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New analysis of California ZEV market finds state will meet or exceed 1.5 million by 2025 goal

*S-curve adoption happening but charging infrastructure not keeping pace
Important implications for Governor Brown's new 5 million ZEVs by 2030 goal*

SAN FRANCISCO — California's zero-emission vehicle (ZEV) market is growing dramatically and is on track to meet or exceed Gov. Jerry Brown's previous goal of 1.5 million ZEVs on California's roads by 2025. That's according to a new analysis produced by Beacon Economics for the nonprofit, nonpartisan think tank [Next 10](#). But as Gov. Brown calls for a new goal of 5 million ZEVs by 2030, the report finds that growth could be inhibited if charging infrastructure doesn't keep pace.

"Going from 1.5 million ZEVs in 2025 to 5 million in 2030 is a big jump, but we're seeing rapid growth in the ZEV market," said F. Noel Perry, businessman and founder of Next 10. "Barriers such as inadequate infrastructure could slow progress, but our report shows that by 2040, ZEVs could be as ubiquitous as smartphones are today."

[The Road Ahead for Zero-Emission Vehicles in California: Market Trends & Policy Analysis](#) analyzes California's ZEV market, including historic sales, costs, technology trends, forecasts and challenges. It also reviews policies and implications that could affect future market growth.

"2017 marked a turning point for electric vehicles. Battery costs fell, ranges grew, new models hit the showrooms, and nations including China, France and the U.K. announced plans to phase out gas-powered cars," said Perry. "The growth we're seeing in California's ZEV market shows that the state is standing alongside leading countries in the transition to a cleaner transportation future."

As of October 2017, 337,483 ZEVs have been sold in California. ZEV sales increased 29.1 percent between 2016 and 2017, bringing the state's ZEV market share to 4.5 percent, compared to 3.6 percent in 2016. When the state's ZEV goal was enacted in 2012, California needed to average 35.5 percent annual growth from 2013 to 2025 to meet its goal. But with a 53 percent increase in growth from 2013-2017, the annual growth rate required to meet the ZEV goal from 2017 on has decreased to 20 percent annually.

ZEV adoption isn't just accelerating in California. In 2017, global passenger electric vehicle sales reached about 1 million, up from half a million in 2015. Looking ahead, the report finds that electric vehicles could be as ubiquitous in 2040 as smartphones are today.

"Often with advanced technology, adoption hits a tipping point and then you see exponential growth — an s-curve — rather than incremental, linear rates of adoption. And zero-emission vehicles are following this pattern," said Adam Fowler, economist at Beacon



Economics, an independent research and consulting firm that compiled the report. “Add to that the advent of autonomous vehicles and new business models such as ride hailing and car sharing, and we could be on the brink of major disruption in the transportation sector,” Fowler said.

But California is lagging behind when it comes to ensuring its charging infrastructure keeps up with the growth of its electric vehicle fleet. California has 16,549 public and nonresidential private-sector charging outlets — the most in the nation by far. But it works out to only 0.05 public charging outlets per California ZEV, and that’s one of the lowest ratios in the country. Studies show that California will need 125,000 to 220,000 charging ports from private and public sources by 2020 in order to provide adequate infrastructure.

Highlights of the report include:

California’s ZEV leadership

- California 2017 ZEV sales increased 29.1% over 2016, while U.S. 2017 ZEV sales grew by 28.8% over 2016. These increases are based on sales data from January through October in 2016 and 2017, as confirmed sales data for the last two months of 2017 is not yet available.
- ZEV market share in California was 4.5% in 2017, up from 3.6% in 2016. This compares to 2017 ZEV market share of 1.1% in the U.S. and 1.8% in China.
- When the state’s ZEV goal was enacted in 2012, California needed to average 35.5% annual growth from 2013 to 2025 to meet its goal. But given the 53% increase in growth from 2013-2017, the annual growth rate required to meet the ZEV goal has decreased to 20% annually.

China’s ZEV leadership

- China leads the world in ZEV sales. Sales of EVs increased 70% from 2015 to 2016 with cumulative EV sales reaching 650,000, overtaking the U.S. in cumulative sales for the first time.
- China’s intention to achieve 20% ZEV penetration by 2025 means it will add 7 million vehicles a year.

Market Trends

Factors driving acceleration or deceleration of ZEV adoption include price, performance, choice, convenience, and public policy. Current trends suggest that barriers to EV adoption such as price, range, selection and charging-time will continue to diminish, as costs come down and technology improves.

