

California Case

The fleet of plug-in electric vehicles in the United States is the largest in the world, with a 43% share of global sales as of September 2014. Since 2008, about 260,000 highway legal plug-in electric cars have been sold in the country through the end of September 2014.¹ California accounts for about 40% of all plug-in cars sold in the country, with over 100,000 units sold through August 2014, and not only has more plug-in electric vehicles than any other American state but also more than any other country.²

Market

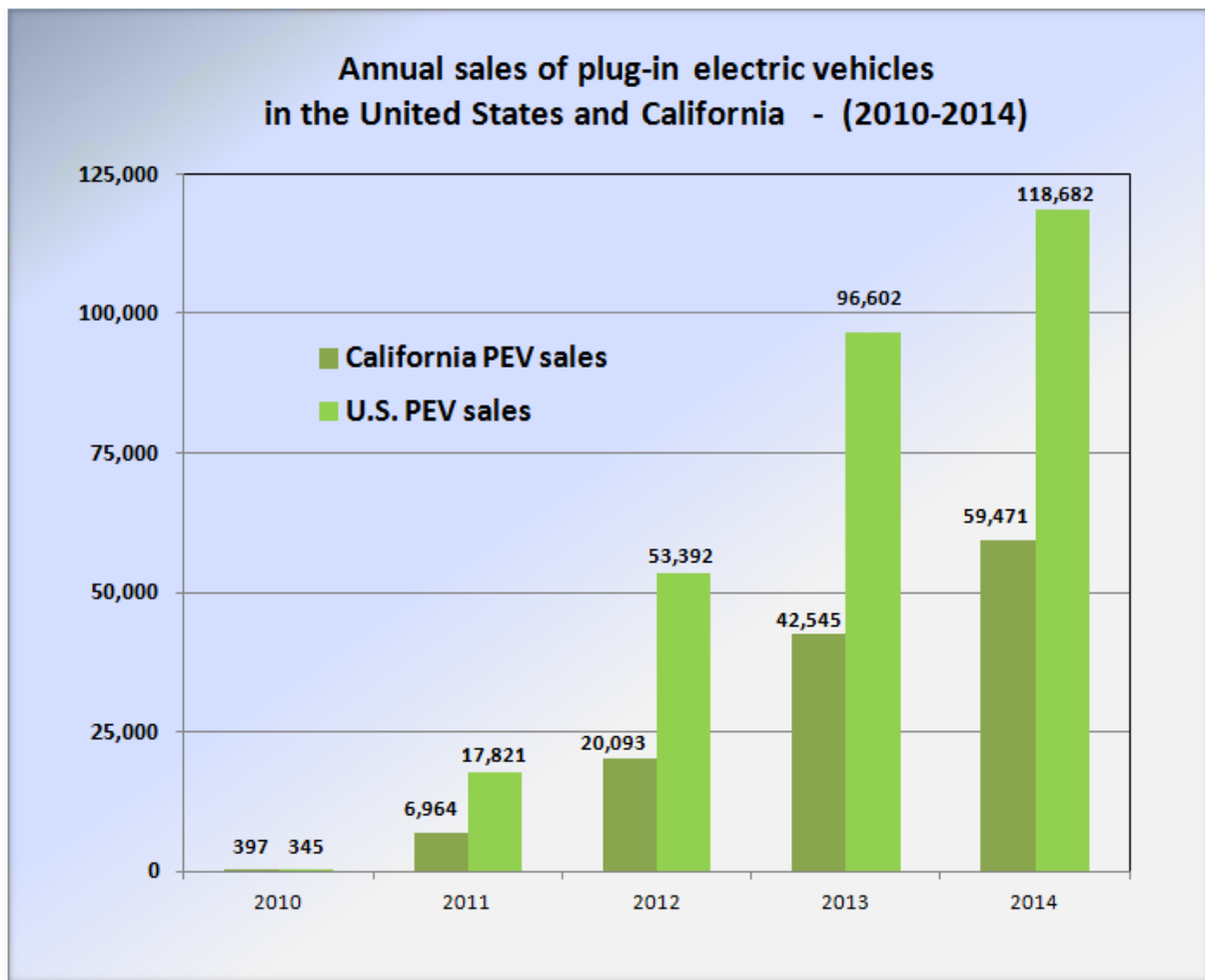
As of December 2014, a total of 129,470 plug-in electric vehicles have been registered in California between December 2010 and December 2014, representing about 45% of all plug-in cars sold in the U.S. since 2010. During 2014 California's PEV market share reached 3.2% of total new car sales in the state, up from 2.5% in 2013, while the national PEV market share in 2014 was 0.71%. Registrations of plug-in electric cars in the state in 2014 represented 50.1% of total PEV sales in the U.S. that year.³

¹ Jeff Cobb (2014-10-22). "Global Plug-in Car Sales Now Over 600,000". HybridCars.com. Retrieved 2014-10-23. *Cumulative global sales totaled 603,932 highway legal plug-in electric passenger cars and light utility vehicles through September 2014, consisting of 356,232 all-electric cars and utility vans and 247,700 plug-in hybrids. Sales figures account for sales only in the top ten world's markets.*

² Dana Hull (2014-09-08). "California charges ahead with electric vehicles". [*San Jose Mercury News*](#).

