State of California
AIR RESOURCES BOARD

Updated Informative Digest

PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CALIFORNIA ZERO-EMISSION VEHICLE REGULATIONS

Sections Affected: Amendments to title 13, California Code of Regulations (CCR), section 1962 and the incorporated "California Exhaust Emission Standards and Test Procedures for 2003 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid-Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes," section 1900(b)(19)-(21), section 1960.1(k), and section 1961(a)(8)(A) and (d).

The Current ZEV Regulations

The California Zero-Emission Vehicle (ZEV) regulations were originally adopted by the Air Resources Board (ARB or Board) in 1990, as part of the first California Low-Emission Vehicle (LEV I) regulations. The ZEV program is an integral part of California's mobile source control efforts, and is intended to encourage the development of advanced technologies that will secure increasing air quality benefits for California now and into the future.

As originally adopted, the ZEV regulations required that specified percentages of the passenger cars and lightest light-duty trucks produced by each of the seven largest auto manufacturers be ZEVs, starting in 1998. The percentages were 2 percent for the 1998-2000 model years and 5 percent for the 2001-2002 model years. A requirement of 10 percent ZEVs applied to all but small-volume manufacturers starting in model-year 2003. The ZEV program also includes a marketable credits system.

In 1996 the ARB modified the regulations to allow additional time for the technology to develop. The requirement for 10 percent ZEVs in model years 2003 and beyond was maintained, but the sales requirement for model years 1998 through 2002 was eliminated. At that same time, the ARB entered into Memoranda of Agreement (MOAs) with the seven largest auto manufacturers. Under the MOAs the manufacturers agreed to place more than 1,800 advanced-battery electric vehicles (EVs) in California in the years 1998 through 2000, and the ARB agreed to work with state and local governments to help develop ZEV infrastructure and remove barriers to ZEV introduction.

As part of the 1998 "LEV II" rulemaking, the ARB provided additional flexibility in the ZEV program by allowing additional types of vehicles to be used to meet program requirements. Under the 1998 amendments, manufacturers may use partial credits of 0.2 or more generated from vehicles with extremely low emissions (referred to as partial ZEV allowance vehicles or

PZEVs) to meet the 10 percent ZEV requirement. For large-volume manufacturers, however, at least 4 percent of the passenger cars and lightest trucks offered for sale in California must be vehicles classified as "full" ZEVs.

Other aspects of the program provide additional options to manufacturers. Auto companies can earn extra ZEV allowances by introducing vehicles before the 2003 model year, thereby reducing their total ZEV obligation. Extra allowance is also available for battery electric vehicles with more than a 100-mile range per charge. Manufacturers may also delay compliance by one year provided they produce two years' worth of ZEVs by the end of the next model year.

Under the current ZEV regulation, ARB staff estimates that approximately 22,000 full function electric vehicles would need to be offered for sale in 2003 to meet a four percent ZEV requirement. However, this total could change significantly, up or down, based on each manufacturer's actual production decisions and their chosen compliance path. As noted above, early ZEV introduction or the use of additional vehicles with extended range would decrease the 2003 obligation. Reduced reliance on PZEVs, on the other hand, would increase the number of ZEVs needed. Widespread use of City EVs or Neighborhood Electric Vehicles (NEVs) also would increase the required number of EVs, because such vehicles earn fewer credits per vehicle than the full function EVs that are the basis of the 22,000 estimate. Staff estimates that, under the current regulations, ZEV production of full function vehicles at the 4 percent level would reach 31,000 in the 2006 model year, and 39,000 in 2008 and beyond.

The 2000 Biennial Review

When the Board adopted the LEV I regulations in 1990, it directed staff to report biennially on the status of technological progress towards meeting the LEV and ZEV requirements. As part of the 2000 Biennial Review, in August 2000 the staff released a Staff Report assessing the technical and economic issues related to ZEVs. Since automakers generally need three years' lead time for production, this most recent biennial review was also the last significant opportunity to assess their readiness for meeting the 2003 requirements.

