# PUBLIC MEETING AGENDA

March 27-28, 2003
9:00 a.m. / 8:30 a.m.

03-2-1 Public Meeting to Consider a Health Update

03-2-3 Public Meeting to Consider Proposition 40 and Amendments to the Carl Moyer Program and School Bus Program Guidelines

03-2-4 Public Hearing to Consider Amendments to the California Zero Emission Vehicle Regulation

Includes AcrobatTM ReaderTM

PC and Mac Compatible

ELECTRONIC BOARD BOOK

California Environmental Protection Agency

# Air Resources Board

## PUBLIC MEETING AGENDA

LOCATION:

California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, CA 95814

This facility is accessible by public transit. For transit information, call: (916) 321-BUSS, website www.sacrt.com (This facility is accessible to persons with disabilities.)

March 27-28, 2003
9:00 a.m. / 8:30 a.m.


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| 03-2-4 | **Public Hearing to Consider Amendments to the California Zero Emission Vehicle Regulation** | **13-196** |


The Board Book is comprised of a number of individual documents, many of which are individually numbered. The Board Book itself is numbered in the top right and left hand corners. These numbers are *reflected in the Table of Contents above.*


**CONTACT CLERK OF THE BOARD, 1001 I Street, 23rd Floor, Sacramento, CA 95814 (916) 322-5594**
**FAX: (916) 322-3928**
**ARB Homepage: www.arb.ca.gov**


To submit written comments on an agenda item in advance of the meeting.
To request, in advance of the meeting, to be placed on the list to testify on an agenda item.
To request special accommodations for those persons with disabilities (at least 7 days prior to the meeting date please).
For persons with a hearing or speech impairment, please use our telephone device for the deaf
**TDD: (916) 324-9531 or (800) 700-8326.**

**SMOKING NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD**

California Environmental Protection Agency

# Air Resources Board

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March 27-28, 2003
9:00 a.m. / 8:30 a.m.

03-2-1 **Public Meeting to Consider a Health Update**

*Staff will present the results of a study assessing the relationship between traffic related air pollution and cardiopulmonary death.*

03-2-2 **Public Meeting to Consider Appointments to the Research Screening Committee**

*Staff will recommend appointments to the Board's Research Screening Committee. The Committee reviews and recommends air pollution research projects to the Board.*

03-2-3 **Public Meeting to Consider Proposition 40 and Amendments to the Carl Moyer Program and School Bus Program Guidelines**

*Staff will propose amendments to the Carl Moyer Program and school bus program guidelines.*

03-2-4 **Public Hearing to Consider Amendments to the California Zero Emission Vehicle Regulation**

*Staff will propose amendments to the California Zero Emission Vehicle Regulation.*

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**SMOKING NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD**

**OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD**

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of five minutes to ensure that everyone has a chance to speak.

**THOSE ITEMS ABOVE WHICH ARE NOT COMPLETED ON MARCH 27 WILL BE HEARD BEGINNING AT 8:30 A.M. ON MARCH 28.**

**THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.**

# SUMMARY OF BOARD ITEM

**ITEM # 03-2-1:** Public Meeting to Consider a Health Update

**STAFF RECOMMENDATION:** Informational Item

**DISCUSSION:** The Air Resources Board (ARB) staff provides the Board with regular updates on recent research findings on the health effects of air pollution. This month staff will review a study conducted in the Netherlands assessing the relation between traffic-related air pollution and mortality in an elderly population group.

**SUMMARY AND IMPACTS:** Long term exposure to traffic-related air pollutants was estimated for the study and the results show that living near a major road was more strongly associated with cardiopulmonary mortality than ambient background levels. These findings are important in the context of California's long term ambient air quality standards for particulate matter. In order to ensure that the State's ambient air quality standards are protective of all Californians, potentially susceptible populations, such as the elderly, must be thoroughly evaluated.
The ARB, through the Vulnerable Populations Research Program, has committed to understanding and attempting to quantify the adverse health effects of air pollution in California's vulnerable populations.

## SUMMARY OF BOARD ITEM

**ITEM # 03-2-3:** Public Meeting to consider revisions to the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) Guidelines and to the Lower-Emission School Bus Program Guidelines.

**STAFF RECOMMENDATION:** Staff recommends that the Board approve the proposed revisions.

**DISCUSSION:** The Board initially approved Carl Moyer Program Guidelines in February 1999 and updated those in November 2000. The Carl Moyer Program provides funding for projects that reduce oxides of nitrogen (NOx). These reductions assist California in meeting State Implementation Plan commitments and in ensuring conformity with transportation plans, thus preventing the loss of federal highway dollars. Funds are overseen by ARB and administered by local air districts. In the first three years of the Carl Moyer Program (1998-2001), NOx reductions of approximately 11 tons per day were achieved at an average cost-effectiveness of $4,000 per ton.

ARB also oversees the Lower-Emission School Bus Program, designed to reduce school children's exposure to toxic particulate matter (PM) and smog-forming NOx. The Board approved original guidelines for the School Bus Program in December 2000. The program began that year with a $50 million allocation from the state budget. There was an additional budget allocation of $16 million in 2002. In the first two years of the program, emission reductions were achieved by replacing older, high polluting buses with newer models, and by equipping in-use school buses with ARB-verified retrofit devices.

In 2002 state voters approved Proposition 40 – the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act – which contains an additional $50 million for Carl Moyer projects. Assembly Bill 425 of 2002 (Chapter 379) further directs that 20 percent of these funds be allocated to the Lower-Emission School Bus Program.

The proposed revisions to the Carl Moyer Program Guidelines include tentative district funding allocations, new matching fund requirements that include the opportunity for smaller districts to obtain a one-year waiver for their match, updated cost-effectiveness criteria, and a new provision for satisfying match requirements with PM reduction projects. New environmental justice requirements per recent statutory changes were also incorporated. Finally, the proposal also includes an update of cost-effectiveness, engine emission standards and inventories, and several minor technical and administrative modifications.

The School Bus Guidelines are being revised to address new school bus purchase eligibility criteria, to eliminate match requirements for air districts that self-administer the program, and to add a mechanism for assessing monetary penalties on business entity(ies) responsible for delays that result in failure of program-funded bus delivery. Minor changes to requirements for school districts to contribute funds toward the purchase of new school buses are also included.

**SUMMARY AND IMPACTS:**

The proposed guideline revisions will ensure that the Carl Moyer and School Bus programs continue to deliver real, quantifiable, enforceable, and cost-effective emission reductions in concert with the new funding stream offered by Proposition 40 and new engine technologies recently introduced in California.

## AIR RESOURCES BOARD

## NOTICE OF PUBLIC MEETING TO CONSIDER REVISIONS TO THE CARL MOYER MEMORIAL AIR QUALITY STANDARDS ATTAINMENT PROGRAM GUIDELINES AND THE LOWER-EMISSION SCHOOL BUS PROGRAM GUIDELINES

The California Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider revisions to the Carl Moyer Program (CMP) Guidelines and the Lower-Emission School Bus Program Guidelines. The guidelines govern the disposition of funds under two ARB grant programs.

DATE: March 27, 2003

TIME: 9:00 a.m.

PLACE: Air Resources Board
Central Valley Auditorium
1001 "I" Street
Sacramento, CA 95812

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., March 27, 2003, and may continue at 8:30 a.m., March 28, 2003. This item may not be considered until March 28, 2003. Please consult the agenda for the meeting, which will be available at least ten days before March 27, 2003, to determine when this item will be considered.

If you have special accommodation or language needs, please contact ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech to Speech users may dial 7-1-1 for the California Relay Service.

### FUNDING FOR CARL MOYER AND SCHOOL BUS PROGRAMS – PROPOSITION 40

On March 5, 2002, the voters of California approved Proposition 40, the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act. The measure allows the State to sell $2.6 billion of general obligation bonds to conserve natural resources. Of these bonds, the measure allocates a total of $50 million over two years to the ARB for distribution to local air pollution control and air quality management districts for projects that "affect air quality in state and local parks and recreation areas" in accordance with the Carl Moyer Program (Health and Safety Code [HSC] section 44275 et seq.) guidelines. In addition, Assembly Bill 425 (Stats. 2002, Ch. 379) directs that 20 percent of the Proposition 40 funds made available to ARB shall be allocated for the acquisition of "clean, safe, school buses for use in California's public schools." Assembly Bill 425 did not provide any funding for continuation of the in-use diesel bus retrofit component of the ongoing Lower-Emission School Bus Program. Considered together, these appropriations provide $19.5 million for the CMP and $4.92 million for the Lower-Emission School Bus Program in the 2002/2003 fiscal year.

The Carl Moyer and the School Bus Programs are ongoing grant programs that have been well received and significantly oversubscribed in the past – the CMP for the past four years and the Lower-Emission School Bus Program for the past two years. Both programs are

expected to be oversubscribed with the new funding. In both programs, the ARB provides oversight but does not administer the program directly. All CMP funds are provided to local air districts while the local air districts or the California Energy Commission (CEC) administers the school bus funds. Finally, both programs contain environmental justice criteria, i.e., criteria to ensure that at least 50 percent of the funds are allocated in areas disproportionately affected by air pollution.

**THE CARL MOYER PROGRAM**

The Carl Moyer Memorial Air Quality Standards Attainment Program (HSC section 44275 et seq.) is a grant program that funds the incremental cost of cleaner-than-required engines and equipment. Public or private entities that operate eligible engines and/or equipment in California can participate by applying for funds directly to their local air pollution control or air quality management districts (districts). Examples of eligible engines and equipment include heavy-duty on-road and off-road, marine, locomotive, stationary agricultural pumps, forklifts, airport ground support equipment, and heavy-duty auxiliary power units.

The Carl Moyer Program provides funds for significant near-term reductions in emissions of oxides of nitrogen ($NO_X$), a smog-forming pollutant. These reductions are necessary for California to meet its clean air commitments under the State Implementation Plan (SIP) and for air districts to meet commitments in their conformity plans and state air quality plans. The program also provides reductions of particulate matter (PM) emissions, which are a component of diesel engine exhaust and have been identified by the ARB as a toxic air contaminant.

The ARB holds responsibility for developing the guidelines that districts use to implement the program and allocates funding to the districts. In order to allocate and oversee initial funding, the ARB approved the first set of guidelines for the CMP in February 1999. In November 2000, the ARB generated and approved a revision designed to improve and optimize the program based on data obtained from the first year of operation. These guidelines are available at ARB's Public Information Office, 1001 I Street, Sacramento, CA, 95812 and at the ARB website: http://www.arb.ca.gov/msprog/moyer/moyer.htm.

During the first year of implementation, 1998/1999, demand for the $25 million allocation far exceeded available funding, thus enabling the resulting emission reductions to become extremely cost-effective. As a result, the Governor and the Legislature responded to the program's initial success by approving one-time budget appropriations of $23 million, $50 million, and $16 million over the next three years, respectively, in order to continue the program. Total program funding for the first four years reached approximately $114 million.

In the second year of the CMP, legislation established a 13-member Advisory Board (HSC section 44297) with the responsibility for making recommendations on the need to continue the program, the amount and source of continued funding, and program modifications, if necessary. The Advisory Board recommendations included *i)* the continuation of the CMP with increases in funding through the year 2010; *ii)* a cap on local district matching fund requirements; and *iii)* a statewide 25% PM emission reduction target and a 25% PM emission reduction requirement for districts in serious

non-attainment of the federal PM10 standards. Many of the recommendations of the Advisory Board have been implemented through legislation or CMP guidance updates. Although no permanent funding has been established at the levels hoped by the Advisory Committee, the CMP has provided some continued level of funding for the last five years.

In the first three years of the CMP, funded projects reduced $NO_X$ emissions by more than 11 tons per day (tons/day) at an average cost-effectiveness of approximately $4,000 per ton of $NO_X$ reduced. This cost-effectiveness compares favorably to other air pollution control programs in California. Project lifetimes range from five to 20 years depending on the type of project. Thus, the program offers necessary and cost-effective near- and long-term emission reduction benefits.

**THE LOWER-EMISSION SCHOOL BUS PROGRAM**

The Lower-Emission School Bus Program is an incentive program that provides grants to school districts to reduce school children's exposure to both toxic PM emissions and smog-forming NOx emissions through the implementation of two program components: 1) a school bus purchase and infrastructure component to replace the oldest, highest-polluting buses with new, lower-emitting buses meeting the latest federal motor vehicle safety standards; and 2) a retrofit component to reduce PM emissions from the in-use diesel school bus fleet.

For the past two years, the ARB, in conjunction with the CEC, has administered the Lower-Emission School Bus Program. Through the state budget process, Governor Gray Davis and the Legislature allocated a total of $66 million for the implementation of this program. Of this total funding amount, $49.5 million has been dedicated to the purchase of safe, lower-emitting new school buses throughout the 2000/2001 and 2001/2002 fiscal years. The remaining $16.5 million has been dedicated to the purchase and installation of exhaust aftertreatment devices to reduce PM emissions from in-use diesel school buses.

The ARB, the CEC, and the local air quality management and air pollution control districts have administered and implemented the program using the original Lower-Emission School Bus Guidelines approved by the Board on December 7, 2000.

These guidelines are available at ARB's Public Information Office, 1001 I Street, Sacramento, CA, 95812 and at the ARB website: http://www.arb.ca.gov/schoolbus/schoolbus.htm. The CEC has been responsible for direct implementation of the program component to replace old school buses with new, low-emitting models in many areas of the state; the five most populous air districts have been responsible for program implementation in their respective regions. For the in-use diesel bus retrofit component of the program, participating air districts are responsible for its direct implementation. This program component is on-going and is not scheduled for completion until September 2003. The ARB is responsible for general program oversight and administration for both components of the Lower-Emission School Bus Program, and will continue in this role for expenditure of the funding provided through Proposition 40, as described below.

## PROPOSED REVISIONS TO THE CARL MOYER PROGRAM

Staff is proposing the following eight revisions to the Carl Moyer Program guidelines, each of these revisions are discussed below. Districts may fund only those projects that meet the CMP guidelines and eligibility criteria, or those projects approved on a case-by-case basis by the ARB's Executive Officer.

1) New District Matching Fund Requirements, In-kind Contributions, and Tentative Funding Allocations for FY 2002/2003

Matching fund requirements are important because they provide a literal "buy-in" from local air districts responsible for the selection, monitoring, and enforcement of projects. This requirement also helps ensure that the most worthwhile projects are selected and that more funds are available for clean air projects. For this reason, in the first four years of CMP implementation, a cost share of $1 of local district funds for every $2 of CMP funds was required. However, ARB recognizes the new fiscal realities, especially for smaller air districts and the challenges in meeting matching fund requirements. A minimum allocation of $100,000 for each participating district and a one year waiver of the match requirement for local districts with populations totaling less than one percent of the state population and in attainment of the ozone federal standard are proposed.

As in the past, districts with populations totaling more than one percent of the state population or in non-attainment of the ozone federal standard are eligible for additional funding determined equally by population and commitments for attainment. For these districts, the matching fund requirement remains the same: one dollar of district funds for every two dollars of Carl Moyer funds.

2) New Cost-Effectiveness to Allow for Cost-of-Living Increases

The program cost-effectiveness requirement of $13,000 per ton of NOx reduced was approved by the ARB in the current set of guidelines in November 2000. Section 44283 of the HSC authorizes the Board to adjust the cost-effectiveness limit to reflect inflation. Thus, ARB has adjusted the cost-effectiveness limits for FY 2002/2003 to reflect a cost of living increase from 2000 to the present. The new cost-effectiveness is $13,600 per ton of NOx reduced, applicable for FY 2002/2003 and later.

3) Meeting Matching Requirements with PM Emission Reduction Projects

A new provision offers participating districts the ability to use funds under their authority for projects that focus exclusively on PM emission reductions. Funds allocated for PM-only projects can be used to meet matching fund requirements established by the CMP. Possible projects include retrofits for heavy-duty (HD) diesel trucks or off-road diesel equipment with ARB verified after-treatment systems. Participating districts without a match requirement cannot use their minimum allocations to fund PM reduction projects. In addition, the cost-effectiveness criterion of $13,600/ton of NOx reduced required for all CMP projects does not apply for projects focused on PM emission reductions only. ARB staff will work with districts to develop appropriate cost-effectiveness limits for PM. Districts will retain the flexibility to propose appropriate allocations for PM reduction projects subject to ARB's concurrence.

4) Environmental Justice Requirements

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations, and policies (Government Code section 65040.12). The ARB is committed to making environmental justice an integral part of all its activities. In December 2001, the ARB adopted "Policies and Actions for Environmental Justice" establishing a framework for improving air quality and public health in all California communities, especially in low-income and minority communities. The policy recognizes the need for local air districts to address environmental justice issues at the community level.

AB 1390 (Firebaugh; Stats. 2001, Ch. 763; HSC section 43023.5) established environmental justice requirements for the CMP. Beginning in fiscal year 2001/2002, air districts with greater than one million inhabitants must allocate at least 50% of their CMP incentive money in a manner that directly benefits low-income communities and communities of color that are disproportionately affected by air pollution. This currently includes five air districts: Bay Area Air Quality Management District (AQMD), Sacramento Metropolitan AQMD, San Diego County Air Pollution Control District (APCD), San Joaquin Valley Unified APCD, and South Coast AQMD. Districts with less than a million residents are encouraged to consider environmental justice in allocating CMP funds, to the extent feasible. Some smaller districts have developed environmental justice methodology to implement the CMP. This includes Mendocino County AQMD and Monterey Bay Unified APCD.

Proposition 40 (Public Resources Code section 5096.650), which allocates CMP funds for the fiscal years 2002/2004, reiterates the requirement that environmental justice criterion be considered in determining eligible CMP projects.

5) Update of Engine Emission Standards and Emission Inventories

NOx and PM emission factors have been revised to reflect the most recent information from ARB's emission inventory models, EMFAC and OFFROAD. Also updated are the emission factors for off-road, agricultural irrigation pump, and marine engines. Specifically, OFFROAD incorporates the most recent regulations for off-road diesel engines adopted by both the U.S. Environmental Protection Agency and ARB.

Under the new guidelines, engines designated for participation in any averaging, banking, and trading (AB&T) program are ineligible to participate in the CMP. This includes off-road engines designated "flexibility" or "family emission level (FEL)" engines. Similarly, on-road engines not meeting current standards, but available through non-conformance penalties (NCP) are not eligible for CMP funding.

6) Consideration of Projects Not Included in the Existing Guidelines

Participating air districts are required to observe strict adherence to the ARB-approved guidelines for the CMP. Technologies that offer real and quantifiable emission reduction benefits are fast developing in a number of project categories. On occasion, these technologies fall outside the core project categories of engine replacement, repower, or retrofit projects. Guidance is included in the revised program guidelines to allow for consideration of these unique and innovative technologies. So long as

emission reduction benefits are real, quantifiable, and enforceable, new provisions allow local districts to identify meritorious projects under an "other" category. Districts are required to consult with ARB for final determination of project eligibility. Projects that fall under the "other" category must be evaluated on a case-by-case basis; funding may not be requested to comply with a regulation or any other legally binding agreement that requires the emission reductions.

7) Engine Repowers

For clarification and in an effort to ensure that emission reductions resulting from engine repowering projects funded under the CMP remain guaranteed for the life of the project by the engine's original equipment manufacturer (OEM), the use of OEM parts and OEM-authorized dealerships and/or distributors for engine repowers shall be required. In this context, repower also includes remanufacturing and rebuilding of engines.

In addition, ARB recognizes that Tier 2 engines may not be feasible for repower installation on some pre-2002 off-road equipment. The Tier 2 engine support system including electrical, cooling, hydraulics, and engine mounts may not be practically installed. Therefore, the revised guidelines include provisions that may allow engines meeting Tier 1 standards for repower installations when it is the only feasible option.

8) Reporting Requirements for Participating Local and Regional Air Districts

An annual report on Proposition 40 expenditures to the Legislature is required. As a result, the Department of Finance, Office of State Audits and Evaluations, will audit program administration at both the state and local levels. The ARB's reports are based on the information provided by all participating districts. Thus, each district must continue to report routinely to ARB following ARB-approved forms and formats. The proposed guidelines offer specific reporting requirements for the participating districts.

**PROPOSED REVISIONS TO THE LOWER-EMISSION SCHOOL BUS PROGRAM**

The staff is proposing several changes to the existing Lower-Emission School Bus Program. Summarized below are the proposed changes for the continuation of the program with 2002/2003 fiscal year funds provided through Proposition 40.

1) Updated regional funding allocations based on $4,290,000 available statewide in the 2002/2003 fiscal year for the purchase of "clean, safe, school buses."

2) CEC administration of the program for school districts in more regions throughout California than in the two previous years of the program, i.e., fewer regions will self-administer the program.

3) Board-designated funding split for alternative-fuel school bus purchases and intermediate level diesel school bus purchases (i.e., two-thirds of funding for alternative-fuel school buses; one-third of funding for diesel school buses) to be maintained as statewide goal, with less emphasis on region-specific implementation.

4) Minor changes to requirements for school districts to contribute funds toward the purchase of new school buses, including a reduced school district funding

contribution for the purchase of a new school bus that replaces an in-use pre-1977 model year school bus.

5) Elimination of the requirement for air districts that self-administer the program to contribute match funding in the amount of ten percent of their respective state funding allocations.

6) Updated eligibility criteria for funding new alternative-fuel and intermediate level diesel school buses with 2003 model-year engines.
7) Updated program timetable with enforceable delivery deadline for program-funded school buses.

8) Monetary penalty assessed on business entity responsible for any delay that results in the failure to deliver program-funded school buses to school districts by the program delivery deadline.

9) Program expenditures, at both the local and State level, subject to audit by Office of State Audits and Evaluations, Department of Finance.

**STAFF RECOMMENDATIONS**

Staff recommends that the Board, at its March 27, 2003 hearing, approve the proposed guideline revisions for the Carl Moyer and Lower-Emission School Bus Programs. The guidelines establish the framework for implementation of the program in California. The impetus for the CMP revisions is to integrate into the program updated information and clarifications of previous provisions. The goal of the program continues to be to achieve real, quantifiable, and enforceable, cost-effective emission reductions. The impetus for the revisions to the Lower-Emission School Bus Program is to update eligibility criteria for funding new school buses due to the introduction of new engine emissions requirements in October 2002, and to incorporate other minor administrative changes.

**AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSON**

The proposed revisions to the Carl Moyer Program Guidelines and the Lower-Emission School Bus Program Guidelines will be presented by the ARB staff at the Board meeting. Copies of the staff reports, which incorporate the proposed guideline revisions, may be obtained from the Board's Public Information Office, 1001 I Street, Sacramento, CA 95812, (916) 322-2990, prior to the scheduled meeting. Revisions to the Carl Moyer Program Guidelines will also be available electronically on ARB's website at http://www.arb.ca.gov/msprog/moyer/moyer.htm. Further inquiries on the CMP should be directed to Chuck Bennett, Air Resources Engineer, at (916) 322-2321.

Revisions to the Lower-Emission School Bus Guidelines are also available on the ARB's website at http://www.arb.ca.gov/schoolbus/schoolbus.htm. Inquiries regarding the Lower-Emission School Bus Program should be directed to Krista Fregoso, Air Pollution Specialist, at (916) 445-5035.

The adoption of the revised guidelines is not subject to the Administrative Procedures Act. However, in order to provide at least 45 days for public comment prior to final

adoption, the record on this matter will be held open until April 17, 2003, and comments will be considered by the Executive Officer prior to adopting the revised Guidelines.

**SUBMITTAL OF PUBLIC COMMENTS**

The public may present comments relating to this matter orally or in writing to the Clerk of the Board in person, on the day of the meeting, and in writing or by e-mail before or after the meeting. To be considered, written submissions not physically submitted at the Board meeting must be received **no later than 12:00 noon, April 17, 2003**, and addressed to the following:

Postal mail is to be sent to: Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, CA 95814

Electronic mail is to be sent to mover03@listserv.arb.ca.gov and received at the ARB **no later than 12:00 noon, April 17, 2003.**

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, April 17, 2003.**

The Board requests but does not require 30 copies of any written submission that you would like considered at the public meeting. Also, the ARB requests that written and e-mail statements be filed at least ten days prior to the meeting so that ARB staff and Board Members have time to fully consider each comment.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

Date: February 28, 2003

## SUMMARY OF BOARD ITEM

**ITEM # 03-2-4:** Public Hearing to Consider Amendments to the California Zero Emission Vehicle (ZEV) Regulation.

**STAFF RECOMMENDATION:** Staff recommends that the Board amend the ZEV regulation to postpone implementation of the program until 2005, to remove all references to fuel economy and efficiency, and to amend the ZEV and Advanced Technology Partial ZEV Allowance Vehicle (AT PZEV) and credit calculation methods. Staff also recommends that the Board provide an alternative compliance option. Other minor proposed changes are included. The proposed changes are intended to maintain the goal of zero emissions, resolve legal issues, ensure ongoing technology development, provide flexibility to industry to comply with the regulations and take full advantage of the technologies available today.

**DISCUSSION:** The ZEV program was originally adopted in 1990 as part of the ARB's Low-Emission Vehicle rule. The ZEV requirement is an integral part of California's mobile source control effort and encourages the development of advanced technologies that provide increasing air quality benefits for California now and into the future.

In 2001, the ARB amended the ZEV program to provide additional credits for early vehicle introduction, for increased range, and for improved vehicle efficiency. The changes were intended to both "prime the market" and to reduce overall costs to manufacturers. However, they also had the effect of reducing the number of pure ZEVs required in 2003 and beyond, as manufacturers took advantage of the new mechanisms and amassed significant early introduction credits.

In June 2002, a federal preliminary injunction was issued that prohibited the ARB from enforcing the ZEV program due to its vehicle efficiency provisions which were deemed preempted by federal law. To address the issues raised by the injunction, staff has developed a proposal that removes all references to

fuel economy and efficiency. At the same time, staff proposed additional amendments to maintain progress toward the commercialization of ZEV technologies while recognizing the current state of development and the related cost implications. The proposal maintains a core ZEV component, but significantly reduces the number of pure ZEVs in the 2005 to 2011 timeframe.

Staff identified various recommended changes in response to public comments received since release of the initial Staff Report. The new modifications, made available March 5, would provide an alternative compliance option, further amend the credits for AT PZEVs, and make several other clarifying and corrective changes.

**SUMMARY AND IMPACTS:** The original staff proposal, released in January, would have effectively decreased the minimum requirement for ZEVs to one percent for the 2005 through 2011 model years, allowing manufacturers to fill the remaining portion of their two percent ZEV obligation with AT PZEVs. In 2012 and beyond, the number of ZEVs required would be essentially the same as that required under the 2001 regulation. The two most significant concerns raised about this proposal were that it a) continued and exacerbated the use of banked ZEV credits thereby delaying the return of new ZEVs to the marketplace; and b) that it provided no relief to overly expensive ZEV production requirements that would be imposed before significant cost reductions could be achieved by the manufacturers.

In response to these concerns, staff amended its initial proposal and issued modifications for public review in March. The March modifications give manufacturers two distinct compliance options as compared to the single path proposed in January. The first option is to comply with the primary ZEV regulation which would retain the prior two percent pure ZEV requirement with no AT PZEV substitution. This option was intended to preserve as much of the status quo as possible for those manufacturers who prefer complying with the original regulation, and for those stakeholders who are concerned about

increasing the already large quantities of existing early introduction credits. The primary compliance option would retain the mix of vehicles permitted under the 2001 amendments. If all manufacturers used the primary option and freely traded banked credits, staff estimates that no pure ZEVs would be needed for compliance until 2009 due to existing, early compliance ZEV credits.

The second, alternative compliance option proposed in March would allow manufacturers to build a smaller number of demonstration fuel cell vehicles between now and 2008, then to meet the balance of the two percent ZEV requirement with AT PZEVs. If all large manufacturers choose the alternative path, they would have to produce by the 2008 model year a cumulative total of about 250 pure Type III ZEVs (those with characteristics expected to be met by fuel cell vehicles). Used to the maximum, this option would more than double the expected numbers of AT PZEVs. For the alternative compliance path, no ZEV production numbers have been stipulated for the post 2008 period. Accordingly, at least three years prior to the 2009 model year, the Board would consider changes to the ZEV program based on a technology assessment by an independent expert review panel. Manufacturers would likely elect the alternative compliance option if it resulted in cost savings compared to their respective, existing compliance plans. The ultimate savings could be substantial.

The estimated savings of staff's January proposal range from $375 million to $3.6 billion between 2005 and 2011, based on projected savings to manufacturers. The range reflects uncertainty regarding each manufacturer's compliance strategy. The direct cost of compliance with staff's original proposal ranges from $710 million to $2.0 billion over the same seven-year period using worst case assumptions about manufacturer use of banked ZEV credits (i.e., no trading). The costs and savings of the March 2003 proposal have not been quantified but are expected to exceed the benefits of the January proposal because there is more flexibility.

Staff estimates that the modified proposal will result in an emission benefit of about 0.1 tons per day of direct emissions of ozone precursors in 2010 when compared to the current regulation. For 2020, staff estimates an emission benefit of about 0.2 tons per day of ozone precursors from the modified proposal when compared to the 2001 amendments which required two percent compliance with pure ZEVs.

As compared to a no ZEV requirement baseline, ARB staff estimates that the modified proposal will reduce approximately 1.4 and 5.5 tons per day of ozone precursors by 2010 and 2020, respectively. In addition, the proposal maintains significant pressure on manufacturers to continue ZEV technology development needed to achieve the long-term goal of a vehicle population of zero and near-zero emissions with lifetime durability.

ARB staff has solicited input from interested parties throughout the regulatory process. A public workshop was conducted in December 2002 and ARB staff has held numerous individual meetings with industry and interested stakeholders.

## TITLE 13. CALIFORNIA AIR RESOURCES BOARD

## NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF THE 2003 AMENDMENTS TO THE CALIFORNIA ZERO EMISSION VEHICLE REGULATION

The Air Resources Board (Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the California Zero Emission Vehicle (ZEV) regulation.

DATE: February 27, 2003

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Auditorium, Second Floor
1001 "I" Street
Sacramento, CA 95814

This item will be considered at a two-day meeting of the ARB, which will commence at 9:00 a.m., February 27, 2003, and may continue at 8:30 a.m., February 28, 2003. This item may not be considered until February 28, 2003. Please consult the agenda for the meeting, which will be available at least 10 days before February 27, 2003, to determine the day on which this item will be considered.

This facility is accessible to persons with disabilities. If accommodation is needed, please contact ARB's Clerk of the Board at (916) 322-5594, or Telecommunications Device for the Deaf (TDD) (916) 324-9531 or (800) 700-8326 for TDD calls from outside the Sacramento area, by February 13, 2003, to ensure accommodation.

## INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

**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" as last amended July 30, 2002.

### Background

The California ZEV regulation was originally adopted in 1990, as part of the ARB's first Low-Emission Vehicle (LEV I) regulations. It established an ambitious program to dramatically reduce the environmental impact of light-duty vehicles through the gradual introduction of ZEVs into the California fleet. As originally adopted, the ZEV regulation

required that specified percentages of the passenger cars and lightest light-duty trucks (called the LDT1 category) 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 (MYs) and 5 percent for the 2001-2002 MYs. A requirement of 10 percent ZEVs applied to all but small-volume manufacturers starting in MY 2003. The regulation also included a marketable credits system. Although the regulation did not require a specific technology, the expectation at that time was that the requirements would be met by the introduction of battery electric vehicles (EVs).

