CALIFORNIA GOVERNOR'S OFFICE OF BUSINESS AND ECONOMIC DEVELOPMENT

Electric Vehicle Charging Station Permitting Guidebook

California Governor's
Office of Business and Economic
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Additionally, several publications formed the foundation of this guidebook. A list of select resources can be found at the end of this guidebook.

Any errors in the Guidebook are the sole responsibility of the Governor's Office of Business and Economic Development. With that in mind, we are always looking for ways to improve the resources we create. Please send suggestions to zev@gobiz.ca.gov.

Images courtesy of the Bay Area Air Quality Management District, EVgo and the California Energy Commission

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Executive Summary

California is at the beginning of a massive transformation from internal combustion to zero emission vehicles. The question is not "if" we will complete the transition, the question is "when." "When" matters. Timing pivots on our collective ability to streamline zero emission vehicle infrastructure development.

California's transportation sector remains the single largest contributor of emissions for both greenhouse gases and health impacting criteria pollutants. Nearly 3 million Californians suffer from asthma and climate change impacts are already worse than expected.[1,2] The solution is to reduce drive times and distances, and eliminate emissions from the transportation system. Each zero emission vehicle (ZEV) that replaces the function of an internal combustion vehicle brings us closer to the long-term goal of a carbon-neutral transportation system.[3]

To reach true market potential as quickly as possible, California should be the most straightforward place in the country to install market enabling ZEV charging and fueling infrastructure. The goal of this guidebook is to hasten the transition to plug-in electric vehicles (PEVs) by simplifying the deployment of electric vehicle charging stations. We aim to accomplish this by creating a shared foundation of understanding for how cities, counties, and developers can work together to streamline the planning, permitting, installation, and ongoing operation of electric vehicle charging stations and supporting equipment.

The guide is comprised of eight parts. Throughout the guidebook, we include three layers of information: context, requirements, and recommendations or best practices. We dive into the greatest depth in four key areas: planning, permitting, accessibility, and grid connection, and tie recommendations together with a ZEV Readiness Scorecard and checklists at the end of the document. The best-case scenario includes a local government committed to strong building standards and electric vehicle related planning; a streamlined and transparent permitting process, inclusive of applying an informed approach to ensuring accessibility; a predictable connection to the grid, when applicable; and a well-informed electric vehicle charging station developer who has benefited from easily accessible resources.

Planning: Local authorities having jurisdiction can create a ZEV future by incorporating ZEV infrastructure into city planning initiatives and adopting voluntary building codes to ensure supporting infrastructure is installed at the least costly point in time—during construction. Clear planning direction can help station developers with their project proposals, just as understanding how station developers choose sites can help inform permitting processes.

Permitting: California's electric vehicle charging station permit streamlining law (AB 1236 Statutes of 2015, Chapter 598) was enacted to address mutual frustration: electric vehicle charging station providers wanted to speed the permitting process; and cities and counties often needed better information from applicants and/or a directive to create streamlined processes.

To help address these frustrations, AB 1236 establishes permitting process and communication requirements for cities and counties—essentially putting best

1 State of the Air, 2018. American Lung Association.

2 California's Fourth Climate Change Assessment.

3 Executive Order B-55-18.

4 Hydrogen and fuel cell electric vehicles, which are a complimentary zero emission vehicle technology, are addressed in the companion Hydrogen Station Permitting Guidebook.

practices into statute. However, to meet California's ZEV goals, we need communities to implement AB 1236 and improve upon its requirements by sharing on-the-ground learnings and best practices. The electric vehicle charging industry continues to rapidly evolve and ultimate success hinges on ongoing dialogue and process improvements.

Accessibility: As a market leader, California is also the first state in the nation to develop electric vehicle charging station accessibility regulations to define compliance with the broad responsibility under the federal Americans with Disabilities Act. The State developed these regulations to provide certainty for cities, charging station providers, and property owners to help balance co-equal goals of deploying infrastructure and ensuring broad access to services. Implementation of these rules often comes down to local interpretation. This guide provides the context for the development of the accessibility regulations and suggests resources to help local building officials and station developers deliver projects that benefit all ZEV drivers.

Grid connection: Electric vehicle charging stations are one of many grid-connected services vying for utility attention. This guide explores the preferred processes for California's five largest utilities, all of which are committed to electrifying transportation.

In addition to the above subject areas, the guide addresses the construction and commissioning of stations and looks forward to a California with normalized electric vehicle charging station development processes and ubiquitous zero emission vehicles. To get there, California has many advantages. We have the most robust ZEV market in the country—the most charging and fueling stations, the most vehicles, and the most experienced city and county planners, building officials, and local leaders.

While ultimate success is not inevitable, experience has shown that just one dedicated individual within a local government can catalyze efforts that turn their city or county into a model ZEV enabling community. These leaders have come from local planning, building, and sustainability departments. They have been elected officials and regional decision makers, and all of them play a vital role in meeting our collective vision.

Bold local and regional leadership, constructive station developers, and a small amount of shared, dedicated effort to streamline station development can help make local jurisdictions leaders in ZEV adoption and the future of transportation. California is committed to working with these partners to create the replicable systems necessary to create the future our health and climate depends on.

Image courtesy of Adopt a Charger

Images courtesy of EVgo and Tesla

PART 01:

Setting the Stage

The transportation sector stubbornly remains the largest contributor of greenhouse gas and criteria pollutant emissions in California.[5] We cannot meet our state climate and air quality objectives without a massive, near-term shift from internal combustion engines to zero emission drivetrains.

The State of California is a national and international leader in the deployment of zero emission vehicles (ZEVs). These cars are any type of vehicle that has no tailpipe emissions. They run on electric motors and are powered by electricity stored in batteries or created onboard using hydrogen and fuel cells.

In contrast to conventional internal combustion vehicles, ZEVs produce zero tailpipe emissions, preventing harmful greenhouse gas and criteria pollutants from being released into the environment. They can also help integrate renewable energy into the transportation sector. Moreover, the communities most burdened by air pollution are often the ones along major transportation and shipping corridors and a switch to ZEVs will help alleviate that burden.

To support California's ambitious ZEV deployment goals—5 million ZEVs in California by 2030—the state is prioritizing the development of infrastructure to support these vehicles, in the form of plug-in electric vehicle charging stations and hydrogen fueling stations.[6] At the most fundamental level, infrastructure enables the deployment of ZEVs. When consumers look to buy a new or used car, they need confirmation that it will be able to take them where they want to go. Widespread availability of infrastructure ensures that Californians will have that confidence.

In addition to benefitting ZEV drivers directly, the installation of ZEV infrastructure benefits communities. Each ZEV on the road means incrementally cleaner air, regardless of who owns or drives the vehicle, and the presence of chargers attract drivers to local establishments—generating revenue for local businesses. Furthermore, ZEVs keep fuel spending local and are often less expensive to operate than conventional vehicles—saving residents and visitors money.[7]

This guidebook is comprised of eight parts and is intended to help navigate station developers and local jurisdictions through the infrastructure development process from selecting sites for plug-in electric vehicle charging through the permitting and construction processes. This guidebook goes into greater depth in Part 3: Permitting, Part 4: Accessibility, and Part 5: Grid Connection, due to the influence these stages can have on the overall project timeline and cost.[8] We provide clarity and tips on implementing the statewide permitting streamlining requirements (AB 1236, 2015), as compliance with and understanding of these requirements are vital to ensuring ZEV infrastructure deployment across the state.

Ultimately, a successful transition to zero emissions hinges on success at the local level. Success up to

5 California's 2017 Climate Change Scoping Plan.

6 Plug-in electric and hydrogen fuel cell electric vehicles are complimentary zero emission technologies.

7 Strategen Consulting Impact Analysis: Governor Brown's 2030 Energy Goals.

8 Key definitions can be found in Part 8 of this document.

this point has been a necessarily iterative process as the ZEV stakeholder community has learned how to best deploy chargers in a variety of settings. This guidebook reflects the latest best practices collected from stations developers and local jurisdictions with experience in developing and approving electric vehicle charging stations. We hope this experience can save time and minimize iterations for both station developers and local jurisdictions. The faster we deploy safe and reliable infrastructure, the sooner we accumulate the benefits ZEVs bring to our communities, the state, and, ultimately, the world.

PEVs in California Today

Plug-in Electric Vehicles (PEVs) as a percentage of new passenger car sales continue to increase. PEV sales exceeded 5% of all new passenger car sales in California 2017 and comprised approximately 8% of sales in 2018. In total, well over 600,000 PEVs have been sold in California as of the publishing of this document.[9] With the increasing popularity of ZEVs and increasing ZEV sales, the need for ZEV infrastructure is increasingly important.

Station Counting

The Alternative Fuels Data Center (AFDC) maintains a database of publicly available charging stations. This data can be accessed by drivers and app developers alike to help ensure drivers understand their charging options when not charging at home or work. However, public charging only tells part of the story—California's 250,000 chargers by 2025 target includes private workplace and multifamily chargers, both of which serve core market development functions.

The State of California is partnering with the AFDC to collect data on workplace and multifamily chargers—this data is not intended to pinpoint locations on a map, but to help all stakeholders better understand progress towards our charger deployment goal the impact that shared, private chargers have on the market.

Station developer/owners/site hosts are encouraged to submit their data to the AFDC using their existing relationship with AFDC and/or via the AFDC New Station Submittal web form. AFDC staff will work with station owners/site hosts to ensure data is secure and to prevent double-counting.

Image courtesy of Adopt a Charger

As of June 25th, 2019, there are 20,653 public chargers in California. This includes Level 1 (4–5 miles of range per hour, 367 chargers at 169 sites), Level 2 (12–70 miles of range per hour, 17,216 chargers at 4,764 sites), and DC Fast (3–20 miles of range per minute, 3,070 chargers at 685 sites).[10] For the purposes of this guidebook, a charging station is defined as an electric vehicle charging space served by an electric vehicle charger. A multiport electric vehicle charger that can charge vehicles in multiple spaces simultaneously is counted based on the number of vehicles that can charge at one time.

A map of chargers statewide is available through the federal Alternative Fuels Data Center Station Locator tool. Publicly funded stations are required to report to this database and an increasing number of private stations are submitting data to help stakeholders track overall deployment progress. California is working to develop better tools to track stations in multi-unit dwellings, workplaces, and other private shared stations that are not required to report to this database. As a station developer, authority having jurisdiction (AHJ), or site host, you can help develop robust statewide statistics by reporting your stations to help state and local leaders better understand

9 See Veloz for ongoing sales data: https://www.veloz.org/sales-dashboard/.

10 Note: not all public connectors serve all plug-in electric vehicles and not all connectors can be used simultaneously. Tesla, for example, operates a network of chargers dedicated to Tesla vehicles. Furthermore, a substantial number of shared private chargers, often found in workplaces or in multifamily housing, help ensure ZEV adoption and are not accounted for in this count. Finally, single family home-charging, when available, is a key market enabler and is also not accounted for in the connector count.

the charging availability and needs statewide.[11] We are working to develop a clearer understanding of California's plug-in electric charging picture in non-public use cases, without releasing geographically sensitive information (for chargers installed for a particular set of users, for example).

Path to 2030

California has established ambitious ZEV infrastructure and vehicle targets for the state—250,000 shared plug-in electric vehicle chargers, including 10,000 direct current fast chargers (DCFC) and 200 hydrogen stations, by 2025. These targets were set to put California on the path to host 5 million ZEVs by 2030.[12]

More information on the plug-in electric charger targets is detailed in the California Energy Commission's Electric Vehicle Infrastructure Projection (EVI-Pro) Analysis and the supporting county-level Visualization Tool. EVI-Pro simulates household travel behaviors to quantify the charging infrastructure necessary for plug-in electric vehicles to meet the current needs of drivers across the state. The EVI-Pro analysis estimates that, by 2025, California will need between 229,000 and 279,000 plug-in electric chargers, including public, workplace, and multi-unit dwelling chargers. This projected need for chargers is in addition to single-family home chargers, which serve as the primary charging location for most plug-in electric vehicle drivers.[13]

Charging needs vary across different areas of the state, market segments, and communities. Suburban communities primarily occupied by single-family homeowners may not require as many public chargers per vehicle as drivers will be able to charge at home, while urban areas or those with large numbers of renters and unassigned parking will require more shared access charging (in both public and private locations).[14] Rural community needs are likely to vary, depending on typical travel patterns and vehicle types. Charging can and should be considered in general planning, transit planning, and other mapping and planning of regional, local, and community travel patterns.

Scope and Purpose

The intent of this guidebook is to add value for plug-in station developers and local AHJs and help both parties navigate emerging challenges that remain for the installation of plug-in electric vehicle charging. The content reflects our efforts to prioritize new and emerging issues for plug-in electric vehicle charging, and within that context, issues that can be addressed at the statewide level to streamline the station permitting and development process.

Although station developers and AHJs are our two main audiences, we elaborate on site host challenges when appropriate and recognize the complexity of the utilities' role in station development (e.g., sometimes utilities are a station developer, sometimes they solely handle the connection to the grid).

This guidebook focuses primarily on the permitting process, detailing obstacles and emerging challenges and spotlighting best practices from jurisdictions and station developers across the state. We provide context on site selection and other issues to help illuminate, for both station developers and AHJs, the constraints that they operate under and the decisions that inform permitting processes.

Part 2 of this guidebook focuses on planning for charging stations with a focus on actions cities and counties can take such as incorporating ZEV infrastructure into planning efforts and adopting stretch building codes. The section also explains how station developers select locations with the goal of informing station approval processes.

Part 3 focuses on permitting including considerations prior to submitting a construction or building permit application for a charging installation, best practices for charging station permitting, compliance with AB 1236 permit streamlining requirements, and how to prepare a permit application.

Part 4 addresses the implementation of California's regulations for Americans with Disabilities Act compliance.

Part 5 focuses on interconnection with the grid, with sections on the processes for California's largest utilities.

11 Station developers and site hosts can help by submitting private station data to the Alternative Fuels Data Center: https://www.afdc.energy.gov/stations/#/station/new. Note, stations marked "private" in the data submission will not be included in any public facing maps.

12 Executive Order B-48-18.

13 See "Quantifying the electric vehicle charging infrastructure gap across U.S. markets," ICCT (2019), pg. ii.

14 The majority of plug-in electric vehicle charging occurs at home and importance of this segment cannot be overstated. However, this document primarily focuses on charging at shared locations (public, workplace, multifamily), which have historically have been the most challenging to develop.

Part 6 covers construction, commissioning, and operation, including what to expect from a building inspection and information on signage.

Part 7 takes a brief look forward, acknowledging the fact that station development is a process that can continually be improved.

Part 8 provides key definitions, the ZEV Readiness Scorecard that GO-Biz will use to track station permit streamlining and voluntary building code adoption efforts, checklists for stakeholders to reference as they work to improve the overall ZEV infrastructure development system, and the text of AB 1236

This guidebook does not cover how to seek and attain funding for station development. We begin at the site selection phase under the assumption that funding has already been secured. If you are looking to secure funding, we recommend consulting resources such as the GO-Biz ZEV Incentives webpage.

This Guidebook and the 2015 Hydrogen Station Permitting Guidebook serve as the companion documents to the 2013 ZEV Community Readiness Guidebook, a publication from the Governor's Office of Planning and Research that provided an early comprehensive guide to the steps communities can take to support increasing adoption of ZEVs.

Images courtesy of the Bay Area Air Quality Management District and Electrify America

Image courtesy of EVgo

PART 02:

Planning and Site Selection

In this section of the guidebook, we explain the site selection and approval process from both the station developer and the AHJ perspective. Key questions include: Where is the best location to place stations to ensure ample utilization and, if applicable, secure a return on investment, however that return is defined? Should level 1, level 2, or DCFC stations be installed? Where on the property should chargers be located? Should the stations be grid connected or standalone?

How Station Developers Select Sites

Station developers look at a variety of factors in selecting sites. Depending on their business model, each station developer will consider and prioritize factors differently. Some station developers select, secure, and operate stations at sites. They may sign a contract with the property owner for the right to operate a station in a certain parking space and hold responsibility for all operations of a station. Other station developers may only select and secure sites and leave owning and operating the station to the property owner. Finally, some station developers do not engage in site selection at all, and contract with site hosts who are already interested in installing charging stations. In this chapter, we look at the selection process with intent to inform AHJs of all the work that has already gone into site selection by the time a site makes it to the permitting stage.

Filtering Potential Locations

Station developers may consider many sites, evaluate different criteria at each one, and reach out to several different site owners before selecting projects

Heavy Duty Vehicle Charging—Make-Ready Opportunities Are Here and Now

Heavy-duty fleet operators can prepare facilities for electrification years in advance of actual truck deployments. Electrified parking improvements require conduit, trenching and electrical panel upgrades that can be sized to support future heavy-duty electric truck charging. Contractors and facility managers should be proactive when making decisions to upgrade or modify their site's existing infrastructure so that their improvements can double as make-ready investments for future charging equipment. Being proactive in this decision can save tens of thousands of dollars in construction cost for future charger installments. The best practice is to add conduit sized for planned power as well as 1" conduits for internet, and a conduit for a low power 120V outlet near the planned charging equipment. The main conduit provides electricity to charge the vehicle, the internet conduit to allow for network capabilities, and the 120V outlet powers the charger interface.

Image courtesy of Penske Truck Leasing

to move forward. The site selection process can be different for each station developer, but some general principles apply.

At least five key factors play a role in determining site selection:

1. **Location.** Station developers typically use public or proprietary data on travel patterns, fleet use, nearby amenities, throughput and availability to the public, and/or local knowledge to evaluate whether a station will receive enough use to justify investment.
2. **Available space.** A great location only works if there is room for the charging equipment.
3. **Permitting.** A site that is difficult to permit can add months to a project. Conversely, a streamlined permit process opens opportunities for more investment. AHJ's can help attract charging stations by streamlining their permitting processes (see Part 3: Permitting).
4. **Electrical capacity and location of service.** Utility interconnection can add considerable cost when trenching and/or upgrades are required; sites with excess electrical capacity or well-located electrical service are attractive. More information on connecting to the grid is provided in Part 5: Connecting to the Grid.
5. **Property ownership.** Ultimate success depends on a willing site host, and charging projects often need to compete against other uses.

Negative grades for any of the above factors can kill a project.

Securing a Specific Site

By the time a potential station first appears on the radar of city or county planning and building departments, a landlord and station developer have typically been involved in months of negotiation and contract development. In many cases, a site host and station developer will negotiate a property license agreement regarding a specific piece of land on which the parties have agreed to place the station. These negotiations result in a site that addresses site host concerns (accessibility, construction impacts, and site host customer experience) and station developer needs (cost, access to power, sufficient space, well-lit and visible, and acceptable elevation grade).

While there are many benefits to having charging stations on-site, potential site hosts can be hesitant to host charging stations having concerns about limiting non-electric vehicle parking capacity at the site, the amount of rent (if any) that will be paid to lease the parking spaces, and concerns about whether

Adequate Clearance for Medium-Duty Vehicles

Plug-in medium-duty vehicles are increasingly common in commercial fleets. The electrification of work trucks (including full-size vans, pick-ups, box trucks, step vans and other delivery vehicles) is essential to reducing transportation sector emissions and should be given deep consideration when planning EVCS projects. There is considerable near-term potential for the commercialization of the medium-duty vehicle class given the match of technological capability and market demand.

While similar to light-duty charging in the site selection and development, medium and heavy-duty charging differs in the following ways:

1. **Chargers often require more power to support the vehicle adequately. Demand for electricity scales with vehicle size. Whereas a 20kW charger may be sufficient for a light-duty vehicle, 100+kW can often be a baseline for heavy-duty. This multiplicative increase in electrical demand affects every part of the site plan while most notably affecting the sizing of the utility transformer.**
2. **Fleet operators may have an added interest in deploying on-site storage and renewable power generation to manage demand charges. The payback for on-site storage and energy generation technologies can be particularly attractive for projects serving heavier vehicles given the increased consumption of electricity.**
3. **These stations require extra clearance as the vehicles' maneuverability are limited. Where possible, avoid low-hanging canopies, tight turns, and compact spaces. Even panel vans may be prevented from charging at a compact-sized parking space.**

Image courtesy of Electrify America

Electrical capacity and site viability

On a single property, such as a shopping center, electrical capacity and location has a major impact on where a DCFC station can be built economically. For example, station developers have reported that two sites in the same shopping center parking lot could range in construction cost by substantially more than $100,000 if one location requires trenching or boring and the other does not.

individuals visiting the site to charge will patronize their business. Additionally, site hosts do not always have information on the electrical capacity of their building which adds an additional complication to the site host solicitation process. When using charging management hardware or software to avoid large electrical upgrades, station developers often must educate site hosts and electricians about the technology and help alleviate any initial concerns about impacts on the property and utility bills.

