2012 ZEV ACTION PLAN

A Roadmap toward 1.5 Million Zero-emission Vehicles on California Roadways by 2025

Governor's Interagency Working Group on Zero-emission Vehicles

Governor Edmund G. Brown Jr.
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[DRAFT VERSION FOR PUBLIC COMMENT]

Introduction & Purpose

In March 2012, Governor Brown issued an Executive Order directing state government to help significantly expand the market for Zero-emission Vehicles (ZEVs) in California. The Executive Order established several milestones, highlighted by the target of 1.5 million ZEVs in California by the year 2025. This *2012 ZEV Action Plan* follows on the Governor's Executive Order by identifying specific strategies and actions that state agencies will take to meet the Executive Order.

This Action Plan is the product of an interagency working group led by the Governor's Office that includes several state agencies: California Air Resources Board (CARB); California Energy Commission (CEC); California Public Utilities Commission (CPUC);California Independent System Operator (CAISO); California Department of Transportation (CalTrans); Department of General Services (DGS), including the Division of the State Architect (DSA); the Building Standards Commission (BSC); the California Housing and Community Development Department (HCD); the Labor and Workforce Development Agency, including the Employment Training Panel; and the California Department of Food and Agriculture, Division of Measurement Standards. This Action Plan builds upon significant work already undertaken by these agencies.

The Action Plan also benefits from extensive input from outside stakeholders, including the California Plug-in Electric Vehicle Collaborative (PEVC) and the California Fuel Cell Partnership (CaFCP). The PEVC and CaFCP are broad-based public-private partnerships, with membership that includes industry, non-government organizations (NGOs) and government, which increase coordination to advance zero-emission vehicles. The Governor's Executive Order specifically directs state agencies to collaborate with these two organizations.

This Action Plan is being released in draft form in September 2012 to solicit broad stakeholder input. Following that input, a final version of the Action Plan will be released later in 2012. The interagency working group that developed this Action Plan recognizes that many planned actions will have to be adjusted over time to meet the needs of a rapidly evolving ZEV market. As a result, the working group plans will modify its actions as needed over time and will continue to meet in order to implement the Action Plan. The working group will also continue to coordinate with the PEVC, CaFCP and other non-governmental stakeholders.

For the purposes of this Action Plan, ZEVs include hydrogen fuel cell vehicles (FCVs) as well as PEVs, which include both pure battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

Governor Brown's Executive Order

Recognizing the multiple benefits of ZEVs, as well as challenges to growing the market, Governor Brown issued an Executive Order 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 the year 2050.

The Governor's Executive Order establishes several interim milestones on the way to the target of 1.5 million ZEVs in California by 2025. These milestones are organized into three time periods: 2015, 2020 and 2025. The milestones include:

- 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 to 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.

The Executive Order also directs state government to purchase ZEVs in order to support the market and capture environmental and economic benefits. Specifically, it requires that beginning in 2015, 10% of light-duty fleet purchases by state departments be ZEVs, climbing to 25% of light duty purchases by 2020.

To achieve these milestones, the Executive Order directs the CARB, the CEC, and the CPUC and other relevant agencies to work with the PEVC and the CaFCP to establish benchmarks to help achieve these milestones. This *2012 ZEV Action Plan* contains the benchmarks— or actions— that agencies are taking to achieve the Governor's vision.

A copy of the Governor's Executive Order is provided as an appendix to this Action Plan.

Progress to Date and Current Opportunity

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.

Our state'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.

Benefits of ZEVs

Zero-emission vehicles are becoming an accessible, attractive transportation option for California drivers.

More ZEVs coming to market is good news for California consumers. Zero-emission vehicles offer expanded vehicle options for California consumers, with over a dozen new PEV models available in 2012. Zero-emission vehicles will save California drivers millions of dollars in reduced fuel costs over the life of their vehicles.[1] In many cases, these fuel cost savings will allow PEV purchasers to recoup the increased purchase costs for their PEV vehicle and will have a strong multiplier effect, generating millions of dollars in savings that can be reinvested into our state's economy. Plug-in electric vehicles also allow drivers the convenience of refueling their vehicles overnight in their own garages.

More ZEVs on the road means cleaner air for Californians to breathe. Increasing the share of ZEVs among vehicles using California roads is imperative for meeting federal air quality standards and the State's climate change targets. Transportation emissions are the primary source of particulates, air toxics and smog in California. Reducing vehicle emissions through increased use of ZEVs will result in fewer respiratory illnesses and premature deaths in California. Increasing ZEVs also reduces greenhouse gas emissions that contribute to climate change. Currently, the transportation sector is the biggest contributor to California's greenhouse gas emissions, accounting for approximately 40 percent of this pollution. CARB's staff analysis has concluded that ZEVs are crucial to achieving the State's 2050 greenhouse gas goal of 80% emission reductions below 1990 levels, as well as meeting federal air quality standards. Achieving 1.5 million ZEVs by 2025 is critical to advancing the market and putting the state on path to meet these requirements.

