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Model State Building Code for Equitable EV Charging in Multi-Family Housing

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Executive Summary

Historically, California residents in lower income multi-family housing (MFH) units have not had the same access to at-home charging as single-family homeowners/dwellers. Ensuring equal access to convenient and affordable at-home charging is essential for all owners of EVs. To highlight this important issue, the EV Charging for All Coalition (EVCAC) has constructed a model code with the following guidelines: 1. Ensuring that 100% of newly constructed MFH units with parking have access to at least one EV Ready charging space with the EV circuit wired to the unit's electrical panel or meter; 2. Ensures the MFH resident has the same rate/tariff options to low-cost, utility time-of-use rates as residents of Single Family Homes (SFH); and 3. Ensures the resident does not have to depend on the variable and higher pricing of public chargers or potential extra fees by the electric vehicle service provider (EVSP) or MFH complex owner or manager.

Keywords: Policy, Regulation, Standardization, Sustainability, ZEV (zero emission vehicle).

1 Introduction

By 2035, California has mandated that 100% of all new cars and light trucks sold in the State will be zero-emission vehicles. Given that goal, a corresponding amount of at-home charging will needed in order to accommodate the increase of EVs. Widespread adoption of EVs will necessitate that all communities have equal access to charging, which especially means at home charging. As public charger access is less available in areas

with below-median incomes and predominantly Black and Hispanic populations, this underscores the need to ensure that lower income residents have reliable and convenient access to home charging [1].

Under the National Electric Vehicle Infrastructure Formula Program in the United States, the Federal Highway Administration states that their "final rule is the opportunity to advance both equity and environmental justice for communities that have been underserved by transportation infrastructure and overburdened by costs and environmental harms by supporting wide scale national EV adoption and the deployment of EV charging infrastructure." Additionally, the Justice40 Initiative "established a goal that 40 percent of the overall benefits of certain Federal investments flow to disadvantaged communities" [2]. Unfortunately, while much of the focus and funding has been directed to installing DCFC stations along major transportation corridors, the more effective approach would be to provide all EV drivers with home charging. Since the cost to charge at DCFC stations exceeds the cost of home charging by a substantial amount, this approach does not provide equitable opportunity for residents of MFH to charge their EV. The vast majority of EV drivers charge at home, leveraging long dwell times to access inexpensive time-of-use rates from their electric utilities, which has been one of the prime drivers of EV adoption. This underscores the need to focus on improving home charging access for residents of MFH, so they also are able to enjoy the many advantages of EVs, including fuel and maintenance savings, cleaner air and greater transportation security. The California code has provided at-home charging for residents of SFH since 2014, and it is high time for these advantages to be extended to ALL residents of MFH

1.1 The Need For At-Home Charging

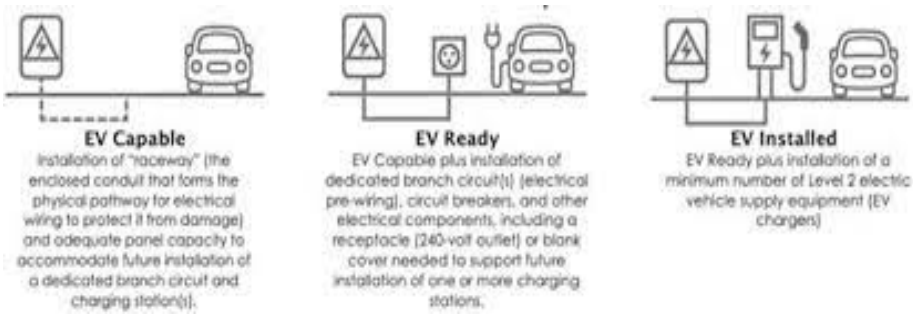
Residents of apartments and condominiums usually lack at-home charging and instead must rely on public charging [3], which is often unreliable, inconvenient, unpredictable, potentially less safe at night and in certain locations, and much more expensive than charging on a home-based circuit. Moreover, the current used EV market offers early EV models with a relatively limited range. If buyers in lower-income markets, who tend to purchase used vehicles, were to adopt EVs, they would likely have higher reliance on public chargers due to the limited range of the used EVs [4]. Additionally, placing public EV chargers in or near an energy and environmental justice (EEJ) underserved community does not always result in meaningful benefits to community residents. Throughout EEJ stakeholder engagement efforts performed by the Department of Energy, numerous stakeholders recounted examples where a public EV charger was placed in a census tract identified as a disadvantaged community (DAC) in a screening tool, yet the EV charger was not accessible, affordable, operable and/or convenient to community residents and did not benefit those residents. Additionally, a DCFC that has a high cost for EV charging a vehicle may not be an affordable EV charging solution for low-income residents [5]. As a consequence of these issues, EV adoption by multi-family housing (MFH) residents has been very low.