In 1996 the ARB amended the ZEV regulation to allow additional time for the technology to develop. The requirement for 10 percent ZEVs in MYs 2003 and beyond was maintained, but the percentage ZEV requirements for MYs 1998 through 2002 were eliminated. At the 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 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 Board adopted amendments that allowed manufacturers to use partial allowances 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. To be certified as a PZEV, a vehicle must meet the ARB's most stringent exhaust emission standards, have zero evaporative emissions, and be covered by an emissions warranty for 15 years or 150,000 miles, whichever occurs first. However, a large-volume manufacturer was required to have a minimum of 4 percent of its California fleet of passenger cars and lightest trucks be vehicles classified as "full" ZEVs.

**The 2001 Amendments to the ZEV Regulation**

Following a January 2001 hearing, the ARB adopted major amendments to the ZEV regulation that were designed to maintain progress towards commercialization of ZEVs while recognizing the market constraints created primarily by the cost of battery technology. The amendments maintained a core ZEV component, but significantly reduced the cost of the program – primarily through a reduction in the number of vehicles required in the near term and a further broadening in scope of the vehicle technologies allowed. The key elements of the 2001 amendments pertinent to this rulemaking are described below.

*Reducing the number of ZEVs needed in the near term.* Several amendments reduced the number of ZEVs required in the early years of the program. The amendments established multipliers that provided extra credits for ZEVs in the early years. ZEVs introduced before the 2006 MY received early introduction multipliers of 4.0 for the 2001 and 2002 MYs and 1.25 for the 2003-2005 MYs. A separate "NEV discount" multiplier reduced the credits earned by Neighborhood Electric Vehicles (NEVs) – which have a top speed of no more than 25 miles per hour – to 0.625 for the 2004 and 2005 MYs because of their limited functionality. For 2006 and subsequent years the credits

earned by NEVs were further reduced to 0.15. The early introduction multipliers for ZEVs in a given model year and the extended range multiplier described below were only available to ZEVs that not only were "delivered for sale" but were also "placed in service." The Initial Statement of Reasons for the rulemaking indicated that to earn multiple allowances, manufacturers would be required to certify to the Executive Officer the number of vehicles placed in service during the course of the model year.

*Reducing the number of PZEVs needed in the near term.* The amendments added PZEV early introduction multipliers that reduced the number of PZEVs needed to meet the maximum PZEV allowance amount to 25 percent of the preexisting requirement in MY 2003, 50 percent in MY 2004, and 75 percent in MY 2005. Manufacturers were also provided two years to make up a PZEV shortfall rather than the one year previously allowed.

*Allowing advanced technology PZEVs to satisfy one-half of the "pure ZEV" requirement and increasing their allowances.* Qualifying advanced technology vehicles that were not ZEVs were permitted to satisfy up to one half of the four percent "pure ZEV" portion of the ZEV requirement. These were known as Advanced Technology PZEVs (AT PZEVs), defined as any PZEVs earning a ZEV allowance of more than 0.2, not including the early introduction multiplier. One category of AT PZEVs consisted of PZEVs such as grid-connected hybrid electric vehicles with an all-electric range of 10 miles or more; the additional "zero emission vehicle miles traveled (VMT) allowance" for these vehicles varied from about 0.4 to 2 depending on the electric range. Another category of AT PZEVs – those using a fuel such as compressed natural gas with very low fuel-cycle emissions – qualified for an additional allowance of up to 0.2, depending on the degree to which the vehicle uses that fuel.

A third category of AT PZEVs included vehicles that employed "advanced ZEV componentry" but did not qualify for a zero-emission VMT allowance – vehicles such as a non-grid connect gasoline hybrid electric vehicle. For this category, the amendments established three alternative performance-based paths that the manufacturer could use to calculate the allowance: (1) $CO_2$ savings, (2) vehicle efficiency, or (3) through MY 2007 only, the percent of peak power that comes from the battery. The calculations for the first two methods relied on the vehicle's fuel economy as measured by the U.S. Environmental Protection Agency (U.S. EPA). The vehicle had to meet a threshold performance level to qualify for any allowance; for qualifying vehicles the amount of the allowance increased with the vehicle's performance. The amendments also provided an additional allowance of 0.1 for vehicles that use gaseous or hydrogen fuel storage.

*Expanding ZEV range credits and adding an efficiency multiplier for ZEVs and AT PZEVs.* Modifying ZEV extended range credit provisions that had been added in 1996, the amendments reduced the minimum range needed for multiple credits to 50 miles, with credits increasing with range up to 10 credits for a range of 275 miles or more. Because a vehicle with a refueling time of less than 10 minutes earned the maximum credit regardless of range, a hydrogen fuel cell vehicle earned 10 credits, not including any phase-in multiplier.

A ZEV or AT PZEV having an efficiency at least 50 percent greater than the average for its size class qualified for a new efficiency multiplier. All vehicle efficiencies (gasoline, CNG, electric) were converted into the common units of California Miles per Equivalent Gallon (CMPEG). The multiplier earned was the larger of 1.0 or the vehicle CMPEG divided by the baseline. For ZEVs, the efficiency multiplier partially replaced the range multiplier on a phased-in basis beginning in MY 2005, and the combined value of the range and efficiency multipliers was gradually reduced, resulting in larger numbers of vehicles in later years. For AT PZEVs, the efficiency multiplier took effect beginning in MY 2002.

*Increasing the percentage ZEV requirement in later years.* The 10 percent ZEV requirement for large and medium-duty manufacturers was ramped up to 11 percent for the 2009-2011 MYs, 12 percent for the 2012-2014 MYs, 14 percent for the 2015-2017 MYs, and 16 percent for 2018 and subsequent MYs. During these ramp-ups, the portion of the ZEV requirement that could be satisfied by 0.2 allowance PZEVs was held at 6 percent. Thus the pure ZEV portion gradually increases from 4 percent in the 2003 through 2008 MYs to 10 percent by 2018. Up to one half of this pure ZEV portion could be satisfied with allowances from AT PZEVs.

*Phased addition of LDT2 vehicles to the base for calculating a manufacturer's ZEV obligation.* At the January 2001 hearing the Board decided to modify the originally proposed amendments to phase in a new requirement that "LDT2" vehicles be included in the base for determining a manufacturer's full percentage ZEV obligation, along with the passenger cars and LDT1 vehicles that had always been included. The LDT2 category includes most sport utility vehicles (SUVs), minivans, and larger pickup trucks. The addition of LDT2 vehicles was phased in beginning in the 2007 MY, when 17 percent of the manufacturer's California LDT2 production would be counted. The percentage increased by 17 percent increments through the 2011 MY, with a 100 percent requirement starting in the 2012 MY. Full inclusion of LDT2 vehicles increases the base across all manufacturers by an average of about 70 percent, although the impacts differ among individual manufacturers.

*Restricting the future use of "banked" credits earned by NEVs.* To avoid the possibility that manufacturers could place large numbers of NEVs in these early years and thereby amass enough credits from NEVs alone to avoid producing ZEV program vehicles for a number of years, the amendments capped the use of such credits in future years. NEV credits earned in prior years could only be used to satisfy 75 percent of a manufacturer's ZEV obligation in MY 2006 and 50 percent in MY 2007 and beyond.

*Miscellaneous other changes.* Various other changes made by the 2001 amendments included permitting additional ZEV credits for ZEVs, AT PZEVs and PZEVs placed as part of a transportation system in MYs 2001-2007. Additional credits were also authorized for a vehicle in California service for more than three years with an extended battery or fuel cell stack warranty.

## Litigation and Other Recent Developments

There have been three lawsuits filed by General Motors and DaimlerChrysler challenging the 2001 ZEV Amendments and their implementation; the first two also named some Fresno-area auto dealers as additional plaintiffs.

*The federal preemption lawsuit.* One of the cases was filed in January 2002 in federal district court in Fresno, asserting that the provisions pertaining to AT PZEVs that are gasoline hybrids are related to fuel economy standards and accordingly are preempted by the Energy Policy and Conservation Act of 1975 – the law that directed the National Highway Traffic Safety Administration to establish corporate average fuel economy (CAFE) standards. On June 11, 2002, a federal district judge issued a preliminary injunction that prohibits the ARB's Executive Officer from enforcing the 2001 ZEV Amendments with respect to the sale of new motor vehicles in the 2003 or 2004 MYs, pending final resolution of the case. The judge issuing the preliminary injunction found that the plaintiffs were likely to succeed in their preemption claim. He rejected arguments that the optional nature of the AT PZEV provisions eliminated preemption concerns, because he found that disparities in costs among the various compliance options in effect required manufacturers to produce gasoline hybrids. He enjoined enforcement of all of the 2001 ZEV Amendments based on the conclusion that the challenged AT PZEV provisions likely were not severable from the rest of the ZEV program. The ARB has appealed issuance of the preliminary injunction to the U.S. Court of Appeals for the Ninth Circuit, which has scheduled oral argument for the appeal on February 13, 2003. In the interim, the preliminary injunction remains in effect.

*The first state court lawsuit.* The second case was filed in January 2002 in the Fresno County Superior Court with Isuzu Motors as an additional plaintiff. As most recently amended, the complaint identities seven theories under which the 2001 ZEV amendments are claimed to be partially or wholly invalid. One allegation is that the amendments adding LDT2s to the base for the percentage ZEV requirements was beyond the scope of the original hearing notice and could not adopted without a new notice. There are also claims that the ARB did not comply with the California Environmental Quality Act (CEQA), that the ZEV regulation is inconsistent with the ARB's authorizing statutes, and that the Board failed to make a rational cost-effectiveness determination. On December 19, 2002 the trial court denied the automakers' motion for summary judgment and a trial court hearing on the merits is expected after January 2003.

*The second state court lawsuit.* On December 11, 2002, DaimlerChrysler and General Motors filed a second lawsuit in Fresno County Superior Court, this time challenging a November 21, 2002 guidance letter transmitted by the ARB's Executive Officer to vehicle manufacturers. The letter responded to inquiries on when 2002 MY NEVs would need to be placed in service in order to qualify for the 2002 MY early introduction multiplier – in case the preliminary injunction was lifted or the issue became relevant in the context of subsequent amendments to the ZEV regulation. The Executive Officer interpreted the regulation as allowing a MY 2002 ZEV to receive the 4.0 multiplier only if

it is placed in service by the end of March 2003. Following a December 17 hearing, a temporary restraining order was issued temporarily prohibiting enforcement of the March 31, 2003 deadline as established in the guidance letter.

*Technology developments.* When the Board amended the regulation in 2001, it did so with the understanding that near-term compliance with the pure ZEV portion of the regulation would be expensive for automakers, but that continued vehicle and technology development would lead to less costly approaches. Since that time, there have been no significant reductions in the cost of battery EVs. Meanwhile, the marketing of battery EVs has been met with only modest success, with only NEVs emerging as a commercial although limited usage product. These factors, along with the federal lawsuit, have slowed or even halted automaker plans regarding battery EV development.

In addition, projections regarding the pace of commercialization of fuel cells, which were projected to provide a second ZEV technology late in this decade, have become less certain although automakers remain fully committed and continue to invest heavily in the technology. As a result, it appears that under the current regulation manufacturers will need to develop additional battery EV products to bridge the interim years until fuel cells are available in larger quantities in the next decade.

**The Proposed 2003 ZEV Amendments**

Although the staff believes that the challenged AT PZEV provisions are not preempted by federal law and that the federal preliminary injunction should be reversed on appeal, there is no doubt that the injunction has introduced considerable uncertainty regarding the ZEV regulation that would not necessarily be ended by a reversal by the Ninth Circuit Court of Appeal. Removal of this uncertainty is essential for the ZEV program to move ahead. While there are advantages to the scoring provisions for gasoline hybrid AT PZEVs and the efficiency multiplier in the 2001 amendments, the staff has developed what it considers to be a satisfactory alternative approach that removes all references in the regulation to fuel economy and addresses the preemption concerns.

The staff has also developed additional proposed amendments that are designed to maintain pressure on the commercialization of ZEV technologies while recognizing the current state of the technology and the cost implications related to their development. The staff proposal includes the following elements:

*Delaying start of the percentage ZEV requirements until the 2005 MY.* The proposed amendments would delay the start of the percentage ZEV requirements two years, until the 2005 MY. Qualifying MY 2004 and earlier ZEVs, AT PZEVs and PZEVs would generate credits or allowances that could be used in future MYs.

*Deleting the efficiency multiplier for AT PZEVs and ZEVs, and changing the methods for awarding allowances for AT PZEVs.* The staff proposal eliminates the efficiency multiplier for AT PZEVs and ZEVs. The amendments would increase the advanced

componentry allowance for a vehicle with a high-pressure hydrogen storage system from 0.1 to 0.2. There would be no change to the 0.1 allowance for a vehicle equipped with a qualifying high pressure gaseous fuel storage system. The amendments would eliminate the three current methods – the $CO_2$ reduction method, the efficiency method and the peak power method – that establish sliding scales for awarding allowances to PZEVs with other advanced ZEV componentry, including gasoline hybrids. In their place would be a flat allowance of 0.4 in the 2003-2011 MYs, and 0.35 in the 2012 and subsequent MYs for any PZEV with advanced ZEV componentry that meets either of two threshold criteria: a "peak power ratio" of greater than 13 percent, or a "peak power ratio" of greater than 8 percent with a zero emission drive system maximum power rating of at least 10 kilowatts. These provisions would be accompanied by an express severability clause, and a more general severability clause would also be added to the regulation.

The amendments would also change the way other AT PZEV allowances are determined. The maximum overall cap for PZEVs with low fuel-cycle emissions would be increased from 0.2 to 0.3 and the applicable equation would be revised to increase the allowance by 50 percent. The allowance for zero emission VMT for hybrid electric vehicles and the phase-in multiplier for AT PZEVs with any zero emission vehicle miles traveled would also be increased. The amendments would add a cap on total AT PZEV allowances for any technology type of 3.0 starting in the 2012 MY.

*Changing the way credits from ZEVs are calculated and applied.* Along with removing the efficiency multiplier for ZEVs, the amendments would make a series of changes to simplify the calculation and encourage sustainable commercialization of ZEVs. They would identify five ZEV "types" that would be the basis for awarding ZEV credits: NEVs, Type 0 (utility low-range ZEVs), Type I (mid-range ZEVs like City electric vehicles), Type II (longer-range ZEVs like full-function battery electric vehicles) and Type III (long range, fast-refueling ZEVs like fuel cell vehicles). A 2003 and subsequent MY ZEV, other than a NEV, would earn 1 ZEV credit when it is produced and delivered for sale in California. A 2003 and subsequent MY ZEV would earn additional credits based on the earliest model year in which it is placed in service (not earlier than the ZEV's model year). The following table shows the total number of credits the ZEV would earn, including the credit not contingent on placement in service, if it is placed in service in the specified model year or by March 31 after the end of the model year.

| *Tier* | *Model Year in Which ZEV is Placed in Service* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012+* |
| NEV | 1.25 | 0.625 | 0.625 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| Type 0 (Utility) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1 | 1 | 1 | 1 |
| Type 1 (City) | 8 | 8 | 8 | 7 | 7 | 5 | 2 | 2 | 2 | 2 |
| Type II | 12 | 12 | 12 | 10 | 10 | 7 | 3 | 3 | 3 | 3 |
| Type III | 40 | 40 | 40 | 15 | 15 | 15 | 4 | 4 | 4 | 3 |

Proposed additional amendments affecting the ZEV credit calculations reflect the above changes to the structure of the calculation and experience with the program to date. These proposed changes include modification of the fast refueling definition and elimination of the in-service/warranty credit for MY 2005 and later.

*Expanding manufacturers' compliance options prior to the 2012 MY.* The amendments would allow a manufacturer to use AT PZEVs to meet three-quarters rather than one-half of its MY 2005-2011 ZEV obligation that could not be met with PZEVs. This would mean that for MYs 2005-2008 only 10 percent of the manufacturer's overall ZEV obligation would have to be met with ZEVs or credits from ZEVs. During the 2009-2011 MYs, an increase in the permitted AT PZEV share would mean that only 1.25 percent of a manufacturer's applicable California passenger car, LDT1 and LDT2 production volume would have to be ZEVs. These amendments are proposed to create a slower ramp up of volumes of pure ZEVs and to encourage an increase in AT PZEV volumes in the early years.

Additionally, staff proposes that ZEVs be removed from the sales volume used to calculate the ZEV requirement. Also, staff proposes elimination of the cap on the use of banked NEV credits when used to meet obligations that can be satisfied with allowances from PZEVs or AT PZEVs.

*Refining the "placed in service" requirements.* The amendments would provide that a 2001-2002 MY ZEV qualifies for the early introduction multiplier of 4.0 only if it is placed in service in California by April 15, 2003. If it is placed in service after that time, it would be subject to the credit provisions applicable to 2003 and subsequent MY ZEVs as described above.

*Miscellaneous changes.* The energy storage device on a hybrid electric PZEV is currently required to be warranted for 15 years or 150,000 miles, whichever occurs first. The proposed amendments would revise the warranty requirement for the energy storage device to 10 years or 150,000 miles. The amendments would also extend the

sunset date on the award of transportation system credits from MY 2007 to MY 2011, and remove credits earned by vehicles from the cap on the use of transportation system credits.

*Reaffirmation of the phased addition of LDT2s.* During the comment period in this rulemaking, the Board will accept comment on whether it should reaffirm the changes in the 2001 ZEV amendments that phase in a requirement that LDT2 vehicles be included in the base for calculating a manufacturer's ZEV obligation. In MY 2007, 17 percent of the manufacturer's California LDT2 production is to be counted. The percentage increases by 17 percent increments through the 2011 MY, with a 100 percent requirement starting in the 2012 MY. The staff is proposing that, at the conclusion of the hearing, the Board reaffirm the inclusion of these provisions in the ZEV regulation.

## AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal, and supporting technical documentation. The staff report is entitled: "Initial Statement of Reasons for Rulemaking, Proposed 2003 Amendments to the California Zero Emission Vehicle Regulation."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strike-out format to allow for comparison with the existing regulations, may be obtained from the ARB's Public Information Office, Environmental Services Center, 1001 "I" Street, First Floor, Sacramento, California 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing (February 27, 2003).

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons: Chuck Shulock, Vehicle Programs Specialist, at (916) 322-6964, or Analisa Bevan, Manager, ZEV Implementation Section, Mobile Source Control Division at (916) 323-8966.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, or Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the Air Resources Board ADA Coordinator at (916) 323-4916, or

TDD (916) 324-9531, or (800) 700-8326 for TDD calls from outside the Sacramento area.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at http://www.arb.ca.gov/regact/zev2003/zev2003.htm.

## COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred in reasonable compliance with the proposed regulations are presented below.

The Executive Officer has determined that the proposed regulatory action will not create costs or savings, as defined in Government Code section 11346.5(a)(6), to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary savings to local agencies.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has initially determined that the proposed amendments should have minimal or no impacts on the creation or elimination of jobs within the State of California, minimal or no impacts on the creation of new businesses and the elimination of existing businesses within the State of California, and minimal or no impacts on the expansion of businesses currently doing business within the State of California.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on private persons and businesses. Any business involved in manufacturing, purchasing or servicing passenger cars and light-duty trucks could be affected by the proposed amendments. Also affected are businesses that supply parts for these vehicles. Some affected businesses may be small businesses. California accounts for only a small share of total nationwide motor vehicle and parts manufacturing. As discussed below, the Executive Officer has determined that the proposed regulatory action will not have a significant cost impact on directly affected persons or businesses.

As with the 2001 amendments to the ZEV regulation, comparing the projected compliance costs associated with the current regulations and the proposed amendments involved consideration of two key factors: (1) the number of vehicles that are required to be placed, and (2) the incremental cost per vehicle. Both factors must be estimated, and both estimates are subject to considerable uncertainty, in large part

because of the compliance flexibility provided. Nevertheless, the direction of the cost impact of the proposed amendments is clear – they will reduce the cost of the program – but the magnitude of the savings is more difficult to assess.

Overall, staff estimates the cost savings resulting from the proposed amendments for model year 2005 through 2011 range from an estimated $375 million to $3,623 million. In addition to the modifications proposed herein, staff is proposing that the Board reconsider and reaffirm the inclusion of LDT2 vehicles to the sales base. This component of the existing regulation was added as part of the post-Board hearing modification in the 2001 rulemaking. The costs of this provision are taken into account in the estimated savings noted above.

*PZEVs:* In the Initial Statement of Reasons for the 2001 amendments, ARB staff estimated that the incremental cost for PZEV compliance was $500. In the Final Statement of Reasons for that rulemaking, this estimate was reduced to $200 based on new information. Today, based on staff analysis of the most recent vehicles certified by manufacturers, staff estimates that the incremental cost for a PZEV is $100. Under the amendments proposed herein, the number of PZEVs required, and thus the incremental cost of compliance, will not change. Assuming full use of PZEVs, the costs for Stage I (MYs 2003-2005) are $27.5 million, increasing to $51.1 million at the end of Stage II (MYs 2006-2008), and $66.3 million at the end of Stage III (MYs 2012 and beyond).

*AT PZEVs:* In the 2000 Biennial Review Staff Report and the Initial Statement of Reasons for the 2001 ZEV amendments, the incremental cost for an AT PZEV was estimated to be $3,300 in the near term and $1,100 in volume production. Staff currently estimates that the incremental cost for an AT PZEV is $3,300 in Stage I, $1,500 in Stage II, $1,200 in Stage III, and $700 in 2012 and beyond. It should be noted that the incremental cost of hybrid electric vehicles within this category will be partially offset by vehicle attributes such as performance or fuel economy for which consumers are willing to pay a premium estimated to exceed $1,000. The use of this premium results in a "negative" incremental cost in 2012 and beyond – in other words by 2012 the hybrid electric vehicle is estimated to be less expensive to own and operate over its lifecycle than a conventional vehicle.

Assuming manufacturers make full use of the AT PZEV option under staff's proposal, manufacturers are expected to produce more AT PZEVs than under the current regulation; thus the overall incremental cost of compliance in this category will exceed that expected under the current regulation. Specifically, in 2005, the incremental cost under the proposed amendments is $39.6 million compared to $31 million under the existing regulation; in 2008 at the end of Stage II, the incremental cost under staff's proposal is $32 million compared to $24 million under the existing regulation; and in 2011 at the end of Stage III, the incremental cost under the proposal is $21 million compared to $15 million under the existing regulation. The higher incremental cost for this category of vehicles, however, will be more than offset by reductions resulting from changes in requirements for the ZEV category.

*ZEVs:* In this analysis staff uses the battery EV cost estimates from the 2000 Biennial Review Staff Report because there has not been any significant changes affecting those estimates since that time. In that report, the total near term incremental cost for full function battery electric vehicles was estimated to range between $13,000 and $24,000, depending on the type of vehicle and the battery employed. For City EVs the near term incremental cost ranged from $7,500 to $10,000. Costs in volume production were estimated to range from $1,500 to $11,000, again depending on the type of vehicle and the battery used. The two reports did not include an estimate of the incremental cost of fuel cell EVs. For this proposal, staff estimates the incremental costs for a fuel cell vehicle to be $1 million in Stage I, $300,000 in Stage II, $120,000 in Stage III, and $10,000 in MYs 2012 to 2020.

The estimated incremental cost of the pure ZEV portion of the regulation decreases significantly under the staff proposal, due to the fact that this category in total is reduced to one-half of its current size, while the credits earned per vehicle are increased over time. As a result manufacturers will not be required to produce as many ZEVs – whether they are full function battery EVs, city cars or fuel cell electric vehicles – particularly in the early years of the program.

With the proposed changes, the incremental cost of compliance for the ZEV component of the program is zero at the end of Stages I and II and approximately $83 million, $117 million and $225 million for city EVs, full function EVs and fuel cell EVs, respectively, in 2011 at the end of Stage III. This compares to incremental costs under the existing regulation of $109 million, $94 million and $1,290 million for city EVs, full function EVs, and fuel cell EVs, respectively, in 2008 at the end of Stage II, and $234 million, $221 million and $1,440 million for those categories in 2011 at the end of Stage III.

Staff reiterates that these estimates are subject to considerable uncertainty. While there is no doubt that staff's proposed changes will reduce the cost of compliance, the magnitude of the savings is much more difficult to assess.

Before taking final action on the proposed regulatory action, the Board must reasonably determine that no alternative considered by the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons or businesses than the proposed action.

## SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received no later than **12:00 noon, February 26, 2003**, and addressed to the following:

Postal Mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: zev2003@listserv.arb.gov and received at the ARB by no later than **12:00 noon, February 26, 2003.**

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB no later than **12:00 noon, February 26, 2003.**

The Board requests, but does not require, 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring any suggestions for modification of the proposed regulatory action to the attention of staff in advance of the hearing.

## STATUTORY AUTHORITY

This regulatory action is proposed under that authority granted in sections 39600, 39601, 43013, 43018, 43101, 43104 and 43105 of the Health and Safety Code. This action is proposed to implement, interpret and make specific sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43204 and 43205.5 of the Health and Safety Code.

## HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code. Following the public hearing, the ARB may adopt the regulatory language as originally proposed or with nonsubstantial or grammatical modifications. The ARB may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. Potential modifications include, but are not limited to, prevention of a ZEV product blackout, minimizing the impact of section 177 of the federal Clean Air Act on manufacturers, inclusion of credit for fueling infrastructure deployment or stationary fuel cells, amendment of treatment of credits from 2004 and earlier MY PZEVs, adjustment of credits earned by AT PZEVs and the threshold performance requirements to earn advanced componentry credit, the treatment of specialty vehicles, and requirements for length of vehicle placement to earn credits. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted. The public may request a copy of the modified regulatory text

from the ARB's Public Information Office, Environmental Services Center, 1001 "I" Street, First Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Michael P. Kenny
Executive Officer

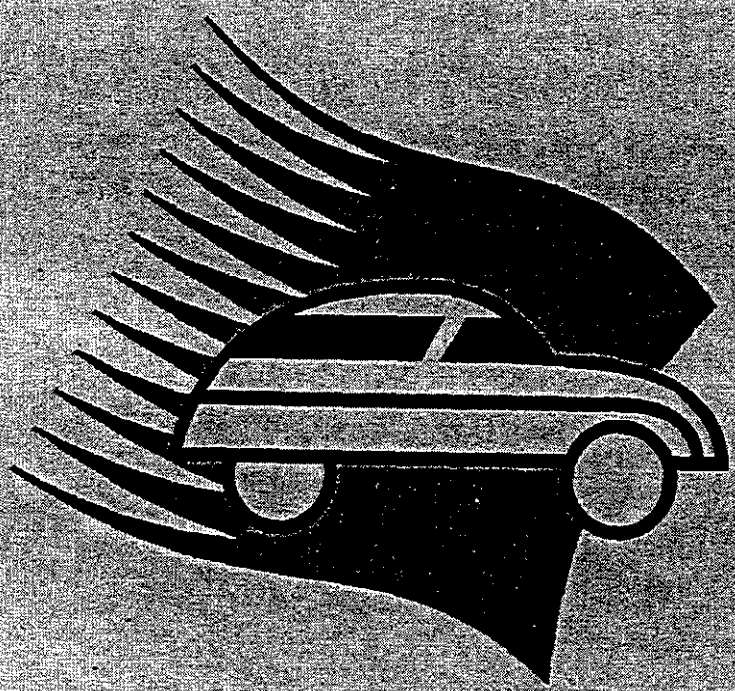
Date: December 31, 2002

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our Web-site at www.arb.ca.gov.*

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

# STAFF REPORT: INITIAL STATEMENT OF REASONS

# 2003 PROPOSED AMENDMENTS TO THE CALIFORNIA ZERO EMISSION VEHICLE PROGRAM REGULATIONS



This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Date of Release: January 10, 2003
Scheduled for Consideration: February 27, 2003

## EXECUTIVE SUMMARY

In 1990, the California Air Resources Board adopted an ambitious program to dramatically reduce the environmental impact of light-duty vehicles through the gradual introduction of zero emission vehicles (ZEVs) into the California fleet. Specifically, the Air Resources Board (ARB) required that at least 2 percent, 5 percent and 10 percent of new car sales be zero-emitting by 1998, 2001 and 2003, respectively. To provide flexibility, the regulations allow automakers to bank and trade ZEV credits. Although the ZEV regulations did not require a specific technology, the expectation at that time was that the requirement would be met through the introduction of battery electric vehicles (EVs).

The ZEV requirements for passenger cars have been changed three times since the program's inception – in 1996, 1998 and 2001. Although the program implementation has been changed when necessary to reflect the status of technology, the original objective has not changed. California continues to maintain a strong commitment to zero emissions performance in the passenger car and light-duty truck fleet. In response to the ZEV requirements, automakers have developed and placed a limited number of zero emission vehicles into the market to evaluate technological and commercial feasibility. Additionally, automakers have demonstrated and marketed an array of near zero emission and advanced technology vehicles supportive of the zero emission vehicle goals.

In 1996, the ARB modified the regulations to allow additional time for technology to develop. The requirement for ten 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, ARB entered into Memoranda of Agreement with the seven largest vehicle manufacturers to place several thousand ZEVs in California. These ZEVs demonstrated the performance capabilities of battery EVs. They also resulted in a group of consumers who were, and continue to be, passionate about the new technology.

In 1998, the Board adopted amendments that allowed automakers to meet a portion of their ZEV requirement with a new class of vehicle, the Partial ZEV Allowance Vehicle, or PZEV. To certify as a PZEV, the vehicle must meet the ARB's most stringent emission standard, have zero evaporative emissions and carry a warranty of 15 years or 150,000 miles on all emissions related components. Seven models are now available to consumers that meet these extremely low emission levels.

In January 2001 the ARB approved further amendments to the ZEV regulations that were designed to maintain progress towards the commercialization of zero emission vehicles while recognizing the market constraints created by the cost of battery technology. The amendments preserved the fundamental requirement that 10 percent of all new passenger cars and the lightest light-duty trucks be

ZEVs. A new credit approach was established, however, to provide additional credits for early introduction, increased range and improved vehicle efficiency. These changes served to substantially reduce the number of pure ZEVs that would be needed beginning in 2003. It was hoped that these changes would provide for a spectrum of clean ZEVs (full-function, city, neighborhood, and fuel-cell vehicles). Unfortunately, at this time, manufacturers have generally limited production to neighborhood electric vehicles.

An important element of the 2001 amendments was the establishment of a new vehicle category, referred to as the "Advanced Technology PZEV" or "AT PZEV." Per the amended regulations, vehicles meeting the AT PZEV certification standard (which includes gasoline hybrid-electric vehicles) could be used to meet up to one-half of a manufacturer's pure ZEV obligation. This provision was included to provide greater incentives for the continued development of advanced technologies that are supportive of zero emission vehicle commercialization and to offer additional flexibility to automakers in meeting the program requirements.

In June 2002, a federal district judge issued a preliminary injunction that prohibits the ARB from enforcing the 2001 ZEV Amendments with respect to the sale of new motor vehicles in the 2003 or 2004 model years. The preliminary injunction resulted from the AT PZEV provisions that provide manufacturers with the option of earning additional ZEV credit if they produce vehicles that make use of advanced ZEV componentry such as that used in gasoline hybrid-electric vehicles. The judge issued the preliminary injunction after finding that the plaintiffs were likely to succeed in their claim that the provisions are related to fuel economy standards and thus preempted by the Energy Policy and Conservation Act of 1975. While the ARB has appealed the issuance of the preliminary injunction to the U.S. Court of Appeals for the Ninth Circuit, the preliminary injunction remains in effect.