Retrieved 2015-03-15

³ <http://www.hybridcars.com/californians-bought-more-plug-in-cars-than-china-last-year/>



Comparison of annual sales of plug-in electric vehicles in the United States versus California between 2010 and 2014.⁴

As of December 2014, California not only has more plug-in electric vehicles than any other American state but also more than any other country in the world.⁵

California is the leading Volt market and accounted for almost 23% of Volt sales during the second quarter of 2012, followed by Michigan with 6.3% of national sales. The leading regional markets in California were San Francisco, Los Angeles, and San Diego.⁶

Governor Jerry Brown issued an executive order in March 2012 that established the goal of getting 1.5 million zero-emission vehicles (ZEVs) in California by 2025.⁷

⁴ <http://www.hybridcars.com/market-dashboard/>

⁵ <http://www.hybridcars.com/californians-bought-more-plug-in-cars-than-china-last-year/>

⁶ Nathan Bomey (2012-06-05). "California can't get enough of the Chevy Volt as sales surge". *Detroit Free Press*. Retrieved 2012-06-06.

⁷ Staff (2012-03-23). "Governor Brown Announces \$120 Million Settlement To Fund Electric Car Charging Stations Across California". Office of Governor Edmund G. Brown Jr. Retrieved 2014-09-22

California is the largest American market for the Tesla Model S.⁸ In March 2013, Tesla Motors reported the delivery of the 3,000th Model S in California, representing around 50% of total Model S sales in the U.S.

Charging stations

As for retailers, Walgreens is by far the plug-in friendliest, with 365 stores deploying plug-in stations nationally. 55 Kohl's stores had public stations as of March 22, while Whole Foods was home to 39 stations.

As of March 2013, the United States had 5,678 charging stations across the country, led by California with 1,207 stations (21.3%). In terms of public charging points, there were 19,472 public outlets available across the country by the end of December 2013, again led by California with 5,176 (26.6%) public charging points.⁹

Incentives

California has been a leader in the promotion of plug-in electric vehicles as the state has in place several financial and non-financial incentives. In addition to the existing federal tax credit, PEVs are eligible for a purchase rebate of up to US\$2,500 through the Clean Vehicle Rebate Project (CVRP).¹⁰ Also, battery electric vehicles and initially, the first 40,000 applicants that purchase or lease a plug-in hybrid meeting California's Enhanced Advanced Technology Partial Zero Emission Vehicle (Enhanced AT PZEV), are entitled to a clean air sticker that allows the vehicle to be operated by a single occupant in California's carpool or high-occupancy vehicle lanes (HOV high-occupancy vehicle lane (also known as an HOV lane, carpool lane, diamond lane, and transit lane or T2 or T3 lanes in Australia and New Zealand) is a restricted traffic lane reserved at peak travel times or longer for the exclusive use of vehicles with a driver and one or more passengers, including carpools, vanpools, and transit buses.). The white access sticker is reserved for zero-emissions vehicles, while plug-in hybrids use the green sticker.¹¹ As part of the package of bills signed into law by Governor Brown in September 2014, through SB 1275 the California Air Resources Board was mandated to draft a financial plan to meet California's goal of 1 million vehicles on the road while making sure that disadvantaged communities can participate. For this purpose CARB has to change the Clean Vehicle Rebate program to provide an extra credit for low-income residents who wish to purchase or lease an electric car. CARB also should provide

⁸ Angelo Young (2014-09-02). ["Tesla Motors' Tesla Model S Is Outselling Nissan Leaf In Northern European Markets". *International Business Times*](#). Retrieved 2014-09-21.

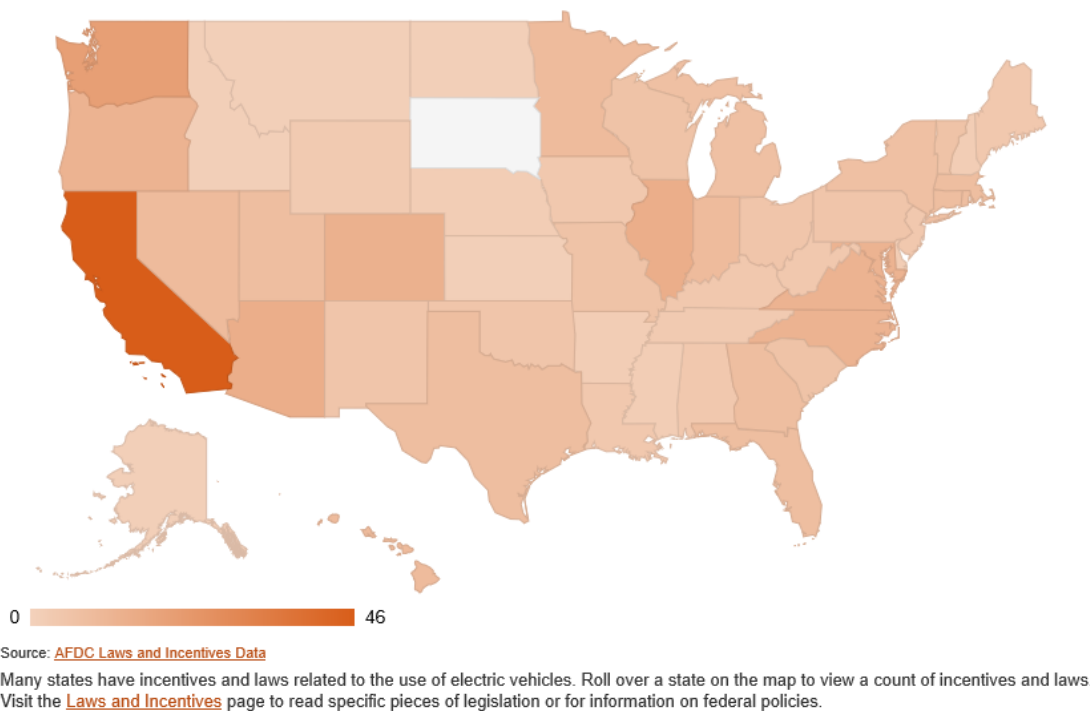
⁹ [U.S. Department of Energy](#) (2013-12-25). ["Alternative Fueling Station Counts by State"](#). Alternative Fuels Data Center (AFDC). Retrieved 2013-12-31. *The AFDC counts electric charging units or points, or EVSE, as one for each outlet available, and does not include residential electric charging infrastructure.*

