Title 24: Building Codes for Plug-in Electric Vehicles
September 22, 2015
Webinar Questions

1. Enrique M. Rodriquez, what incentives and barriers are there to providing overhead structures supporting both solar panels and battery storage, with connections provided for drop-down cables to chargers which could be installed with minimal digging or trenching? This structure could be very inexpensive, if the full design potential of the structural system is accepted by codes and the State. This can be done over parking lots, driveways and streets, with charger preparation for each parking space. Since the demand is not that great yet, the system would also have aggregated and managed delivery of electricity to the grid, and could be designed to take advantage of demand levels, load shifting, peak shaving, and ancillary services. Could the other presenters also comment on this vision? Policy-wise, we would want this to be left for non-utility development and ownership; possibly public-private partnerships, and partnering with CCAs -- in fact, it would encourage proliferation of CCAs, because it would support adjacent generation, a form of distributed generation.

   Answer by PEVC: New technologies will always be developing to support renewables and clean transportation. We see the building codes as one low cost option to increase PEV capable parking spots in new construction but this does not prohibit other technologies from working in existing buildings or still being implemented in new construction in addition to what is required. Also, as new technologies become more commercially viable, the code adoption process can take these technologies into consideration for future updates.

2. Can you speak to the relationship between building code and electrical code here? (i.e. do these capacity requirements also come with a demand schedule that speaks to the number of simultaneous charging sessions expected)?

   Answer by Housing and Community Development (HCD) and the CA Building Standards Commission (CBSC): For Residential Buildings, Section 4.106.4.2.4 requires that the electrical panel capacity and system shall have sufficient capacity to simultaneously charge all EV's at the full rated amperage of the Electrical Vehicle Supply Equipment (EVSE) at all required EV Charging Stations (EVCS). EV Charging is considered a continuous load for calculating loads, additionally; the branch circuit for EV charging is required to be a dedicated circuit.

   Similar requirements apply to nonresidential occupancies see Section 5.106.5.3 for electrical requirements. Additionally, Section 5.106.5.3 has a

reference to both the California Building Code and Electrical Code as there are some EVSE code requirements found in those two codes.

3. Are separate electrical services covered under the code amendments or would the EV infrastructure be served in combination with the non-EV loads?

   Answer by HCD and CBSC: The electrical system must be considered in total to ensure that all loads are considered, and be in compliance with the Electrical Code. However, a dual-meter is also an option, if permitted (or required) by the local enforcing agency and/or the local power company for lower rates for dedicated EV charging.

4. What is the motivation for repealing the requirement to identify EVCS locations in the construction documents? (for the recommendations for the residential 2016 code update)

   Answer by HCD: HCD is proposing to repeal the requirement for identification of EVCS on the construction documents in Section 4.106.4.2 because the same requirement exists in Section 4.106.4.2.1. There is no reason for the same requirement to be duplicated.

   Section A4.106.8.2 refers to Section 4.106.4.2 for additional requirements related to EVCS for multifamily dwellings, including the requirement for identification in Section 4.106.4.2.1. There is no reason for the same requirement to be duplicated.

5. We have a similar proposal in at the WA building code council for multifamily & commercial. One of our Code Council members has asserted that conduit is not required on the front end (having a specified pathway and sleeves through wall is all) because he believes conduit would cost the same to install later. Can you speak to the relative cost of conduit first vs. conduit later (if a path is specified)?

   Answer by HCD: It is HCD's opinion based on discussions with stakeholders that there is a higher cost to install a raceway after the original construction of the building in most cases. Trenching and installation of an underground raceway to a parking area adjacent to a multifamily building after original construction requires mobilization of equipment and construction of raceways and patching of roads and parking areas. Installation of a raceway or conductors from an electrical panel to a garage or other parking area in a home after original construction may often include demolition or removal of wall and/or ceiling finishes and patching. It is HCD's opinion based on these factors that it is less costly to install a raceway capable of future installation of a branch circuit at the time of original construction.

