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BRIEFING

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Update: California's electric vehicle market

This briefing summarizes data on the development of the electric vehicle market in California through 2016. It quantifies electric vehicle market growth across California cities and metropolitan areas and provides U.S. market context.

INTRODUCTION

California has seen much faster uptake of electric vehicles than elsewhere in the U.S. and most places around the world. This briefing updates our assessment of the 2015 California market[1] and quantifies key developments through 2016. It includes metropolitan area data and city-level data, providing greater resolution on markets where electric vehicle uptake is the highest. The paper analyzes uptake of battery-electric vehicles (BEVs) and plug-in hybrid vehicles (PHEVs), excluding conventional gasoline-electric hybrids.

It is important to understand that California accounts for almost half of the U.S. market for plug-in electric vehicles. California represents 12% of the U.S. population, 14% of the economy, and 12% of new light-duty vehicle sales. (See Table 1.) Electric vehicle sales in the state since 2011 totaled 269,000, about 48% of U.S electric vehicle purchases. Public vehicle charging infrastructure in California represents 31% of the U.S. infrastructure, including a quarter of the public direct-current fast charging.

1 Searle, S., Pavlenko, N., Lutsey, N. (2016). Leading edge of electric vehicle market development in the United States: An analysis of California cities. International Council on Clean Transportation. Retrieved from http://www.theicct.org/ev-markets-calif-cities-sept2016

Prepared by Nic Lutsey.

Table 1. Electric vehicle and general data for California and the U.S.

		U.S.	California	California as percent of U.S.
General	Population	321 million	39 million	12%
	Gross domestic product	$18 trillion	$2.5 trillion	14%
	Light-duty vehicle sales in 2016	16.5 million	2.0 million	12%
Electric vehicles	New 2016 electric vehicles	151,000	74,000	49%
	2011-2016 electric vehicles	556,000	269,000	48%
Electric vehicle public charging	Level 2 charge points	30,600	9,800	32%
	Fast charge points	4,900	1,300	26%
	Total charge points	36,500	11,000	31%

Numbers may not add due to rounding. Population from U.S. Census; income from U.S. Bureau of Economic Analysis; vehicle registrations from IHS Automotive; public charging from Alternative Fuel Data Center.

When comparing local electric vehicle markets, California stands out even more. The state includes six of the 50 largest metropolitan areas by population.[2] Those six ranked among the top eight electric vehicle markets nationally in 2016. And while electric vehicles accounted for about 1% of the national light duty vehicle market, sales reached 10% in San Jose, 6% in San Francisco, and 4% in Los Angeles, making them the three biggest U.S. electric vehicle markets.

The map in Figure 1 shows how much bigger the electric vehicle markets were in California compared with elsewhere. The electric vehicle data shown in the figure, and throughout the report, are based on new vehicle registrations from IHS Automotive. We consider annual vehicle sales as synonymous with new vehicle registrations. Along with the six California markets, Portland, Seattle, Detroit, and Salt Lake City rounded out the 10 metropolitan areas with the largest electric vehicle shares of new vehicles that were purchased and leased. Los Angeles residents area purchased 30,000 new electric vehicles in 2016, about a fifth of the entire U.S. electric vehicle market. Los Angeles electric vehicle sales for 2011–2016 totaled more than 100,000.

2 U.S. Office of Management and Budget (U.S. OMB) (2015). OMB Bulletin No. 15-01. Retrieved from https://obamawhitehouse.archives.gov/sites/default/files/omb/bulletins/2015/15-01.pdf

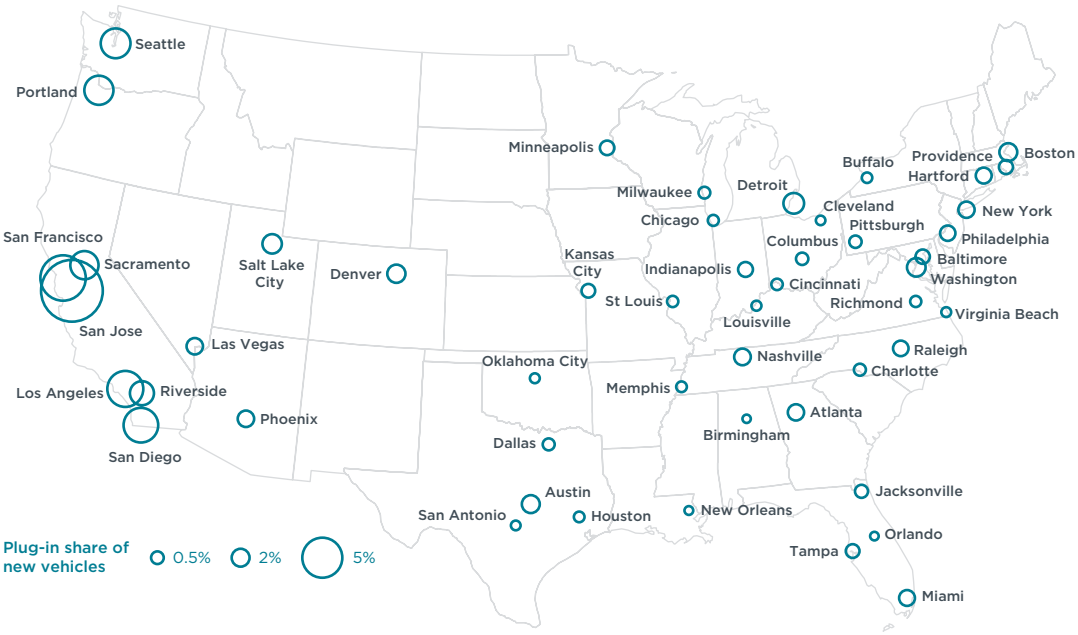

Figure 1. Electric vehicle 2016 market shares in 50 most populous U.S. metropolitan areas
(Vehicle registrations from IHS Automotive)

A combination of policies and other measure help distinguish the California market from the rest of the nation. The state's Zero-Emission Vehicle program, consumer rebates, access to carpool lanes, extensive electric vehicle charging infrastructure, progressive electric utility policies, greater model availability and marketing, and continued growth of local electric vehicle promotions have spurred uptake in California.[3]

3 Lutsey, N., Slowik, P., Jin, L. (2016). Sustaining electric vehicle market growth in U.S. cities. International Council on Clean Transportation. Retrieved from http://www.theicct.org/leading-us-city-electric-vehicle-2016

LEADING CALIFORNIA MARKETS

Narrowing the focus to the city level from metropolitan areas, Figure 2 shows that the City of Los Angeles, California's most populous city, generated 2016 electric vehicle sales of 10,000, more than twice as many as the second largest electric vehicle-sales city, San Jose.