¹⁰ ["Clean Vehicle Rebate Project FAQ: Changes in CVRP FY 2011-2012"](#). Center for Sustainable Energy California. Retrieved 2011-05-22.

¹¹ [California Department of Motor Vehicles](#) (March 2014). ["Clean Air Vehicle \(CAV\) Decals - High Occupancy Vehicle HOV Lane Usage"](#). DMV California. Retrieved 2014-03-23.

assistance to car sharing programs in low-income neighborhoods and install charging stations in apartment buildings in those communities. Under SB 1275, low-income residents who agree to scrap older, polluting cars will also get a clean vehicle rebate on top of existing payments for junking smog-producing vehicles.¹²

Electric Vehicle Incentives and Laws, by State



AB 2565 facilitates access to charging stations by requiring commercial and residential property owners to approve installation if the charging station meets requirements and complies with the owner's process for approving a modification to the property. The law makes a term in a lease of a commercial property, executed, renewed, or extended on or after 1 January 2015, void and unenforceable if it prohibits or unreasonably restricts the installation of an electric vehicle charging station in a parking space.¹³

As of 10 March 2014, a total of 52,264 clean vehicle rebates have been issued, for a total of US\$110,222,866 disbursed, with only US\$3.8 million remaining for fiscal year 2013-2014. The distribution of the rebates issued correspond to 27,210 zero-emission vehicles (ZEVs), including both battery electric vehicles (BEVs) and fuel cell vehicles (FCVs); 24,657 plug-in hybrids (PHEVs); 49 commercial zero-emission vehicles (CZEVs); 210 zero-emission motorcycles (ZEMs); and 138

¹² Melanie Mason and Patrick McGreevy (2014-09-21). "[Gov. Jerry Brown signs bills to boost purchases of electric cars](#)". [Los Angeles Times](#). Retrieved 2014-09-21.

¹³ Marisa Lagos (2014-09-22). "[Brown signs several clean-air vehicle bills](#)". [San Francisco Chronicle](#). Retrieved 2014-09-22.

neighborhood electric vehicles (NEVs).¹⁴ The Clean Vehicle Rebate Project notes their figures do not capture all plug-in electric vehicles sold in California because not every PEV owner applies for the rebate

Customers (February 2014 Survey Report)

The Plug-in Electric Vehicle (PEV) Owner Survey is a long-term collaborative research project managed by Center for Sustainable Energy's (CSE), in coordination with the California Air Resources Board (ARB) and researchers at UT Austin's Lyndon B. Johnson School of Public Affairs and the UC Davis Institute of Transportation Studies.

The latest survey of California's plug-in electric vehicle (PEV) drivers shows differences in primary purchase motivations from owners of one model to the next. The survey also shows increased satisfaction with public charging options and wider availability of workplace charging.

Previous rounds of the CSE survey consisted largely of all-electric Nissan Leaf drivers. This is the first time drivers of multiple vehicle types have participated: 57% Leaf, 17% Chevrolet Volt and 22% Toyota Prius Plug-in.

The current survey covers drivers who have owned their vehicle for at least six months as of March 1, 2013.

Highlights from the survey include:

- The primary motivations for vehicle purchase vary significantly between models – Leaf drivers claimed environment as the primary motivator, Plug-in Prius owners indicate HOV lane access and Volt drivers said fuel savings.
- Chevy Volt-driving respondents are more than four times as likely to have a level 2 charging station installed at their home than Toyota Prius Plug-In respondents.
- Workplace charging availability is becoming more widespread, 46% of respondents reported access to workplace charging, an increase of 14% from March 2012.
- Of those with access to workplace charging, 74% have access to this charging at no cost to the driver, down from 89% in March 2012.
- Though low, driver satisfaction with public charging infrastructure continues to improve, rising from 17% in March 2012 to 29% in May 2013.
- HOV lane access was an extremely or a very important purchase motivation for 59% of respondents; 84% are displaying the HOV lane access sticker.¹⁵

¹⁴ [Clean Vehicle Rebate Project](#) (2014-03-10). "[Clean Vehicle Rebate Project Statistics](#)". California Center for Sustainable Energy. Retrieved 2014-03-23.

