

Senate Bill 1000 California Electric Vehicle Infrastructure Deployment Assessment

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Executive Summary

The inclusion and participation of underserved communities in California's zero emission transportation future is crucial to the achievement of the state's climate action and clean transportation goals. Senate Bill (SB) 1000 (Lara, Statutes of 2018, Chapter 368) requires that the California Energy Commission (CEC) consult with the State Air Resources Board to assess whether charging station infrastructure, including direct-current (DC) fast charging infrastructure, is disproportionately deployed, to inform the CEC's infrastructure investments. The CEC is required to evaluate charger deployment by population density, geographical area, and population income level.

This analysis evaluates drive times to public DC fast charging stations and identifies communities with sparse fast charging coverage, defined as communities with average drive times of 10 minutes or more to a station. The study finds that rural communities have less coverage than urban communities, low-income rural communities have the least coverage, and coverage gaps among disadvantaged urban communities exist.

Keywords: charger, DC Fast Charging, driver experience, electric vehicle supply equipment (EVSE), infrastructure

1 Background

California's climate action and clean transportation goals necessitate the transition to zero emission vehicles and rapid but strategic deployment of charging infrastructure in communities, including rural, low-income, and disadvantaged communities. Electric vehicles (EVs) provide numerous benefits including pollution reduction in communities and lower refueling and vehicle maintenance costs for drivers [1]. But historically EV adoption has been more common in affluent urban households and charger deployment has followed these EV drivers. Public charging gaps in rural, low-income, and disadvantaged communities could amplify disparities in EV adoption and the associated benefits. Access to public charging is critical to give current and future drivers, especially those unable to charge at home, confidence that EVs are a practical choice for meeting their mobility needs.

Senate Bill (SB) 1000 (Lara, Statutes of 2018, Chapter 368) requires the California Energy Commission (CEC) to assess whether EV charging station infrastructure, including direct-current (DC) fast chargers, is disproportionately deployed by population density, geographical area, or population income level [2]. This

analysis informs the CEC's Clean Transportation Program (CTP) investments in light-duty charging infrastructure.

The CEC issued the first SB 1000 report in 2020, and found that low-income communities, on average, have fewer public chargers per capita than middle- or high-income communities [3]. The report also found that public chargers are unevenly distributed across state air districts and counties but collocated with county populations and plug-in electric vehicles. Informed by input from stakeholders, this report builds upon the 2020 SB 1000 assessment and identifies rural, low-income, and disadvantaged communities in California with sparse public fast charging station coverage.

2 Drive times to public fast charging stations are a measure of infrastructure coverage and access

Drive time is one way to measure access to public DC fast charging stations among communities and is complementary to the density metrics explored in the 2020 SB 1000 report. Drive time analysis allows for the identification of fast charging network gaps that discourage EV travel within California communities and travel to and from those communities. While the 2020 report identified chargers per capita averaged among communities characterized by population density and income level, this report explores access in more geographic detail. Staff used mapping software to identify the quickest drive time routes during peak traffic¹ from census tract population centers to the nearest public DC fast charging station. Staff identified census tracts as urban or rural communities, low-, middle-, or high-income urban or rural communities, or disadvantaged or non-disadvantaged urban or rural communities.

About 81 percent of Californians live in census tracts with population centers that are within a 10-minute drive of a public DC fast charging station. About one in five communities have sparse public fast charging station coverage, characterized in this report as census tracts with drive times of 10 minutes or more to a public fast charging station.

3 Rural communities have less public fast charging station coverage than urban communities: 60 percent have drive times of 10 minutes or more

The transition to EVs requires charging infrastructure to support all kinds of trips and drivers, including those in rural areas. Public charging, including DC fast charging, in rural areas can improve range confidence for rural drivers with longer daily travel, and support road trips and tourism in rural communities. But many rural communities have sparse public fast charging coverage.