Even after site control is secured and the two parties have worked out a contract, site control may still be delicate. If a building or construction permit application has to go through multiple rounds of comments and if extensive unanticipated construction or extraneous site improvement is added as a condition of approval, site hosts can become frustrated with the process and withdraw from the agreement.[15] The bottom line is that whenever a station developer is installing stations at a site they do not own or where they do not have a pre-existing relationship, taking the time to understand and work through potential site control challenges is paramount.

Planning Charging Layout

After selecting a site, station developers and site hosts negotiate what level of charging to install, how many chargers to install, and where the chargers should be placed on the property. Common locations for shared-use station development include parking garages, parking lots, workplaces, apartment complexes and other multi-unit dwellings, and shopping centers. Each location can present a different use case by attracting people, parking, and charging at different times of the day and for different lengths of time. This informs what charging layout makes the most sense for the site.

For a workplace where some people leave their cars parked all day, while others take their cars to off-site locations throughout the day, a mix of level 1 and 2 chargers for workers with long dwell times and level 2 chargers for workers who will come-and-go can make more sense. Similarly, a shopping center may develop level 1 and 2 chargers for its employees who will stay on site for an extended period, but DCFCs and level 2 chargers for its customers who will be in-and-out. Similar logic applies for a downtown parking garage that is partially used by office workers who park all-day and partially used by individuals running errands: slower charging for the office workers, and faster charging for individuals with shorter dwell times. Drivers who rely on fast chargers have tended to be drivers who do not have charging at home or at their workplace or need a fast charge to extend their trip or provide rideshares.[16]

15 Note: Per AB 1236, discussed later in this guidebook, extraneous work not related to health and safety cannot be required as a condition of approval.

16 Planning charging layout also involves determining which model or models of charger to procure and install. For more background, readers can consult the Electric Vehicle Charger Selection Guide from the Redwood Coast Energy Authority, the Schatz Energy Research Center, the Local Government Commission/Civic Spark, and the Siskiyou County Economic Development Council.

Once the distribution of different charging technologies and the specific charger models are decided, station developers and site hosts determine where to locate the chargers, especially in locations with multiple potential sites (such a large parking garage). Some site hosts may wish to locate chargers in highly visible locations, such as close to the building entrance, to promote a sustainable image. Others may want to reserve prime parking spaces that can be used by every car and prefer to locate charging stations in the back of a parking lot. Safety and convenience are factors as well. Charging stations are less likely to be utilized if they are consistently located in the back of a parking lot or in poorly lit locations of a parking lot.

Station developers' flexibility on charger placement can be heavily limited by available electrical capacity. Since there is usually minimal existing conduit and wiring throughout a parking lot, the most cost-effective option is often to place chargers closest to the existing electrical panel or transformer. This placement may not align with where the station developer and/or site host would prefer to locate the chargers, leaving station developers and site hosts to face a trade-off between securing their ideal charger locations versus the increased costs to trench and lay additional conduit and wiring. This trade off will only be exacerbated as the needed power capacity and size of station increases. During permit review, AHJs should be aware that station developers frequently must place stations near power sources to allow for deployment of stations with the least disturbance to site hosts in an economically viable manner.[17]

Expected throughput, the availability of electrical capacity, and the desired level of charging inform how many chargers to place on the site. At workplaces, employers will often survey staff to find out how many currently drive or are interested in driving a plug-in electric vehicle. At other sites, publicly available data through sources such as the Clean Vehicle Rebate Project can help inform station developers on the prevalence of plug-in electric vehicles in their community and how many chargers would be reasonable to install. Some incentive programs may require a minimum number of chargers to be installed to receive funding. The number of chargers will also be informed by accessibility regulations, as different numbers of chargers trigger different thresholds for numbers of accessible spaces. We discuss accessibility regulations further in Part 4: Accessibility. Finally, station developers may choose to install chargers in anticipation of future growth.

Future-Proofing

Future-proofing involves creating opportunities to enable future easy and low-cost expansion of charging, upgrading of equipment, and improved customer experience at a site. Future-proofing can mean pre-wiring during new construction or renovations, including excess electrical capacity in anticipation of future charging installations, installing additional dedicated electrical circuits for anticipated charger expansion, preparing a site for on-site energy storage and power generation, installing ultra-fast chargers ahead of the availability of ultra-fast charging capable vehicles, and a host of other strategies to lower future expenditures on station development and operation.

Spaces can be prepped for future charger installation to at least one of two levels, depending on the level desired up-front investment.

- EV Capable: Installation of "raceway" (the enclosed conduit that forms the physical pathway for electrical wiring to protect it from damage) and adequate panel capacity to accommodate future installation of a dedicated branch circuit and charging station(s).
- EV Ready: Installation of dedicated branch circuit(s), circuit breakers, and other electrical components, including a receptacle or blank cover needed to support future installation of one or more charging stations. These spaces are often called "make-readies".[18]

The most cost-effective time to create EV Capable and EV Ready sites is during construction – either when a building is being constructed or retrofitted or when an initial electric vehicle charging station project is being installed. In the latter case, station developers plan for how many chargers they intend to install in the future and prepare make-readies or EV Capable spots accordingly. The approach helps avoid expensive retrofitting costs and allows chargers to be easily added to meet growing demand.

In addition to planning for the ability to add chargers and higher speed charging, future-proofing can

17 Note: depending on a station developer and property owner strategy, load management and battery support systems can also be deployed to minimize costs and avoid unnecessary grid upgrades.

18 These definitions come from California Air Resources Board's Electric Vehicle (EV) Charging Infrastructure: Multifamily Building Standards. Please refer to the report for more information on the cost effectiveness of EV space preparation.

incorporate the addition of on-site energy storage and renewable power generation. Both can work together to minimize the cost of electricity by reducing peak demand on the grid.

For their part, local jurisdictions can adopt, or surpass, CALGreen stretch codes for new construction that places EV Capable and/or EV Ready spaces in significant percentages of parking spaces.[19] The "Advancing Infrastructure through Building Standards" section discusses building codes in more detail.

Station developers should also plan for compliance with state accessibility regulations when designing a site for the addition of future chargers. The state accessibility regulations apply only to spaces with electric vehicle supply equipment installed and not to spaces with only make-readies installed. To avoid costly retrofits, restriping, and the loss of spaces, make-readies should be installed in a manner to be compliant with accessibility regulations once stations are installed. For more details on accessible design including requirements for accessible routes, path of travel, stall dimensions, slope, and more, see Part 4: Accessibility.

How AHJs Plan and Support Station Development

AHJs engage in numerous planning and incentivizing efforts to influence and shape the private site selection process and may also install stations of their own at locations including their own workplaces, public parks, and transportation corridors.

Planning for Charging Growth

Local planners and other leaders can incorporate charging within their planning tools, both binding and nonbinding. In addition to meeting and exceeding state permit streamlining requirements (see the AB 1236 section), charging should be considered and included within general plans, capital improvement plans, climate action plans, design guidelines, and zoning codes as applicable. Incorporating a jurisdiction's plans for charging across all applicable documents helps communities plan and develop charging. Zero emission vehicle supporters within local governments should familiarize themselves with the timelines for updates of major documents and be prepared to advocate for charging and hydrogen fueling within those update cycles.

Through support from the California Energy Commission, many jurisdictions have developed and adopted ZEV readiness plans. A ZEV readiness plan is a document at the neighborhood, city, county, or regional level that captures the current state of ZEVs and ZEV infrastructure deployment in the area, the local ZEV goals, and actions and strategies to achieve those goals. The most important component of a ZEV readiness plan is stakeholder buy-in. Involving stakeholders as deliberative committee members at every stage of readiness plan development gives the plan the greatest chance of success and longevity.[20]

When planning for public charging in their community, planners will likely evaluate similar qualitative and quantitative datasets as station developers but will look at these factors through different lenses. Like station developers, AHJs will look at data such as travel patterns, station throughput, and available electrical capacity, but engage with these factors from a regional and local planning perspective. AHJs are more likely to plan public charging distribution through an equity and environmental justice lens and consider charging's relationship to multimodal transportation projects and other community-wide planning considerations. AHJs may also develop charging in their parking lots and government buildings and for their fleets. For example, in the City of Pasadena, these two purposes go hand-in-hand as the City is able to use its workplace charging to charge its fleet vehicles overnight. Other AHJs may open their workplace charging to the public on the evening and weekends to create further public charging opportunities.

Parking Stall Requirements and Charger Installation

Parking ordinances can be used to attract and encourage the installation of charging stations, especially in the context of new development. For example, Sacramento County development standards allow staff level planners to count charging spaces as up to two parking spaces depending on other parking reduction measures; and the City of

19 CALGreen electric vehicle charging station stretch codes for new construction can be found in sections A4.106.8 and A5.106.5.3 of the residential and nonresidential voluntary measures respectively. A compilation of AHJs that have adopted voluntary measures can be found in Appendix C of the California Air Resources Board's Electric Vehicle (EV) Charging Infrastructure: Multifamily Building Standards report.

20 Example plans include the 2017 Sacramento Electric Vehicle Readiness and Infrastructure Plan and the 2018 Final Butte PEV Readiness Plan.

Regional EV Readiness Planning: An Example from San Diego

The San Diego Regional Plug-in Electric Vehicle Infrastructure Working Group, led by the San Diego Association of Governments (SANDAG) and the Center for Sustainable Energy, brought local governments, Miramar College and UC San Diego, the San Diego port and airport, and San Diego Gas & Electric to the table as voting members during their EV readiness plan development and deliberation process. This level of stakeholder engagement creates ownership over a ZEV readiness plan and ensures that it does not just become another document languishing on a website. As a testament to its level of stakeholder engagement, the San Diego regional readiness plan is now included in both the City and County Climate Action Plans.

Councils of governments and other regional planning bodies and transit commissions can play a useful role in bringing together local governments across a region to synchronize permit requirements and plan across a region. In the San Diego region, SANDAG and the Center for Sustainable Energy were awarded additional California Energy Commission funds to implement their regional EV readiness plan through Plug-in San Diego. Best practices, correction sheets, and checklists for charging station permitting, installation and inspection were developed and disseminated for plug-in station developers and AHJs. SANDAG also utilized the Center for Sustainable Energy as a regional "EV Expert" to provide no-cost technical assistance to site hosts at any point in the process of installing charging.[21] Interested parties fill out a pre-screening questionnaire and then set up a free consulting appointment to learn more about options available to them.

Table 1:
Sample Zoning Amendments that count charging stations as parking spaces [22]

AHJ	Policy
Sacramento County	EVCS spaces count as two spaces
Los Angeles County	EVCS spaces count as one space
City of Pleasanton	EVCS spaces count as one space
City of Santa Barbara	EVCS spaces count as one space
City of West Hollywood	EVCS spaces count as one space
City of Stockton	EVCS spaces count as two spaces, for up to 10% reduction of parking requirements

Stockton municipal code counts charging spaces as two parking spaces for up to 10% of total required parking. Other jurisdictions have clarified that within the context of zoning, a charging space equals a parking space.

In addition, AHJs can take innovative approaches to parking challenges by promoting the deployment of ZEV car sharing. In this regard, AHJs can adopt ordinances that allow for parking space reductions when car sharing is utilized. For example, the City of Santa Monica reduces parking requirements by two spaces (up to up to a maximum of 25% of the required parking spaces, not to exceed 10 spaces) when a car-sharing parking space is provided.[23]

It should be noted that within the context of permitting charging stations and support equipment on existing sites, local zoning and parking considerations should not factor into the permit approval process (unless the project would pose a substantial health and safety risk). This is because AB 1236 (Statutes of 2015, Chapter 598) requires local jurisdictions to focus their review of EVSE projects on non-discretionary health and safety considerations. AB 1236 is discussed in detail in Part 3: Permitting.

21 Link to Plug-In San Diego checklists/correction sheets/best practice reports: http://energycenter.org/pluginsd/resources.

22 Links to sample zoning amendments: Sacramento County, Los Angeles County, City of Pleasanton, City of Santa Barbara, City of West Hollywood, and City of Stockton.

23 City of Santa Monica Municipal Code. See Section C-1.

Advancing Infrastructure through Building Standards

CALGreen, the state green building code (California Code of Regulations, Title 24, Part 11), sets requirements for installing EV Capable infrastructure in new residential and nonresidential buildings. CALGreen contains minimum requirements that apply state-wide as well as reach codes that can be adopted by local governments. Local governments can also choose to develop and adopt their own reach codes.

Starting January 1, 2020, CALGreen requires that new construction of multi-unit dwellings include EV Capable infrastructure in at least 10% of parking spaces, rounded up, meaning that they have race-way and panel capacity installed. Also starting in 2020, CALGreen has two tiers of reach codes that will enable cities to seamlessly adopt requirements of EV Capable infrastructure in 15% and 20%, respectively, of parking spaces. These readiness requirements do not require placing a charger in the space immediately but avoid most of the costs that would have been required to retrofit electrical infrastructure, ease the process of installing a charger later, and ease nonfinancial barriers such as gaining landlord or HOA approval.

Furthermore, new construction of single-family residences, duplexes, and townhouses with private garages must have raceway and panel capacity to support future installation of level 2 charging stations; under CALGreen voluntary reach codes a dedicated circuit including wiring must be installed. These residential EV infrastructure building codes align with state policies, including Assembly Bill (AB) 2565 (Statutes of 2014, Chapter 529) and AB 1796 (Statutes of 2018, Chapter 163), which empower renters to deploy EVSE on the properties where they reside by reducing the practical barriers for them to do so. In addition, CALGreen requires that about 6% of parking spaces in new nonresidential buildings must be EV-capable.[24] Two tiers of voluntary CALGreen reach codes increase these levels to about 8% and 10% respectively.[25]

Local governments play a critically important role in EV infrastructure building code implementation. As of publication, over 20 California jurisdictions have exercised their authority to exceed state minimum code requirements by adopting higher EV infrastructure requirements to align with California's EV adoption goals. Local codes range from adoption of CALGreen voluntary tiers to codes that require EV charging electrical infrastructure at one parking space per multifamily dwelling unit (Meno Park and Palo Alto) or require a mix of full circuits for some spaces and specified levels of EV charging electrical infrastructure for all remaining parking spaces (Oakland, San Francisco). Local agencies can also ensure that local permitting and inspection staff are trained and prioritize implementing these codes, whether it is the statewide minimum or stricter local requirements.

In addition to increasing the number of parking spaces with EV infrastructure, AHJs can address two important companion issues. The first is expanding the scope of these codes to address existing buildings similar to codes adopted by the City of Marin, the City of Menlo Park and the City and County of San Francisco.[26] These codes target building alterations and additions that provide cost-effective opportunities to install EV infrastructure. The second is harmonizing with state accessibility requirements, where applicable, so that EV infrastructure can be

Parking Enforcement

Driver confidence and vehicle utility relate directly to the ability to charge when needed. Jurisdictions can help ensure charging spaces are used for charging through signage and enforcement by installing tow-away signs at charging spaces along with clearly striping and marking the associated pavement. For enforcement, local jurisdictions have authority under AB 1314 (Statutes of 2002, Chapter 640) to designate off-street spaces for the exclusive use of plug-in electric vehicles and tow and fine violators, and authority to designate and enforce similar restrictions on on-street parking as well under AB 1452 (Statutes of 2017, Chapter 635).

24 The actual percentage ranges from 4% to 10% depending on number of parking spaces.

25 Note: Existing EV-readiness codes are focused on making buildings ready for level 2 charging. Future considerations may include EV-readiness provisions for DC fast chargers, including additional space for dedicated utility transformers, equipment pads, and other needs.

26 See Pike, Ed et. al. 2018 "Driving Plug-in Electric Vehicle Adoption with Green Building Codes."

built out into EV charging spaces without conflicting with the accessibility requirements in Title 24 Chapter 11B (see for example Fremont, Oakland, and San Francisco building codes) that are described later in this guidebook. Requirements such as accessible routes and slopes can be designed into new construction but are much harder to change later.

One of the latest building code innovations is the combination of voluntary tiers and other stretch codes with charging management software or hardware to get more chargers out of a given amount of electrical capacity—effectively reaching more spaces. Charging management, also known as load sharing, allows vehicles at multiple spaces to share a given amount of electrical panel capacity, allowing for charging more vehicles with less capital cost. When only one or a handful of vehicles are charging, they can all charge at full capacity, but when more vehicles are charging the charging load can be shared between vehicles. How much power each vehicle receives in a reduced capacity scenario depends on the complexity of the charging management technology, the charging patterns, and the desired charging behaviors. In the simplest set-up, each car's charging rate would be reduced equally, but there are also more adaptive methods available, such as deploying batteries to augment power flow, allowing drivers to indicate when they will need their vehicle fully charged, and/or modulating charging percentages in real time to ensure that drivers with shorter dwell times will get proportionately higher charging rates even in a reduced capacity scenario.

Curbside Charging

Some local jurisdictions are piloting curbside charging programs (i.e., charging stations on public streets). This is a promising option, especially for providing charging opportunities for residents of multi-unit dwellings, but development of this charging solution remains preliminary. Curbside charging development can cost upwards of thousands of dollars more than placing the equivalent in a parking garage due to the greater amount of trenching and other labor usually required, as well as the potential for a longer permitting process. However, low cost opportunities may exist. For example, shifting street lights to LED lighting can help create some spare electrical capacity that can be shifted to on-street vehicles (given the efficiency of LED lights).

Creative Strategies to Get Electricity to More Spaces

The City of Vancouver, British Columbia, is the international leader for combining charging management with building code requirements. Vancouver has adopted a requirement for 100% of parking spaces in multi-unit dwellings to be EV-ready but does not require enough electrical capacity to charge vehicles at 100% of spaces at full power at any given time. Rather, Vancouver's requirements allow for the use of charging management software or hardware, achieving a high level of plug-in electric vehicle readiness while not requiring exceedingly large capacity upgrades.

The City of Oakland's EV-readiness ordinance, which requires panel capacity to charge 20% of spaces at new multi-unit dwellings at 40 amps, also explicitly allows for the use of charging management to increase the number of spaces served.[27]

Image courtesy of the California Energy Commission

27 For further information, see the City of Oakland's fact sheet on the ordinance.

Because the statewide accessibility regulations promulgated by the Division of the State Architect in the California Building Codes do not apply to public streets, there are no statewide regulations on accessibility for curbside charging. However, accessibility must still be provided under state and federal law. It is up to each local government to determine what requirements charging on public streets must meet in order to be accessible. AHJs may refer to the existing accessibility regulations as general guidance but may also develop their own criteria for equivalent facilitation for compliance with state and federal law.

For more information on curbside charging, refer to the City of Sacramento Curbside EV Charging Pilot, the City of Berkeley Residential Curbside Electric Vehicle Charging Pilot, and the City of Seattle Pilot Permit Program Requirements document.

Establishing Cooperation between Station Developers and AHJs

A number of factors within an AHJs control can attract charging to a jurisdiction, some of which have already been mentioned (favorable parking counts, progressive building standards, established readiness plans and related resources). Perhaps most importantly, AHJs can attract stations by creating a straightforward, transparent, and expedited permitting process. The more station developers know about a jurisdiction's approach to permitting ahead of time, the more time and effort all parties tend to save. The next section (Part 3: Permitting) explores this topic in detail.

Furthermore, AHJs can experiment with innovative ways to use zoning code to further promote and streamline charger development. For example, the City of Sacramento is currently exploring amending their planning and development code to define a separate land use classification for situations where charging is the primary land use, with the hope of streamlining development of large-scale charging depots. The market is rapidly evolving and open communication with and from cities and counties is fundamental to success.

Station developers can help AHJs by sharing their development plans as soon as they can—ahead of permitting if possible. This sharing can enable AHJs to proactively prepare for projects or classes of projects. It can take place through a variety of avenues both within and external to the permitting process. In the context of permitting, station developers can notify AHJs as soon as they have a site in mind. Outside of permitting, developers can send public plans to key jurisdictions, meeting with pivotal cities or counties, presenting to local government groups (e.g., Councils of Governments, Associations of Governments, ZEV Readiness Councils), and partnering with state agency leadership and staff to communicate general and specific plans.[28]

28 To help with this effort, GO-Biz has created a website to track ZEV readiness, share best practices, and connect readers to ZEV investment plans that can be used by AHJs to prepare for near term ZEV investments – www.business.ca.gov/ZEVReadiness.

