# Air Resources Board

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October 16, 2000 Mail Out #MSC-00-23

TO: ALL INTERESTED PARTIES

SUBJECT: PUBLIC WORKSHOP TO DISCUSS ISSUES RELATED TO THE ZERO EMISSION VEHICLE REGULATIONS:

AGENDA AND BACKGROUND MATERIAL

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At its September 7 and 8 meeting, the Air Resources Board considered the status of the Zero Emission Vehicle (ZEV) program. After hearing extensive testimony and public comment, the Board by unanimous vote 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 response to the Board's directive, staff is developing recommendations to be brought before the Board at a January 25, 2001 public hearing. As a first step in developing possible regulatory changes, staff is holding a workshop to outline issues under consideration and receive public comment. The details of the workshop are as follows:

October 25, 2000
9:00 AM to 5:00 PM
Air Resources Board
Annex IV
9530 Telstar Avenue
El Monte, California

The agenda for the workshop and related background material are attached.

Please note that the October 25 workshop will focus on possible changes to the zero emission vehicle regulation. Other, non-regulatory measures such as incentives, public education, or market development will be addressed separately. Additional information regarding the development and consideration of such non-regulatory measures will be provided as it becomes available.

At the prior Year 2000 Biennial Review workshops held in March and May, staff's goal was to develop comprehensive background information. Therefore the agenda focused on factual topics (e.g. battery technology, cost, environmental impact), and speaker presentations were oriented towards improving the factual base being assembled for the Board's review. As we now enter into the next phase of the process--the development of recommended changes--staff's focus has shifted to the consideration of issues rather than the description of the current state of technology. Therefore at the upcoming October 25 workshop staff intends to encourage discussion rather than formal presentations. Each of the topics outlined on the attached background document will be addressed in turn, and participants will have the opportunity to comment in a roundtable fashion. Those interested in providing formal statements on any of the agenda topics, or other matters, are encouraged to submit such statements in writing prior to or at the workshop, or contact staff directly to discuss setting up a separate meeting.

If you have any questions regarding this workshop please feel free to contact Mr. Chuck Shulock at 916-322-6964 or cshulock@arb.ca.gov.

Sincerely,

//s//

Robert H. Cross, Chief
Mobile Source Control Division

Attachments

**DRAFT AGENDA**

**PUBLIC WORKSHOP**

**ISSUES RELATED TO THE**
**ZERO EMISSION VEHICLE PROGRAM REGULATIONS**

October 25, 2000
9:00 AM to 5:00 PM
Air Resources Board
Annex IV
9530 Telstar Avenue
El Monte, California

I. Welcome and Introduction

II. Staff PZEV Phase-In Proposal

III. Other Regulatory Issues

- A. ZEV Production Levels
- B. Credit Structure--Vehicles
- C. Credit Structure--Other Areas
- D. Overall ZEV Requirement

IV. Conclusion and Next Steps

October 16, 2000

# BACKGROUND INFORMATION

# PUBLIC WORKSHOP

# ISSUES RELATED TO THE ZERO EMISSION VEHICLE PROGRAM REGULATIONS

At its September 7 meeting, the Air Resources 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. Staff is seeking comment on whether the current ZEV requirement should be changed to reduce the cost of implementation and increase the availability and use of zero and near-zero emission vehicles. To that end staff is interested in obtaining comment on a menu of compliance options that will accelerate the program towards greater customer and market acceptance.

This background document focuses on issues related to possible regulatory changes. Other, non-regulatory measures (such as incentives, public education, or market development) will be addressed separately.

In developing possible regulatory changes, staff will consider modifications that allow the ZEV program to better achieve the following objectives that were outlined by the Board:

- Enhance environmental protection
- Maintain a “true” zero emission vehicle component, increasing over time
- Encourage advanced propulsion technologies
- Provide a market opportunity for today’s zero emission vehicles
- Address cost to manufacturers
- Communicate a clear, consistent message

This document first provides general background information regarding the ZEV program. It then describes a specific staff proposal regarding a phase-in period for the 6 percent PZEV option. Finally, it outlines a number of issues that must be addressed as staff moves forward to develop other possible regulatory changes. Staff is seeking public comment on all of these matters.