- **Total Cost of Ownership:**
 - An analysis of 17 popular 2017 models found ZEVs can already be price competitive now, without government incentives.
 - Based on 12,330 miles driven per year, the pure battery electric Nissan Leaf has lower five-year and 10-year life cycle costs than the internal combustion Hyundai Elantra and the plug-in hybrid Chevrolet Volt, even without the federal government incentive.
 - The average Californian drives 14,435 miles every year. Accounting for that mileage and state and federal incentives, the smart fortwo ED and the Nissan Leaf have the lowest total cost of ownership of any of the 17 models studied, which include both ZEVs and internal-combustion-engine (ICE) vehicles.
- **Price:**



- The most expensive component of a ZEV is the battery. From 2010 through 2016, average battery cost per kilowatt-hour has dropped 74%, from over \$1,000 to \$273/Kwh while energy density has improved 5% per year. Bloomberg New Energy Finance estimates battery cost will decline by almost 10% until 2025, when ZEVs will reach price parity with ICE vehicles.
- **Performance:**
 - Battery range has been increasing annually. In 2017, Tesla Model S had the farthest EPA-rated range for an all-electric vehicle, at 315 miles.
- **Choice:**
 - 150 different plug-in hybrids and pure electric vehicles are available worldwide, with that number set to rise to over 240 by 2021.
 - China leads with over 75 EV models. It introduced 25 new models in 2016 and saw sales jump 70%.
 - In the top California cities for EV penetration, auto dealers offer 25 to 30 different models.
 - More than half of the U.S population lives in a metropolitan area with 7 or fewer available models.
 - Volkswagen, Daimler, Volvo and Nissan have announced plans to electrify their fleets over the next 10 years. GM plans to introduce 20 new ZEV models by 2023, while Ford promises 13.
- **Convenience:**
 - **Infrastructure:** From 2011 to 2016, the number of stations for charging electric vehicles increased by 1,138% in the U.S. In 2016 there was one charging plug for about every 6 electric cars.
 - As of January 2018, California had a total of 16,549 public and nonresidential private-sector charging outlets. This works out to 0.05 public charging outlets per ZEV, one of the lowest ratios in the country.
 - **Fueling time:** Tesla's Superchargers can recharge EVs to 80% in 20 to 40 minutes. Others fully charge EVs in 3 to 4 hours, while slower charging points take around 6 to 8 hours.
 - Automakers are reducing charging times. Honda is working on high-capacity batteries capable of 15-minute charging with a 240 km range for release in 2022 models.
 - **Maintenance:** ZEVs require significantly less time and money spent on maintenance because they have only about 20 moving parts – about 1,980 fewer moving parts than traditional ICE vehicles.
- **Public Policy:**
 - National governments including China, the U.K., France, the Netherlands and India have stated the intention to phase out the internal combustion engine.
 - California and nine other states are moving to accelerate ZEV adoption. Eight states including California signed a memorandum of understanding (MoU) committing to bring 3.3 million ZEVs on the road by 2025.
 - As of October 2017, California had fulfilled 22.5% of the MoU goal, followed by Oregon with 10%. California appears to be the only state on track to fulfill its MoU goals.
 - In January 2018, Assemblyman Phil Ting introduced a bill that would ban gas-powered cars by 2040.



- There are a number of public policies within California to promote the development of charging infrastructure.
- The growth of ZEVs represents a potential drain on motor vehicle fuel taxes, which could affect state transportation revenue.
- Grid overload is another concern. The California Public Utilities Commission is studying it. SoCal Edison and the Los Angeles Air Force Base are conducting a pilot program that allows electric vehicles to act as batteries and send power back to the grid.

About Next 10

[Next 10](#) is an independent, nonpartisan, nonprofit organization that educates, engages and empowers Californians to improve the state's future. With a focus on the intersection of the economy, the environment, and quality of life, Next 10 employs research from leading experts on complex state issues and creates a portfolio of nonpartisan educational materials to foster a deeper understanding of the critical issues affecting our state.

About Beacon Economics

[Beacon Economics](#) is one of California's leading economic research and consulting firms, specializing in economic and revenue forecasting, economic impact analysis, economic policy analysis, and regional economic analysis. Known for delivering independent and rigorous research, the firm provides its clients with economic trend and data analysis that strengthens strategic decision-making about investment, revenue, and policy.