When the Board amended the regulation in 2001, it did so with the understanding that the near-term compliance with the pure ZEV portion of the regulation would be expensive for automakers, but that continued vehicle and technology development would lead to less costly approaches. Since that time, there have been no significant reductions in the cost of battery EVs. Meanwhile, the marketing of battery EVs has achieved only modest success. These factors, along with the lawsuit, have slowed or even halted automaker plans regarding battery EV development.

In addition, projections regarding the pace of commercialization of fuel cells, which were projected to provide a second ZEV technology late in this decade, have become less certain, although automakers remain fully committed and continue to invest heavily in the technology. As a result, it appears that under the current regulation manufacturers will need to develop additional battery EV

products to bridge the interim years until fuel cells are available in larger quantities in the next decade.

There is considerable disagreement over the effects and relative benefits of the current ZEV program. Supporters of battery EV technology have argued that the additional battery EV products required per the current regulation will help build the market for ZEV products. They have also maintained that continued development of battery products provides a "safety net" in the event that fuel cell technology encounters impenetrable barriers. The auto manufacturers, on the other hand, have argued that the need to devote engineering staff and resources to mid-term battery EVs will actually detract from the pace of fuel cell commercialization. Moreover, many manufacturers have stated that they would prefer to target their investment towards fuel cell technology rather than battery EV technology, because they believe that fuel cells show promise of future market commercialization while battery EVs do not.

In light of the current uncertainty the Board needs to re-affirm its commitment to ZEVs by removing the legal issues, restructuring the transition years of the program and allowing automakers to refocus their efforts into technology areas that have long-term commercialization potential.

**Proposed Amendments to the Regulations**

To address the issues raised by the preliminary injunction, staff has developed a proposal that removes all references to fuel economy and efficiency and thus responds to the preemption concerns raised in the district court's decision. At the same time, staff has developed additional amendments that are designed to maintain pressure on the commercialization of ZEV technologies while recognizing the current state of the technology and the cost implications related to their development. The staff proposes the following specific amendments:

*2005 Program Start.* Restart the ZEV requirement in 2005 while allowing manufacturers to earn and bank for future use credit earned by any vehicles produced prior to 2005.

*Amend AT PZEV Calculation Method.* Staff proposes amendments that would remove all references to fuel economy and efficiency from the calculation of AT PZEV credits. The restructuring of the calculation method includes several elements that simplify the structure of the calculation. Staff proposes amendments that would establish flat credits for vehicles with advanced hybrid componentry or gaseous storage systems. Staff further proposes amendments that would revise the calculation of the low fuel-cycle emissions credit. The credit for zero emission vehicle miles traveled for hybrid electric vehicles is adjusted upward and the phase-in multiplier for AT PZEVs with any zero emission vehicle miles traveled is increased under staff's proposal. Post 2011, staff proposes amendments that would cap the total AT PZEV credit that can be earned by any

technology type at 3.0. Finally, staff proposes amendments that permit each element of the AT PZEV credit calculation and each general provision to be severed from the remainder of the program if warranted.

*Amend ZEV Calculation Method.* Staff also proposes amendments that remove the efficiency multiplier from the ZEV credit calculation. To restructure the ZEV credit calculation, staff proposes a series of amendments aimed at simplifying the calculation and encouraging sustainable commercialization of ZEVs. Staff proposes amendments that create ZEV "types" that will be the basis for the ZEV credits. These types include NEVs, Type 0 (utility low-range ZEVs), Type I (mid-range ZEVs, like City EVs), Type II (longer-range ZEVs, like full-function battery EVs) and Type III (long range, fast-refueling ZEVs, like fuel cell vehicles). The proposed amendments do not change the amount of credit earned by NEVs. Type 0 ZEVs would earn 1.5 credits until 2008 and then one credit for 2009 and later under staff's proposal. Type I, II, and III ZEVs earn an increased level of credits in staff's proposal through the 2011 timeframe. In 2012 and beyond, Type I vehicles (City EVs) continue to earn somewhat enhanced credits as compared to the 2001 amendments while credits for other vehicles are similar to the amounts provided by the 2001 amendments.

Additional changes are proposed to the ZEV credit calculations. These proposed changes include amendments to the fast refueling definition and the elimination of the in-service/warranty credit for model year 2005 and later vehicles.

*Amendment of Compliance Options.* The 2001 amendments allowed automakers to satisfy up to half of the pure ZEV requirement with certain other advanced technologies that are not ZEVs. Staff proposes amendments that permit automakers to satisfy up to three-quarters of the pure ZEV portion of the ZEV requirement with such vehicles during the transition period from 2005 through 2011. This adjustment to the amount of AT PZEV credit that can be used to satisfy the pure ZEV requirement has been proposed to reflect the reality of current ZEV technology and to take advantage of current opportunities in AT PZEV technology.

Additionally, staff proposes amendments that 1) remove ZEVs from the sales volume used to calculate the ZEV requirement and 2) eliminate the cap on use of banked NEV credits when used for the PZEV or AT PZEV compliance options.

*Miscellaneous Changes.* The 2001 amendments required HEVs to have a 15-year/150,000 mile warranty on the battery. Staff is proposing amendments that reduce this warranty requirement to 10-years/150,000 miles. Staff also proposes amendments that extend the sunset date on the award of "transportation system" credits from 2007 to 2011, remove credits earned by vehicles from the cap on the use of transportation system credits, and clarify the regulatory definition of placed in service.

*LDT2 Vehicles.* Staff proposes that the Board reconsider and affirm its January 2001 action to add LDT2 vehicles to the base against which manufacturers' ZEV obligations are determined.

**Effect of Proposed Amendments**

Staff has developed scenarios that illustrate the number of vehicles that would be required under the 2001 amendments and the staff proposal. Due to the flexibility afforded by the ZEV regulation, it is not possible to accurately predict manufacturer strategies, and therefore these scenarios should be viewed as illustrations rather than firm predictions.

In general, the staff proposal would decrease the number of ZEVs required during the transition period from 2005 through 2011, while increasing the number of AT PZEVs (assuming that manufacturers take full advantage of that option). In 2012 and beyond, after the conclusion of the transition period, a manufacturer's ZEV obligation would be essentially the same as that required under the 2001 amendments.

Adding up the total cost of the program (ZEV, PZEV and advanced-technology PZEV production), and taking into account the use of banked credits, the staff proposal results in slightly increased costs in the early years as compared to the 2001 amendments (due to the larger number of AT PZEVs) but significant cost savings in model years 2008 through 2011 (due to the smaller number of pure ZEVs required). Over the entire 2005-2011 transition period, the estimated savings under the staff proposal range from $256 million to $3.5 billion. This extreme range reflects the uncertainty regarding manufacturer compliance strategies. In all cases, however, the staff proposal results in savings.

Staff has estimated the 2010 and 2020 emissions impact of the staff proposal for the South Coast Air Basin, as compared to the current regulation and the "no-ZEV program" alternative. These estimates assume that compliance begins in 2005 even under the 2001 amendments.

ARB staff estimates that the proposed changes will result in a net decrease of about 0.04 tons per day of direct emissions of reactive organic gases (ROG) and oxides of nitrogen (NOx) in 2010 when compared to the 2001 amendments. For 2020, staff estimates a net decrease of about 0.1 tons per day of direct emissions of ROG and NOx from the proposed amendments as compared to the 2001 amendments.

Staff estimates the proposed amendments will reduce approximately 1.37 and 4.84 tons per day of ROG and NOx by 2010 and 2020, respectively, as compared to a "no-ZEV" alternative.

**Staff Recommendation**

The ARB staff recommends that the Board adopt the amendments as proposed in this Initial Statement of Reasons. The proposed amendments address the issues raised by industry litigation, respond to the current state of ZEV technology, and reduce the overall cost of compliance to industry while maintaining the push toward ZEV commercialization.

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# Table of Acronyms

AER..... All Electric Range
ARB ..... California Air Resources Board
AT PZEV ..... Advanced Technology Partial ZEV Allowance Vehicle
CAFE ..... Corporate Average Fuel Economy
CNG ..... Compressed Natural Gas
EIR ..... Environmental Impact Report
EMFAC ..... ARB's mobile emissions inventory modeling program
EV ..... Electric Vehicle
FSOR ..... Final Statement of Reasons
GVWR ..... Gross Vehicle Weight Rating
HEV ..... Hybrid-Electric Vehicle
ISOR ..... Initial Statement of Reasons
LDT1 ..... Light Duty Truck with a loaded vehicle weight of 0-3750 pounds
LDT2..... Light Duty Truck with a loaded vehicle weight of 3751 pounds to a gross vehicle weight of 8500 pounds, or a "LEV I" light-duty truck with a loaded vehicle weight of 3751-5750 pounds
LEV I .....First generation Low Emission Vehicle program, adopted in a 1990-1991 rulemaking, and generally applicable in the 1994-2003 model years
LEV II .....Second generation Low Emission Vehicle program, adopted in a 1998-1999 rulemaking, and generally applicable in the 2004 and subsequent model years
MOA ..... Memoranda of Agreement
MY ..... Model Year
NEV ..... Neighborhood Electric Vehicle
NiMH ..... Nickel Metal-Hydride
NMOG ..... Non-Methane Organic Gases
NOx ..... Oxides of Nitrogen
OBD ..... On-Board Diagnostic
PC ..... Passenger Car
PEM ..... Proton Exchange Membrane
PZEV ..... Partial ZEV Allowance Vehicle
ROG ..... Reactive Organic Gases
SAE ..... Society of Automotive Engineers
SULEV ..... Super Ultra-Low Emission Vehicle
SUV ..... Sport Utility Vehicle
Type 0 ..... Utility EV < 50 miles
Type I ..... City EV >= 50, < 100 miles
Type II ..... Full Function EV, >= 100 miles
Type III ..... ZEV, >= 100 miles plus fast refueling
UDDS ..... Urban Dynamometer Driving Schedule
ULEV I ..... Ultra-Low Emission Vehicle, pre-1998 regulations
ULEV II ..... Ultra-Low Emission Vehicle, post-1998 regulations
U.S. EPA ..... United States Environmental Protection Agency
VMT ..... Vehicle Miles Traveled
ZEV ..... Zero-Emission Vehicle

## 1. INTRODUCTION

In 1990, the California Air Resources Board adopted an ambitious program to dramatically reduce the environmental impact of light-duty vehicles through the gradual introduction of zero emission vehicles into the California fleet. The Zero Emission Vehicle (ZEV) program, which affects passenger cars and light-duty trucks, has been adjusted three times since its inception, in 1996, 1998, and 2001. The fundamental goal of the program, however, has not changed. California remains committed to the commercialization of zero emission vehicle technologies wherever feasible. The challenge facing the Board is determining how to achieve a sustainable commercial market given the uncertainties in cost and the pace of technological development.

California's strong commitment to the ZEV program reflects the essential need for zero-emission vehicle technology in order to achieve the State's public health protection goals. Health-based state and federal air quality standards continue to be exceeded in regions throughout California. California's growing population and increasing use of motor vehicles mean continued upward pressure on statewide emissions. Manufacturing, power generation, petroleum refining, goods transport, home heating and cooling, personal mobility and a wide range of human activities all have direct air pollution consequences. Achieving zero emissions from these source categories is critical to mitigating their impacts on human health.

Zero-emission technologies can greatly reduce or even eliminate some of the persistent problems with conventional vehicles. Combustion-based engines are prone to deterioration over time and result in higher fuel cycle emissions. Catastrophic failures are also a concern. Older gasoline-powered vehicles, for example, become gross emitters if their emission control systems fail. Combustible fuels also have significant "upstream" impacts. Refining, fuel storage and delivery all have associated emissions from routine operations, accidents (breakdowns, fuel spills), and ongoing compliance problems (e.g., leaking underground tanks). Apart from upset conditions that may occur during electric power generation or hydrogen fuel production and distribution, zero emission vehicles have none of these vulnerabilities.

While ZEVs can provide significant environmental benefits, it is also necessary that they be economically viable. Since the program's inception, substantial technological improvements have occurred. These improvements have raised the level of vehicle performance and have resulted in attractive solutions to personal mobility. However, the cost goals necessary for such technologies to compete successfully in the marketplace have not been met, preventing the more widespread introduction of the technology.

In January 2001 the ARB approved amendments to the ZEV regulations that maintained the requirement for pure ZEVs while recognizing the market constraints associated with the cost of available battery technologies. Under the amendments, a new credit mechanism was implemented to provide additional credits for early introduction, increased range and improved vehicle efficiency. The changes served to substantially reduce the number of pure ZEVs beginning in 2003 and the attendant costs to industry.

The 2001 amendments also created the "Advanced Technology Partial Zero Emission Vehicle" or "AT PZEV" certification standard. Vehicles meeting the AT PZEV certification standard could be used to meet up to one-half of a manufacturer's pure ZEV obligation of four percent. The AT PZEV was included to provide incentives for the continued development of advanced technologies and to offer additional flexibility to automakers in meeting the program requirements.

In June 2002, however, a federal preliminary injunction was issued that prohibits the ARB from enforcing the 2001 ZEV amendments. The preliminary injunction resulted from the AT PZEV provisions that provide manufacturers with the option to earn additional ZEV credit if they produce vehicles that make use of advanced ZEV componentry such as that used in gasoline hybrid-electric vehicles. The judge issued the preliminary injunction after finding that the plaintiffs were likely to succeed in their claim that the provisions are related to fuel economy standards and thus preempted by the Energy Policy and Conservation Act of 1975. The ARB has appealed the issuance of the preliminary injunction and expects to receive a ruling on the appeal in early 2003. Given the uncertainty of the current litigation, the ARB is now proceeding with a regulatory process to remove all references to fuel efficiency. This process has also provided ARB staff with an opportunity to propose additional changes to the program that reflect the status of technology two years after the Board last amended the regulations.

When the Board adopted the changes in 2001, it did so with the understanding that the near-term compliance with the pure ZEV portion of the regulation would be expensive for automakers. However, the Board maintained the requirements believing that continued research and development would lead to more economical approaches that could be developed in modest quantities as an interim step to larger scale commercialization. Unfortunately, significant reductions in cost have not occurred.

In response to the preliminary injunction, staff has developed recommendations that remove all references to fuel economy and that address the preemption concerns raised in the district court's decision. In addition, staff's proposal also includes proposed amendments that are designed to further encourage commercialization of ZEV technologies. The staff proposal and its rationale are presented in this Initial Statement of Reasons.

## 2. BACKGROUND

### 2.1 Staff Objectives

The ongoing amendments to the ZEV program are the result of the continuing need to maintain a balance between pressure on vehicle manufacturers to pursue zero emission vehicles, and recognition of the real-world status of the available technologies. Historically, the objective of the ZEV program has been to push the boundaries of ZEV development, but to take into account the cost, performance, suitability for volume production and long-term prospects of the technologies at hand.

This same philosophy holds true today. While manufacturers have argued that the Board should abandon its pure ZEV requirement and focus solely on the air quality benefits achievable from technologies ready for volume production, staff believes that the ARB needs to maintain a core zero emission requirement to provide an incentive for further vehicle development. While the program has not yet resulted in the sustained commercial introduction of ZEVs, the tremendous developments that have been made in a variety of advanced technologies can, at least in part, be attributed to the existence of the ZEV requirement. Furthermore, ARB staff believes that continued regulatory requirements are needed to push the development of pure ZEVs.

At the same time, the ZEV program should provide flexibility for manufacturers to pursue specific clean vehicle strategies that they believe offer the best hope for commercial viability. While the introduction of any new vehicle technology requires sizable up-front investment for research and development, vehicles meeting the ZEV requirements must ultimately succeed in a competitive market in volume production. The number of vehicles required in the pure ZEV or "gold" category under this proposal reflects what ARB staff believes is necessary to sustain serious research and development efforts which will sustain progress toward commercialization while not arbitrarily requiring high volumes of not-yet-ready technologies. In more specific terms, the objectives of the proposed amendments are:

- To achieve long-term public health goals,
- Maintain a pure ZEV requirement and the goal of zero emissions,
- Resolve issues raised by the federal preliminary injunction,
- Accelerate ZEV technology development,
- Provide support for future ZEV commercialization,
- Take full advantage of technology options that are available today, to achieve air quality improvement and provide a bridge to ZEV commercialization,
- Provide manufacturers with the option to pursue their preferred path towards ZEV commercialization, and

- Provide flexibility with respect to fuels, technologies, and compliance pathways.

## 2.2 Timing Considerations

Staff has developed proposed amendments to be brought before the Board at a February 27, 2003 public hearing. Major milestones in this regulatory process are:

| | |
|---|---|
| December 5, 2002 | Public Workshop<br>Possible Amendments to the ZEV Regulations<br>Sacramento |
| January 10, 2003 | Release of the Initial Statement of Reasons |
| February 27, 2003 | Board Hearing<br>Sacramento |

The staff has developed the proposed amendments in a relatively short time frame to return certainty to the regulatory system as quickly as possible. As a result, the proposal does not address and resolve every issue. The ARB staff intends to fully engage with interested parties during the 45-day comment period through collection of comments and further conversations with interested stakeholders. Staff may develop and release additional proposed amendments prior to the Board meeting that reflect this consensus building process.

Possible topics that may be considered during the 45-day comment period include:

- Measures to avoid a possible sustained "blackout" of pure ZEV production due to the availability of banked credits
- Measures to consider the aggregate effect of California production requirements in light of the parallel adoption of California requirements in other states
- Further refinement of the minimum requirements that a vehicle must meet in order to earn advanced componentry credit
- Methods to award credit for placement of hydrogen infrastructure
- Providing ZEV credit for stationary fuel cell applications that support the commercialization of fuel cell and infrastructure technology that can be applied to vehicles
- Measures to encourage the voluntary production of model year 2003 and 2004 PZEVs
- Measures to ensure that "specialty" vehicles receive appropriate levels of credit

These issues are discussed in more detail in Section 8.2 below.

## 2.3 Air Quality in California

Air quality in California has improved dramatically over the past 25 years, largely due to continued progress in controlling pollution from motor vehicles. Faced with ever more stringent regulations, vehicle manufacturers have made remarkable progress in advancing vehicle technology. Vehicles meeting the ARB's most stringent emission certification standards achieve emission levels that seemed impossible when the Low Emission Vehicle Program was adopted in 1990.

Despite this progress, however, air quality in many areas of the state still does not meet federal or state health-based ambient air quality standards. Mobile sources still are responsible for well over half the ozone-forming emissions in California. The relative contribution of passenger cars and small trucks is expected to decline over time as new standards phase in, but in 2020 such vehicles will still be responsible for about 10 percent of total emissions. State and federal law requires the implementation of control strategies to attain ambient air quality standards as quickly as practicable.

Mobile sources also produce toxic air contaminants and are a major contributor to greenhouse gas emissions. Furthermore, facilities needed to refuel conventional vehicles such as service stations, bulk terminals and refineries are significant sources of smog precursors, air toxics, water pollution, and hazardous waste.

## 2.4 Zero Emission Vehicle Program

The ZEV program was originally adopted in 1990, as part of the first ARB Low-Emission Vehicle regulations. The ZEV program is an integral part of California's mobile source control effort, and is intended to encourage the development of advanced technologies that will provide increasing air quality benefits for California now and into the future.

Under the 1990 regulations, the seven largest auto manufacturers were required to produce ZEVs beginning with model year 1998. In model years 1998 through 2000, two percent of the passenger cars and lightest light-duty trucks offered for sale in California by large volume manufacturers were to be ZEVs, and this percentage was to increase to five percent in model years 2001 and 2002. The requirement became ten percent for all but small volume manufacturers starting in model year 2003. To provide flexibility, the regulations allow automakers to bank and trade ZEV credits.

In the early years of the program, ZEV technology focused on battery EVs. In 1996 the ARB modified the regulations to allow additional time for battery research and development. The requirement for ten percent ZEVs in model years 2003 and beyond was maintained, but the ZEV requirement for model

years 1998 through 2002 was eliminated. At that same time, the ARB entered into Memoranda of Agreement (MOA) with the seven largest vehicle manufacturers in the California market. Under the MOAs, these manufacturers placed more than 1,800 advanced-battery EVs in California during 1998 to 2001, ensuring a significant near-term market for advanced battery manufacturers. This market was expected to allow battery manufacturers to be able to transition to commercial production. The MOAs also required the ARB to work with state and local governments to help develop the necessary recharging infrastructure and to address other issues such as building codes modifications and emergency response training that would result from use of the technology. These ZEVs demonstrated the performance capabilities of battery EVs. They also resulted in a group of consumers who were, and continue to be, passionate about the new technology.

Meanwhile, manufacturers achieved rapid progress on extremely clean near-zero emission conventional vehicles. In recognition of the air quality benefits afforded by such technologies and the status of pure ZEV development, in 1998 the ARB provided additional flexibility in the ZEV program by allowing an additional certification standard, the Partial ZEV Allowance Vehicle (PZEV), to be used to meet a portion of the program requirements. More specifically, the 1998 amendments allowed intermediate-sized manufacturers to use PZEVs to meet the entire 10 percent ZEV requirement, while large manufacturers could meet up to 60 percent of their ZEV requirement with such vehicles. To certify as a PZEV, a vehicle must meet the ARB's super ultra low emission standard (SULEV), have zero evaporative emissions and provide a warranty of 15 years/150,000 miles on all emissions related components.

## 2.5 2001 Board Hearing

In January 2001 the ARB approved amendments to the ZEV regulations designed to maintain progress towards the commercialization of zero emission vehicles while recognizing the near-term constraints due to cost, lead-time, and technical challenges. The amendments preserved the fundamental requirement that 10 percent of all new passenger cars and light-duty trucks be classified as ZEVs. However, a new credit mechanism was established to provide additional ZEV credits for early vehicle introduction, greater range and improved vehicle efficiency. These changes served to substantially reduce the number of pure ZEVs that would be needed beginning in 2003.

An important element of the 2001 amendments was the establishment of a new vehicle category, referred to as the "Advanced Technology Partial Zero Emission Vehicle" or "AT PZEV." Per the amended regulations, vehicles meeting the AT PZEV certification standard (including qualifying gasoline hybrid-electric vehicles) could be used to meet up to one-half of a manufacturer's pure ZEV obligation of four percent. This provision was included to provide greater incentives for the

continued development of advanced technologies and to offer additional flexibility to automakers in meeting the program requirements.

## 2.6 Preliminary Injunction

On June 11, 2002, a federal district judge issued a preliminary injunction that prohibits the ARB's Executive Officer from enforcing the 2001 ZEV Amendments with respect to the sale of new motor vehicles in the 2003 or 2004 model years, pending final resolution of the underlying lawsuit. The suit was brought by General Motors, DaimlerChrysler and various Fresno-area auto dealers. The ARB has appealed issuance of the preliminary injunction to the U.S. Court of Appeals for the Ninth Circuit. The appeal has been fully briefed with oral arguments scheduled for February 13, 2003.

In the lawsuit, the two manufacturers claimed that components within the AT PZEV provisions are preempted by federal law. There are three options for qualifying gasoline hybrids as AT PZEVs and calculating the number of ZEV credits they earn. One option is based on the amount of carbon dioxide ($CO_2$) emissions that are reduced. Another is based on the vehicle's efficiency as measured by fuel economy. The third provided credit based on the percentage of maximum available power that is provided by the electric storage system, but only through 2007 model year.

The judge issuing the preliminary injunction found that the plaintiffs were likely to succeed in their claim that the first two AT PZEV provisions mentioned above are related to fuel economy standards and preempted by the Energy Policy and Conservation Act of 1975. This Act directs the National Highway Traffic Safety Administration to establish corporate average fuel economy (CAFE) standards. The judge rejected arguments that the optional nature of the AT PZEV provisions eliminated preemption concerns on the basis that the disparities in costs among the various compliance options in effect required manufacturers to produce gasoline hybrids. The judge enjoined enforcement of all of the 2001 amendments after concluding that the challenged AT PZEV provisions likely were not severable from the rest of the ZEV program.

## 2.7 Status of Technology Development

Battery Electric Vehicle Technology

When the Board adopted the 2001 amendments, it did so with an understanding that near-term compliance with the "pure ZEV" portion of the regulation would be expensive for manufacturers. The Board anticipated, however, that continued development work would lead to more economical approaches that could be employed in modest quantities as the required vehicle volumes increased. The cost projections available in 2001 were based on a report provided by a panel of experts hired by the ARB to assess the state of technology. The report

concluded that the most widely used advanced battery technology, nickel metal hydride (NiMH), would cost vehicle manufacturers between $9,500 and $13,000 per vehicle in quantities of 10,000 to 20,000 per year. When manufactured at production levels exceeding one hundred thousand packs per year, total battery cost was estimated to be approximately $7,000 to $9,000 per vehicle.

ARB staff believes there have been only modest improvements in battery cost since the extensive review undertaken by the Battery Panel in 2000. A recent report entitled The 2002 Industry Report – A Critical New Assessment of Automotive Battery Trends, authored by one of the Battery Panel experts, focuses on batteries for advanced vehicles, primarily hybrid electric vehicles. Findings within this report pertaining to battery EVs are consistent with staff's assessment that current and reasonably projected battery electric vehicles will not play a significant role in personal transportation due to their inability to provide sufficient range at affordable cost. The technology may prove attractive for certain limited applications, but does not at this point appear to hold promise for widespread commercial introduction. Consequently, requiring that automakers place substantial numbers of battery EVs will not be a catalyst for cost reduction but rather will draw resources away from other promising technologies now being developed.

In response to battery costs, several automakers focused on placing Neighborhood Electric Vehicles (NEVs) as a means of earning early credit towards the ZEV requirements. Such vehicles are limited in size and speed, but have the potential to provide air quality benefits by displacing cold starts and short trips, and may have a small but stable self-supporting market. In general, however, it appears that manufacturers sought to place large numbers of NEVs primarily because they provided the lowest cost approach toward compliance with the regulations.

Fuel Cell Vehicle Technology

Automakers have chosen to pursue proton exchange membrane (PEM) fuel cells for vehicle applications due to their low temperature operation and potential for low-cost manufacturing. Over the last decade, industry has made impressive advances in hydrogen-air PEM fuel cell stack technology. As a result, several automakers are now placing the first prototype vehicles into research and demonstration applications, and almost all large automakers are committed to demonstration fuel cell fleets over the next several years.

While technical challenges remain to integrate all essential components into a complete system that provides acceptable weight, volume and operating characteristics, the most daunting challenge is to significantly reduce cost. Widespread introduction of the technology will be possible only when the technology can be produced and sold at a price comparable to that of today's conventional vehicles. Although prototypes are being placed in research

programs, considerable time is still needed for engineering development and for achieving the necessary cost reductions. Projections regarding the pace of commercialization of fuel cells, which were expected to provide a second ZEV technology late in this decade, have become less certain, although automakers remain fully committed and continue to invest heavily in the technology. Based on the most recent information and announcements regarding technology development, ARB staff believes that a true commercial introduction will not occur before 2011. As a result, it appears that under the current regulation manufacturers will need to develop additional battery EV products to bridge the interim years until fuel cells are available in larger quantities in the next decade.

The draft proposal reflects this expectation and provides regulatory incentives based on three stages of development prior to 2012. Each stage is designed to foster the placement of vehicles in order to push toward viable commercialization as quickly as possible.

There is considerable disagreement over the effects and relative benefits of the current ZEV program. Supporters of battery EV technology have argued that the additional battery EV products required by the current regulation will help build the market for ZEV products. They have also maintained that continued development of battery products provides a "safety net" in the event that fuel cell technology encounters impenetrable barriers. The auto manufacturers, on the other hand, have argued that the need to devote engineering staff and resources to mid-term battery EVs will actually detract from the pace of fuel cell commercialization. Moreover, many manufacturers have stated that they would prefer to target their investment towards fuel cell technology rather than battery EV technology, because they believe that fuel cells show promise of future marketability while battery EVs do not.

Near-Zero Emission Vehicle Technology

Meanwhile, technical progress in the AT PZEV and PZEV categories continues at a rapid pace, with a number of models in each category either already introduced or under active development. Currently, seven passenger car models have been certified to the PZEV standard with additional vehicles expected soon. Given the uncertainties created by the preliminary injunction, no AT PZEVs have been certified. However, staff believes that automakers are poised to introduce these vehicles in the near future once certainty in the regulations is provided. Staff believes that it is critical to provide regulatory incentives to ensure their continued commercial introduction.

## 3. SUMMARY OF PROPOSED AMENDMENTS

To achieve the objectives identified above, staff proposes that the Board adopt the following amendments to the program.

- Delay the start of the percentage ZEV requirements until model year 2005, and allow vehicles placed prior to 2005 to earn credit towards compliance.
- Amend the method used to calculate credit earned by AT PZEVs:
  - Simplify the Advanced Componentry credit awarded
  - Amend the low fuel-cycle emissions credit equation
  - Increase the credit for grid-connected HEVs for their zero emission miles traveled
  - Increase the phase-in multiplier for AT PZEVs with any zero emission vehicle miles traveled
  - Cap total AT PZEV credit earned by any technology at 3.0 after 2011
  - Make each element of the AT PZEV credit calculation (and each provision in the regulation) severable from the remainder of the regulation
- Amend the method used to calculate credit earned by ZEVs.
  - Create ZEV Type definitions: NEV, Type 0, I, II, and III
  - Establish credit levels by ZEV Types that achieve approximately the same number of vehicles by 2012 as envisioned by the 2001 amendments
  - Eliminate the In-service/Warranty credit
  - Amend the definition of fast refueling
- Amend the compliance options available to manufacturers:
  - During the 2005-2011 time period reduce the pure ZEV requirement to one half of its value under the 2001 amendments (new value would be one percent in 2005-2008 and 1.25 percent in 2009-2011) and increase the AT PZEV category by that same amount. At the conclusion of this demonstration period, in model year 2012, the full function ZEV credit levels would revert to the level needed to meet the 2001 ZEV amendments
  - Remove ZEVs from the sales base used to determine a manufacturer's obligation
  - Remove the cap on the use of NEV credits in the AT PZEV and PZEV categories
- Make other miscellaneous amendments, including:
  - Modify the required warranty on HEV energy storage devices to 10 years/150,000 miles
  - Extend the sunset date on award of "transportation system" credits from 2007 to 2011, and remove credits earned by vehicles from the cap on the use of transportation system credits
  - Clarify provisions relating to the placed-in-service requirement

- In addition, staff proposes that the Board reconsider and affirm its January 2001 action to add LDT2 vehicles to the base against which manufacturers' ZEV compliance obligations are calculated.

The following sections describe each of these proposed amendments in turn.

### 3.1 Delay of Start-up

Staff proposes amendments that delay the start of the ZEV program until model year 2005. 2002 and earlier model year vehicles meeting the ZEV requirements and offered for sale prior to the 2003 model year would earn ZEV credits based on the 2001 amendments. All further changes to the regulation described below pertain to 2003 and subsequent model year vehicles.

Timing elements of the regulation that are not changed by staff's proposal include the schedule for early introduction multipliers that apply to model years 2001 through 2005, and the schedule for inclusion of light-duty truck 2 (LDT2) volumes in ZEV obligation calculations in model years 2007 through 2012.