The staff concluded that ZEVs provide comprehensive environmental, energy and societal benefits. They are the "gold standard" for vehicular air pollution control. They reduce both criteria and toxic pollutant emissions to the maximum feasible levels. High-efficiency ZEVs and hybrid-electric near-ZEVs also cut emissions of carbon dioxide and other greenhouse gases. Finally, ZEVs minimize the multi-media impacts of vehicle operation, eliminating the need for a whole host of upstream petroleum refinery, storage and delivery activities. Admittedly, ZEVs have their own upstream impacts related to power generation and create new waste disposal issues. However, on an overall lifecycle basis, they are environmentally superior to conventional automobiles. Advanced battery ZEVs and hybrid-

electric near-ZEV technologies are also highly efficient, reducing absolute energy demand per mile of vehicle operation. Finally, ZEVs have the potential to be powered by renewable sources of energy such as wind, hydropower or solar energy. The societal benefits of ZEVs include their clean, quiet operation in neighborhoods and on city streets.

The ZEVs available today are battery electric vehicles. Batteries are the single most expensive component of electric vehicles. For that reason, affordable battery packs – both today and when produced in volume – are crucial to achieving a sustainable electric vehicle market. ARB contracted with a team of outside experts to obtain the best available information on battery advances, costs and future trends. The Battery Panel concluded that nickel metal hydride (NiMH) batteries were the most promising advanced technology, having both high performance and the longest useful life. Unfortunately, the Panel also concluded that battery costs are high and will not meet cost-competitive targets for some time. Although volume production will help, a breakthrough is needed to achieve truly affordable NiMH packs.

Today's ZEVs are more costly for manufacturers to make than any other vehicle technology being produced for sale between now and 2003. As noted above, most of that cost differential stems from the battery pack. The cost gap will narrow as technology improves and manufacturers move to volume production. However, there is no getting around the fact that near-term ZEVs will be relatively more expensive to produce. Staff estimates that the incremental costs for ZEVs in 2003 will range from $7,500 for City EVs, up to more than $20,000 for freeway capable ZEVs with advanced NiMH batteries. These calculations exclude the costs incurred for research and development of each ZEV model. Under an optimistic but nonetheless plausible scenario, battery EVs could become cost-competitive with conventional vehicles on a lifecycle cost basis. This scenario assumes volume production of more than 100,000 ZEVs per year.

There is significant disagreement over the extent of market demand for electric vehicles. Manufacturers assert that the lack of leases during the first years when vehicles were available means that the market can only absorb a few hundred ZEVs per year. Electric vehicle advocates and fleet operators point to current waiting lists as evidence of strong customer interest and pent-up demand. Staff views this as the most difficult area in which to develop reliable estimates. The entire market is new and product availability has been constrained such that true consumer interest is exceedingly difficult to gauge.

At its September 7 and 8, 2000 meeting, the Board considered the status of the ZEV program. After hearing extensive testimony and public comment, the Board adopted a resolution affirming that the ZEV program is an essential component of the State's long-term air quality strategy. The Board further resolved that the basic ZEV requirements be retained and implemented in California. Finally, the Board directed staff to develop and propose regulatory modifications and other steps that address the challenges associated with the successful long-term implementation of the ZEV program, and that result in a

sustainable market for ZEVs. In particular, the Board identified the need for near-term product availability and market stability, the need to greatly enhance public education regarding the attributes and benefits of ZEV technologies, and the need to reduce or mitigate the high initial costs of vehicles and batteries in low-volume production.

In preparing proposed amendments in response to the Board's directions, the staff pursued the following objectives:

- Provide incentives for ongoing technology advancement, across a wide variety of vehicle types (both ZEVs and PZEVs).
- Maintain the visibility and momentum of the ZEV program during this period of further development.
- Ensure that an adequate number of battery EVs is available in the near term to explore many different possible market applications.
- Take advantage of the air quality benefits afforded by available PZEV technology.
- Adjust the near term production requirements to better correspond to PZEV availability and the emerging market for ZEVs.

The Adopted Amendments

As ultimately adopted, the amendments include the following elements.