1.2 The Cost of Electric Vehicle Supply Equipment

Installing electric vehicle supply equipment (EVSE) in MFHs can be expensive. Level 2 electric vehicle supply equipment installation costs can range between $1,800 and $17,800. In contrast, single-family EVSE installations average $1,500 [6]. It is imperative that EVSE is installed during construction of new MFH units. A cost analysis prepared by Energy Solutions for Peninsula Clean Energy and Silicon Valley Clean Energy compared 2 multi-unit dwelling scenarios and found that the cost of retrofitting EVSE could be 4 times greater than when installed during new construction (table 1), [7]. And, since utility retrofit installed costs are often closer to the $17,000, these exceed new construction installed costs by more than tenfold.

Therefore, it is imperative to build new multi-family housing with EV Ready charging from the start, installing raceways, conduit, wiring, receptacle and right-sized panels during construction, when the costs are the lowest and economies of scale the most advantageous. Demolition, disposal of materials, and repair of surface parking areas is not required when installing conduit in new construction when conduit can be installed directly

underneath a parking area, prior to paving, rather than routing around existing barriers [8]. In MFHs, the renter does not have an incentive to purchase EVSE for housing that they may only be living in for the short term. Likewise, the MFH owner/manager also may not see the value of investing in high cost retrofitted EVSE since the return on investment may not be clear. The requirement for an EV Ready space wired directly to the electrical panel or meter, instead of an EV Capable one, is vital because an EV Ready space does require an EVSP with networked EVSE which can control pricing and payment, hours of operation, or user access since EVSPs are allowed to operate as unregulated monopolies inside the MFH complex [9]. Instead, by plugging directly into the outlet, the resident will access their unit's meter and can benefit from time-of-use utility rates [10]. A well-designed code is essential to provide MFH residents with the same affordable and convenient at-home charging that single-family residents enjoy—in a way that's also cost-effective for builders.



1.3 Cold-Water Flats

The importance of building codes is frequently overlooked, but they are essential to ensure basic rights and equity. A good example can be found in the "cold-water flats" that predominated in low-income housing until mid-century. Until the 1950's and 1960's in the United States, apartments in low-income neighborhoods were usually built without hot water, as a way for builders to save money. The residents didn't have the resources to afford more expensive housing options, so were forced to settle for these cold-water flats where they had to boil on the stove all of the hot water needed for bathing and cooking. It wasn't until city leaders decided that this was unacceptable and changed their building codes to require hot water in all residential construction that running hot water transitioned from an expensive "amenity" to a "basic right" for all residents.

Yesterday's cold-water flat is today's multi-family housing parking lot. Builders and apartment managers may consider EV charging an amenity for which they can charge residents higher fees. To ensure that all residents get access to EV charging without additional mark-ups, state and local building codes must require EV Ready charging for all newly built units with parking. Universal access removes any justification for charging more for EV charging, and provides all residents—regardless of whether they live in single-family or newly built multi-family housing—with ubiquitous access to the lowest-cost electricity for charging.