Images courtesy of the Bay Area Air Quality Management District and the City of Sacramento

PART 03:

Permitting

In this section, we share requirements and best practices for station permitting to help AHJs streamline their processes and station developers submit effective applications. The section begins with a summary table for AHJs (Table 2: Electric Vehicle Charging Station Permit Streamlining Requirements & Best Practices) and is followed by a narrative designed to communicate context and insights collected from leading practitioners.

Image courtesy of Electrify America

Table 2: Electric Vehicle Charging Station Permit Streamlining Requirements & Best Practices

	AB 1236 Compliant (EVCS Friendly)	Not AB 1236 Compliant (Challenging to Deploy Charging)
Required by AB 1236	Ordinance creating an expedited, streamlined permitting process for electric vehicle charging stations (EVCS) including level 2 and direct current fast chargers (DCFC) has been adopted	No permit streamlining ordinance; and/or ordinances that create unreasonable barriers to EVCS installation
	Checklist of all requirements needed for expedited review posted on Authority Having Jurisdiction (usually a city or county) website	No checklist for EVCS permitting requirements
	EVCS projects that meet expedited checklist are administratively approved through building or similar non-discretionary permit	Permitting process centered around getting a discretionary use permit first
	EVCS projects reviewed with the focus on health and safety	EVCS projects reviewed for aesthetic considerations in addition to building and electrical review
	AHJ accepts electronic signatures on permit applications*	Wet signatures required on one or more application forms
	EVCS permit approval not subject to approval of an association (as defined in Section 4080 of the Civil Code)	EVCS approval can be conditioned on the approval of a common interest association
	AHJ commits to issuing one complete written correction notice detailing all deficiencies in an incomplete application and any additional information needed to be eligible for expedited permit issuance	New issue areas introduced by AHJ after initial comments are sent to the station developer
Best Practice	Clear EVCS permitting process detailed on AHJ website	Permitting process not explained on AHJ website
	ZEV Infrastructure permitting ombudsperson appointed to help applicants through the entire permitting process	AHJ does not offer access to an expert who can support station developers through the entire permitting process
	Guidance documents for permitting and inspecting charging stations at single family home, multifamily home, workplace, public (L2 and DCFC), and commercial medium and heavy duty posted on AHJ website	Limited or no information online
	Pre-application meetings with knowledgeable AHJ staff are offered	Full permit package needs to be submitted to gain feedback from AHJ staff
	AHJ has published an ordinance or bulletin clarifying that a plug-in electric vehicle charging space counts as one or more parking spaces for zoning purposes	EVCS installation projects trigger a parking count review
	Concurrent reviews are made available for building, electrical (and planning, if deemed necessary)	Sequential permit reviews only
	Planning for ZEVs and supporting infrastructure is incorporated and prioritized within documents such as the general plan, capital improvement plan, climate action plan, and design guidelines	EV charging guidelines are not incorporated into planning documents
	EVCS are classified as an accessory use to a site, not as a traditional fueling station	AHJ considers charging stations as fueling stations, leading to additional zoning review
	AHJ has established/published timelines for EV permit application review that are expedited when compared to standard building permit review timelines in that jurisdiction.	AHJ does not have expedited permitting process for EV applications – resulting in standard project permitting timelines
	AHJ's expedited EV permit review process encourages permit reviewers to conditionally approve permits (aka "approved as noted")	AHJ does not encourage conditional approval of permits

* Note: if a city or county determines it is unable to accept electronic signatures on all forms, the permit streamlining ordinance shall state the reasons.

Understanding the Permit Process

In California, EVCS permit applications are supposed to be approved through a truncated permitting process. EVCS permit applications will usually be reviewed for compliance with building, electrical, accessibility, and fire safety regulations. The permit applications may also receive public safety, structural, and engineering review based on the processes and organizational structure of the AHJ. If possible, these reviews are done concurrently and AHJs and station developers should continue to look for ways to save time and share successes that can be emulated by others.

Plan checkers evaluate the permit application to determine whether all required documentation is attached, whether the load calculations are correct, whether new electrical service will be required, whether all diagrams are accurate, whether the proposed design will comply with electrical code, whether the proposed charging layout is in accordance with the California Building Code accessibility regulations, and other evaluation factors as deemed necessary to ensure public health and safety.

If the application package is deemed complete and accurate and all materials are in compliance with applicable codes and regulations, the permit should be approved. If the plan reviewers determine that revisions to the application are required, they will return the permit application to the submitter with instructions for revision. This is called a cycle, or round of comments, and requires the submitter to revise and resubmit until approval can be granted.

Once approval to build is granted, construction can begin. The site will be visited by a building inspector one or more times during the process, including after construction is finished for final approval. After final approval from the AHJ and utility, the station is eligible for commissioning and operation.

The following sections explore the requirements and best practices related to electric vehicle charging stations. The concepts apply to all levels of charging but it is important to consider the unique circumstances of some typical installations.

Image courtesy of Tesla

Single Family Residential Charging

As a first priority, many AHJs have streamlined single-family charging station permits, making them electronic applications with no need for a plan review and the option of same-day approval.

Residential charging is easily streamlined because typically only one or two level 2 chargers will be installed at a given house. The electrical work needed for a level 2 charging installation is similar to the installation of a dryer or other household appliance, in essence only requiring a field inspection.

DC Fast Charging Considerations

DCFC installations are more complex than level 1 and level 2 installations since these installations often require bringing more power to a site. DCFC installations often pull power from their own electrical service drop. If complex trenching is involved, station developers should be aware of the various right-of-ways they are working in—something AHJs can help identify during an early consultation. A station developer may need to get special encroachment permits—from Caltrans for example—to trench under an existing right of way. In general, encroachment permits can add considerable time to a project and should be accounted for during project planning.

Multifamily Housing (also referred to as Multi-Unit Dwellings [MUD]) represent a key market segment in need of charging options. They constitute between 38% and 67% of California's housing stock (depending on the region) but fewer 9% of ZEVs in California have been registered to MUD residents.[29] To achieve 100% ZEV penetration, this market segment likely needs to be addressed through a combination of access to level 2 charging, DC fast charging, and hydrogen fueling.

A variety of factors—ranging from ownership structure to available power and parking—have worked against adding charging to existing MUDs at the necessary scale. The following best practices can help address the challenge:

Best Practice	Rationale
Encourage charging in rental properties to be shared use	EVCS spaces count as two spaces
Encourage the highest rate of charging to maximize throughput capacity, while balancing cost	EVCS spaces count as one space
Avoid treating EV charging at MUDs as a commercial parking service	EVCS spaces count as one space
Allow/encourage load management and battery supported chargers if the service drop to a property is not adequate	EVCS spaces count as one space
For new buildings – adopt CALGreen voluntary measures or better (see Advancing Infrastructure through Building Standards section)	EVCS spaces count as one space

State Permit Streamlining Requirements (AB 1236)

AB 1236 requires all cities and counties to develop an expedited, streamlined permitting process for all levels of electric vehicle charging stations (level 1, level 2 and DCFC). The law was developed based on the reality that the availability of charging infrastructure drives the adoption of zero emission vehicles—the faster charging stations are deployed, the sooner California's air quality improves, greenhouse gas emissions are reduced, and local economic benefits are captured.[30]

When AB 1236 was being developed, permitting processes and actual timelines varied widely—in many cases adding considerable delay to the station development process. Delays continue to come from both sides of the equation. Both AHJs and station developers have reported frustrations with incomplete information.

AB 1236 aims to address the core issues that tend to undermine station permitting by focusing on the following solutions for all levels of charging stations:

1. **Aligning AHJs and applicants:** Process and communication matters. Much of the frustration on both sides of the process come from a breakdown in communication. To address this, the law requires cities and counties to adopt an electric vehicle charging station permitting checklist (or checklists) detailing the requirements for a project to be eligible for an expedited review. The idea is to create process transparency that simplifies communication for both AHJs and station developers. More and more communities are establishing these checklists but much work remains to be done to spread this solution across

29 See "Quantifying the electric vehicle charging infrastructure gap across U.S. markets," ICCT (2019).

30 Streamlined permitting of electric vehicle charging and hydrogen fueling stations is a key climate strategy that cities and counties can add to their Climate Action Plans—the faster infrastructure is added the sooner cities can reduce transportation related emissions.

the state (checklists were required to be posted by September 30, 2017).[31]

65850.7(g)(1)"…In developing an expedited permitting process, the city, county, or city and county shall adopt a checklist of all requirements with which electric vehicle charging stations shall comply to be eligible for expedited review…"

2. **Making it easy to apply for a permit:** AHJs are required to allow for electronic submission of application packets for plug-in electric vehicle charging stations through email, internet, and/or fax and allow for electronic signatures on all forms. This simple change can save considerable time and money.[32]

   65850.7 (2) "The checklist and required permitting documentation shall be published on a publicly accessible Internet Web site, if the city, county, or city and county has an Internet Web site, and the city, county, or city and county shall allow for electronic submittal of a permit application and associated documentation, and shall authorize the electronic signature on all forms, applications, and other documentation in lieu of a wet signature by an applicant…"

3. **Laying the foundation for streamlined reviews:** Under AB 1236, cities and counties shall approve permit applications through a building permit or similar non-discretionary permit focusing on public health and safety. The station permitting checklist plays a key role. Any project that meets all the requirements in the checklist, as determined by the AHJ, shall qualify for expedited review. In the vast majority of cases, this means that no discretionary use permit will be required, which can be the most time-consuming aspect of permit approvals.[33]

   65850.7(b) "A city, county, or city and county shall administratively approve an application to install electric vehicle charging stations through the issuance of a building permit or similar nondiscretionary permit. Review of the application to install an electric vehicle charging station shall be limited to the building official's review of whether it meets all health and safety requirements of local, state, and federal law. The requirements of local law shall be limited to those standards and regulations necessary to ensure that the electric vehicle charging station will not have a specific, adverse impact upon the public health or safety. However, if the building official of the city, county, or city and county makes a finding, based on substantial evidence, that the electric vehicle charging station could have a specific, adverse impact upon the public health or safety, the city, county, or city and county may require the applicant to apply for a use permit."

AB 1236 requires cities to adopt an ordinance (or ordinances) to ensure the above solutions are enabled through a transparent, streamlined EVCS permitting process. Additionally, the law establishes that local ordinances cannot create unreasonable barriers to station installation, including subjecting applications to aesthetic review or other processes that require unnecessarily long timelines. On the contrary, AB 1236 explicitly calls out the legislative intent "to encourage the installation of electric vehicle charging stations," and a growing number of cities and counties are responding with constructive policies and procedures.

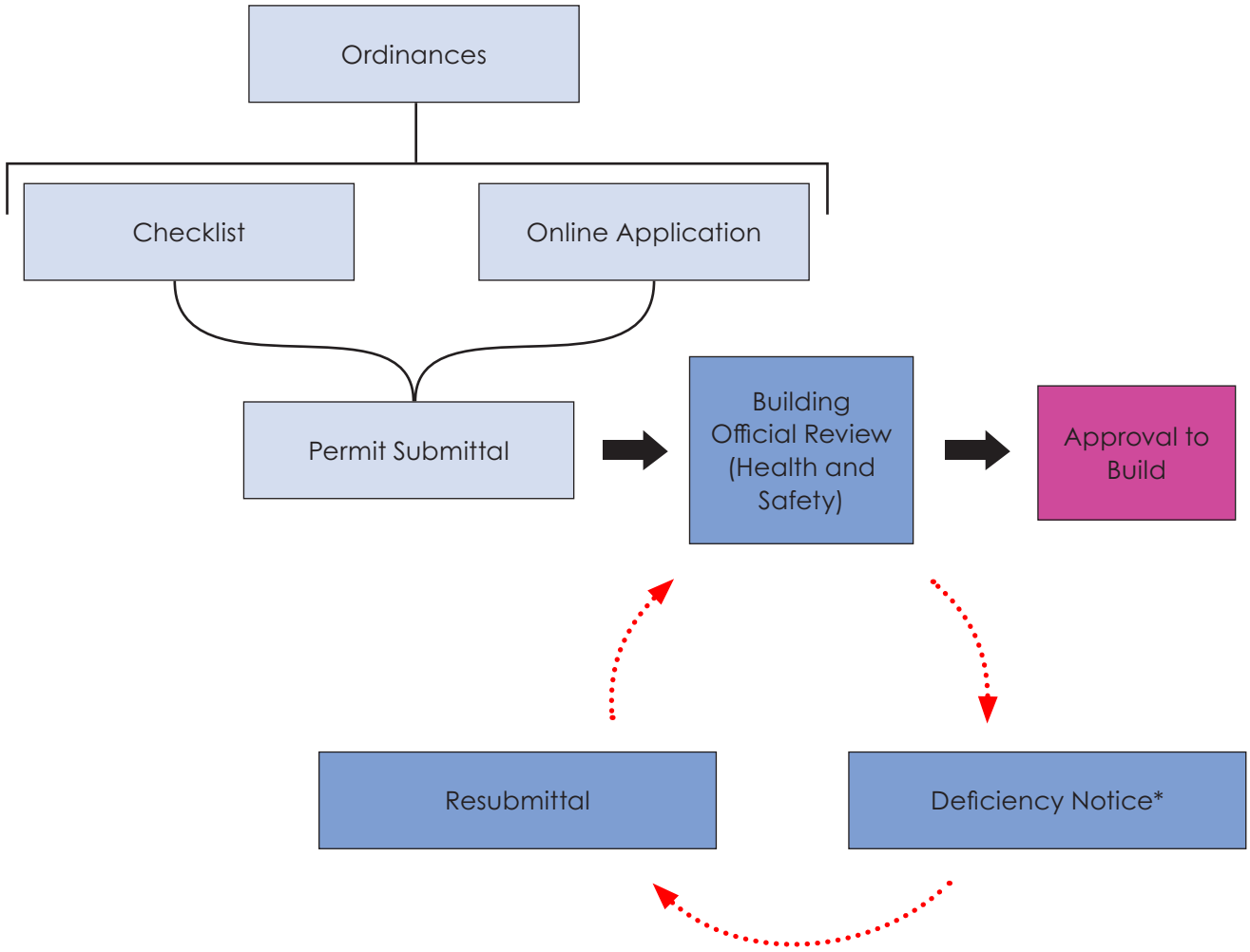
Taken together, a station developer will know, up front, everything they need to do to have a streamlined permit process. Similarly, AHJs will be able to use the complete information supplied by project applicants to approve charging stations through a ministerial process. In practice, this means that permit review will typically be conducted by the building and/or electrical department, often over the counter, as opposed to going through the planning or zoning department for planning approval.

Per AB 1236, the city building and/or electrical department will review the project with a focus on "health and safety" using objective measures. AB 1236 allows building officials to assess if a "specific, adverse impact" may result due to the installation of EVCS or EVSE equipment. For example, health and safety concerns can lead to the need for project revisions when the building official believes that added EV charging loads may affect existing electrical infrastructure or when the project might create a visual hazard. It should be noted that a visual hazard is different than a visual impairment. A visual hazard may compromise fire safety, while a visual impairment can be mitigated to not adversely impact safety.

31 See the Town of Woodside's EV permitting checklist for an example.

32 To be clear, electronic application submittals do not replace the value of in-person communication, especially for large projects. The approach simply saves applicants from having to make a separate trip to submit their application.

33 A discretionary permit can only be required if the building official makes a finding, based on substantial evidence, that the electric vehicle charging station could have a specific, adverse impact upon the public health or safety.



* The deficiency notice should include one complete set of comments.
Note: It may take station developer multiple rounds to address the AHJ comment set.

Taking Steps to Simplify the Process

Permit streamlining need not be complex or expensive. Tuolumne County used to require paper submittals, expensive studies, and station developers reported waiting at least 30 days for approval of typical level 2 projects. This was problematic for a number of reasons, not the least of which is that the County is large, and travel to the permit office can be time consuming.

To improve the process, the County decided to go to a paperless permitting system, with electronic plan check, auto-approval of permits, and printable permits. Software tools exist to handle an all-electronic permitting system, but the County did not have the budget to purchase the software. Instead, they used common software (Adobe Pro) they already owned to create and share downloadable, fillable PDF applications. Station developers simply download and fill out the forms, include an electronic signature, and submit the document to the County via email. In many cases, the only in-person interaction occurs during the final site inspection.

The County permit process for EVCS is now paperless, with approvals granted in five days or less.

Complying with AB 1236

AB 1236 gave communities until September 30, 2017 to develop and adopt streamlined processes, including passing an ordinance to codify the approach and raise awareness.[34] Unfortunately, due to lack of awareness, enforcement, and inconsistent application across the state, a wide variance in permitting processes persists.

AB 1236 establishes streamlined charging station permitting as a statewide imperative, but success depends on local implementation and AHJs retain flexibility in how they implement the law and intake and process applications. From a station developer perspective, the ideal process of permitting charging stations would be uniform across all jurisdictions, modeled after the fastest processes in the state. In reality, processes vary. In one city, it may make sense to create a unique process specifically for charging stations. In another, putting charging station reviews through a standard electrical permit process may yield the best results.

The best approach may depend on volume of applications, the structure of planning and building departments, whether the AHJ has full-time staff for permit review or whether it contracts with external reviewers, and other factors. The most important factor is to ensure that whatever process is adopted, it streamlines the process for both the AHJ and station developer rather than adding additional complications.

In all cases, permit application documents should be available to be downloaded and submitted digitally with the ability to provide electronic signatures (in fillable PDF or similar format). If comments are necessary, AHJs should send one complete set of comments that can be addressed in a streamlined manner through modifications to the existing application. Giving station developers one complete set of comments as early in the process as possible saves time and money by enabling them to streamline resources when developing their response. While it may take more than one iteration to completely address an AHJ's comments, AHJ's should avoid providing a second round of unrelated comments which can add preventable expenses and time to a project.

We encourage AHJs to invite industry and stakeholders to the table to discuss existing processes, identify restrictions in the process, and develop strategies for streamlining and improvement. Local jurisdictions can also use this as an opportunity to train local contractors and station developers on proper permit submittals to save time spent on reviewing incomplete applications. A streamlined process designed to be responsive to stakeholders saves staff time for both the station developer and the AHJ involved.

Best Practice: Identify a ZEV Permitting Ombudsperson

An ombudsperson who understands the entire permitting process and serves as a single point of contact for ZEV infrastructure projects can save time and frustration for both the applicant and AHJ staff. In many cities, individual staff members may only know their specific piece of the process. Having a single point of contact who understands the process in its entirety can help expedite the application and review.

The benefits of a regional approach

AB 1236 allows flexibility for local jurisdictions in terms of allowances for unique climatic, geological, seismological, or topographical conditions, how they design their permitting checklist and expedited review process, and other components of implementation. However, it is also beneficial to coordinate with other AHJs in the region to share best practices and, ideally, develop substantially similar standardized intake and review processes. Relatively similar permitting processes across a region allows for station developers to clearly plan and develop stations across a geographic area without having to spend additional labor time familiarizing themselves with significantly different processes. Ideally, these conversations could be coordinated through the local council of governments or other regional planning body, saving time and expense for all involved.

34 For example, the City of Burbank, and the County of Sonoma have each adopted ordinances that translate AB 1236 into the city's local processes and code.

Image courtesy of Tesla

Installing Charging Stations in the Coastal Zone

A coastal development permit (CDP) may be required to install charging stations located in the coastal zone. Local governments in the coastal zone with certified Local Coastal Programs (LCPs) are responsible for determining whether a Coastal Development Permit (CDP) is required for proposed development within their respective jurisdictions, but some local CDP decisions can be appealed to the Coastal Commission. In areas where there is no certified LCP, the Coastal Commission is responsible for determining whether a CDP is required for proposed development.

Construction of new, or expansion of existing, EV charging stations constitutes development that is subject to the Coastal Act; however, such development may be exempt from CDP requirements (see Pub. Res. Code § 30610(a), (b); 14 Cal. Code Regs §§ 13250, 13253) or may be approvable through an expedited review process, such as through a de minimis permit waiver. Ensuring that proposals for new or expanded EV charging stations avoid adverse impacts to coastal resources, particularly habitats, public coastal views and coastal access parking will help expedite the CDP determination and review process.*

In an effort to align coastal resource protection efforts with the Legislative intent of AB 1236 to promote buildout of EV charging stations, the Coastal Commission will work with local coastal jurisdictions to identify potential coastal resource concerns with respect to new or expanded EV charging stations and clearly define the circumstances when a CDP will and will not be required. In the interim, questions about permitting EV charging stations in the coastal zone can be addressed to the Coastal Commission's local district office: https://www.coastal.ca.gov/contact/#/

**** Note that adding charging to existing parking stalls is not an adverse impact to coastal access parking.***

Resources to help communities enable a ZEV-only future

There are several resources available to help local jurisdictions comply with AB 1236. The legislation recommends referring to the Plug-In Electric Vehicle Infrastructure Permitting Checklist, found on page 111 of the Governor's Office of Planning and Research's ZEV Community Readiness Guidebook (provided for reference in Part 8: Definitions and Additional Resources). Please note that the Community Readiness Guidebook checklist is primarily geared toward station developers, while the Electric Vehicle Charging Station Permit Streamlining Requirements & Best Practices checklist from Table 2 in this document is geared toward AHJs. California Building Officials (CALBO) offer AB 1236 compliance toolkits for both small and large jurisdictions. These toolkits include model ordinance templates, adoption timelines, and supporting staff reports, as well as a sample permitting checklist.[35] Local governments should also study their implementation of AB 2188 (Statutes of 2014, Chapter 521), which mandated streamlined rooftop solar permitting, for areas of overlap and lessons learned.