¹⁵ <http://energycenter.org/clean-vehicle-rebate-project/vehicle-owner-survey/feb-2014-survey>

What Drives California's Plug-in Electric Vehicle Owners?

California Plug-in Electric Vehicle Driver Survey Results

Survey population

Rebate recipients who have driven their vehicle for six months or longer as of March 1, 2013

8,756

Total respondents

3,881

California's Plug-in Electric Vehicles

As of October 2013, Californians have purchased or leased more than 45,000 plug-in electric vehicles (PEVs). The Clean Vehicle Rebate Project (CVRP) has issued more than 37,226 rebates to California drivers, including 19,648 for battery electric vehicles (BEVs) and 17,227 for plug-in hybrid electric vehicles (PHEVs).

Distribution of survey respondents by county



Nissan Leaf



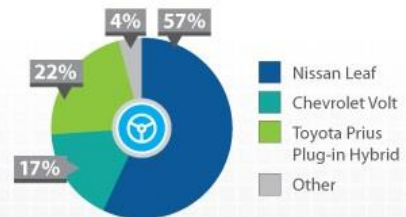
Chevrolet Volt



Toyota Prius Plug-in Hybrid

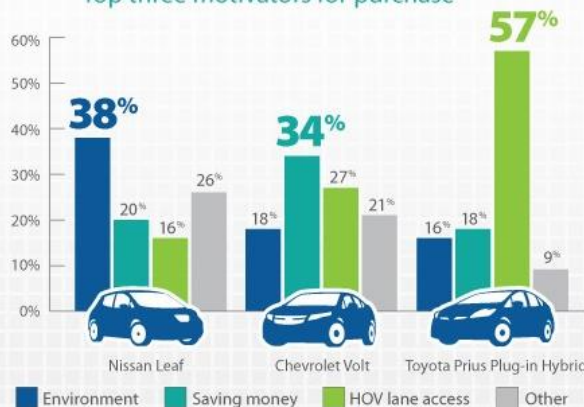


Top three vehicle types driven by respondents

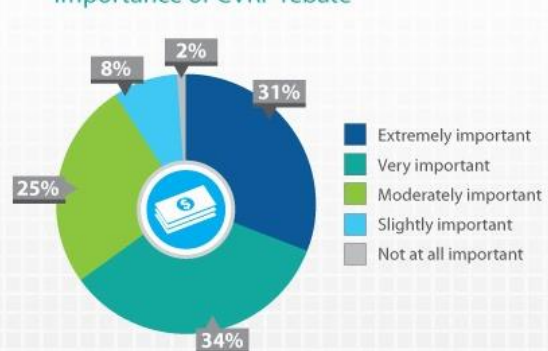


Motivations for PEV Purchase

Top three motivators for purchase



Importance of CVRP rebate



59% said having HOV lane access was extremely or very important in their decision to purchase a PEV



84% are displaying an HOV sticker on their vehicle



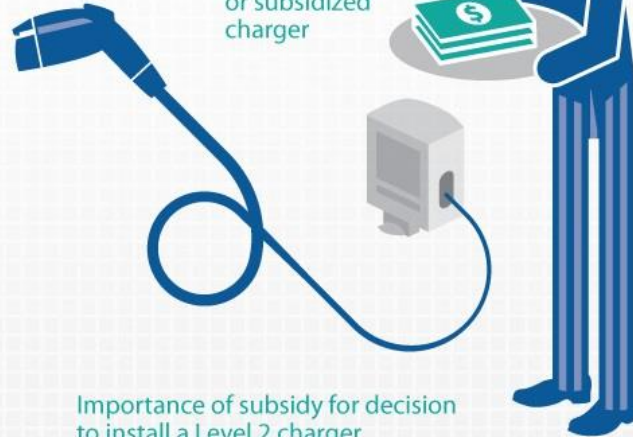
Vehicle Charging

Respondents who have installed a Level 2 charger at home



Of those with an installed Level 2 charger at home

64% received a free or subsidized charger

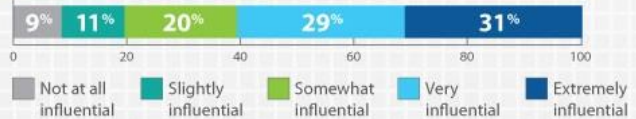


46% of respondents had access to workplace charging

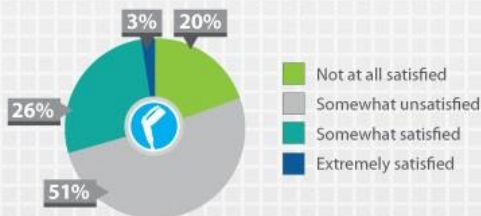


Of those who had workplace charging **74%** had free access

Importance of subsidy for decision to install a Level 2 charger



71% expressed some level of dissatisfaction with public charging infrastructure



Overall satisfaction with public charging infrastructure among Nissan Leaf drivers has been steadily increasing

Satisfaction with public charging infrastructure (Nissan Leaf drivers only)



May 2013 Survey Report

PEV Owners Highly Satisfied with Driving Experiences

The latest survey data on how California's plug-in electric vehicle (PEV) drivers use and charge their cars indicates that CVRP recipients are highly satisfied with their choice to go electric and use their PEVs as their primary transportation. The study shows PEV owners drive their cars an average of nearly 29 miles per day and charge their vehicles primarily at night when electrical rates are lowest.

