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Assembly
California Legislature

SELECT COMMITTEE ON
ELECTRIC VEHICLES AND
CHARGING INFRASTRUCTURE
PILAR SCHIAVO, CHAIR
ASSEMBLYMEMBER, FORTIETH DISTRICT

Tuesday, October 24th
9:00 a.m. – CSU Northridge
Orchard Conference Center, Room A
18111 Nordhoff Street,
Northridge, CA 91330

INFORMATIONAL HEARING
BACKGROUND

More than a Car: How Charging Innovation Allows Communities to Fully Benefit from the Electric Vehicle Transition and what Policies can Pave the Way

Introduction

The Sixth Assessment Report of the International Panel on Climate Change (IPCC) identifies a few key trends. First, human-caused climate change is already affecting many weather and climate extremes across the globe, leading to widespread negative impacts. Second, globally, current financing of adaptation falls short of levels needed to meet climate goals. Finally – and optimistically - deep, rapid, and sustained reductions in greenhouse gas emissions would make both a noticeable slowdown in global warming within two decades and noticeable changes in atmospheric composition within a few years. In short, the greenhouse gas (GHG) reductions actions we take this decade will largely determine how well we can limit warming.[1]

In California, the transportation sector still represented the largest slice of the GHG pie in 2020 despite significant reductions attributed to shelter-in-place during the COVID-19 pandemic.[2] With over one-third of emissions arising from transportation and one-quarter specifically from light-duty vehicles, increasing use of zero-emission vehicles (ZEVs) with zero tailpipe emissions not only reduces GHG emissions, but it also eliminates a source of air pollution such as NO_x, reactive organic gases, and particulate matter that impact health at the local level.[3-5]

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[1] IPCC; "Climate Change 2023 Synthesis Report"; https://www.ipcc.ch/report/ar6/syr/
[2] California Air Resources Board (CARB); "Califonria Greenhouse Gas 2000-2020 Emissions Trends and Indicators Report"; https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf
[3] CARB; "2017 Estimated Annual Average Emissions"; https://ww2.arb.ca.gov/applications/statewide-emissions
[4] Health Effects Institute; "Characterizing Determinants of Near-Road Ambient Air Quality for an Urban Intersection and a Freeway Site" https://www.healtheffects.org/publication/characterizing-determinants-near-road-ambient-air-quality-urban-intersection-and-freeway
[5] Health Effects Institute; "Traffic-Related Air Pollution"; https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health

Growing Charging Need

To reduce the impact of the transportation sector California has set clear timelines to reduce GHG emissions in the transportation sector[6-9], and budget actions have also invested millions into supporting individuals and communities make the transition toward zero emission vehicles.[10,11] A centerpiece for the light- and medium-duty ZEV space in the past year has been electric vehicles (EVs), with 20% of light-duty vehicles sold in 2023 being battery electric vehicles (BEVs).[12] Further, there are 1,561 electric buses operating throughout the state. Already, California has surpassed the 2025 goal of 1.5 million ZEVs on the road,[7] and it is well on its way to reach the 2030 goal of 5 million ZEVs on the road,[13] with over one hundred 2023 models of BEVs available in the state as compared to just 39 models three years ago.[14]

Unfortunately, EV charging infrastructure has not kept pace. CEC estimates place the number of public and shared private chargers at just under 95,000, less than half of the 2025 goal of 250,000 ZEV chargers. However, the State cannot stop at 250,000. Based on current light-duty purchasing trends, the CEC estimates that there will be 7.1 million plug-in electric vehicles on the road by 2030 and over 15 million by 2035, requiring over 1 million chargers in 2030 and double that only five years later.[15] While the current estimates of chargers statewide do not include private chargers or Level 1 chargers (a chart of plug-in charger types reproduced below[15]), the AB 2127 report details opportunities for Level 1 chargers and charging at multifamily units to ramp up statewide charger capacity. While there are a number of statewide initiatives to do so[16,17], there are already gaps in charger service and access that must be addressed for the ZEV, and specifically the EV transition to be equitable.

Low Power AC (Level 1)	**Mid-High Power AC (Level 2)**	**DC Fast Charging (DCFC)**
• 120 VAC • Up to 1.4 kilowatts • About 4 miles range added per hour at 1.4 kilowatts	• 208/240 VAC • Up to 19.2 kilowatts • About 32 miles range added per hour at 9.6 kilowatts	• 200 - 500 VDC • Up to 350 kilowatts • About 139 miles range added in 10 minutes at 250 kilowatts