ZEV expansion bolsters California's innovation-based clean technology sector. A major share of international investment in ZEVs comes to California companies, which are breaking new ground in developing and manufacturing ZEV technologies. In 2010, California accounted for 80 percent of

[1] Refer to CARB Zero Emission Vehicle Regulation staff report, Table 5.7 (Dec 2011)

total U.S. venture capital investment in PEV-related sectors, and 60 percent of total global investment in this sector.[2] California also ranks first in the nation in total PEV technology patents, and third among countries throughout the world.[3] This concentrated economic investment and innovation within California translates into the growth of companies and jobs across the state. As the consumer market for ZEVs grows in California, our state has an opportunity to leverage this growth for continue expansion of companies and employment within this sector.

ZEVs increase our energy independence. California currently imports two-thirds of its petroleum from out of state, including half of its petroleum from foreign countries, and accounts for about 10 percent of U.S. gasoline and diesel consumption. Recent estimates suggest that oil dependence has cost the U.S. over $2 trillion in direct costs over the last five years, including $500 billion in 2011 alone.[4] Zero-emission vehicles, fueled by electricity and hydrogen, reduce California's dependence on foreign oil, enhance energy security and economic competitiveness, and build resiliency into the state and federal economy.

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. Major current challenges include, but are not limited to:

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.

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.

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

[2] Next 10 and Collaborative Economics (2011) "Powering Innovation: California is Leading the Shift to Electric Vehicles from R&D to Early Adoption" (http://www.next10.org/powering-innovation-california-leading-shift-electric-vehicles-rd-early-adoption)
[3] Next 10 and Collaborative Economics (2011)
[4] Greene, D.L. (2012) "Low Carbon Transportation: A Crucial Link to Economic and Energy Security," Presentation at the Chair's Lecture Series, California Air Resources Board, Sacramento, CA, September 4, 2012. (http://www.arb.ca.gov/research/lectures/speakers/greene.pdf)

vehicle incentive, respectively, but the higher initial ZEV costs remain a barrier for many California consumers.

Structure of the 2012 ZEV Action Plan

This 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 enhances 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 Investments in the Sector

Each of these four goals is the topic of a separate section in the remainder of the Action Plan. Each section begins by listing the Executive Order milestones that are relevant to the section's goals. Next, following a brief summary of the goal, specific strategies and actions are listed that are either underway or currently being planned. For each action, the responsible agency and estimated start date for the action is listed in parentheses. For example, "(CEC, 2013)" placed after an action item indicates that the California Energy Commission is the lead agency on this action and that the action is planned to begin in 2013.

Goal 1: Complete Needed Infrastructure and Planning

Executive Order Milestones Related to Completing Infrastructure and Planning:

- By 2015 the State's major metropolitan areas will be able to accommodate zero-emission vehicles, each with infrastructure plans and streamlined permitting
- By 2020 the State's zero-emission vehicle infrastructure will be able to support up to one million vehicles
- By 2020 electric vehicle charging will be integrated into the electricity grid
- By 2020 there will be widespread use of zero-emission vehicles for public transportation and freight transport
- By 2020 transportation sector greenhouse gas emissions will be falling as a result of the switch to zero-emission vehicles

The widespread use of ZEVs relies on adequate fueling infrastructure for these vehicles. As the market for ZEVs grows, fueling infrastructure must expand to meet consumer needs.

Fueling infrastructure for PEVs and FCVs are fundamentally different and each technology presents distinct challenges. Plug-in electric vehicles primarily rely on strategically deployed charging stations in a variety of locations including drivers' homes, workplaces and in public places such as parking lots and parking garages. The process of installing PEV charging stations can 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 vehicles require distinct fueling infrastructure that is more similar in function to the traditional gas pump. Hydrogen fueling stations need not be as ubiquitous as electric vehicle charging stations due to the longer range of FCVs compared with most currently available PEVs, but hydrogen fueling stations are currently much more expensive to construct. Fuel-cell vehicles will likely not be sold unless consumers are confident that a sufficient network of hydrogen fueling stations exists for their use. Additionally, hydrogen cannot currently be sold as a transportation fuel on a per kilogram basis until type certifications are established.

Effective state and local government planning is essential r to enable adequate and appropriately located fueling stations, both for PEVs and FCVs. Government policies and actions should also be focused on reducing infrastructure costs for ZEV users and ensuring affordable fueling options.

The *2012 ZEV Action Plan* is intended to help provide sufficient infrastructure to support up to one 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, this Action Plan does not attempt to anticipate what infrastructure and planning-related actions state government should take after 2020. Indeed, those decisions will be made in coming years as the ZEV market develops and evolves.

Strategies and Actions

Strategy: Support ZEV infrastructure planning and investment by the State and the California's electric utilities.

- Develop and implement automaker ZEV reporting requirements detailing the amount and locations of ZEVs sold, as well as projected ZEV sales, using Low Emission Vehicle regulation reporting and other survey tools. CARB will collect automaker ZEV sales data by region through reporting required by the Low Emission Vehicle regulation in order to develop sales projections for infrastructure planning. (CEC and CARB, ongoing)

- Continue to track local grid impacts of increased PEV use and monitor adequacy of notice to electric utilities regarding PEV registrations. (CPUC, ongoing)

Strategy: Support the interoperability and public access of all charging stations to PEV drivers.