1.4 When It Comes to EV Charging, "There's No Place Like Home."

At-home charging is the ideal setting for an EV owner. Having to drive around looking for a public charger where there may be a line or finding out that the charger is non-operational is time-consuming. Moreover, instead of being subjected to unregulated public charging rates, owners using at-home charging benefit from time-of-use utility rates that are less expensive during off-peak hours. With average electricity costs of 18 cents per kilowatt hour in California, fully charging an EV with a 150-mile range would cost around $7. In comparison, fueling a 25-mile per hour gas-powered vehicle at $4.30 per gallon would cost around $26 to drive 150 miles [11]. Being able to charge at home is critical to increasing EV adoption, even in dense urban areas, whether a resident lives

in a single-family home or a MFH unit.

1.5 Benefits of Low Power Versus High Power Charging

With reliable, at-home access to charging being paramount to EV adoption, low power win-win solutions that save costs for MFH builders, owners and residents, and increase access by providing charging for all MFH residents, should be pursued instead of "shared" higher-powered options. Low power level 2 charging can be provided for all residents in a MFH at the same cost as a limited number of shared, higher-power level 2 charging stations. In order to address the inequity of shared, higher- powered charging the EV Charging for All Coalition introduced a new regulatory standard suggesting that it is more equitable to provide low power level 2 for every resident without having to share circuits, since the cost difference compared to a limited number of higher power Level 2 is minimal and inconsequential. There has been a tendency among regulators in California, to require builders to install a limited number of shared level 2 charging stations with a circuit size accommodating a 6.2 kW output, rather than provide lower-power charging for all residents.

By reducing the minimum power requirement to low power level 2 with a circuit size accommodating 3.3 kW, significant cost reductions can be achieved while giving residents access to charging that reliably meets their needs given multi-family residents long dwell times for charging. This in turn allows guaranteed charging access to 100% of units with access to parking. Additionally, the model code recommends that receptacles, not necessarily EV charging stations, be installed for residential EV parking. From many observations of parking lots, when higher power EV parking spaces have to be shared, users are forced to coordinate the swapping of parking spaces amongst themselves, a time-consuming and inefficient process, in order to guarantee individual charging access, which often discourages EV charging, and in turn leads to lower EV adoption. Unfortunately, current California building codes are designed with the expectation that multi-family residents must endure the burdensome and discouraging process of sharing/swapping charging spaces with other MFH residents since an insufficient number of electrified charging spaces are required by the code. This is unequitable, unnecessary, shortsighted, will not encourage large-scale EV adoption, and will not allow California to achieve its climate change and GHG reduction goals.

Sven Thesen & Associates compared two MFH charging codes. They are the August 12, 2021 proposal by California's Housing Community Development (HCD) and the low-power level 2 (LPL2) approach first presented to HCD and other agencies in February, 2021 by the EVCAC. For a 60-unit market rate MFH scenario, the analysis found "that the LPL2 proposal results in greater economic benefits both for residents of multi-family housing and for California as a whole at comparable cost. It also yields greater emissions reductions at significantly lower cost." (A comparison of two multi-family dwellings, Sven Thesen, 2021)

2 Model Code for Newly Built Multi-Family Housing

In order to truly have an equitable code, these guiding principles are key:

- Maximize access to reliable, convenient, predictable, safe & affordable EV Ready charging at home for residents; and
- Minimize cost and complexity for residents, builders, owners and managers.

EVCAC analyzed California's state MFH building code and found that it falls short in both regards. The California State Building Code should, but fails to, prioritize a win-win situation for residents interested in

adopting an EV and for the MFH owners/managers who wish to minimize installed EVSE costs and avoid the burden of determining which EVSP will provide attractive EV charging services with fair pricing to the residents.

