



Zero-Emission Vehicle (ZEV) Charging Infrastructure: Progress To-Date and Plans to Meet State Goals

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California Energy Commission
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California's Bold Climate Actions

Executive Order

- 100% of new passenger car and truck sales will be ZEV by 2035
- 100% of medium-duty/heavy-duty vehicles will be ZEV by 2045, where feasible
- 100% of drayage trucks will be ZEV by 2035
- 100% of off-road vehicles and equipment will be ZEV by 2035

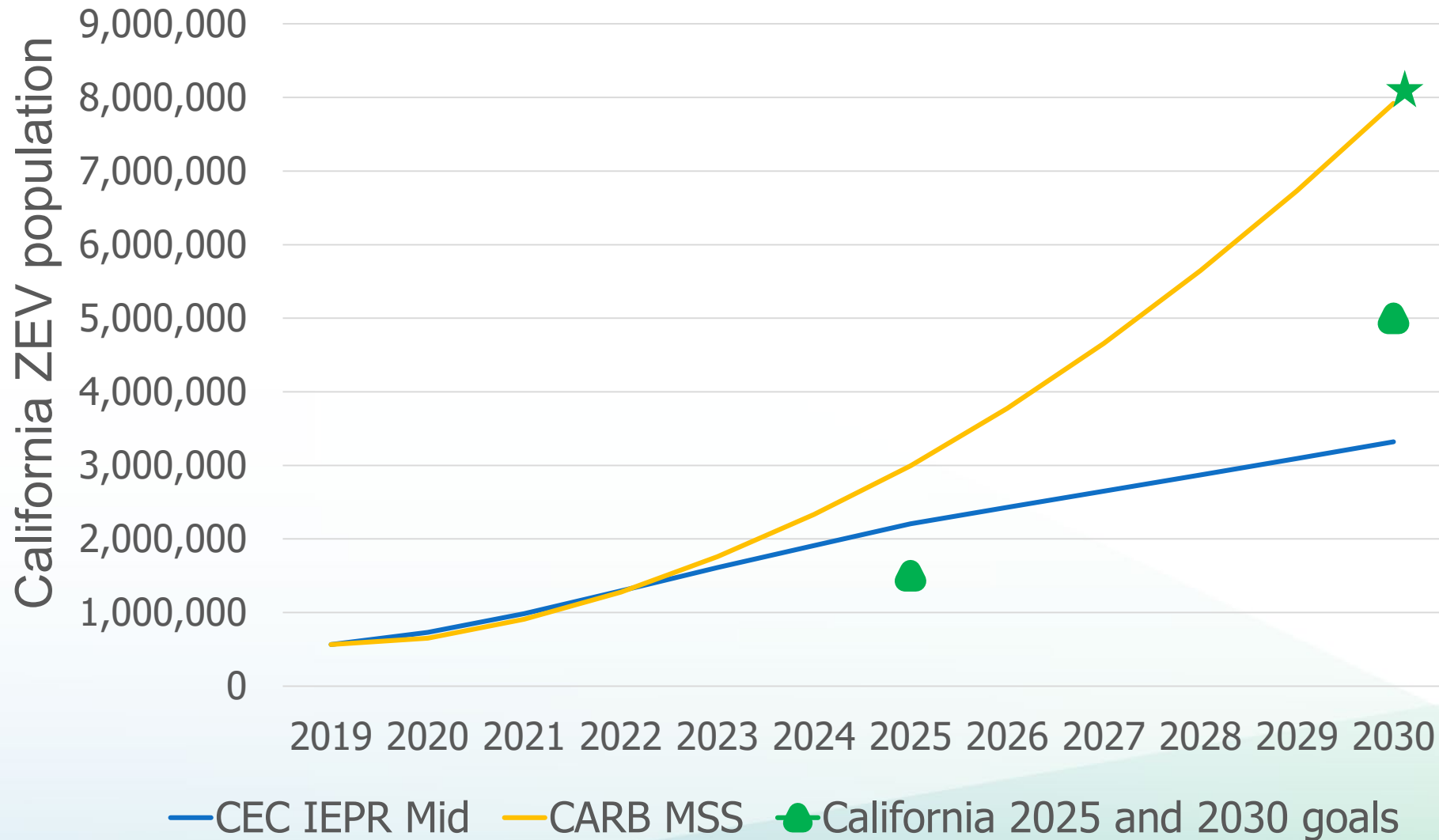


Governor's Budget

- Governor Newsom's Proposed 2021-22 State Budget
- \$1.5 billion ZEV package
- \$1 billion towards infrastructure
- \$465 million for targeted vehicle rebates
- \$50 million to green the CA fleet



Light-Duty ZEV Trajectories

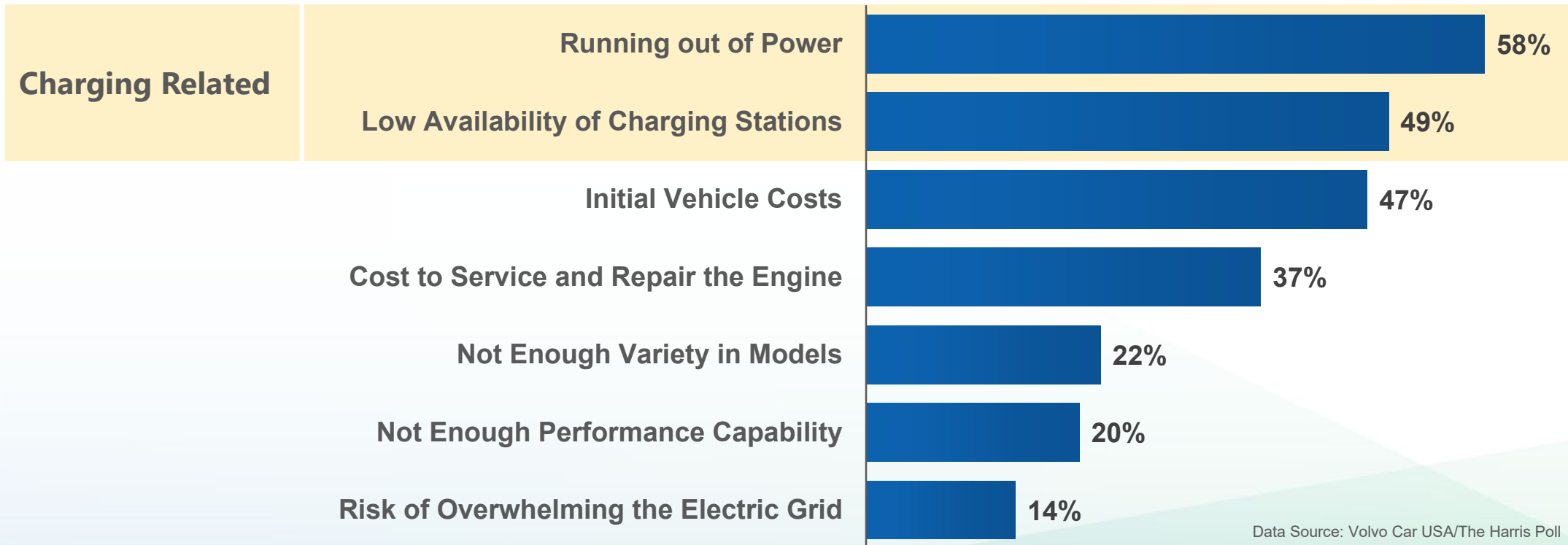




ZEVs Need Infrastructure

Public Perception of Widespread and Easy Charging Infrastructure Is Also Key to ZEV Uptake