- Support industry efforts to develop interoperability standards for Electric Vehicle Supply Equipment (EVSE). Charging interoperability will allow PEV drivers to locate and reserve public charging stations and be billed regardless of driver's EVSE company membership. (Multiple agencies, Ongoing)

Strategy: Provide signage on highway corridors and surface streets that directs drivers to ZEV charging and hydrogen fueling stations and indicates available use of HOV lanes.

- Standardize signage for public PEV charging and FCV refueling access across the state and ensure local governments are aware of this standardized signage. (CalTrans, December 2012)

- Install signage along highway corridors and city/county roads to indicate direction and proximity to PEV charging and hydrogen stations, as well as available use of HOV lanes for qualified ZEV vehicles. (CalTrans/CEC/OPR, Winter 2012)

Strategy: Support local governments' efforts to prepare their communities for increased ZEV usage, including completing local planning and building necessary infrastructure.

- Ensure completion of regional PEV plans and provide support to ensure plans are comprehensive and cohesive. Continue to coordinate Regional PEV Coordinating Council efforts and collaborate with the PEVC to support implementation of regional plans. (CEC, ongoing)

- Develop Statewide Charging Infrastructure Plan to complement regional plans and ensure sufficient charging infrastructure is available to meet the needs of PEV drivers while minimizing stranded assets. A Statewide Plan will consider interregional corridors and ensure coordination and cohesiveness among regional plans. (CEC/CARB, 2013)

- Establish ZEV Ready Community standards including codes and standards for infrastructure, streamline permitting and inspection and tools and resources to deploy

strategically placed fueling stations. This will focus on PEVs in the near-term, but will ultimately include community readiness efforts for FCVs as well. (OPR, ongoing)

Strategy: Ensure a minimum network of hydrogen fueling stations for commercial launch of fuel cell vehicles between 2015 and 2017.

- Continue providing grants to build new hydrogen stations to grow the hydrogen fueling network to meet consumer needs. Current projections suggest that 68 stations are needed by the end of 2015 for initial vehicle launch and ultimately 100 stations for full commercial launch. (CEC/CARB, ongoing)

Strategy: Ensure that hydrogen can legally be sold as a retail transportation fuel.

- California Department of Food and Agriculture, Division of Measurement Standards promulgates necessary standards and certifications that enable hydrogen to be sold commercially on a per kilogram basis. (California Department of Food and Agriculture, 2014)

Strategy: Help local communities prepare for deployment of hydrogen fueling infrastructure and roll-out of FCVs.

- State Fire Marshal provides training and education to local building and fire inspectors regarding hydrogen fueling infrastructure and supports codes/standards development that regulate this infrastructure on a statewide basis. (Office of the State Fire Marshal, 2013)

- Create new category of the Governor's Environment and Energy Leadership Award (GEELA) for local governments with most supportive building codes and permitting processes for hydrogen fueling stations. (CalEPA, 2012)

Strategy: Maximize benefits from the State's investment in ZEV infrastructure by considering opportunities for infrastructure to serve multiple vehicle sectors (e.g. light duty fueling stations that also accommodate transit buses.)

- Actively consider heavy-duty ZEVs when planning infrastructure for light-duty vehicles, including hydrogen fueling stations. This consideration ensures, where appropriate, that infrastructure built to support light-duty ZEVs can also benefit heavy-duty ZEV models. (CEC, ongoing)

Strategy: Plan for and integrate peak vehicle demand for electricity into the state's energy grid.

- Develop electricity tariffs for public transit, fleets and the freight sector that encourage electrification, promote efficient utilization of grid resources and allow for recovery of utility capital costs. (PUC, 2013)

- Pilot infrastructure systems that avoid or minimize demand impacts on the grid from EV charging through energy storage, demand response, distributed generation, or other mechanisms. (PUC, 2013)

- Develop roadmap to commercialize Vehicle to Grid (V2G) services provided by EV batteries. The V2G Roadmap will describe the technology and policy/regulatory environment that must be developed to deploy smart charging and V2G, including CAISO rules to enable this energy services market. The Roadmap should lay out a pathway for partners to help accelerate this development, including research projects and pilot programs. (CAISO, 2013)

- Demonstrate vehicle to grid (V2G) and smart charging capabilities for medium-duty and heavy-duty PEV fleets. (PUC/CEC, 2014)

Goal 2: Expand Consumer Awareness and Demand

Executive Order milestones regarding expanding consumer awareness and demand:

- By 2015 the State's academic and research institutions will be contributing to zero-emission vehicle research, innovation and education
- By 2020 the costs of zero-emission vehicles will be competitive with conventional combustion vehicles
- By 2020 zero-emission vehicles will be accessible to mainstream consumers
- By 2020 there will be widespread use of zero-emission vehicles for public transportation and freight transport
- By 2020 transportation sector greenhouse gas emissions will be falling as a result of the switch to zero-emission vehicles

California governmental policies, including the state's ZEV mandate, have helped to bring ZEVs to market. A wide variety of PEVs are now available to California consumers and FCVs will likely be available in the next three years. Now that these vehicles are becoming available for use in California, one of the state's highest priorities must be to help Californians purchase, lease and use these cars. Explained in another way, now that California has a supply of ZEVs for consumers, we need to take appropriate actions that help to build demand for these vehicles.