Additional Permitting Best Practices

Station developers who do not own the land being developed often have limited flexibility on any given site. For a variety of reasons, a site host may limit his or her willingness to install charging to a specific location on the property, especially early in the market. Available utilities and providing accessibility can also constrain options. The following strategies can help prevent permitting from being an additional constraint:

1. Collaborate with the EV charging industry to minimize the constraints and maximize opportunities for charging projects to qualify for expedited permitting, as required by AB 1236.
2. Articulate the expected review time for each project type on the official website.
3. Define the materials needed for a permit package to be complete, the associated fees, and what building inspectors will be looking for.

35 Note: at the time of publication of this document, CALBO's sample permitting checklist resides only in the small jurisdiction toolkit.

What does a streamlined process look like?

At the most basic level, a streamlined permitting process does two things:

1. **Creates clear pathways to a non-discretionary permit approval**
2. **Makes the non-discretionary permit simple and straightforward.**

On the AHJ side, successful implementation requires clear communication about how project applicants can design their project to avoid special review.

In the City of Sacramento, for example, the City tells applicants up front to design projects to avoid impacts to heritage trees and bio-swales to avoid complicating the review process. This type of direction to applicants can be given on a city or county permitting website, using permitting checklists and fact sheets, and re-iterated at pre-application meetings, which are often recommended for larger projects.

Sacramento also clearly communicates that putting charging stations into existing parking lots will not trigger bringing the parking lot into compliance for new landscaping, or other onerous requirements that could make the project infeasible—effectively eliminating an uncertainty for a station developer.

On the station developer side, successful streamlining requires understanding any unique constraints of a particular site and designing projects to avoid triggering special review.

If an application requires amendments after review, the best practice is for AHJs to commit to one round of complete comments for applicants to respond to—and for applicants to answer AHJ questions in full.

4. Offer pre-application meetings with knowledgeable AHJ staff for projects that may require additional review and help the applicant understand the advantages or disadvantages of each project approval approach

Station developers with a clear understanding of what AHJs will be looking for are better positioned to work with site hosts to find favorable solutions that work for all parties.[36]

In addition to minimizing the chances of incomplete application packages (which creates extra work for both the AHJ and stations developer), providing clear information on a city or county's website can also be a great way to attract charging station development, as a transparent and informational website will allow station developers to more easily plan for and deploy charging within a jurisdiction. Reasonable fees, or even subsidized fees, can also attract development. For instance, the City of Anaheim waives what would be a $147.56 fee for single-family residential charging.

It is important to delineate between the requirements for each kind of installation site, be specific on any differences in requirements between different levels of charging and provide comprehensive and clearly labeled information. Based on our review, many AHJs provide fact sheets and information for single-family residential permitting, but none, yet, for permitting requirements at multifamily dwellings or shopping centers, or for DCFCs. Fact sheets for these scenarios help save time—especially if the fact sheets define parameters within which permitting and inspection can be streamlined.[37] While the requirements and fees are sometimes the same across various levels of charging, this is not always the case, hence the need for clear communication and information.

Finally, timing matters. Long permitting processes add expense and uncertainty to any project and ultimately impact consumer decision making. An installed bank of chargers at the right location and time can make the difference between converting a driver to a ZEV or committing them to internal combustion for an additional purchase cycle. GO-Biz has developed the following best practice timelines for EVSE permitting based on a collection of real-world EVSE permitting experiences in California (Table 3). These expedited timelines meet the intent of AB 1236.

When interpreting the table and timelines, please consider the following points:

35 In defining which types of projects might trigger a longer review, it is important to note that for typical charging installations at an existing facility, electric vehicle charging should be considered an accessory use and should not be considered a fueling station or otherwise trigger additional zoning review. This approach is consistent with AB 1236.

36 For example, a DCFC fact sheet could communicate that an application placed in a parking lot that does not impact existing drive aisles would go straight to building/electrical review.

1. The timeframes are in business days and do not include the time station developers take to respond.
2. In all cases, the optimal scenario is a day-of response; on-line or over the counter. Online transactions can save considerable travel time and expense.
3. The optimal scenario hinges on the station developer submitting a well-organized, complete application with all necessary materials. The application should match the AHJ's permitting checklist.
4. Communication matters – station developers can help AHJs by giving them a heads up about an upcoming application submittal and advance notice about when construction will be complete.
5. Depending on staff resources and project complexity, day-of approval or responses are not always feasible – but the objective is to get as close to optimal as possible.

Table 3: Permit Timeline Best Practice (times are measured in business days)

Application Submittal » Complete Response		
Type of Charger	**Within Best Practice**	**Optimal**
L2 – Single Family	1 day	Same Day
Multi L2 – Shared (Multi Family/Workplace/Public)	5 days	
DCFC	5 days	

Complete package » Approval to Build		
Type of Charger	**Within Best Practice**	**Optimal**
L2 – Single Family	1 day	Same Day
Multi L2 – Shared (Multi Family/Workplace/Public)	15 days*	
DCFC	15 days*	

Construction Complete Notice » Inspection		
Type of Charger	**Within Best Practice**	**Optimal**
L2 – Single Family	5 days	Same Day
Multi L2 – Shared (Multi Family/Workplace/Public)	5 days	
DCFC	5 days	

* Note: Municipalities with integrated utilities may require more time to align the utility planning and review that occurs before building permit approval.

Cities and counties eager to attract charging can publish their expedited timelines for EVCS application review. To help meet and exceed these timelines, simple time saving measures, such as encouraging plan checkers to conditionally approve permits (aka "approved as noted") can have a considerable impact. In many cases, this time savings translates into monetary savings—savings that can be invested in more charging stations in the state. Furthermore, for cities or counties that contract with third-party reviewers can help by building expedited turn-around times into those processes—working against the reality that third-party review can often add time to the process.

Preparing a Permit Application

When developing a permit application, station developers should carefully review the application requirements for the specific jurisdiction they are working in, especially in cities and counties that have not yet complied with the state's permitting streamlining requirements (AB 1236). Requirements can differ significantly from other jurisdictions in the region. Even if a developer has worked with the AHJ before, processes may have changed since the last project. If the AHJ has a checklist for expedited permit review, station developers should review those requirements and ensure the project meets the standards for expedited review. If the AHJ offers pre-application meetings, station developers should take advantage of the opportunity to learn about any special considerations for the process, what kind of reviews to expect, and any steps they can take to make the process easier.

If the city or county has developed an EV-ready ordinance, regional readiness plan, or other planning or policy document, station developers should familiarize themselves with the contents and look to engage with the local department or departments involved in creating it. Whether plug-in electric vehicle readiness has been led by planning, public works, environment and sustainability, or other city or county departments, engaging the lead departments in the project can help with troubleshooting any issues that come up and can develop a valuable ally to help get a project through the process.

Station developers should begin engaging the local utility at pre-application stage of the process as well. The state's utilities differ in how they expect the timelines of the parallel permitting and grid connection approval processes to interact. Some are comfortable with a simultaneous review process, while some may want to wait until the permit is approved to begin the service connection review process. At this stage, station developers should develop an understanding of the extent of electrical work that will be required and the timeline for its completion. We discuss service connection in further detail later in this guidebook (Part 5: Connecting to the Grid).

Awareness about charging installations, the different levels of charging, and the requirements for each is still growing in local jurisdictions across the state, even in jurisdictions with high numbers of electric vehicles. Station developers should be ready to address questions or misconceptions with building department staff, fire officials, and other permit reviewers, and share this guidebook or other resources specific to the kind of project.

Pre-Application Meetings

Pre-application meetings are strongly encouraged for large projects being pursued in communities that have not yet established a streamlined permitting process and/or for projects that might trigger additional review. These meetings should occur as early in the process as possible, include decision makers from both the AHJ and applicant, and be used to ensure the project is set up for permitting success.

Clear fact sheets and checklists can minimize the need for pre-application meetings by communicating how projects can be designed to avoid triggering additional review, and conversely which types of projects or project features are likely to trigger special review. Station developers can use this information to design projects to meet the pre-defined criteria for a streamlined process.

What to Include in Your Application

A number of documents can be required for an application to install a public charger, and the information requested can vary by jurisdiction and project type. Common pieces of information include site plans, a single line electrical diagram; load calculations and whether a panel upgrade will be required; a separate mechanical permit application if ventilation will be required for the station; and charger installation instructions from the manufacturer. Public station applications will need to pay special attention to accessibility, with clear diagrams and text showing how the project will meet state accessibility regulations.

Given the requirements of AB 1236, it is important for project applicants to focus their submittal on alleviating any potential health and safety concerns up front. For example, a DCFC project that draws energy from the existing service could require additional safety review compared to a project that will rely on its own service drop. In either case, the review will benefit from documentation that demonstrates how the electrical load will be managed. From a visual perspective, building and fire officials will look for visual hazards – for example, structures that block fire lane visibility.

If not all the components on a jurisdiction's AB 1236 expedited review checklist are present, a project may be deemed ineligible for expedited review without revision or resubmission and may be routed through a standard review process. Additionally, if the AHJ determines that the project poses a specific, adverse impact upon health and safety, the AHJ may remove the project from expedited review and may also require a use permit application.

Station developers must pay permit application fees when they submit a project. Permit fees are usually based on a combination of the percentage of anticipated cost of materials and construction, staff time, the size and scope of the project, any additional permits required, and fees for inspection. Fees are not standardized statewide and can vary dramatically, even in neighboring cities. To support ZEV deployment, AHJs should structure fees to both meet their needs and minimize the costs of installing charging stations.

Just as AHJs can implement steps and procedures to make the permitting process easier for station developers, so too can station developers take actionable steps to streamline the permitting process for cities and counties. Common errors from station developers include inaccurate load calculations, inconsistent diagrams, and failure to comply with accessibility regulations, such as inclusion of grades that are too steep, inaccessible placement of the charging station itself, and lack of accessible route and path of travel. Errors in submission lengthen the process and can also jeopardize site control if a site host grows concerned over a process being delayed by many rounds of comments and revision.

Consistent and clear lines of communication between staff and contractors working on the permit application and station installation is also important. Some station developers who work with many contractors will have one team of contractors develop the plans and go through the permitting process but another team of contractors install the charging station. While this can work if executed carefully, it raises the risk of mistakes in the construction process and inconsistencies with the approved permit, raising costs for both parties and causing frustration for inspectors and building officials. This is especially likely to happen if the construction and installation contractors have not seen the site before the start of construction.

Common Obstacles

Aesthetics: Some jurisdictions have subjected projects to design review and asked the permit applicant to make aesthetic changes to the permit application. While design guidelines that implicate health and safety, such as safety related lighting, clearance, and signage are permissible under the AB 1236 state permitting guidelines, aesthetic changes without a specific impact on health and safety—such as landscaping—are not in accordance with state permitting requirements under AB 1236. In areas with sensitive design standards, stations developers and AHJs are encouraged to collaborate on practical design elements that can be implemented with minimal expense, minimal complication, and without impacting the project timeline.

Zoning Conflicts: Some AHJs have deemed larger charging installations to be fueling stations, as opposed to site accessories, and expressed concern over their compliance with zoning codes. Similarly, some cities and counties have communicated that a DCFC charging depot application could be streamlined in a location zoned for fueling but not if the DCFC depot is to be constructed in a commercial zone or retail setting. This approach runs contrary

to AB 1236 and AHJs are encouraged to develop strategies to enable streamlined permitting for DCFC depots in as many site types as possible.

Inconsistency: Accessibility regulations (see Part 4: Accessibility for an in-depth discussion) are ultimately applied on a site-specific basis by local building officials. That means that one AHJ's interpretation of the code may differ from another AHJ's interpretation of the code, especially if an installation presents a site-specific challenge.

Lack of Familiarity: The amount of power required for DCFC installations may be unfamiliar and concerning for AHJs, especially to fire inspectors given the reality that some DCFC installations can pull as much power as a city block. However, it is important to understand that DC fast charging is a normal and tested technology found across the state in thousands of installations. DCFCs are carefully constructed and equipped with numerous safety features. DCFCs are designed to code and building officials ensure that all codes and standards are safely met. We encourage station developers and AHJs to work together to overcome misconceptions to achieve the state's goals of 10,000 DCFCs in the state by 2025.

Conversely, other building officials may be familiar with DC fast charging safety requirements and presume that features such as disconnect switches should be required on level 2 charging as well. They are not. Station developers should be ready to share manufacturer installation instructions and other resources, as necessary, to help clear up misconceptions and address concerns.

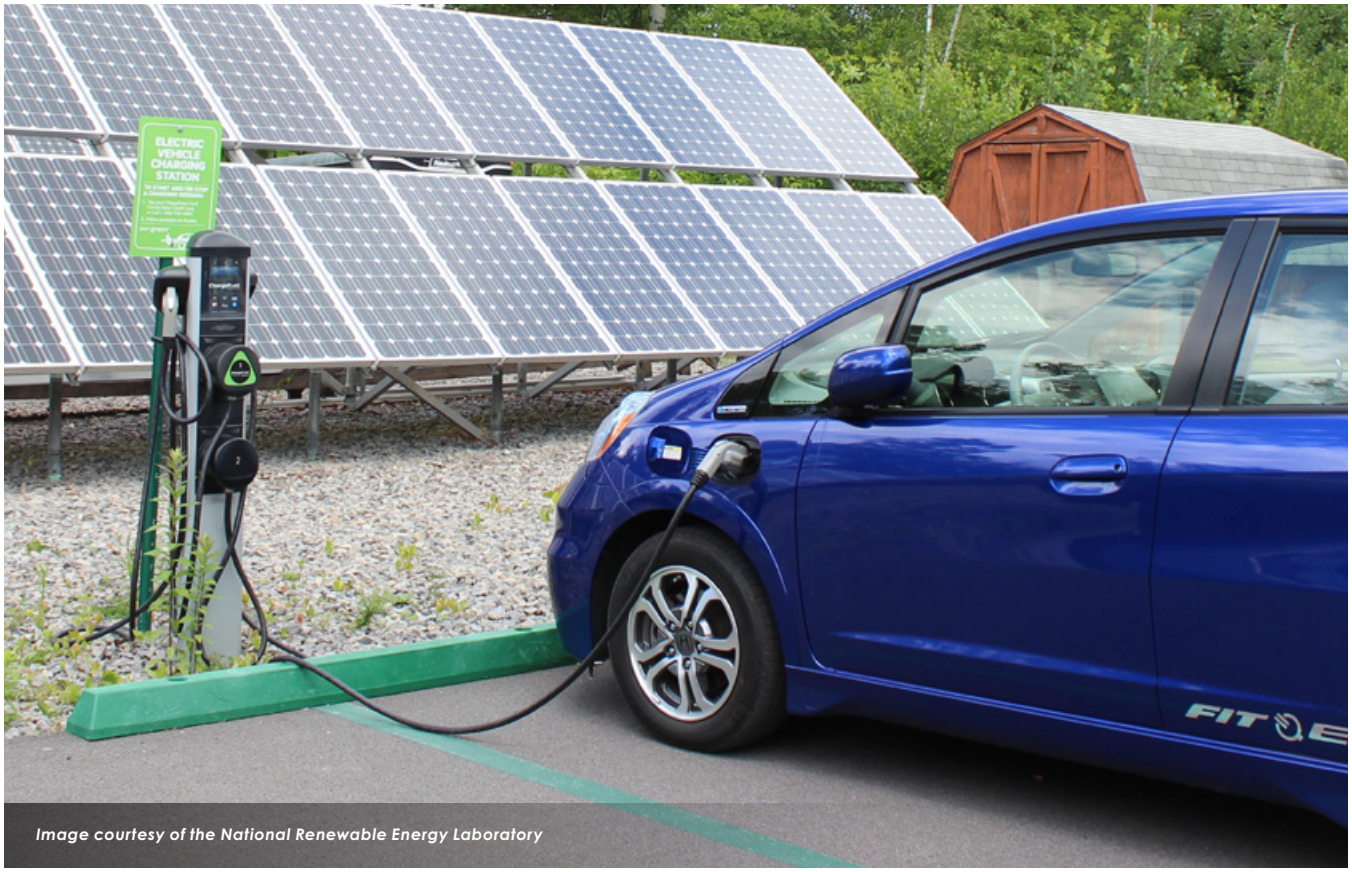


Image courtesy of the National Renewable Energy Laboratory

Images courtesy of EVgo and Electrify America

PART 04:

Accessibility

Providing accessibility to plug-in electric vehicle charging stations requires advancing two of California's key values: accessibility to goods and services for all and the growth of a clean mobility market in its infancy. With the largest zero emission vehicle market in the United States and a long history of firsts in providing accessibility, California is leading the nation in both contexts, and most importantly, at their intersection.

Accessibility has always been required at plug-in electric vehicle charging stations (as with all goods or services available to the public) under the federal Americans with Disabilities Act and as of January 1, 2017, California became the first state in the nation to have specific accessibility standards for electric vehicle charging stations in its building code. As a result, authorities having jurisdiction (AHJs) and station developers are on the front lines of implementation of these specific requirements. After years of careful development, the challenge and responsibility rests with all parties involved in plug-in electric vehicle charging station development to successfully implement the specific requirements, collect lessons learned along the way, and work with the local jurisdictions to problem solve and provide accessibility for this emerging, yet increasingly mainstream technology.

This section of the guidebook is not intended to be consulted in lieu of the specific requirements in regulation, which can be found in the California Building Code. Rather, the purpose of this section is to provide context, summarize the code requirements, and highlight examples of implementation success thus far across California. It is critical for all parties involved to read and adhere to the applicable code requirements as the primary and final resource when designing for accessibility.

Background

Federal Law

Providing accessibility at public plug-in electric charging stations has always been required under the federal Americans with Disabilities Act. The Americans with Disabilities Act includes construction standards for accessible design that apply to all types of public accommodations including privately-owned facilities that are open to the public and publicly-owned facilities. The scope of the Americans with Disabilities Act provides broad coverage intended to prohibit discrimination against individuals with disabilities in all areas of public life, including jobs, schools, transportation, and all publicly-owned and privately-owned places that are open to the general public.[38]

The Americans with Disabilities Act is the overarching applicable law. When a benefit or service is provided, it must be provided in an accessible manner. For construction standards explicitly detailed in the Americans with Disabilities Act, it is the Division of the State Architect's role to incorporate these

38 Title II of the Americans with Disabilities Act requires all state and local governments to give individuals equal opportunity to engage with services and opportunities provided. Title III of the Americans with Disabilities Act requires access to all public accommodations. California's electric vehicle charging station accessibility regulations in the California Building Code cover public accommodations, public buildings, commercial buildings, and public housing.

Image courtesy of Electrify America

requirements for accessibility into the California Building Code, Part 2, Title 24, California Code of Regulations. However, this typical process is different for plug-in electric vehicle charging because the Americans with Disabilities Act does not address charging specifically, although it is covered by the overarching law. This is often the case for emerging technology applications and because federal law is silent on specifics (and not updated with frequency) the burden lies at the state level to develop appropriate specific standards for accessibility. An obligation to provide access exists absent specific technical requirements at the federal level.

California's Early Process and Need for Specific Requirements

During the development of the ZEV Community Readiness Guidebook in 2013, accessibility for plug-in electric vehicle charging stations emerged as a key issue requiring additional focus and discussion. As a result, in parallel to the ZEV Community Readiness Guidebook process, the Division of the State Architect (DSA) and the Office of Planning and Research jointly worked with stakeholders to develop best practice guidance for accessibility at charging stations as an interim guidance document. This guidebook expanded upon the very first California guidance document on this topic published by the Division of the State Architect in 1997.