Consumer Concerns for Purchasing a Battery Electric Vehicle



Data Source: Volvo Car USA/The Harris Poll



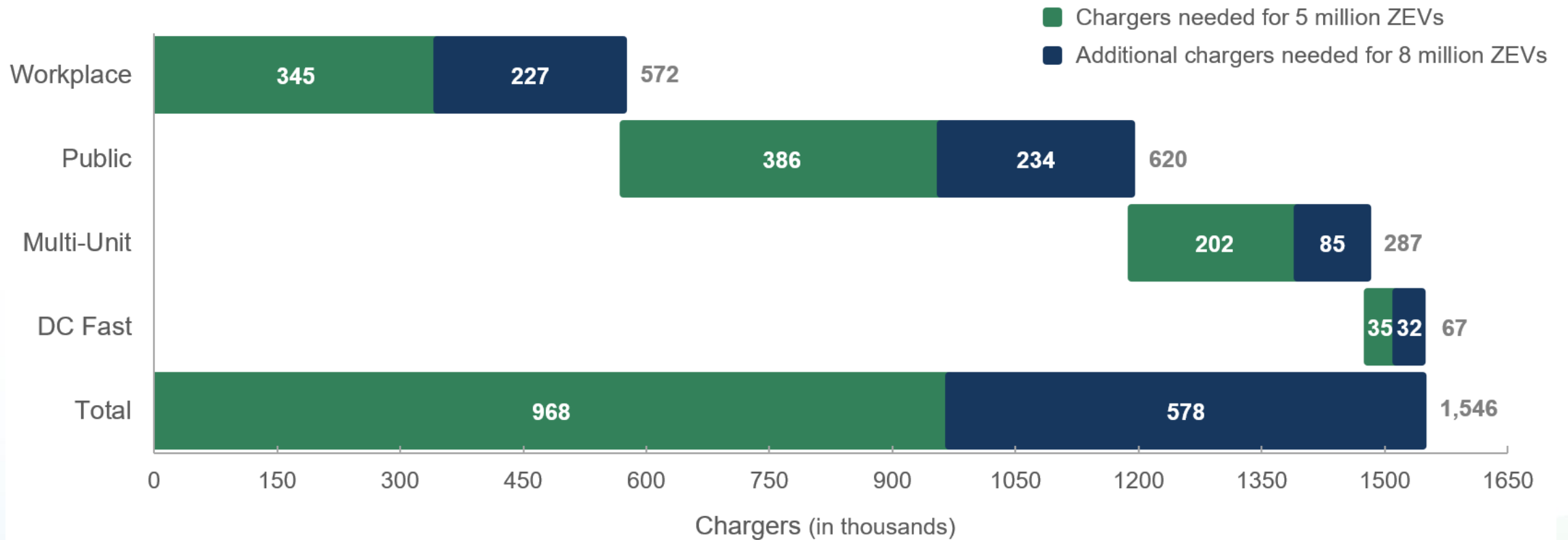
Clean Transportation Program Investments

Table ES-1: Clean Transportation Program Awards as of May 1, 2020

Funded Activity	Cumulative Awards to Date (in Millions)*	# of Projects or Units
<i>Alternative Fuel Production</i>		
Biomethane Production	\$73.08	28 Projects
Gasoline Substitutes Production	\$31.94	15 Projects
Diesel Substitutes Production	\$63.94	26 Projects
Renewable Hydrogen Production	\$7.93	2 Projects
<i>Alternative Fuel Infrastructure</i>		
Electric Vehicle Charging Infrastructure**	\$182.81	11,276 Level 2 Chargers/ DC Fast Chargers
Hydrogen Fueling Infrastructure	\$135.58	62***** Public Fueling Stations, plus Fleets
E85 Fueling Infrastructure	\$3.61	57 Fueling Stations
Upstream Biodiesel Infrastructure	\$3.98	4 Infrastructure Sites
Natural Gas Fueling Infrastructure	\$24.11	70 Fueling Stations
<i>Alternative Fuel and Advanced Technology Vehicles</i>		
Natural Gas Vehicle Deployment***	\$86.84	3,152+ Vehicles
Propane Vehicle Deployment	\$5.98	514 Trucks
Hybrid and ZEV Deployment (Including CVRP, HVIP, and Low-Income Mobility Incentives)	\$32.02	10,700 Cars and 150 Trucks
Advanced Technology Freight and Fleet Vehicles****	\$125.67	54 Demonstrations
<i>Related Needs and Opportunities</i>		
Manufacturing	\$55.54	24 Manufacturing Projects
Workforce Training and Development	\$33.33	17,440 Trainees
Fuel Standards and Equipment Certification	\$3.90	1 Project
Sustainability Studies	\$2.04	2 Projects
Regional Alternative Fuel Readiness	\$11.11	51 Regional Plans
Centers for Alternative Fuels	\$5.41	5 Centers
Technical Assistance and Program Evaluation	\$9.22	n/a
Total	\$898.92	



Projected 2030 Charger Counts to Support 5 Million and 8 Million Light-Duty Zero-Emission Vehicles