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. For ZEVs, the largest concern cited by most new car buyers is the initial purchase price of the vehicle compared to conventional counterparts. Even if operating cost savings are considerable, many consumers rarely consider these savings, placing higher importance on initial costs. Additionally, consumers may be hesitant about performance attributes that will require lifestyle changes, including range limitations, uncertainty about fueling infrastructure, and uncertainty about new technology durability and quality. Generally speaking, most consumers are unfamiliar with ZEVs and will need both information and direct driving experience to understand their clear benefits .

At the same time, 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 (PEVs). California consumers have a history of adopting new and 'green' technologies."*

This Action Plan includes three broad strategies to help bring down barriers to consumer use of ZEVs: reducing upfront purchase and operating costs; promoting consumer awareness; and strengthening the connection between ZEVs and renewable energy. Actions within these strategies are presented below.

Strategies and Actions

Strategy: Reduce up-front purchase costs for plug-in electric and fuel cell vehicles.

- Explore reauthorization of state vehicle and infrastructure incentive programs that have played an important role in reducing the initial purchase price for ZEVs and infrastructure. The source of the current ZEV consumer incentives, known as AB 118 funding, expires in 2015. Continuation of consumer incentives relies on renewing this funding stream or securing alternative funding. (Governor's Office/CEC/CARB, ongoing)

- Support and advocate for continued federal tax credit for ZEVs. (Governor's Office, ongoing)

- Identify and execute financial mechanisms to allow local and state governments to capture the federal tax credit when acquiring ZEVs for fleet usage. (DGS, 2013)

- Ensure that the current rule within the Low Carbon Fuel Standard (LCFS) program requiring the full value of electricity credits be returned to PEV users is implemented in a manner that maximizes financial benefit to the EV owner. (CPUC, 2013)

- Evaluate ways to reduces PEV equipment costs by creating a simpler metering option for homes with PEV chargers. This action includes assessing sub-metering protocol and other policies that could reduce costs for homeowners to access PEV-specific Time of Use (TOU) rates. (CPUC, ongoing)

- Complete feasibility study of an alternative vehicle registration and/or sales tax for ZEVs that would result in an equivalent registration or tax as conventional vehicles of similar size and model types. (CARB/CEC, 2012)

- Conduct demonstration projects to determine the value of used vehicle batteries as grid storage. (CPUC,/CEC 2014).

Strategy: Reduce operating costs for plug-in electric and fuel cell vehicles.

- Evaluate the need to revise utility time of use electricity rates for PEVs, based on PEV charging data, in order to incentivize off-peak charging. (CPUC, ongoing)

- Encourage electric utilities to conduct targeted outreach to homeowners with new PEVs, to ensure they are aware of time-of-use (TOU) electric rates and the potential cost savings to their households. Currently, many PEV owners have not signed up for local TOU rate programs, and whole-house TOU rate programs do not require special equipment. (CPUC/CEC, 2013)

- Complete a feasibility study to evaluate transportation funding sources that ensure equity between all fuels and continue to encourage vehicle efficiency. The existing gasoline tax that provides transportation funding is not sufficient for required program costs, and does not include alternative fuels. (CEC, CARB, ongoing)

Strategy: Promote consumer awareness of availability and benefits of ZEVs through public education and outreach.

- Partner with stakeholders in consumer outreach campaigns, with a goal of raising awareness of availability and benefits and offering driving opportunities. (CARB, 2013)

- Examine state policy and financial support, including possible subsidies, to increase ZEV usage in rental and car sharing fleets. Increasing ZEV penetration among rental cars and car sharing fleets is a meaningful way to build consumer awareness and experience driving ZEVs. (CARB, 2012)

- Integrate education and information on fuel cell vehicles into ZEV outreach websites and community readiness efforts currently geared toward plug-in vehicles. (CARB, 2013)

- Ensure locations of hydrogen stations are documented in the DOE/NREL Alternative Fuel Database. (CARB, 2014)

- Explore presenting electric usage from PEVs more explicitly on consumers' utility bills in a manner that could compare the cost of PEV fueling versus conventional gasoline fueling for same amount of travel. Showing fuel cost savings on electricity bills may help to increase word-of-mouth promotion by ZEV users to friends and family. (CPUC, 2015)

- Continue funding research to learn about ZEV user and household preferences. Research would include exploring how ZEV owners use public fueling infrastructure (where, how often), ZEV household travel behaviors, and purchase preferences. (CARB, CEC, CalTrans ongoing)

Strategy: Strengthen connection between electricity used for PEVs and renewable energy generation, particularly small-scale "distributed generation" of renewable energy.