### 3.2 Amendments to AT PZEV Credit Determination

The incentives provided to AT PZEVs under the regulation are primarily intended to accelerate the development and deployment of ZEV technologies in the marketplace. Examples of such technologies include electric drive, battery storage and regenerative braking used in hybrid electric vehicles, and gaseous fuel storage used in compressed natural gas and hydrogen internal combustion engine vehicles. Promoting the widespread adoption of these technologies in PZEVs will lead to performance improvements and cost reductions that are necessary for ZEVs to become mass-market vehicles in the future. Progress has recently accelerated in the following key technology areas, in part due to the AT PZEV option:

- Greater battery calendar life, cycle life capacity, and specific power, as manufacturers expand the use of batteries in mild HEVs,
- Higher pressure gaseous fuel storage for CNG vehicles
- More efficient and less costly drive system motors and power electronics

The AT PZEV incentives are specifically designed to further the development and use of technologies and components that contribute to the commercialization of pure ZEV vehicles, including battery EVs and fuel cell vehicles. These linkages are described in comments provided to staff, which note that:

- Hybrid electric vehicles and pure ZEV technologies such as fuel cells share many of the same electric drive components, especially traction motors and motor controllers. Hybridizing fuel cell vehicles adds electric storage devices

(e.g. batteries and ultracapacitors) and regenerative braking systems to the list of common components.

- Hybridization of fuel cell vehicles can improve performance and reduce cost, and there is a clear trend towards hybridization of fuel cell vehicles for these reasons. This trend strengthens the technological linkages between hybrids and pure ZEVs. For example, Toyota's latest fuel cell prototype, the FCHV4, derives its drivetrain from its hybrid electric vehicle, the Prius. Ford uses the same battery pack and regenerative braking system for its more recent Focus fuel cell vehicle prototype and its forthcoming hybrid version of the Escape. The Nissan Xterra fuel cell vehicle uses hybrid control technologies developed for the Tino hybrid.

- In terms of technology and cost innovations, electric drive components are not fully mature. Increased volume production of electric drivetrain components will reduce the cost of critical components common to both hybrids and pure ZEVs. Researchers from University of California, Davis, for example, have quantified the cost benefits of producing critical electric drive components at high volumes.

These same points are made by automakers themselves. In keynote presentations at the December 2002 Electric Transportation Industry Conference, representatives from Toyota, Honda and Ford all noted that their hybrid electric vehicle programs are building blocks that support their move towards future deployment of fuel cell vehicles. Along the same lines, a recent article in Automotive News quoted a General Motors executive as stating that GM will benefit from hybrid technology because engineers can use some of the powertrain's electrical components, such as the software, controllers and electric motors, for fuel cell vehicles, and that "Hybrids are a medium-term bridging strategy to the hydrogen economy".

Although manufacturers will continue to be given a wide variety of AT PZEV options, staff is currently unaware of any near-term plans for manufacturers to produce AT PZEVs other than CNG and mild HEVs in significant volumes. Staff believes it is likely that the vast majority of near-term AT PZEVs will be compressed natural gas and non grid-connected hybrid electric vehicles.

### 3.2.1 PZEV Allowance for Advanced ZEV Componentry

The advanced componentry credit is awarded to PZEVs that utilize technology that is supportive of ZEV commercialization. Staff is proposing the following changes to the amount of credit provided and the criteria to be met in order for advanced componentry credit to be awarded.

Hydrogen Storage Systems

Hydrogen internal combustion engine vehicles qualify as AT PZEVs due to their use of hydrogen storage systems. Staff proposes amendments that increase the credit for hydrogen storage systems in dedicated-hydrogen vehicles from 0.1 to 0.2. This change is proposed in order to recognize the value of development of this technology to ZEV commercialization and the additional costs and challenges associated with on-board hydrogen storage. Additionally it recognizes the importance of deployment of hydrogen infrastructure to support these vehicles.

Hybrid Electric Drive Systems

Although the staff believes that the AT PZEV provisions challenged in the federal lawsuit are not preempted by federal law and that the preliminary injunction should be reversed on appeal, there is no doubt that the injunction has introduced considerable uncertainty regarding the ZEV regulation that would not necessarily be ended by a reversal by the Ninth Circuit Court of Appeal. Removal of this uncertainty is essential for the ZEV program to move ahead. While there are advantages to the scoring provisions for gasoline hybrid AT PZEVs and the efficiency multiplier in the 2001 amendments, the staff has developed what it considers to be a satisfactory alternative approach that addresses the preemption concerns.

The 2001 amendments established three methods for the calculation of advanced componentry credit for hybrid electric drive systems. Staff proposes amendments that remove all references to fuel economy from the advanced ZEV componentry determination. Instead, a flat advanced ZEV componentry credit of 0.4 through 2011 and 0.35 in 2012 and beyond will be provided to all PZEVs that meet either of the following criteria:

- A "peak power ratio" of greater than 13 percent, or
- A "peak power ratio" of greater than 8 percent and a zero emission drive system maximum power rating of at least 10 kilowatts.

As is the case under the current regulation, the peak power ratio is equal to the maximum system power output available from the electrical storage device divided by the sum of the electrical storage device plus the Society of Automotive Engineers (SAE) net power of the heat engine. The intent of setting these threshold values for peak power or peak power and motor size is to define the minimum characteristics of a HEV that is supportive of the advancement of ZEV commercialization.

Staff notes that "peak power ratio" measures the degree to which a vehicle relies upon electric drive, and thus is a useful indicator of the extent to which the componentry on the vehicle supports the commercialization of pure ZEV

technologies. The peak power ratio is not, on the other hand, correlated with fuel economy. Manufacturers seeking to improve vehicle fuel economy can follow a number of different design and engineering strategies, some of which involve increased use of electric drive and others of which do not. As a result, vehicles with very different peak power ratios can achieve similar fuel economy ratings. For example, the unadjusted U.S. Environmental Protection Agency fuel economy ratings for the Toyota Prius and Honda Civic hybrid are similar, but the Prius has a peak power ratio of 0.29 while the Civic ratio is 0.14.

Meanwhile, increased use of electric drive, as measured by the peak power ratio, can provide benefits other than fuel economy. Vehicles with high peak power can have increased acceleration relative to conventional vehicles and also provide smooth zero-emission performance at low speeds. This point is emphasized, for example, in an Automotive News article which quotes a Toyota source as stating that while fuel economy will be improved [by the hybridization of the Lexus RX 330 and Toyota Highlander], the main goal of the hybrids will be advances in horsepower and acceleration.

Staff invites comment regarding the appropriate threshold for the minimum motor size and power ratio needed to earn advanced componentry credit or other ways to establish an appropriate threshold.

### 3.2.2 PZEV Allowance for Low Fuel-Cycle Emissions

Staff proposes amendments that increase the maximum overall cap for low fuel-cycle emissions credit from 0.2 to 0.3, using the following equation:

(0.3) X (*percent of vehicle miles traveled with low fuel-cycle emission fuels*) / 100

Furthermore, this low fuel-cycle emissions credit would be limited to a maximum of 0.15 for PZEV HEVs that still make use of any non-low fuel-cycle emission fuels for propulsion, for example, grid-connected gasoline HEVs.

### 3.2.3 PZEV Zero Emission VMT Credit for Grid-Connected Hybrid Electric Vehicles

Staff believes it is appropriate to increase the amount of credit awarded to grid-connected HEVs in relation to the amount of zero emission vehicle miles traveled (VMT). Zero emission VMT from grid HEVs is extremely valuable to the success of the commercialization of ZEVs and may have significant air quality benefits depending on how the vehicle is used. In a study with EPRI, ARB learned that grid-connected HEVs with 20 miles of zero-emission VMT have the potential to reduce criteria pollutants approximately 30 percent compared to conventional new vehicles. In recognition of these benefits which are proportional to the amount of zero emission VMT – staff proposes that the Board amend the zero emission VMT allowance formula as shown in Table 3.1.

**Table 3.1**
**Zero Emission Vehicle Miles Traveled Credit Calculation**

| | Urban All-Electric Range (AER) | Zero-emission VMT Credit |
|---|---|---|
| 2001 Amendments | <10 miles | 0.00 |
| | 10- 120 miles | (10 + [0.5 x Urban AER])/ 35 |
| | >120 miles | 2.00 |
| Proposed Amendments | <10 miles | 0.00 |
| | 10- 90 miles | (33.8 +[0.5 x Urban AER])/ 35 |
| | >90 miles | 2.25 |

This amendment will provide additional AT PZEV credit for grid-connected HEVs to recognize the potential benefits of this class of HEV. The effect of these changes, in combination with other amendments to AT PZEV credits, will raise the grid-connected HEV credit to the level first proposed at the December 5, 2002 public workshop. The proposed increase in the zero emission VMT credit is shown in Table 3.2.

**Table 3.2**
**Comparison of 2001 Amendments and Proposed Amendments**
**Example Zero Emission VMT Credit**

| ZER | ZEVMT Credit Under 2001 Amendments | ZEVMT Credit Under Proposed Amendments |
|---|---|---|
| 10 miles | 0.43 | 1.11 |
| 20 miles | 0.57 | 1.25 |
| 60 miles | 1.14 | 1.82 |

### 3.2.4 Phase-In Multipliers for AT PZEVs with Zero Emission VMT

Under the 2001 amendments, an extended "early introduction" multiplier through the 2011 model year is provided for grid-connect hybrid vehicles, but not for other AT PZEVs (the early introduction multiplier for other AT PZEVs expires in 2005). This was intended to recognize that grid-connected HEVs needed additional time for commercialization. Staff proposes amendments that increase the phase-in multiplier for AT PZEVs with zero emission VMT according to Table 3.3. The proposed amendments also align the model year groupings with the Stage I, Stage II and Stage III concept used elsewhere in the staff proposal.

**Table 3.3**
**Phase-In Multiplier for AT PZEVs with Zero Emission VMT**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| **Phase-In Multiplier for PZEVs with ZE-VMT Credit** | **2000-2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** |
| 2001 Amendments | 2.0 | 2.0 | 2.0 | 1.5 | 1.5 | 1.25 | 1.25 |
| Current Proposal | 6.0 | 6.0 | 6.0 | 6.0 | 3.0 | 3.0 | 3.0 |

*In addition, this phase-in multiplier is proposed to apply to all* AT PZEVs with zero emission VMT including those with zero emissions of a single pollutant (for example, a vehicle with zero emissions of NOx, but SULEV level NMOG emissions). AT PZEVs subject to this multiplier include grid-connected HEVs, hydrogen internal combustion engine vehicles, and methanol reformer fuel cell vehicles. *This early introduction is intended to encourage and accelerate the* development and deployment of classes of AT PZEVs that are significantly further from commercialization than non-grid connected HEVs or CNG AT PZEVs.

### 3.2.5 Elimination of Efficiency Multiplier for AT PZEVs

In consideration of its relationship to fuel economy standards, staff proposes elimination of the efficiency multipliers that have been available to qualifying AT PZEVs and ZEVs.

### 3.2.6 Cap on Total AT PZEV Credit Post-2011

Staff further proposes to apply a cap to the maximum value of AT PZEV credits per vehicle of 3.0 for 2012 model year and beyond. This would ensure that AT PZEVs cannot earn more credit than pure ZEVs.

### 3.2.7 Combined AT PZEV Credit Examples

The following table provides examples of proposed potential credits for a variety of AT PZEV types. These examples are for illustration purposes only and are, in some cases, dependent on a successful application to the Executive Officer for particular credits on vehicle configurations. It is entirely possible that different manufacturers' vehicles of the same general type may earn different AT PZEV credit.

**Table 3.4**
**Example Credit Calculations for Different AT PZEV Types**

| AT PZEV Vehicle Type | Base | Zero Emission VMT | Advanced Componentry | Low Fuel Cycle | Intro Mult. | Total AT PZEV Credit |
|---|---|---|---|---|---|---|
| Non-Grid HEV | 0.20 | | 0.40 | | N/A | 0.6 |
| Non-Grid HEV post 2011 | 0.20 | | 0.35 | | N/A | 0.55 |
| CNG | 0.20 | | 0.10 | 0.30 | N/A | 0.6 |
| Hydrogen Internal Combustion Engine ('09-'11) | 0.20 | 1.00 | 0.20 | 0.30 | 3.0 | 5.1 |
| Methanol Reformer Fuel Cell Vehicle ('09-'11) | 0.20 | 1.00 | 0.40 | 0.30 | 3.0 | 5.7 |
| P20 Grid HEV ('09- '11) | 0.20 | 1.25 | 0.40 | 0.12 | 3.0 | 5.9 |
| P60 Grid HEV ('09- '11) | 0.20 | 1.82 | 0.40 | 0.15 | 3.0 | 7.7 |
| P20 Grid HEV ('12+) | 0.20 | 1.25 | 0.40 | 0.12 | N/A | 2.0 |
| MAXIMUM AT PZEV Post 2011 | | | | | | 3.0 |

### 3.2.8 AT PZEV Severability

Staff proposes amendments that sever, under certain circumstances, a manufacturer's option to earn ZEV credit for AT PZEVs from the remaining provisions of the ZEV regulation. If found unenforceable, the AT PZEV provisions will be eliminated as options to the pure ZEV requirements, resulting in AT PZEVs earning 0.2 credit. Manufacturers must make up any credit shortfall with pure ZEVs. Furthermore, if individual credit provisions of the AT PZEV determination are found to be unenforceable, they may also be severed individually and the remaining credits shall be used to determine AT PZEV credit at a reduced overall level. The proposed amendments also contain a more general severability clause that applies to all provisions in the regulation.

## 3.3 Amendments to ZEV Credit Calculations

### 3.3.1 ZEV Types

The proposed amendments eliminate the use of the efficiency multiplier for ZEV credit determination. Because the efficiency multiplier and the range multiplier were used together in a complementary fashion in the determination of overall ZEV credit, the range multiplier must also be altered with the removal of the efficiency multiplier. Staff proposes amendments that, beginning in 2003, permit the ZEV credit determination to be based only upon vehicle range and fast refueling capability according to a 5 "tier" system. The ZEV tiers are defined as follows, and described separately below.

**Table 3.5**
**Proposed ZEV Credit Tiers**

| ZEV Tier | Description | ZEV Range (UDDS)* | Fast Refueling Capability |
|---|---|---|---|
| NEV | NEV | No minimum | N/A |
| Type 0 | Utility EV | <50 miles | N/A |
| Type I | City EV | >= 50, <100 miles | N/A |
| Type II | Full Function EV | >= 100 miles | N/A |
| Type III | Fuel Cell EV | >= 100 miles | Must be capable of replacing 95% maximum rated energy capacity in <= 10 minutes |

* Urban Dynamometer Driving Schedule

### 3.3.2 ZEV Credit Levels

Under the staff proposal, credits for NEVs remain the same as under the 2001 regulation, but credits for other ZEV types are increased. Specifically, staff proposes amendments establishing the following ZEV credit values for each of the 5 new tiers.

**Table 3.6**
**Proposed ZEV Credit Values**

| | Stage I | | | Stage II | | | Stage III | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tier** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012+** |
| **NEV** | **1.25** | **0.625** | **0.625** | **0.15** | **0.15** | **0.15** | **0.15** | **0.15** | **0.15** | **0.15** |
| Type 0 (Utility) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1 | 1 | 1 | 1 |
| Type I (City) | 8 | 8 | 8 | 7 | 7 | 5 | 2 | 2 | 2 | 2 |
| Type II | 12 | 12 | 12 | 10 | 10 | 7 | 3 | 3 | 3 | 3 |
| Type III | 40 | 40 | 40 | 15 | 15 | 15 | 4 | 4 | 4 | 3 |

The proposed ZEV credits shown in Table 3.6 replace the former base credit, efficiency, range, and early introduction multipliers, as well as the in-service/ under-warranty credit from the 2001 amendments. For comparison purposes, the former credit levels are shown in Table 3.7 below. Staff anticipates that all vehicles (other than NEVs) produced to date or likely to be produced in the near term would receive higher credit levels under the staff proposal than under the 2001 amendments.

**Table 3.7**
**2001 Amendments ZEV Credit Values**

| **Tier** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012+** |
|---|---|---|---|---|---|---|---|---|---|---|
| **NEV** | **1.25** | **0.625** | **0.625** | **0.15** | **0.15** | **0.15** | **0.15** | **0.15** | **0.15** | **0.15** |
| Type I (City) | 1.75 | 1.75 | 1.96 | 2.01 | 2.33 | 1.38 | 1.4 | 1.42 | 1.42 | 1.4 |
| Type II | 5.87 | 5.87 | 5.94 | 5.17 | 5.21 | 3.44 | 3.34 | 3.2 | 3.2 | 2.9 |
| Type III | 12.5 | 12.5 | 11.3 | 8.03 | 7.07 | 4.36 | 3.92 | 3.46 | 3.46 | 2.92 |

The various vehicle types are further described as follows:

- NEVs, which are low speed vehicles as defined in California Vehicle Code section 385.5, are only now beginning to sell in significant quantities. Because they are still new to the marketplace, there is still a less than complete understanding of customers' use patterns and the resulting air quality benefits. Staff proposes amendments such that NEVs continue to earn the same credit as defined in the 2001 amendments. Staff also

proposes that the credit value for 2006 and beyond be reexamined and possibly revised at a later date when more detailed NEV customer usage and vehicle durability information is available to ARB.

- Type 0 or "utility" ZEVs will earn 1.5 ZEV credits until 2008, and then 1.0 credit in 2009 and beyond. This lower credit level corresponds to the reduced functionality of these vehicles as compared to Types I, II and III. Type 0 ZEVs typically would be vehicles with smaller battery packs, or low range city electric vehicles.

- Type I ZEVs (typically city electric vehicles) would earn approximately two-thirds the credit value of a Type II ZEV. This change is proposed to provide more consistent credits for Type I ZEVs and to help offset the additional marketing challenges that are expected for these reduced-range and, usually, reduced-size vehicles. Staff believes that Type I battery EVs have the potential to be sold at a profit before full function ZEVs because they are equipped with smaller, more affordable battery packs that are better suited to their driving mission. Longer-range battery EVs are equipped with relatively large and expensive battery packs, but seldom make complete use of their entire capacity to drive longer distances. Recent improvements in NiMH batteries have increased their cycle life relative to their calendar life, and Type I battery EVs will benefit the most from this trend because they are more deeply cycled than longer range battery EVs where battery life is primarily limited by calendar life.

  Staff believes that zero emission VMT accumulated by Type I ZEVs will be higher in relation to Type II ZEVs than was reflected in the credit ratios proposed in the 2001 amendments. Staff believes this class of ZEV provides an attractive option for automakers and has proposed an increase in ZEV credit to further encourage their development and deployment.

- Type II ZEVs (typically full function battery EVs) would earn approximately double the 2001 amendment level in model years 2005-2008, and approximately the same as the 2001 amendments thereafter. The increase is intended to provide an incentive for manufacturers to continue to pursue these vehicle types and to act as an extension of the early introduction credits offered in the 2001 amendments. The proposed increase is also provided to offset the elimination of the in-service/ under-warranty credit and to maintain parity with the credit levels earned by fuel cell vehicles.

- Type III ZEVs (typically fuel cell vehicles) would earn credit increased by a factor of 3.5 over the 2001 amendments in Stage I, 2.5 times in Stage II, and approximately 13% in Stage III. Staff proposes an increase of this credit relative to Type 0, I and II ZEVs because Type III vehicles are far from fully developed, and because of the more challenging infrastructure challenges they face. It is expected that most Type III ZEVs will be hydrogen fuel cell

vehicles which, because of their ability to fast recharge, may be less challenging to market than battery EVs as direct replacements for conventional gasoline vehicles. Credits proposed for 2012 and beyond remain the same as Type II ZEVs, and are similar to the values proposed for fuel cell vehicles in the 2001 amendments.

Type 0, Type I, and Type II ZEVs are distinguished according to range performance only, while Type III ZEVs meet the Type II range requirement but must also be capable of routine fast-refueling (they can attain 95% of their maximum rated energy capacity in 10 minutes or less when starting from any operationally allowable state).

### 3.3.3 Fast Refueling Definition

Staff proposes amendments that eliminate the existing fast refueling credit for ZEVs that are able to restore 60 miles of range in less than 10 minutes. This option was most commonly intended for fast charging of battery EVs. Staff recommends elimination of this provision because of high infrastructure costs, lack of a clearly defined market for this modest improvement in capability, and a lack of combined infrastructure supplier/automaker interest. While fuel cell refueling infrastructure imposes significant costs, these costs are spread over many more vehicles because they refuel much faster, and because hydrogen storage or generation systems can be fitted with multiple dispensers for simultaneous use.

### 3.3.4 In Service/Warranty Credit

Staff proposes amendments that delete the additional credit for ZEVs kept in service and under warranty beyond 3 years for model year 2005 and later vehicles. Staff believes that the complexities involved in tracking compliance with this option are overly burdensome to both automakers and ARB staff and that other avenues should be explored to encourage automakers and ZEV users to extend the useful lives of ZEVs.

## 3.4 Compliance Option Limits

Staff proposes several amendments to the options available to manufacturers in order to comply with the percentage ZEV requirements.

### 3.4.1 Category Percentages

Staff proposes a restructuring of the percentages associated with the category options that can be used to comply with the regulation. Specifically, the amount of AT PZEV (sliver) credit that could be used to satisfy the pure ZEV (gold) requirement would be adjusted to create a slower ramp up of volumes of pure ZEVs and to encourage an increase in AT PZEV volumes in the early years.

Table 3.8 below shows the proposed restructuring of categories through the transition years of the program from 2005 through 2011. The amount of PZEV (bronze) credit that can be used to satisfy the ZEV obligation is not changed. In 2012 and beyond the program returns to the structure of the current regulation.

**Table 3.8**
**Credit Option Limits**

| | Stage I | | | Stage II | | | Stage III | | | Return to 2001 Amendment Level | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| 1% | | | | | | | | | | | | | |
| 1% | | | | | | | | | | | | | |
| 1% | | | | | | | | | | | | | |
| 1% | | | | | | | | | | | | | |
| 1% | | | | | | | | | | | | | |
| 1% | | | | | | | | | | | | | |
| 2% | | | | | | | | | | | | | |
| 6% | | | | | | | | | | | | | |

As shown above, the portion of the regulation that must be met with pure ZEVs (gold) is reduced from 2 percent to 1 percent between for model years 2005 through 2008. From 2009 to 2011, the pure ZEV requirement is 1.25 percent compared to 2.5 percent in the current regulation. Starting in 2012, the pure ZEV obligation returns to the 3 percent as exists in the current regulation, and increases in future years as defined in the 2001 amendments.

To compensate for the reduction in the pure ZEV requirement, the amount of credit that can be earned from AT PZEVs (silver) is increased by one percent between 2005 and 2008 and by 1.25 percent between 2009 and 2011. Like the pure ZEV category, the portion of the regulation that can be met by AT PZEVs returns to the requirements contained within the 2001 amendments in 2012.

The PZEV (bronze) category is unchanged in the staff's proposal compared to the existing regulation.

### 3.4.2 ZEVs Exempt from Obligation Determination

A manufacturer's ZEV obligation is calculated as a percentage of the volume of passenger cars and covered light-duty trucks it produces and delivers for sale in California. Staff proposes amendments that omit ZEVs, including NEVs, placed in service in California from the manufacturer's total sales used to calculate the ZEV obligation. ZEVs do not include PZEVs and AT PZEVs for purposes of this calculation. This reduced volume does not affect a manufacturer's classification in terms of size. Eligible vehicles must be manufactured by the automaker or a majority owned subsidiary. This amendment is proposed to encourage manufacturers to produce ZEVs without causing their overall obligation under the ZEV requirements to increase as a result of that production.

### 3.4.3 Expansion of Banked NEV Credit Applicability

The 2001 amendments restrict the use of credits from 2001-2005 NEVs in 2006 to 75 percent of an automaker's ZEV obligation. This is reduced to 50 percent in 2007 and beyond. This restriction applies to all credit categories (PZEV, AT PZEV, and ZEV). Staff recommends that restrictions on yearly NEV credit allocation be amended to continue to restrict ZEV applicability but allow unlimited NEV credit usage for meeting PZEV and AT PZEV percentage options. Staff proposes this change to increase flexibility for manufacturers who may need additional time to commercialize PZEV and AT PZEV technologies.

## 3.5 Other Changes

### 3.5.1 Hybrid Electric Vehicle Energy Storage Device Warranty Requirement

Staff proposes amendments to the PZEV extended warranty requirement for HEV batteries. The 2001 amendments require a 15-year or 150,000 mile (whichever occurs first) warranty for an HEV traction battery used in AT PZEVs. Staff proposes amendments that exempt PZEV and AT PZEV "zero emission energy storage devices" used for traction power from the 15 year/150,000 mile PZEV warranty period, and replace this requirement with a 10 year/150,000 mile warranty. Examples of ZEV energy storage systems include batteries, ultracapacitors, and hydrogen storage. On-board diagnostic elements of these

storage systems that monitor performance would not be exempt from the 15-year/150,000 requirements.

### 3.5.2 Transportation System Credit

Under the 2001 amendments, a cap is placed on the amount of credit from transportation systems programs that can be used to meet a manufacturer's obligation. The cap includes the credit generated by both the vehicle and its placement in the program. Staff proposes amendments making this cap apply only to the credits earned from participation in the transportation system program. Thus, the credit earned by the vehicle would not be subject to the cap applicable to transportation system credits.

Staff also proposes to extend the opportunity to earn ZEV credits from transportation systems from 2007 to 2011. This change is proposed to provide more certainty to entities that are already working on plans for these programs and projects that extend beyond 2007.

Staff plans to reexamine the progress made and benefits attributable to transportation systems and to reassess the credit values at a future date.

### 3.5.3 "Placed in Service" Requirement

Staff proposes amendments providing that in order to earn any credit a 2003 and subsequent model year NEV must be placed in service. This change is intended to ensure that manufacturers continue to seek appropriate market niches for these vehicles.

In addition, there have been recent discussions regarding the date by which a vehicle must be placed in service in order to earn the early introduction multiplier provided in section 1962(d)(3)(A) of the ZEV regulation. When this issue first surfaced, staff realized that the regulation itself was unclear about whether there was a deadline for placement of vehicles to qualify for early introduction credits. The rulemaking record, however, was replete with statements that the early introduction credits would be available for vehicles placed during the model year, which by regulation ends no later than December 31. Based on information provided by some manufacturers, however, staff became concerned that they had not understood the regulation to establish a deadline; that is, some manufacturers assumed they could earn early introduction credits for 2001 through 2005 model year vehicles regardless of when they were placed. Additionally, staff understood that some manufacturers would be producing 2002 model year NEVs with the intention of qualifying for the early introduction credit multiplier through the end of the model year, thus making it very difficult if not impossible to place those 2002 MY NEVs by December 31, 2002.

In order to address these issues, on November 21, 2002, the Executive Officer issued a letter to affected vehicle manufacturers informing them that early introduction credits would be available for 2002 model year vehicles placed through March 31, 2003 (with a similar "sell through" period for the remainder of the early introduction credits). On December 17, 2002, however, in a lawsuit filed in December by DaimlerChrysler and General Motors, a Fresno County Superior Court Judge announced he would issue a temporary restraining order (TRO) enjoining ARB from implementing the provisions of the November 21 advisory. The judge issued the TRO after determining that the plaintiffs, DaimlerChrysler and General Motors, would likely prevail on the claim that the advisory constituted an underground regulation -- ruling, in effect, that the creation of a "sell through" date could not be accomplished without formal rulemaking. As a result of the TRO, the "sell through" period provided by the advisory is not available. Consequently, unless the Board takes action to establish a "sell through" date, early introduction credits will be available only for vehicles placed during the applicable model year.

The amendments would provide that a 2001-2002 model year ZEV qualifies for the early introduction multiplier of 4.0 only if it is placed in service in California by April 15, 2003. If it is placed in service after that time, it would be subject to the credit provisions applicable to 2003 and subsequent model year ZEVs. These provisions would explicitly award credits beyond one (all credit in the case of NEVs) according to the model year in which the vehicle is placed in service, with a cut-off date of March 31st after the end of the specified model year.

### 3.5.4 Addition of LDT2 Vehicles

At the January 2001 hearing the Board decided to modify the originally proposed amendments to phase in a new requirement that LDT2 vehicles be included in the base for determining a manufacturer's full percentage ZEV obligation, along with the passenger cars and LDT1 vehicles that had always been included. The LDT2 category includes most sport utility vehicles (SUVs), minivans, and larger pickup trucks. The addition of LDT2 vehicles was phased in beginning in the 2007 MY, when 17 percent of the manufacturer's California LDT2 production is to be counted. The percentage increases by 17 percent increments through the 2011 MY, with a 100 percent requirement starting in the 2012 MY. Full inclusion of LDT2 vehicles increases the base across all manufacturers by an average of roughly 70 percent, although the impacts differ among individual manufacturers.

One of the claims in a state court lawsuit filed in January 2002 challenging the ZEV regulation is that the Board's addition of LDT2 vehicles was unlawful because it was beyond the scope of the hearing notice. To remove any possible basis for this claim, which has not yet been adjudicated, staff recommends in addition to the amendments proposed above that the Board reconsider and affirm the addition of LDT2 vehicles to the sales base in the 2001 amendments. During the comment period in this rulemaking, the Board will accept comment on

whether it should affirm the earlier action regarding the LDT2 category. The effect of the action regarding LDT2 vehicles on the total number of vehicles required and the estimated incremental cost are discussed below.

There are two primary reasons for the phased addition of LDT2 vehicles to the sales base for applying the percentage ZEV requirements. First, while a large percentage of vehicles in the LDT2 category have traditionally been used for work purposes, it is now very common for the SUVs, pick-up trucks and minivans making up the category to be used primarily for personal transportation, i.e. as passenger cars. In recognition of this phenomenon, a key element of the LEV II rulemaking in 1998-1999 was to make these vehicles subject to the same exhaust emission standards as passenger cars. This requirement is being phased in during the 2004 – 2007 model years. For the same reason it is appropriate for these vehicles to trigger the same ZEV obligations as passenger cars. Secondly, the absence of LDT2 vehicles from the sales base encourages a manufacturer to sell more large vehicles in order to reduce the number of zero and near zero emission vehicles it must produce.

### 3.6 Effect of Proposed Changes

The following section provides scenarios illustrating the number of vehicles that may be produced under the staff proposal as compared to the current regulation.

To estimate the number of ZEVs in the early years this analysis assumes that manufacturers will use banked credits first. Banked credits are those credits that are earned from voluntary vehicle placements prior to the implementation of the ZEV regulation. Banked credits are assumed to be used only to satisfy the pure ZEV requirement and any 2005-2007 shortfall in the AT PZEV option.

Each manufacturer is in a unique situation. Some manufacturers have small numbers of banked credits, while others have credits sufficient for a number of years. Some manufacturers have both NEV and non-NEV credits, while others do not. In addition, manufacturers differ in the status of fuel cell development, the availability of PZEV or AT PZEV products in the near term, and the technologies to be emphasized in their corporate strategy. All of these factors affect each manufacturer's compliance status, and therefore the compliance pathways they pursue.

Finally, staff emphasizes that due to the flexibility afforded by the regulation, it is impossible to predict with accuracy the number of vehicles in each category that will actually be produced. The following scenarios show plausible outcomes but should not be viewed as firm estimates.

### 3.6.1 Number of Vehicles

This section outlines two scenarios regarding vehicle production, which differ in their treatment of banked credits. The ZEV regulation allows credits to be freely bought, sold or traded among manufacturers. Thus credit trading is possible, but the extent to which credit trading will actually occur is unclear.