California is the nation's largest PEV market with some 30,000 vehicles, roughly 35 percent of the U.S. total, with sales adding about 2,500 additional cars in the state each month. The data in this survey reflects the actions of some 2,039 PEV owners throughout the state.

Highlights from the survey include:

- The CVRP rebate was as an important motivating factor in the purchase decision for 95% of respondents.
- PEV driver satisfaction is high, with 92% of respondents reporting overall satisfaction and driving an average of 910 miles per month.
- Driver satisfaction with public charging infrastructure remains low, but it is improving. Between February and October 2012, satisfaction increased from 17% to 23%.
- Access to workplace charging is available to 37% of survey respondents; however, 66% reported using it less than once per week when charged usage fees.
- For occasional public charging outside the home, two-thirds of respondents reported a willingness to pay up to \$1.00 per hour with less than one-third willing to pay \$1.50 per hour.
- For daily charging outside the home, only 16% of respondents expressed a willingness to pay up to \$1.25 per hour, but 43% were willing to pay \$1.00.¹⁶

¹⁶ <http://energycenter.org/clean-vehicle-rebate-project/vehicle-owner-survey/may-2013-survey>

Who Are California's Plug-in Electric Vehicle Owners?

Clean Vehicle Rebate Project

Survey population

(PEV owners for 6 months or longer as of March 1, 2012)

4,329

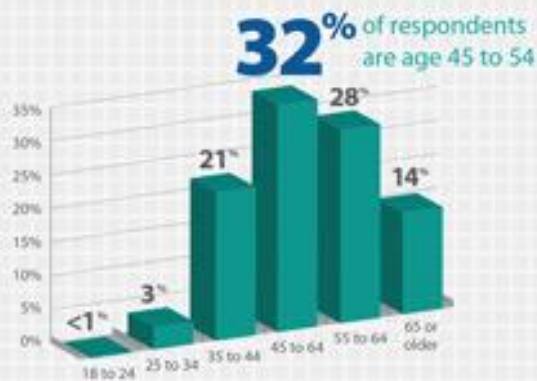
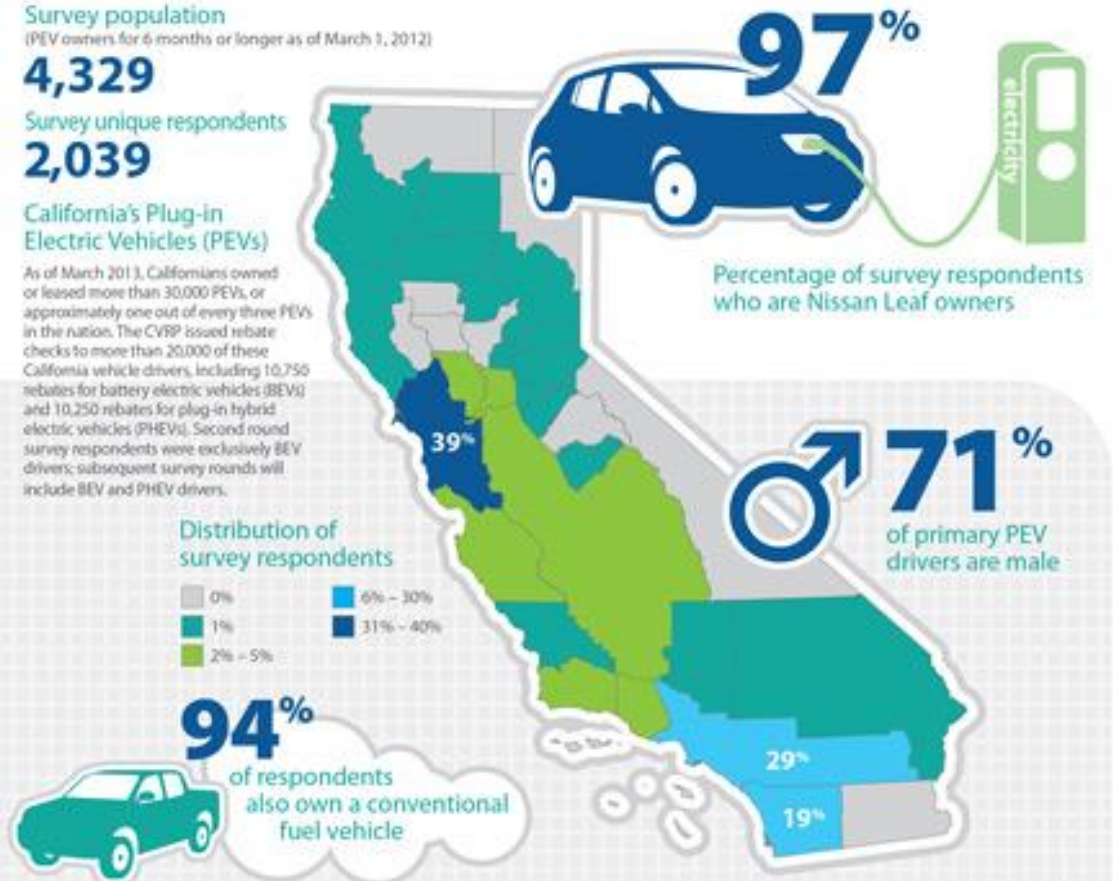
Survey unique respondents