- Explore possibility of requiring or incentivizing utilities to implement voluntary green power purchasing programs for PEV users. (CPUC/CEC, 2015)

- Make the greenhouse gas emission profile of currently available electricity available for PEV users' charging decisions. (CEC/CARB, ongoing)

Goal 3: Transform Fleets

Executive Order Milestones regarding transforming fleets:

- By 2015 California's state vehicle fleet will increase the number of its zero-emission vehicles through the normal course of fleet replacement so that at least 10 percent of fleet purchases of light-duty vehicles are zero-emission
- By 2020 at least 25 percent of state fleet purchases of light-duty vehicles will be zero-emission.
- By 2020 there will be widespread use of zero-emission vehicles for public transportation and freight transport
- By 2020 transportation sector greenhouse gas emissions will be falling as a result of the switch to zero-emission vehicles

This Governor's Executive Order directs action to expand ZEVs in both public and private vehicle fleets. Regarding public fleets, the Executive Order directs DGS and state departments to increase the share of ZEVs in the state's vehicle fleet through the normal course of fleet replacement. It directs that:

- Ten percent of fleet purchases of light-duty vehicles be zero-emission by 2015; and
- 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 necessary for the protection of the public safety and welfare.

Accomplishing these fleet targets depends on state agencies being able to select from several models of ZEVs depending on their specific performance needs and having access to ample fueling infrastructure to support ZEVs. Currently, electric vehicles—along with their decentralized refueling opportunities—offer the State a near term path toward transforming its fleet . Fuel cell vehicles will likely play a key role in meeting the ZEV mandate in the coming years as vehicle manufacturers begin to expand commercial offerings and refueling infrastructure expands.

DGS is leading the state's efforts to comply with the Governor's directive for 2015. DGS is actively working on several fronts: preparing solicitations for multiple ZEV technologies; developing an efficient procurement method for agencies to purchase charging equipment; and deploying pilots including the installation of 24 electric charging stations at five State parking facilities in the Sacramento area and the addition of 10 PEVs into the state's rental pool. These pilots allow agencies and staff to gain first-hand experience using PEVs to meet their transportation needs and provide DGS important information that will inform the roll-out of additional purchases of PEVs and related infrastructure.

The Action Plan also calls for expanded ZEV usage 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, and other regions of the state with some of the nation's worst air quality problems. Expanding ZEVs in private light-duty vehicle fleets helps drive demand for ZEVs in the state and provides broader

exposure to the technology for employees and the general public. Finally, increased ZEV usage in private fleets lessens petroleum dependence and can provide operational savings.
This action plan identifies a range of actions that state government should take to encourage increased ZEV usage in private fleets: providing funding support to minimize the cost difference between ZEVs and conventional vehicle models; keeping ZEV fueling affordable; continuing specific policies such as CARB's Zero Emission Bus rule; increasing coordination and communication among fleet users to share information on incorporating ZEVs into fleets; and incorporating ZEV commercialization in a variety of state freight planning efforts, including Caltrans' California Transportation Plan and CARB's freight strategy.

Specific strategies and actions include:

Strategies and Actions

Strategy: Stimulate ZEV demand and enhance public awareness by incorporating ZEVs into State fleet.

- Develop implementation plan for State fleet ZEV purchases required under Governor's Executive Order. (DGS, ongoing)

Strategy: Establish policy and procedures that enable efficient procurement of ZEVs and ZEV infrastructure.

- Establish State fleet purchasing rules for ZEVs. (DGS, 2012)
- Develop statewide contract for multiple PEVs. (DGS, 2012)
- Develop statewide contract for multiple electric charging stations. (DGS, 2013)
- Explore the potential benefits and feasibility of pooling purchase of PEVs with other jurisdictions, including possibility of Department of Defense and other states including Oregon and Washington. (DGS, 2013)

Strategy: Identify funding strategies to finance acquisition of ZEVs and ZEV infrastructure.

- Identify/ generate state funding to cover difference in up-front purchase price of ZEVs. (OPR, ongoing)
- Identify/generate funding sources to design and install PEV charging infrastructure. (OPR, ongoing)
- Explore how to integrate life-cycle cost calculations into fleet purchasing decisions. (DGS, 2012)
- Utilize innovative financing mechanisms that allow fleet acquisitions to capture federal tax incentives. (DGS, 2013)

Strategy: Execute near-term pilot projects to enhance understanding of PEV's and PEV infrastructure within state departments.

- Upgrade 24 legacy electric charging stations at five DGS parking garages in the Sacramento area to support the ZEV rental fleet. (DGS, completed)

- Acquire ten ZEVs for State's rental car pool. (DGS, 2012)

- Upgrade 9 legacy electric charging stations at the Sacramento State Garage to support the ZEV rental fleet. (DGS, 2012)

Strategy: Maximize use of ZEVs in state-sponsored car rentals.

- Include PEVs in statewide rental car contract. (DGS, 2013)

Strategy: Complete necessary infrastructure to allow for 10% ZEV purchases by 2015.

