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## **California's ZEV Action Plan**

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### **Short Abstract**

Accelerating the market for zero-emission vehicles (ZEVs) is a cornerstone of California's long-term transportation strategy to reduce localized pollution and greenhouse gas emissions, save consumers money, and enable continued economic growth. In addition to promoting these vehicle technologies, the state supports the development and use of low carbon fuels, as well as planning more environmentally sustainable communities that reduce unnecessary vehicle travel and congestion. In March 2012 Governor Brown signed an Executive Order calling for 1.5 million ZEVs by 2025. To identify specific actions that the State can take to reach this goal, the Governor's Office with the input from a Governor's Office Interagency Working Group developed the 2013 ZEV Action Plan.

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## **1 Introduction**

Recognizing the multiple benefits of zero-emission vehicles (ZEVs), as well as challenges to growing the market, Governor Brown issued Executive Order B-16-2012 on March 23, 2012 that directed California to "encourage the development and success of zero-emission vehicles to protect the environment, stimulate economic growth and improve the quality of life in the State." The Governor's Executive Order sets a long-term target of reaching 1.5 million ZEVs on California's roadways by 2025. The Executive Order also sets a longer-term target of reducing transportation-related greenhouse gas emission by 80 percent below 1990 levels by 2050. Subsections. The Governor's Executive Order establishes several milestones organized into three time periods:

- By 2015: The state's major metropolitan areas will be able to accommodate ZEVs through infrastructure plans and streamlined permitting; private investment and manufacturing in the ZEV sector will be growing, and the state's academic and research institutions will contribute to ZEV market expansion by building understanding of how ZEVs are used.
- By 2020: The State's ZEV infrastructure will be able to support up to one million vehicles; the costs of ZEVs will be competitive with conventional combustion vehicles; ZEVs will be accessible to mainstream consumers; and there will be widespread use of ZEVs for public transportation and freight transport.
- By 2025: Over 1.5 million ZEVs will be on California roadways and their market share will be

expanding; Californians will have easy access to ZEV infrastructure; the ZEV industry will be a strong and sustainable part of California's economy; and California's clean, efficient ZEVs will annually displace at least 1.5 billion gallons of petroleum fuels.

## **2 Progress in California's ZEV Market**

Over the past two decades, actions by multiple levels of government and private parties have helped develop the market for ZEVs. State policies, beginning with CARB's 1990 Zero-Emission Vehicle mandate, have catalyzed development of ZEVs. Funds from the state's Alternative and Renewable Fuel and Vehicle Technology Program and Air Quality Improvement Program (often referred to as the AB 118 Program) have provided funding for statewide consumer vehicle rebates, hydrogen infrastructure station development, installation of electric vehicle charging stations, medium- and heavy-duty bus and truck demonstrations, and alternative vehicle manufacturing. This funding has also helped California-based companies to grow and develop new ZEV technology. The California State Legislature has passed important legislation over the last several years to increase access to affordable, convenient electric vehicle charging and to define how the market for EV charging is regulated.

Many local governments have developed charging and hydrogen infrastructure in their communities, streamlined permitting processes for new infrastructure, and planned how ZEVs will operate within their local transportation networks. The federal Department of Energy (DOE) has funded many of these local government activities and provided additional funding for statewide efforts to build the ZEV market. Strong public-private partnerships embodied in the PEVC and CaFCP have enabled unprecedented coordination between the private sector and government, which has provided a better understanding of barriers to widespread adoption of ZEVs and strategies to surpass these barriers. As a result of these collective actions, California's share of the plug-in electric vehicles (PEV) market in the United States currently stands at nearly 40 percent.