San Diego, San Francisco, Fremont, and Irvine followed, with between 1,500 and 4,300 new electric vehicle sales in 2016. Palo Alto and Oakland each had about 1,000. All 30 cities in Figure 2 had more than 500 new electric vehicle registrations in 2016.

Also shown in the figure is the split between battery-electric vehicles and plug-in hybrid electric vehicles. The cities with highest electric vehicle penetration did not show any clear trend as to type of technology.

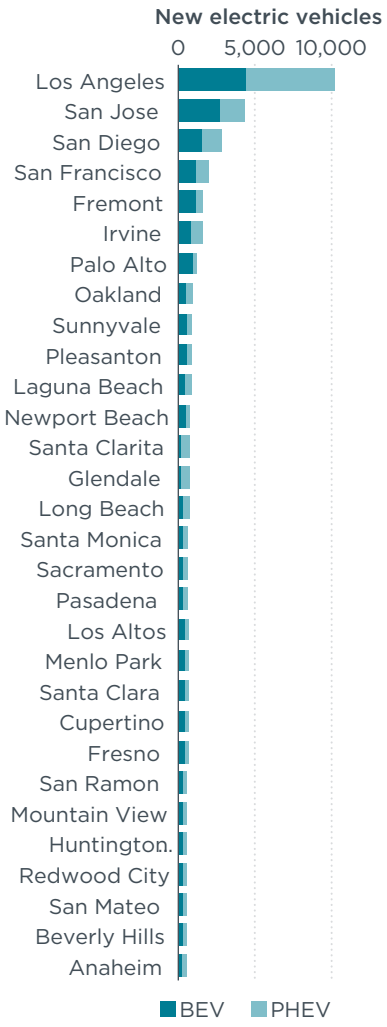

Figure 2. New electric vehicle sales in 2016, showing battery-electric vehicles and plug-in hybrid electric vehicles.

(Vehicle registrations from IHS Automotive)

Figure 3 analyzes California cities by market share of new plug-in electric vehicles. This provides an early indication of which markets may be expanding beyond the first early adopters.

Among the top 40 California cities by electric vehicle market share in 2016, Palo Alto led with 22%, followed by Los Altos at 21% and Saratoga at 20%. Six cities had electric vehicle market shares of more than 15%, and 16 had above 10%. Going beyond those listed in the chart, there were 64 cities with above a 5% share of electric vehicles.

The cities with higher electric vehicle shares tended to have a much higher proportion of BEVs. The PHEV share was 3-6% for all of these cities, making BEV share the differentiating element. In the top four cities, Tesla accounted for 45% or more of electric vehicle sales.

Almost all of the cities with the highest electric vehicle market shares were in the metropolitan areas of San Francisco (16 cities), San Jose (12), and Los Angeles (10). Many of the cities at the top of the list are in the Silicon Valley region.

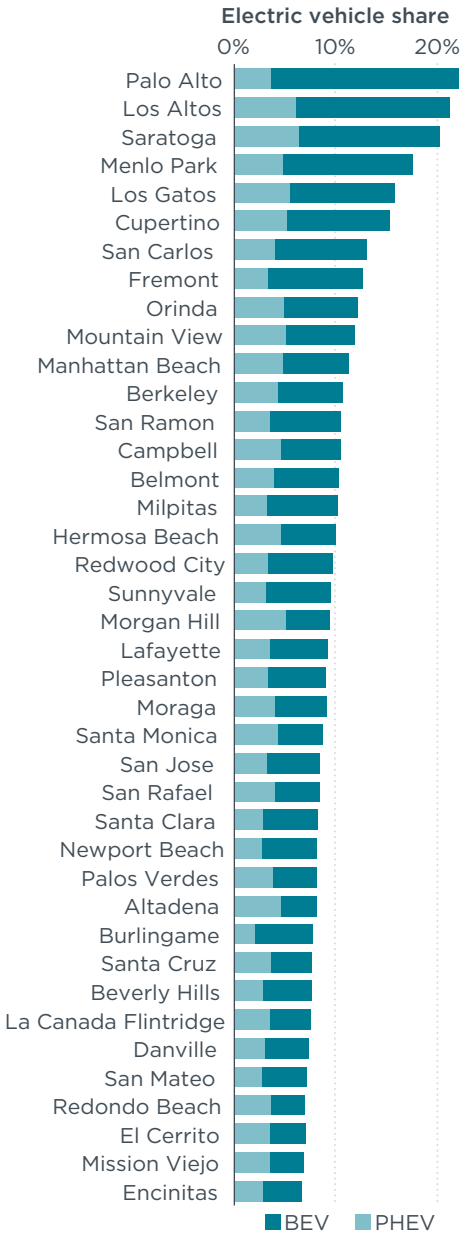

Figure 3. New electric vehicle market share in 2016

(Vehicle registrations from IHS Automotive)

MARKETS WITH THE HIGHEST GROWTH

The California electric vehicle market grew 20% from 2015 to 2016, reaching 74,000 new registrations. Among California cities, as shown in Figure 4, 40 had 2016 electric vehicle market shares above 6.6%; this compares with 30 such cities in 2015. Of the top 40 cities, 34 recorded increases in market share from the previous year.