Phase in the Introduction of PZEVs. The amendments establish multipliers that provide extra allowances for PZEVs in the early years. The phase-in level is 25 percent of the current requirement in 2003, 50 percent in 2004, 75 percent in 2005, and 100 percent in 2006. In addition, the existing SULEV intermediate compliance standards apply to all 2005 and earlier model-year PZEVs. Manufacturers are also provided two years to make up a PZEV shortfall rather than the one year allowed under the current regulation.
Phase in the Introduction of ZEVs. Several amendments reduce the number of ZEVs required, especially in the early years of the program. ZEVs introduced before the 2006 model year receive multipliers of 4.0 for the 2001 and 2002 model years and 1.25 for the 2003-2005 model years. Other changes, discussed below, provide larger credits for vehicles with increased range.

The credits earned by Neighborhood Electric Vehicles (NEVs), which have a top speed of no more than 25 miles per hour, are reduced to 0.625 for the 2004 and 2005 model years. For 2006 and subsequent years their credit is further reduced to 0.15.

Increase the Percentage ZEV Requirement in Later Years. The 10 percent ZEV requirement for large and medium-duty manufacturers is ramped up to 11 percent for the 2009-2011 model years, 12 percent for the 2012-2014 model years, 14 percent for the 2015-2017 model years, and 16 percent for 2018 and subsequent model years.

Add LDT2 Vehicles to the Base. The ZEV regulation requires that a certain percentage of manufacturers' sales must be ZEVs. Under the current regulation, the percentage requirement is assessed against passenger cars and "LDT1" vehicles (small light duty trucks). The amendments expand the base to include "LDT2" vehicles. This category includes most minivans, SUVs, and larger pickup trucks. Adding LDT2 vehicles to the base increases the base by a factor of about 70 percent. The adopted amendments expand the program base for all ZEV categories (ZEVs, AT PZEVs, and PZEVs) to include LDT2 vehicles. This expansion is phased in beginning in model year 2007 and concluding in model year 2012.

Allow Advanced Technology Vehicles to Satisfy One-Half of the Pure ZEV Requirement. Under the amendments certain other advanced technologies that are not ZEVs may be used to satisfy up to one half of the "pure ZEV" portion of the ZEV requirement. The qualifying advanced technology vehicles are known as Advanced Technology PZEVs (AT PZEVs), defined as any PZEVs earning an allowance of 0.2 or more, not including the early introduction multiplier. The current mechanism under which a PZEV earning a score of 1.0 is considered a full ZEV allowance vehicle, not subject to the 60 percent limit for PZEV allowances, is eliminated.

Manufacturers that meet an accelerated PZEV phase-in schedule (50 percent of the current requirement in 2003 and 100 percent of the current requirement in 2004) are granted an additional 2 years to make up any shortfall in their use of the Advanced Technology PZEV option in 2003 and 2004.

As the ZEV requirement increases over time starting in the 2009 model year, the portion that can be satisfied by 0.2 allowance PZEVs is held at 6 percent. Thus the pure ZEV portion gradually increases from 4 percent in the 2003 through 2008 model years to 10 percent by 2018. Up to one half of this pure ZEV portion can be satisfied by advanced technologies. The amount that can be offset is 2 percent in the 2003 model year, increasing to 5 percent in 2018.

Modify the ZEV Range Credit. The amendments modify the ZEV range credit to reduce the minimum range needed for multiple credits to 50 miles. As range increases from 50 miles to 275 miles, the credit increases from 1 to 10. Because vehicles with a refueling time of less than 10 minutes earn the maximum credit regardless of range, a hydrogen fuel cell vehicle earns 10 credits, not including any phase-in multiplier.

Provide Credit Multiplier Based on Vehicle Efficiency. The amendments establish an efficiency multiplier for ZEVs and advanced technology PZEVs. All vehicle efficiencies (gasoline, CNG, electric) are converted into the common units of California Miles per Equivalent Gallon (CMPEG). In order to earn any credit, a vehicle must have an efficiency that is at least 50 percent greater than the average for its size class. The multiplier earned is the larger of 1.0 or the vehicle CMPEG divided by the baseline. For ZEVs, the efficiency

multiplier partially replaces the range multiplier on a phased-in basis beginning in 2005. For PZEVs, the efficiency multiplier increases the current scores earned, and takes effect beginning in 2002.