Although the initial guidance document was helpful and provided detailed assistance for charging stations being developed at the time, it soon became clear that a full regulatory process should be undertaken to develop specific building standards in California for the following reasons:

- **Projected Growth:** California's zero emission vehicle market is expected to increase rapidly in coming years and with such significant growth expected, developing specific standards for accessibility will ensure that infrastructure built for the transportation system of the future is accessible to all and accessible in a consistent manner, to the extent possible.
- **Clarity:** With specific building standards formalized in code, station developers and AHJs can ensure that projects in their jurisdiction comply with requirements to provide accessibility.
- **Stakeholder Engagement:** The formal regulatory process provides a venue for all stakeholders to participate in the development of building standards.

California's accessibility regulations for electric vehicle charging for privately-owned multifamily dwellings is covered in the California Green Building Code (CALGreen).

Regulation Development

With the need for specific regulations identified, DSA initiated a transparent, multi-year public process to develop building standards for accessibility at charging stations. In September 2014, DSA convened a working group to discuss accessibility needs for charging stations and inform the regulatory process. The working group included an array of stakeholders including individuals with disabilities, disability advocates, access professionals, building officials, architects, electric vehicle charging station manufacturers, electric utility companies, building industry representatives, electric vehicle advocates, and state agency representatives. The working group convened for a series of meetings (eight in total) over the course of approximately six months to discuss accessibility options specific to electric vehicle charging stations.

Taking the feedback from the working group, DSA drafted the accessibility building standards which were initially submitted to the California Building Standards Commission (CBSC) for rulemaking in June 2015. In August 2015, the regulations entered a formal public comment process. DSA then analyzed the comments, amending the regulatory rulemaking, as appropriate, and submitted the final building standards for approval to the CBSC at the end of 2015.

In January 2016, the building standards were approved by the CBSC commissioners. In July 2016, the building standards were published by the California Building Standards Commission and the International Code Council and became effective on January 1, 2017.

Regulatory Requirements (High-Level Summary)

California's requirements for electric vehicle charging station accessibility at public housing, public accommodations, commercial facilities, and public buildings are found in the current edition of the California Building Code (CBC) (California Code of Regulations, Title 24, Part 2).[39] The CBC is typically used in three parts: 1) definitions, 2) scoping provisions (big picture - what type of spaces and how many are required) and 3) technical requirements (where exactly the spaces are and how to make them accessible). For electric vehicle charging, the three main parts can be located in the California Building Code as follows:[40]

1. **Definitions:** Chapter 2, Section 202
2. **Scoping:** Chapter 11B, Division 2, Section 11B-228.3 Electric Vehicle Charging Stations
3. **Technical:** Chapter 11B, Division 8, Section 11B-812 Electric Vehicle Charging Stations

The remainder of this section will outline the major requirements of the accessibility standards for electric vehicle charging in California. **This is not a copy of the actual code and any station developers or local AHJs that are planning, designing, or approving actual sites must comply with the regulations in the California Building Code.** This is intended to aid understanding of the core requirements of the regulations for a general audience.

Scoping Provisions

Scoping provisions broadly determine how many charging spaces must be accessible (the number is based on the total number of charging spaces provided) and what kind of spaces those must be (standard accessible, van accessible, ambulatory, or drive through). California's scoping provisions are consistent with three key determinations made by the United States Access Board:

1. Electric vehicle charging is a service provided by the facility owner or public entity, and therefore must be accessible to individuals with disabilities.
2. An electric vehicle may not need to charge every time it is parked, so public and common use charging stations are charging spaces, not parking spaces.
3. While an electric vehicle needs to be parked to charge, charging (not parking) is the primary purpose of a charging station.

Because parking and charging are separate and the two functions have separate scoping requirements, they are also located in different sections of the code. Scoping provisions for parking are located in the California Building Code Chapter 11B, Section 11B-208. Scoping provisions for charging are located in the California Building Code Chapter 11B, Section 11B-228.3.

Charging vs. Parking

It is easy to confuse "charging" and "parking" when applying local zoning requirements for the number of parking spaces. Within the context of zoning requirements, cities or counties can help enable charging projects by clarifying that charging stations count as one or more parking spaces. This approach helps to ensure that charger installation does not take a site out of zoning compliance (see the Parking Stall Requirements and Charging Installation section). In contrast, the California Building Code has specific requirements that address charging stations as charging stations, because accessible parking stalls (i.e., the normal ADA parking stalls that are required at any public parking location) have their own set of regulatory provisions.

39 Private multifamily housing is covered in Chapter 11A. Note that the 2019 California Building Code (effective January 1, 2020) includes an exception allowing private multifamily housing charging stations to be designed in compliance with Chapter 11B or Chapter 11A.

40 The Division of the State Architect has collected these sections, and related federal resources, into a single document.

For scoping provisions related to charging spaces, the number and type of accessible charging spaces required at a site is determined by the total number of charging spaces at a facility. The table below provides a guide that enables a station developer to determine the number and type of accessible electric vehicle charging stations (EVCS) required. Ambulatory spaces, as indicated in the last column, are charging spaces that can be used by any EV driver. Van Accessible spaces (second column) must be reserved for vehicles with the International Symbol of Accessibility (ISA) Placard when there are five or more EVCS at a facility. Standard Accessible spaces (third column) must be reserved for vehicles with an ISA Placard where a facility has 26 or more chargers. When there are four or fewer charging spaces provided, no chargers need to be reserved for drivers with an ISA sign. With 25 or fewer chargers, the Standard Accessible space does not require an ISA sign and the space can be used by any EV vehicle driver, but the Van Accessible space would need to be reserved for vehicles with an ISA placard.

To demonstrate how the table is used, let's consider two different examples:

- **Facility with three electric vehicle charging spaces.** A facility with three charging spaces falls in the range of "1-4" within the first column on the left ("Total Number of EVCS at a Facility"). Follow the 1 to 4 range across the row to determine what is required. For a facility with three charging spaces, one van accessible space is required and no standard accessible and ambulatory accessible spaces need to be provided. In this example, because the charger range is at the lowest threshold (1-4), the regulations do not require the van accessible space to be reserved for use by those with a disabled parking placard or license plate and can be used by any electric vehicle driver.
- **Facility with 22 electric vehicle charging spaces.** A facility with 22 charging spaces falls in the range of "5-25" within the first column on the left ("Total Number of EVCS at a Facility"). Follow the

Table 4: How many accessible spaces are required and what type?
(Table 11B-228.3.2.1 from the 2016 California Building Code, Chapter 11B, Section 11B-228.3)

Total Number of EVCS at a Facility[1]	Minimum Number (by type of EVCS Required to Comply with Section 11B-812:[1] Van Accessible	Minimum Number (by type of EVCS Required to Comply with Section 11B-812:[1] Standard Accessible	Minimum Number (by type of EVCS Required to Comply with Section 11B-812:[1] Ambulatory
1 to 4	1	0	0
5 to 25	1	1	0
26 to 50	1	1	1
51 to 75	1	2	2
76 to 100	1	3	3
101 and over	1, plus 1 for each 200, or fraction thereof, over 100	3, plus 1 for each 60, or fraction thereof, over 100	3, plus 1 for each 50, or fraction thereof, over 100

1 Where an EV charger can simultaneously charge more than one vehicle, the number of EVCS provided shall be considered equivalent to the number of electric vehicles that can be simultaneously charged.

5 to 25 range across the row to determine what is required. For this facility with 22 charging spaces, one van accessible space and one standard accessible space is required and no ambulatory accessible spaces need to be provided. In this example, the regulations require the van accessible space to be identified with ISA signage and reserved for electric vehicle drivers with a disabled parking placard or license plate but the standard accessible stall is not required to be identified with an ISA and can be used by any electric vehicle driver.

An electric vehicle charger that has two ports and can simultaneously charge two vehicles (and therefore offering a charging space available for each), is counted as two charging spaces.[41] If the charger has multiple connectors (like a level 2 and DCFC, for example), but can only charge one car at a time, it is counted as one charging space despite technically having more than one charging port. The count is not based on the number of chargers but rather the total number of vehicles that the chargers can simultaneously serve.

When new charging stations are added to a site that has existing charging stations, the total number of new + existing charging stations is used when determining how many accessible spaces need to be provided with the new installation. The existing non-accessible stations are not required to be retrofitted to meet the new technical requirements (discussed in detail in the "technical requirements" section below) because they were installed prior to the regulations but they are counted when determining the total number of accessible stations required.

Technical Requirements

With the number and types of accessible spaces required identified, we turn to the technical requirements to determine how the accessible sites should be constructed to provide accessibility. The following text highlights the differences in requirements between the spaces. **Please note that the language and code citations below are for reference only and not a replacement for the regulations in the California Building Code. Please refer to the California Building Code for all applicable requirements.**[42]

There are four types of accessible spaces (defined below), three of which were introduced above in the "Scoping Provisions" section, and each has different requirements set by the California Building Code, Chapter 11B, Section 11B-812. All four types of accessible EV spaces must be 18 feet (216 inches) minimum in length and marked with letters that are at least 12 inches high that say "EV CHARGING ONLY." Vertical clearance of at least 98 inches (8'-2") must be provided and overhead cable management systems cannot obstruct required vertical clearance. Please note there are two exceptions under Section 11B-812.6:

Exceptions:

1. Where the long dimension of vehicle spaces is parallel to the traffic flow in the adjacent vehicular way, the length of vehicle spaces shall be 240 inches (6096 mm) minimum.
2. Vehicle spaces at drive-up EVCS shall be 240 inches (6096 mm) long minimum and shall not be required to be marked to define their width.

Best Practices to Promote Accessibility Use

Signage plays a key role in the success of a location by making parking requirements and recommendations clear to users, especially since each site may be different. Any EV driver can charge at a Van Accessible charging station if there are 4 charging stations or less on the site; any EV driver can charge at a Standard Accessible charging station if there are 25 charging stations or less, and any EV driver can charge at an Ambulatory Accessible charging station at any time.

However, to increase access, in all cases, Standard, Van and Ambulatory Accessible charging spaces should be used last by drivers who do not have a disabled parking placard or license plate. Courtesy "Use this space last" signage can help ensure the charging station is available for drivers who require more space to be able to use the charging station.

40 It is worth noting that a dual port charger can be positioned to service both an accessible and a standard charging station.

41 The California Building Code can be accessed through the International Code Council. Refer to Chapter 11B.

The below text is included to increase general understanding of basic accessibility requirements for each type of charging space. Again, please refer to the California Building Code for all applicable requirements.

Image courtesy of the California Energy Commission

Van Accessible Spaces

Van accessible spaces are three feet wider than standard accessible spaces to accommodate a van equipped with a ramp or lift. Van accessible spaces are required to be 12 feet (144 inches) minimum in width and 18 feet (216 inches) minimum in length. The access aisle, which is a no-parking zone wide enough for the use of a wheelchair, is required to be 5 feet (60 inches) minimum width, located on the passenger side. The access aisle shall have the words "NO PARKING" painted on the surface at a minimum of 12 inches in height. Where one to four total charging spaces are provided at a site, none of the spaces are required to be marked with the International Symbol of Accessibility (ISA).

Where five to 25 charging stations are provided at a site, one van accessible space is required to be marked with the ISA, indicating that only drivers with a disabled parking placard or license plate may park there. When 26 or more charging stations are located at a site, all van accessible spaces are required to be marked with the ISA. While this may seem like a large requirement, it is important to remember that only a site with 101 or more charging stations will be required to have more than one van accessible charging space.

Standard Accessible Spaces

Standard accessible spaces are provided with access to an access aisle. Standard accessible spaces are required to be 9 feet (108 inches) minimum in width, and 18 feet (216 inches) minimum in length. The access aisle is required to be 5 feet (60 inches) minimum width, located on either side of the vehicle. When 26 or more charging stations are located at a site, all standard accessible spaces must be marked with the ISA. For perspective, a site with 100 charging stations would require three standard accessible spaces.

Ambulatory Spaces

An ambulatory space is a slightly wider charging space that gives a little additional room to maneuver. Ambulatory spaces are required to be 10 feet (120 inches) minimum in width and 18 feet (216 inches) minimum in length. An access aisle is not required. Ambulatory spaces are not required to be marked with the ISA and are available for use by any EV driver.

Drive-Up Spaces

A drive-up space is a space for an electric vehicle where charging is limited to 30 minutes maximum. The site is designed so that the driver approaches the station moving forward, stops to charge, and then continues moving forward to leave the space. The design is similar to a traditional gas station. Drive-up spaces are required to be 17 feet (204 inches) minimum in width and 18 feet (216 inches) minimum in length. An access aisle is accommodated due to the required width of the EV space; however, it is not required to be marked. Drive-up spaces are not required to be marked with the ISA but all drive-up spaces must meet the accessibility requirements.

Table 5: Requirements for accessible parking spaces by type

	Van Accessible	Standard Accessible	Ambulatory	Drive-up
Purpose	Wider charging space with access aisle to accommodate van with ramp or lift	Charging space with access aisle	Slightly wider charging space	Similar to a gas station - drive in and drive out, moving forward
Width	12 feet (144 inches)	9 feet (108 inches)	10 feet (120 inches)	17 feet (204 inches)
Access aisle	Yes, on passenger side, markings required	Yes, on either side, markings required	No	Yes, but not marked
Identify with the ISA sign?	When 5-25 charging stations, identify one; when 26+, identify all	When 26+ charging stations, identify all	No	No

Sample EVCS Layouts

Figure 1: Two EVCS = one van accessible EV space required

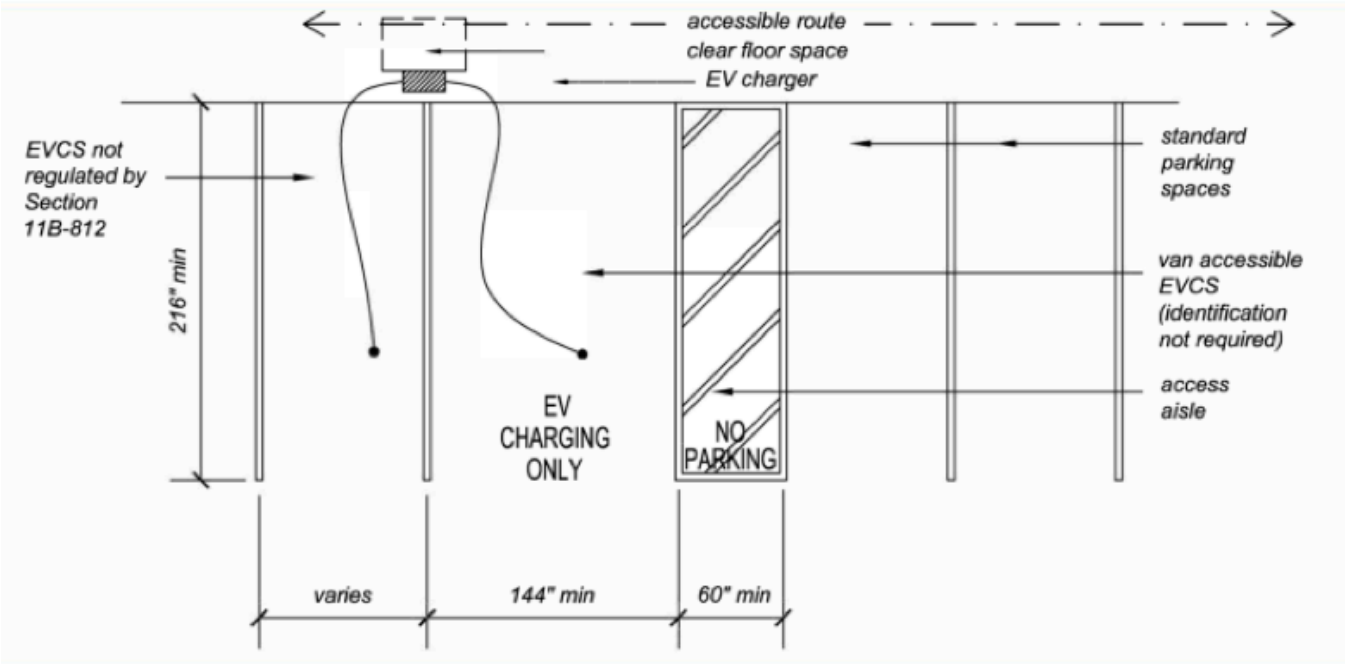


Figure 2: Five EVCS = two accessible EV spaces required

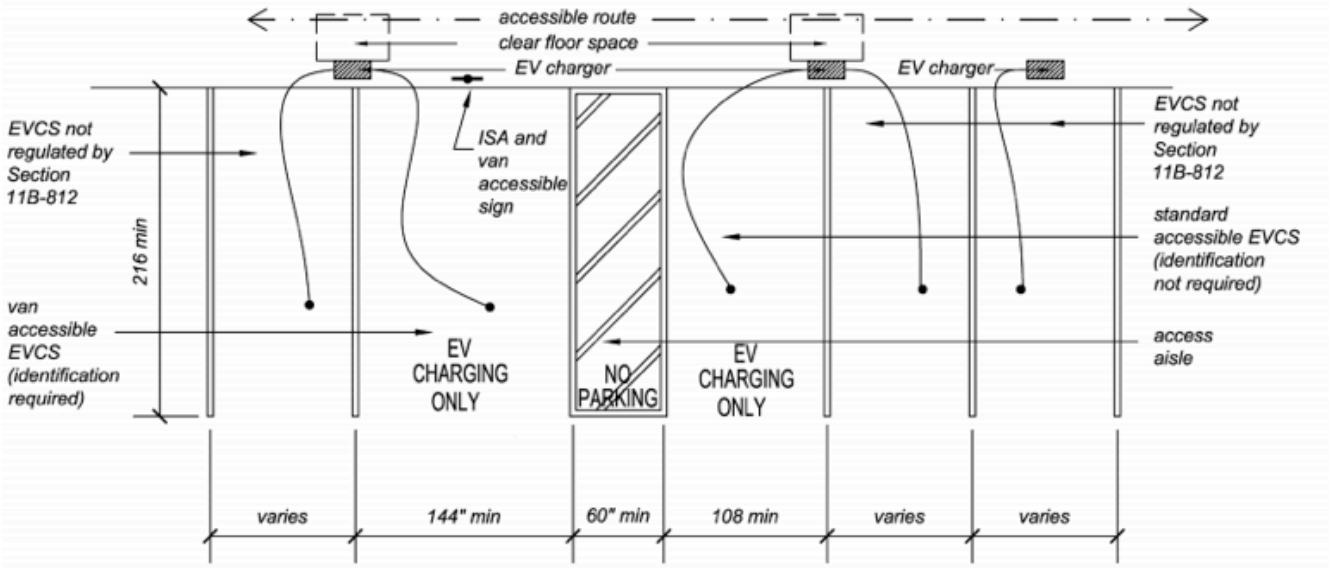
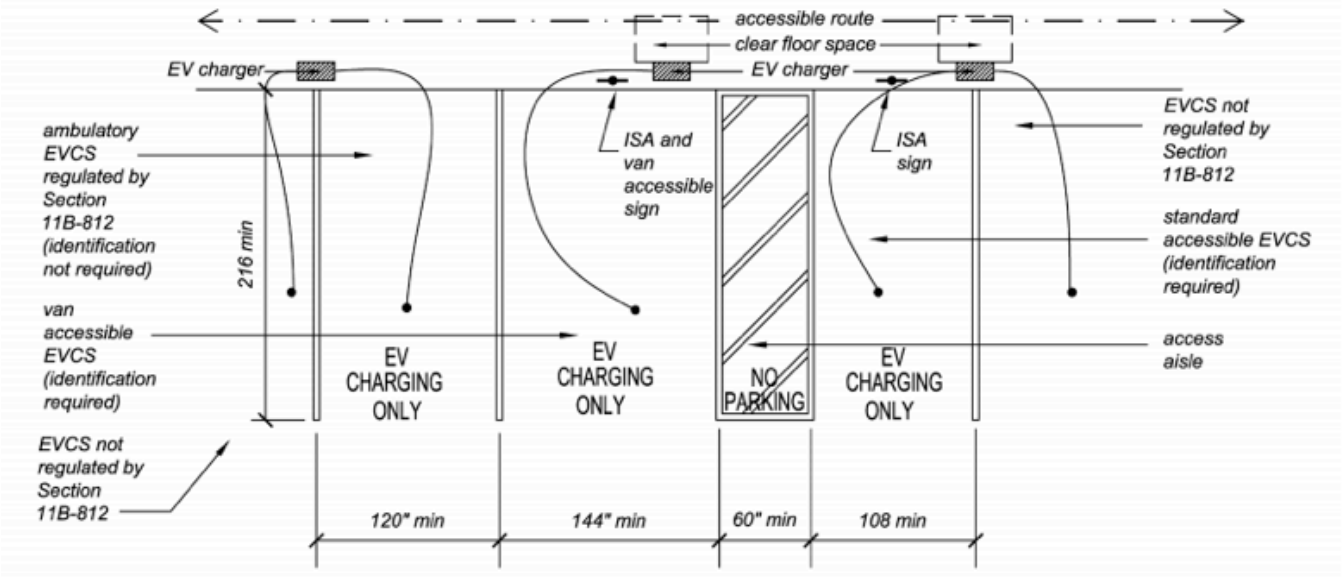


Figure 3: 26 EVCS = three accessible EV Spaces required



Path of Travel Improvements and Accessible Route

Path of travel improvements and accessible route are two closely related concepts. An accessible route must always be provided in new construction and in alterations of existing facilities, while path of travel improvements may or may not be required when a facility is altered.