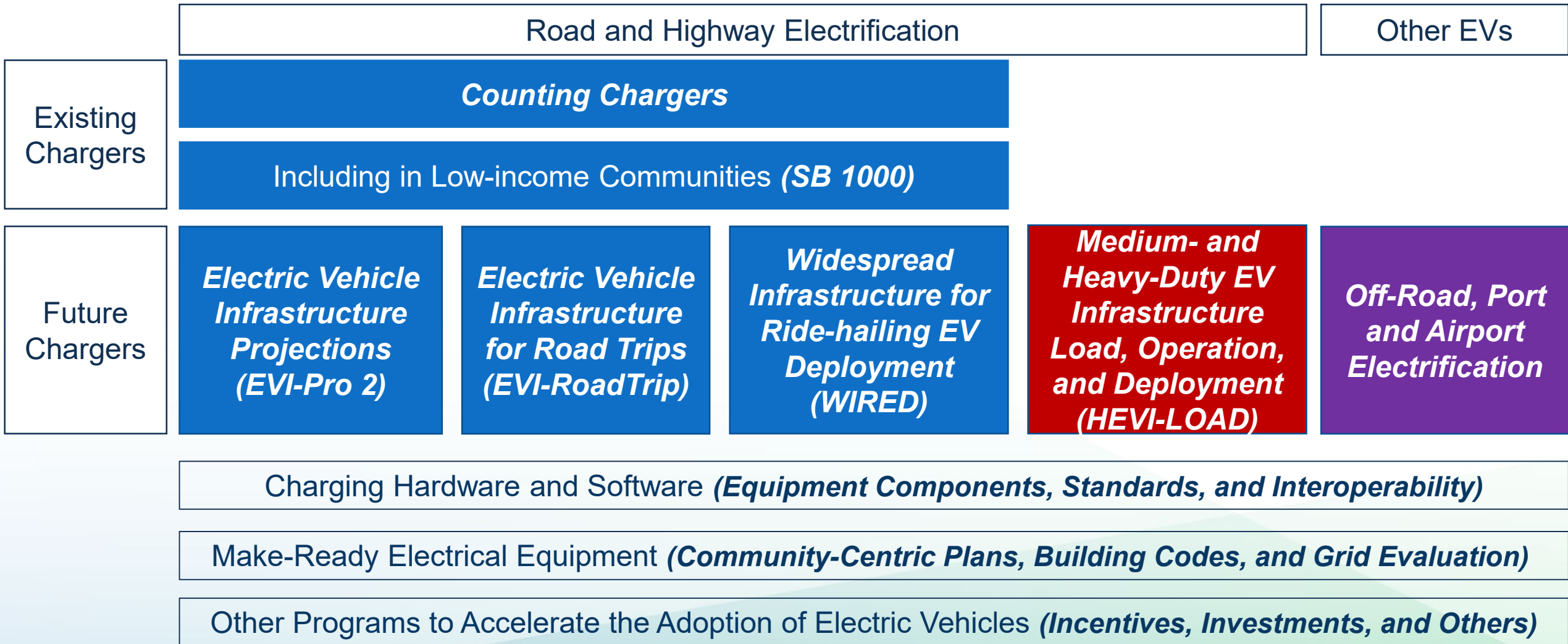


Medium- and Heavy-Duty Vehicle Infrastructure

- CARB's Draft 2020 Mobile Source Strategy projects the state will need **180,000 medium- and heavy-duty ZEVs in 2030** to achieve climate and air quality goals and comply with Executive Order N-79-20.
- Preliminary modeling suggests **157,000 DC fast chargers** will be needed, of which 141,000 are 50 kW and 16,000 are 350 kW.
- Although there is timing variation in energy demand among vehicle types and uses, this charging network corresponds with a load in excess of **2,000 MW around 5 p.m. on a typical weekday.**
- More granular data can help reduce uncertainty in future iterations of the model.



Other CEC Activities





Actions to Support Widespread Deployment of Charging Infrastructure

1. Continue public support for charger deployment.
2. Continue the quantitative modeling efforts.
3. Support innovative charging and financing solutions.
4. Support local efforts to prepare for transportation electrification.
5. Ensure equitable distribution of charger deployment.
6. Align charging with renewable generation and grid needs.
7. Prioritize standardized charger connectors and communications protocols.



ZEV Dashboard

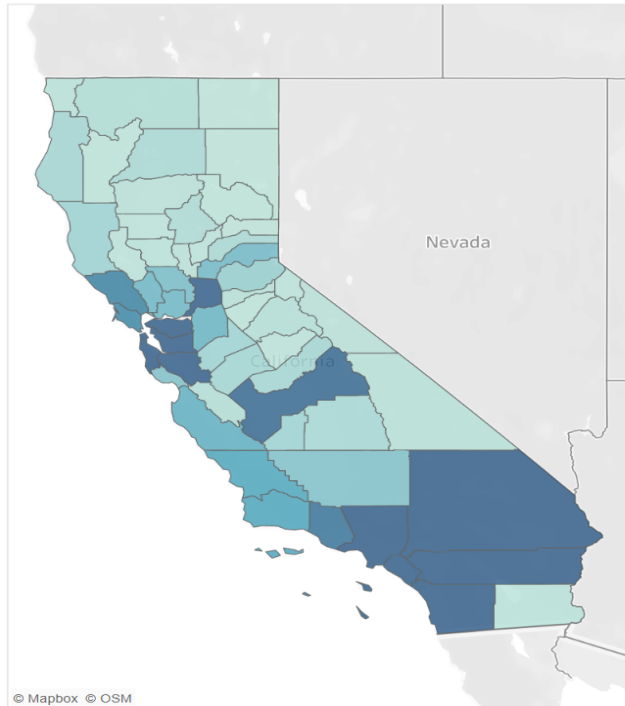
TOTAL EV CHARGERS

Total Public and Shared Private Electric Vehicle Chargers

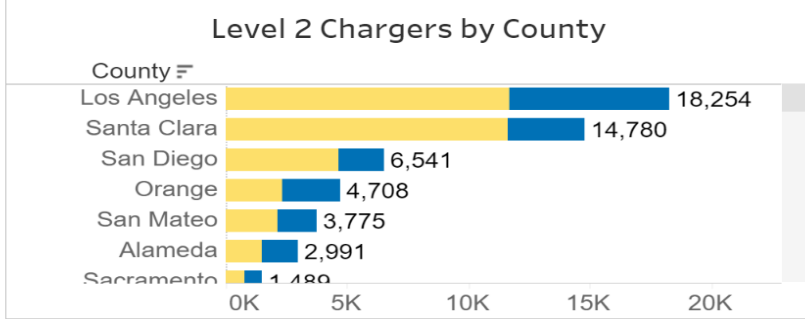
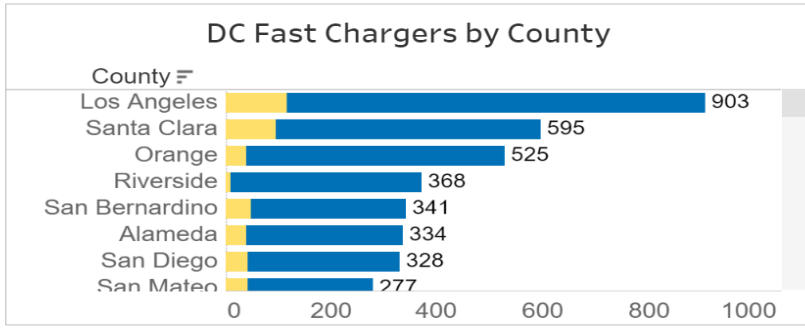
70,479

Public
43.43%
30,610

Shared Private
56.57%
39,869



© Mapbox © OSM



	Public	Shared Private	Grand Total
Level 1	326	109	435
Level 2	24,880	39,201	64,081
DC Fast	5,404	559	5,963
Total	30,610	39,869	70,479