The first scenario assumes no trading of banked credits among manufacturers. This is consistent with views expressed by manufacturers, who have stated that it is unlikely that significant trading of banked credits will occur in their competitive environment. The second scenario represents in some ways a "worst case" approach that assumes that manufacturers freely trade credits to postpone ZEV production as long as possible, and also assumes that manufacturers abandon their current plans to place demonstration quantities of fuel cells over the next several years.

No Trading Scenario

As noted above, manufacturers have stated that it is unlikely that ZEV credits would be freely traded to any significant extent. To better understand the effect of credit trading on vehicle production totals, staff has reviewed credit status on a manufacturer-by-manufacturer basis. Viewed in this light and using currently available information, it appears that some manufacturers would exhaust their supply of available banked credits as early as the 2005 and 2006 model years. Those manufacturers thus would be required to produce some number of ZEVs in those years.

Tables 3.9 and 3.10 below show examples of the number of ZEVs, AT PZEVs, and PZEVs that could be produced between model years 2005 and 2011 under the 2001 amendments and the staff proposal, assuming no credit trading.

**Table 3.9**
**Additional Vehicle Production Scenarios, No Credit Trading, 2001 Amendments**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| | | | | | | | |
| ZEVs | | | | | | | |
| If City | 1300 | 1500 | 2700 | 13000 | 16700 | 20600 | 22300 |
| If Full Function | 900 | 1100 | 1900 | 9300 | 11200 | 13700 | 14800 |
| If Fuel Cell | 270 | 700 | 1300 | 4300 | 8400 | 10300 | 11100 |
| | | | | | | | |
| AT PZEVs | 13400 | 19500 | 28100 | 47100 | 64800 | 70600 | 76500 |
| | | | | | | | |
| PZEVs | 274600 | 410200 | 460800 | 511400 | 562000 | 612600 | 663200 |

**Table 3.10**
**Additional Vehicle Production Scenarios, No Credit Trading, Staff Proposal**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| | | | | | | | |
| ZEVs | | | | | | | |
| If City | 200 | 500 | 800 | 1400 | 4600 | 8200 | 9600 |
| If Full Function | 100 | 400 | 600 | 1000 | 3100 | 5500 | 6400 |
| If Fuel Cell | 40 | 200 | 400 | 500 | 2300 | 4100 | 4800 |
| | | | | | | | |
| AT PZEVs | 18400 | 27000 | 43500 | 64100 | 88100 | 96100 | 104100 |
| | | | | | | | |
| PZEVs | 274600 | 410200 | 460800 | 511400 | 562000 | 612600 | 663200 |

With regard to AT PZEV production, staff recognizes that not all manufacturers have the capability to take full advantage of the AT PZEV option in the initial years of the program at either the 2 percent level (the 2001 amendments) or the 3 percent level (the staff proposal). Instead, staff assumes that industry-wide, manufacturers are able to fulfill the portion of the AT PZEV option specified in Table 3.11 below:

**Table 3.11**
**Assumed AT PZEV Production Capability**

| | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|
| 2001 Amendments (2 percent) | 60 | 60 | 75 | 100 |
| Staff Proposal (3 percent) | 50 | 50 | 75 | 100 |

That is, staff assumes that in 2005 manufacturers have the ability to take advantage of 50 percent of the 3 percent AT PZEV option under the staff proposal, or 60 percent of the 2 percent AT PZEV option under the 2001 amendments (the totals do not move proportionally because staff assumes that some but not all manufacturers have the ability to move from 2 to 3 percent). Staff has assumed that automakers will produce HEVs or CNG vehicles to meet their AT PZEV option.

For PZEVs, the number of vehicles expected under the staff proposal is the same as under the 2001 amendments because no changes are proposed that would affect this total. The totals shown above cover PZEV production by both large and intermediate manufacturers. (Intermediate manufacturers have the option to fully comply with the regulation by producing PZEVs, and staff assumes that all intermediate manufacturers will adopt this strategy).

Credit Trading Scenario

Staff also has developed a "worst case" scenario that assumes free credit trading among manufacturers and no voluntary fuel cell production. Tables 3.12 and 3.13 below show examples of the number of ZEVs, AT PZEVs, and PZEVs that could be produced between model years 2005 and 2011 under the 2001 amendments and the staff proposal, using these assumptions.

**Table 3.12**
**Additional Vehicle Production Scenarios, With Credit Trading, 2001 Amendments**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| | | | | | | | |
| ZEVs | | | | | | | |
| If City | 0 | 0 | 0 | 13700 | 25200 | 27100 | 29300 |
| If Full Function | 0 | 0 | 0 | 5500 | 10500 | 12000 | 13000 |
| If Fuel Cell | 0 | 0 | 0 | 4300 | 9000 | 11100 | 12000 |
| | | | | | | | |
| AT PZEVs | 13400 | 19800 | 27900 | 47100 | 64800 | 70600 | 76500 |
| | | | | | | | |
| PZEVs | 274600 | 410200 | 460800 | 511400 | 562000 | 612600 | 663200 |

**Table 3.13**
**Additional Vehicle Production Scenarios, With Credit Trading, Staff Proposal**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| | | | | | | | |
| ZEVs | | | | | | | |
| If City | 0 | 0 | 0 | 0 | 4600 | 9600 | 10400 |
| If Full Function | 0 | 0 | 0 | 0 | 3100 | 6400 | 6900 |
| If Fuel Cell | 0 | 0 | 0 | 0 | 2300 | 4800 | 5200 |
| | | | | | | | |
| AT PZEVs | 17200 | 25600 | 43300 | 64100 | 88100 | 96100 | 104100 |
| | | | | | | | |
| PZEVs | 274600 | 410200 | 460800 | 511400 | 562000 | 612600 | 663200 |

In addition to the effect of credit trading, staff notes that manufacturers have plans in place to produce demonstration numbers of fuel cell vehicles over the next several years. Given the aggressive pursuit of fuel cell technology to date, the sizable investments underway, and manufacturer announcements regarding future product development, staff believes it is unlikely that manufacturers would abandon fuel cell placements until 2009 as is implied by Table 3.13 above. Rather, staff expects that manufacturers will continue to pursue fuel cell commercialization, which will necessitate ongoing vehicle placements.

A comparison of Table 3.10 (the "no credit trading" staff proposal scenario) and Table 3.13 (the "with credit trading" staff proposal scenario) shows that credit trading significantly shifts the timing of ZEV production. Under the "no credit trading" scenario there are more vehicles produced in the early years (no blackout exists) but fewer vehicles in the later years. This occurs because fewer banked credits are used in the early years in the "no trading" scenario (without trading not all manufacturers have banked credits available for use), leaving more banked credits available for use in the later years.

### 3.6.2 Addition of LDT2 Vehicles

As noted above, staff recommends that the Board reconsider and affirm its 2001 action to add LDT2 vehicles to the sales base against which manufacturers' compliance obligations are calculated.

Table 3.14 below shows the estimated manufacturer sales base, with and without the phased-in inclusion of LDT2 vehicles, for model years 2005 through 2012. The estimates in Table 3.14 assume that manufacturers base their obligation on the prior three years average sales, rather than using the option to base their obligation on current year sales. Please note that after 2006, the sales numbers used by staff assume no sales growth over time.

**Table 3.14**
**Sales Base for Manufacturers' Compliance Obligation**

| Sales Base | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| Without LDT2 | 917398 | 1025457 | 1025457 | 1025457 | 1025457 | 1025457 | 1025457 | 1025457 |
| With LDT2 | 917398 | 1025457 | 1153419 | 1281380 | 1409342 | 1537304 | 1665266 | 1778173 |

Table 3.15 below shows how the number of vehicles required under the staff proposal changes with the addition of LDT2 vehicles to the sales base. The numbers shown are the additional vehicles of each type that are needed in order to satisfy the increased compliance obligation stemming from the addition of LDT2 vehicles to the sales base.

**Table 3.15**
**Number of Additional Vehicles Needed**
**Due to Addition of LDT2 Vehicles to Sales Base, Staff Proposal**

| | Stage I | Stage II | | | Stage III | | | |
|---|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| | | | | | | | | |
| ZEVs | | | | | | | | |
| If City | 0 | 0 | 0 | 0 | 4600 | 3400 | 4000 | 11300 |
| If Full Function | 0 | 0 | 0 | 0 | 3100 | 2300 | 2600 | 7500 |
| If Fuel Cell | 0 | 0 | 0 | 0 | 2300 | 1700 | 2000 | 7500 |
| | | | | | | | | |
| AT PZEVs | 0 | 0 | 4800 | 12800 | 24000 | 32000 | 40000 | 41100 |
| | | | | | | | | |
| PZEVs | 0 | 0 | 50600 | 101200 | 151800 | 202400 | 253000 | 297700 |

Please note that these volumes are included in the totals shown in Tables 3.9, 3.10, 3.12 and 3.13 above, which already take into account the addition of LDT2 vehicles to the sales base. Thus the totals given in Tables 3.9, 3.10, 3.12 and 3.13 would decrease by the amounts shown here if LDT2 vehicles were excluded.

# 4. REGULATORY ALTERNATIVES

## 4.1 Do Not Amend Program

Staff considered not recommending any amendments to the ZEV regulations. In this case, manufacturers would ultimately need to produce and offer for sale vehicles sufficient to comply with the 2001 amendments, taking into account the use of banked credits. Tables 3.9 and 3.12 above show two such scenarios.

This assumes, of course, that the state prevails in the current litigation. If the state is not successful, the "do nothing" alternative would result in the loss of the ZEV program until necessary amendments are adopted. In addition, staff is concerned about the risk of the program becoming dormant if we wait and stand by while the lawsuits play out. This idle time could deter progress towards commercialization of zero and near zero emission technologies. In addition, it is likely that the federal preliminary injunction has affected some manufacturers' marketing and product plans.

Production at this level would impose a large cost burden on the manufacturers. The vehicles would need to be priced aggressively to meet the sales targets, and this would reduce the revenue available to the manufacturers to offset their costs. To the extent that the state provides subsidies in order to assist with vehicle marketing, such a large number of vehicles needing subsidies would result in large state expenditures. Under the 2001 amendments, moreover, manufacturers would need to develop additional ZEV products (likely battery EVs) to meet near-term credit needs.

## 4.2 Amend Program Only to Address Federal and State Lawsuits

As discussed in Section 2.6, a federal district court judge has issued a preliminary injunction that prohibits the ARB from enforcing the 2001 ZEV amendments with respect to the sale of motor vehicles in the 2003 and 2004 model years. The ARB has appealed issuance of the preliminary injunction and is hopeful of a decision in the first part of 2003. To remove uncertainty, staff considered proposing amendments that remove all references to fuel economy in the ZEV regulation to address the preemption concerns raised in the court's decision, but make no further changes.

Staff did not adopt this approach because as noted above, staff believes that additional changes are warranted in light of the current status and trends in ZEV technology. There has not been a significant reduction in the cost of battery EVs, with only NEVs emerging as a commercial, although limited use product. In addition, projections regarding the pace of commercialization of fuel cells, which were expected to provide a second ZEV technology late in this decade, have become less certain, although automakers remain fully committed and continue

to invest heavily in the technology. As a result, it appears that under the current regulation, manufacturers will need to develop additional battery EV products to bridge the interim years until fuel cells are cost effective in the next decade.

In addition, ARB staff believes that the delay imposed by the June 11, 2002 preliminary injunction against the ARB could have significantly affected manufacturers' marketing and production plans.

### 4.3 Adopt Substantial Revisions to the ZEV Regulation

Staff's proposal addresses litigation issues, delays implementation and restructures the credit calculation system to address near term technology and marketing concerns. Since 1990, ZEV regulations for passenger cars have been modified several times. Adjustments were made for cost, technology and market concerns. The ultimate goal, however, remains – to achieve significant and growing numbers of zero emission vehicles on California's roads.

The substantially revised regulation would maintain the pressure to continue the development of emerging ZEV technologies. It would take advantage of all the technology options that are available today and provide manufacturers the flexibility to pursue their individual paths towards ZEV commercialization.

## 5. ECONOMIC IMPACTS

The proposed amendments to the ZEV program are projected by ARB staff to reduce the costs of compliance for automobile manufacturers. Staff believes, therefore, that the proposed amendments would cause no noticeable adverse impact on California employment, business status, and competitiveness. Because the ZEV regulations provide considerable flexibility to manufacturers, the magnitude of these savings is difficult to estimate with any certainty. A more detailed discussion follows.

### 5.1 Legal Requirement

Sections 11346.3 and 11346.54 of the Government Code require state agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include consideration of the impact of the proposed regulation on California jobs, business expansion, elimination, or creation, and the ability of California businesses to compete.

State agencies are also required to estimate the cost or savings to any state or local agency and school districts in accordance with instruction adopted by the Department of Finance. This estimate is to include any nondiscretionary costs or savings to local agencies and the costs or savings in federal funding to the state.

### 5.2 Directly Affected Businesses

Any business involved in manufacturing passenger cars and light-duty trucks would be directly affected by the proposed amendments. Also affected are businesses that supply parts for these vehicles. California accounts for only a small share of total nationwide motor vehicle and parts manufacturing. There are about 40 companies worldwide that manufacture California-certified light- and medium-duty vehicles and heavy-duty gasoline engines. Only one motor vehicle manufacturing plant is located in California, the NUMMI facility, which is a joint venture between GM and Toyota.

### 5.3 Potential Impact on Manufacturers

The proposed amendments are expected to reduce costs to motor vehicle and parts manufacturers. The key factors that determine the cost of compliance with the current ZEV regulation, or an amended version, are (1) the number of vehicles that are required to be placed, and (2) the incremental cost per vehicle. Both are estimated, and both estimates are subject to considerable uncertainty.

Tables 3.9, 3.10, 3.12 and 3.13 in Section 3.6.1 above provide staff-developed scenarios as to the number of ZEVs, AT PZEVs and PZEVs that would be

produced by large and intermediate manufacturers and offered for sale in order to satisfy the 2001 amendments compared to the proposed amendments. Because of the flexibility provided in the regulation, it is not possible to present a single point estimate. For ZEVs, different totals are provided assuming that the manufacturers use 100 percent City EVs (Type I), 100 percent full function EVs (Type II), or 100 percent Fuel Cell Vehicles (Type III). All ZEV estimates assume that manufacturers take full advantage of the possible 6 percent PZEV offset. In addition, the ZEV estimates assume that beginning in 2008 manufacturers will make full use of the AT PZEV option to meet the maximum allowed percentage of the ZEV obligation (between 3 and 3.5 percent). As discussed in Section 3.6.1, staff assumes that prior to that date not all manufacturers have the capability to take full advantage of the AT PZEV option.

Section 3.6.1 provides two scenarios, the first of which assumes no credit trading and the second of which represents a worst case approach which assumes free credit trading and no voluntary production. The cost estimates developed here use the worst case scenario of vehicle production. Because the number of vehicles needed in the early years (when per vehicle incremental costs are highest) is smaller under this approach, using it provides a conservative estimate of the savings achieved under the staff proposal.

### 5.3.1 Incremental Per-Vehicle Cost Estimates

With regard to incremental cost per vehicle, the starting point for the staff estimates is the staff analysis from the 2001 regulatory amendment process, with further refinements and updates as described below.

PZEVs

In the 2001 Initial Statement of Reasons, ARB staff estimated that the incremental cost for PZEV compliance was $500. In the 2001 Final Statement of Reasons, this estimate was reduced to $200 based on new information. Today, based on staff analysis of recently certified PZEVs, staff estimates that the incremental cost for PZEV compliance is $100.

As of December 31, 2002, the ARB has certified seven gasoline PZEVs in California. These are primarily four cylinder engines, with one in-line five cylinder and one in-line six cylinder model. Displacements range from 1.8 to 2.5 liters. The models include the Honda Accord, Toyota Camry, Nissan Sentra, Volkswagen Jetta, Volvo V70 & S60 FWD, Ford Focus, and the BMW 325.

In evaluating the emission control systems, it is clear that some manufacturers have been able to simplify and reduce cost more effectively than others. Staff estimates that in a few years, manufacturers will converge on optimized designs as experience increases.

Honda's PZEV Accord utilizes one under-floor catalyst, two oxygen sensors and exhaust gas recirculation. The Nissan Sentra utilizes a warm-up and under-floor catalyst, two oxygen sensors, but no exhaust gas recirculation. The Toyota Camry utilizes a warm-up and under-floor catalyst, three oxygen sensors and no exhaust gas recirculation. Other PZEVs utilize various combinations of multiple catalysts, several oxygen sensors, exhaust gas recirculation, and an air pump.

Initially, Honda submitted a SULEV application for the 2003 Accord 4-cylinder. Subsequently, Honda modified its application to a PZEV. Doing so required Honda to increase the emission warranty to 150,000 miles and to add a zero evaporative emission control system. No additional hardware changes were required for this SULEV to qualify as a PZEV (even though PZEVs are required to meet the tailpipe standard for 15 years or 150,000 miles instead of 120,000 miles). Honda's SULEV had minimal deterioration and a large enough compliance margin that no hardware or catalyst loading changes were required for the vehicle to qualify as a PZEV.

Honda also certified an identical 2004 Accord as a LEV vehicle for sale in California. In examining the emission control hardware, it appears that the basic architecture is identical for both the LEV and the PZEV. The catalyst loading is increased to achieve the lower emission level. Staff obtained the difference in price for this vehicle and the identical PZEV model for 2003. For a 4-door Accord EX with automatic transmission, the LEV model price is $22,860 while the same model PZEV is $23,010, a difference of $150. While pricing may not necessarily reflect the actual costs of a model, it can provide some basis for gauging the relative cost of one emission control system versus another when the basic hardware is the same. In this case, staff estimates that the incremental cost covers only the additional precious metal content of the catalyst in the PZEV. Therefore, it appears that Honda is not charging significantly more for the improved warranty (and staff continues to believe that zero evaporative emission control costs about $10 based on our earlier analysis).

Toyota also sells the same model Camry as both a ULEV and a PZEV, without any cost differential. This may be because the dominant sales package is expected to be the PZEV whereas in the case of Honda, the LEV and PZEV models are expected to be produced in similar volumes.

Given the further progress in producing simpler PZEVs, and the apparent similarity of the tailpipe emission control systems in terms of architecture and catalyst loadings in the case of the Honda SULEV and PZEV applications, plus no apparent attempt to recover warranty costs in the case of the PZEV Accord, staff now estimates that the incremental cost of PZEVs relative to SULEVs is likely to be less than $100 as vehicles are optimized in the next few years. The additional cost would cover some improvement in components should manufacturers design for less than a 150,000 mile life currently (we expect manufacturers would design for the same failure rate, but at a higher mileage so

warranty costs themselves shouldn't increase much), and an additional $10 for zero evaporative emission control system upgrades.

Overall, as in the past, the automotive industry continues to significantly exceed expectations in terms of their ability to simplify, refine, and reduce the costs of their emission control systems.

AT PZEVs

In the 2001 Initial Statement of Reasons and 2000 Biennial Review Staff Report, the incremental cost for an AT PZEV was estimated to be $3,300 in the near term and $1,100 in volume production.

In this staff analysis, AT PZEV incremental costs for 2012 and beyond are based on the long-term estimates prepared by ARB and California Energy Commission staff as part of the AB 2076 report on reducing petroleum dependency. Estimates for earlier years are based on staff's understanding of current and projected incremental costs for various production HEVs.

Specifically, staff estimates that the incremental cost for an AT PZEV is $3,300 in Stage I (2003-2005), $1,500 in Stage II (2006-2008), $1,200 in Stage III (2009-2011) and $700 in 2012 and beyond.

These estimates do not take into account the fact that AT PZEVs that make use of hybrid electric drive will have vehicle attributes (such as increased performance or fuel economy, or in some cases 4-wheel drive) that are of value to customers. Thus, customers might be expected to pay a premium for such vehicles, and in fact the hybrids on sale in the market today sell for a premium compared to their conventional counterparts.

In an October 2001 report entitled ARB Staff Review of Report Entitled "Impacts of Alternative ZEV Sales Mandates on California Motor Vehicle Emissions: A Comprehensive Study" staff discussed the valuation of HEV fuel savings. That report noted that an analysis cited by the automakers estimated a lifetime fuel savings of $350 for each 10 percent fuel efficiency improvement, using a gasoline price of $1.30 per gallon. Using a staff methodology, the ARB Staff Review estimated that the net present value of lifetime fuel savings for passenger vehicles with a 50 percent fuel economy improvement was approximately $1,600, using a fuel price of $1.75 per gallon.

The hybrid vehicles on the market today achieve fuel economy improvements of from 25 percent to 50 percent or more. For purposes of this analysis, staff assumes a fuel economy improvement of 30 percent, which results in a lifetime fuel savings net present value of about $1,040 under the staff methodology or $1,050 under the methodology cited by the automakers. This is rounded to

$1,000 for the calculations in this report. This value appears to be conservative in light of the fuel price premiums achieved in the market today.

Staff notes that the use of this value results in a "negative" incremental cost in 2012 and beyond—in other words the HEV is estimated to be less expensive to own and operate over its lifecycle than a conventional vehicle.

Battery EVs

In the 2000 Biennial Review Staff Report, the total near term incremental cost for full function battery EVs was estimated to range between $13,000 and $24,000, depending on the type of vehicle and the battery employed. For City EVs the near term incremental cost ranged from $7,500 to $10,000. Costs in volume production were estimated to range from $1,500 to $11,000, again depending on the type of vehicle and the battery used. In the 2001 Initial Statement of Reasons staff used near term estimates of $17,000 for full function EVs and $8,000 for City EVs.

Battery EV costs in this report are based on the 2001 staff analysis. Staff is not aware of changes since that time that significantly affect these cost estimates. Thus, for the purposes of the cost discussion here we assume an incremental cost of $17,000 for full function EVs and $8,000 for City EVs. We do not use lower "volume production" estimates for battery EVs because we do not expect volume production of battery EVs to occur in this timeframe.

Fuel Cell EVs

The 2001 Initial Statement of Reasons and the 2000 Biennial Review Staff Report did not provide estimates for fuel cell EV incremental cost. The October 2001 ARB Staff Review used an Arthur D. Little report that estimated a long-term incremental cost for a hydrogen fuel cell of roughly $9,300.

Estimates for near term fuel cell vehicle costs are highly speculative. Fuel cell costs can range considerably among manufacturers. In addition, fuel cell costs are considered highly sensitive information and are carefully guarded by manufacturers. In the early years the majority of the fuel cell vehicle cost is attributed to research and development, and the prototype nature of the vehicles produced.

In this analysis, near term cost estimates are based on currently held views in the fuel cell community. The cost for 2012 and beyond is based on estimates from the AB 2076 analysis, which in turn draws on long term estimates prepared by Arthur D. Little. The AB 2076 analysis assumed an incremental per vehicle cost for a hydrogen fuel cell of between $6,300 and $12,300.

Specifically, in this analysis incremental costs for a fuel cell vehicle are estimated to be $1 million in Stage I (2003-2005), $300,000 in Stage II (2006-2008), $120,000 in Stage III (2009-2011), and $9,300 in 2012 to 2020.

Table 5.1 below presents our incremental cost estimates in summary form.

**Table 5.1**
**Incremental Vehicle Cost Estimates**

| | Stage I | Stage II | | | Stage III | | | |
|---|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012+ |
| | | | | | | | | |
| ZEVs | | | | | | | | |
| If City | $8,000 | $8,000 | | | $8,000 | | | $8,000 |
| If Full Function | $17,000 | $17,000 | | | $17,000 | | | $17,000 |
| If Fuel Cell | $1,000,000 | $300,000 | | | $120,000 | | | $9,300 |
| | | | | | | | | |
| AT PZEVs | | | | | | | | |
| Initial cost | $3,300 | $1,500 | | | $1,200 | | | $700 |
| Customer value | $1,000 | $1,000 | | | $1,000 | | | $1,000 |
| Net cost | $2,300 | $500 | | | $200 | | | -$300 |
| | | | | | | | | |
| PZEVs | $100 | $100 | | | $100 | | | $100 |

Staff notes that estimates for all the vehicle types are subject to great uncertainty associated with projecting future costs for evolving technology. Finally, the actual impact on manufacturers depends upon the extent to which they are able to pass along any increased costs to consumers, and the amount of any public subsidies that are provided.

For all of these reasons, staff notes that although the direction of the cost impact of the proposed amendments is clear – they will reduce the cost of the program – the magnitude of the savings is much more difficult to assess. We present our best estimates, based upon what we believe are reasonable assumptions, but we emphasize that the reader should recognize the uncertainty. We first address the anticipated cost of compliance with the 2001 amendments. We then discuss the anticipated cost of compliance with the staff proposal, and then finally the savings due to the staff proposal (the difference between the two). At the end of this section there is a summary table that lays out the results of our cost estimation in comparison form.

### 5.3.2 Estimated Program Costs – 2001 Amendments and Staff Proposal

This section provides a review of the incremental cost of the 2001 amendments and the staff proposal under the no credit trading scenario. Please note that manufacturers make significant use of banked credits in the early years. The cost that was incurred to acquire those banked credits is not taken into account here—it is a sunk cost that has no bearing on the relative cost of the staff proposal versus the 2001 amendments.

The estimated incremental cost for each program category in each year is the product of the number of vehicles produced in that year (taken from Tables 3.12 and 3.13 above) times the incremental cost per vehicle in that year (taken from Table 5.1 above). The results for the 2001 amendments are shown in Table 5.2 below, and the results for the staff proposal are shown in Table 5.3. As noted above, these cost estimates are based on the "worst case" ZEV production scenario.

**Table 5.2**
**Estimated Annual Incremental Cost, 2001 Amendments**
**(Dollars in Thousands)**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| | | | | | | | |
| ZEVs | | | | | | | |
| If City | $0 | $0 | $0 | $109,600 | $201,600 | $216,800 | $234,400 |
| If Full Function | $0 | $0 | $0 | $93,500 | $178,500 | $204,000 | $221,000 |
| If Fuel Cell | $0 | $0 | $0 | $1,290,000 | $1,080,000 | $1,332,000 | $1,440,000 |
| | | | | | | | |
| AT PZEVs | $30,820 | $9,900 | $13,950 | $23,550 | $12,960 | $14,120 | $15,300 |
| | | | | | | | |
| PZEVs | $27,460 | $41,020 | $46,080 | $51,140 | $56,200 | $61,260 | $66,320 |
| | | | | | | | |
| Total | | | | | | | |
| If City | $58,280 | $50,920 | $60,030 | $184,290 | $270,760 | $292,180 | $316,020 |
| If Full Function | $58,280 | $50,920 | $60,030 | $168,190 | $247,660 | $279,380 | $302,620 |
| If Fuel Cell | $58,280 | $50,920 | $60,030 | $1,364,690 | $1,149,160 | $1,407,380 | $1,521,620 |

**Table 5.3**
**Estimated Annual Incremental Cost, Staff Proposal**
**(Dollars in Thousands)**

| | Stage I | Stage II | | | Stage III | | |
|---|---|---|---|---|---|---|---|
| Type of Vehicle | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| | | | | | | | |
| ZEVs | | | | | | | |
| If City | $0 | $0 | $0 | $0 | $36,800 | $76,800 | $83,200 |
| If Full Function | $0 | $0 | $0 | $0 | $52,700 | $108,800 | $117,300 |
| If Fuel Cell | $0 | $0 | $0 | $0 | $276,000 | $576,000 | $624,000 |
| | | | | | | | |
| AT PZEVs | $39,560 | $12,800 | $21,650 | $32,050 | $17,620 | $19,220 | $20,820 |
| | | | | | | | |
| PZEVs | $27,460 | $41,020 | $46,080 | $51,140 | $56,200 | $61,260 | $66,320 |
| | | | | | | | |
| Total | | | | | | | |
| If City | $67,020 | $53,820 | $67,730 | $83,190 | $110,620 | $157,280 | $170,340 |
| If Full Function | $67,020 | $53,820 | $67,730 | $83,190 | $126,520 | $189,280 | $204,440 |
| If Fuel Cell | $67,020 | $53,820 | $67,730 | $83,190 | $349,820 | $656,480 | $711,140 |

A comparison of Table 5.2 and Table 5.3 brings forth several key points. First of all, the staff proposal has no effect on the estimated cost of the PZEV option.

The number of vehicles needed to take full advantage of this option is the same under the staff proposal as under the 2001 amendments.

Second, the estimated cost of the AT PZEV option increases somewhat. This is due to the fact that the allowable use of this option is increased during the 2005-2011 transition period, resulting in larger numbers of vehicles being produced in this category.

Finally, the estimated cost of the pure ZEV portion of the regulation decreases significantly under the staff proposal, due to the fact that this category in total is reduced to one-half of its former size, while the credits earned per vehicle are increased, particularly in the early years.

### 5.3.3 Cost Savings

Adding up the total cost of the program (ZEV, AT PZEV and PZEV production), the estimated savings due to the staff proposal in model years 2005 through 2011 range from an estimated $375 million to $3,623 million. These estimates are summarized below in Table 5.4.

**Table 5.4**
**Estimated Total Savings Under Staff Proposal, 2005 –2011**
**(Dollars in Thousands)**

| Type of Vehicle | Stage I | Stage II | Stage III | Total |
|---|---|---|---|---|
| | | | | |
| ZEVs | | | | |
| If City | $0 | -$109,600 | -$456,000 | -$565,600 |
| If Full Function | $0 | -$93,500 | -$324,700 | -$418,200 |
| If Fuel Cell | $0 | -$1,290,000 | -$2,376,000 | -$3,666,000 |
| | | | | |
| AT PZEVs | $8,740 | $19,100 | $15,280 | $43,120 |
| | | | | |
| PZEVs | $0 | $0 | $0 | $0 |
| | | | | |
| Total | | | | |
| If City | $8,740 | -$90,500 | -$440,720 | -$522,480 |
| If Full Function | $8,740 | -$74,400 | -$309,420 | -$375,080 |
| If Fuel Cell | $8,740 | -$1,270,900 | -$2,360,720 | -$3,622,880 |

### 5.3.4 Addition of LDT2 Vehicles

As noted above, staff recommends that the Board reconsider and affirm its 2001 action to add LDT2 vehicles to the sales base against which manufacturers' compliance obligations are calculated.

Table 5.5 below shows the estimated additional cost to manufacturers due to the addition of LDT2 vehicles to the sales base, using the staff proposal credit and

compliance structure. The estimated additional costs for each program category in each year are the product of the number of additional vehicles assumed to be needed in that year (taken from Table 3.15 above) times the incremental cost per vehicle in that year (taken from Table 5.1 above).

**Table 5.5**
**Additional Cost Due to Addition of LDT2 Vehicles to Sales Base**
**(Dollars in Thousands)**

| Type of Vehicle | Stage I | Stage II | Stage III | Total |
|---|---|---|---|---|
| | | | | |
| ZEVs | | | | |
| If City | $0 | $0 | $96,000 | $96,000 |
| If Full Function | $0 | $0 | $136,000 | $136,000 |
| If Fuel Cell | $0 | $0 | $720,000 | $720,000 |
| | | | | |
| AT PZEVs | $0 | $8,800 | $19,200 | $28,000 |
| | | | | |
| PZEVs | $0 | $15,180 | $60,720 | $75,900 |
| | | | | |
| Total | | | | |
| If City | $0 | $23,980 | $175,920 | $199,900 |
| If Full Function | $0 | $23,980 | $215,920 | $239,900 |
| If Fuel Cell | $0 | $23,980 | $799,920 | $823,900 |

As is shown in Table 5.5, the addition of LDT2 vehicles to the sales base has no impact in Stage I, due to the fact that the phase-in of LDT2 vehicles only begins in 2007. In Stage II there is no impact on pure ZEV cost, because under the "worst case" production scenario used here manufacturers have sufficient banked credits to cover the entire pure ZEV obligation even accounting for the addition of LDT2 vehicles. There is, however, an increased cost in Stage II for the AT PZEV and PZEV categories. The full effect of the addition of LDT2 vehicles to the base is felt in Stage III and beyond.