[6] CARB; "AB 32 Global Warming Solutions Act of 2006"; https://ww2.arb.ca.gov/resources/fact-sheets/ab-32-global-warming-solutions-act-2006
[7] Executive Order B-16-12
[8] CARB; "AB 32 Climate Change Scoping Plan"; https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan
[9] Executive Order N-79-20
[10] California Climate Investments; "2023 Annual Report"; https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/cci_annual_report_2023.pdf
[11] California Energy Commission (CEC); "Clean Transportation Program"; https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program
[12] CEC;"New ZEV Sales in Califonria"; https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/new-zev-sales
[13] Executive Order B-48-18
[14] Drive Clean; https://driveclean.ca.gov/search-vehicles
[15] CEC; "Implementation of AB 2127 Electric Vehicle Charging Infrastructure Assessments"; https://efiling.energy.ca.gov/GetDocument.aspx?tn=251866&DocumentContentId=86859
[16] California Public Utilities Commission; "Multifamily Housing and Small Business EV Charger Program"; https://www.pge.com/en_US/small-medium-business/energy-alternatives/clean-vehicles/ev-charge-network/program-participants/multifamily-housing-smb-ev-charger-program.page#:~:text=Program%20details,*
[17] CaleVIP; https://calevip.org/

Unequal Access to Charging

In 2020, the CEC completed a study as required by SB 1000 (Lara, Chpt. 368, Stats. 2018) to assess whether charging station infrastructure is disproportionately deployed by population density, geographical area, or population income level, including low-, middle-, and high-income levels. This included whether direct current fast charging stations are disproportionately distributed and whether access to these charging stations is disproportionately available. Based on their analysis, the CEC found that though some counties did not have a single public charger at the time of publication, firstly, there are generally more chargers available in census tracts with lower population density than higher density, and, secondly, public chargers available per capita increases with income level.[18]

The CEC identified zoning as a contributing factor to the first finding. More populous, residentially zoned districts, typically have fewer public chargers available than low population commercial districts. As to the second finding, one compounding factor is the difficulty of installing chargers in multifamily housing. Low-income individuals are more likely to live in multifamily housing than in single-family housing. The CEC found in recent surveys of tenants and homeowners that currently around half as many multifamily homes have access to charging.[19] Complementary of the CEC's work, research based on the same charging network data found that, separate from income level and multi-unit housing rate, Black and Latino communities had fewer chargers nearby than other demographics.[19,20]

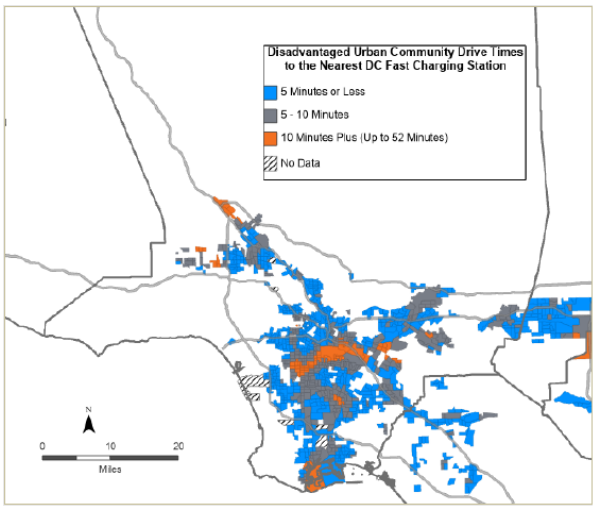

Figure 1: Map of dive times from disadvantaged urban communities to the nearest public DCFC. Reproduced from [15]

As an example, for disadvantaged communities (as defined by CalEPA through the SB 535 process) in Los Angeles, a DCFC may be up to an hour away. The landscape evolving around charger access is already creating barriers to ZEV ownership in low-income and pollution burdened communities. In a recent survey, conducted by Plug In America, second to cost of an EV, the most prevalent concern was lack of public charging networks.[21] As mentioned above, there are statewide programs to begin closing this gap; however, as the committee digs into the space of EVs and charging, evaluating novel approaches and partnerships that not only update our thinking of a "refueling" experience but also how a community can more readily benefit from the electric vehicle transition.

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[18] CEC; "SB 1000 Electric Vehicle Charging Infrastructure Deployment Assessment"; https://efiling.energy.ca.gov/getdocument.aspx?tn=236189

[19] CEC; "Home Charging Access in California"; https://www.energy.ca.gov/sites/default/files/2022-01/CEC-600-2022-021.pdf

[20] Hsu, C-W, Fingerman, K.; "Public electric vehicle charger access disparities across race and income in California"; Transport Policy' 2020

[21] Plug In America;"The Expanding EV Market"; https://pluginamerica.org/wp-content/uploads/2022/03/2022-PIA-Survey-Report.pdf

Charging Paradigms and Committee Considerations

The CEC currently reports that there are 8,161 retail gasoline stations for over 32 million registered cars and trucks in California.[22,23] Even assuming 10 pumps per station, the state would still need 25 times as many electric chargers for the 2035 goals 2 million chargers. To put this in perspective, assuming San Francisco needs a proportion of public chargers equal to its pecentage of automobile registrations, the County would need around 30,000 public chargers, in the same league as the 43,000 street lights in San Francisco, and 6,000 more than the number the San Francisco Public Utilities Commission manages.[24] For a fully ZEV or EV future, the sheer scale of the issue requires understanding that, though they look like gas cars, EVs are fundamentally different machines. That being said, there are innovative opportunities to leverage their flexibility in how they "refuel".