## I. PROGRAM BACKGROUND

The ZEV requirement applies to large and intermediate volume manufacturers (defined in II.D.3 below). Beginning in model year 2003, at least 10 percent of the passenger cars and light duty trucks below 3,750 pounds gross vehicle weight produced and delivered for sale in California by large and intermediate volume manufacturers must be

ZEVs. An intermediate volume manufacturer may meet this ZEV requirement entirely with partial ZEV allowance vehicles or credits generated by such vehicles. A large volume manufacturer must meet at least 40 percent of its ZEV requirement with pure ZEVs, full ZEV allowance vehicles, or credits generated by such vehicles. Large volume manufacturers may, at their option, meet the remaining 60 percent of their ZEV requirement with partial allowance vehicles or credits generated by such vehicles. A small volume manufacturer is not required to meet the percentage ZEV requirements, but may earn and market credits for the ZEVs or ZEV allowance vehicles it produces and delivers for sale in California.

## II. PZEV PHASE-IN

Under LEV II, ZEV-like vehicles may qualify to earn a ZEV allowance of between 0.2 and 1.0 per vehicle. Vehicles that qualify for a ZEV allowance of 1.0 are known as full ZEV allowance vehicles. Vehicles that qualify for a ZEV allowance of between 0.2 and 1.0 are known as partial ZEV allowance vehicles, or PZEVs.

Large automakers must meet at least 40 percent of their ZEV requirement with pure ZEVs, full ZEV allowance vehicles, or credits generated by either of these vehicle types. They may meet the remaining 60 percent of their overall ZEV requirement with PZEVs earning ZEV allowances of less than one.

To earn a ZEV allowance for a vehicle, the manufacturer must, at a minimum, meet the following baseline PZEV requirements:

- Certify vehicle to 150,000 mile SULEV emission standards
- Certify vehicle to zero evaporative emission standards
- Certify vehicle to meet OBD II requirements for SULEVs, and
- Extend performance and defects warranty to 15 years/ 150,000 miles

Vehicles that meet all of these minimum or “baseline” requirements earn a 0.2 PZEV allowance. Since ARB regulations do not specify particular fuel or propulsion technologies, there is a wide variety of potential vehicle fuel and drive system combinations that may qualify for PZEV allowance in the coming years. The overall ZEV allowance assigned to a vehicle is the sum of 3 individual assessments:

- Baseline (minimum) PZEV allowance 0.2
- Zero emission vehicle miles traveled (VMT) allowance or Advanced Componentry 0.0 to 0.6
- Low fuel cycle emissions allowance 0.0 to 0.2

Staff has determined that modifications to the PZEV portion of the regulation are needed to allow manufacturers to take greater advantage of this option in 2003 and 2004. Development of vehicles able to meet the PZEV requirements is an engineering

challenge, in particular given the relatively large number of vehicles that must be produced. Staff is concerned that leaving the PZEV option intact in its current form would preclude most manufacturers from fully using this option. A phase-in also is more consistent with regulatory implementation schedules for previous regulatory requirements.

Staff therefore intends to propose modifications that will allow manufacturers with aggressive PZEV programs to take full advantage of the 6 percent PZEV option beginning in 2003. Specifically, staff proposes to retain the option that PZEV credits can satisfy 60 percent of the 10 percent ZEV requirement, but phase in the number of vehicles needed to fully take advantage of this option. Specifically, staff proposes a "40-80-100" phase-in, which will reduce the number of vehicles required to 40 percent of the former required level in model year 2003, and 80 percent of the former required level in model year 2004. The current required level would remain unchanged for model years 2005 and beyond. This phase in concept is consistent with the approach used in many other vehicle control regulations.

