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California's Zero Emission Program: Reducing Emissions and Promoting Advanced Vehicle Technologies

Elise Keddie[1], Anna Wong, Craig Childers, Krista Eley, Analisa Bevan
[1]*California Air Resources Board, P.O. Box 2815, Sacramento CA 95812, ekeddie@arb.ca.gov*

Abstract

The California Air Resources Board (ARB) adopted an ambitious program in 1990 to significantly reduce the environmental impact of light-duty vehicles through the gradual introduction of zero emission vehicles (ZEV) into the California fleet. The ZEV regulation, which affects passenger cars and light-duty trucks, remains critically important to California's efforts to meet health based air quality goals. More recently, the program's goals have evolved to also include paving the way for achieving California's long term climate change emission reduction goals. For these reasons, California remains committed to the commercialization of ZEV technologies. The regulatory amendments adopted in January 2012 focus the regulation on technologies needed to meet California's 2050 greenhouse gas goals, simplify the regulation where possible, and increase the requirement for 2018 and subsequent model years. Projected compliance with the 2018 through 2025 requirements will result in around 1.4 million ZEVs and plug-in hybrid electric vehicles operating in California.

Keywords: California, policy, regulation, ZEV

1 Background

In 1990, the California Air Resources Board (ARB or Board) adopted an ambitious program to dramatically reduce the environmental impact of light-duty vehicles (LDV) through the gradual introduction of zero emission vehicles (ZEV) into the California fleet as part of the original Low Emission Vehicle (LEV I) program. The ZEV program, which affects passenger cars (PC) and light-duty trucks (LDT), has been adjusted five times since its inception - in 1996, 1998, 2001, 2003, and 2008, to reflect the pace of ZEV development and the emergence of new ZEV and ZEV-like technologies.

Manufacturers originally pursued the development of battery electric vehicles (BEV) to meet the ZEV requirements. In 1996, ARB eliminated the requirements for the 1998 through 2002 model years due to cost and performance issues, to allow additional time for battery research and development. ARB entered into memorandums of agreement (MOA) with vehicle manufacturers to place, in California, roughly 1,800 advanced-BEVs between 1998 and 2000. The agreements were designed to provide battery developers with the necessary initial production volumes to meet the cost and performance goals needed for begin early commercial production. Although advanced battery costs remained too high for commercial viability, several manufacturers continued to place a modest number of BEVs beyond the MOA volumes. These vehicles earned ZEV credits that have been used for compliance with the regulation.

Development of hydrogen fuel cell vehicles (FCV) in the late 1990s as an alternative to BEVs resulted in changes to the ZEV regulation in 2003 which provided new incentives for FCVs, resolved legal challenges, and addressed the state of technology at that time.

2 Program Compliance

An automobile manufacturer's ZEV obligation, in the form of a credit requirement, is determined by how many vehicles it sells in California. Each vehicle produced by a manufacturer is given a credit value, where ZEVs typically earn more

credits than near-zero emission vehicles. The largest manufacturers must produce pure ZEVs (BEVs and/or FCVs). Additionally, manufacturers may produce other near-zero emission vehicles, like plug-in hybrids, conventional hybrids and clean gasoline vehicles, in lieu of ZEVs, to offset some of their overall requirement.

Ten other states (Connecticut, Maine, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Rhode Island, and Vermont) have adopted California's ZEV regulation, requiring manufacturers to place ZEVs and near-zero emission vehicles in those states in addition to California.

The ZEV regulation has been successful: Partial Zero Emission Vehicles (PZEV, a gasoline vehicle meeting stringent exhaust and evaporative emission standards), and conventional hybrid electric vehicles (HEV) have reached commercialization. Over 1.7 million PZEVs and nearly 400,000 HEVs have been produced for sale in California. In addition, more than 28,000 neighborhood electric vehicles, 5,200 BEVs, and 350 FCVs have been placed in California through 2010.

3 Direction for Revisions

Staff received direction at the 2008 ZEV regulatory amendments hearing to redesign the program requirements for 2015 and beyond, strengthening the requirement and focusing on zero emission technologies, to ensure California as the central location for advanced, low greenhouse gases (GHG) technology vehicles from the demonstration phase to commercialization.

In 2009, staff undertook an assessment of ZEV technologies, an analysis of pathways to meeting California's long term 2050 GHG reduction goals in the LDV subsector and a review of current and possible future complementary policies that would be needed to aid in infrastructure development and market pull policies for ZEVs. Staff presented its findings [1,2] at the December 2009 Board Hearing. At the December hearing, the Board reaffirmed its direction to meet California's long term air quality and climate change reduction goals through commercialization of low-carbon emitting vehicle technologies. Staff was directed to expand the focus of the ZEV regulation to include GHG emission reductions as well as criteria pollutant reductions, to consider new LEV III GHG fleet standards in revising the ZEV regulatory structure, credit values, and stringency of the current requirements, with a goal of transforming California's light-duty fleet and commercializing low-carbon emitting technologies, such as ZEVs and PHEV in a timeframe sufficient to meet California's 2050 target of an 80 percent reduction in GHG emissions compared to 1990 levels.