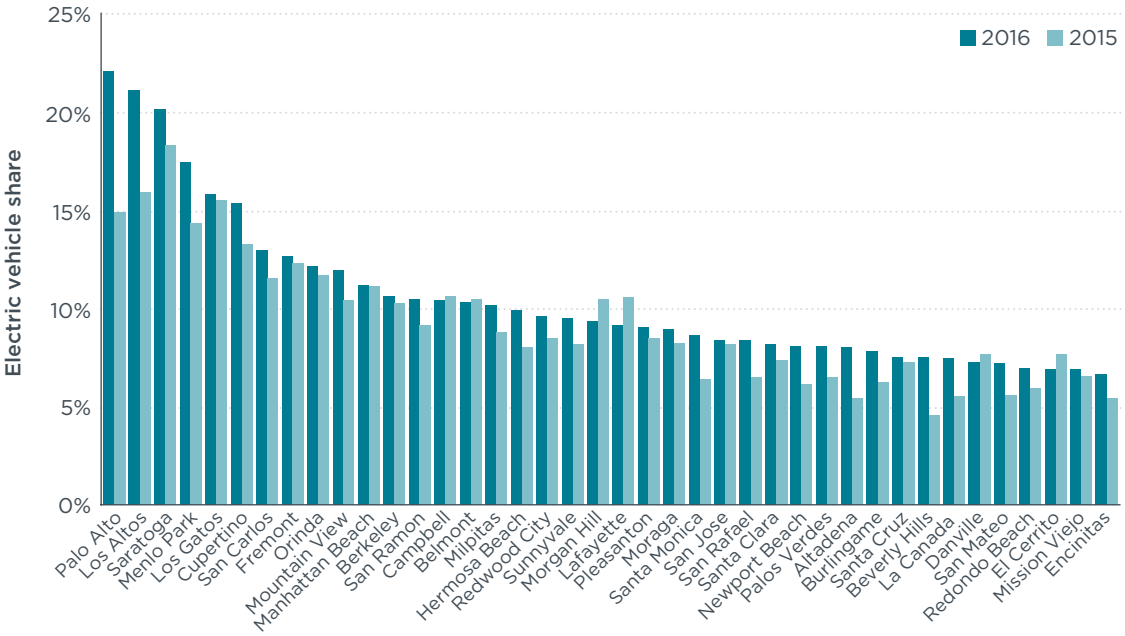

Figure 4. Top 40 cities ranked by new electric vehicle market share in 2016, compared with 2015 *(Vehicle registrations from IHS Automotive)*

Electric vehicle sales in several cities expanded much faster in 2016 than the statewide increase of 20%. Table 2 summarizes features of the 10 cities where electric vehicle registrations exceeded 200 and where sales grew more than 50%. Los Angeles made by far the largest gain, more than doubling sales to about 10,000. Many of the other cities where electric vehicle registrations expanded the most, including Rancho Santa Margarita, La Puente, Beverly Hills, Glendale, Escondido, and Newport Beach, were also in southern California.

Table 2. California cities with the fastest growth in electric vehicle sales, 2015-2016

City	New 2016 electric vehicle sales	Percentage increase in 2015-2016 electric vehicle sales	Attributes
Rancho Santa Margarita	290	187%	• Top sellers: Fiat 500e, Chevrolet Volt, Tesla Model S • Above average use of state rebate • High metropolitan area charging (2.4x U.S. average) • High median income
Los Angeles	10,112	119%	• Top sellers: Tesla Model S, Chevrolet Volt • Low use of state rebate • High metropolitan area charging (2.4x U.S. average) • Many city-led programs: Electric police car fleet, electric car sharing program, EV-ready building codes • Below average median income
San Rafael	204	102%	• Top sellers: Tesla Model S, Chevrolet Volt • High use of state rebate • High metropolitan area charging (3.8x U.S. average) • Above average median income
Fresno	589	77%	• Top seller: Fiat 500e • High use of state rebate • Low metropolitan area charging (0.6x U.S. average) • Below average median income
La Puente	513	62%	• Top sellers: Fiat 500e, Chevrolet Volt • High metropolitan area charging (2.4x U.S. average) • Below average median income
Beverly Hills	331	62%	• Top sellers: Tesla Model S, Tesla Model X • Low use of state rebate • High metropolitan area charging (2.4x U.S. average) • High median income
Glendale	714	59%	• Top sellers: Chevrolet Volt, Fiat 500e • Low use of state rebate • High metropolitan area charging (2.4x U.S. average) • Below average median income
Escondido	232	54%	• Top sellers: Chevrolet Volt, Nissan Leaf • Above average use of state rebate • High metropolitan area charging (2.8x U.S. average) • Below average median income
Newport Beach	760	53%	• Top sellers: Tesla Model S, Tesla Model X • Low use of state rebate • High metropolitan area charging (2.4x U.S. average) • High median income
Santa Rosa	448	51%	• Top sellers: Nissan Leaf, Chevrolet Volt • High metropolitan area charging (5.0x U.S. average) • Average median income

Based on vehicle registrations from IHS Automotive; rebate use information based on Clean Vehicle Rebate Program data from Center for Sustainable Energy; income information from U.S. Census; charging infrastructure data from Alternative Fuel Data Center.

Three cities in the table—Rancho Santa Margarita, Beverly Hills, and Newport Beach—have median incomes of $100,000 or more. Expensive Tesla models were among the top sellers in those markets. In five cities with low median incomes—Los Angeles, Fresno, La Puente, Glendale, and Escondido—the most popular models were the less costly Chevrolet Volt, Fiat 500e, and Nissan Leaf. Car buyers in the San Joaquin Valley and South Coast areas also benefited from additional incentives for lower-income households, which were extended throughout the state in late 2016.[4,5] In the Los Angeles area, drivers of electric vehicles benefit from access to carpool lanes. Many of the fastest-growing markets feature more-extensive charging infrastructure.

CHARGING INFRASTRUCTURE

Research has shown a clear link between public charging infrastructure and electric vehicle uptake.[6] Access to charging gives drivers more confidence to utilize the full range of their vehicles and extends the functional daily range of electric vehicles. We have updated our previous assessment[7] of public charging infrastructure at the metropolitan area level.