2,039

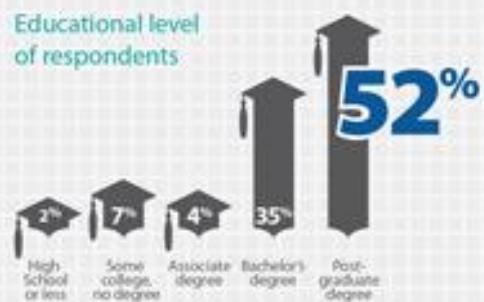
California's Plug-in Electric Vehicles (PEVs)

As of March 2013, Californians owned or leased more than 30,000 PEVs, or approximately one out of every three PEVs in the nation. The CVRP issued rebate checks to more than 20,000 of these California vehicle drivers, including 10,750 rebates for battery electric vehicles (BEVs) and 10,250 rebates for plug-in hybrid electric vehicles (PHEVs). Second round survey respondents were exclusively BEV drivers; subsequent survey rounds will include BEV and PHEV drivers.

Distribution of survey respondents



Educational level of respondents





94% of respondents reside in households of two people or more

96%
of respondents own their home

90% reside in a single-family detached home

56% received a free or subsidized Level 2 charger



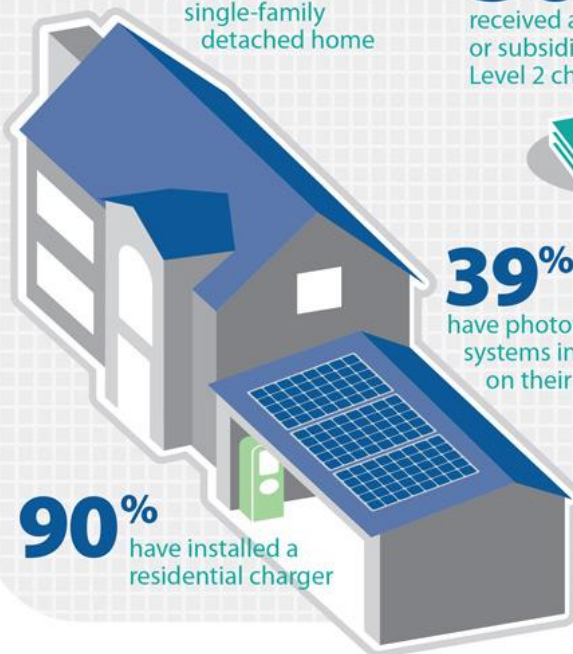
6% reside in a single-family attached home (townhome, duplex, triplex, etc.)



3% reside in an apartment/condominium



1% reside in other dwellings

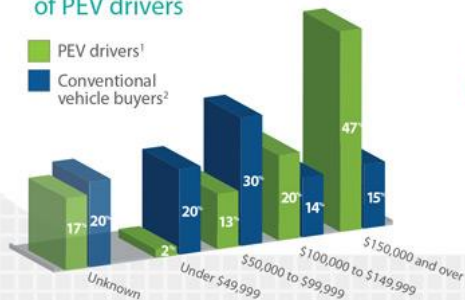


39% have photovoltaic systems installed on their home

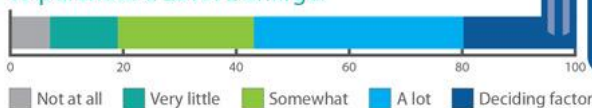
90% have installed a residential charger

71% of respondents park their vehicle in a garage

Household income of PEV drivers



Importance of subsidy for decision to purchase a Level 2 charger



¹ Reported household income for PEV survey respondents CY 2012.

² Household income based on California new personal car registrations Jan–Nov 2012 (Source: Polk Inc.)



Center for Sustainable Energy
CALIFORNIA



CLEAN VEHICLE
REBATE PROJECT

Source: Survey conducted October 2012 by the California Center for Sustainable Energy
www.energycenter.org

What Drives California's Plug-in Electric Vehicle Owners?