Answer by the Air Resources Board (ARB): By installing raceway and panel capacity in new commercial buildings, it helps to provide the necessary infrastructure to support future installation of EVSE. It also helps to avoid retrofit costs. According to a report completed by the MITRE Corporation, initial construction costs to install raceway in new parking lots ranges from a low of $400 in garages to a high of $1,800 in surface lots. The CALGreen Code also requires installation of adequate panel capacity to support a dedicated 40 amp, 240 VAC circuit to every EV-capable charging space for future installation of Level 2 charging stations. ARB staff reviewed the 2015 National Construction Estimator to identify a more accurate average cost for EV charging infrastructure with all of these components. ARB staff estimated an average cost of $830 to install raceway and panel capacity to support dedicated branch circuits to each EV-capable charging space.

Retrofit costs can vary significantly depending on the existing commercial building site. Costs may be higher if there is not sufficient panel capacity. Costs can vary depending on the number of circuits and EVSE charging stations installed. Costs can increase if there is a long distance from the electrical panel to the charging location or if the electrical panel needs to be upgraded or a subpanel needs to be added. Costs can also be affected by the need to install transformers or other electrical infrastructure equipment. However, costs associated with transformers are often applicable for DC fast charging stations where higher voltage (480 VAC) is needed. Commercial buildings usually have 240 VAC power readily available and may not need to install additional transformers. Retrofit costs tend to be lower in parking garages because conduit and wiring can run along the walls and the charging stations can be mounted on the wall. Retrofit costs tend to be higher in parking lots because of the need for trenching through concrete or asphalt. Most of these retrofit costs can be avoided if EV charging infrastructure is installed during new construction.

MITRE Corporation estimated retrofit costs range from $1,200 in garages to $2,900 in surface lots. However, ARB staff reviewed multiple studies that indicate retrofit costs may actually be much higher and range from $3,500 to $12,500. ARB staff estimates that the median cost for retrofitting existing parking lots with EV charging infrastructure is $6,975 in surface lots and $3,750 in parking garages.

6. What's the difference between the "PEV Circuit" (solid bar) and PEV Ready (hashed bar) sensitivity?

   Answer by Energy Solutions: The PEV Circuit includes a complete 240 V 40 amp circuit. PEV Ready includes electrical panel capacity for a 240 V 40 amp circuit, and any conduits that pass underground or through a wall.

7. Who is modeling acceptance of EVs that is comparable to the cell phone in the developed and developing worlds?

   Answer by PEVC: We are not aware of anyone doing this type of modeling.

8. Was requiring EV charging stations, rather than just EV capable spaces, considered and evaluated? Are there downsides, besides the additional expense, of requiring EV charging stations as projects are built?

   Answer by HCD: The largest factor is the additional cost associated with the installation of a circuit and or charger. Additionally, it does not make sense from a material use and resource conservation standpoint to require branch circuits and chargers in every parking area when only a small percentage of parking areas will be equipped with EV Chargers at this time. In addition, requiring installation of Level 2, 40A chargers (or circuits) only, would limit options to use different charging equipment - Level 1 chargers, or faster Level 2, 80A chargers for instance. This would affect the customer satisfaction, and would add additional expenses for retrofitting.

   Answer by ARB: ARB staff evaluated the option of installing EV charging stations in new commercial buildings, but did not recommend it at this time. The equipment is getting less expensive, advancing technologically and it may add unnecessary costs if EV charging stations are installed at the time of new construction. The price of EV charging stations may continue to drop as production volumes increase. Additionally, it allows for third parties or building owners to install the EV charging stations of their choice. In some cases, building owners may want to install basic Level 2 charging stations and provide the electricity free of charge to their employees as a benefit. In other cases, third parties may wish to install smart chargers. By installing the raceway and panel capacity at the time of new construction, it leaves flexibility for the building owner or third parties in selecting the type of EV charging stations.