Figure 5 draws the contrast between charging infrastructure in California metropolitan areas and elsewhere in the U.S. The horizontal axis shows the number of public level 2 and direct current fast charge points per million residents,[8] and the vertical axis, the percentage of new electric vehicle sales in 2016. The size of each circle represents the number of registrations by metropolitan area. The 13 labeled metropolitan areas are those with the highest electric vehicle sales in California, and the represent 97% of the state's electric vehicle market. At the end of 2016, there were about 281 public charge points per million residents across California with an electric vehicle market share of 3.7%—close to the Los Angeles data point. For the rest of the U.S., there were 87 charge points per million people with an electric vehicle share of 0.5%.

4 California Air Resources Board, (2015, June 23). Making the Cleanest Cars Affordable. Retrieved from https://www.arb.ca.gov/newsrel/efmp_plus_up.pdf

5 Clean Vehicle Rebate Program (2017). Eligibility Guidelines. Retrieved from https://cleanvehiclerebate.org/eng/eligibility-guidelines

6 Lutsey, N., Slowik, P., Jin, L. (2016). Sustaining electric vehicle market growth in U.S. cities. International Council on Clean Transportation. Retrieved from http://www.theicct.org/leading-us-city-electric-vehicle-2016

7 Searle, S., Pavlenko, N., Lutsey, N. (2016). Leading edge of electric vehicle market development in the United States: An analysis of California cities. International Council on Clean Transportation. Retrieved from http://www.theicct.org/ev-markets-calif-cities-sept2016

8 U.S. Department of Energy (U.S. DOE) (2017). Alternative Fuel Station Locator. Alternative Fuels Data Center. Retrieved from http://www.afdc.energy.gov/locator/stations/

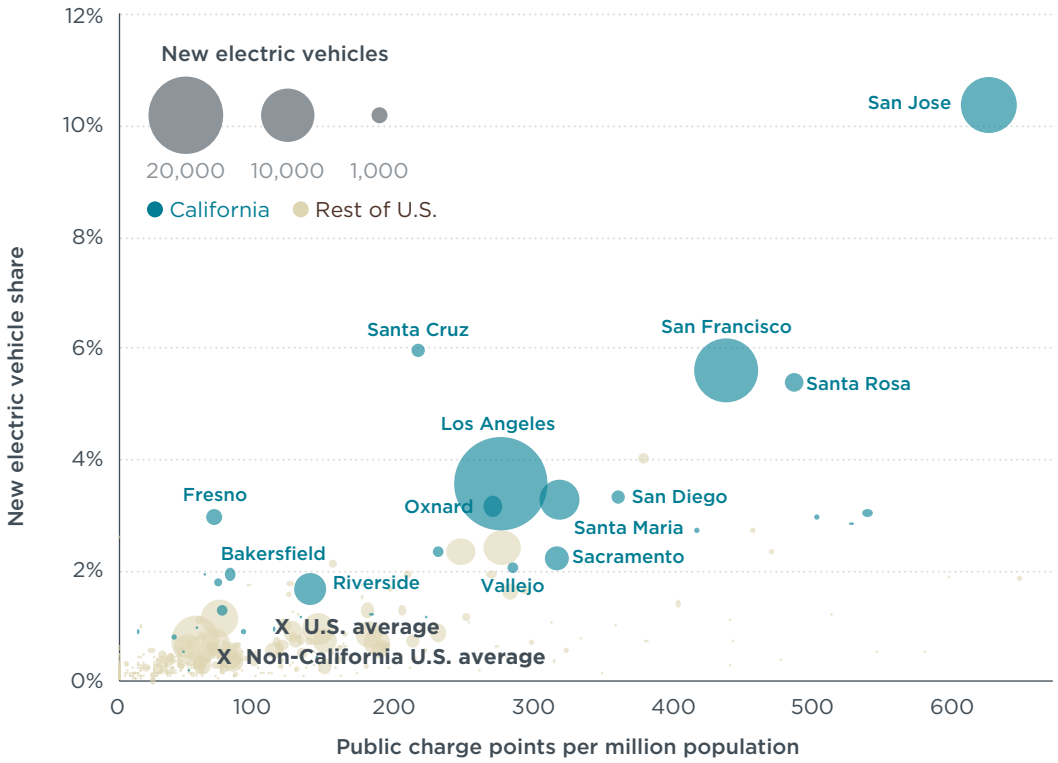

Figure 5. Electric vehicle market share and public charging infrastructure per capita for California and other U.S. metropolitan areas

(Vehicle registrations from IHS Automotive; charging data from Alternative Fuel Data Center)

Cities with the most extensive public charging networks tend to have the highest electric vehicle market share. The three largest electric vehicle markets in California underscore the point. San Jose, with a 10% electric vehicle share, has more than five times the U.S. average number of public charging stations per capita; San Francisco, with a 6% share, has more than 3.5 times the national average; and Los Angeles, with a 4% share, has more than twice the U.S. average. The Northern California markets of San Jose, San Francisco, Santa Rosa, and Vallejo have built more-extensive public charging networks than in Southern California or the central valley markets such as Fresno and Bakersfield.

Although there is a demonstrated link between charging infrastructure and electric vehicle uptake, determining to what extent charging must precede electric vehicle uptake remains a difficult question. The data do not show a perfect correlation, as there are many other factors at play from market to market. Uptake differences could relate to differences in housing, such as fewer homes with garages and private charging; differences in parking availability, such as dense urban areas with more parking and public charging difficulties; and differences in workplace charging availability. In San Jose, for example, several employers are leaders in installing charging for workers, but those charge points are not counted in Figure 5.

CONSUMER INCENTIVES

Incentives for buying and driving electric vehicles lower the costs closer to those of conventional vehicles. Electric vehicle buyers in California and elsewhere in the U.S. are potentially eligible for federal tax credits of $2,500 to $7,500. The federal tax credit value depends on the capacity of the electric vehicle battery pack and thus their greater ability to be operated on electricity. California's government, as do those of many other states, also offers rebates to further encourage electric vehicle sales.

Incentive payments from the state's Clean Vehicle Rebate Program (CVRP) in 2016—paid on top of the federal incentives—were $2,500 for BEVs and $1,500 for PHEVs for households with moderate incomes. However, the state suspended the rebate program from mid-June to early September 2016 as part of the government's budget debates. After the incentives resumed, eligibility for high-income buyers shrank while incentives expanded for those with lower incomes.