Once again, the incremental costs shown in Table 5.5 above are already included in Tables 5.2 and 5.3 above, which take into account the addition of LDT2 vehicles to the sales base. Removal of LDT2s from the sales base thus would decrease the totals given in Tables 5.2 and 5.3.

### 5.4 Potential Impact on Dealerships

The extent to which motor vehicle dealerships are affected by the current ZEV regulation, or the amended regulation, depends on the specifics of the interaction between the dealership and the manufacturer. During the course of the last biennial review in September 2000 dealership representatives stated their concern that they would be forced to absorb increased costs stemming from the increased incremental cost of vehicles produced to meet the regulation. Staff is

unable to estimate the magnitude of any such effect. It is clear, however, that by reducing total program costs the proposed amendments would also reduce any cost impact on motor vehicle dealerships.

### 5.5 Potential Impacts on Vehicle Operators

As is the case with dealerships, the impact of the current regulation or the amended regulation on vehicle purchasers will depend on the extent to which manufacturers choose, and are able, to pass along any increased costs. Once again, staff cannot estimate the extent to which this would occur, but it is clear that the proposed amendments would serve to reduce any possible cost increases for vehicle purchasers as compared to the current regulation.

### 5.6 Potential Impact on Business Competitiveness

Because the proposed amendments are anticipated to reduce costs faced by California businesses, they would have no adverse impact on the ability of California businesses to compete with businesses in other states.

### 5.7 Potential Impact on Employment

The proposed amendments are not expected to cause a noticeable change in California employment because California accounts for only a small share of motor vehicle and parts manufacturing employment.

### 5.8 Potential Impact on Business Creation, Elimination or Expansion

The proposed amendments are not expected to affect business creation, elimination or expansion.

### 5.9 Potential Costs to Local and State Agencies

The proposed amendments are not expected to result in an increase in costs for state and local agencies.

## 6. ENVIRONMENTAL IMPACTS

This section includes a discussion of the emission impacts of the proposed regulatory amendments, the model used to determine the emissions, and the assumptions made concerning the emissions.

### 6.1 Introduction

The Mobile Source Emission Inventory, EMFAC2002, was used to assess the emission impacts of the current regulation as amended by the 2001 ZEV amendments adopted in final form on April 12, 2002, and the proposed amendments. Using EMFAC, staff modeled various implementation scenarios applicable to the South Coast Air Basin representing the emissions from vehicles subject to this regulation. This includes passenger cars and light-duty trucks weighing less than 3,751 pounds gross vehicle weight (LDT1s), plus light duty trucks weighing less than 8,500 pounds gross vehicle weight (LDT2s) phased in beginning in 2007.

In summary, the proposed amendments would temporarily reduce the required number of pure ZEVs to one half the current requirement. The new requirement for pure ZEVs would be 1 percent in 2005 through 2008 and 1.25 percent in 2009 through 2011. The current regulation requires 2 percent in 2005 through 2008 and 2.5 percent in 2009 through 2011.

After 2011 there is no modification to the percentage ZEV requirements. The pure ZEV requirement is 3 percent from 2012 through 2014, 4 percent from 2015 through 2017, and 5 percent from 2018 through 2020 in both the 2001 amendments and the staff proposal. The number of pure ZEV vehicles required under the staff proposal in 2012 and beyond will decrease slightly due to minor changes in the credit value earned by vehicles in those years. The number of AT PZEV vehicles likewise will change slightly, assuming that manufacturers choose to take advantage of that option.

### 6.2 Emissions Scenarios and Assumptions

To determine the emission impact of the proposed amendments, staff prepared emission estimates for the South Coast Air Basin using the current and proposed regulations. In both cases staff used the worst case (free credit trading and no voluntary production) scenario. For the reference or baseline emission values staff used the assumptions contained in the December 8, 2000 ZEV Program Regulations amendments staff report.

- The current regulation scenario assumes that all manufacturers take full advantage of the 6 percent PZEV option, and take full advantage of the AT PZEV option beginning in 2008. Prior to that date manufacturers would make

partial use of the AT PZEV option, as outlined in Section 3.6.1 above. Although the current regulation requires that compliance begin in 2003, for purposes of this emission analysis we assume that the start of the program is delayed until 2005. Other than that the compliance structure and credit values are taken from the 2001 amendments.

- The proposed amendments scenario assumes that manufacturers take full advantage of the PZEV option, and take full advantage of the AT PZEV option beginning in 2008. Prior to that date manufacturers would make partial use of the AT PZEV option, as outlined in Section 3.6.1 above. The compliance structure and credit values are taken from the staff proposal.

The net impact of the staff proposal would result in a decrease in the number of ZEVs and an increase in the number of AT PZEVs as compared to the 2001 amendments.

Tables 6.1 and 6.2 below present the difference in direct emissions for the South Coast Air Basin in 2010 and 2020 for the staff proposal as compared to the 2001 amendments. As shown in the Table 6.1, staff estimates that the proposed changes will result in a net decrease of about 0.04 tons per day of direct emissions of reactive organic gases (ROG) and oxides of nitrogen (NOx) in 2010 as compared to the 2001 amendments. For 2020, Table 6.2 shows a net decrease of about 0.1 tons per day of direct emissions of ROG and NOx from the proposed amendments when compared to the 2001 amendments.

**Table 6.1**
**Summertime Direct Emissions, South Coast Air Basin in 2010**
**(Tons per day)**

| | ROG | NOx | CO | PM |
|---|---|---|---|---|
| NO ZEVs | 155.50 | 144.24 | 1574.80 | 5.85 |
| 2001 Amendments | 155.13 | 143.28 | 1570.85 | 5.85 |
| Proposed 2003 Amendments | 155.10 | 143.27 | 1570.82 | 5.85 |
| | | | | |
| Net change from 2001 Amendments | -0.03 | -0.01 | -0.03 | 0 |
| Net change from no Program | -0.40 | -0.97 | -3.97 | 0 |

**Table 6.2**
**Summertime Direct Emissions, South Coast Air Basin in 2020**
**(Tons per day)**

| | ROG | NOx | CO | PM |
|---|---|---|---|---|
| NO ZEVs | 90.86 | 67.81 | 807.38 | 7.20 |
| 2001 Amendments | 88.07 | 65.86 | 790.89 | 7.18 |
| Proposed 2003 Amendments | 87.98 | 65.85 | 790.41 | 7.18 |
| | | | | |
| Net change from 2001 Amendments | -0.09 | -0.01 | -0.48 | 0 |
| Net change from no Program | -2.88 | -1.96 | -16.97 | -0.02 |

The ZEV program, with the proposed amendments, remains beneficial to air quality. Tables 6.1 and 6.2 list the total emissions benefits compared to having no ZEV program. Staff estimates the proposed amendments will reduce approximately 1.37 and 4.84 tons per day of ROG and NOx by 2010 and 2020, respectively, as compared to the "No-ZEV" case.

In addition to direct vehicle emissions, staff considered the indirect emissions that result from vehicle refueling, fuel transport, fuel processing, and feedstock extraction. As direct emissions decrease, indirect emissions represent a larger share of the total emissions that are attributed to vehicle operations. ARB staff did not provide updated estimates of indirect emissions as part of this analysis. With regard to indirect emissions attributable to hydrogen fuel cell vehicles, taking into account the limited number of vehicles affected by the proposed amendments emissions from hydrogen production are expected to be extremely low and comparable to emissions from the production of electricity for battery zero emission vehicles. Based on contract work performed by Acurex Environmental (now part of TIAX) in 1996 and updated in 1999, staff projects that that the impacts from the staff proposal on indirect emissions will be negligible.

"Fleet Turnover" Effect

During the development of the 2001 amendments, General Motors Corporation filed extensive written comments asserting that the ZEV regulations will ultimately increase rather than decrease emissions. GM claimed that this will happen because assumed increases in the prices of new California cars and light trucks resulting from the ZEV mandate will depress sales of new vehicles, to the extent that emission increases from the greater number of higher-emitting older vehicles on the road due to reduced "fleet turnover" will more than offset the emission decreases attributable to the presence of ZEVs in the new vehicle fleet. To support this position, GM relied on a report dated January 2001 by National Economic Research Associates, Inc. and Sierra Research, Inc. entitled Impacts of Alternative ZEV Sales Mandates on California Motor Vehicle Emissions: A Comprehensive Study (the NERA/Sierra Report).

The ARB staff analysis of these arguments was outlined in the ARB Staff Review of Report Entitled "Impacts of Alternative Sales Mandates on California Motor Vehicle Emissions: A Comprehensive Study". The ARB staff review concluded that the NERA/Sierra report significantly overstated the purported effect of the ZEV program on fleet turnover and resulting fleetwide emissions. Major considerations included:

- The cost increases assumed by NERA/Sierra were overstated.
- Manufacturers will not necessarily be able to pass along all increased costs.
- Small price increases can be addressed by a variety of manufacturer marketing practices and will not necessarily reduce sales.
- The NERA/Sierra emission modeling failed to take into account recent changes to the LEV II program.

The ARB staff analysis went on to demonstrate that when using more reasonable ARB staff assumptions rather than the assumptions used in the NERA/Sierra analysis, the NERA/Sierra model projected an average per vehicle increased cost of roughly $25 to $40 rather than the $250 to $400 estimated in the NERA/Sierra report. Staff believed that at these modest levels, such increases would have an insignificant effect on vehicle sales. Even if one accepts the NERA/Sierra premise that any cost increase, no matter how small, will reduce vehicle sales, staff concluded that the 2001 amendment version of the ZEV program will still result in an emission decrease, rather than the emission increase alleged in the NERA/Sierra report.

The proposed changes put forth in the staff proposal serve to reduce the number of pure ZEVs that will be needed in model years 2005-2011 as compared to the 2001 amendments. As is shown in Table 5.4 above, this will significantly reduce the cost of the ZEV program to manufacturers. The estimated savings range from $375 million to almost $3.7 billion over the 2005-2011 transition period, depending on the types of vehicles manufacturers choose to build.

In addition, staff's estimate of the incremental cost of a PZEV has been further reduced from the level assumed in the 2001 rulemaking. Based on staff's analysis of recently certified PZEVs, staff now concludes that the incremental cost to build a PZEV is $100 per vehicle rather than the $200 per vehicle assumed in the Staff Review and the 2001 Final Statement of Reasons. Although the cost difference per vehicle is small, it has a large effect on the total cost of the program given the large number of PZEVs that will be built as compared to the other vehicle types. (Under the vehicle production scenarios outlined in Section 5, in 2011 there will be some 663,000 PZEVs produced versus roughly 90,000 AT PZEVs and ZEVs). The reduction in estimated total incremental cost to manufacturers over the 2005-2011 transition period due to this reduced PZEV cost is roughly $350 million.

Moreover, the analysis conducted as part of the 2001 rulemaking did not take into account the use of banked credits. As is shown in the worst case scenario outlined in Section 5 above, the use of banked credits could under some circumstances allow manufacturers to significantly reduce or eliminate the production of pure ZEVs during the early years of the program. This would serve to dramatically reduce manufacturer compliance cost from the levels assumed in the NERA/Sierra report.

Based on the above considerations, staff concludes that the modified ZEV program described in the staff proposal will have an even smaller effect on fleet turnover than the 2001 amendment version. Given that the effect of the 2001 amendment version was demonstrated to be minimal, staff concludes that fleet turnover will likewise play a minimal role under the staff proposal.

Finally, staff also notes that a recent RAND report entitled Driving Emissions to Zero – Are the Benefits of California's Zero Emission Vehicle Program Worth the Costs? contains an evaluation of the fleet turnover effect. The authors chose not to include any fleet turnover effect in their quantitative emission and cost effectiveness analyses. They instead address it in narrative form as an "uncounted potential cost," stating that "While this feedback is possible in principle, we found that there is a great deal of uncertainty about its size." (RAND page xviii). More specifically, after summarizing previous work on the topic the report contains the following evaluation:

> There are good arguments on both sides of this debate. The ZEV program does create a cost of selling an additional ICEV in states that have adopted the program. Simple models of profit maximization conclude that manufacturers set prices on products according to the costs of producing and selling those products. The ZEV program creates no additional costs in states that have not adopted the program, so prices should not rise in those states. Complications in the real world raise doubts about this reasoning, however. First, competition from small- and intermediate-volume manufacturers not subject to the pure ZEV portion of the program may dissuade the large-volume manufacturers from concentrating price increases in California. Now that the cutoff between intermediate- and large-volume manufacturers has risen to 60,000 vehicles per year (from 35,000 previously), large price increases by large-volume manufacturers may have real consequences for their market share. Second, manufacturers have spread costs outside the markets that generate them in a number of circumstances. Dixon and Garber (1996) were told by observers inside and outside the auto industry that companies typically spread vehicle transportation and delivery costs across geographic areas. The Green Car Institute found that manufacturers had recently dropped the $100 typically added to a vehicle's retail price to cover California emission requirements because "from a market standpoint the automakers viewed the separate charge for

the California emissions programs as negative to their other marketing efforts" (Green Car Institute, 2001, p. 24). Manufacturers may be less likely to spread costs if the additional costs are large (as opposed to modest, as in the case of transportation and shipping charges); but in any case, uncertainty remains about the ZEV program's effect on new vehicle prices and any consequent indirect effect on fleet emissions in California.

Even if manufacturers spread costs nation- or even worldwide, there may be some reductions in new vehicle sales and, consequently, increase in emissions both inside and outside California. Thus, consideration of the ZEV program's feedback on new vehicle sales would lead to an increase in the cost-per-ton estimates presented here, but the overall significance of the effect is uncertain. (RAND, pages 93-94).

### 6.3 Other Environmental Media

ZEVs can provide significant positive contributions in other environmental media. Just as gasoline refining, marketing, and distribution result in air pollution emissions, they likewise result in water pollution due to leaks, spills, and wastewater discharge, and are a source of hazardous waste. Given the relatively small changes in near term fleet composition that result from the proposed amendments, staff expects no significant negative impact in these environmental areas.

### 6.4 Energy Diversity and Energy Demand

Reducing demand for gasoline can have important benefits for California. A reduction in demand could help reduce potential shortages of cleaner-burning California gasoline and thereby help stabilize prices. A successful effort to reduce gasoline demand would also reduce the need for additional refining, transportation and distribution facilities, thus preventing additional air and water pollution as noted above. The placement of ZEVs and AT PZEVs will provide reductions of $CO_2$ emissions and other greenhouse gases.

Battery and hydrogen ZEVs, which use electricity directly and indirectly, provide significant alternative fuel benefits because electricity can be produced from a variety of non-petroleum energy sources. Moreover, because electricity and hydrogen can be produced from renewable resources such as solar, wind, or hydropower, or biomass feedstocks, the increased use of ZEV can help pave the way towards a sustainable energy future.

## 7. COST – EFFECTIVENESS

This section discusses the cost-effectiveness of the various elements of the ZEV program. Determining the cost-effectiveness of the ZEV program has always been more difficult and uncertain than for other regulatory measures due to the far-reaching nature of the program. Predicting the future cost of technologies that are still in the demonstration stage is difficult at best. In addition, the ZEV program has always combined two distinct objectives -- first, achieving emission reductions today through expanded introduction of commercially available near-zero emission technology, and second, accelerating the development of pure ZEV technologies that have the potential to provide significant air quality benefits over the long term, but have minimal immediate air quality impact given their pre-commercial status and limited production.

Cost-effectiveness is a measure of the cost incurred to achieve a specific outcome, as compared to other ways to reach that same end. Thus it is appropriate to separately consider the two distinct objectives outlined above.

Near Term Emission Reductions

The first objective -- achieving emission reductions today -- involves the PZEV and AT PZEV options included within the program. These options encourage the mass-market production of commercially available technologies.

Table 7.1 below shows the lifetime emission reductions achieved by a PZEV and HEV PZEV as compared to a conventional SULEV meeting the 0.5 grams per test evaporative emission standard. These values are taken from the 2001 Final Statement of Reasons and are based on information prepared by staff and used by Toyota in its comments on the 2001 staff proposal.

**Table 7.1**
**Lifetime Emission Benefits**

| Vehicle Type | NMOG (g/mile) | NOx (g/mile) | 150,000 mile ROG + NOX (pounds) | Benefit vs. SULEV/0.5 evap (pounds) |
|---|---|---|---|---|
| SULEV/0.5 evap | 0.0703 | 0.0266 | 32.02 | 0.00 |
| PZEV | 0.0577 | 0.0256 | 27.52 | 4.50 |
| PZEV HEV | 0.0477 | 0.0251 | 24.05 | 7.97 |

Table 7.2 below shows the cost-per-ton of emissions reduced for each technology, given the incremental cost per vehicle assumed for Stage I, Stage II, Stage III, and 2012 and beyond. Incremental costs are taken from Table 5.1 in Section 5 above.

**Table 7.2**
**Dollars per Ton of Emission Reduction**

| | Stage I | Stage II | Stage III | 2012+ |
|---|---|---|---|---|
| Vehicle Type | | | | |
| AT PZEV | | | | |
| Incremental Cost | $2,300 | $500 | $200 | -$300 |
| Dollars per Ton | $577,164 | $125,471 | $50,188 | -$75,282 |
| | | | | |
| PZEV | | | | |
| Incremental Cost | $100 | $100 | $100 | $100 |
| Dollars per Ton | $44,444 | $44,444 | $44,444 | $44,444 |

Long Term Emission Reductions

The second objective of the program is to accelerate the development of pure ZEV technology to achieve significant future air quality benefits. This is accomplished by the pure ZEV obligation within the program.

In proposing amendments to the regulation in 2001, ARB staff provided data to the Board that showed that in the early years of the ZEV program the dollars spent per ton of pollutant reduced would be much higher than for any other ARB regulatory measure. The Board, however, voted unanimously to maintain the program because of its belief that the ZEV program needs to be viewed and considered on a long-term basis. Simply put, the Board has expressed confidence in the technical capability of industry to reduce cost such that the long-term costs of ZEVs will be comparable to conventional vehicles.

Table 7.3 below shows the lifetime emission reductions achieved by ZEVs as compared to a conventional SULEV meeting the 0.5 grams per test evaporative emission standard. As was the case with the PZEV and AT PZEV estimates given above, these values are taken from the 2001 Final Statement of Reasons and are based on information prepared by staff and used by Toyota in its comments on the 2001 staff proposal.

**Table 7.3**
**Lifetime Emission Benefits**

| Vehicle Type | NMOG (g/mile) | NOx (g/mile) | 150,000 mile ROG + NOX (pounds) | Benefit vs. SULEV/0.5 evap (pounds) |
|---|---|---|---|---|
| SULEV/0.5 evap | 0.0703 | 0.0266 | 32.02 | 0.00 |
| ZEV (BEV) | 0.002 | 0.0003 | 0.76 | 31.26 |

Table 7.4 below shows the cost-per-ton of emissions reduced for a hydrogen fuel cell vehicle, given the incremental cost per vehicle assumed for Stage I, Stage II, Stage III, and 2012 and beyond. Incremental costs are taken from Table 5.1 in Section 5 above.

**Table 7.4**
**Dollars per Ton of Emission Reduction**

| | Stage I | Stage II | Stage III | 2012+ |
|---|---|---|---|---|
| Vehicle Type | | | | |
| ZEV (fuel cell) | | | | |
| Incremental Cost | $1,000,000 | $300,000 | $120,000 | $10,000 |
| Dollars per Ton | $63,979,527 | $19,193,858 | $7,677,543 | $639,795 |

Clearly the dollars per ton estimates given above greatly exceed those for other air pollution control measures. They must, however, be viewed in the context of the objective that the Board is trying to achieve. The purpose of the pure ZEV obligation within the ZEV program is to maintain significant pressure on manufacturers to continue ZEV technology development. Staff knows of no other mechanism that can accomplish this objective in a more economical fashion.

In addition, the staff expects that the long-term cost of ZEV technology will decline beyond the cost estimates shown here. The Board's confidence in the ability of engineering and manufacturing improvements to reduce cost is rooted in the history of vehicular air pollution control programs. Not only were the PZEV and AT PZEV technologies not commercially available when the Board first adopted the ZEV program in 1990, they were not even envisioned or thought possible. Now they are mass-market products with low incremental costs, spurred on by the pressure provided by the ZEV mandate.

The staff expects the same progress to occur with the next generation of technology, such as fuel cell vehicles. The Board's long-term vision is that zero emission vehicles will be cost effective when compared to conventional vehicles. The notion that such vehicles will one day be cost competitive is supported by the tremendous investments being made by all of the automakers. Automakers have invested several billion dollars to date in developing fuel cell technology and have publicly stated plans to continue heavy investment in the next decade. Staff believes it is unlikely that this level of investment would exist or continue without a belief on the part of the automakers that there is a long-term business case to be made for the profitable mass production of fuel cell vehicles.

ARB staff has proposed amendments that provide generous credits for ZEVs during what is referred to as the developmental stage. The proposed amendments are designed to leverage manufacturer investments, and consequently require a relatively small incremental cost to industry during this timeframe. At the same time, the proposed amendments provide certainty that automakers will continue their efforts and send an important signal to industrial suppliers regarding California's commitment to ZEV technologies.

# 8. SUMMARY AND STAFF RECOMMENDATION

## 8.1 Summary of Staff Proposal

As presented in the previous sections, the staff proposal addresses the preemption concerns raised in the industry lawsuit by removing all references to fuel efficiency. In addition, proposed amendments are included to maintain pressure on the commercialization of ZEV technologies while at the same time reflecting the current state and cost of ZEV technology.

The staff proposes that the Board make the following specific amendments:

*2005 Program Restart.* Restart the ZEV requirement in 2005 while allowing manufacturers to earn and bank for future use credit earned by any vehicles produced prior to 2005.

*Amend AT PZEV Calculation Method.* Staff proposes amendments that remove all references to fuel economy in the calculation of AT PZEV allowances. The resulting restructuring of the calculation method includes several elements that simplify the structure of the calculation. Staff also proposes amendments that would establish flat allowances for advanced componentry for HEVs and gaseous storage systems. Staff recommends a revised calculation of the low fuel-cycle emissions allowance. The allowance for zero emission vehicle miles traveled for hybrid electric vehicles is adjusted upward and the phase in multiplier for AT PZEVs with any zero emission vehicle miles traveled is increased under staff's proposal. Post 2011, staff proposes amendments that cap the total AT PZEV allowances that can be earned by any technology type at 3.0. Finally, staff proposes amendments such that each element of AT PZEV allowance calculation may be severed from the remainder of the program if warranted.

*Amend ZEV Calculation Method.* Staff proposes amendments that remove the efficiency multiplier from the ZEV allowance calculation. To restructure the ZEV allowance calculation, staff proposes a series of amendments aimed at simplifying the calculation and at encouraging sustainable commercialization of ZEVs. Staff proposes amendments to create ZEV "types" that will be the basis for the ZEV allowances. These types include NEVs, Type 0 (utility low-range ZEVs), Type I (mid-range ZEVs like City electric vehicles), Type II (longer-range ZEVs like full-function battery EVs) and Type III (long range, fast-refueling ZEVs like fuel cell vehicles). The staff's proposed amendments do not change the amount of credit earned by NEVs. Type 0 ZEVs earn 1.5 credits until 2008 and then 1 credit for 2009 and beyond under the proposal. Type I, II, and III ZEVs earn an increased level of credits in staff's proposal through the 2011 timeframe. In 2012 and beyond, Type II vehicles (City EVs) continue to earn somewhat enhanced credits as compared to the 2001 amendments while credits for other vehicles are similar to the 2001 amendments.

Additional changes are proposed to the ZEV credit calculations that reflect the above changes to the structure of the calculation and experience with the program to date. These proposed changes include amendment of the fast refueling definition and elimination of the in-service/warranty credit.

*Amendment of Compliance Options.* The 2001 amendments allow automakers to satisfy up to half of the pure ZEV requirement with certain other advanced technologies that are not ZEVs. Staff proposes amendments providing that during a transition period of 2005 through 2011 automakers are allowed to satisfy up to three-quarters of the pure ZEV portion of the ZEV requirement with such vehicles. This adjustment to the amount of AT PZEV credit that can be used to satisfy the pure ZEV requirement has been proposed to create a slower ramp up of volumes of pure ZEVs and to encourage an increase in AT PZEV volumes in the early years.

Additionally, staff proposes amendments that remove ZEVs from the sales volume used to calculate the ZEV requirement and that eliminate the cap on use of banked NEV credits when used for the PZEV or AT PZEV compliance options.

*Miscellaneous Changes.* The 2001 amendments require HEVs to have a 15-year/150,000 mile warranty on the battery. Staff is proposing amendments that reduce this requirement to 10-years/150,000 miles. Staff also proposes amendments to extend the sunset date on the award of "transportation system" credits from 2007 to 2011, remove credits earned by vehicles from the cap on the use of transportation system credits, and clarify the regulatory definition of placed in service.

*LDT2 Vehicles.* Staff proposes that the Board reconsider and affirm its January 2001 action to add LDT2 vehicles to the base against which manufacturers' ZEV compliance options are calculated.

## 8.2 Issues

As described in Section 2, staff is continuing to explore additional amendments to the ZEV regulation. The public process of comment and consensus building has been useful and productive. Not all of the concepts that may have merit for the package of proposed amendments have been incorporated into this staff report and the proposed regulatory language. This section briefly describes several open areas of discussion that will continue to be explored during the 45-day comment period and may be presented as part of a modified staff proposal for the Board's consideration.

### 8.2.1 Floor for ZEVs to Prevent Complete "Blackout"

Staff has received significant comment from interested parties that a blackout of ZEV product availability due to credits earned in years prior to the start of the regulation is possible under both the 2001 amendments and the staff proposal. It has been suggested that staff include a requirement that some quantity of ZEVs be produced in each model year or each stage to ensure that product is available throughout the implementation of the program and to ensure that manufacturers maintain their efforts towards ZEV commercialization. Such a floor requirement could take one of several forms in the regulation. It could be accomplished by requiring a minimum number of ZEV allowances to be earned from ZEVs built in the compliance model year or stage. It could also be accomplished by capping the amount of the ZEV obligation that can be met with banked ZEV credits.

### 8.2.2 Minimizing the Impact of Section 177

Section 177 of the Clean Air Act allows other states to adopt California's motor vehicle programs. Auto manufacturers have expressed concern that the ZEV program obligations in California are multiplied across other states that have adopted California's ZEV program. This is of particular concern when considering a fuel cell vehicle compliance approach as the volumes necessary to comply are challenging under the California program and even more difficult when considering other states as well. It has been suggested that Type III ZEVs placed in any state that has adopted California's ZEV program be allowed to count towards California's ZEV requirement.

### 8.2.3 Minimum Requirements for Advanced Componentry Credit

Under the 2001 amendments a vehicle must obtain a minimum of 13 percent of its peak power from electric drive in order to earn advanced componentry credit. The staff proposal adds an alternative path under which 8 percent peak power, plus at least 10 kW of motor power, would suffice. The intent of this restriction is to ensure that vehicles earning advanced componentry credit make use of technical approaches that advance ZEV commercialization. Staff anticipates further discussion as to methods that provide a reasonable floor but allow flexibility for differing manufacturer engineering approaches.

### 8.2.4 ZEV Credit for Fueling Infrastructure Deployment

At the workshop held on December 5, 2002, staff proposed the generation of credit from the installation of refueling stations that support ZEVs, such as hydrogen refueling stations. While discussion on the appropriateness of such credit has continued, a clear method and appropriate credit levels have not been worked out. The current proposal does not include this credit element as it was felt further development of the credit structure is needed. Preliminary work on this topic suggests that public infrastructure programs deploying significant

numbers of ZEV refueling facilities in California could earn AT PZEV credit. Such credit could depend on the number of ZEVs that could be supported daily by such stations. For private infrastructure, credit could depend on automaker submittal of proposals to the Executive Officer for large scale deployment of private ZEV refueling infrastructure where these systems would be delivered and installed along with the purchase or lease of individual ZEVs. These systems might include, for example small, privately owned reformers, compressors, and pumps for home refueling of ZEVs that would address the challenging early stage deployment of public hydrogen infrastructure.

### 8.2.5 ZEV Credit for Placement of Stationary Fuel Cells

It has been suggested that the development of fuel cell technology for automobile applications benefits greatly from the improvement and demonstration of the same fuel cell stack technology in stationary applications. Staff has received requests that credit be granted for placement of stationary fuel cells as a means to further development and to reduce costs for eventual commercialization in vehicles.

### 8.2.6 Encouragement for Production of Model Year 2003 and 2004 PZEVs

Under the staff proposal, manufacturers' compliance obligations do not begin until 2005. However, some manufacturers have the capability to produce PZEVs beginning in 2003 consistent with the requirements of the 2001 amendments as evidenced by the PZEV certification of seven models to date. Staff anticipates discussion as to measures that would encourage manufacturers to voluntarily produce quantities of model year 2003 and 2004 PZEVs, in order to take advantage of these potential air quality benefits.

### 8.2.7 Specialty Vehicles

Under the 2001 amendments, specialty vehicles that are built on the same platform and use the same battery and drivetrain as an existing vehicle can earn credit according to the characteristics (range) of the base vehicle. This provision was originally drafted in order to avoid penalizing special purpose vehicles such as Postal EVs that use the same components as the base vehicle but have reduced range due to their modified design. This provision as drafted does not accommodate vehicles that are not based on existing ZEVs. Staff invites comment on measures to ensure that such specialty vehicles receive appropriate credit levels under the staff proposal.

### 8.2.8 Length of Placement

The 2001 amendments do not address how long a vehicle that earns pure ZEV credit must remain in service. ARB staff has become aware of several instances where credit-earning ZEVs have been removed from service prematurely or have

been offered for very short lease terms. This has called into question the appropriateness of allowing such vehicles to earn credit towards compliance with the ZEV regulation since these vehicles are not making any contribution to California's air quality and were removed by the manufacturer. Staff anticipates discussion of measures that would provide incentives for the sale or longer-term lease of vehicles.

### 8.3 Staff Recommendation

The ARB staff recommends that the Board amend section 1962, Title 13, California Code of Regulations, 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". The proposed amendments to section 1962 are set forth in the Proposed Regulation Order in Appendix A.

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## APPENDIX A: PROPOSED AMENDMENTS

1. Proposed Regulation Order: Amendments to the Zero-Emission Vehicle Regulation

   Attached

2. Proposed Amendments to 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 (incorporated by reference in section 1962, title 13, California Code of Regulations)

   Copies of the Test Procedures are available on the ARB's Internet site at http://www.arb.ca.gov/msprog/zevprog/2003rule/2003rule.htm, or may also be obtained by contacting the agency contact person for this rulemaking, Thomas Evashenk, at (916) 445-8811 or via email at tevashen@arb.ca.gov.