SELECT FILTERS

County
(All) ▾

Access
 (All)
 Public
 Shared Private

Access Legend
■ Public
■ Shared Private

RESET FILTERS

<https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics>



Thank you

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Appendix

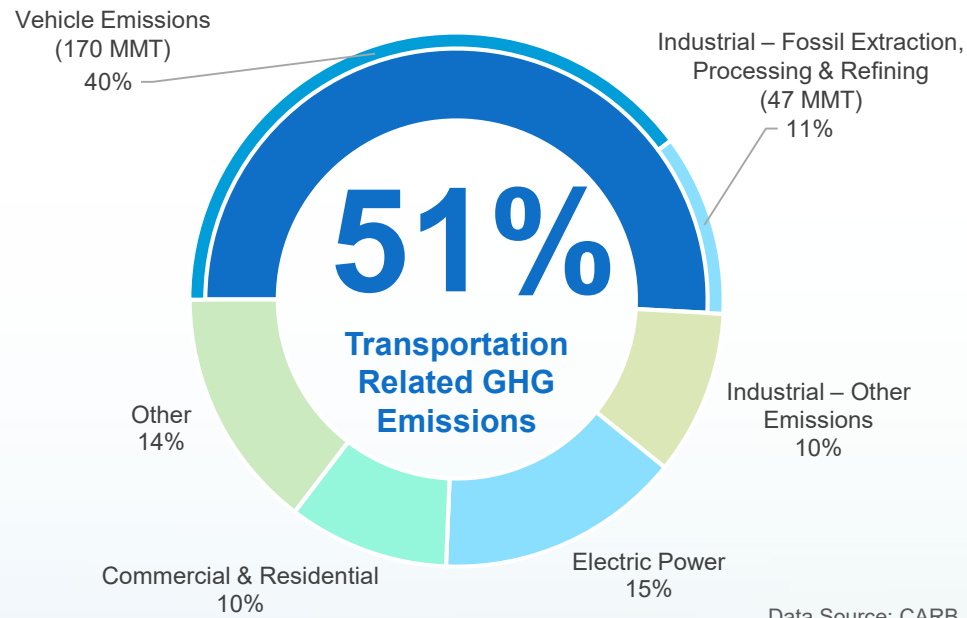
California Energy Commission



Transportation is California's #1 Climate Challenge

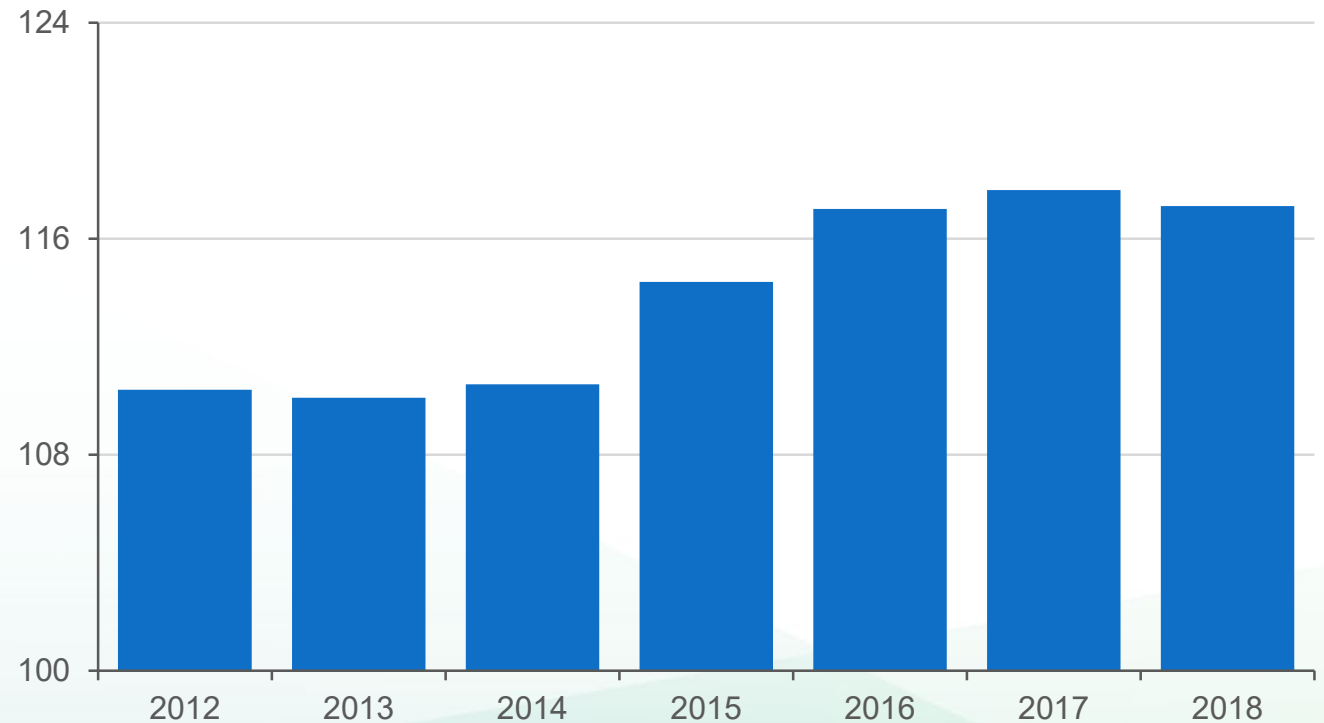
Passenger Vehicle GHG Emissions Remain High

California 2018 GHG Emissions
425 Million Metric Tons (MMT) CO₂e



Data Source: CARB

Passenger Vehicle Emissions, 2012-2018

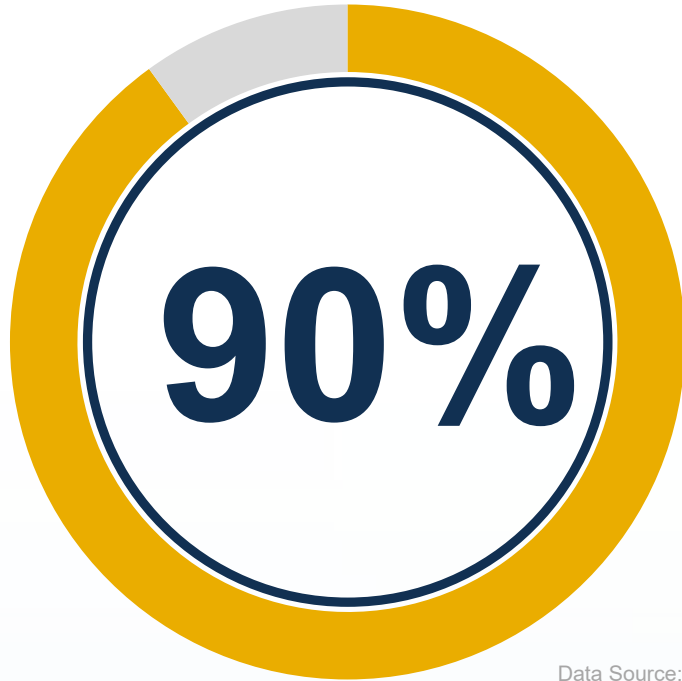


Data Source: CARB



Transportation is a Huge Public Health & Equity Concern

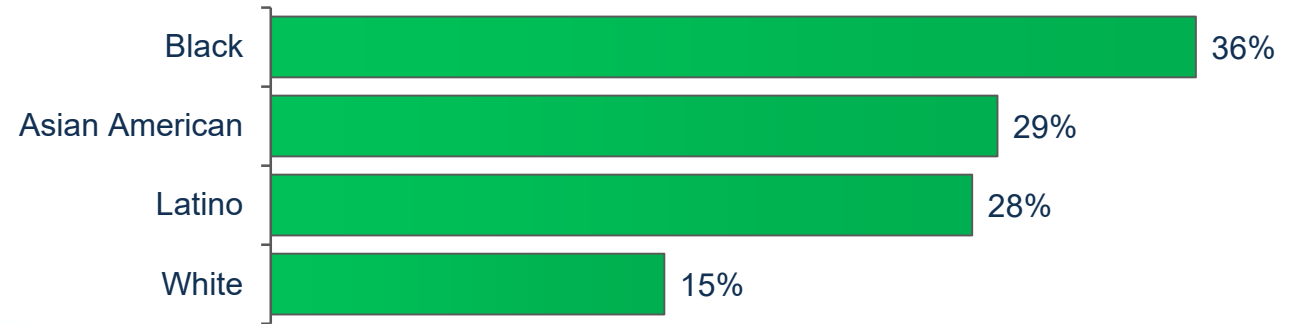
Transportation Pollution Disproportionately Impacts Minority Populations and Low-Income Communities