Figure 6 shows the percentage of electric vehicle purchases for which the state paid rebates by quarter in 2015 and 2016, based on IHS Automotive and Center for Sustainable Energy data on the Clean Vehicle Rebate Program[9]. When the program was suspended for part of the second and most of the third quarter of 2016, rebate activity fell. However, considering that California electric vehicle sales still rose in 2016, the long-term implications of the mid-year rebate pause and the new restrictions on high-income buyers are not yet clear.

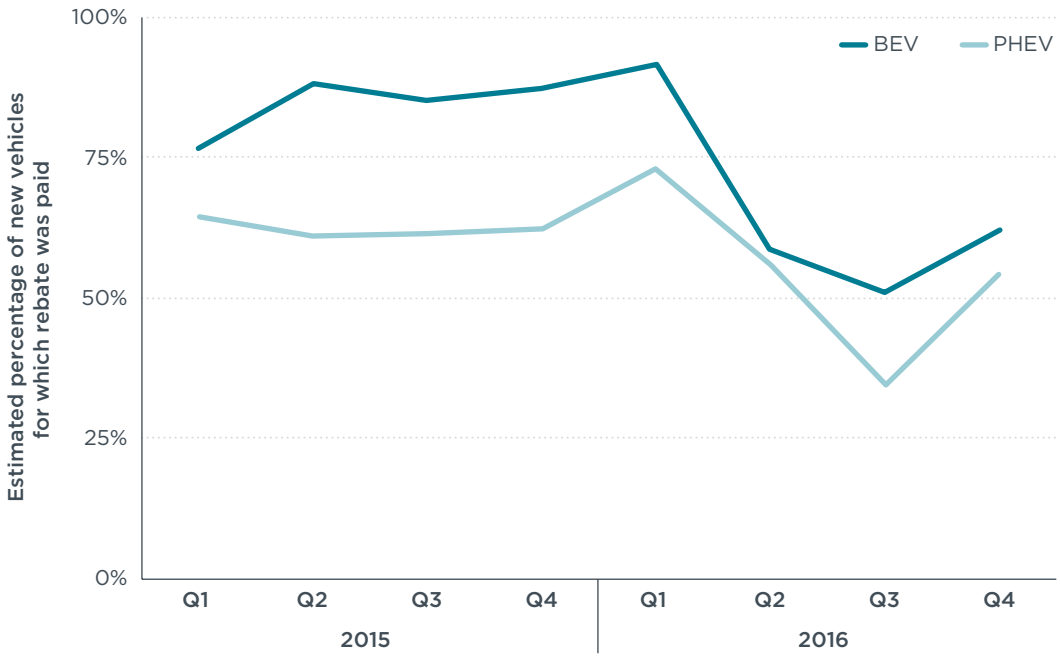

Figure 6. Estimated 2015-2016 use of California rebates for BEVs and PHEVs by quarter
(Vehicle registrations from IHS Automotive; rebate data from Center for Sustainable Energy)

9 Center for Sustainable Energy (CSE) (2017). California Air Resources Board Clean Vehicle Rebate Project, Rebate Statistics. Retrieved from https://cleanvehiclerebate.org/eng/rebate-statistics

Figure 7 shows new electric vehicle registrations and average use of California rebates by automaker for 2016. The data do not show a clear relationship between company sales and rebate use, but there are some possible explanations. Most companies focusing on PHEVs have less consumer participation in the program. Because Chevrolet is the PHEV leader and has a higher rate of rebate participation than other PHEV brands, it could be that Chevrolet dealers do a better job of positioning the Volt as an electric vehicle and using the rebates as a sales tool. In addition, models that were introduced late in the year, such as the Toyota Prius Prime, may have had more limited marketing, or their rebate applications were not filed until early 2017.

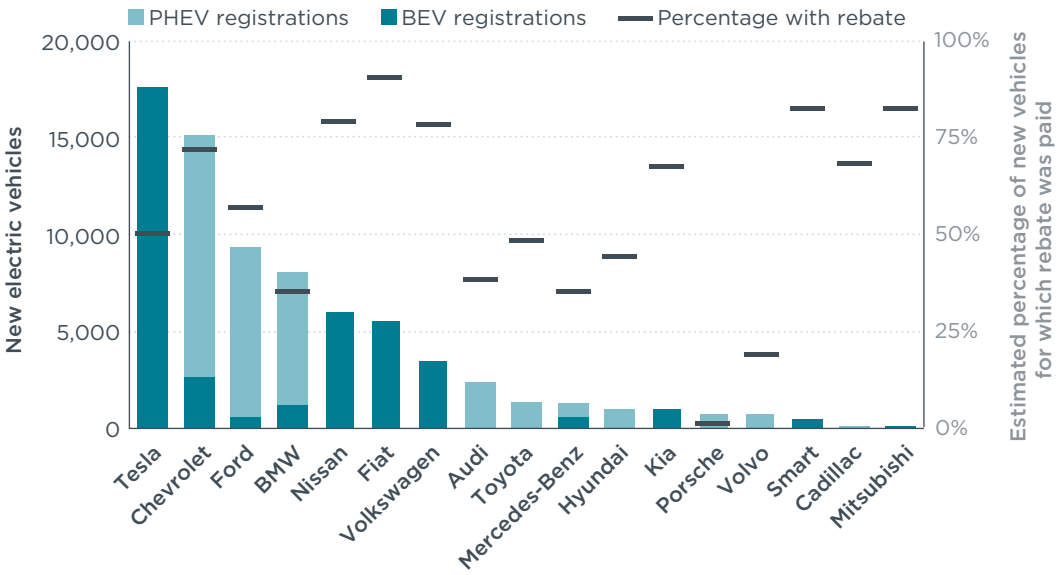

Figure 7. Estimated 2016 use of California electric vehicle rebates by automaker brand
(Vehicle registrations from IHS Automotive; rebate data from Center for Sustainable Energy)

Luxury buyers cash in the rebates at a much lower rate than other consumers, according to the data. Purchases or leases of luxury-brand electric vehicles—including Tesla, BMW, Audi, Mercedes, Porsche, Volvo, and Cadillac—collected rebates at a combined rate of about 40%, compared with 70% for all non-luxury brands. Eligibility for the rebates was limited for incomes above $250,000 through October 31, 2016, and above $150,000 for single tax filers or $300,000 for joint filers starting November 1, 2016.[10] In addition, some luxury electric vehicles do not meet California's most stringent emission requirements, making them ineligible for rebates.