California's ZEV market is poised for major new growth. Auto manufacturers now offer a range of attractive PEVs, including many that are manufactured here in the state by new California-based companies. These auto companies have enthusiastically embraced ZEVs and are looking to ways to expand their market in the state. Additionally, California-based infrastructure companies are building thousands of charging stations that allow drivers to charge their electric vehicles conveniently and affordably. Thousands of Californians have already transitioned to PEVs, and they are joined by new PEV drivers each month. Finally, on the near-term horizon, fuel-cell vehicles (FCVs) appear poised to compete in the vehicle market as well, with vehicle introductions as early as 2015. Currently, two manufacturers are leasing FCVs to consumers in California in limited quantities. To support this market launch, an initial network of hydrogen stations is being planned and built.

## **4 Challenges to ZEV Expansion in California**

While ZEVs offer multiple consumer, environmental and economic benefits, a range of challenges exist to moving ZEVs into mainstream markets. Below is a discussion of some of the major current challenges.

### **4.1 ZEVs require new infrastructure**

Both PEVs and FCVs require new infrastructure to enable convenient and cost-effective fueling. For PEVs, the primary infrastructure-related challenge involves providing convenient and affordable vehicle charging, which includes: enabling efficient deployment of electric vehicle service equipment (EVSE) in homes, workplaces and public space; structuring electricity rates to allow for affordable fueling; and ensuring that PEVs integrate efficiently into the state's electricity grid. For FCVs, the primary challenge remains building sufficient hydrogen fueling stations so that FCV drivers can conveniently refuel once these vehicles come to market.

### **4.2 Consumer awareness of ZEVs is limited**

Many consumers are simply unaware that ZEVs are available for purchase or lease, while others don't fully understand the potential total cost savings, convenience and other operating features of ZEVs. Also, while governments have offered valuable incentives for ZEV usage, including use of High Occupancy Vehicle (HOV) lanes on the state freeways and free public charging, many consumers are unaware of these benefits.

### **4.3 Up-front costs for ZEVs remain high compared to traditional vehicles**

Zero-emission vehicles are currently more expensive than equivalent conventional models. The purchase price for ZEVs is projected to decline as manufacturers sell more ZEVs and technology evolves, but the higher upfront purchase price currently serves as a barrier to widespread sales. The federal government and California state government have helped address this price difference through a tax credit and vehicle incentive, respectively, but the higher initial ZEV costs remain a barrier for many California consumers.

## **5 2013 ZEV Action Plan**

The 2013 Action Plan outlines significant actions that state government is currently taking or plans to take to help expand the ZEV market. It is intended to serve a “roadmap” that clearly communicates state government’s efforts to advance ZEVs. It is also intended to serve as a “to-do” list for the Governor’s Office and state agencies that enhance coordination on state actions moving forward. The Action Plan contains four broad goals for state government to advance ZEVs:

- Goal 1: Complete Needed Infrastructure and Planning
- Goal 2: Expand Consumer Awareness and Demand
- Goal 3: Transform Fleets
- Goal 4: Grow Jobs and Investment in the Private Sector

### **5.1 Complete Needed Infrastructure and Planning**

The widespread use of ZEVs relies on adequate fueling and charging infrastructure for these vehicles. For PEVs, charging infrastructure must expand as the market grows. For FCEVs, adequate hydrogen stations must come online to enable the commercial launch of these vehicles.

Fueling infrastructure for PEVs and FCEVs is fundamentally different and each vehicle type presents distinct challenges. Plug-in electric vehicles primarily rely on strategically deployed charging stations in a variety of locations including drivers’ homes, workplaces, fleet facilities and public places such as parking lots and parking garages. The process of installing PEV charging stations can sometimes be complex, protracted and expensive. Additionally, PEVs introduce new energy demand on the state’s energy system and care must be taken to allow PEVs to integrate smoothly and safely into the state’s electricity grid.

Fuel cell electric vehicles require hydrogen stations that are similar to today’s fueling model in that one station serves hundreds of vehicles. In the coming years, hydrogen stations must be located in early market communities and along corridors between key destinations. This will enable early consumers to use their FCEV in the same manner as they would a conventional gasoline vehicle. Additionally, hydrogen dispensers must be certified before hydrogen can be sold on a per kilogram basis in a retail transaction.