Street Side Charging

One major promise of EVs is the ability to charge overnight. Not only does this spread out the timing of electric demand on the grid, but it also does not require attention of the owner. Unfortunately, in their survey examining home charging access, the CEC found that for respondents, the potential for at-home charging for multifamily housing maximum was 40%.[19] This means that the majority of those living in multifamily homes would be unable to charge their vehicle overnight with the current public charger landscape. The City of Los Angeles is taking initiative to change the charger landscape by leveraging existing grid connections – street lights – to create new charging stations.[25] Curbside parking that minimizes infrastructure costs while maximizing services to the majority of tenants that rely on overnight street parking opens opportunities to serve mainly multifamily housing communities. The committee may wish to explore the challenges with deployment but also opportunities to rapidly serve communities with limited charger access.

Inductive Charging/Wireless Charging

Another unique feature of EVs are their ability to charge wirelessly. Similar to how wireless charging works in phones, inductive charging uses the magnetic field produced by wire coils embedded within a road surface to induce a current in a corresponding coil apparatus installed on a vehicle, charging the battery.[26] With the potential for both stationary and mobile charging, use cases are already arising for heavily trafficked areas as well as public transit applications.[27-29] In addition to the ability to charge on the go, undergrounding of electric components has the potential

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[22] CEC; "California Retail Fuel Outlet Annual Reporting Results"; https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting
[23] California Department of Motor Vehicles (DMV); "Vehicles Registered by County"; https://www.dmv.ca.gov/portal/dmv-research-reports/research-development-data-dashboards/vehicles-registered-by-county/
[24] San Francisco Planning; "San Francisco Better Streets Plan"; https://sfplanning.org/sites/default/files/archives/BetterStreets/docs/Better-Streets-Plan_Final-Adopted-10-7-2010.pdf
[25] LA Lights; "EV Charging Stations"; https://lalights.lacity.org/connected-infrastructure/ev_stations.html
[26] EV Charging Summit; "Everything You Need to Know About Wireless EV Charging ";https://evchargingsummit.com/blog/everything-you-need-to-know-about-wireless-ev-charging/
[27] Michigan Department of Transportation; "Wireless Charging Roadway"; https://www.michigan.gov/mdot/travel/mobility/initiatives/wireless-charging-roadway
[28] Link Transit; "Electric Bus Project"; https://www.linktransit.com/services_and_programs/electric_bus_project.php
[29] Antelope Valley Transit Authority;"Electric Bus Fleet Converstion"; avta.com/electric-bus-fleet-conversion.php

to reduce vandalism risk. A hurdle which the committee may wish to explore is the necessary coordination of efforts and alignment of funding between transit agencies and utilities.

Public Transit

Beyond the mechanisms of charging, benefiting from the expansion of EVs includes the variety of modes of transportations communities use. Expanded charger networks allows EV car sharing programs, such as BlueLA, to expand service areas and increase user flexibility.[30] Additionally, electric buses capable of charging not only reduce operational costs to public transit agencies, but inductively charged buses are also able to stay in operation for 12-14 hours.[29,31] Reducing operational costs on already strained public transit systems can create breathing room for expanded service hours, additional routes, and more to those who may not be able to afford a personal EV or who relies purely on the public transit system. The committee may wish to explore how agencies are strategically thinking about the prioritization of funding toward personal vs. public EV transportation networks and opportunities to maximize public benefit.

Additional Considerations

With a number of state and local initiatives and grant programs, given the flexibility of electric vehicles, the committee may also wish to consider engaging agencies on whether existing programs include the necessary flexibility to support emerging technologies. Further, in a future with millions of chargers, it may be worth delving into the capacity and upkeep costs for companies and public agencies and whether exploring novel financing models may be a future topic for discussion.

[30] BlueLA; https://ladot.lacity.org/bluela

[31] Cision; One of America's Largest Bus Fleets Reveals Operating Costs of EV Buses Using Wireless Chargers from Momentum Dynamics is Half of a Diesel-Fueled Bus"; https://www.prnewswire.com/news-releases/one-of-americas-largest-electric-bus-fleets-reveals-operating-costs-of-ev-buses-using-wireless-chargers-from-momentum-dynamics-is-half-of-a-diesel-fueled-bus-301570760.html