Based on the available data, it was possible to conduct a limited analysis of rebates by specific city. Detailed analysis using the IHS and CVRP data was complicated by an imperfect match between the data collections. These include details about rebate application date versus registration date, vehicle categorization as PHEV or BEV, and cataloging by city, as registration could be outside the vehicle's ownership city. There was also uncertainty about how many of the purchases qualify for rebates.

10 Clean Vehicle Rebate Program (2017). Eligibility Guidelines. Retrieved from https://cleanvehiclerebate.org/eng/eligibility-guidelines

Within that context, a couple of trends emerged. First, for electric vehicles purchased in the major cities of Los Angeles, San Francisco, and Sacramento, there appeared to be less than 50% rebate usage. On the other hand, Fresno stood out with high rebate collection, involving 80% of new electric vehicle purchases in 2016. This suggests that there are different outreach, awareness, and advertising campaigns among California cities, and there is much room for improvement in promoting the rebates.

Access to California's high occupancy vehicle (HOV) lanes is an important nonfinancial incentive for electric vehicle buyers. Although this briefing does not analyze the market effect, other investigators have taken note of its importance.[11] While BEV models have consistently received bumper stickers allowing HOV access, that hasn't been the case for PHEVs. Over the course of 2015-2016, California limited the number of PHEV stickers, extended the limit numerous times, and then suspended access to new stickers. Finally, in late 2016,[12] authorities dropped all limits. The policy swings reflect periodic reviews to ensure that the number of electric vehicles in HOV lanes does not expand too rapidly.

ELECTRIC VEHICLES AND INCOME

Figure 8 shows that the cities where electric vehicles account for 10% of the market or more tend to be the wealthiest. The data reflects five-year city median household income averages from the U.S. Census,[13] compared with electric vehicle penetration. Data linking specific electric vehicle sales to purchaser household income were not available. Many of the cities with the highest electric vehicle market shares, such as Palo Alto, Los Altos, and Saratoga in Silicon Valley, are among the wealthiest in the state. The city with the highest electric vehicle sales, however, was Los Angeles, where the median household income was about $50,000, below the statewide median of $62,000. The 2016 median income of U.S. buyers of all new compact cars was $73,000[14]; of midsize cars, $87,000[15]; and of crossover vehicles, $90,000[16]. This context is provided because new car buyers are relatively wealthy compared to the population at large.

11 Sheldon, T.L., DeShazo, J.R. (2016). How does the presence of HOV lanes affect plug-in electric vehicle adoption in California: A generalized propensity score approach. http://innovation.luskin.ucla.edu/sites/default/files/2016.02.23_GPSHOV.pdf

12 California Air Resources Board (2016). Eligible vehicle list: Single occupant carpool lane stickers. https://www.arb.ca.gov/msprog/carpool/carpool.htm

13 U.S. Census. (2017). 2011-2015 American Community Survey (5-year estimates). Retrieved from http://factfinder.census.gov/bkmk/table/1.0/en/ACS/15_5YR/CP03/0400000US06%7C0400000US06.05000%7C0400000US06.16000

14 J.D. Power (2016). PowerSteering: 2016 Chevrolet Cruze Review. Retrieved from http://www.jdpower.com/cars/articles/new-car-reviews/powersteering-2016-chevrolet-cruze-review

15 J.D. Power (2016). PowerSteering: 2017 Honda Accord Review. Retrieved from http://www.jdpower.com/cars/articles/new-car-reviews/powersteering-2017-honda-accord-review

16 J.D. Power (2017). PowerSteering: 2017 Honda CR-V Review. Retrieved from http://www.jdpower.com/cars/articles/new-car-reviews/powersteering-2017-honda-cr-v-review

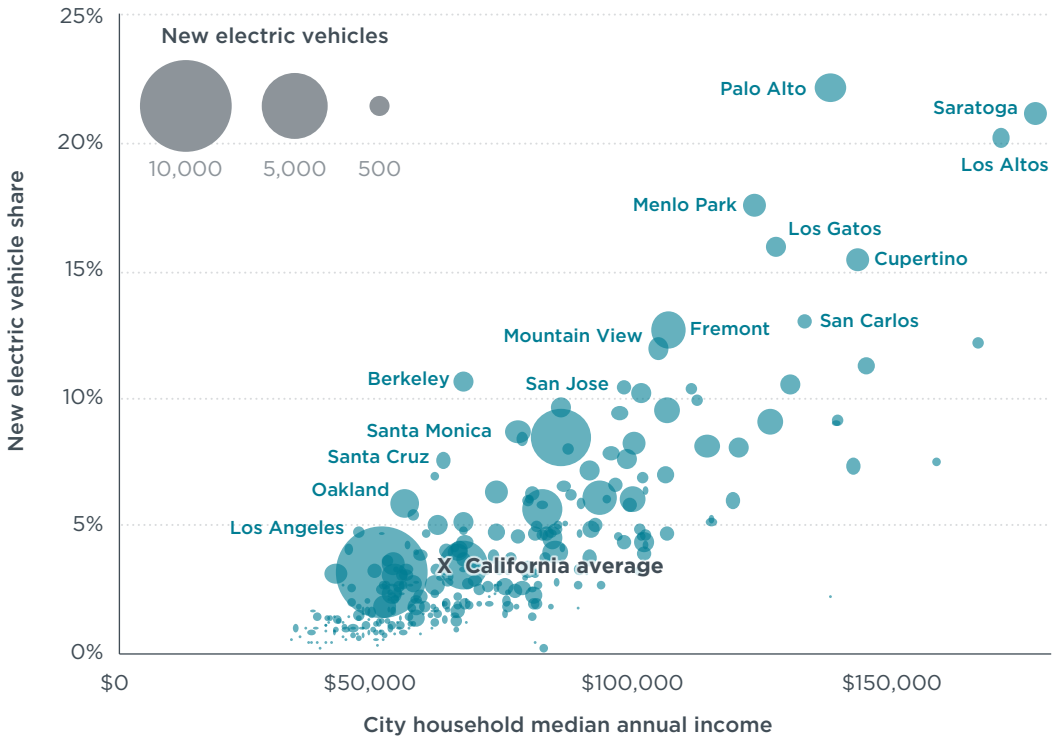

Figure 8. Share of California new vehicle sales that are electric by city median household income *(Vehicle registrations from IHS Automotive; income data from U.S. Census)*