- Survey existing parking spaces and PEV charging stations at state facilities and align vehicle charging support needs to charger infrastructure development. (DGS, 2012)

- Design and install PEV charging infrastructure. (DGS, 2013)

Strategy: Develop measurable roadmap to achieve the 2015 milestone.

- Require state agencies to develop three year implementation plans by June 2013. (DGS, 2012)

- Determine appropriate types of charging stations for various types of state facilities and departmental fleets. (DGS, 2012)

- Develop plan for phasing installations of PEV charging infrastructure in state facilities. (DGS, 2013)

- Establish metrics to measure success of State fleet meeting the Governor's Executive Order. (DGS, 2013)

Strategy: Expand use of ZEVs for private fleets (light and medium-duty).

- Publicize the potential revenues available for fleets from Low Carbon Fuels Standard (LCFS). CARB's LCFS establishes a market for "credits" created when low-carbon fuels (including hydrogen and electricity) are used in transportation. Fleets of ZEVs could generate significant number of LCFS credits that provide new revenue streams. (CARB, ongoing)

- Explore and publicize the potential revenues available from Vehicle to Grid (V2G) systems. Smart charging and V2G systems potentially provide new revenue streams for ZEV fleets by enabling ZEVs in these fleets to provide services provided to the electricity grid, including demand response or voltage regulation. (CARB, CAISO, CPUC, ongoing)

- Explore establishing state policy coordinator to coordinate existing state and local ZEV policy and incentives for private fleets. A central coordinator would ensure communication between bodies, help to coordinate planning processes and leverage incentives. (CARB/GO, 2013)

- Explore establishing statewide ZEV Fleets Users Forum. A Users Forum could organize communication with ZEV manufacturers on the vehicle and support needs of fleet markets. The Forum could also share lessons learned and best practices between current ZEV fleet users and disseminate tools for future fleet users, such as Total Cost of Ownership models. Finally, such a Forum could provide a venue for coordinating research, demonstration and data collection. (CARB, 2013)

Strategy: Help to expand ZEVs within bus fleets.

- Monitor technology and market progress through existing and continued demonstrations and update zero-emission bus (ZBus) regulation according to technology and market development. CARB will monitor ZBus technology development and update the ZBus regulation to require transit fleets to use ZBuses as the technology becomes cost-effective. (CARB, 2013)

- Develop roadmap for fuel cell bus deployment in California in partnership with the CaFCP, including planning deployment of infrastructure to prepare for commercialization of FCVs. (CARB, 2013)

Strategy: Reduce cost barriers to ZEV adoption for freight vehicles.

- Continue to provide incentive funding (e.g. purchase vouchers) for buses and heavy duty vehicles to reduce up-front purchase costs. The Carl Moyer, Proposition 1B, and AB 118 programs all provide incentive funding that may be used to cover the incremental costs of zero emission vehicles in the medium- and heavy-duty freight sectors. (CARB, 2013)

Strategy: Integrate ZEVs into freight planning.

- Coordinate among CalTrans, CARB and related departments on ongoing and future freight-related planning efforts, including Caltrans' California Transportation Plan and CARB's Freight Strategy Update. Include and prioritize actions to accelerate the commercialization of medium and heavy-duty ZEVs. (CARB/CalTrans, 2013)

Goal 4: Grow Jobs and Investments in the Sector

Executive Order Milestones regarding growing jobs and investment in the ZEV sector:

- By 2015 the State's manufacturing sector will be expanding zero-emission vehicle and component manufacturing
- By 2015 the private sector's investment in zero-emission vehicle infrastructure will be growing
- By 2015 the State's academic and research institutions will be contributing to zero-emission vehicle research, innovation and education
- By 2020 the private sector's role in the supply chain for zero-emission vehicle component development and manufacturing in the State will be expanding.
- By 2020 transportation sector greenhouse gas emissions will be falling as a result of the switch to zero-emission vehicles

California's leadership to date advancing Zero-emission vehicles and its current status as a major consumer market for ZEVs positions our state as a global frontrunner in the emerging ZEV industry. Our state's central position in the growing ZEV sector has translated into hundreds of millions of dollars of investment into the California economy. In 2010, California attracted $840 million of 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 an additional $467 million of ZEV-related venture capital investment.[5]

Currently, the development and manufacturing of ZEV vehicles, components, and refueling equipment are still in their commercial infancy with low volume production levels, small supply networks, and undercapitalization. Nevertheless, some the most successful companies within this nascent sector are located in California and manufacturing of ZEVs, components, and fueling infrastructure are all occurring in our state. In the coming years, expanding the supply chain to meet the growing demand for ZEVs presents a tremendous economic opportunity for California. Reaping the benefits of this growth is a major focus of the executive order, which envisions that steady growth in ZEV and component manufacturing in California will create jobs and opportunities for economic advancement.