Data Source: CARB

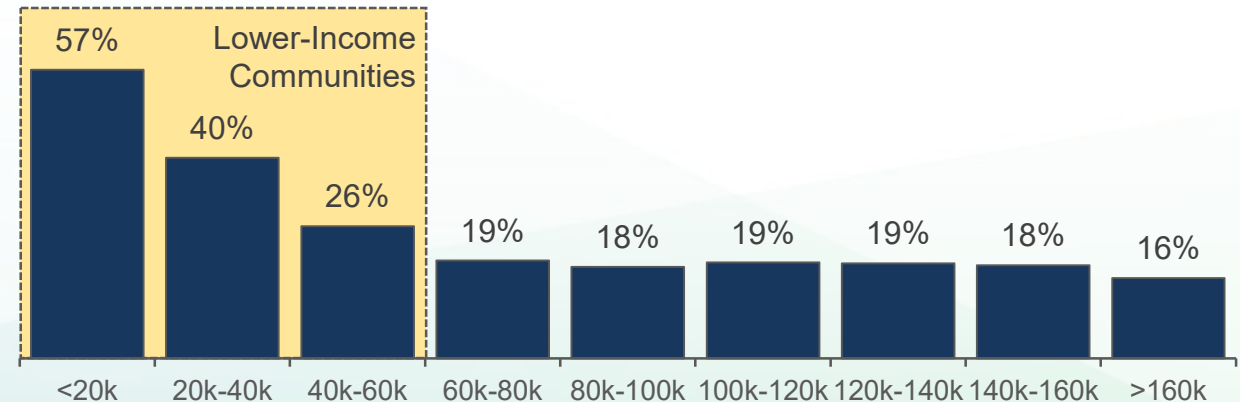
Mobile sources are responsible for 90% of diesel particulate matter – a leading cause of cancer risk

Percent of Residents Living in Communities with High Diesel PM Exposure, by Race



Data Sources: OEHHA, US Census Bureau

Percent of Residents Exposed to High Diesel PM by Census Tract Median Household Income



Data Sources: OEHHA, US Census Bureau



Proposed Funding Allocations

Category	Funded Activity	2020-2021 (Allocation)	Next 2½ FYs (Planned)
Zero-Emission Vehicles and Infrastructure	Light-Duty Electric Vehicle Charging Infrastructure and eMobility	\$92.7*	\$40.2
Zero-Emission Vehicles and Infrastructure	Medium- and Heavy-Duty Zero-Emission Vehicles and Infrastructure	\$20	\$109.8
Zero-Emission Vehicles and Infrastructure	Public Hydrogen Refueling Infrastructure	\$20	\$50
Alternative Fuel Production and Supply	Zero- and Near Zero-Carbon Fuel Production and Supply	-	\$25
Related Needs and Opportunities	Manufacturing	\$2	\$7
Related Needs and Opportunities	Workforce Training and Development	\$1.5	\$6
Related Needs and Opportunities	Recovery and Reinvestment	\$10	-
	Total	\$146.2	\$238

*FY 20-21: \$51 million one-time legislative expenditure authority to increase EV charging infrastructure



Key Solicitations

CALeVIP

- Oversubscribed
- Hundreds of millions of dollars of unfunded projects

EV Ready Communities Blueprints

- Planning in Phase 1 and funded projects in Phase 2

MD/HD Block Grant

- Launching now with CALSTART as administrator

Transit

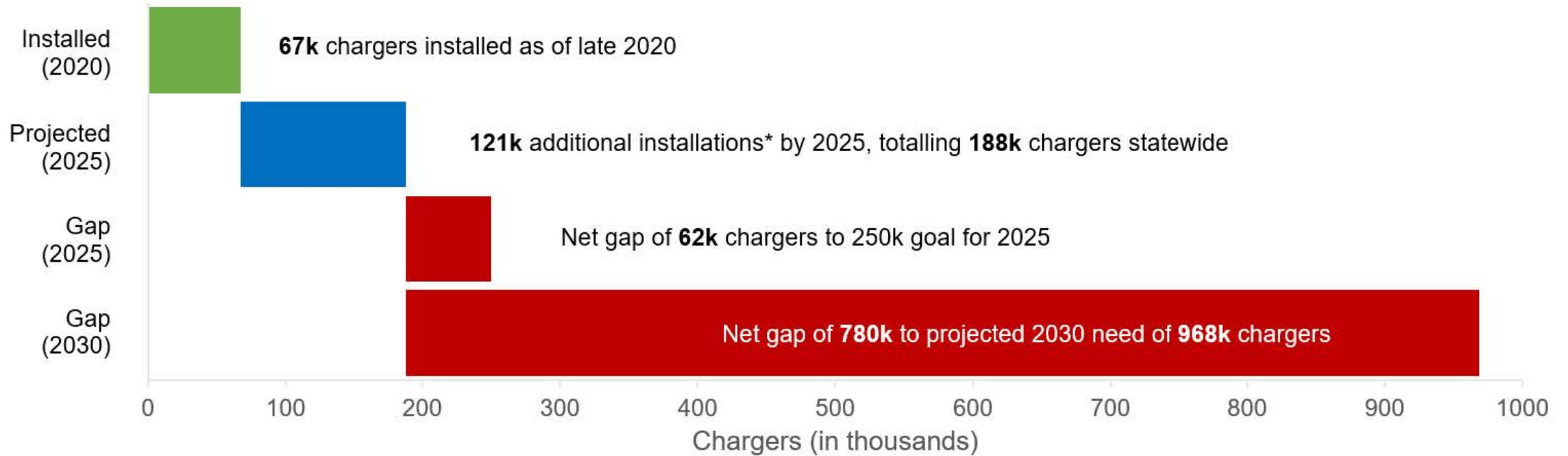
- Aligned with CARB ICT rules

Drayage Trucks

- \$44M joint solicitation between CARB/CEC



Current Status of Charging Infrastructure in CA





SB 1000

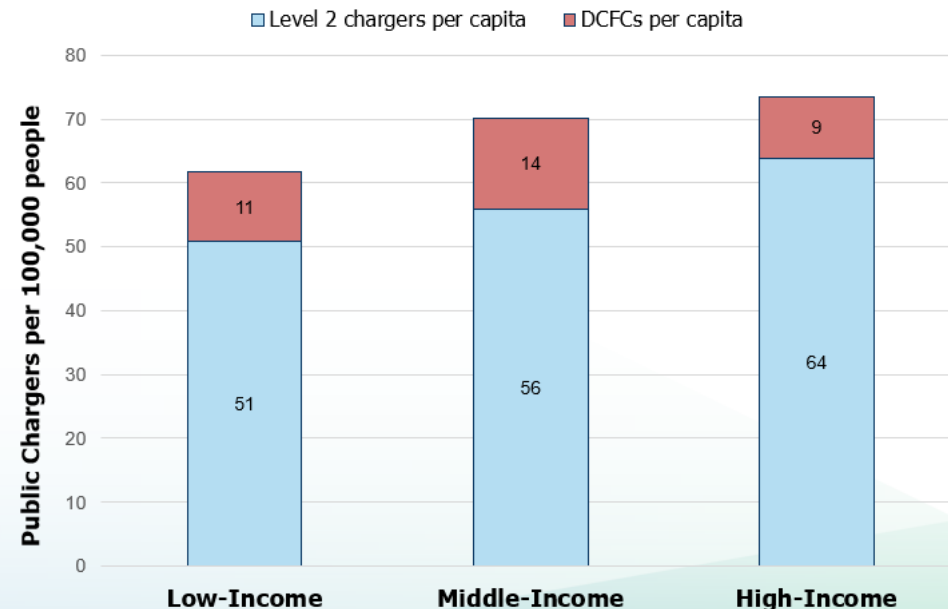
<https://efiling.energy.ca.gov/getdocument.aspx?tn=236189>



SB 1000

1. Are charging stations disproportionately deployed?
2. Are direct current fast charging stations disproportionately distributed and accessible?