The data show that 55% of California electric vehicle sales were in cities with median household incomes of less than $80,000. Thus, even if electric vehicles were predominantly purchased by higher-income households, the exposure to electric vehicles on city streets and highways is broadening. Expanding awareness may account for part of the vehicles' success in Los Angeles.

MODEL AVAILABILITY

Customers of course cannot buy what auto dealers do not stock. In the four top metropolitan areas for electric vehicle penetration, representing 81% of California and 40% of U.S. electric vehicle sales, markets had 25 to 30 electric models available, as shown in Figure 9. The figure compiles electric vehicle model availability for California metropolitan areas and the rest of the U.S., omitting those where 2016 registrations fell below 20. Mid-sized California markets had 13-21 electric models available. Other major U.S. markets—Seattle, Portland, and New York—also had substantial numbers of models available. Dealers in many U.S. markets offered fewer than 10 models. More than half of the U.S. population lived in a metropolitan with seven or fewer electric models on sale.

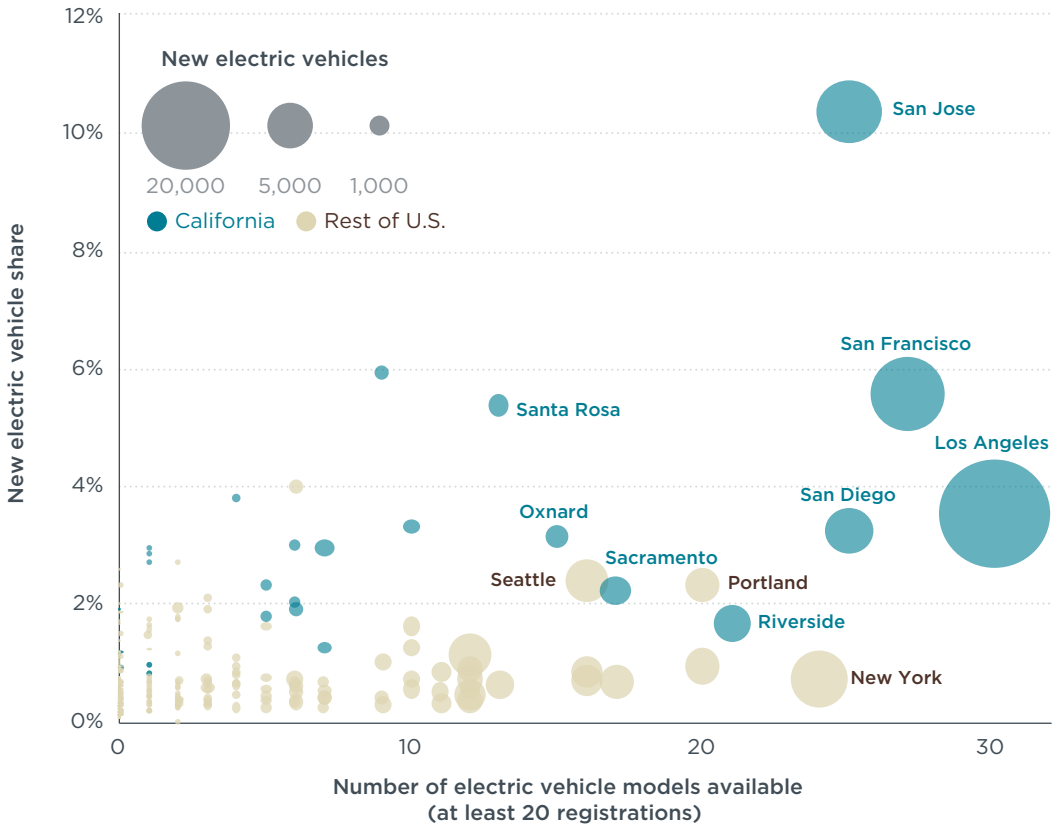

Figure 9. Electric vehicle model availability for leading California electric vehicle markets
(Vehicle registrations from IHS Automotive)

THE ZEV REGULATION

It is important to acknowledge the role of California's special policy driver, the Zero-Emission Vehicle (ZEV) regulation. The ZEV regulation, first instituted in 1990, requires that an increasing share of electric vehicles be sold annually through 2025. The last major modifications to the rules were adopted in 2012, and the standards become incrementally more stringent through model year 2025. The ZEV standards have been adopted by nine other states, Oregon plus eight across the Northeast. Including California, the standards now apply to 29% of the U.S. market.

Figure 10 shows the growth since 2010 in new electric vehicle sales in California, the other ZEV-adopting states, and the rest of the U.S. After stalling in 2015, electric vehicle sales resumed expanding in 2016 as availability of new electric vehicle models increased. These include the Chevrolet Volt, Audi A3 e-tron, BMW X5 xDrive40e, and Tesla Model X. The ZEV states including California accounted for 64% of 2016 U.S. electric vehicle sales.