For this analysis, rural communities are defined as census tracts where at least 50 percent of the census tract's land area is designated as rural by the U.S. Census Bureau. Census tracts that do not fit this rural definition are considered urban communities in this analysis. To determine percent rural land area, staff summed the area of all rural census blocks, which are designated by the U.S. Census Bureau, within a census tract and divided that number by the census tract's total land area.²

About 60 percent of rural communities have drive times of 10 minutes or more to a public fast charging station. This represents about 8 percent of California's population and 84 percent of the state's geographic area. In contrast, 12 percent of urban communities have drive times of 10 minutes or more. Figure 3.1 shows high variability in drive times among urban and rural communities. Drive times from rural communities reach

¹ This analysis includes roadway data developed by the California Air Resources Board for the California Hydrogen Infrastructure Tool using high-resolution roadway geometry from the U.S. Census Bureau and traffic data from Metropolitan Planning Organization traffic models. The traffic model data includes weekday average pm peaks up to 2014. More information on CARB's methodology can be found in Annual Hydrogen Evaluation Reports, available at <https://ww2.arb.ca.gov/resources/documents/annual-hydrogen-evaluation>.

² The U.S. Census Bureau designates urban and rural census blocks every 10 years. Staff referred to the Census Bureau's 2010 urban and rural designations, which was the most recent data available for urban and rural areas at the time of this analysis.

up to over 3 hours (189 minutes) with most under 2.5 hours (150 minutes), whereas drive times from urban communities reach up to over 2 hours (139 minutes) with most under 1.2 hours (66 minutes).

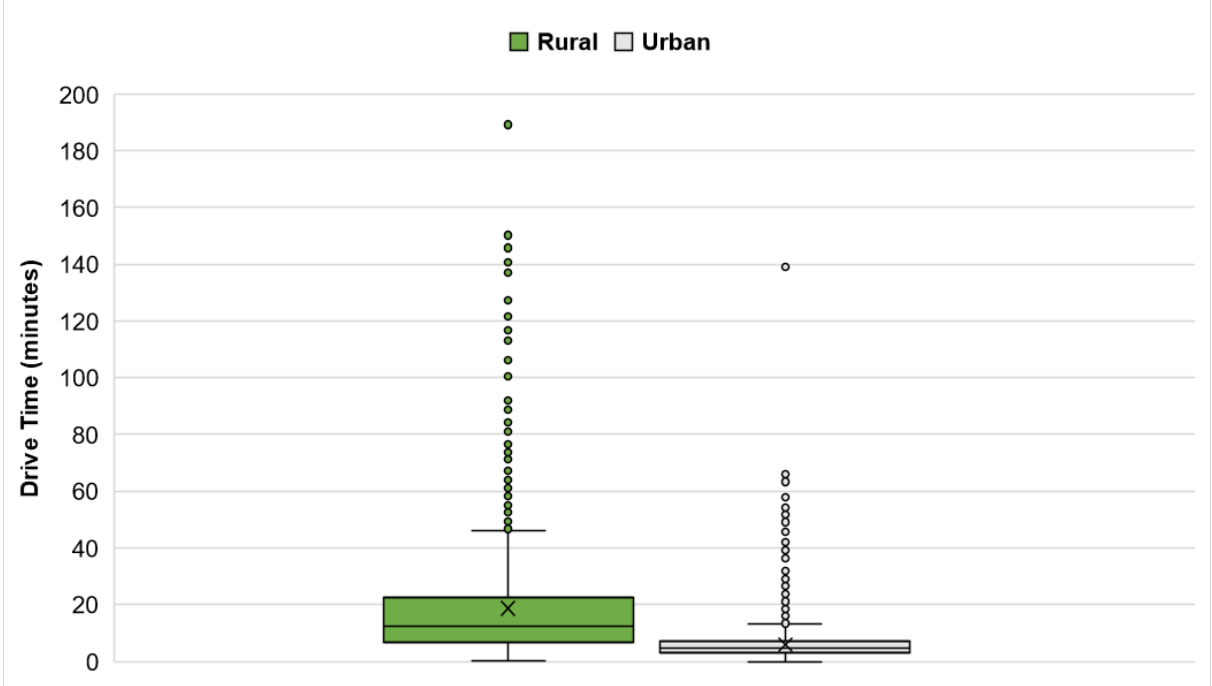


Figure 3.1: Drive time to the nearest DC fast charging station by urban and rural communities

Of the 60 percent of rural communities with long drive times, about 4 percent have drive times of more than an hour, about 13 percent have drive times between 30 and 60 minutes, and about 42 percent have drive times between 10 and 29 minutes. Figure 3.2 shows the different degrees of public DC fast charging coverage gaps among rural communities statewide.