## APPENDIX B: DESCRIPTION OF LITIGATION INVOLVING THE ZERO EMISSION VEHICLE REGULATION

# PROPOSED REGULATION ORDER

## PROPOSED 2003 AMENDMENTS TO THE CALIFORNIA ZERO EMISSION VEHICLE REGULATION

**Note:** Set forth below are the proposed 2003 amendments to the California zero emission vehicle (ZEV) regulation. The text of the proposed amendments is shown in underline to indicate additions and ~~strikeout~~ to indicate deletions, compared to the preexisting regulatory language.

1. Amend California Code of Regulations, title 13, section 1962 to read as follows:

**§ 1962. Zero-Emission Vehicle Standards for ~~2003~~ 2005 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.**

(a) *ZEV Emission Standard.* The Executive Officer shall certify new ~~2003~~ 2005 and subsequent model passenger cars, light-duty trucks and medium-duty vehicles as ZEVs if the vehicles produce zero exhaust emissions of any criteria pollutant (or precursor pollutant) under any and all possible operational modes and conditions. Incorporation of a fuel-fired heater shall not preclude a vehicle from being certified as a ZEV provided: (1) the fuel-fired heater cannot be operated at ambient temperatures above 40°F, (2) the heater is demonstrated to have zero fuel evaporative emissions under any and all possible operational modes and conditions, and (3) the emissions of any pollutant from the fuel-fired heater when operated at an ambient temperature between 68°F and 86°F do not exceed the emission standard for that pollutant for a ULEV under section 1961(a)(1).

A vehicle that would meet the emissions standards for a ZEV except that it uses a fuel-fired heater that can be operated at ambient temperatures above 40°F, that cannot be demonstrated to have zero fuel evaporative emissions under any and all possible operation modes and conditions, or that has emissions of any pollutant exceeding the emission standard for that pollutant for a ULEV under section 1961(a)(1), shall be certified based on the emission level of the fuel-fired heater.

(b) *Percentage ZEV Requirements.*

(1) *General Percentage ZEV Requirement.*

(A) *Basic Requirement.* The minimum percentage ZEV requirement for each manufacturer is listed in the table below as the percentage of the PCs and LDT1s, and LDT2s to the extent required by section (b)(1)(C), produced by the manufacturer and delivered for sale in California that must be ZEVs, subject to the conditions in this section 1962(b).

| *Model Years* | *Minimum ZEV Requirement* |
|---|---|
| ~~2003~~ 2005 through 2008 | 10 percent |
| 2009 through 2011 | 11 percent |
| 2012 through 2014 | 12 percent |
| 2015 through 2017 | 14 percent |
| 2018 and subsequent | 16 percent |

(B) *Calculating the Number of Vehicles to Which the Percentage ZEV Requirement is Applied.* A manufacturer's volume of PCs and LDT1s produced and delivered for sale in California will be averaged for the 1997, 1998, and 1999 model years to determine the California PC and LDT1 production volume for the model year ~~2003 to~~ 2005 ZEV requirements. For subsequent three-year periods following model years ~~2003 to~~ 2005, a manufacturer's California production volume of PCs and LDT1s, and LDT2s as applicable, will be based on a three-year average of the manufacturer's volume of PCs and LDT1s, and LDT2s as applicable, produced and delivered for sale in California in the prior fourth, fifth and sixth years (e.g. 2006 to 2008 model-year ZEV requirements will be based on California production volumes of PCs and LDT1s, and LDT2s as applicable, for 2000 to 2002 model years). This production averaging is used to determine ZEV requirements only, and has no effect on a manufacturer's size determination. As an alternative to the three year averaging of prior year production described above, a manufacturer may during the first model year of a three year period elect to base its ZEV obligation on the number of PCs and LDT1s, and LDT2s to the extent required by section (b)(1)(C), produced by the manufacturer and delivered for sale in California that same year. If a manufacturer elects to use this method it must be used for each year of the three-year period. In applying the ZEV requirement, a PC, LDT1, or LDT2 (beginning in the 2007 model year) that is produced by a small volume manufacturer, but is marketed in California by another manufacturer under the other manufacturer's nameplate, shall be treated as having been produced by the marketing manufacturer.

(C) *Phase-in of ZEV Requirements for LDT2s.* Beginning with the ZEV requirements for the 2007 model year, a manufacturer's LDT2 production shall be included in determining the manufacturer's overall ZEV requirement under section (b)(1)(A) in the increasing percentages shown the table below.

| *2007* | *2008* | *2009* | *2010* | *2011* | *2012+* |
|---|---|---|---|---|---|
| 17% | 34% | 51% | 68% | 85% | 100% |

(D) *Exclusion of ZEVs in determining a manufacturer's sales volume.* In calculating for purposes of sections 1962(b)(1)(B) and 1962(b)(1)(C) the volume of PCs, LDT1s and LDT2s a manufacturer has produced and delivered for sale in California, the manufacturer shall exclude the number of ZEVs produced by the manufacturer, or by a subsidiary in which the manufacturer has a greater than 50% ownership interest, and delivered for sale in California.

(2) *Requirements for Large Volume, Intermediate Volume, Independent Low Volume, and Small Volume Manufacturers.*

(A) *Large Volume Manufacturers.*

1. *Model Years 2005-2008.* In ~~2003~~ 2005 through 2008 model years, a large-volume manufacturer must meet at least ~~20%~~ 10% of its ZEV requirement with ZEVs or ZEV credits generated by such vehicles, and at least another ~~20%~~ 30% with ZEVs, advanced technology PZEVs, or credits generated by such vehicles. The remainder of the large-volume manufacturer's ZEV requirement may be met using PZEVs or credits generated by such vehicles.

2. *Model Years 2009-2011.* In 2009 through 2011 model years, the maximum portion of a large volume manufacturer's 11% percentage ZEV requirement that may be satisfied by 0.2 allowance PZEVs, or credits generated by such vehicles, is limited to 6% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume. The maximum portion of the ZEV requirement that may be satisfied by advanced technology PZEVs, or credits generated by such vehicles, is limited to 3.75% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume. The 1.25% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume that remains must be met only with ZEVs or credits generated by ZEVs.

3. *Model Years 2012 and subsequent.* As the ZEV requirement increases over time ~~(from 10%~~ from 12% in model year ~~2003~~ 2012 to 16% in model years 2018 and subsequent~~)~~, the maximum portion of ~~the~~ a large volume manufacturer's percentage ZEV requirement that may be satisfied by 0.2 allowance PZEVs, or credits generated by such vehicles, is limited to 6% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume; advanced technology PZEVs or credits generated by such vehicles may be used to meet up to one-half of the manufacturer's remaining ZEV requirement.

(B) *Intermediate Volume Manufacturers.* In ~~2003~~ 2005 and subsequent model years, an intermediate volume manufacturer may meet its ZEV requirement with up to 100 percent partial ZEV allowance vehicles or credits generated by such vehicles.

(C) *Small Volume Manufacturers and Independent Low Volume Manufacturers.* A small volume manufacturer or an independent low volume manufacturer is not required to meet the percentage ZEV requirements. However, a small volume manufacturer or an independent low volume manufacturer may earn and market credits for the ZEVs or PZEVs it produces and delivers for sale in California.

(3) *Counting ZEVs and PZEVs in Fleet Average NMOG Calculations.* For the purposes of calculating a manufacturer's fleet average NMOG value and NMOG credits under sections 1960.1(g)(2) and 1961(b) and (c), a vehicle certified as a ZEV is counted as one ZEV, and a PZEV is counted as one SULEV certified to the 150,000 mile standards regardless of any ZEV or PZEV multipliers.

(4) *Implementation Prior to ~~2003~~ 2005 Model Year.* Prior to the ~~2003~~ 2005 model year, a manufacturer that voluntarily produces vehicles meeting the ZEV emission standards

applicable to ~~2003~~ 2005 and subsequent model year vehicles may certify the vehicles to those standards and requirements for purposes of calculating fleet average NMOG exhaust emission values and NMOG credits under sections 1960.1(g)(2) and 1961(b) and (c), and for calculating ZEV credits as set forth in section 1962(d).

(5) *Changes in Small Volume, Independent Low Volume, and Intermediate Volume Manufacturer Status.*

(A) *Increases in California Production Volume.* In 2003 and subsequent model years, if a small volume manufacturer's average California production volume exceeds 4,500 units of new PCs, LDTs, and MDVs based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, or if an independent low volume manufacturer's average California production volume exceeds 10,000 units of new PCs, LDTs, and MDVs based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, or if an intermediate volume manufacturer's average California production volume exceeds 60,000 units of new PCs, LDTs, and MDVs based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, the manufacturer shall no longer be treated as a small volume, independent low volume, or intermediate volume manufacturer, as applicable, and shall comply with the ZEV requirements for independent low volume, intermediate volume or large volume manufacturers, as applicable, beginning with the sixth model year after the last of the three consecutive model years. The lead time shall be four rather than six years where a manufacturer ceases to be a small or intermediate volume manufacturer in the 2003 or subsequent years due to the aggregation requirements in majority ownership situations, except that if the majority ownership in the manufacturer was acquired prior to the 2001 model year, the manufacturer must comply with the stepped-up ZEV requirements starting in the 2010 model year.

(B) *Decreases in California Production Volume.* If a manufacturer's average California production volume falls below 4,500, 10,000 or 60,000 units of new PCs, LDTs, and MDVs, as applicable, based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, the manufacturer shall be treated as a small volume, independent low volume, or intermediate volume manufacturer, as applicable, and shall be subject to the requirements for a small volume, independent low volume, or intermediate volume manufacturer beginning with the next model year. In determining small volume manufacturer status, vehicles produced by one manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as part of the California production volume of the sales of the marketing manufacturer.

(C) *Calculating California Production Volume in Change of Ownership Situations.* Where a manufacturer experiences a change in ownership in a particular model year, the change will affect application of the aggregation requirements on the manufacturer starting with the next model year. The manufacturer's small or intermediate volume manufacturer status for the next model year shall be based on the average California production volume in the three previous consecutive model years of those manufacturers whose production volumes must be aggregated for that next model year. For example, where a change of ownership during the 2004 model year

results in a requirement that the production volume of Manufacturer A be aggregated with the production volume of Manufacturer B, Manufacturer A's status for the 2005 model year will be based on the production volumes of Manufacturers A and B in the 2002-2004 model years. Where the production volume of Manufacturer A must be aggregated with the production volumes of Manufacturers B and C for the 2004 model year, and during that model year a change in ownership eliminates the requirement that Manufacturer B's production volume be aggregated with Manufacturer A's, Manufacturer A's status for the 2005 model year will be based on the production volumes of Manufacturers A and C in the 2002-2004 model years. In either case, the lead time provisions in section 1962(b)(5)(A) and (B) will apply.

(c) *Partial ZEV Allowance Vehicles (PZEVs).*

(1) *Introduction.* This section 1962(c) sets forth the criteria for identifying vehicles delivered for sale in California as PZEVs. A PZEV is a vehicle that cannot be certified as a ZEV but qualifies for a PZEV allowance of at least 0.2.

(2) *Baseline PZEV Allowance.* In order for a vehicle to be eligible to receive a PZEV allowance, the manufacturer must demonstrate compliance with all of the following requirements. A qualifying vehicle will receive a baseline PZEV allowance of 0.2.

(A) *SULEV Standards.* Certify the vehicle to the 150,000-mile SULEV exhaust emission standards for PCs and LDTs in section 1961(a)(1) (for model years 2003 through 2006, existing SULEV intermediate in-use compliance standards shall apply to all PZEVs). Bi-fuel, fuel-flexible and dual-fuel vehicles must certify to the applicable 150,000-mile SULEV exhaust emission standards when operating on both fuels;

(B) *Evaporative Emissions.* Certify the vehicle to the evaporative emission standards in section 1976(b)(1)(E) ("zero" evaporative emissions standards);

(C) *OBD.* Certify that the vehicle will meet the applicable on-board diagnostic requirements in section 1968.1 for 150,000 miles; and

(D) *Extended Warranty.* Extend the performance and defects warranty period set forth in sections 2037(b)(2) and 2038(b)(2) to 15 years or 150,000 miles, whichever occurs first.~~, For HEVs that are advanced technology PZEVs, the traction battery must be included as a warranty item.~~ except that the time period is to be 10 years for a zero emission energy storage device used for traction power (such as a battery, an ultracapacitor, or a hydraulic, pneumatic and hydrogen storage device ) other than the device's on-board diagnostic elements.

(3) *Zero-Emission VMT PZEV Allowance.*

(A) *Calculation of Zero Emission VMT Allowance.* A vehicle that meets the requirements of section 1962(c)(2) and has zero-emission vehicle miles traveled ("VMT") capability will generate an additional zero emission VMT PZEV allowance calculated as follows:

| *Urban All-Electric Range* | *Zero-emission VMT Allowance* |
|---|---|
| < 10 miles | 0.0 |
| 10 miles to ~~120~~ 90 miles | (~~10~~ 33.8 + [0.5 x Urban AER])/35 |
| >~~120~~ 90 miles | ~~2.0~~ 2.25 |

The urban all-electric range shall be determined in accordance with section E.3.(2)(a) of the "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," incorporated by reference in section 1962(h).

(B) *Alternative Procedures.* As an alternative to determining the zero-emission VMT allowance in accordance with the preceding section 1962(c)(3)(A), a manufacturer may submit for Executive Officer approval an alternative procedure for determining the zero-emission VMT potential of the vehicle as a percent of total VMT, along with an engineering evaluation that adequately substantiates the zero-emission VMT determination. For example, an alternative procedure may provide that a vehicle with zero-emissions of one regulated pollutant (e.g. NOx) and not another (e.g. NMOG) will qualify for a zero-emission VMT allowance of one-half that of a vehicle with zero emissions of all regulated pollutant.

(C) *Additional Allowances for Qualifying HEVs.* The Executive Officer shall approve an additional 0.1 zero-emission VMT partial ZEV allowance for an HEV with an all-electric range if the manufacturer demonstrates to the reasonable satisfaction of the Executive Officer that the HEV is equipped with software and/or other strategies that would promote maximum use of off-vehicle charging, and that the strategies employed are reasonably reliable and tamper-proof.

(4) *PZEV Allowance for Advanced ZEV Componentry.* A vehicle that meets the requirements of section 1962(c)(2) but does not qualify for any zero-emission VMT PZEV allowance under section 1962(c)(3) may qualify for an advanced componentry PZEV allowance as provided in this section 1962(c)(4).

(A) *Use of High Pressure Gaseous Fuel or Hydrogen Storage System.* A vehicle equipped with a high pressure gaseous fuel storage system capable of refueling at 3600 pounds per square inch or more and operating exclusively on this gaseous fuel shall qualify for an advanced componentry PZEV allowance of 0.1. A vehicle fueled exclusively by hydrogen stored in a high pressure system capable of refueling at 3600 pounds per square inch or more, or stored in nongaseous form, shall also qualify for an advanced componentry PZEV allowance of ~~0.1~~ 0.2.

(B) *Other Advanced ZEV Componentry.*

1. *Qualification for Allowance.* A vehicle shall qualify for an additional advanced componentry allowance of 0.4 in the 2003 through 2011 model years, and 0.35 in the 2012 and subsequent model years, if the manufacturer demonstrates to the reasonable satisfaction of the Executive Officer that the vehicle is equipped with advanced ZEV componentry such as an advanced battery integral to the operation of the vehicle power train or an electric power train and qualifies under one of the two methods listed below. ~~The allowance earned by a vehicle shall be calculated according to one of the following methods, as elected by the manufacturer:~~

a. The maximum system power output available from the electrical storage device divided by the sum of the electrical storage device and the SAE net power of the heat engine is greater than 13%; or

b. The maximum system power output available from the electrical storage device divided by the sum of the electrical storage device and the SAE net power of the heat engine is greater than 8% and the maximum power rating of the zero emission drive system is at least 10 kilowatts.

2. *Severability.* In the event that one of the two methods in section 1962(c)(4)(B)1. is found invalid, the remainder of section 1962, including section 1962(c)(4)(B)1., remains in full force and effect. In the event that both of the two methods in section 1962(c)(4)(B)1. are found invalid, the remainder of section 1962 without section 1962(c)(4)(B)1. remains in full force and effect.

~~1. *$CO_2$ Reduction Method.*~~

~~a. *General.* A vehicle whose operation results in reduced $CO_2$ emissions as compared to the average vehicle in its class may qualify for an additional advanced componentry allowance in accordance with this section (c)(4)(B)1. The vehicle's class is determined in accordance with section 1962(e)(3).~~

~~b. *Equation for Determining Additional Allowance.* The following equation is used to calculate the additional allowance, provided that in order to earn any additional allowance, the $CO_2$ Savings must be at least 39,000:~~

~~Advanced Componentry Allowance = $CO_2$ Savings ÷ 250,000~~

~~Where: $CO_2$ Savings = (Class Average $CO_2$ Production) – (Vehicle $CO_2$ Production)~~
~~Vehicle $CO_2$ Production = (150,000 ÷ CMPEG) × 19.564~~
~~CMPEG is determined in accordance with section (e)(2)~~
~~Class Average $CO_2$ Production for the 2000-2007 model years is determined using the following table:~~

| ~~*Vehicle Class*~~ | ~~*Class Average $CO_2$ Production, 2000-2007 MY*~~ |
|---|---|
| ~~Subcompact PC~~ | ~~95,902~~ |
| ~~Compact PC~~ | ~~96,533~~ |
| ~~Midsize PC~~ | ~~108,689~~ |
| ~~Large PC~~ | ~~114,633~~ |
| ~~Small Truck~~ | ~~117,384~~ |
| ~~Medium Truck~~ | ~~137,131~~ |
| ~~Large Truck~~ | ~~161,242~~ |

~~Class Average CO2 Production for the 2008-2014 model years is determined in accordance with the following equation:~~

~~Class Average CO2 Production = (150,000 / Baseline Fuel Economy for model years 2008-2014) × 19.564~~

~~Where: Baseline Fuel Economy for model years 2008-2014 means Baseline Fuel Economy for either the 2008-2011 or 2012-2014 model years, as applicable, as determined in accordance with section (e)(5).~~

~~c. *Alternative Method for Determining $CO_2$ Savings of a Vehicle That Is Not Gasoline Fueled.* For purposes of the equation in section (c)(4)(B)1.b., the Executive Officer shall approve an alternative method for determining $CO_2$ savings of a vehicle that is not gasoline-fueled, if the manufacturer submits the alternative method with an engineering evaluation that demonstrates to the reasonable satisfaction of the Executive Officer that the alternative method fairly represents the $CO_2$ impacts of the vehicle.~~

~~2. *Alternative Efficiency Method.* A manufacturer may elect to have a vehicle's additional advanced componentry allowance determined according to the Efficiency Method, in which case the allowance shall be determined in accordance with the following equation:~~

~~Advanced Componentry Allowance = ((CMPEG / (1.3 * Baseline Fuel Economy)) - 1) * 0.5~~

~~Where: CMPEG is determined in accordance with section (e)(2).~~
~~Baseline Fuel Economy is determined in accordance with section (e)(4).~~

~~A vehicle earning an Efficiency Method advanced componentry allowance of less than zero pursuant to this subsection will be treated as having an Efficiency Method advanced componentry allowance of zero.~~

~~3. *Alternative Percent Peak Power Method For the 2000-2007 Model Years.* For the 2000-2007 model years only, a manufacturer may elect to have a vehicle's additional advanced componentry allowance determined using the Percent Peak Power method, in which case the allowance shall be determined in accordance with the following equation:~~

~~Advanced Componentry Allowance = Percentage of "maximum available power" from the electric storage device~~

~~Where: Percentage of "maximum available power" means the maximum system power output available from the electrical storage device divided by the sum of the electrical storage device and the SAE net power of the heat engine.~~

~~In order to earn any score using the Percent Peak Power method a vehicle must be able to recover kinetic energy through regenerative braking and provide at least 13 percent of "maximum available power" from the electrical storage device.~~

(5) *PZEV Allowance for Low Fuel-Cycle Emissions.* A vehicle that uses fuel(s) with very low fuel-cycle emissions shall receive a PZEV allowance not to exceed ~~0.2~~ 0.3 (0.15 in the case of an HEV that uses for propulsion any fuel that does not have very low fuel-cycle emissions). In order to receive the fuel-cycle PZEV allowance, a manufacturer must demonstrate to the Executive Officer, using peer-reviewed studies or other relevant information, that NMOG emissions associated with the fuel(s) used by the vehicle (on a grams/mile basis) are lower than or equal to 0.01 grams/mile. Fuel-cycle emissions must be calculated based on near-term production methods and infrastructure assumptions, and the uncertainty in the results must be quantified. The fuel-cycle PZEV allowance is calculated according to the following formula:

PZEV Fuel Cycle Allowance = ~~0.2~~ 0.3 x [(percent of VMT using fuel(s) meeting the requirements of the preceding paragraph) / 100]

A manufacturer's demonstration to the Executive Officer that a vehicle qualifies for a fuel-cycle PZEV allowance shall include test results and/or empirical data supporting the estimate of the relative proportion of VMT while operating on fuel(s) with very low fuel-cycle emissions.

(6) *Combined ZEV Allowance.*

(A) *Calculation of Combined ZEV Allowance for a Vehicle.* The combined PZEV allowance for a qualifying vehicle in a particular model year is the sum of the PZEV allowances listed in this section 1962(c)(6), multiplied by any PZEV introduction phase-in multiplier or PZEV high efficiency multiplier listed in section 1962(c)(7) (if a 2002 through 2005 model-year PZEV qualifies for both multipliers listed in section 1962(c)(7), the product of the

two multipliers is used as the PZEV multiplier), subject to the cap in section 1962(c)(6)(B) for 2002 and subsequent model-year vehicles.

~~(A)~~ 1. *Baseline PZEV Allowance.* The baseline PZEV allowance of 0.2 for vehicles meeting the criteria in section 1962(c)(2);

~~(B)~~ 2. *Zero-Emission VMT PZEV Allowance.* The zero-emission VMT PZEV allowance, if any, determined in accordance with section 1962(c)(3);

~~(C)~~ 3. *Advanced Componentry PZEV Allowance.* The advanced ZEV componentry ZEV allowance, if any, determined in accordance with section 1962(c)(4); and

~~(D)~~ 4. *Fuel-Cycle Emissions PZEV Allowance.* The fuel-cycle emissions ZEV allowance, if any, determined in accordance with section 1962(c)(5).

(B) *Cap for 2012 and Subsequent Model-Year Vehicles.* The maximum value of AT PZEV allowances a 2012 and subsequent model-year vehicle may earn, including the baseline PZEV allowance, is 3.0.

(7) *PZEV Multipliers.*

(A) *PZEV Introduction Phase-In Multiplier.* Each 2000 through 2005 model-year PZEV that is produced and delivered for sale in California qualifies for a PZEV introduction phase-in multiplier as follows:

| | *MY 2000-2003* | *MY 2004* | *MY 2005* |
|---|---|---|---|
| Multiplier | 4.0 | 2.0 | 1.33 |

~~(B) *AT PZEV High-Efficiency Multiplier.* An AT PZEV qualifies for a full high-efficiency multiplier in accordance with section 1962(e) starting with the 2002 model year.~~

~~(C)~~ (B) *Introduction Phase-In Multiplier for PZEVs ~~with > 10 Mile~~ That Earn a Zero Emission ~~Range~~ VMT Allowance.* Each 2000 through 2011 model year PZEV ~~with > 10 miles~~ that earns a zero emission ~~range~~ VMT allowance under section 1962(c)(3) and is produced and delivered for sale in California qualifies for a phase-in multiplier as follows:

| | *MY 2000~~-2007~~-2008* | *MY ~~2008-2009~~-2011* | *~~MY 2010-2011~~* |
|---|---|---|---|
| Multiplier | ~~2.0~~ 6.0 | ~~1.5~~ 3.0 | ~~1.25~~ |

(d) *Qualification for ZEV Multipliers and Credits.*

(1) *1996-1998 Model-Year ZEV Multipliers.*

(A) *1996-1998 Model-Year ZEV Multiplier Based on Vehicle Range.*

1996-1998 model-year ZEVs shall qualify for a ZEV multiplier based on vehicle range as follows:

| *ZEV Multiplier* | *Vehicle Range (miles)* | |
|---|---|---|
| | *Model Years 1996 and 1997* | *Model Year 1998* |
| 2 | any | ≥100 |
| 3 | ≥70 | ≥130 |

Range shall be determined in accordance with section 9.f.(2)(a) of the "California Exhaust Emission Standards and Test Procedures for 1988 Through 2000 Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," incorporated by reference in section 1960.1(k).

(B) *1996-1998 Model-Year ZEV Multiplier Based on Specific Energy of Battery.* 1996-1998 model-year ZEVs shall qualify for a ZEV multiplier based on specific energy of the battery as follows:

| *ZEV Multiplier* | *Specific Energy of Battery (w-hr/kg)* |
|---|---|
| 2 | any |
| 3 | ≥40 |

(C) *Election of Multiplier.* A 1996-1998 model-year ZEV may qualify for a ZEV multiplier according to section 1962(d)(1)(A) or section 1962(d)(1)(B), but not both.

(2) *1999-2000 Model-Year ZEV Multiplier Calculation for Extended Electric Range Vehicles.* Each ZEV that is produced and delivered for sale in California in the 1999-2000 model years and that has an extended electric range shall qualify for a ZEV multiplier as follows:

| *All-electric range* | *MY 1999-2000* |
|---|---|
| 100-175 | 6-10 |

ZEV multipliers under the above schedule will be determined by linear interpolation between the values shown in the above schedule. Range shall be determined in accordance with Section E.3.(2)(a) of the "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," incorporated by reference in section 1962(h). ZEVs that have a refueling time of less than 10 minutes and a range of 100 miles or more shall be counted as having unlimited all-electric range, and shall consequently earn the maximum allowable ZEV multiplier for a specific model year. ZEVs that have a range of 80 to 99 miles shall qualify for ZEV multipliers in the 1999-2000 model years in accordance with the following equation:

ZEV multiplier = (6) x (AER equivalent to a 10 minute recharge/100) x 0.5.

(3) *ZEV Multipliers for 2001-2002 ~~and Subsequent~~ Model Years.*

(A) *ZEV Phase-In Multiplier.* Each 2001 ~~to 2005~~ and 2002 model-year ZEV that is placed in service in California by April 15, 2003 qualifies for a ZEV phase-in multiplier ~~as follows:~~ of 4.0. A 2001 to 2002 model-year ZEV that is placed in service in California after April 15, 2003 earns credits in accordance with section 1962(d)(5) instead of section 1962(d)(3).

| | ~~*MY 2001-2002*~~ | ~~*MY 2003-2005*~~ |
|---|---|---|
| ~~Multiplier~~ | ~~4.0~~ | ~~1.25~~ |

~~(B) *ZEV Discount Multiplier for NEVs.* Each 2004 and subsequent model-year NEV that is produced and delivered for sale in California is subject to a ZEV discount multiplier for NEVs as follows:~~

| | ~~*MY 2004 - MY 2005*~~ | ~~*MYs 2006 and Subsequent*~~ |
|---|---|---|
| ~~Discount Multiplier~~ | ~~0.5~~ | ~~0.15~~ |

~~(C)~~(B) *ZEV Extended Electric Range Multiplier.*

1. *Basic Multiplier Schedule.* Each 2001 and ~~subsequent~~ 2002 model-year ZEV that is placed in service in California and that has an extended urban electric range qualifies for a ZEV extended electric range multiplier as follows:

| *Urban All-Electric Range* | *Multiplier* |
|---|---|
| < 50 miles | 1 |
| > 50 miles to < 275 miles | (Urban AER-25)/25 |
| > 275 miles | 10 |

A NEV is not eligible to earn a ZEV extended electric range multiplier. In determining ZEV range multipliers, specialty ~~electric vehicles~~ ZEVs may, upon Executive Officer approval, be tested at the parameters used to determine the ZEV multipliers for the existing ~~electric vehicle~~ ZEV.

2. *Fast refueling.*

a. *Full Fueling in 10 Minutes or Less.* A ~~2008 and earlier~~ 2001-2002 model-year ZEV with the demonstrated capability to accept fuel or electric charge until achieving at

least 95% SOC or rated fuel capacity in 10 minutes or less when starting from all operationally allowable SOC or fuel states is counted as having unlimited zero emission range and qualifies for the maximum allowable ZEV extended electric range multiplier.

b. *At Least 60-Mile Range in Less Than 10 Minutes.* A ~~2008 and earlier~~ 2001-2002 model year ZEV with the demonstrated capacity to accept fuel or electric charge equivalent to at least 60 miles of UDDS range when starting from 20% SOC in less than 10 minutes is counted as having 60 additional miles (up to a 275 mile maximum) of UDDS range in the range multiplier determination in section 1962(d)(3)(C)1.

~~3. *Multiplier Phase-Down.* Starting with the 2005 model year, the ZEV extended electric range multiplier is phased down to 0.15 of its value in accordance with section 1962(e)(6).~~

~~(D)~~(C)*Combined ZEV Multiplier.* ~~Starting with~~ During the 2001-2002 model years, the combined ZEV multiplier for each ZEV in a specific model year is the product of:

1. The ZEV phase-in multiplier if any as set forth in section 1962(d)(3)(A), times

2. In the case of a NEV, the ZEV discount multiplier for NEVs if any as set forth in section 1962(d)(3)(B), times

3. The extended electric range multiplier if any as set forth in section 1962(d)(3)(C)~~, times~~.

~~4. The high efficiency multiplier if any as set forth in section 1962(e).~~

(4) ~~(E)~~ *Effect of ZEV Multipliers in the 1996-2002 Model Years.* In calculating the number of ZEVs produced and delivered for sale in California by a manufacturer in ~~a~~ the 1996-2002 model years and the ZEV credits from such vehicles, the number of ZEVs qualifying for a particular ZEV multiplier shall be multiplied by the combined ZEV multiplier.

(5) *ZEV Credits for 2003 and Subsequent Model Years.*

(A) *ZEV Tiers for Credit Calculations.* Starting in the 2003 model year, ZEV credits from a particular ZEV are based on the assignment of a given ZEV into one of the following five ZEV tiers:

| *ZEV Tier* | *Common Description* | *UDDS ZEV Range* | *Fast Refueling Capability* |
|---|---|---|---|
| NEV | NEV | No minimum | N/A |
| Type 0 | Utility EV | <50 miles | N/A |
| Type I | City EV | >= 50, <100 miles | N/A |
| Type II | Full Function EV | >= 100 miles | N/A |
| Type III | Fuel Cell EV | >= 100 miles | Must be capable of replacing 95% maximum rated energy capacity in <= 10 minutes |

A specialty ZEV may, upon Executive Officer approval, be categorized on the basis of the existing ZEV from which it is modified.