Clean Vehicle Rebate Project

Survey population

(PEV owners for 6 months or longer as of March 1, 2012)

4,329

Round 2 respondents

1,202

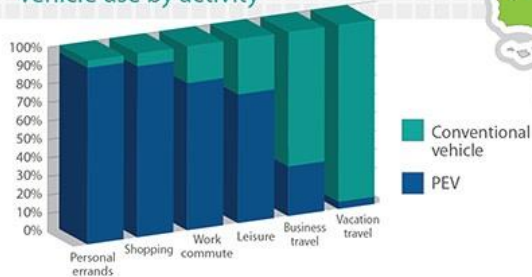
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Distribution of survey respondents



PEV vs. conventional vehicle use by activity

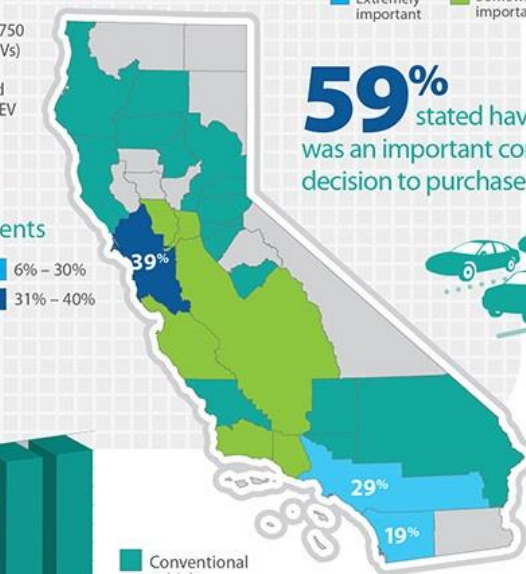


37% of survey respondents had access to workplace charging



Of those who reported having workplace charging

82% had access to it for free



59% stated having HOV lane access was an important consideration in their decision to purchase a PEV

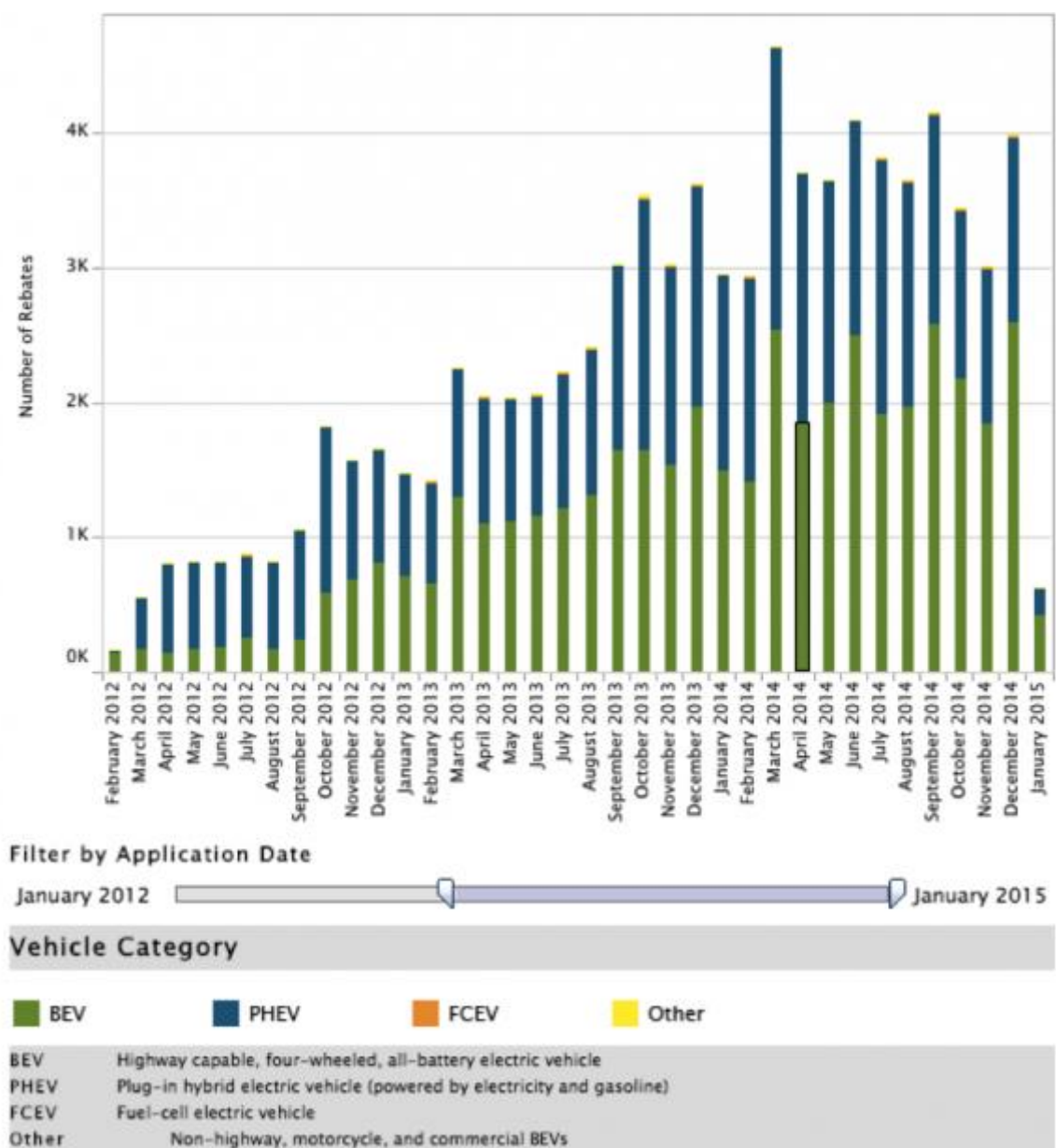


74% of survey respondents display an HOV sticker on their PEV

For those who pay to charge at work, charge less than once a week or not at all



in 2015, both in California and around the country. Here's a chart showing California sales of EVs in 2014, based on rebate applications.