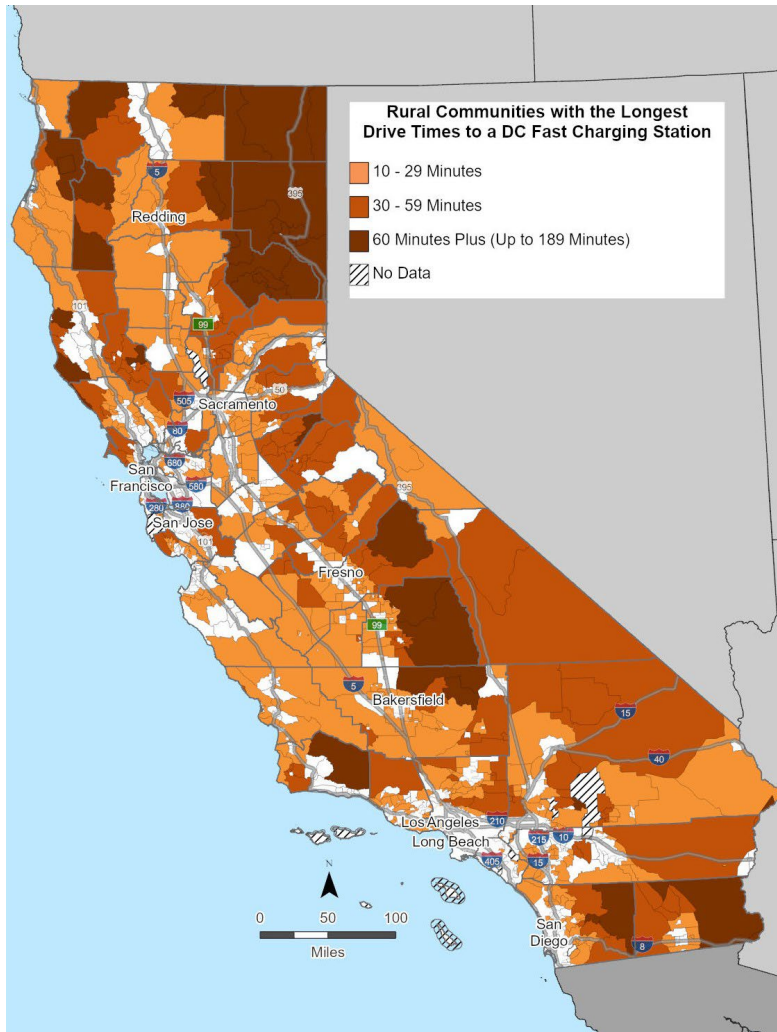


Figure 3.2 Map of Rural Communities with the Longest Drive Times to a DC Fast Charging Station

The CEC is committed to using CTP grant funding to increase public charging coverage, including fast charging coverage, for rural communities. The CEC’s California Electric Vehicle Infrastructure Project (CALeVIP) provides funding for chargers in specific regions across the state and is a vehicle for both rapid charger deployment and addressing charger gaps [4]. The CEC launched CALeVIP projects in the Sonoma Coast (July of 2020) and the Inland Counties (April 2021), both of which required a minimum of 25 percent of project funding in unincorporated areas of certain counties. At the end of 2021, the CEC released a grant funding opportunity for deployment of public chargers in rural communities and announced over \$20 million of proposed awards in June of this year [5].

4 Low-income rural communities have the least public fast charging station coverage: 69 percent have drive times of 10 minutes or more

For this analysis, low-, middle-, and high-income communities are defined as:

- Low-income communities are census tracts with median household incomes at or below 80 percent of the statewide median income or with median household incomes at or below the threshold designated as low income by the Department of Housing and Community Development’s list of state income limits adopted pursuant to Section 50093 of the California Health and Safety Code [6].

- Middle-income communities are census tracts with median household incomes between 80 to 120 percent of the statewide median income, or with median household incomes between the threshold designated as low- and moderate-income by the Department of Housing and Community Development’s list of state income limits adopted pursuant to section 50093 of the California Health and Safety Code.
- High-income communities are census tracts with median household incomes at or above 120 percent of the statewide median income, or with median household incomes at or above the threshold designated as moderate-income by the Department of Housing and Community Development’s list of state income limits adopted pursuant to section 50093 of the California Health and Safety Code.