Accessible Route

An accessible route is a path that can be traveled by someone using a wheelchair and is accessible because it meets the requirements as specified in Division 4 of Chapter 11B of the California Building Code. Requirements for an accessible route include the provision of handrails for ramps over 5% slope, 32" minimum wide clearances for doors, level surfaces for clear floor spaces, maneuvering clearances, and turning spaces, in addition to many more requirements. Detailing all the requirements for an accessible route is beyond the scope of this guidebook. In this section, we will focus on the particular accessible route requirements for electric vehicle charging stations.

If the electric vehicle charging station is located in a parking lot that serves a particular building or facility such as a business, shopping center, or school, all accessible charging spaces must be located on an accessible route to an entrance of that building or facility. If the charging station does not serve a particular facility, e.g., if it is a general-purpose parking garage that is not connected to any particular establishment, an accessible route must be provided to the public way, such as to the sidewalk. In both cases, charging cables may not obstruct the accessible route and there must be an accessible route between the vehicle space and the charger.[43]

Electric vehicle charging station location in relation to the building entrance is more flexible than the requirements for parking location. Accessible parking spaces must be located on the shortest accessible route to the entrance of the facility they serves, which is why accessible parking is found near the entrance of a building. Accessible electric vehicle charging spaces are not required to be on the shortest accessible route, to the entrance of the facility; they are just required to be on an accessible route which creates flexibility for station developers and preserves their ability to locate charging stations throughout a parking facility.

Image courtesy of Electrify America

Locating Accessible Chargers on an Accessible Route.

Accessible charging stations require an accessible route to the primary entrance. If the chargers support a specific building, the accessible route must connect to the primary entrance of the building (e.g., the store, office, venue, etc.). If charging is the primary function of the site, the accessible route must connect to the parking structure entrance or public right of way (e.g. the sidewalk).

In a best-case scenario, accessible charging locations can be located adjacent to accessible parking – making the accessible route as short as possible. This arrangement potentially enables a tie-in to the existing accessible route from existing accessible parking.

For a variety of reasons (space, power supply, rights of way, etc.), accessible charging will not always be able to be placed next to accessible parking. In these cases, the station developer or building owner should work with the local building official to determine the best-case scenario for the project, taking site constraints into account. When developing accessible route solutions, it is important to remember that accessible charging must be on an accessible route but does not have to be on the shortest accessible route.

43 Note: Site specific issues and opportunities should be addressed by working with the local building official. The Division of the State Architect is available for consultation at the request of the local building official. Contact information is listed at the bottom of this section.

Path of Travel Improvements

While an accessible route is a route that leads from the charging station to the entrance of the facility or the public way, path of travel improvements address an accessible route within a site or facility. The path of travel connects an area of alteration to the building entrance, bathrooms, telephones, and drinking fountains in a facility, so that these supporting facilities are upgraded to current accessibility standards.

When alterations or additions are made to existing buildings or facilities, path of travel improvements apply. In the case of charging stations, path of travel improvements are required only to facilities where vehicle fueling, recharging, parking or storage is a primary function, such as parking garages. For example, path of travel improvements are not required to a parking lot associated with an office building, because the primary function of the parking facility is to allow people to conduct business in the office building.

If the building entrance, bathrooms, telephones, and drinking fountains of a facility where vehicle fueling, recharging, parking, or storage is a primary function are not in compliance with current accessibility regulations, these elements will need to be upgraded to comply. Path of travel improvements are limited to 20% of the cost of work directly associated with the installation of the chargers.

Technical Infeasibility and Unreasonable Hardship

"Technical infeasibility" and "unreasonable hardship" are regulatory terms defined in the California Building Code. If legal or structural constraints make it impossible to comply with accessibility regulations, a station developer may request a finding of technical infeasibility from the local building official. Examples of technical infeasibility include scenarios where the installation of electric vehicle charging space would require the removal of a load-bearing column, would require construction beyond the legal boundary of the site, would require extending the length of

Understanding Accessible Route and Path of Travel in Simple Terms

In all cases, charger installation projects must provide an accessible route to the building entrance. Where EVCS do not serve a particular building, an accessible route is required to an accessible entrance of the EV charging facility. In either instance, this route does not have to be the shortest accessible route to the entrance.

Path of travel improvements (e.g., altering drinking fountains, bathrooms, telephones, building entrances) are only required in specific circumstances if facilities are not compliant to current code, and are limited to 20% of the cost of the work directly associated with the installation of the charging stations.

Required to Do Path of Travel Improvements?		
Chargers added to:	**Yes** (only if elements are not compliant to current code)	**No**
Shopping Centers		X
Restaurant Parking		X
Event Parking		X
Standalone DC Fast Charger Depot	X	
Gasoline Station	X	
Standalone Parking Garage	X	
Business Park Parking Lot		X

the parking spot into the drive aisle, or if it is not possible to meet the minimum height clearance in a parking garage.[44] If a technical infeasibility is declared, station developers must provide equivalent accessibility or comply with requirements to the maximum extent feasible.

A finding of unreasonable hardship is when the costs of compliance with path of travel improvements would be so high as to make the project impractical. In general, when a finding of unreasonable hardship has been demonstrated to the enforcement entity, the cost of path of travel improvements can be no lower than 20% of the construction cost. Given the fact that path of travel improvements for the installation of electric vehicle charging stations are capped at 20% of the construction cost in the California Building Code, unreasonable hardship does not apply to electric vehicle charging station projects.

Exceptions

Within the types of properties that Part 2, Chapter 11B of the California Building Code regulations cover (public housing, public accommodations, commercial facilities, and public buildings), there are two cases where accessible charging is not required:

1. If the charging station is not available to the general public and intended for use by a designated driver or vehicle (for example, public or private fleet vehicles or an EVCS assigned to a designated parking spot for a particular employee).

2. In public housing, if the charging station is intended for use by an electric vehicle owner or driver that has an assigned parking space.

Private Multifamily Housing

CBC Part 2, Chapter 11B does not include accessibility regulations for private multifamily housing—private multifamily housing charging stations are covered by CBC Part 2, Chapter 11A. However, the 2019 CALGreen Code (effective January 1, 2020) establishes an exception allowing private multifamily projects, constructed for first occupancy after March 13, 1991, to meet accessibility requirements by designing the project in compliance with Chapter 11B (in addition to being able to use Chapter 11A). This exception was pursued in part because Chapter 11A does not have specific accessibility standards for chargers, but Chapter 11B does. While Chapter 11A[45] remains an option for private multifamily housing, the expectation is that many developers will choose Chapter 11B to leverage its specificity.

Working Together to Achieve Accessibility

Achieving accessibility at plug-in electric vehicle charging stations is an ongoing process. Despite two years of robust regulation development, stakeholders are still refining best practices to provide accessibility for this new and quickly changing technology. To achieve both our accessibility and rapid station development goals, feedback is critical.

First, all stakeholders should consult the current edition of the California Building Code and the suite of support materials available at the Division of the State Architect (DSA) website (search "Electric Vehicle Charging Station" on the DSA website).

The DSA website hosts a 1 hour 15 minute video titled "DSA Presentation: Access California: New Accessibility Regulations for Electric Vehicle Charging Stations" which expands on the material provided in this guidebook and can serve as training material. All AHJ plan reviewers who review EVCS projects, including Certified Access Specialists and Building Officials, are encouraged to watch the video and refer to the associated slide decks.

If you are a local jurisdiction/enforcement authority and have questions about how to provide accessibility at plug-in electric vehicle charging stations, please contact Derek Shaw, Senior Architect at DSA via email at derek.shaw@dgs.ca.gov or phone at 916-324-7178). DSA can assist with site-specific interpretation in your jurisdiction as well as general questions about the requirements.

If you are a station developer, please review the code in detail and if you have general questions about the regulations, please reach out to the local jurisdiction. For site-specific questions about a project in development, the most helpful way to resolve outstanding questions is to request that the local enforcement authority contact the DSA directly.

44 Note: Site specific issues and opportunities should be addressed by working with the local building official. The Division of the State Architect is available for consultation at the request of the local building official. Contact information is listed at the bottom of this section.

45 Note that public multifamily housing projects must use Chapter 11B.

Emerging Challenges

The electric mobility market is rapidly evolving: available charging speeds are increasing, wireless charging is poised to expand, car-sharing and ridesharing are gaining popularity, more types of vehicles are being electrified, and autonomous vehicles could revolutionize the way people move. These exciting developments can be constrained by the reality that much of California's building stock was constructed without anticipating the need to install charging infrastructure or accommodate current accessibility standards. The following issues highlight some of this inherent tension between an ideal accessible site configuration and on-site feasibility, as well as the challenge of introducing new technology without the benefit of clear regulatory parameters.

In all cases below, the applicant should consult with the local building official as early as possible to collaborate and find a workable solution.

As always, the Division of the State Architect (DSA) is available for consultation at the local building official's request, but the decision rests with the local building official. Looking forward, DSA and the State of California are eager to learn about on-the-ground solutions that can help other sites and inform regulation development as charging infrastructure continues to expand.

A Note on Addressing Liability Concerns

Legal liability, as it relates to accessibility, remains a legitimate concern for AHJs and property owners alike. When liability concerns arise, it is important to remember that a building official can approve projects by identifying and clearly articulating a code path to justify and substantiate their decisions.

In other words, if it is technically infeasible to install charging that meets accessibility standards on a site, charging stations can often still be installed. The key is providing the maximum feasible accessibility with a clear code path that supports the building official's decision and recording the determination in the files of the enforcing agency.

- **Parking Garages.** Many old parking garages in California were constructed before the Americans with Disabilities Act was passed and implemented, and it may be technically infeasible to meet one or more accessibility standards for a variety of reasons. For example, in some garages, all spaces meeting the technical requirements for surface slope are already designated as accessible parking spaces or it might not be possible to create an accessible route that does not go behind cars.
- **Multiple Charger Types.** One site may host multiple charger types, from level 1 to level 2 to various DC Fast Chargers. California's accessibility regulations do not specify how to treat sites with multiple levels of charging.
- **Providing access to curbside charging.** California's accessibility regulations do not apply to the roadway, including on-street charging in the public right-of-way. Local jurisdictions may have alternative enforcement procedures for projects in the public right-of-way.
- **Car Sharing.** Electric car sharing is either being piloted or starting to take hold in a variety of locations, improving mobility for these communities. Charging for car-sharing applications does not receive unique treatment and still requires accessibility but may necessitate specific regulations in the future.
- **Innovative Designs.** The EV charging industry is rapidly evolving with new power levels, dispenser designs and station layouts. Situations may arise where a new design provides for accessibility but is not consistent with specific code requirements. If this occurs, a local building official may interpret the accessibility regulations using equivalent facilitation (11B-103). However, such alternatives must result in substantially equivalent or greater accessibility and usability.
- **Angled Parking.** Converting existing angled parking stalls to accessible charging stalls can present unique space challenges. In some scenarios, as many as four angled parking stalls would need to be used to meet the width and depth requirements for one accessible charger. In these cases, the designer may propose an alternative under equivalent facilitation (11B-103, provided the solution provides for substantially equivalent or greater accessibility and usability) for review and approval by the building official.

Implementation Lessons & Updating the Code

Because the rapidly-changing electric vehicle industry is still in its infancy and California is the first jurisdiction to create accessibility requirements for electric vehicle charging stations, it is important to document how the requirements are being implemented on the ground, collect lessons learned, and adapt through time. The end goal is to ensure that this emerging technology, which is projected to make up a significant portion of California's vehicle fleet of the future, is both accessible to all Californians and also rapidly installed to meet the growing demand.

If you are an enforcement official or charging station developer and you are witnessing recurring issues that are consistently creating challenges on the ground for providing accessibility and/or meeting station installation goals, please share your stories and insights with DSA. It is only with quality feedback and input that regulations can be properly adapted with advancements in technology.

The process to amend the California Building Code requires a rigorous public process and extended timeline, so it is important to share your feedback with DSA as early as possible. The process to address code changes is two years before the effective date of the new regulations. For example, the process to make changes that would be effective in January 2020 began in January 2018. DSA accepts code change proposals on an ongoing basis and all proposed amendments to the regulations must have the input of all stakeholders. The next deadline for DSA to proceed with a code change proposal for the intervening code cycle is in July 2019.

Image courtesy of the California Energy Commission

Images courtesy of Paired Power and Electrify America

PART 05:

Connecting to the Grid

Grid connection describes the process through which electric vehicle charging stations are connected to the electrical grid through the local utility. This process may involve connecting electric vehicle supply equipment to pre-installed make-ready wiring, the addition of electrical capacity, laying additional conduit and wiring, trenching to facilitate that conduit and wiring, and more. While not all stations require connection to the electric grid—depending instead on solar generation and on-site battery storage—most stations do use grid connection. Thus, it is important to understand this process early in station planning to reduce potential for development delays in permitting and construction phases.

Grid connection can be complex and can significantly lengthen a project timeline, especially with larger charging installations and at sites with limited existing electrical capacity. By engaging

Image courtesy of Envision Solar

Off grid and mobile solutions

Most charging stations are hardwired to the electrical grid. Depending on the setup, grid connected stations can source their power from any mix of grid power, local power generation, or onsite energy storage. However, not all chargers need to be grid connected, and solutions exist to add increased flexibility to the charging ecosystem.

For example, stand-alone or off-grid EV charging infrastructure solutions, which do not need to connect to utility grids generally receive their power from locally generated renewable energy. These systems can be deployed with both permanent and mobile form factors. Mobile off-grid solutions have the advantages of rapid deployment, no trenching, and minimal permitting (see photo to the left of this box). A permanent off-grid solution might be dedicated to charging or feed into a micro-grid. In both cases, one clear advantage is the ability to continue to charge vehicles during power outages.

Mobile chargers, which are essentially batteries on wheels, can bring the charger to the car. These systems can be charged when electricity rates are low and deployed whenever needed, effectively decoupling the time of power consumption from the time of power generation.

Bottom line: stakeholders should be aware that non-grid connected solutions complement traditional grid connected resources and provide flexible solutions that can help ensure charging can be made available everywhere vehicles travel.

with the local utility early in the process, station providers can gain a clearer understanding of the development timeline, costs, and requirements. Utility approval to begin the grid connection process is a separate and distinct approval process from an AHJ permitting process, although the processes may be more closely linked in areas with a municipal utility.

Understanding Grid Connection

Usually, similar to any other commercial customer, the station developer will be responsible for some of the work of connecting to the grid. The delineation of responsibilities between a developer and the utility varies by territory. Most utilities provide a breakdown of rules and responsibilities for all involved. It is important to clearly understand the specific steps that must be followed and potential pitfalls for a project and site as these can affect the budget and timeline. For example, if underground lines are being installed, easements must be attained by the developer. This can create a barrier if the site host is unwilling to provide an easement or lacks the legal authority to do so. Understanding these details up front can reduce project delays.

The scope and scale of grid connection differs based on the size of the project and the levels of charging involved. If a site already has excess electrical capacity, grid connection via a new service connection may not be required. However, this is not always the case. For example, even when a property appears to have adequate capacity, the utility may be required to update the drop lines to match the existing active service panel rating. If only level 1 charging is planned and there are existing power outlets on site that can be easily designated as level 1 charging spaces, little to no electrical work will be required. However, an electrician should examine and test the outlets prior to operation as charger outlets. For DCFC projects, grid connection will be a more involved process and could include some or all new conduit and wiring, a panel upgrade, and a transformer upgrade via a new service connection. Older buildings and parking lots were not typically built with significant amounts of excess electrical capacity and site hosts may be hesitant to dedicate excess capacity to electric vehicle charging, so grid connection is a common component of charging development projects in these locations. On the other hand, newer buildings are often built with excess capacity. Load testing reveals how much may be available.

In the best-case scenario, sufficient capacity will exist in both the electrical panel and the transformer to accommodate the addition of charging stations. There may be enough capacity in one but not another, necessitating a panel upgrade without a transformer upgrade or the other way around. A transformer upgrade could involve adding a new transformer or upgrading the existing transformer. This can be an expensive task, underscoring the importance of understanding your project's unique demands and needs—and communicating them to your utility—early in the process.

California's three major investor-owned utilities each make Renewable Auction Mechanism maps[46] publicly available on their websites. These maps show transmission and distribution lines as well as substations, and give information including hosting capacity and line capacity. While intended for wholesale generation customers looking for potential photovoltaic projects, these maps can also be used to help station developers identify preliminary sites to discuss with the utility. These maps do not show service impacts, such as whether you can connect to an existing transformer or whether an upgrade will be needed.

Timeline for Communicating with Your Utility

As a rule of thumb, station developers should engage utilities as early in the process as feasible. Given the large amount of electrical load and extensive construction that can be involved, early engagement can shave weeks or months off a project timeline.

To expedite the process, station developers should get in contact with their utility to ensure they understand what components a utility will require for an application to be deemed "complete."

Each utility has different expectations and bandwidth to help walk station developers through the process. Some utilities are available to help with the site selection process, while others cannot provide timeline and cost estimates until a site is selected and secured. In the following sections of this part, we provide more information on how the process varies at different major utilities in the state. These five utilities (three investor-owned and two publicly owned) are the most prominent in the state and represent the

46 PG&E; SDG&E; SCE.

majority of California's population, although there are 59 utilities that cover the whole of California's needs.[47]

Major Utility Grid Connection Processes

Each utility has a different grid connection process and will follow different intake, review, estimating, and construction processes. However, there are also many commonalities between them. If you install stations in multiple service territories, it is important to become familiar with the similarities and differences across the utilities.

It is also important to communicate early with your utility about who will be responsible for the cost of each component of the installation. Almost always, the customer will be financially responsible for the electrical work between the station and the meter, while the utility will be financially responsible for work done beyond the meter up to a pre-defined allowance. When a service upgrade is necessary, utilities may cover some or all of the cost on the utility side of the meter based on anticipated cost recovery from ratepayers. This may vary based on site-by-site conditions, the scale of a project, and other variables.

The basic processes within a utility for installation of level 2 and DCFCs are often similar with some additional requirements and longer timelines for DCFC projects since they tend to be more complex and demand more power. In the following sections, process differences between level 2 and DCFCs are delineated where possible.

Pacific Gas & Electric

The Pacific Gas and Electric Company (PG&E) has put together a dedicated team to evaluate and triage plug-in electric vehicle charging station grid connection applications. New developments where charging is just one component or other projects that include charging as one of many electrical developments will likely go through a standard local office, but the dedicated ZEV team will handle projects where charging is the primary addition. To be routed to the ZEV team, an applicant merely needs to select "Commercial PEV Charging Station" as the project type while submitting their application.

Once an application is received through the standard application portal, it goes to a service representative who will check the application package to make sure all necessary materials are included, review for completeness, and request any additional or clarifying information. Next it goes to an estimator who looks at the request and the existing service available at the site and develops a cost and technical specifications package. The package then moves to a distribution planning team that evaluates any request for additional load to determine whether significant impact to the grid is anticipated. Finally, the estimator compiles the whole package and sends it back to the customer with full specifications and cost estimates.

PG&E aims to deliver an estimate within three to four weeks, although developers report it can often take longer. The station developer should communicate to PG&E the anticipated length of construction, the target work completion date, the timeline for final inspection, and when they would like to begin new electrical service. Station developers may opt to begin their portion of the trenching and conduit before PG&E begins construction on its portion of the work. Designers and builders can consult the PG&E Greenbook Manual for the exact technical specifications required by PG&E.

For a DCFC installation, PG&E wants to work with station developers to help find the best place to connect to the grid quickly and at the lowest cost. As of early 2019, PG&E is piloting a site evaluation service in which station developers can request estimates for five different locations within a one-block radius for a dense urban area or within a one-mile radius for a rural area. The estimator will run cost calculations and impact studies for each site then prioritize best to worst locations for the project parameters. This service may be expanded in the future.