4 January 2012 Amendments

The 2012 ZEV Program amendments [3] adopted by the Board include minor corrections and clarifications for requirements through 2017. The changes provide compliance flexibility for manufacturers, adjust credits and allowances for specific technologies, and add a new ZEV category for a BEV with a small non-ZEV fuel auxiliary power unit for limited range extension.

The adopted amendments for 2018 and subsequent model years facilitate the goal to achieve ZEV and transitional zero emission vehicle (TZEV; most commonly a Plug-in HEV) commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions.

4.1 Increased Requirement for 2018 and Subsequent Model Years

The annual compliance requirement is significantly increased which pushes ZEVs and TZEVs to over 15 percent of new sales by 2025. This ensures production volumes are at a level sufficient to bring battery and fuel cell technology down the cost curve and reduce incremental ZEV prices.

4.2 ZEV and Transitional Zero Emission Vehicle (TZEV) Compliance

PZEVs, and advanced technology (AT) PZEVs, such as conventional HEVs, have been removed as compliance options for manufacturers because these technologies are now commercialized and their emissions are better reflected in the LEV III program. However, manufacturers are allowed to use banked PZEV and AT PZEV credits earned in 2017 and previous model years at a discounted rate in 2018 and subsequent model years with restrictions on usage. 2018 and subsequent model year requirements are met with ZEVs and TZEVs.

4.3 Amend Manufacturer Size Definitions, Ownership Requirements, and Transitions

Intermediate volume manufacturer and large volume manufacturer size definitions have been modified to bring all but the smallest manufacturers under the full ZEV requirements by model year 2018. Additional modifications in ownership requirements and transition periods for manufacturers changing size categories result in applying the ZEV regulation to manufacturers representing 97 percent of the LDV market

4.4 Modify Credit System

The system for assigning credit values for ZEVs is now based entirely on range, with 50 mile BEVs earning 1 credit each and 350 mile FCVs earning 4 credits each. The range of credits reflects the utility of the vehicle (i.e. the zero emitting miles it may travel) and its expected timing for commercialization. TZEV credits have been simplified and are based on the vehicle's zero-emission range capability, and ability to perform 10 miles on the more aggressive US06 drive schedule. In addition to simplifying the program, reducing the spread of credits makes the technologies more evenly treated and reduces the variation in compliance outcomes (numbers of vehicles produced to meet the regulation requirements).

4.5 Modify Travel Provision

The Travel Provision allows manufacturers to count vehicles placed in one state to count towards obligations in other ZEV regulation states. The Travel Provision for FCVs is extended indefinitely until sufficient complementary polices are in place in states that have adopted the California ZEV regulation. This will allow FCV technology to continue to mature, and provide time for states to build infrastructure and put in place incentives to foster FCVs. An optional compliance provision has been developed to facilitate early introduction of BEVs into other ZEV states as well as reduce a manufacturer's obllgation in additional states.

4.6 Add GHG-ZEV Over-Compliance Credits

Manufacturers who markedly over comply with the LEV III GHG fleet standard will be allowed to offset a portion of their ZEV requirement in 2018 through 2021 model years only. Although this provision will reduce the number of ZEVs in the 2018 through 2021 period, considerable GHG emission reductions will be achieved.

5 Conclusions

Since its adoption, the ZEV program has pushed the boundaries of ZEV development and emission reduction from cars and trucks, while taking into account the cost, performance, suitability for volume production, and long-term prospects of various technologies. The 2012 amendments to the ZEV regulation will begin a transformation of California's LDV fleet. These amendments focus on technologies that help meet mid- and long-term climate goals, while simplifying the program where needed as much as possible. By requiring increased numbers of ZEVs and TZEVs in the 2018 through 2025 model year timeframe, vehicle costs will decrease due increased production volumes driving down battery and fuel cell costs, which will help these advanced technologies achieve commercial success in the California LDV market.

References

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Authors

Elise Keddie, Anna Wong, Craig Childers, Krista Eley, and Analisa Bevan are employed by the California Air Resources Board, and were instrumental in developing the recent

program amendments. Ms. Wong is lead regulatory staff, Mr. Childers is lead technical staff, Ms. Eley is ZEV Credit Bank Manager, Dr. Keddie is ZEV Implementation Section Manager, and Ms. Bevan is Chief of the Sustainable Transportation Technologies Branch.