The methodology used to designate low-, middle-, and high-income communities with the definitions above can be found in the full SB 1000 report [7].

About 11 percent of low-income communities in California are rural; about 69 percent of low-income rural communities have drive times of 10 minutes or more to a public DC fast charging station, which is more than any other group. Table 4.1 shows the percentage of communities grouped by income level and urban or rural area with drive times of 5 minutes or less, 6 to 9 minutes, and 10 minutes or more to a public fast charging station.

Table 4.1: Drive time ranges by income level and urban or rural area

	0 to 5 minutes	6 to 9 minutes	10 plus minutes	N/A	Total
Low-income rural	16%	14%	69%	1%	100%
Low-income urban	61%	28%	11%	0%	100%
Middle-income rural	19%	22%	58%	1%	100%
Middle-income urban	62%	24%	14%	0%	100%
High-income rural	25%	29%	45%	1%	100%
High-income urban	54%	32%	14%	0%	100%

Low-income rural communities with drive times of 10 minutes or more make up about 4 percent of California’s population and 64 percent of the state’s geographic area. About 89 percent of low-income communities in California are urban; about 11 percent of low-income urban communities have drive times of 10 minutes or more. The 11 percent of low-income urban communities with long drive times represents 6 percent of California’s population and less than 1 percent of the state’s geographic area.

5 Public fast charging station coverage among disadvantaged urban communities varies and gaps exist: 11 percent have drive times of 10 minutes or more

The CEC is committed to investing in disadvantaged communities, which represent the most vulnerable and pollution-burden communities in California [8]. At the time of this analysis, the California Environmental Protection Agency (CalEPA) identified disadvantaged communities as census tracts that

score within the top 25th percentile of the California Office of Environmental Health Hazards Assessment’s (OEHHA) California Communities Environmental Health Screening Tool (CalEnviroScreen) 3.0 scores, including census tracts with low population and high pollution burden, such as ports [9].

About 92 percent of disadvantaged communities in California are urban and tend to be close to major highways where public DC fast charging stations are more likely to be found. Despite greater average fast charging station coverage in disadvantaged urban communities than non-disadvantaged urban communities, gaps still exist. About 11 percent of disadvantaged urban communities have drive times of 10 minutes or more to a public fast charging station. This group makes up about 22 percent of California’s population. Figure 5.1 shows drive times by disadvantaged urban communities grouped by drive times of 5 minutes or less, 6 to 9 minutes, and 10 minutes or more. Strategies to address these gaps will have to consider more geographic detail than whether a community is designated as disadvantaged. Sparse fast charging coverage also exists among disadvantaged rural communities where about 63 percent have drive times of 10 minutes or more.