The speed at which additional service can be connected depends on the size and scope of the project. If minimal involvement from PG&E is necessary, grid connection should take approximately one month. Larger projects, such as those requiring a new service drop, could take a month to schedule, with a week allotted to perform the work. Additional complexities, such as more undergrounding, right-of-way work, and more intensive service requirements, can push the process out to 3-5 months, or more. The most complex

47 This includes investor-owned utilities, electric load serving entities (including publicly owned utilities), rural electric cooperatives, and community choice aggregators. See CEC Load Servicing Entities in California.

projects could take up to a year, including both the scheduling and completion of work.

PG&E is generally able to complete projects that are relatively close to substations without significant construction and electrical work.[47] In rural areas, which can have long and thin wires intended for single-family housing for several miles, larger charging projects can require substantial infrastructure upgrades.

An overview of the general process for adding electrical service, from application to service connection, can be found on the PG&E website.

At any point during the process, customers may track the project and review its status through the Customer Connection Online Portal. The portal gives detailed summaries of each step of review, showing when an application has been received and reviewed, when project planning is underway, when the contract has been mailed, and when construction is scheduled.

Southern California Edison

Southern California Edison (SCE) has a dedicated electric vehicle connection team, the Transportation Electrification Project Management team, that manages customers submitting multiple EV connection requests throughout the service territory. This team acts as the single point of contact for multi-site EV developers including government entities, fleets, and third party EV developers. SCE routes individual electric vehicle charging station requests through their standard local planning districts and account managers via SCE Local Planning. SCE estimates an average 4–6 months for engineering review and planning once the customer has delivered a complete submittal to SCE. Customer construction timelines will vary based on project scope. Engineering technical review can be the most time-intensive part of the process.

The SCE process for developers, fleets, and other multi-site EV projects is described on their New Development Project Management page. For single EV projects or upgrades to existing service extensions, applicants can contact SCE Local Planning. These pages have a wealth of information, many FAQs and all of the forms needed to apply for service or upgrades to existing service extensions. Station developers are encouraged to refer to them when pursuing projects in SCE service territory.

In addition to streamlining EV service requests, SCE has placed special focus on developing ZEV rates. Access to these rates depends on how stations are metered and is something station developers and site hosts should take into consideration when designing a project:

- For stations metered together with the existing facility load, SCE offers their full range of Time of Use (TOU) rates depending on maximum facility demand.
- For separately metered stations, SCE offers designated electric vehicle charging rates and intends to introduce further rate design options in 2019. The new rates are intended to alleviate demand charges for the first five years of service and then phase demand charges back in over the next five-year period.

SCE offers a Business Rate Analysis Tool to help some business owners estimate their annual rates under different time-of-use plans. The tool currently only supports level 1 and level 2 charging installations at multi-unit dwellings or workplaces.

Image courtesy of Veloz

San Diego Gas & Electric

San Diego Gas & Electric (SDG&E) assigns grid connection projects to a geographically close planner who already has familiarity with the area.

47 Dense urban areas can sometimes be more challenging, adding complexity and expense.

The planner will gather information on the size of the job and look at their service maps to see whether enough power will be available for the project.

If a station developer is planning to develop a network of sites, or multiple similar sites, they can work with one of the design firms with whom SDG&E contracts to ensure more consistency and efficiency than if each site were assigned a different regional staff planner. This list is dynamic and updated frequently. Station developers can request the latest version of the list from the Project Management Group in the geography where the new electric service is needed (there are three offices, provided at the bottom of the Request for Service form).

After this stage, planners are available to perform a site walk with the customer. SDG&E highly recommends the site walk, which often leads to fruitful conversations and highlights opportunities to slightly modify the plans to save money on grid connection costs. After the site walk, the planner will perform additional technical work, as required, such as conducting a fusing study, verifying connections in electrical vaults, and studying the electrical mapping system. This goes into designing the utility portion of the job which concludes in issuing a service order to the station developer with details and instructions for the contractor.

The service order will include a fee for the utility's work. An allowance based on anticipated ratepayer recovery over the first year of station operation will be applied to the fee to reduce it. This may result in no fee being charged due to the station developer and the utility bearing the full construction cost. In larger jobs, the station owner will pay the balance of the fee.

The customer is responsible for laying all conduit from the transformer to the meter pedestal, as well as connecting the pedestal to the station or stations. SDG&E is responsible for placing wire in the empty conduit between the meter pedestal and the trans-former and for placing the meter into the socket. SDG&E may require that their trench inspectors review any trenching before the trenching can be refilled and paved.

After construction is complete, an SDG&E crew will visit the site, make transformer upgrades as needed, put wire through the conduit, connect the transformer to the meter pedestal, and set the meter, energizing the new service. After this point, the station developer can turn on the equipment and begin the commissioning process.

To minimize costs, SDG&E recommends several steps. Early engagement is key, although a customer will likely not be referred to a planner for a more detailed estimate until a project is reasonably planned out. Trenching, which can easily account for two-thirds of costs, should be minimized. Trenching through concrete is typically the most expensive, then trenching through asphalt, then through landscaping. Finally, SDG&E recommends taking a site walk with the assigned planner to discuss the particularities of the site and identify ways to reduce costs.

SDG&E anticipates about twelve weeks to deliver a service order with all information on the work that will be necessary.

More information is available on SDG&E's website as well as the new electric service request form.

Los Angeles Department of Water and Power

Los Angeles Department of Water and Power (LADWP) is the largest municipal water and power utility in the nation, providing service to 1.4 million electric customers in the region. The territory is broken into three service areas: Valley Service Planning, Metro West Service Planning, and Metro East Service Planning.

LADWP has a dedicated service planning team, the EV Service Design Group, that handles all charger installation requests. The developer completes the Commercial EV Charging Plan Review Form and provides complete plot plans and/or site plans, building profile and/or elevation plans, one line electrical diagram, load schedule and Service Planning Information Sheet. If the job includes other work beyond charging infrastructure, developers use "Find The Right Person" to find the appropriate service planner and office to submit other jobs. LADWP assesses the service request, performs an engineering plan review, and provides meter options in a written report. Note that if the project is a dedicated new service or upgrade, the developer must submit a complete submittal package to LADWP to proceed with engineering review and design work. LADWP then provides the service design and Commitment Letter.

The general interconnection process for level 2 and DC fast chargers is the same, with timelines typically longer for DC fast charger projects. DC fast charger projects also include a customer requirement plan (the plan delineates work to be completed by the developer and LADWP). The typical timeline for this portion of the project is approximately 6–12 weeks

depending on the size and complexity of the project. For new or existing services requiring conduit work, transformer work, or street resurfacing on public property, charges may be incurred. The Service Planning Engineer will calculate projected charges based on the submitted plans.

The station developer is responsible for scheduling a pre-construction meeting to review the service design, discuss inspection requirements, confirm the next steps to complete the installation, and sign any necessary documents. The developer is also responsible for obtaining required permits and final electrical approval from the Los Angeles Department of Building and Safety (LADBS) and installing electric service infrastructure as detailed in the service design.

Once the completion of the electrical service infrastructure is known, the developer arranges final inspections by LADBS and LADWP (via "Find the Right Person") and pays for service installations costs. LADWP then dispatches a crew to perform their portion of the work (typically 6–8 weeks lead time).

To save time and money, LADWP recommends engaging them early in the process, prior to selecting the final site and signing agreements with the site host. LADWP also offers a feasibility study for the potential project site that provides detailed and actual estimates of new or upgraded installations. There is a non-refundable $1,500 fee that is credited toward the final cost of the job. Developers should be aware that LADWP has a one site, one service policy that can affect project design and costs. Exceptions may be made and are considered by LADWP on a case-by-case basis. The department is exploring the potential for a broader policy change that will allow additional criteria to be evaluated in support of separate charging services.

More information on EV charger installation is available on LADWP's general EV programs website.

Sacramento Municipal Utility District

Sacramento Municipal Utility District (SMUD) is one of the ten largest publicly owned utilities in the United States, providing electricity to Sacramento County and a small portion of adjacent Placer County.

SMUD has a dedicated team for grid connection projects in their territory. SMUD offers its customers the option of providing the team with pertinent information and cost estimates on the sites they are considering installing chargers so that SMUD can perform due diligence to identify potential issues or pitfalls that may be related to those sites. This helps the project developer make a more informed location decision before getting too far into the project.

Image courtesy of Sacramento Municipal Utility District

Once the site is selected, the developer submits an application with a site diagram, estimated power draw, and a $5,000 deposit (this is later applied to project construction costs). A Line Designer is assigned to the project and begins to create a "commitment drawing". This portion of the project usually takes approximately 60 days. The applicant is then responsible for adding their portion of the infrastructure to the drawing – conduits, boxes, subsurface infrastructure – and ensuring entitlements and other permit requirements are received. Once the developer-installed infrastructure is complete, the applicant and SMUD execute the final contract and the applicant pays the grid connection project costs in full. SMUD typically has a 4-6 week minimum lead time once the project is ready to move forward with construction. The entire process, from applying to having the grid connection complete, is approximately 4-6 months, assuming there are not hold ups on the project developer side.

To minimize costs and project delays, the SMUD team recommends engaging with them early in the process and utilizing the site "due diligence" service. The SMUD Interconnection Information page outlines the interconnection process, and provides guidelines, applications forms, and other helpful information.

Opportunities to Streamline Connection to the Grid

California's major utilities have been trailblazers in bringing charging infrastructure to the state. As the market for charging continues to grow, utilities can continue to take leadership in addressing barriers to station development by providing transparent

estimates for construction timing and connecting customers with the best rate options for each situation. Here are specific recommendations to streamline the process and provide greater transparency for all parties:

Timeline Transparency: A lack of understanding of the timeline to add new electrical service can doom a project and frustrate the station developer and AHJ involved. By providing timely and realistic estimates of the timeline to develop a site and complete construction, utilities can help station developers plan and develop projects as planned. Equally important is meeting those timelines in a realistic manner. A number of factors can extend timelines, including utility workload. Some utilities allow developers to engage third party contractors to complete portions of the work, which can help shorten utility connection timelines.

Dedicated Team for Plug-In Electric Vehicles: When practical, utilities can benefit by establishing a dedicated team for charging stations who are equipped with technical expertise and familiar with the nuances of EV infrastructure development. Incorporating expert review into the process can help speed up the process for everyone.

Thorough Pre-Application Discovery: Quickly establishing the available power on a connection or nearby transformer is essential to understand what type and size of project can be built without major upgrades. Utilities providing this information without the need for detailed site plans or drawings enable station developers to explore possible sites and, when appropriate, adapt site sizing and layout to minimize utility costs.

Collaborate to Plan and Prepare to Meet Installation Demand: AHJs can share information about the number of installations under review and when they are likely to be approved. This can eventually help utilities start their processes before AHJ approval so they can get the right resources in place to minimize the time between permit approval and interconnection.

Clear Rate and Demand Charge Structure: Unpredictable electricity costs charges can be one of the greatest obstacles to station deployment. Utilities can help address cost uncertainties by proactively educating station developers on the range of electricity rate options, charges they can anticipate, and strategies to mitigate their impact.

Clear Understanding of Roles and Responsibilities: It is not always clear to station developers the delineation of grid connection responsibilities between the utility and the station developer. Providing clear and up-front guidance is helpful and allows station developers to better plan and reduce the potential back-and-forth between the utility and developer.

Images courtesy of Electrify America

PART 06:

Construction, Commissioning, and Operation

In this section, we explore the typical review junctures for a charging station permit and how these junctures vary based on jurisdiction or charging station size and discuss key steps in the commissioning and operating process station developers should be aware of.

Construction, Installation, and Review

After permits are issued and installation of the charger is complete, final inspection is required to receive final approval to operate the station. Typically, building inspectors can be scheduled within 48 hours of the end of construction and installation. The building inspector will ensure proper charger installation, correct electrical work, and that construction in line with the permit granted by the building department. If the charger is not constructed and installed in accordance with the granted permit, the building inspector will request changes to the installation before final approval is given.

The building inspector evaluates the site to determine whether the station passes key tests such as secure mounting and fastening, the presence and function of disconnect switches if applicable, adequate space and protection from collision, proper identification and rating of all equipment, and other factors.

To ease the review process, AHJs should:

- develop and share a concise review checklist that gives permit applicants a clear view into what aspects of the charging installation will be inspected before final approval;
- clearly communicate what documents should be brought to the inspection and who needs to be present;
- employ, or contract with, certified electrical plan reviewers and inspectors;[50]
- allow inspections to be done without the project electrician present, saving significant labor costs for the station developer by not having to pay the electrician for idle time during the entire inspection window.

Some station developers report working with building inspectors who have a substantially different interpretation of the state building code accessibility regulations than the building official who approved the permit. These discrepancies in review can delay the project significantly and lead to costly work to come into compliance. AHJs should harmonize interpretations across staff and divisions as much as possible and provide clear mechanisms for reconciling disparate interpretations. Any concern or disagreement about accessibility regulations should be resolved prior to the start of construction.

50 Within the renewable energy space (photovoltaics, energy storage systems and EVCS), underqualified inspectors can create avoidable confusion and delays.

The Center for Sustainable Energy has developed multiple example inspection checklists which AHJs may use for reference and inspiration as they draft an inspection checklist. One example can be found on page 4 of Electric Vehicle Charging Station Installation Guidelines: Residential and Commercial Locations.

Ideally, there will be close coordination between the utility and building department regarding on-site inspections, with inspections from both happening simultaneously or in close parallel. The station cannot be turned on until approved by both parties. Especially in AHJs with municipal utilities where the opportunity for collaboration is greater, AHJs should maintain open lines of communication with the local utility and work to align their inspections whenever possible.

Image courtesy of Electrify America

Commissioning and Operation

After construction and review and before activating the station for operation, stations go through a brief commissioning process that typically takes a few hours (two days at most). For level 1 chargers, commissioning should merely involve a quick confirmation that electricity flows through the outlet. With higher levels of charging, commissioning includes confirming all electrical components and connectors are working and securely connected, verifying cellular connectivity if applicable, adding the charger to public databases, ensuring all covers are attached, and other steps as applicable. For sites requiring new electrical service that is not completed at the time of station installation, some or all of this review may wait until all electrical work is finished. Depending on the electric vehicle supply equipment manufacturer involved, this review and commissioning may be performed either by a contractor from the manufacturer or by the contractor hired by the site host.

Weight and Measures Certification

The California Department of Food and Agriculture, Division of Measurement and Standards (DMS), is responsible for the enforcement of California weights and measures law. In the context of electric vehicle charging, DMS' programs are organized to ensure that a kilowatt hour (kWh) dispensed in a commercial retail environment equals a kilowatt hour received. This helps ensure fair competition for industry and accurate value comparison for consumers.

California is in the process of transitioning from an early market, where public chargers took a variety of approaches to collecting fees in exchange for charging, to a mature market in which electric vehicle service equipment is type certified and field verified. As of publication, DMS is undergoing a rulemaking to enforce the National Institute of Standards and Technology (NIST) Handbook 44 Section 3.40, with a target of the regulations going into effect on January 1, 2020.

Readers are encouraged to track DMS's website for updates on the rulemaking and its implementation.

Signage

When advertising the presence of the station, chargers that are accessible to the public 16 or more hours per day and located within three miles driving distance of a state highway are eligible for free highway signage, providing the station developer purchases and installs directional signage from the freeway to the site (also known as trailblazer signs) on the local streets and roadways. Refer to the "Plug-In Electric Vehicle Charging Station and Hydrogen Fuel Cell Electric Vehicle Fueling Station Signage Fact Sheet" for more information. Additional details on signage requirements can be found in section 2I.03 of the Caltrans Manual on Uniform Traffic Control Devices (MUTCD).

Encroachment permits and installation costs for trailblazer signs are the responsibility of the station developer. However, the purchase and installation of highway signage will be covered by Caltrans at no cost to the station developer.

Station operators should be aware that the California Air Resources Board is currently developing regulations to implement the Electric Vehicle Charging Stations Open Access Act (Statutes of 2013, Chapter 418) which will likely prohibit station operators from requiring a subscription fee or organizational membership to charge at a publicly accessible charging station, require disclosing charging fees at point of sale and make generally available payment options available, and share the location, fees, methods of payment, and roaming charges for the station with the National Renewable Energy Lab so that the information is included in the Alternative Fuel Data Center Database.[51] Once regulations are promulgated, compliance requirements will phase in over a multi-year timeline.

Station developers should plan for long-term operations and maintenance as well as public safety considerations. For public or shared charging, station developers should have a plan for dealing with potential vandalism or collision, especially if bollards to protect the station against collision have not been installed.

Image courtesy of Adopt a Charger

51 The Alternative Fuels Data Center is a public resource that maps stations and shares information with multiple station finding applications.

Image courtesy of EVgo

PART 07:

Looking Forward

The State of California is firmly committed to the success of zero emission vehicles. Too much is at stake to fail. Regions of California suffer from the worst air quality in the nation and the transportation sector stubbornly continues to be the largest source of our greenhouse gases. While the state can write laws, set targets, and dedicate staff to the cause, the mission to replace internal combustion vehicles with zero emission vehicles will only be achieved with focus at the local level–deploying groups of stations and vehicles community by community.

Ultimately, it takes local leadership to scale zero emission vehicles across the state. Ideally, ZEV initiatives will have strong support from city or county leadership–but to get started, they do not have to. Station developers report that some of the best cities and counties to work with are those with dedicated front-line staff pushing from the bottom up. To date, one of the best predictors of an easy permitting process is whether or not city staff drive zero emission vehicles. If they do, projects tend to be extremely welcome and the city is more likely to have engaged in planning to help enable ZEV deployment. These drivers understand—first hand—the importance of infrastructure.

This local leadership is crucial for a host of reasons. Nobody knows a city or county's permitting processes, constraints, and opportunities like city and county staff. They know how to avoid red flags and streamline processes. Cities and counties willing to work with station developers to streamline processes create opportunities for statewide improvement. A process breakthrough in one city can open the door for improvement in another. This local momentum often turns into regional momentum, which feeds state momentum, and leads to national momentum, all of which benefits our shared resources–natural and man-made.

GO-Biz intends for this guidebook to serve as the continuation of an intentional effort for ongoing ZEV infrastructure development improvement, not the end of a process. With the help of local leaders and station developers, we will be collecting and sharing lessons learned, instructive case studies, and actively reaching out to communities that are on their way to creating a robust electric vehicle charging station permit approval process.

If you have insights or ideas that can help improve station deployment processes, please share them with the GO-Biz ZEV team (zev@gobiz.ca.gov) and anyone who has a role to play in the station development process. The keys to success are in all our hands.

PART 08:

Definitions and Additional Resources

Key Terms and Definitions

Accessibility: Under the federal Americans with Disabilities Act (ADA), most public accommodations are required to meet federal regulations ensuring equitable use of services by people with disabilities. Requirements cover the layout and design of physical space and components, design elements and signage, visual and auditory cues, and more. In California, the California Building Code (CBC) and the California Green Building Code (CALGreen) regulates accessibility for most public charging stations.

Authority having jurisdiction (AHJ): The local entity, usually the city or county, that has planning and building authority over a specific site.

Charging management: Also known as load balancing. Charging management describes a set of hardware and software tools that can intelligently throttle the amount of electricity going to charging stations to charge more vehicles with less electrical capacity. If many vehicles are plugged in at once, charging management can be used to proportionately decrease the charging speed of one or more of the vehicles in real time, so that more cars can be charged without having to significantly expand electrical capacity. On-site battery storage can also be used to minimize grid impacts and avoid having to upgrade utility electric supply.

DC fast charging (DCFC): Direct current fast charging, the fastest charging currently available. DCFCs currently range from 50 kilowatt (kW) up to 350kW, adding about 3 to 20 miles per minute, depending on the charger speed and state of charge of the battery. Most PHEVs, and some lower-range BEVs are not equipped with DCFC ports.

Demand charge: The charge from a utility that corresponds to the peak energy transfer rate over a given period of time.

Electric vehicle charging station (EVCS): One or more electric vehicle charging spaces served by an electric vehicle charger or other charging equipment. Where a multiport electric vehicle charger can simultaneously charge more than one vehicle, the number of electric vehicle charging stations shall be considered equivalent to the number of electric vehicles that can be simultaneously charged.

Electric vehicle supply equipment (EVSE): The hardware, including connectors, fixtures, devices, and other components required to charge an electric vehicle.

Level 1 charging: The slowest charging speed, adding 4-5 miles of range per hour. Level 1 charging is the equivalent of plugging into an everyday outlet and is typically used where a car will be parked for a long period of time, such as overnight while the driver is sleeping or at the workplace.

Level 2 charging: A medium charging speed (3.3 – 7.2 kilowatt), adding 12 to as much as 70 miles of range per hour. Level 2 charging is the equivalent of plugging into a dryer or other large appliance outlet.