That said, the California Public Utilities Commission (CPUC) should consider the executive order seriously in its policymaking efforts. There is, after all, a binding law that requires the CPUC to do what it can to effect the EV transition (SB 626, for example, which has been implemented by the commission).

So what can California do to get its EV transition back on track?

1. Expedite approval of utility applications to build out the EV charging infrastructure rapidly

Establishing a robust statewide charging network will do much to solve the chicken-and-egg problem of instilling range confidence in potential EV owners.

SDG&E and SCE have submitted applications to the CPUC seeking approval to build out large numbers of new EV charging stations. SDG&E's application would provide 5,500 charging stations in a five-year "pilot" program, and SCE, not to be outdone, has proposed a program for up to 30,000 charging stations. The CPUC should move quickly to approve these programs, but also ensure that they actually are cost-effective, and that any anti-competitive effect from utility ownership of EV charging infrastructure is minimized.

2. Dramatically expand education and outreach efforts by working with nonprofit educational organizations

The CPUC and other state agencies should work together to fund robust education and outreach efforts on EVs. Energy Upgrade California is a statewide program that is already doing a lot of education and outreach on energy issues, and it is a natural partner to ramp up EV education and outreach. This is also an active issue in the CPUC EV proceedings, and the CPUC should do its best to fund third-party efforts in this area.

3. Create a tariff that allows EV owners to earn money by absorbing excess solar power during peak production times

Excess solar is an issue for PV power producers because they can potentially lose a lot of money. This problem is only growing worse as solar ramps up exponentially around the state. But if EVs can be marshaled en masse to suck up that excess solar power, we have a problem turned into a beautiful solution. Rather than losing that power or curtailing solar power facilities, EV owners could be paid money to absorb the excess solar power.

4. Improve the state rebate process

The time it takes to receive the rebate is ridiculously long: 90 days upon application approval -- and approval itself can take up to a month. Why is this the case in the era of electronic money transfers that take seconds? This needs to change. There's no reason the state rebate process couldn't be improved so that the whole process is largely automated and checks are issued within hours of application submission.

5. Increase the state gas tax and funnel receipts back into rebates for EVs

No one likes higher taxes, but there are some compelling reasons for raising the gas tax. First, higher prices discourage consumption and we all benefit with lower petroleum consumption. We can also incentivize more efficient vehicle purchases, like EVs, and other forms of transportation, because the newly low gas prices are already causing a big uptick in truck and SUV sales. The biggest benefit, however, could be to turn the additional revenue into better rebates for EVs.

At this time, with EV sales dipping dangerously, it is needed to consider all the options for getting sales back on track.

Discussion¹⁷

A Simon Fraser University Faculty of Environment researcher says a new study he conducted with graduate students has important implications for governments with limited budgets to support the electric vehicle market.

Jon Axsen, a professor in the School of Resource and Environmental Management, has co-authored a study that finds accessibility to home-based vehicle charging could do more to boost the popularity of electrical vehicles than public chargers.

Working with his graduate students Joseph Bailey, the study's lead author, and Amy Miele, Axsen found that awareness of public chargers has little impact on consumers' interest in electrical vehicles.

The researchers recently presented their study to the National Academy of Sciences' Transportation Research Board in Washington, D.C.

"When we account for the relevant factors, our analysis suggests that the relationship between public charger awareness and plug-in electric vehicle demand is weak or non-existent," says Axsen. "In other words, the installation of public chargers might not be the best way to encourage growth in the electric vehicle market.

The study collected information from a representative sample of 1,739 new-vehicle-buying households in Canada, with 536 from British Columbia. Respondents were asked about awareness of public charging in their region, and about their overall interest in purchasing a plug-in electric vehicle, such as a Chevrolet Volt or Nissan Leaf.

The data showed that British Columbia's Clean Energy Vehicle program—which installed almost 500 public chargers when the survey was conducted in 2013—was largely successful in increasing charger awareness. Almost one-third of British Columbian respondents had seen at least one public charger, compared to only 13 per cent of respondents in the rest of Canada.

However, that awareness didn't necessarily translate into increased plug-in electric vehicle interest.

The study found that future buyers are far more likely to be attracted to plug-in hybrid vehicles, such as the Chevrolet Volt, which can be powered by both gasoline and electricity.

"Since cars such as the Chevy Volt don't rely only on electricity, potential buyers aren't concerned about public charging," says Bailey. "People can just recharge at home, and then drive wherever they want on any given day. The good news is that about two-thirds of car buyers already have some type of charging access at home."

¹⁷ <https://www.sfu.ca/sfunews/stories/2015/electric-vehicles-success-not-tied-to-public-chargers.html>

Purchase rebates also spark consumer interest

“Given what we’ve seen here, it seems wise for governments to focus their money on incentives other than public electric vehicle chargers,” says Axsen. “We know that purchase rebates can spark consumer interest, and we’ve shown that home charging is important. In combination with the implementation of a Zero Emissions Vehicle mandate like California’s, these measures could be the biggest boosters of electric vehicle sales.”

Grants provided by the Social Sciences and Humanities Research Council of Canada, and Natural Resources Canada funded this research.

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