In addition, staff proposes to provide intermediate in-use compliance standards for early PZEVs, by extending the existing SULEV intermediate compliance standards to apply to PZEVs certified in model years prior to 2006.

Staff seeks comment on these proposals, as well as suggestions for other possible modifications that would allow manufacturers to take greater advantage of the PZEV option in early years or that address other PZEV issues.

## III. OTHER REGULATORY ISSUES

### A. ZEV Production Levels

To provide a context for the Board's evaluation of the ZEV program, staff developed a "base case" estimate of the number of ZEVs that the large manufacturers must produce in 2003 in order to satisfy the 4 percent ZEV requirement. The base case number is lower than a true 4 percent because of the availability and use of multiple credits for pure ZEV or ZEV allowance vehicles. Due to trade secret considerations this estimate does not rely on any confidential information provided in the manufacturer product plans. Instead, it was calculated using publicly available information. Under the base case, the large manufacturers would need to produce about 22,000 vehicles in 2003 to meet the 4 percent requirement. This corresponds to about 2.3 percent of the passenger car and light duty truck production of the affected manufacturers. (Staff notes that this base case estimate is subject to considerable uncertainty due to the possible effect of early introduction, differing mixes of vehicle types, and other factors.)

Looking at the cumulative effect of the program over time, the regulation requires placements in 2004 and 2005 equivalent to those in 2003, and a greater number in

2006 and beyond as multiple credits begin to be phased out. Again using our base case assumptions, the required number of vehicles in 2006 is about 31,000 for a 4 percent requirement, and about 78,000 to meet 10 percent. Thus over the 4 year period from 2003 through 2006, the base case estimate of the total cumulative number of vehicles ranges from about 100,000 (4 percent) to about 250,000 (10 percent).

The Staff Report for the September 7 Board meeting presented incremental cost estimates for a wide variety of vehicle types. That report concluded that for 2003, battery EVs will be significantly more expensive than conventional vehicles on both an initial and lifecycle cost basis. This holds true even under alternative scenarios with increased battery life and increased gasoline price. Thus in the early years of the program there will be a significant cost increment associated with ZEV production. This conclusion was based in part on the findings of the Battery Technology Advisory Panel, which developed information on battery performance, cost and availability.

Meanwhile, there is uncertainty regarding customer demand for electric vehicles. The market is new and product availability has been constrained such that true consumer interest is exceedingly difficult to gauge. In order to have successful ramp up, vehicle production should not outpace the available market.

At the September 7 meeting, the Board directed staff to explore options that reduce the cost of the program and ensure successful implementation. One relevant factor is the number of vehicles that must be produced. Fewer vehicles would result in lower costs, although it must also be recognized that smaller production runs for vehicles and batteries will somewhat increase the cost on a per vehicle basis. Fewer vehicles likewise would result in easier placement, but at the expense of product visibility and customer awareness.

Several factors thus must be taken into account in determining ZEV production levels, including at a minimum the Board's directive to allow for a full exploration of the market, the cost of ZEV production to manufacturers and consumers, and the degree to which the market will absorb vehicles in the early years.

Given all of the above, staff raises the following issues with regard to production levels:

What is the appropriate number of vehicles to require to be produced in 2003 and subsequent years? Are there other factors that should be considered in arriving at required production levels?

Should additional credits be provided to encourage production of vehicles prior to 2003? If so, to what extent?

Should the ZEV percentage requirement increase over time? If so, over what timeframe (2015, 2020?) and to what extent?