Reduce ZEV Credit Values Over Time. In order to achieve the target number of vehicles established by the Board, the adopted amendments introduce calculation "phasing" factors that vary the effective value of the ZEV range and efficiency multipliers over time. The combined value of these multipliers is gradually reduced, resulting in larger numbers of vehicles in later years.

Restrict The Future Use Of "Banked" Credits Earned By NEVs. NEVs placed in service in 2001 and 2002 earn 4 credits each. To avoid the possibility that manufacturers could place large numbers of NEVs in these early years and thereby amass enough credits to avoid producing ZEV program vehicles for a number of years, the adopted amendments cap the use of such credits in future years. NEV credits earned in prior years can only be used to satisfy 75 percent of a manufacturer's ZEV obligation in 2006 and 50 percent in 2007 and beyond. This will ensure that some new product is available in the marketplace in each year. The imposition of the cap is delayed until 2006 to allow manufacturers sufficient lead time to make any necessary adjustments in their product planning.

Provide Additional Credits for a Vehicle In California Service for More Than Three Years with an Extended Battery/Fuel Cell Stack Warranty. Under the adopted amendments a manufacturer receives a credit of 0.1 times the credit value of a similar new vehicle in that year, for each year that a vehicle remains in service in California past three years with extended warranty coverage on the battery or fuel cell stack. The credit is earned at the end of the year of service, and is available for use in the following year.

Increase the Advanced ZEV Componentry Allowance for PZEVs, and Provide More Specific Criteria. The current regulation provides an allowance of 0.1 for vehicles that do not qualify for a zero-emission VMT allowance but are equipped with advanced ZEV componentry, and provides only general guidance as to how a vehicle qualifies for this allowance. Under the adopted amendments there are three alternative paths that manufacturers can use to calculate the allowance, based on (1) CO_2 savings, (2) vehicle efficiency, or (3) the percent of peak power that comes from the battery. The allowance is no longer a fixed 0.1 but rather can vary based upon the characteristics of the vehicle. The adopted amendments also provide an additional allowance of 0.1 for vehicles that use gaseous or hydrogen fuel storage.

Provide Allowances For Vehicles Placed In An Approved Demonstration Program. Under the adopted amendments vehicles placed in advanced technology demonstration programs (e.g., Fuel Cell Partnership vehicles) may earn ZEV allowances even if they are not "delivered for sale."

Provide Incentives for Vehicles Placed in "Transportation Systems". At the January hearing the Board directed staff to enter into an implementation partnership to encourage the placement of vehicles in "transportation systems". Such projects typically involve integration of shared vehicle use and transit systems, and thereby reduce congestion and emissions, and increase energy efficiency. Under the adopted amendments additional ZEV credit is available for vehicles placed in projects that involve shared vehicle use, intelligent technologies such as automated billing and keyless entry, and linkage to transit systems.

Require Vehicle Placement In Order To Earn Multiple Allowances. Under the adopted amendments, ZEVs that are "delivered for sale" but not actually placed in service do not earn early introduction multipliers. The full set of multiple allowances is only available to vehicles that are actually placed in service in California. To earn multiple allowances, manufacturers are required to certify to the Executive Officer the number of vehicles placed in service during the course of the model year.

Change the Base Year Used To Determine the ZEV Obligation. Under the current regulation, the ZEV obligation for a manufacturer in a given model year is based on the number of passenger cars and light-duty trucks sold in that same model year. In order to provide greater certainty, the adopted amendments use vehicle sales in prior years to determine manufacturers' ZEV obligations, and freeze the volume number for three years at a time. (Manufacturers retain the option to use the original "current year sales" method if they so choose). This change is limited only to the determination of the sales volume against which the ZEV percentage requirements are assessed in a given year. It does not affect the determination of manufacturer status (large vs. intermediate vs. small), which is handled separately.

Changes Pertaining To Manufacturer Categories. The adopted amendments increase the maximum size cut-off for an intermediate volume manufacturer from 35,000 to 60,000 new light- and medium-duty vehicles per model year. When a manufacturer transitions from intermediate to large volume manufacturer, there is no "pure" ZEV obligation for the manufacturer until the sixth model year after three consecutive model years over the large manufacturer threshold. An independently owned manufacturer with California sales of light- and medium-duty vehicles not exceeding 10,000 per year is not be subject to the ZEV requirement.