Effective state and local government planning is essential to enable adequate and appropriately located stations for PEVs and FCEVs. Government policies and actions should also focus on reducing infrastructure costs for ZEV customers and ensuring affordable fueling.

The Action Plan is intended to help provide sufficient infrastructure to support up to 1 million ZEVs by 2020. Further actions beyond 2020 will likely be necessary to reach the Executive Order’s target of 1.5 million vehicles by 2025. Due to the changing nature of the ZEV market, the action plan does not address infrastructure and planning-related actions after 2020.

#### **5.1.1 Highlighted strategies and actions**

- Support and advocate for reauthorization of infrastructure funding programs to fund essential early PEV and FCEV infrastructure.
- Ensure development of interoperability standards for electric vehicle charging stations that allow all drivers to charge at a station regardless of membership in a vehicle charging network.
- Ensure adequate funding to build a minimum network of 68 hydrogen stations to support the commercial launch of FCEVs between 2015 and 2017, and expand the network to 100 stations to match FCEV market growth.

## 5.2 Expand Consumer Awareness and Demand

A wide variety of PEVs are now available to California consumers and FCEVs will become widely available beginning in 2015. Now that ZEVs are available to California consumers, the state can help industry take appropriate actions to build demand and maximize the “electric miles” that these vehicles generate.

Similar to many new technologies entering an established market, consumer demand for ZEVs will likely be moderate in the short term and may take time to expand. Generally speaking, most consumers are still unfamiliar with ZEVs. New car buyers who are aware of PEVs cite cost as the biggest impediment to buying a PEV.<sup>1</sup> Consumers may also be hesitant about performance attributes of ZEVs, including range limitations, uncertainty about fueling infrastructure, and uncertainty about durability and quality.

Demand for ZEVs will increase as these technologies become more familiar and the attributes of ZEVs become more widely known. Additionally, California has a strong market of “early adopter” consumers who pioneer innovative technology. As the California Plug-In Vehicle Collaborative’s *Taking Charge* strategic report explains:

“California’s long history of cultural and technological innovation, particularly around automotive lifestyles, makes it well positioned to lead a transition to electric- drive transportation and plug-in electric vehicles. California consumers have a history of adopting new and ‘green’ technologies.”

The Action Plan includes several strategies to help expand consumer awareness and interest in ZEVs, including reducing upfront purchase and operating costs, promoting consumer awareness and strengthening the connection between ZEVs and renewable energy.

### 5.2.1 Highlighted strategies and actions

- Support and advocate for the reauthorization of funding programs to continue consumer rebates for purchase or lease of PEVs and FCEVs.
- Maintain HOV lane access for ZEVs.
- Participate in existing and planned consumer outreach campaigns to raise awareness about the availability and benefits of ZEVs and offering driving opportunities.

## 5.3 Transform Fleets

The Governor’s Executive Order aims to expand ZEVs in both public and private vehicle fleets. It specifically directs DGS and state departments to increase the share of ZEVs in their own fleets through the normal course of fleet replacement requiring that:

- 10 percent of fleet purchases of light-duty vehicles be zero-emission by 2015
- At least 25 percent of fleet purchases of light-duty vehicles must be zero-emission by 2020.

This directive does not currently apply to vehicles that have special performance requirements such as public safety vehicles.

To accomplish these fleet targets, state agencies must be able to select from several models of ZEVs based on specific performance needs. These agencies must also have access to ample fueling infrastructure. Currently, plug- in electric vehicles offers the state a near-term path toward transforming its fleet by 2015. Fuel cell electric vehicles will likely play a key role in meeting Executive Order mandates beyond 2015 as these vehicles become commercially available.

The Action Plan also calls for expanded ZEV deployment within private vehicle fleets, including public transportation and freight transport. Greater use of ZEVs in heavy-duty fleets will reduce greenhouse gas emissions and traditional criteria pollutants in urban areas, freight corridors, ports and other “non-attainment” zones with high amounts of pollution. In addition to reducing air pollution, incorporating ZEVs into fleet operations help drive demand for ZEVs and exposes a greater number of people to these vehicles.