## B. Credit Structure--Vehicles

Under the current regulation, manufacturers can earn "multipliers" for vehicles with extended range, with additional allowances for vehicles delivered prior to 2003. Taken together these two factors can result in up to 10 allowances per vehicle for vehicles delivered in MY 1999 and 2000. Specifically, each ZEV and full ZEV allowance vehicle that is produced and delivered for sale in California in the 1999 to 2007 model years, and that has an extended electric range, qualifies for a ZEV multiplier as shown below. These multipliers are based on range alone and are not dependent on the type of battery or the battery specific energy.

| All-electric range | MY 1999-2000 | MY 2001 -2002 | MY 2003-2005 | MY 2006-2007 |
|---|---|---|---|---|
| 100-175 miles | 6-10 | 4-6 | 2-4 | 1-2 |

In addition to the multipliers discussed above, ZEV credits "banked" in a prior year have greater value when "cashed" in a subsequent year, based on the relative values for the NMOG fleet average for the years in question. Under this provision, for example, ZEV credits earned in 1999 are multiplied by 1.82 if used in 2003, and credits earned in 2000, 2001 and 2002 are multiplied by 1.18, 1.13, and 1.1 respectively.

Staff is evaluating issues regarding several aspects of the credit mechanism, as follows:

1. Vehicle Range

   As noted above, the regulation provides multiple credits for vehicles with a range greater than 100 miles.

   Should the credit multiplier for greater vehicle range be retained? If so, what should be the minimum range necessary to earn multiple credits, and how "steep" should the multiplier be?

2. Vehicle Type

   There are several different types of battery electric vehicles being developed by manufacturers, including Neighborhood Electric Vehicles (NEVs), City Electric Vehicles, and full function electric vehicles. At present, the regulation does not differentiate among such vehicle types, other than via the extra credit for range greater than 100 miles (which currently would only be earned by certain full function vehicles).

   Should the regulation discriminate among these various types of zero emission vehicles?

Should the existing credit for NEVs be reduced or eliminated? If so, to what extent and over what timeframe?

Should additional credits be granted for City EVs and/or full function vehicles? If so, how should such credits be calculated?

Should other measures (caps, percentage limitations) be used to limit the portion of the ZEV requirement that can be met by NEVs or City EVs?

3. Advanced Propulsion Technologies

The credit system for assigning PZEV credit is described above. Staff notes that under the PZEV credit structure, most manufacturers are likely to fully satisfy the 6 percent option using 0.2 credit PZEV SULEV vehicles. As a result, there is little incentive provided in the credit structure for manufacturers to produce other technologies that would earn higher PZEV scores. Such advanced technologies include reformer-based fuel cell vehicles, grid connected hybrid vehicles, CNG or hydrogen fueled ICE vehicles, and power assist hybrids.

Should the credit structure be modified to further encourage such advanced propulsion technologies? If so:

Which technologies (vehicles with all electric range; vehicles with low fuel cycle emissions; fuel cell vehicles specifically; any vehicle with PZEV score greater than 0.2; etc.)?

How should any greater credit be provided (larger credits; allow all or a portion of the credit to count towards the 4 percent requirement)?

Over what timeframe should any such credits be granted?

4. Vehicle Efficiency

Increased vehicle efficiency has many benefits, including reduced fuel consumption (with correspondingly reduced upstream emissions), reduced greenhouse gas production, and—for battery vehicles—the ability to get the same range with a smaller and less expensive battery pack. The current regulation does not directly address vehicle efficiency.

Should additional credits be granted for vehicles with high efficiency? If so, how should such credits be calculated?

5. Battery Life/Battery Warranty

In its report, the Battery Technology Advisory Panel noted that the life of lead-acid batteries remains a serious concern because the high cost of battery replacement might well offset the advantage of any reduced costs. The Panel also found that nickel-metal hydride (NiMH) batteries have demonstrated promise to meet the power and endurance requirements for electric-vehicle propulsion, and that bench tests and recent technology improvements in charging efficiency and cycle life at elevated temperature indicate that NiMH batteries have realistic potential to last the life of an EV, or at least ten years and 100,000 vehicle miles.

Such performance has not yet been proven in real world applications, however, and in our base case estimates staff assumed a 6 year life for NiMH batteries in the 2003 time frame. Thus it is likely (for NiMH) and certain (for lead acid) that early vehicles will require a replacement battery pack at some point. Given this situation:

Who should be responsible for paying the cost of battery replacement--the manufacturer or the consumer?