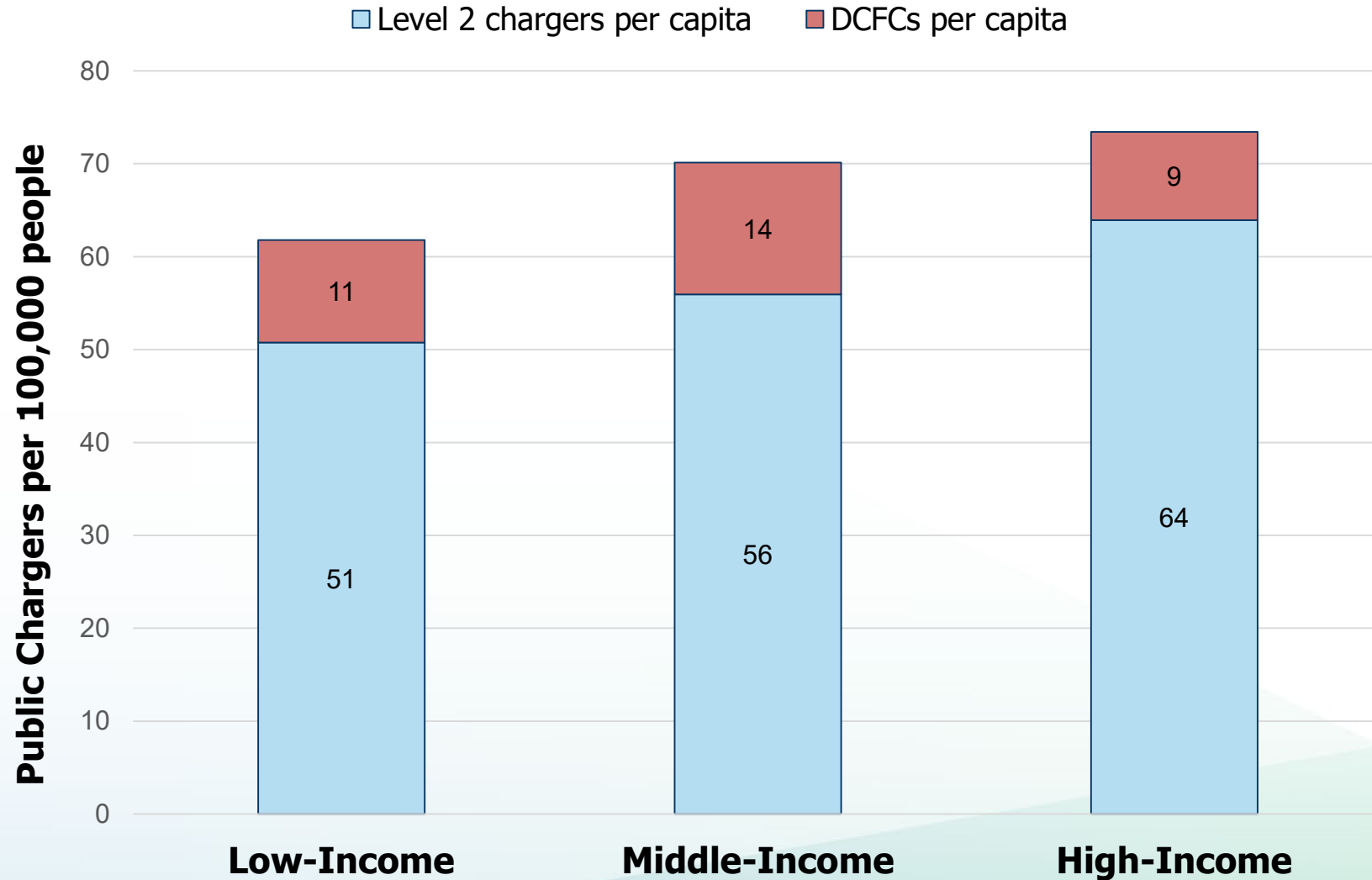
- General direction indicating areas of needed infrastructure (not a siting tool)
- Statewide assessment
- Historical assessment
- Potential market



Sources: U.S. Census Bureau 2014 – 2018 American Community Survey Median Household Income 5-Year Estimates and U.S. Department of Energy's Alternative Fuels Data Center Station Locator data as of July 23, 2020.