Light, medium, and heavy-duty: These are vehicle classifications based on the weight and engine of a vehicle. Light-duty vehicles include most passenger vehicles. Medium-duty vehicles include buses and

forklifts. Heavy-duty include the heaviest trucks and trailers.

Plug-in electric vehicle (PEV): PEV is an umbrella term including both 100% battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), which run primarily on batteries but have a back-up tank of gasoline. For the purpose of this guidebook, the PEV acronym also includes battery electric vehicles that charge wirelessly, using inductive charging.

Station developer: A public or private entity that develops charging stations, often a station development company, manufacturer of electric vehicle supply equipment, investor-owned or publicly-owned utility, automaker, nonprofit, or other interested party. Station developers have a variety of business models, with some engaging in every step of the development process and owning and operating their stations, while others only engage in parts of the process.

Zero emission vehicle (ZEV): A zero emission vehicle is any type of vehicle that has no tailpipe emissions. These cars run on electric motors and are powered by electricity delivered from batteries or hydrogen and fuel cells. In contrast to conventional internal combustion vehicles, ZEVs prevent air pollution, lower greenhouse gas emissions, and help integrate renewable energy into the transportation sector. There are two kinds of ZEV: plug-in electric vehicles (PEVs) and hydrogen fuel cell electric vehicles.

ZEV Readiness Scorecard

The Governor's Office of Business and Economic Development has established a ZEV readiness landing page (www.business.ca.gov/ZEVReadiness) that will be used to track station development streamlining, resulting in a shared resource of best practices, ordinances, and checklists. The site will initially focus on permit streamlining and voluntary building codes.

Permitting

The below "Permitting Electric Vehicle Charging Stations Scorecard" will serve as the foundation for assessing statewide compliance with California's electric vehicle charging station permit streamlining law (AB 1236, 2015). Communities do not need to create ordinances and checklists from scratch. California Building Officials (CALBO) offer AB 1236 compliance toolkits for both small and large jurisdictions. These toolkits include model ordinance templates, adoption timelines, and supporting staff reports, as well as a sample permitting checklist.[52]

Cities and Counties that meet at least 6 of the first 7 checklist criteria will be highlighted as "EVCS Permit Ready" as long as the missing criteria does not have a negative impact in practice. Cities and Counties that add #8 will be designated as "EVCS Permit Ready All Stars" on our permit list.

Permitting Electric Vehicle Charging Stations Scorecard:*

☐	**1. Streamlining Ordinance** Ordinance creating an expedited, streamlined permitting process for electric vehicle charging stations (EVCS) including level 2 and direct current fast chargers (DCFC) has been adopted.
☐	**2. Permitting checklists covering L2 and DCFC** Checklist of all requirements needed for expedited review posted on city or county website.
☐	**3. Administrative approval of EVCS** EVCS projects that meet expedited checklist are administratively approved through building or similar non-discretionary permit.
☐	**4. Approval limited to health and safety review** EVCS project review limited to health and safety requirements found under local, state, and federal law.
☐	**5. Electric signatures accepted** AHJ accepts electronic signatures on permit applications.**
☐	**6. EVCS not subject to association approval** EVCS permit approval not subject to approval of an association (as defined in Section 4080 of the Civil Code).
☐	**7. One complete deficiency notice** AHJ commits to issuing one complete written correction notice detailing all deficiencies in an incomplete application and any additional information needed to be eligible for expedited permit issuance.
☐	**8. Bonus: Expedited timeline for approval** Consistent with the intent of AB 1236, AHJ establishes expedited timelines for EVSE permit approval compared to standard project approval procedures.

* Note: The requirements establish by AB 1236, 2015 is the foundation of this scorecard. See Part 3: Permitting, Table 2 for more information.

** If a city or county determines it is unable to accept electronic signatures on all forms, the permit streamlining ordinance shall state the reasons.

52 Note: at the time of publication of this document, CALBO's sample permitting checklist resides only in the small jurisdiction toolkit.

EVCS Permit Ready Score:
Green: City or County is EVCS Permit Ready, charging infrastructure permitting is streamlined
Yellow: City or County EVCS permit streamlining is in progress, or partially complete
Red: City or County is **not** streamlined for EVCS permitting
Grey: Not yet evaluated (or in process)

Building Standards

Several communities have already adopted voluntary reach building codes. Similar to tracking permitting, the GO-Biz ZEV Readiness website will track progress using the following parameter, and jurisdictions will fall into one of three categories.

Voluntary Building Standard Adoption:
☐ Voluntary reach codes. Has the AHJ adopted voluntary reach building codes for EV charging?

Building Standards
State of California Standards
Voluntary reach code adoption in progress
Some voluntary reach codes adopted
All Voluntary reach codes adopted

GO-Biz anticipates that the ZEV Readiness page will evolve and improve through time with stakeholder participation and feedback.[53]

53 Please send information and feedback to zev@gobiz.ca.gov.

Electric Vehicle Charging Station Streamlining All-Star Checklist

The following checklists provide a series of questions that various stakeholders can ask to help ensure streamlining of the electric vehicle charging station deployment system. Each of the questions is anchored in the guidebook text, with page numbers and sections included for reference.

Planning for Zero Emission Vehicles

A Checklist for Authorities Having Jurisdiction (AHJs – usually a city or county)

- ☐ Are ZEVs, and charging and fueling needs, incorporated within documents such as the general plan, capital improvement plan, climate action plan, and design guidelines?
  Pg. 11 *(Planning for Charging Growth)*
- ☐ Has the AHJ participated in the development and implementation of a regional zero emission vehicle readiness plan?
  Pg. 11 *(Planning for Charging Growth)*
- ☐ Has the AHJ established by ordinance, zoning code or bulletin that electric vehicle charging spaces count as one or more parking spaces for zoning purposes?
  Pg. 11 *(Parking Stall Requirements and Charger Installation)*
- ☐ Has the AHJ adopted voluntary reach building codes for EV charging?
  Pg. 11 *(Advancing Infrastructure through Building Standards)*
- ☐ Does the AHJ have an enforcement policy and plan for electric vehicle charging spots?
  Pg. 13 *(Parking Enforcement)*

Permitting Electric Vehicle Charging Stations Requirements (per AB 1236, 2015):

- ☐ Does the AHJ have an ordinance or ordinances creating an expedited, streamlined permitting process for electric vehicle charging stations (EVCS) including level 2 and direct current fast chargers (DCFC)?
  Pg. 20–22 *(State Permit Streamlining Requirements),* Pg. 23 *(Complying with AB 1236)*
- ☐ Does the AHJ have a checklist of all requirements needed for expedited review posted on the AHJ website?
  Pg. 20–22 *(State Permit Streamlining Requirements)*
- ☐ Are EVCS projects that meet expedited checklist parameters administratively approved through building or similar non-discretionary permit?
  Pg. 20–22 *(State Permit Streamlining Requirements)*
- ☐ Are EVCS projects reviewed with the focus on health and safety, without triggering planning/zoning review?
  Pg. 20–22 *(State Permit Streamlining Requirements),* Pg. 28–29 *(Common Obstacles)*
- ☐ Has the AHJ committed to responding to incomplete permit applications with one complete written correction notice that details all deficiencies and any additional information needed to be eligible for expedited permit issuance?
  Pg. 23 *(Complying with AB 1236)*
- ☐ Does the AHJ accept electronic submittals and signatures on permit applications?
  Pg. 20–22 *(State Permit Streamlining Requirements),* Pg. 23 *(Complying with AB 1236)*
- ☐ Has the AHJ established that EVCS permit approval is not subject to approval of an association (as defined in Section 4080 of the Civil Code)?
  Pg. 17 *(Table 2: Electric Vehicle Charging Station Permit Streamlining Requirements & Best Practices*

Permitting Best Practices:

- ☐ Does the permit approval process meet best practice turnaround timelines?
  Pg. 24 *(Additional Permitting Best Practices)*
- ☐ Is the EVCS permitting process, including fees, timelines, and required application materials, detailed on the AHJ's website?
  Pg. 24 *(Additional Permitting Best Practices)*
- ☐ Has a ZEV Infrastructure permitting ombudsperson been appointed or identified to help applicants through the entire permitting process?
  Pg. 23 *(Best Practice – Identify a ZEV Permitting Ombudsperson)*

- [ ] Has the AHJ posted fact sheets or guidance documents for permitting and inspecting charging stations at single family home, multifamily home, workplace, public (L2 and DCFC), and commercial medium and heavy-duty locations?
  Pg. 24–27 *(Additional Permitting Best Practices)*

- [ ] Are pre-application meetings with knowledgeable AHJ staff offered?
  Pg. 24–27 *(Additional Permitting Best Practices)*

- [ ] Has the AHJ has published an ordinance or bulletin clarifying that a plug-in electric vehicle charging space counts as one or more parking spaces for zoning purposes?
  Pg. 11–12 *(Parking Stall Requirements and Charger Installation)*

- [ ] Are concurrent reviews made available for building and electrical plan checks (and planning, if deemed necessary)?
  Pg. 19 *(Understanding the Permit Process)*

- [ ] Are EVCS classified as an accessory use to a site, not as a traditional fueling station?
  Pg. 24 *(Additional Permitting Best Practices, footnote 35)*

- [ ] Does the expedited permit review process encourage permit reviewers to conditionally approve permits (aka "approved as noted")?
  Pg. 24–27 *(Additional Permitting Best Practices)*

- [ ] Does the AHJ have established/published timelines for EV permit application review that are expedited when compared to standard building permit review timelines in that jurisdiction?
  Pg. 24–27 *(Additional Permitting Best Practices)*

- [ ] Does the AHJ have a concise review checklist for building inspections, showing what will be inspected and what documents will be required?
  Pg. 53–54 *(Construction, Installation, and Review)*

- [ ] Does the AHJ allow inspections to proceed without an electrician present whenever possible?
  Pg. 53–54 *(Construction, Installation, and Review)*

Permit Application Best Practices

A checklist for EVCS station developers

- [ ] Has the station developer carefully reviewed the AHJ's permitting requirements (checklists, forms, etc.)?
  Pg. 27 *(Preparing a Permit Application)*

- [ ] Does the application provide all the information required by the AHJ?

  - [ ] Are the permit application diagrams consistent?

  - [ ] Are permit application load calculations complete? Have they been double checked?
    Pg. 28 *(What to Include in Your Application)*

- [ ] Has the station developer designed the project to comply with accessibility regulations?
  Pg. 28 *(Part 4: Accessibility, What to Include in Your Application)*

- [ ] For complicated projects or project types that have not been approved by the AHJ, has the station developer requested a pre-application meeting? Pg. 27 *(Pre-Application Meetings)*

- [ ] Has the station developer engaged the local utility prior to submitting a permit application?
  Pg. 27 *(Preparing a Permit Application),* Pg. 46 *(Timeline for Communicating with Your Utility)*

Connecting to the Grid Best Practices

A checklist for station developers and utilities

- [ ] Has the station developer carefully reviewed the interconnection process for the subject utility and engaged the utility early in the development process?
  Pg. 47 *(Major Utility Grid Connection Processes, major utility processes are shared on subsequent pages)*

- [ ] If available, has the station developer used Renewable Auction Mechanism maps to conduct a preliminary assessment of the hosting and line capacity at the project site(s)?
  Pg. 46 *(Understanding Grid Connection)*

- [ ] Have clear roles and responsibilities been established between the station developer and utility?
  Pg. 50–51 *(Opportunities to Streamline Connection to the Grid)*

- ☐ Does the utility provide timely and realistic interconnection timelines to the project applicant?
  Pg. 50–51 *(Opportunities to Streamline Connection to the Grid)*
- ☐ Does the utility have a dedicated team to help shepherd EVSE projects through the interconnection process?
  Pg. 50–51 *(Opportunities to Streamline Connection to the Grid)*
- ☐ Does the utility provide information on available power on a connection or nearby transformer without requiring detailed site plans?
  Pg. 50–51 *(Opportunities to Streamline Connection to the Grid)*
- ☐ Does the utility have a system to educate customers about rates and rate options related to EVCS projects?
  Pg. 50–51 *(Opportunities to Streamline Connection to the Grid)*

AB 1236, Chiu – Local ordinances: electric vehicle charging stations

Chapter 598

Approved by Governor October 8, 2015

SECTION 1.

Section 65850.7 is added to the Government Code, to read:

65850.7.

(a) The Legislature finds and declares all of the following:

(1) The implementation of consistent statewide standards to achieve the timely and cost-effective installation of electric vehicle charging stations is not a municipal affair, as that term is used in Section 5 of Article XI of the California Constitution, but is instead a matter of statewide concern.

(2) It is the intent of the Legislature that local agencies not adopt ordinances that create unreasonable barriers to the installation of electric vehicle charging stations and not unreasonably restrict the ability of home-owners and agricultural and business concerns to install electric vehicle charging stations.

(3) It is the policy of the state to promote and encourage the use of electric vehicle charging stations and to limit obstacles to their use.

(4) It is the intent of the Legislature that local agencies comply not only with the language of this section, but also the legislative intent to encourage the installation of electric vehicle charging stations by removing obstacles to, and minimizing costs of, permitting for charging stations so long as the action does not supersede the building official's authority to identify and address higher priority life-safety situations.

(b) A city, county, or city and county shall administratively approve an application to install electric vehicle charging stations through the issuance of a building permit or similar nondiscretionary permit. Review of the application to install an electric vehicle charging station shall be limited to the building official's review of whether it meets all health and safety requirements of local, state, and federal law. The requirements of local law shall be limited to those standards and regulations necessary to ensure that the electric vehicle charging station will not have a specific, adverse impact upon the public health or safety. However, if the building official of the city, county, or city and county makes a finding, based on substantial evidence, that the electric vehicle charging station could have a specific, adverse impact upon the public health or safety, the city, county, or city and county may require the applicant to apply for a use permit.

(c) A city, county, or city and county may not deny an application for a use permit to install an electric vehicle charging station unless it makes written findings based upon substantial evidence in the record that the proposed installation would have a specific, adverse impact upon the public health or safety, and there is no feasible method to satisfactorily mitigate or avoid the specific, adverse impact. The findings shall include the basis for the rejection of potential feasible alternatives of preventing the adverse impact.

(d) The decision of the building official pursuant to subdivisions (b) and (c) may be appealed to the planning commission of the city, county, or city and county.

(e) Any conditions imposed on an application to install an electric vehicle charging station shall be designed to mitigate the specific, adverse impact upon the public health or safety at the lowest cost possible.

(f) (1) An electric vehicle charging station shall meet applicable health and safety standards and requirements imposed by state and local permitting authorities.

(2) An electric vehicle charging station shall meet all applicable safety and performance standards established by the California Electrical Code, the Society of Automotive Engineers, the National Electrical Manufacturers Association, and accredited testing laboratories such as Underwriters Laboratories and, where applicable, rules of the Public Utilities Commission regarding safety and reliability.

(g) (1) On or before September 30, 2016, every city, county, or city and county with a population of 200,000 or more residents, and, on or before September 30, 2017, every city, county, or city and county with a population of less than 200,000 residents, shall, in consultation with the local fire department or district and the utility director, if the city, county, or city and county operates a utility, adopt an ordinance, consistent with the goals and intent of this section, that creates an expedited, streamlined permitting process for electric vehicle charging stations. In developing an expedited permitting process, the city, county, or city and county shall adopt a checklist of all requirements with which electric vehicle charging stations shall comply to be eligible for expedited review. An application that satisfies the information requirements in the checklist, as determined by the city, county, or city and county, shall be deemed complete. Upon confirmation by the city, county, or city and county of the application and supporting documents being complete and meeting the requirements of the checklist, and consistent with the ordinance, a city, county, or city and county shall, consistent with subdivision (b), approve the application and issue all required permits or authorizations. However, the city, county, or city and county may establish a process to prioritize competing applications for expedited permits. Upon receipt of an incomplete application, a city, county, or city and county shall issue a written correction notice detailing all deficiencies in the application and any additional information required to be eligible for expedited permit issuance. An application submitted to a city, county, or city and county that owns and operates an electric utility shall demonstrate compliance with the utility's interconnection policies prior to approval.

(2) The checklist and required permitting documentation shall be published on a publicly accessible Internet Web site, if the city, county, or city and county has an Internet Web site, and the city, county, or city and county shall allow for electronic submittal of a permit application and associated documentation, and shall authorize the electronic signature on all forms, applications, and other documentation in lieu of a wet signature by an applicant. In developing the ordinance, the city, county, or city and county may refer to the recommendations contained in the most current version of the "Plug-In Electric Vehicle Infrastructure Permitting Checklist" of the "Zero Emission Vehicles in California: Community Readiness Guidebook" published by the Office of Planning and Research. A city, county, or city and county may adopt an ordinance that modifies the checklists and standards found in the guidebook due to unique climactic, geological, seismological, or topographical conditions. If a city, county, or city and county determines that it is unable to authorize the acceptance of an electronic signature on all forms, applications, and other documents in lieu of a wet signature by an applicant, the city, county, or city and county shall state, in the ordinance required under this subdivision, the reasons for its inability to accept electronic signatures and acceptance of an electronic signature shall not be required.

(h) A city, county, or city and county shall not condition approval for any electric vehicle charging station permit on the approval of an electric vehicle charging station by an association, as that term is defined in Section 4080 of the Civil Code.

(i) The following definitions shall apply to this section:

(1) "A feasible method to satisfactorily mitigate or avoid the specific, adverse impact" includes, but is not limited to, any cost-effective method, condition, or mitigation imposed by a city, county, or city and county on another similarly situated application in a prior successful application for a permit.

(2) "Electronic submittal" means the utilization of one or more of the following:

(A) Email.

(B) The Internet.

(C) Facsimile.

(3) "Electric vehicle charging station" or "charging station" means any level of electric vehicle supply equipment station that is designed and built in compliance with Article 625 of the California Electrical Code, as it reads on the effective date of this section, and delivers electricity from a source outside an electric vehicle into a plug-in electric vehicle.

(4) "Specific, adverse impact" means a significant, quantifiable, direct, and unavoidable impact, based on objective, identified, and written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete.

SEC. 2.

No reimbursement is required by this act pursuant to Section 6 of Article XIIIB of the California Constitution because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act, within the meaning of Section 17556 of the Government Code.

Select Station Development Resources

Bay Area and Monterey Bay Regions PEV Local Best Practices Document. Prepared for the Bay Area Air Quality Management District by ICF International (August 2012).

Electric Vehicle (EV) Charging Infrastructure: Multifamily Building Standards, California Air Resources Board Technical and Cost Analysis (April 2018).

Electric Vehicle Charger Selection Guide, Redwood Coast Energy Authority, the Schatz Energy Research Center, the Local Government Commission/ Civic Spark, and the Siskiyou County Economic Development Council (Updated January 2018).

Electric Vehicle Charging Station Permitting and Inspection Best Practices: A Guide for San Diego Region Local Governments, Center for Sustainable Energy, Plug-In SD (June 2016).

EV-Ready Codes for the Built Environment: Electric Vehicle Supply Equipment Support Study, Creating EV-Ready Towns and Cities: A Guide to Planning and Policy Tools, Siting and Design Guidelines for Electric Vehicle Supply Equipment. Prepared for New York State Energy Research and Development Authority and Transportation and Climate Initiative by WXY Architecture + Urban Design and Energetics Incorporated for New York (November 2012).

Lessons from Early Deployments of Electric Vehicle Charging Stations: Case Studies from the Northeast and Mid-Atlantic Regions, Prepared for the Transportation Climate Initiative by Logios (May 2013).

Plug-In Electric Vehicle Handbook for Workplace Charging Hosts, U.S. Department of Energy Clean Cities (August 2013).

Plugging In: Speeding the Adoption of Electric Vehicles in California with Smart Local Policies, Environment California Research & Policy Center and Frontier Group (February 2018).

Ready Set Charge California: A Guide to EV-Ready Communities, Association of Bay Area Governments, Bay Area Climate Collaborative, Clean Fuel Connection, EV Communities Alliance, LightMoves Consulting (November 2011).

Site Design for Electric Vehicle Charging Stations, Sustainable Transportation Strategies (July 2012).

Site Owners of Electric Vehicle Charging Stations on Commercial Properties Best Practices Guide, Prepared for New York State Energy Research and Development Authority by Energetics Incorporated (December 2015).

South Bay Cities Plug-in Electric Vehicle Deployment Plan, Prepared for the Southern California Association of Governments by the UCLA Luskin Center for Innovation (June 2013).

Streamlining the Permitting and Inspection Process for Plug-In Electric Vehicle Home Charger Installations Report and Recommendations, California Plug-In Electric Vehicle Collaborative (July 2012).

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