Capturing these benefits requires a comprehensive economic development approach in which local, regional, and state governments collaborate with the private sector to grow and sustain the ZEV manufacturing industry in California. Budgetary constraints limit the State's ability to offer public financing and economic development incentives, so these must be carefully targeted in order to attract and retain manufacturing facilities. Ongoing public support for research, development and demonstration of emerging ZEV technologies will help make California the innovation epicenter of

[5] Next 10 and Collaborative Economics (2011) "Powering Innovation: California is Leading the Shift to Electric Vehicles from R&D to Early Adoption" (http://www.next10.org/powering-innovation-california-leading-shift-electric-vehicles-rd-early-adoption)

the growing ZEV industry. California's universities, community colleges and labor organizations will also play a critical role by preparing workers to fill jobs that develop in this industry.

Strategies and Actions

Strategy: Target incentives at "sweet spots" in emerging ZEV supply chain where CA has advantages and job creation is greatest.

- Conduct supply chain assessment and develop strategic plan. (CARB, 2013)
- Develop proactive outreach program to attract companies in targeted segments of the supply chain. (ongoing)

Strategy: Refine and expand tools to support ZEV business attraction, retention, and expansion.

- Provide appropriate support to ZEV-related companies that encounter challenges with state-required permitting for their facilities and operations. (GO-BIZ, ongoing)
- Identify pre-permitted facilities that can be quickly repurposed for ZEV and component manufacturing (an approach that resulted in Tesla Motors locating its manufacturing facility at Fremont's former NUMMI plant). State agencies are developing a web based platform that will allow local communities to showcase "shovel ready" permitted sites that are available for development. (Governor's Office of Business and Economic Development (GO-BIZ), 2012)
- Continue funding support to California companies for the development of ZEV manufacturing. AB 118 funding, the State's Sales Tax Exemption for green manufacturing equipment (SB 71), the US Department of Energy Alternative Technology Vehicle Manufacturing loan programs (AVTM), and other sources of public capital and incentives have been invaluable to ZEV manufacturing to date. Public and private sources of capital must be identified. This action includes exploring reauthorization of AB 118 funding, which is set to expire in 2015. (CAEATFA, CEC ongoing)

Strategy: Support demonstration and commercialization of ZEV-related technologies by California companies.

- Ensure that Electric Program Investment Charge (EPIC) funds can be directed to RD&D for PEV technologies. (CPUC/CEC/GO-BIZ, 2013)
- Provide funding for ZEV demonstration and commercialization projects. CEC has provided grants to companies through the AB118 Program, so continued funding requires reauthorization of AB 118 or use of an alternative revenue source. (CEC/Governor's Office, ongoing)
- Advance the state's I-HUB Regional Innovation cluster program to support transfer of knowledge between national labs, academia and industry. This program, which identifies

geographic hubs or partnership between these institutions, serves to facilitate discovery and tech transfer. (GO-BIZ, ongoing)

Strategy: Support R&D activities at California universities and research institutions.

- Ensure funding for ZEV research. Research funding has been primarily provided through AB 118 funding, so continued research funding requires reauthorization of AB 118 funding or use of an alternative revenue source. Other funding for applied research and development and technology demonstration and deployment may be available through the EPIC program (CEC/Governor's Office, ongoing)

- Develop and evaluate advanced technologies and methods for the safe and efficient recycling of battery packs from plug-in electric vehicles. (CEC, 2012)

Strategy: Prepare California workers to participate in ZEV related jobs.

- 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 incumbent and new workers. Coordinate efforts with the CEC to support the funding of workforce training, including the use of the AB 118 Program. (ETP, ongoing)

- Provide opportunities for Local Workforce Investment Boards and Community College programs to develop and implement job training programs in the ZEV sector, including contracting with the Employment Training Panel to fund workforce training programs. (ETP, ongoing)

- Support training partnerships between business and state educational institutions and link employers to existing training programs to ensure their employees acquire requisite skills as they are needed. (ETP, ongoing)

- Encourage companies that are active in building ZEV infrastructure to partner with community colleges on training. (CPUC, ongoing)

Appendix A

EXECUTIVE ORDER B-16-2012
MARCH 23, 2012

WHEREAS California is the nation's largest market for cars and light-duty trucks; and

WHEREAS the transportation sector is the biggest contributor to California's greenhouse gas emissions and accounts for approximately 40 percent of these emissions; and

WHEREAS California should 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; and

WHEREAS California is a leader of technological innovation, including the innovation necessary to produce commercially successful zero-emission vehicles; and

WHEREAS California attracts over half of the nation's venture capital for clean technology and ranks high among the states in the number of workers and facilities supporting the clean-car industry; and

WHEREAS California is leading the nation in enacting laws and establishing policies and programs that are reducing greenhouse gases, protecting air and water quality, promoting energy diversity and supporting low-carbon alternative fuel technologies; and

WHEREAS zero-emission vehicles provide multiple benefits in addition to reducing greenhouse gas emissions, such as reducing conventional pollutants, operating quietly and cleanly, allowing home refueling and lowering operating and fuel costs; and

WHEREAS California should support and encourage car manufacturers' plans to build and sell tens of thousands of zero-emission vehicles in California in the coming years.

NOW, THEREFORE, I, Edmund G. Brown Jr., Governor of the State of California, do hereby issue the following orders to become effective immediately:

IT IS HEREBY ORDERED that all State entities under my direction and control support and facilitate the rapid commercialization of zero-emission vehicles.

