).

Larger Efforts and In-Depth Studies

The following strategies are intended to promote EVs through parking opportunities and may require more capital or time investments. The resulting potential will have a greater or more lasting impact.

Provide Discounted Parking for EVs

Provide discounted or free parking passes at community-owned parking facilities for EVs. This strategy has the most impact in parking garages or other areas where community members purchase monthly or annual passes. Residents can apply for the pass through the standard permitting channels and provide vehicle registration or other proof of an EV to receive the discounted or free parking pass.

Examples:

- The [City of Aspen](#) provides permits to EV users for [free parking](#) in residential areas.
- The [City of Sacramento](#) provides special [monthly parking rates](#) for EVs in city-owned parking garages.
- The [City of New Haven](#) in Connecticut provides a pass for [free parking](#) for EVs or alternative fuel vehicles that have a fuel efficiency rating greater than 35 mpg.

Resources

- The [U.S. Department of Energy](#) published the [handbook for charging station hosts](#) that includes information on ownership and payment models.
- The [Greenlining Institute](#) published an [equity toolkit](#) describing the benefits and strategies for focusing on under-served communities.