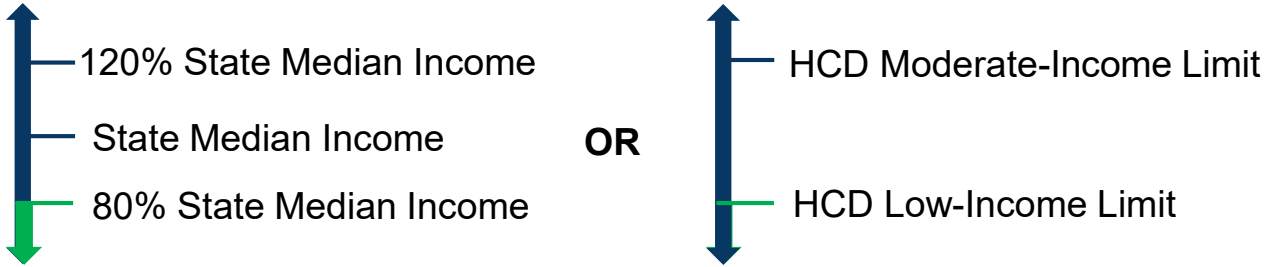
Income Distribution Results



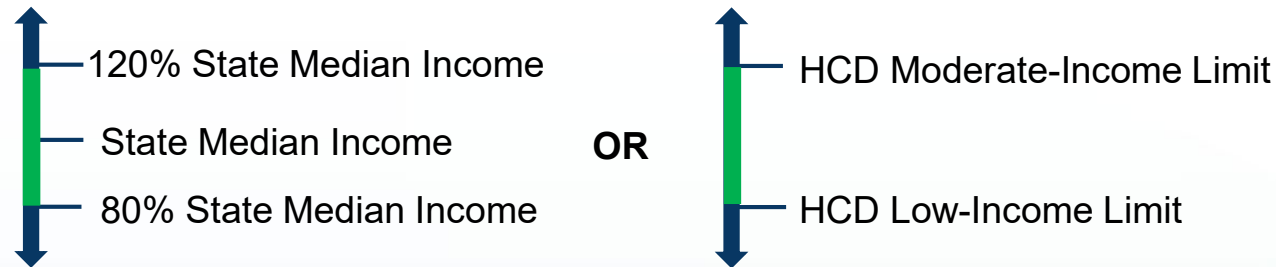


Identification of Low-, Middle-, and High-Income Communities

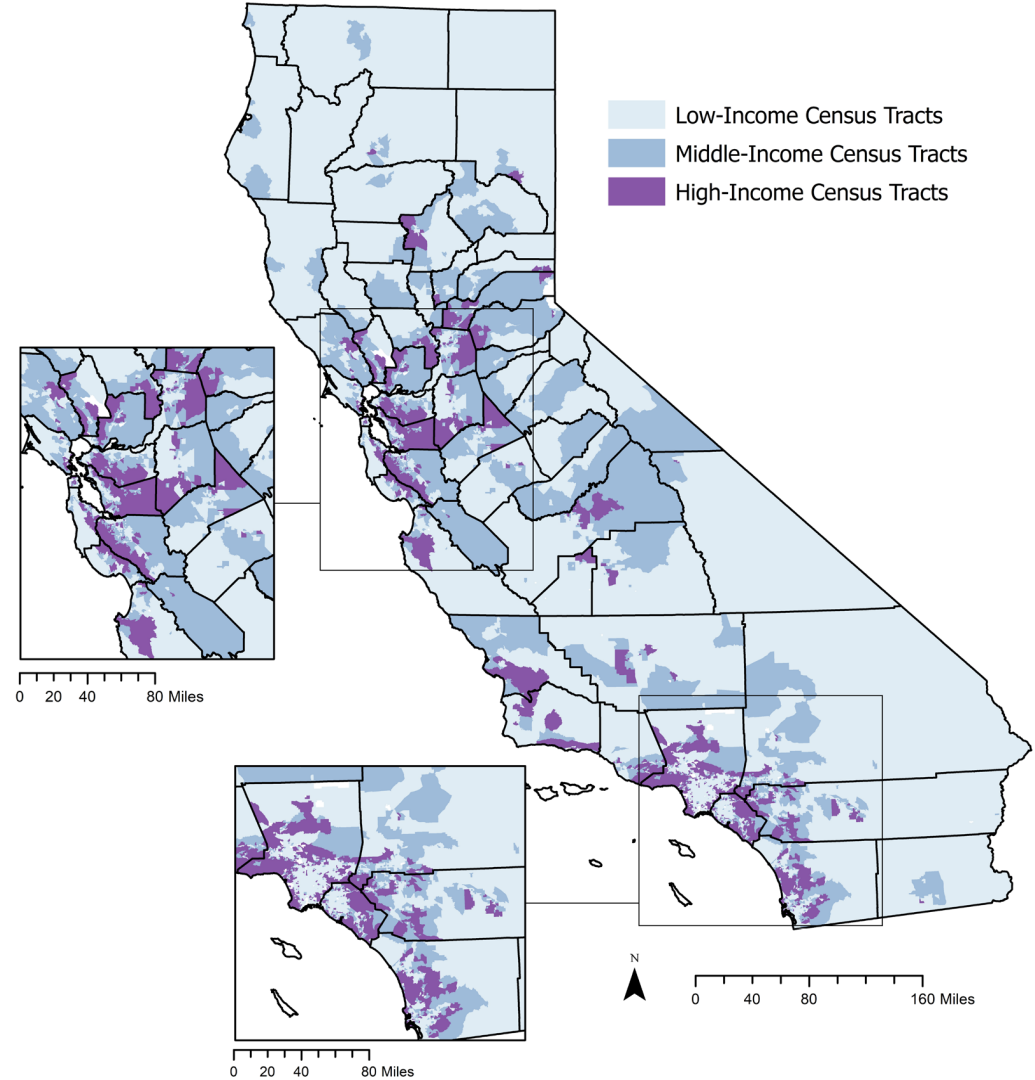
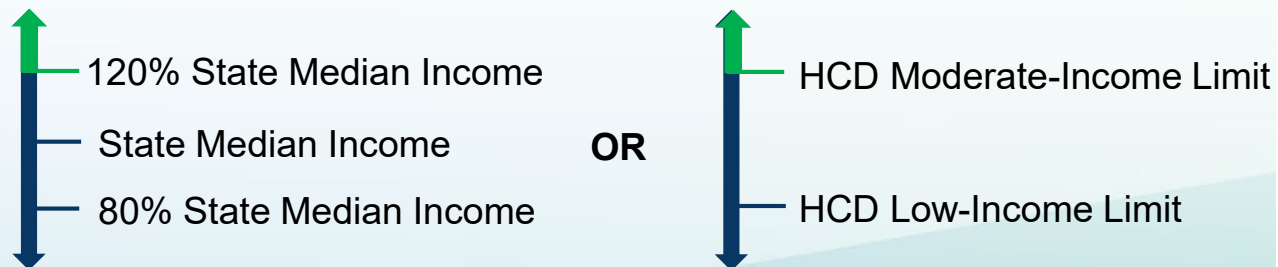
Low-Income Communities:



Middle-Income Communities:



High-Income Communities:

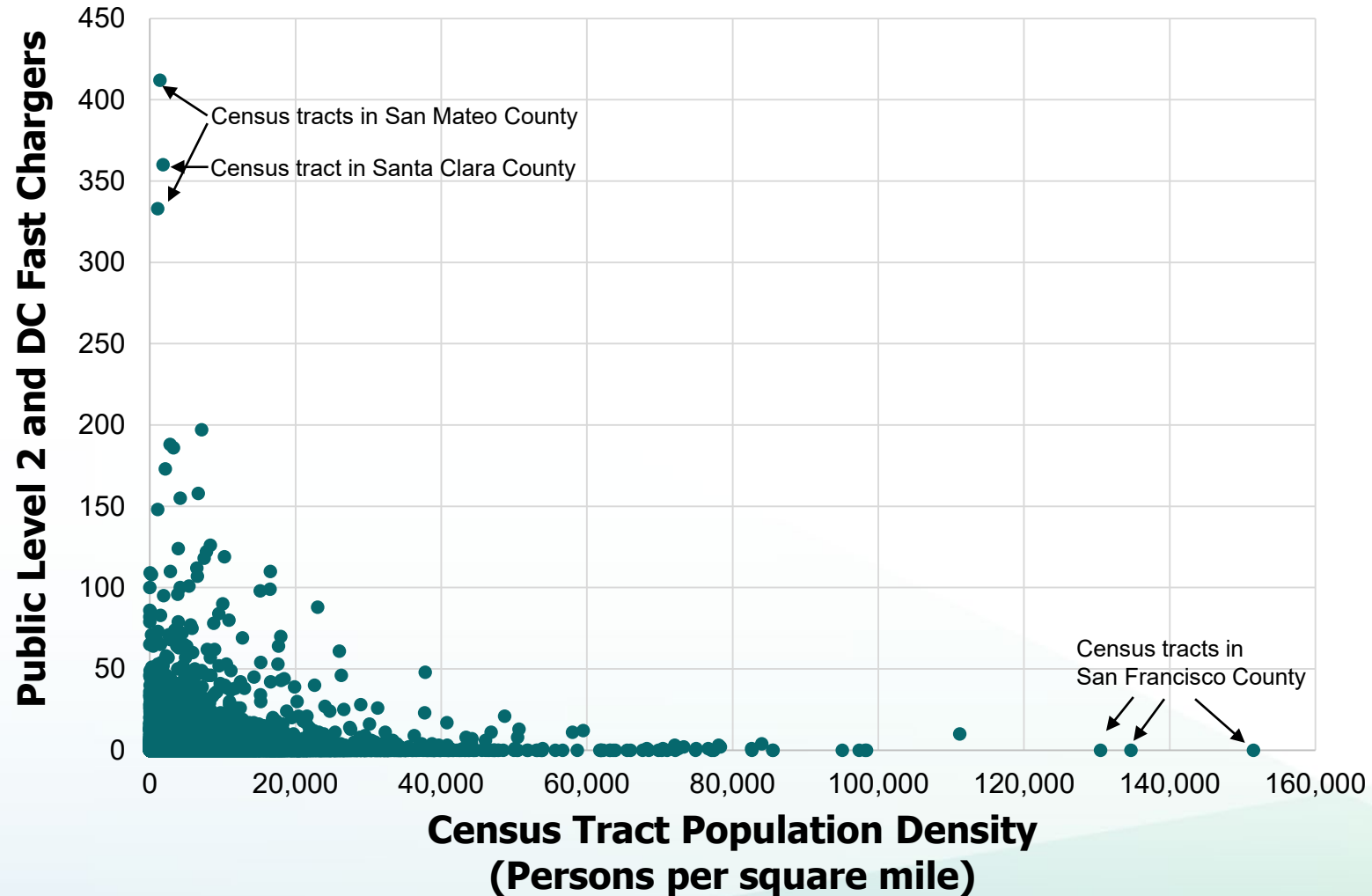


The California Department of Housing and Community Development (HCD) establishes state income limits for each county by household size