IT IS FURTHER ORDERED that the California Air Resources Board, the California Energy Commission, the Public Utilities Commission and other relevant agencies work with the Plug-in Electric Vehicle Collaborative and the California Fuel Cell Partnership to establish benchmarks to help achieve by 2015:

- The State's major metropolitan areas will be able to accommodate zero-emission vehicles, each with infrastructure plans and streamlined permitting; and
- The State's manufacturing sector will be expanding zero-emission vehicle and component manufacturing; and
- The private sector's investment in zero-emission vehicle infrastructure will be growing; and
- The State's academic and research institutions will be contributing to zero-emission vehicle research, innovation and education.

IT IS FURTHER ORDERED that these entities establish benchmarks to help achieve by 2020:

- The State's zero-emission vehicle infrastructure will be able to support up to one million vehicles; and
- The costs of zero-emission vehicles will be competitive with conventional combustion vehicles; and
- Zero-emission vehicles will be accessible to mainstream consumers; and
- There will be widespread use of zero-emission vehicles for public transportation and freight transport; and
- Transportation sector greenhouse gas emissions will be falling as a result of the switch to zero-emission vehicles; and
- Electric vehicle charging will be integrated into the electricity grid; and
- The private sector's role in the supply chain for zero-emission vehicle component development and manufacturing State will be expanding.

IT IS FURTHER ORDERED that these entities establish benchmarks to help achieve by 2025:

- Over 1.5 million zero-emission vehicles will be on California roads and their market share will be expanding; and
- Californians will have easy access to zero-emission vehicle infrastructure; and
- The zero-emission vehicle industry will be a strong and sustainable part of California's economy; and
- California's clean, efficient vehicles will annually displace at least 1.5 billion gallons of petroleum fuels.

IT IS FURTHER ORDERED that California target for 2050 a reduction of greenhouse gas emissions from the transportation sector equaling 80 percent less than 1990 levels.

IT IS FURTHER ORDERED that California's state vehicle fleet increase the number of its zero-emission vehicles through the normal course of fleet replacement so that at least 10 percent of fleet purchases of light-duty vehicles be zero-emission by 2015 and at least 25 percent of fleet purchases of light-duty vehicles be zero-emission by 2020. This directive shall not apply to vehicles that have special performance requirements necessary for the protection of the public safety and welfare.

This Order is not intended to, and does not, create any rights or benefits, substantive or procedural,

enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

I FURTHER DIRECT that as soon as hereafter possible, this Order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this Order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 23rd day of March 2012.

EDMUND G. BROWN JR.
Governor of California

Appendix B

ADDITIONAL INFORMATIONAL RESOURCES

State Government Resources:

- California Air Resources Board Advanced Clean Cars Program http://www.arb.ca.gov/msprog/consumer_info/advanced_clean_cars/consumer_acc.htm
- California Department of General Services Executive Order B-16-12 Implementation Plan: http://www.dgs.ca.gov/ofam/Programs/FARS/AFVP.aspx
- California Energy Commission "Drive" website: http://www.energy.ca.gov/drive/
- California Heavy Duty Vehicle Incentive Program: http://www.californiahvip.org/
- "Drive Clean" Plug-In Electric Vehicle Resource Center: http://www.driveclean.ca.gov/

California Fuel Cell Partnership:

- Website: http://cafcp.org/
- A California Road Map: Bringing Hydrogen Fuel Cell Electric Vehicles to the Golden State http://cafcp.org/sites/files/20120720_Roadmapv(Overview)_0.pdf
- Frequently Asked Questions: http://cafcp.org/sites/files/20110825_factbooklet.pdf

California Plug-in Electric Vehicle Collaborative:

- Website: http://www.evcollaborative.org/
- A Community Toolkit for Plug-in Electric Vehicle Readiness http://pevcollaborative.org/toolkit#overlay-context=toolkit
- Streamlining the Permitting and Inspection Process for Plug-in Electric Vehicle Home Charger Installations Report http://www.evcollaborative.org/sites/all/themes/pev/files/PEV_Permitting_120827.pdf
- Accessibility and Signage for Plug-In Electric Vehicle Charging Infrastructure Report http://www.evcollaborative.org/sites/all/themes/pev/files/PEV_Accessibility_120827.pdf
- Maps and Apps, Today's Mapping and Location-Based Services for Plug-In Electric Vehicle Charging Infrastructure Report http://www.evcollaborative.org/sites/all/themes/pev/files/PEV_Maps_Apps_120827.pdf
- PEV Communication Guides http://www.evcollaborative.org/policy-makers

Additional Resources:

- Clean Vehicle Rebate Project http://energycenter.org/index.php/incentive-programs/clean-vehicle-rebate-project
- Next 10 and Collaborative Economics (2011) "Powering Innovation: California is Leading the Shift to Electric Vehicles from R&D to Early Adoption" http://www.next10.org/powering-innovation-california-leading-shift-electric-vehicles-rd-early-adoption