9. How does the code get enforced given the Effective Date? Would any building that applies for a permit after 1/1/17 be required to comply with the design specifications? i.e. What's the timeframe during which we'll be seeing compliant new buildings?

   Answer by HCD and CBSC: The effective date of the 2013 Intervening Code Cycle changes to the CALGreen Code was July 1, 2015. Any project under the scope of CALGreen for which a permit application was submitted on or after this date would be required to comply with the requirements of Division 4.1 for residential occupancies and Division 5.1

for nonresidential occupancies of the CALGreen Code, or a more stringent locally adopted ordinance such as the adoption of Tier 1 or Tier 2. Compliant new buildings will be seen after 1/1/17 once permits are issued under the new requirements and the projects are built.

10. Tying in the information from the last California PEV Collaborative webinar -- How do the DSA proposals to the Building Code, regarding accessibility at EV charging stations, tie into these CALGreen requirements?

    Answer by ARB: The DSA accessibility provisions go into effect when an EV charging station is installed. The current and suggested EV charging infrastructure provisions in the CALGreen Code do not require installation of EV charging stations.

11. How does the California Building Code EVSE requirements take into account parking standard reductions from TDM or other local reductions?

    Answer by CBSC: No, the California Building Code only addresses the accessible parking requirements for in Chapter 11B; other parking requirements are determined by the local jurisdictions planning and/or zoning requirements and may differ for the various jurisdictions.

12. Given a reasonable percent of homes that are multi car families, are there any reach goals for 2 charging stations at home, or at least raceways, etc to support 2 or more EVCS?

    Answer by HCD: HCD does not have any mandatory or voluntary requirements for multiple EVCS for single-family homes.

13. How did green building standards get placed into building codes originally - legislation?

    Answer by CBSC: In 2004, Executive Order S-20-04 created the "Green Building Action Team" that established efficiency measures for stateowned buildings, with a goal of reducing grid-based electricity by 20% in the year 2015. Under the guidance of the Green Building Action Team, the Department of General Services (DGS) established green building policies for new and existing state buildings. In 2005, Executive Order S-03-05 established the "Climate Action Team" (CAT) and called for an overall reduction in greenhouse gas emissions in California. The Governor's environmental measures include his signature on California's landmark bill, AB32, which establishes a comprehensive program of cost effective reductions of greenhouse gases to 1990 levels by 2020. CBSC and the other agencies staff worked with CAT and the California Air Resources Board to Page 3 of 4 California Building Standards Commission The CALGreen Story ensure that the green building

standards are factored into the program designed to meet the goals of AB32. In early 2007, the prior administration directed CBSC to initiate a process to develop green building standards for the State of California. Together with the Department of Housing and Community Development (HCD), the Division of the State Architect and OSHPD, CBSC developed a plan to accomplish the goal. In October of that year the Governor provided further direction to CBSC to work with specified state agencies on the adoption of green building standards for residential, commercial, and public buildings for the 2010 code adoption cycle. As a result, CBSC made the development of the first statewide green building standards code a priority.

14. Is anyone working with the Division of the State Achitect to increase design flexibility for carport-style solar in schools?

    Answer by ARB: Not at this time. However, it is an interesting idea and we will look into it further.

15. What impact might wireless charging have on it all - considerations such as EMC in my mind?

    Answer by HCD: Although wireless chargers don't need wires to connect to the on-board EV charger, they do need power from the electrical panel to operate. Therefore, wireless chargers need to be connected to the electrical system too. There may be some differences and design options; however, the typical raceway wiring method seems logical to be used for connecting the wireless chargers to the electrical system that provides the electrical power to the charger. Additionally, not all EV's are capable of wireless charging. See page 11 of the Guide to the 2013 California Green Building Standards Code Residential, at: http://www.hcd.ca.gov/codes/shl/CALGreen_Guide_REV_12-13.pdf