The Action Plan identifies a range of actions that state government should take to encourage increased ZEV deployment in private fleets including providing funding support, keeping fueling affordable, increasing coordination and communication among fleet users and incorporating ZEV commercialization in state.

### **5.3.1 Highlighted strategies and actions**

- Take necessary steps to ensure that at least 10% of state's light-duty vehicle purchases are ZEVs by 2015 and that at least 25% are ZEVs by 2020.
- Advance a statewide ZEV Fleets Users Forum or expand existing forums to support the efforts of companies and governments to integrate ZEVs into their fleets.
- Develop a multi-agency strategy to accelerate the commercialization of medium and heavy-duty ZEVs.

### **5.4 Grow Jobs and Investment in the Private Sector**

California leads the world in both ZEV deployment and in financial investment in ZEV-related technology. Supportive policies and a receptive consumer market have translated into hundreds of millions of dollars of investment into California-based clean technology companies. In 2010, California attracted \$840 million of general venture capital investment, representing 80 percent of total U.S. investment and 60 percent of total global investment in this sector. In the first half of 2011, California specifically attracted \$467 million of ZEV-related venture capital investment.<sup>2</sup> Additionally, cost savings by California consumers who transition to ZEVs and reduce their vehicle fueling costs is likely reinvested elsewhere into California's economy, creating new jobs.<sup>3</sup>

Although ZEV design, development and manufacturing is still in commercial infancy, some the most successful companies within this nascent sector are located in California and are increasing research, development and manufacturing of ZEV technology in our state. In the coming years, expanding the supply chain presents a tremendous economic opportunity for California.<sup>4</sup>

While state government continues to provide publicly funded financial incentives to expand the consumer market for ZEVs, the state's actions are intended to ultimately build a ZEV market that is sustainable without public subsidies through growing consumer demand and private investment.

Maximizing economic benefits from the growing ZEV market requires a comprehensive economic development approach in which local, regional and state governments collaborate with the private sector to grow and sustain ZEV manufacturing in California. Budgetary constraints limit the state's ability to offer public financing and economic development incentives, so state efforts must be carefully targeted to attract and retain manufacturing facilities. Ongoing public support for research, development and demonstration will continue to make California the innovation epicenter of the growing ZEV industry. California's universities, community colleges and labor organizations will also play a crucial role by preparing workers to fill jobs that develop in this industry.

#### **5.4.1 Highlighted strategies and actions**

- Conduct supply chain assessment of ZEVs, components and infrastructure to develop a strategic plan to attract promising areas of ZEV supply chains to California.
- Identify pre-permitted facilities that can be quickly repurposed for ZEV and component manufacturing or hydrogen stations.
- Provide workforce training funds to employers, trade associations, Joint Apprenticeship Training Committees, and Chambers of Commerce to address employer-driven, ZEV-related training needs for existing and new workers.

## **6 Conclusion**

California's strong and lasting commitment to zero-emission vehicles reflects the understanding that advanced vehicle technology plays an important role in meeting our state's most pressing environmental challenges. By transitioning to plug-in electric vehicles and fuel cell electric vehicles, Californians are helping to reduce smog and other local pollutants that harm our state's residents. In the process, this transition to cleaner vehicles helps California lead the world in combating global climate change.

Zero-emission vehicles also represent the type of technological innovation that will serve as an important source of California's future economic and job growth. Technology development has driven California's economy over recent decades to become the ninth largest economy in the world. Continued economic growth in our state will be enabled by embracing new, evolving technologies such as ZEVs and working to locate this technological innovation within the state's borders.

In laying out the next steps to accelerate the ZEV market, the 2013 ZEV Action Plan can help California capture the environmental and economic benefits of the transition to cleaner transportation. The goal remains nothing less than a healthier and more prosperous state.

### **Acknowledgments**

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