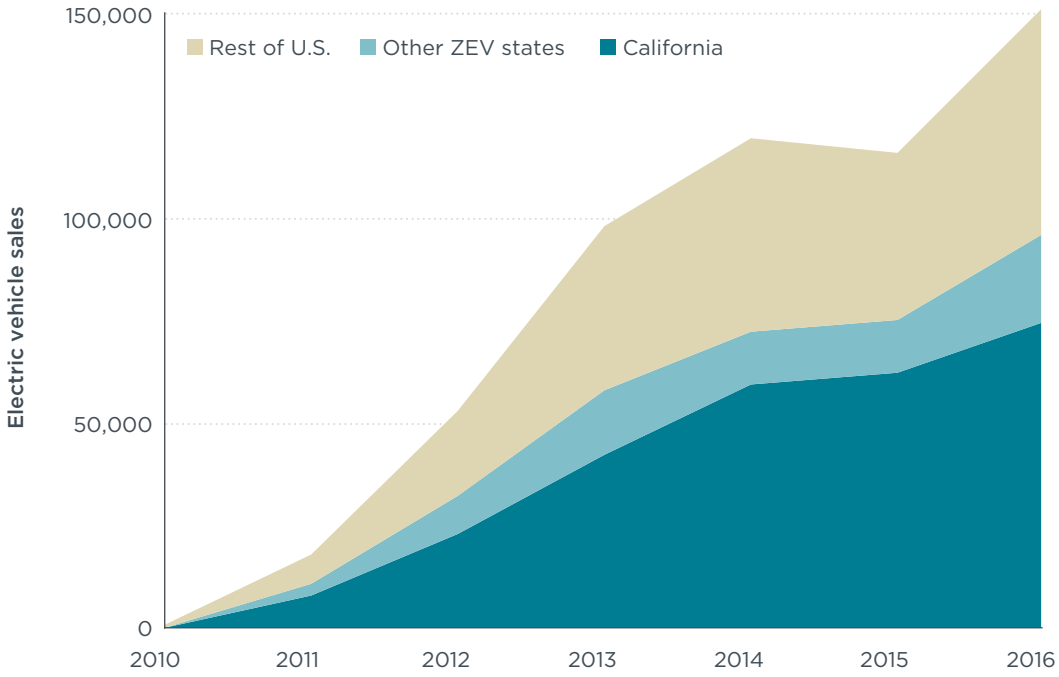

Figure 10. Electric vehicle sales in California, other ZEV states, and rest of the U.S.
(Based on vehicle registrations from IHS Automotive)

While the California electric vehicle market grew by 20% in 2016, the other ZEV markets expanded by 60%. This largely reflects actions adopted in the Northeast states and Oregon over the past several years. However, outside California, electric vehicle markets tend to be limited by relatively low model availability.

California's midterm review in 2017 indicated that the state's electric vehicle market would have to grow by a factor of two to three times, reaching 8% by 2025, to minimally comply with the ZEV regulation.[17] That means the industry has nine model years between 2016 and 2025 to get the rest of the California market up to where much of the greater San Francisco Bay Area market was in 2016. According to the California Air Resources Board, the auto industry is over-complying with the standards, with several times more ZEV credits than required through 2016.[18] This suggests that many auto companies could greatly surpass the minimum 2025 requirements.

17 California Air Resources Board (CARB) (2017a, January 18). California's Advanced Clean Cars Midterm Review: Summary Report for the Technical Analysis of the Light Duty Vehicle Standards. Retrieved from https://www.arb.ca.gov/msprog/acc/mtr/acc_mtr_summaryreport.pdf

18 California Air Resources Board (CARB) (2017, March 24). California's Advanced Clean Cars Midterm Review. Retrieved from https://www.arb.ca.gov/board/books/2017/032317/17-3-8pres.pdf

CONCLUDING THOUGHTS

The electric vehicle market continues to show steady growth in California. Here is a review of the main takeaways.

California is home to several of the world's electric vehicle capitals. The San Jose, San Francisco, and Los Angeles metropolitan areas generate some of the highest electric vehicle sales and market shares in the world. Along with other global electric vehicle capitals such as Oslo, Amsterdam, Shanghai, and Beijing, California's leading markets for electric vehicles are pursuing comprehensive programs to spur the market.[19] These include charging infrastructure, state policies, and strong model availability. Within the three leading California metropolitan areas, 16 cities had electric vehicle market shares of more than 10%; six, more than 15%; and three, more than 20%.

Metropolitan Los Angeles is simultaneously an electric vehicle success and an opportunity for much greater growth. The Los Angeles metropolitan area already has more than 100,000 electric vehicles on the road, including 30,000 within the city of Los Angeles. At the same time, electric vehicle sales in 2016 amounted to about 4% of the new-vehicle market, considerably less than in many northern California cities and other world-leading markets. Sales of electric vehicles will have to rise substantially over the next decade to meet air quality and climate goals. Authorities and automakers can encourage greater awareness of buying incentives, more use of electric vehicles in carsharing, and expanded educational campaigns. Charging infrastructure and consumer incentives will need to be steered toward disadvantaged and low-income communities.

The electric vehicle market needs to broaden beyond the early adopters. Even the relatively large vehicle markets of Bakersfield, Fresno, Modesto, Riverside, Sacramento, and Stockton record electric vehicle shares below the statewide average. They tend to have less-extensive charging infrastructure and more limited electric vehicle model availability than the bigger, wealthier markets. These cities and metropolitan areas have a greater percentage of lower and middle income households. Policymakers, electric utilities, and auto dealers will need to strengthen and expand on the successful strategies in the top electric vehicle markets. New initiatives such as consumer purchasing incentives and utility infrastructure deployment appear to be headed in this direction, including support for disadvantaged communities and low-income households.

Sustained electric vehicle growth is not guaranteed. California's long-term plans for climate stabilization call for a complete transition to ZEVs by 2050. To reach that goal, California will need to sustain comprehensive incentive and enabling policies beyond 2025. These include continued clean fuel policies, strengthened ZEV regulation, build-out of the public charging infrastructure network, sustained consumer incentives, low electricity rates, and greater consumer outreach. Setting emissions standards to 2030 would capitalize on declining battery costs while providing long-lead regulatory time for technology investments in a mainstream electric vehicle market.

19 Hall, D., Moultak, M., Lutsey, N. (2017). Electric vehicle capitals of the world: Demonstrating the path to electric drive. International Council on Clean Transportation. Retrieved from http://www.theicct.org/EV-capitals-of-the-world