In order to provide equitable access to charging EVCAC recommends that code writers focus on providing 100% of ***MFH units*** with access to charging, rather than on a ***percentage of parking spaces*** that are electrified. Additionally, EVCAC recommends that the EV circuit be a minimum 20A branch circuit at 208/240V terminating in a receptacle for every home with parking, aka low power level 2 (LPL2). Lastly to ensure that charging remains affordable, EVCAC recommends that EV charging circuits be wired directly to the electrical panel or meter of each unit, unless infeasible. This ensures that residents are able to charge at utility time of use rates which typically are the lowest priced rates available to residents of single family and multi-family homes.

1. In order to reduce complexity and cost for builders, EVCAC not only recommends a branch circuit of at least a 20A, LPL2, but also removing requirements for the installation of electric vehicle charging stations. Charging stations are not a requirement for single-family homes, nor should they be for multifamily homes, as long as there is prominent signage at every EV receptacle location, and the money saved by not requiring charging stations for MFH provides builders with sufficient funds to provide an EV Ready LPL2 circuit terminating in an EV receptacle for every apartment and condo unit.

Recognizing that parking access and decision-making power for multi-family residents are different than they are for single-family homeowners, EVCAC recommends that MFH building codes include the following elements:

- Every MFH unit with access to parking should have access to at least one EV Ready parking space/receptacle with the EV circuit/receptacle wired directly to the unit's electrical panel or meter; and
- There should be highly visible "EV Ready" signage at every EV charging space.

In California, following these standards allows for 100% of residents in new multi-family building with access to parking to have at least one EV ready LPL2 space at the same cost as the current proposed code for EV charging infrastructure in new multifamily buildings. (A comparison of two multi-family dwellings, Sven Thesen, 2021).

3 Summary

As California leads the country towards the widespread adoption of EVs, we must ensure that all EV owners have equitable access to at-home charging. Historically, ownership of EVs in lower-income MFH has been low due to the lack of access to charging at these units. Having to rely on public chargers with variable rates instead of utilizing less-expensive time-of-use rates at home is an unfair burden for these residents. Now is the time to reverse the tide. The EVCAC endorses a code that maximizes access to reliable and affordable EV Ready charging for MFH residents and minimizes the cost and complexity of installing EV charging equipment for residents, builders, and managers. In addition, the EVCAC recommends reducing the minimum power level at these units to low power level 2 which will reduce the cost of supplying power to the building. It will also lower the overall costs to builders and help ensure that 100% of residents of newly constructed MFH with access to parking will be provided with one EV Ready space. This will help level the playing field for all EV owners and help usher in the new wave of universal EV ownership.

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Presenter Biography

Jared Johnson is Acterra's Sr. Manager of Policy and External Relations as well as a co-leader of the EV Charging for All Coalition (EVCAC). Jared has extensive experience directing and organizing issue-specific campaigns. He has worked on issues ranging from stopping the routine use of antibiotics on factory farms to lobbying state legislators for campaign finance reform. Jared is an alumnus of Penn State University, where he received a Bachelor's Degree in Energy Engineering. Most recently, Jared has been working with San Jose staff on their municipal EV infrastructure code and was the liaison for the EV Charging for All Coalition's bill, SB 1482, on expanding multifamily charging access in new buildings.

Michelle Pierce is the founder of EV Nirvana, a company dedicated to promoting, educating, and advocating about plug-in EVs. As a co-leader of the EV Charging for All Coalition (EVCAC), she contributes electrical engineering skills and shares her invaluable lived experience—including to Governor Newsom's advisors and agency heads—as a long-time EV driver living in single family housing and then recently transitioning to multi-family housing. As a Project Engineer, Michelle works for an engineering firm designing electric vehicle charging infrastructure for government entities. She is a co-founder of the Electric Vehicle Association's Inland Empire Chapter, leading EV Expos and advising prospective EV drivers how to overcome charging hurdles. She has a B.S. in Electrical Engineering from California State University, Long Beach.