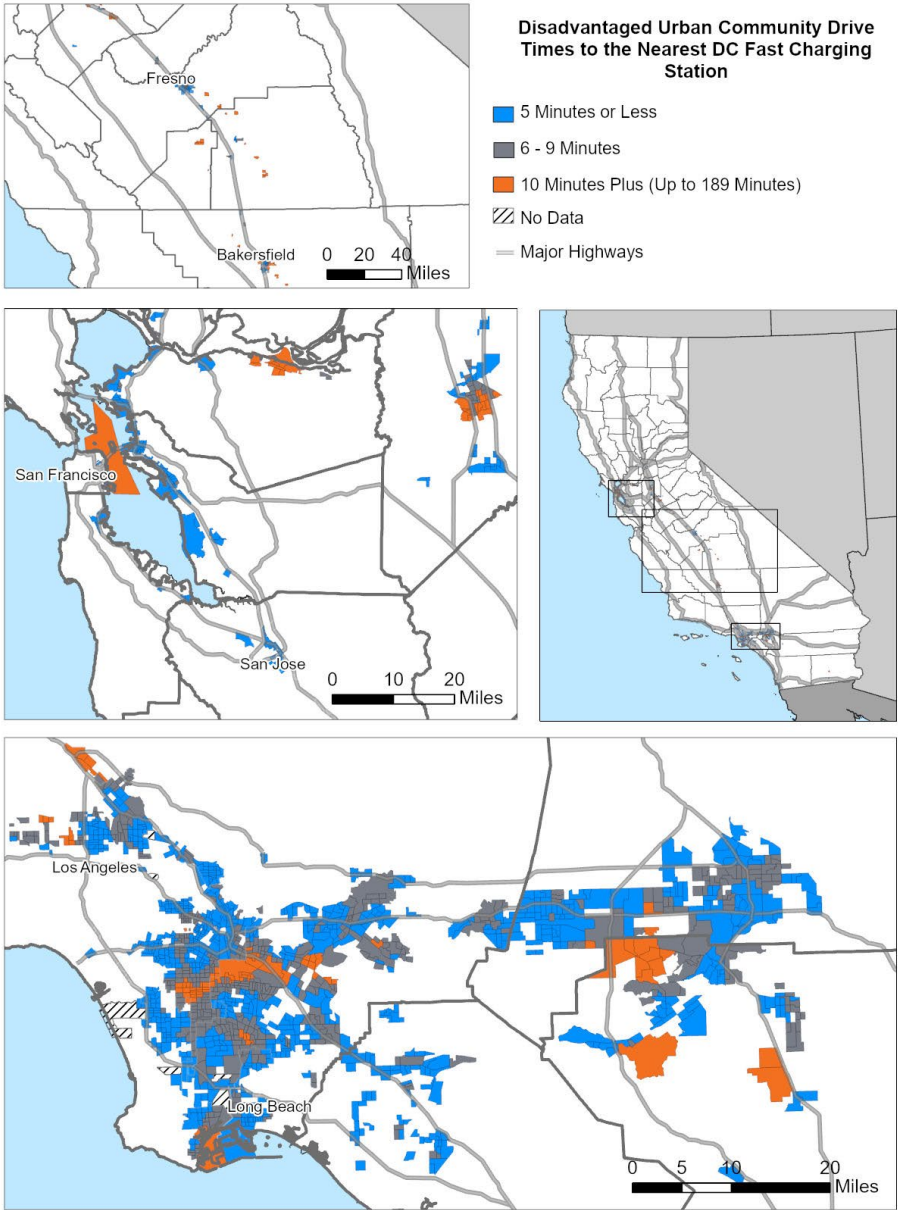


Figure 5.1: Map of disadvantaged urban community drive times to the nearest DC fast charging station

The CEC's CTP commits at least 50 percent of its funding to low-income and/or disadvantaged communities, which includes funding for EV chargers, hydrogen fueling stations, and other projects. Drive time results indicate the need to focus efforts to a finer level of detail to reach all disadvantaged and low-income communities. The CEC will continue to prioritize low-income and disadvantaged communities, including communities with sparse public fast charging station coverage.

6 Conclusions

About 19 percent of census tracts in California are 10 minutes or more from a public fast charging station. This represents 19 percent of Californians and 85 percent of the state's geographic area and includes:

- 69 percent of low-income rural communities
- 63 percent of disadvantaged rural communities
- 60 percent of rural communities
- 12 percent of urban communities
- 11 percent of low-income urban communities
- 11 percent of disadvantaged urban communities.

Widespread EV adoption is essential for the state to reach its climate action and clean transportation goals. The CEC recognizes that access to charging infrastructure is a significant barrier to EV adoption and use. CEC staff will use these results to inform CTP funding decisions for fast chargers to improve charging coverage and access for rural, low-income, and disadvantaged communities. Drive time results will help inform new block grant programs for light-duty EV charging infrastructure (CALeVIP 2.0 and Communities in Charge) and future grant funding opportunities. Solutions to address charging access may vary depending on the intersecting characteristics of the community to be served, including whether a community is rural, urban, low-income, and/or disadvantaged. CEC staff will continue to refine and update the analysis to identify charging network gaps in underserved communities and build out charging infrastructure that serves all Californians. The CEC conducts workshops and solicits input on funding solicitations to effectively identify public infrastructure funding needs to maximize benefits to communities.

Acknowledgments

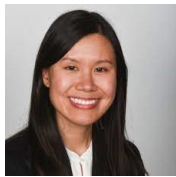
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Presenter Biography



Tiffany Hoang is an Air Pollution Specialist at the California Energy Commission (CEC). She works in the Infrastructure Modeling and Assessment Unit within the Fuels and Transportation Division. Tiffany graduated with a B.S. in Biology from the University of Texas, Austin and has an M.S. in Environmental Policy with specializations in Energy & Transportation Planning and City & Regional Planning from the University of California, Davis.