Should manufacturers be granted additional credit if they warrant the battery for the useful life of the vehicle? If so, how much?

## C. Credit Structure--Other Areas

### 1. Vehicle Placement

Under the current regulation, credit is earned when a vehicle is produced and offered for sale in California. Thus there is no requirement that the vehicle be leased or sold.

Should additional credit be granted for vehicles that are actually placed in service, as opposed to “produced and offered for sale”? Should additional credit be granted for vehicles placed early in the model year? If so, how should such credits be calculated?

### 2. Infrastructure Development

For vehicles using alternative fuels, the availability of fueling infrastructure has an effect on customer confidence and hence customer demand.

Should manufacturers that take extra measures to ensure that infrastructure is available for their customers receive extra credit? If so, how should such credit be calculated?

3. Transportation Programs

Some manufacturers have indicated that the best use of current BEV technology is as part of a larger transportation system, rather than as a stand-alone replacement for a customer's own vehicle.

Should additional credit be granted for manufacturers that place vehicles in broader transportation programs (e.g. station car applications or Intelligent Transportation System approaches)? If so, how should such credit be calculated? Can station car programs play a role in accelerating and expanding market acceptance of ZEVs?

## D. Overall Requirement

1. Percentage Requirements

At present, vehicles earning PZEV credits of 1.0 are termed "full ZEV allowance vehicles", and credits earned by such vehicles can be used to satisfy the ZEV requirement.

Should a portion of the ZEV requirement be set aside that can only be satisfied by pure zero emission vehicles (at present, battery electric vehicles and hydrogen fuel cells)? In other words, should the "full ZEV allowance vehicle" concept be modified or eliminated?

2. Vehicle Weight Classifications

Under the current regulation, the 10 percent requirement applies to passenger cars and light duty trucks below 3750 pounds gross vehicle weight. Much of the growth in the consumer market in recent years has been in the next heavier vehicle class (LDT2), which includes many of the popular vans and sport utility vehicles.

Should credits earned by vehicles in the LDT2 and heavier weight classes be eligible to apply against the existing ZEV requirement?

3. Manufacturer Volume Classifications

For purposes of classification for 2003, small volume manufacturers are defined as those with California sales below 4,500 per year, using the average number of vehicles sold over the preceding three years. Small volume manufacturers are not subject to the ZEV requirement. Based on current production and sales data, ARB staff expects the small volume manufacturers in MY 2003 to be Dae Woo, Ferrari, GFI, Lamborghini, Lotus, Porsche, Rolls Royce, Saab, and Suzuki.

Intermediate volume manufacturers are defined for 2003 as those with California sales between 4,501 and 35,000 light and medium duty vehicles per year, again averaged over the preceding three years. Based on the same data, ARB staff expects the intermediate volume manufacturers in MY 2003 to be BMW, Subaru (Fuji), Hyundai, Isuzu, Jaguar, Kia, Mazda, Mitsubishi, Rover, Volkswagen, and Volvo.

Large volume manufacturers are defined as those that are not small volume manufacturers or intermediate volume manufacturers. Based on the same data, ARB staff expects the large manufacturers in MY 2003 to be DaimlerChrysler, Ford, GM, Honda, Nissan, and Toyota.

Should the minimum volume thresholds that trigger “intermediate” and “large” manufacturer status for the ZEV program be changed, or increased? If so, to what levels?

4. Federal Motor Vehicle Safety Standards

Should full compliance with FMVSS requirements be necessary in order for a vehicle to earn ZEV credit (e.g. no waivers)?

5. Biennial Review

Currently the Board conducts a Biennial Review of the ZEV program. Staff is concerned that this requirement has interfered with the orderly growth of the ZEV market, because of the uncertainty that it introduces into planning and implementation activities on the part of manufacturers, government agencies, and other parties.

How can the ZEV program provide ongoing evaluation of technology status without the negative consequences of a Biennial Review?