Sources: U.S. Census Bureau 2014 – 2018 American Community Survey Median Household Income 5-Year Estimates and HCD 2020 State Income Limits



Population Distribution Results

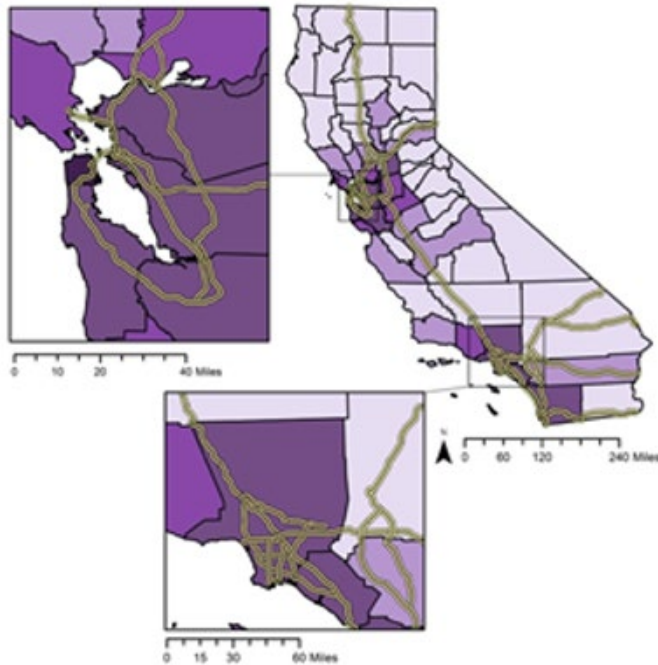


Sources: U.S. Census Bureau 2014 – 2018 American Community Survey Total Population 5-Year Estimates and U.S. Department of Energy's Alternative Fuels Data Center Station Locator data as of July 23, 2020.

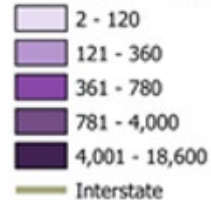


Geographic Distribution Results

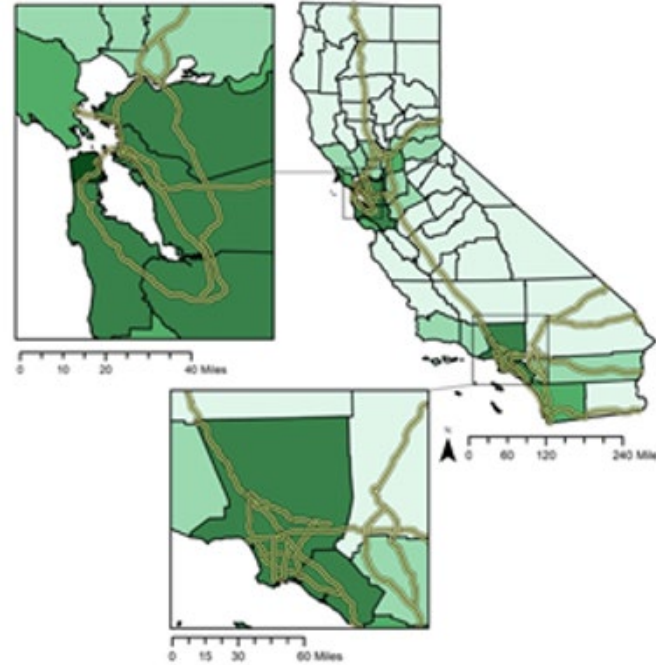
Population Density



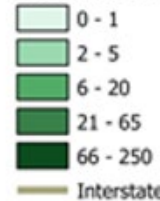
Total Population per Square Mile



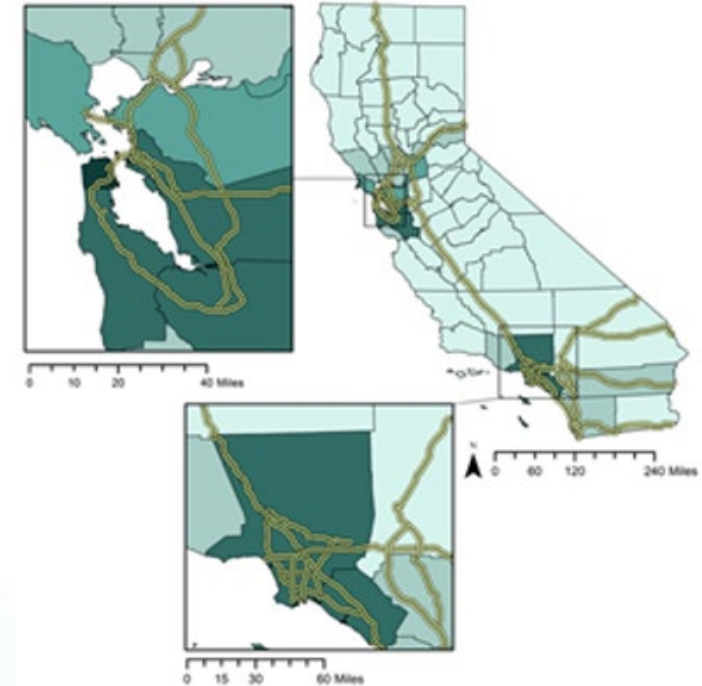
PEV Density



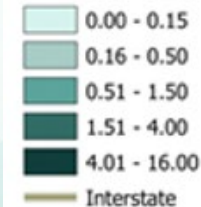
PEVs Registered per Square Mile



Public Charger Density



Level 2 and DC Fast Chargers per Square Mile



Sources: U.S. Census Bureau 2014 – 2018 American Community Survey Total Population 5-Year Estimates, California Department of Motor Vehicles registration statistics as of October 2018, and U.S. Department of Energy's Alternative Fuels Data Center Station Locator data as of July 23, 2020.



AB 2127

<https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127>



Vehicle-to-Grid Recommendations

- Support bidirectional charging by confirming paths for inverters designed for mobile energy storage
- Possibly leverage the CEC's Solar Equipment Lists
- Streamline interconnection pathways that accommodate AC and DC discharge
- Unlock greater revenue generating opportunities with bidirectional technologies
 - Alleviate local congestion
 - Switching from grid to V2B during extreme demand
- ***More to come in the 2021 Vehicle-Grid Integration Roadmap Update...***



State Agency Collaboration