(B) *ZEV Credits for 2003 and subsequent model-year ZEVs.* A 2003 and subsequent model-year ZEV, other than a NEV, earns 1 ZEV credit when it is produced and delivered for sale in California. A 2003 and subsequent model-year ZEV earns additional credits based on the earliest model year in which the ZEV is placed in service (not earlier than the ZEV's model year). The following table identifies the credits that a ZEV in each of the five ZEV tiers will earn, including the credit not contingent on placement in service, if it is placed in service in the specified model year or by March 31 after the end of the specified model year.

| *Tier* | *Model Year in Which ZEV is Placed in Service* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012+* |
| NEV | 1.25 | 0.625 | 0.625 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| Type 0 (Utility) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1 | 1 | 1 | 1 |
| Type 1 (City) | 8 | 8 | 8 | 7 | 7 | 7 | 2 | 2 | 2 | 2 |
| Type II | 12 | 12 | 12 | 10 | 10 | 10 | 3 | 3 | 3 | 3 |
| Type III | 40 | 40 | 40 | 15 | 15 | 15 | 4 | 4 | 4 | 3 |

~~(e) *ZEV and Advanced Technology PZEV High Efficiency Multipliers*~~

~~(1) *Eligibility.* Beginning with the 2005 model year for ZEVs and the 2002 model year for advanced technology PZEVs, both ZEVs and advanced technology PZEVs are eligible for a high efficiency multiplier. A NEV is not eligible to earn an efficiency multiplier. A vehicle earning an efficiency multiplier value of less than 1.00 pursuant to section 1962(e)(3) will be treated as having an efficiency multiplier of 1.~~

~~(2) *Calculation of CMPEG Rating.* For all vehicle types, a CMPEG (California miles per equivalent gallon) rating is determined as follows:~~

~~(A) For gasoline-fueled vehicles and HEVs with < 10 mile zero-emission range, CMPEG = Combined Fuel Economy determined in accordance with 40 CFR Part 600 = 1/ [.55 / (EPA city mpg, unadjusted) + .45 / (EPA highway mpg, unadjusted)].~~

~~(B) For BEVs and off-vehicle charge capable HEVs with ≥ 10 mile zero-emission range, CMPEG = [ 33,705 AC whr/gal / (.55 (AC whr/mile UDDS) + .45 (AC whr/mile HFEDS))] where AC whr/ mile values are determined in accordance with section E.3. "Determination of All-Electric Range-Urban," and "Determination of All-Electric Range-Highway" of the "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," as incorporated by reference in section 1962(h). Qualifying HEV CMPEG determination shall be based solely on electric mode operating efficiency for vehicles that are able to maintain test cycle speed and time tolerances for the entire zero-emission range test.~~

~~(C) *Alternative Fuel Vehicles.*~~

~~1. For vehicles operating on an alternative fuel other than hydrogen, including CNG or alcohol, CMPEG = Combined Fuel Economy as determined in accordance with 40 CFR Part 600. Alternate fuel vehicle CMPEG shall not be compensated with the federal (1/0.15) "fuel content" factor used in determining average fuel economy.~~

~~2. For vehicles operating on hydrogen, CMPEG shall be determined by converting the combined fuel economy value measured on the basis of miles per kg of hydrogen (MPkg) into CMPEG as follows:~~

~~Hydrogen MPkg x (1.0 kg H2/gallon gasoline) = CMPEG~~

~~(D) For flexible-fuel or dual-fuel vehicles, CMPEG is the lowest of the federal combined fuel economy values determined for any fuel or fuel mixture on which the vehicle is certified to operate.~~

~~(3) *Vehicle classes.*~~

~~(A) *List of vehicle classes.* Efficiency multipliers will be determined based on assignment of a vehicle to one of the following vehicle classes; interior volume is determined in accordance with SAE Recommended Practice J1100 and U.S. EPA Fuel economy regulations, 40 CFR 600.315-82.~~

| ~~*Vehicle Class*~~ | ~~*Class Description*~~ |
|---|---|
| ~~City Vehicle (effective beginning in 2008 model year)~~ | ~~2 passenger electric vehicle with length < 3 meters~~ |
| ~~Subcompact PC~~ | ~~Interior volume up to 99 ft^3, and not a City Vehicle~~ |
| ~~Compact PC~~ | ~~Interior volume 100-109 ft^3~~ |
| ~~Midsize PC~~ | ~~Interior volume 110-119 ft^3~~ |
| ~~Large PC~~ | ~~Interior volume over 120 ft^3~~ |
| ~~Small Truck~~ | ~~LDT 1~~ |
| ~~Medium Truck~~ | ~~LDT 2~~ |
| ~~Large Truck~~ | ~~LDT 3 & 4~~ |

~~(B) *Assignment of derivative or converted vehicles.* A derivative station wagon shall be placed in the same class as the sedan on which it is based. A minivan shall be placed in the appropriate truck category based on adjusted or adjusted loaded vehicle weight. A derivative or conversion ZEV that shares a production platform with one or more gasoline engine versions shall be placed in the same class as the smallest or lightest gasoline version of the same platform for that model year.~~

~~(4) *High efficiency multipliers for the 2002-2007 model years.* For model years 2002-2007, the efficiency multiplier for each vehicle class is determined according to the following equation:~~

~~High Efficiency Multiplier = CMPEG / (1.5 * Baseline Fuel Economy)~~

~~Where: Baseline Fuel Economy is determined in accordance with the following table:~~

| ~~*Vehicle Class*~~ | ~~*Baseline Fuel Economy MY 2002-2007*~~ |
|---|---|
| ~~Subcompact PC~~ | ~~30.6~~ |
| ~~Compact PC~~ | ~~30.4~~ |
| ~~Midsize PC~~ | ~~27.0~~ |
| ~~Large PC~~ | ~~25.6~~ |
| ~~Small Truck~~ | ~~25.0~~ |
| ~~Medium Truck~~ | ~~21.4~~ |
| ~~Large Truck~~ | ~~18.2~~ |

~~(5) *High efficiency multipliers for the 2008 and subsequent model years.* For the 2008 and subsequent model years, the efficiency multiplier for each vehicle class is determined in accordance with the following equations:~~

~~For ZEVs and PZEVs with > 10 mile Zero Emission Range: Efficiency multiplier = CMPEG / (2.0 * Baseline Fuel Economy)~~

~~For all other AT PZEVs: Efficiency multiplier = CMPEG / (1.5 * Baseline Fuel Economy)~~

~~Where: *Baseline Fuel Economy* for model years 2008-2011 is the model year 2004 unadjusted combined federal sales weighted fuel economy for the vehicle class as determined by U.S. EPA. For a City Vehicle, the baseline fuel economy is 45.9.~~

~~*Baseline Fuel Economy* for Model Years 2012-2014 is the model year 2008 unadjusted combined federal sales weighted fuel economy for the vehicle class as determined by U.S. EPA. For a City Vehicle, the baseline fuel economy is 45.9.~~

~~*Baseline Fuel Economy* for model years 2015 and beyond shall be determined using the same methodology.~~

~~(6) *Phasing in the High Efficiency Multiplier for ZEVs.*~~

~~(A) *Range and Efficiency Phasing Factors.* For ZEVs, the high efficiency multiplier is phased in, and the extended electric range multiplier is phased down to 0.15 of its initial value, using the phasing factors in the following schedule:~~

~~*Range and Efficiency Phasing Factors for Each Model Year*~~

| | ~~2004~~ | ~~2005~~ | ~~2006~~ | ~~2007~~ | ~~2008~~ | ~~2009~~ | ~~2010~~ | ~~2011~~ | ~~2012+~~ |
|---|---|---|---|---|---|---|---|---|---|
| ~~Range~~ | ~~1.000~~ | ~~0.825~~ | ~~0.600~~ | ~~0.450~~ | ~~0.300~~ | ~~0.250~~ | ~~0.200~~ | ~~0.200~~ | ~~0.150~~ |
| ~~Efficiency~~ | ~~0.000~~ | ~~0.100~~ | ~~0.350~~ | ~~0.550~~ | ~~0.600~~ | ~~0.700~~ | ~~0.800~~ | ~~0.800~~ | ~~0.825~~ |

~~(B) *Application of the Range and Efficiency Phasing Factors.* The range and efficiency phasing factors are applied as follows:~~

~~Phased range multiplier = ((range multiplier − 1) × range phasing factor) + 1~~

~~Phased efficiency multiplier = ((efficiency multiplier − 1) × efficiency phasing factor) + 1~~

(f) *In-Service Warranty Multiplier for 2001-2004 Model-Year ZEVs and PZEVs With ≥ 10 Mile Zero Emission Range.* Except in the case of a NEV, an additional ZEV or PZEV multiplier will be earned for the 2001 through ~~2011~~ 2004 model years by a ZEV or a PZEV with ≥ 10 mile zero emission range whose zero-emission energy storage or conversion system is under an original warranty from the vehicle manufacturer beyond three years of service and is registered for operation on public roads in California. For the 2001 through 2007 model years, a manufacturer will receive 0.1 times the ZEV credit earned by the vehicle if it were leased or sold new in that year, including multipliers, on a year-by-year basis beginning in the fourth year. For the 2008 through 2011 model years, a manufacturer will receive 0.05 times the ZEV credit earned by the vehicle if it were leased or sold new in that year, including multipliers, on a year-by-year basis beginning in the fourth year. The warranty multiplier is reported and earned in the year following each continuous year of service. ZEVs, other than NEVs, re-leased prior to January 25, 2001 for a period beyond three years of service will earn an additional ZEV multiplier of 0.1 times the ZEV credit earned by the vehicle if it were leased or sold new in that year, including multipliers, for each additional year that they are in service and registered for operation on public roads in California. Such vehicles are not required to have the zero emission energy storage or conversion system under an original warranty from the vehicle manufacturer.

(g) *Generation and Use of ZEV Credits; Calculation of Penalties*

(1) *Introduction.* A manufacturer that produces and delivers for sale in California ZEVs or PZEVs in a given model year exceeding the manufacturer's ZEV requirement set forth in section 1962(b) shall earn ZEV credits in accordance with this section 1962(g).

(2) *ZEV Credit Calculations.*

(A) *Credits from ZEVs.* The amount of g/mi ZEV credits earned by a manufacturer in a given model year from ZEVs shall be expressed in units of g/mi NMOG, and shall be equal to the number of credits from ZEVs produced and delivered for sale in California that the manufacturer applies towards meeting the ZEV requirements for the model year subtracted from the number of ZEVs produced and delivered for sale in California by the

manufacturer in the model year and then multiplied by the NMOG fleet average requirement for PCs and LDT1s for that model year.

(B) *Credits from PZEVs.* The amount of g/mi ZEV credits from PZEVs earned by a manufacturer in a given model year shall be expressed in units of g/mi NMOG, and shall be equal to the total number of PZEVs produced and delivered for sale in California that the manufacturer applies towards meeting its ZEV requirement for the model year subtracted from the total number of PZEV allowances from PZEVs produced and delivered for sale in California by the manufacturer in the model year and then multiplied by the NMOG fleet average requirement for PCs and LDT1s for that model year.

(C) *Separate Credit Accounts.* The number of credits from a manufacturer's [i] ZEVs, [ii] advanced technology PZEVs, and [iii] all other PZEVs shall each be maintained separately.

(3) *ZEV Credits for MDVs and LDTs other than LDT1s.* ZEVs and PZEVs classified as MDVs or as LDTs other than LDT1s may be counted toward the ZEV requirement for PCs and LDT1s, and included in the calculation of ZEV credits as specified in this section 1962(g) if the manufacturer so designates.

(4) *ZEV Credits for Advanced Technology Demonstration Programs.* A vehicle placed in a California advanced technology demonstration program may earn ZEV credits even if it is not "delivered for sale." To earn such credits, the manufacturer must demonstrate to the reasonable satisfaction of the Executive Officer that the vehicles will be regularly used in applications appropriate to evaluate issues related to safety, infrastructure, fuel specifications or public education. Such a vehicle is eligible to receive the same allowances and credits that it would have earned if placed in service. To determine vehicle credit, the model-year designation for a demonstration vehicle shall be consistent with the model-year designation for conventional vehicles placed in the same timeframe.

(5) *ZEV Credits for Transportation Systems.*

(A) *General.* In model years 2001 through ~~2007~~ 2011, a ZEV, advanced technology PZEV or PZEV placed as part of a transportation system may earn additional ZEV credits, which may used in the same manner as other credits earned by vehicles of that category, except as provided in section (g)(5)(C) below. A NEV is not eligible to earn credit for transportation systems. To earn such credits, the manufacturer must demonstrate to the reasonable satisfaction of the Executive Officer that the vehicle will be used as a part of a project that uses an innovative transportation system as described in section (g)(5)(B) below.

(B) *Credits Earned.* In order to earn additional credit under this section (g)(5), a project must at a minimum demonstrate [i] shared use of ZEVs, AT PZEVs or PZEVs, and [ii] the application of "intelligent" new technologies such as reservation management, card systems, depot management, location management, charge billing and real-time wireless information systems. If, in addition to factors [i] and [ii] above, a project also features linkage to transit, the

project may receive further additional credit. For ZEVs only, not including NEVs, a project that features linkage to transit, such as dedicated parking and charging facilities at transit stations, but does not demonstrate shared use or the application of intelligent new technologies, may also receive additional credit for linkage to transit. The maximum credit awarded per vehicle shall be determined by the Executive Officer, based upon an application submitted by the manufacturer and, if appropriate, the project manager. The maximum credit awarded shall not exceed the following:

| *Type of Vehicle* | *Shared Use, Intelligence* | *Linkage to Transit* |
|---|---|---|
| PZEV | 2 | 1 |
| Advanced Technology PZEV | 4 | 2 |
| ZEV | 6 | 3 |

(C) *Cap on Use of Credits.*

1. *ZEVs.* Credits earned or allocated by ZEVs pursuant to this section (g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-tenth of a manufacturer's ZEV obligation in any given model year.

2. *AT PZEVs.* Credits earned or allocated by AT PZEVs pursuant to this section (g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-twentieth of a manufacturer's ZEV obligation in any given model year, but may only be used in the same manner as other credits earned by vehicles of that category.

3. *PZEVs.* Credits earned or allocated by PZEVs pursuant to this section (g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-fiftieth of the manufacturer's ZEV obligation in any given model year, but may only be used in the same manner as other credits earned by vehicles of that category.

(D) *Allocation of Credits.* Credits shall be assigned by the Executive Officer to the project manager or, in the absence of a separate project manager, to the vehicle manufacturers upon demonstration that a vehicle has been placed in a project. Credits shall be allocated to vehicle manufacturers by the Executive Officer in accordance with a recommendation submitted in writing by the project manager and signed by all manufacturers participating in the project, and need not be allocated in direct proportion to the number of vehicles placed.

(6) *Submittal of ZEV Credits.* A manufacturer may meet the ZEV requirements in any given model year by submitting to the Executive Officer a commensurate amount of g/mi ZEV credits, consistent with section 1962(b). These credits may be earned previously by the manufacturer or acquired from another manufacturer, except that beginning with the 2006 model year credits earned from NEVs offered for sale or placed in service in model years 2001 through 2005 cannot be used to satisfy more than the following portion of ~~any program category (ZEV, AT PZEV, PZEV)~~ a manufacturer's percentage ZEV obligation that may not be satisfied with credits from AT PZEVs or PZEVs:

| *2006* | *2007 and beyond* |
|---|---|
| 75% | 50% |

This limitation applies to credits earned in model years 2001 through 2005 by the same manufacturer or earned in model years 2001 through 2005 by another manufacturer and acquired. The amount of g/mi ZEV credits required to be submitted shall be calculated according to the criteria set forth in this section 1962(g).

(7) *Requirement to Make Up a ZEV Deficit.*

(A) *General.* A manufacturer that produces and delivers for sale in California fewer ZEVs than required in a given model year shall make up the deficit by the end of the next model year by submitting to the Executive Officer a commensurate amount of g/mi ZEV credits, except that credits generated from PZEVs may be used to offset deficits for two model years. The amount of g/mi ZEV credits required to be submitted shall be calculated by [i] adding the number of ZEVs produced and delivered for sale in California by the manufacturer for the model year to the number of ZEV allowances from partial ZEV allowance vehicles produced and delivered for sale in California by the manufacturer for the model year (for a large volume manufacturer, not to exceed that permitted under section 1962(b)(2)), [ii] subtracting that total from the number of ZEVs required to be produced and delivered for sale in California by the manufacturer for the model year, and [iii] multiplying the resulting value by the fleet average requirements for PCs and LDT1s for the model year in which the deficit is incurred.

~~(B) *Additional Time to Make Up ZEV Deficits for the 2003-2004 Model Years.*~~

~~1. *Model Year 2003 ZEV Deficits.* A manufacturer that produces, and delivers for sale in California, model year 2003 or earlier PZEVs that generate at least twice as many credits as are necessary to take full advantage of the manufacturer's 60% PZEV option for the 2003 model year has through the 2007 model year to fully exercise its option to meet an additional 20% of its ZEV requirement for the 2003 model year with credits from advanced technology PZEVs.~~

~~2. *Model Year 2004 ZEV Deficits.* A manufacturer that qualifies under section 1962(g)(7)(B) 1., and produces, and delivers for sale in California, model year 2004 or earlier PZEVs that generate at least twice as many credits as are necessary to take full advantage of the manufacturer's 60% PZEV option for the 2003 and 2004 model years, has through the 2008 model year to fully exercise its option to meet an additional 20% of its ZEV requirement for the 2004 model year with credits from advanced technology PZEVs.~~

(8) *Penalty for Failure to Meet ZEV Requirements.* Any manufacturer that fails to produce and deliver for sale in California the required number of ZEVs or submit an appropriate amount of g/mi ZEV credits and does not make up ZEV deficits within the specified time period shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer that sells a new motor vehicle that does not meet the applicable emission standards

adopted by the state board. The cause of action shall be deemed to accrue when the ZEV deficits are not balanced by the end of the specified time period. For the purposes of Health and Safety Code section 43211, the number of vehicles not meeting the state board's standards shall be calculated according to the following equation, provided that the percentage of a large volume manufacturer's ZEV requirement for a given model year that may be satisfied with partial ZEV allowance vehicles or ZEV credits from such vehicles may not exceed the percentages permitted under section 1962(b)(2)(A):

> (No. of ZEVs required to be produced and delivered for sale in California for the model year) - (No. of ZEVs produced and delivered for sale in California for the model year) - (No. of ZEV allowances from partial ZEV allowance vehicles produced and delivered for sale in California for the model year) - [(Amount of ZEV credits submitted for the model year) / (the fleet average requirement for PCs and LDT1s for the model-year)].

(h) *Test Procedures.* The certification requirements and test procedures for determining compliance with the this section 1962 are set forth in "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," adopted by the state board on August 5, 1999, and last amended ~~July 30, 2002~~ [Insert date of amendments], which is incorporated herein by reference.

(i) *ZEV-Specific Definitions.* The following definitions apply to this section 1962.

(1) "Advanced technology PZEV" or "AT PZEV" means any PZEV with an allowance greater than 0.2 before application of the PZEV early introduction phase-in multiplier or the high efficiency multiplier.

(2) "Battery electric vehicle" means any vehicle that operates solely by use of a battery or battery pack, or that is powered primarily through the use of an electric battery or battery pack but uses a flywheel or capacitor that stores energy produced by the electric motor or through regenerative braking to assist in vehicle operation.

(3) "Neighborhood electric vehicle" means a motor vehicle that meets the definition of Low-Speed Vehicle either in section 385.5 of the Vehicle Code or in 49 CFR 571.500 (as it existed on July 1, 2000), and is certified to zero-emission vehicle standards.

(4) "Placed in service" means having been sold or leased to an end-user and not to a dealer or other distribution chain entity, and having been individually registered for on-road use by the California Department of Motor Vehicles.

(5) "Specialty ~~electric vehicle~~ ZEV" means a version of an existing ~~electric vehicle~~ ZEV that is designed for a commercial or governmental fleet application, and has the same battery pack and chassis as the existing ~~electric vehicle~~ ZEV from which it is modified.

(j) *Abbreviations.* The following abbreviations are used in this section 1962:

"AER" means all-electric range.
"BEV" means battery electric vehicle.
~~"CMPEG" means California miles per equivalent gallon.~~
"HEV" means hybrid-electric vehicle.
"HFEDS" means highway fuel economy driving cycle.
"LDT" means light-duty truck.
"LDT1" means a light-truck with a loaded vehicle weight of 0-3750 pounds.
"LDT2" means a "LEV II" light-duty truck with a loaded vehicle weight of 3751 pounds to a gross vehicle weight of 8500 pounds, or a "LEV I" light-duty truck with a loaded vehicle weight of 3751-5750 pounds.
"MDV" means medium-duty vehicle.
"Non-Methane Organic Gases" or "NMOG" means the total mass of oxygenated and non-oxygenated hydrocarbon emissions.
"MY" means model year.
"NEV" means neighborhood electric vehicle.
"NOx" means oxides of nitrogen.
"PC" means passenger car.
"PZEV" means any vehicle that is delivered for sale in California and that qualifies for a partial ZEV allowance of at least 0.2.
"SOC" means state of charge.
"SULEV" means super-ultra-low-emission-vehicle.
"UDDS" means urban dynamometer driving cycle.
"ULEV" means ultra-low emission vehicle.
"VMT" means vehicle miles traveled.
"ZEV" means zero-emission vehicle.

(k) *Severability.* Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this article remains in full force and effect.

Note: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43204, and 43205.5, Health and Safety Code.

## APPENDIX B: DESCRIPTION OF LITIGATION INVOLVING THE ZERO EMISSION VEHICLE REGULATION

1. *Central Valley Chrysler-Plymouth, Inc., DaimlerChrysler Corp., Frontier Dodge, Inc., General Motors Corp., Hallowell Chevrolet Company, Inc., Keller Motors, Inc., Kitahara Pontiac-GMC-Buick, Inc., Surroz Motors, Inc., and Tom Fields Motors, Inc. v. Michael P. Kenny.* U.S. District Court for the Eastern District of California – Fresno, Case No. F-02-05017. Original complaint filed January 3, 2002.

The plaintiffs assert that the provisions in the ZEV regulation pertaining to AT PZEVs that are gasoline hybrids are related to fuel economy standards and accordingly are preempted by the Energy Policy and Conservation Act of 1975 – the law that directed the National Highway Traffic Safety Administration to establish corporate average fuel economy (CAFE) standards. On June 11, 2002, a federal district judge issued a preliminary injunction that prohibits the ARB's Executive Officer from enforcing the 2001 ZEV Amendments with respect to the sale of new motor vehicles in the 2003 or 2004 model years, pending final resolution of the case. The judge issuing the preliminary injunction found that the plaintiffs were likely to succeed in their preemption claim. He rejected arguments that the optional nature of the AT PZEV provisions eliminated preemption concerns, because he found that disparities in costs among the various compliance options in effect required manufacturers to produce gasoline hybrids. He enjoined enforcement of all of the 2001 ZEV Amendments based on the conclusion that the challenged AT PZEV provisions likely were not severable from the rest of the ZEV program. The ARB has appealed issuance of the preliminary injunction to the U.S. Court of Appeals for the Ninth Circuit, which has scheduled oral argument for the appeal on February 13, 2003. In the interim, the preliminary injunction remains in effect.

Amendments to the complaint claim that the ARB is federally preempted from enforcing the ZEV regulation as it existed prior to the 2001 amendments because the previous set of amendments have not yet received a waiver of preemption under section 209(a) of the federal Clean Air Act.

2. *Liberty Motors, Inc., Lovegren Motor Co., Michael Cadillac, Inc., Sequoia Chevrolet Corp., Sun Bop, Inc., DaimlerChrysler Corp., General Motors Corporation, and Isuzu Motors, Limited v. California Air Resources Board and Michael P. Kenny*, Fresno County Superior Court, Case No. 02 CE CG00039. Original complaint filed January 4, 2002.

As most recently amended, the complaint identifies seven theories under which the 2001 ZEV amendments are claimed to be partially or wholly invalid. One allegation is that the amendments adding LDT2s to the base for the percentage ZEV requirements was beyond the scope of the original hearing notice and could not adopted without a new notice. There are also claims that the ARB did not comply with the California Environmental Quality Act (CEQA), that the ZEV regulation is inconsistent with the ARB's authorizing statutes, and that the Board failed to make a rational cost-effectiveness determination. There are additional claims challenging the Executive Officer's denial of the petition for amendments to the ZEV regulation filed by General Motors on January 23, 2001, the lawfulness of the ZEV regulation prior to the 2001 amendments, and the ARB's authority to enforce the preexisting regulation. In July 2002, a preliminary injunction was issued barring the Executive Officer from enforcing the ZEV regulation as it existed before the 2001 Amendments. On December 19, 2002 the trial court denied the automakers' motion for summary adjudication on claims pertaining to the 2001 Amendments and a trial court hearing on the merits is expected after January 2003.

3. *DaimlerChrysler Corporation and General Motors Corporation v. California Air Resources Board and Michael P. Kenny*, Fresno County Superior Court, Case No. 02 CECG 04456. Filed December 11, 2002.

The plaintiffs challenge a November 21, 2002 guidance letter transmitted by the ARB's Executive Officer to vehicle manufacturers. The letter responded to inquiries on when 2002 MY NEVs would need to be placed in service in order to qualify for the 2002 MY early introduction multiplier – in case the federal preliminary injunction was lifted or the issue became relevant in the context of subsequent amendments to the ZEV regulation. The Executive Officer interpreted the regulation as allowing a MY 2002 ZEV to receive the 4.0 multiplier only if it is placed in service by the end of March 2003. At a December 17 hearing, a Fresno County Superior Court judge announced he would issue a temporary restraining order (TRO) temporarily prohibiting enforcement of the March 31, 2003 deadline as established in the guidance letter. A preliminary injunction hearing is scheduled for January 29, 2003.

# Description and Rationale for Staff's Additional Proposed Modifications to the January 10, 2003 ZEV Regulatory Proposal

March 5, 2003

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**Appendix A**

**Staff's Suggested Modifications to the Proposed Regulation Order: Proposed Amendments to the California Zero Emission Vehicle Regulation**

# 1. INTRODUCTION

## 1.1 Purpose of This Document

On January 10, 2003 ARB staff released an Initial Statement of Reasons outlining proposed amendments to the California Zero Emission Vehicle (ZEV) regulation. The amendments were intended to resolve issues that had been raised in litigation and take into account the current status of zero emission and near-zero emission vehicle development. The proposed amendments were originally scheduled for public hearing on February 27, 2003; that hearing was subsequently postponed to March 27, 2003.

Since release of the original proposal staff has received a significant amount of public comment. In response to this input, staff has been working to refine and augment the original proposal to better accomplish the original goals of the ZEV program. This document outlines additional modifications developed by staff, which will be considered by the Board along with the amendments originally proposed by staff at the March 27 public hearing.

This document begins with a review of the ZEV program goals and achievements. It then summarizes the major additional proposed modifications, outlines the next steps in the regulatory process, and provides a description of each proposed modification and its rationale. It concludes with a brief description of the impact of the additional proposed modifications on vehicle production and on air quality, and a summary of staff recommendations and remaining issues.

Please note that this document is a supplement to, rather than a replacement of, the January 10, 2003 Initial Statement of Reasons. The modifications use as a starting point the proposed regulatory amendments contained in the Initial Statement of Reasons. Thus the modifications proposed here are modifications to the January proposal, and any amendments originally proposed in January that are not further discussed here should be viewed as continuing on as originally proposed.

## 1.2 Program Goals

The ZEV program has undergone tremendous change since its adoption in 1990. Originally designed as a catalyst to stimulate the commercial introduction of zero-emitting battery electric vehicles (EVs), the program has been amended several times to recognize the state of technology development and incorporate the significant advances in emission control technology. Each time the ZEV program has been amended by the Board it has broadened flexibility and expanded the family of clean vehicle technologies. In 1998 and 2001, the program was adjusted to take advantage of the development of extremely low emitting technologies that, while not zero, provide meaningful and substantial air quality

benefits. Throughout this process, the Board has not wavered from its commitment to the ultimate goal of pure ZEV technology commercialization. While the focus on pure ZEV commercialization remains, there has been much debate and discussion on how to best ensure its success.

### 1.3 Program Achievements

Throughout the program's history, the primary metric for measuring success has been the number of pure ZEVs placed each year. The program has also, however, pushed the development of extremely clean conventional and advanced technology vehicles that are now achieving widespread commercialization.

During the 1990's, automaker research and development efforts focused on battery EVs as the compliance pathway for meeting the requirements beginning in 1998. Automakers developed prototypes and worked with battery developers to produce the most efficient and best performing EVs possible. Local, state and federal government provided resources to establish incentives and prepare the market. The U.S. Department of Energy provided major funding in a collaborative effort with industry to develop advanced batteries via the United States Advanced Battery Consortium. The ZEV program was the key driver in these efforts and responsible for the renewed efforts towards making a commercially viable battery EV.

In 1996, the ARB signed memoranda of agreement (MOA) with the seven largest automakers. The primary role of the MOAs was to ensure the placement of nearly 2,000 vehicles using advanced batteries. Battery experts suggested that this relatively small but significant market was needed to ensure that battery developers had the necessary capital to bring the next generation of advanced batteries to market. Such batteries were expected to overcome performance and cost issues and lead to a viable commercial product.

In the context of demonstrating large numbers of state-of-the-art battery EVs and providing the necessary investment in battery development, the MOAs were a success. However, because the expected advances in battery development fell short of expectations, the ensuing reluctance on the part of automakers to move forward with a commercial market and place vehicles created the impression that the MOAs were a failure.

During this time, improvements in a variety of areas including fuel control, materials and electronics provided an opportunity for new emission reductions from conventional vehicles. Thus, in 1998, the ARB developed a new emissions standard, the super ultra low emission vehicle (SULEV). The certification emission levels for the SULEV standard were based on the estimated power plant emissions resulting from electric vehicle charging. This standard, coupled with extended warranty and zero evaporative emissions to create a partial ZEV

allowance vehicle (PZEV), became an option in 1998 that automakers could use to meet a large percentage of the ZEV requirement.

Likewise, the Advanced Technology PZEV (AT PZEV) category, adopted in 2001, not only reduces emissions like the PZEVs but advances ZEV technology development and provides incentives for alternative fuels. The ZEV regulation provides AT PZEV incentives that are specifically designed to further the development and use of technologies and components that contribute to the commercialization of pure ZEVs. Again, the introduction and volume commercialization of AT PZEVs are a direct result of the ZEV program. These vehicles will provide significant near-term environmental benefits, foster the continued development of vehicle technologies and provide incentives for alternative fuels.

To summarize, the ZEV program has been a success. The regulation has been responsible for pushing the boundaries of ZEV technology, particularly battery EVs. PZEVs are available for purchase today, with over 100,000 expected to be sold in California this year. ZEV enabling technologies such as hybrid electric vehicles (HEVs) have also been commercialized; three HEV models and additional CNG models are currently offered for sale. ARB staff believes that automakers will introduce additional AT PZEVs in the near future once certainty in the regulations is provided.

While the program has pushed automotive emissions to zero and near-zero levels and has resulted in the achievements noted above, the technology needed to cost-effectively meet the pure ZEV requirement in the near term has not yet been commercialized. Recognition of this situation led the staff to propose additional amendments in the January 10, 2003 staff report and the further modifications in this document.

## 1.4 Further Modifications Proposed

The staff proposal for amendments to the ZEV regulation released January 10, 2003 addressed litigation issues and reflected staff's thinking on the current state of ZEV marketability relative to the percentage requirements. The 45-day public comment period since the proposal's release has been constructive. In light of the comments received and as a result of further deliberation by staff, the following additional modifications to the proposal are now recommended.

Early response to the January 10, 2003 proposal was mixed; while much focus was placed on near term implications, a growing concern began to be expressed about the feasibility of the out years of the program. Based on feedback from a number of stakeholders regarding the credibility of the ZEV program in the long term, ARB staff has concluded that the program requirements for pure ZEVs contained in the January 10, 2003 proposal are overly optimistic, especially the large increase required in the 2012 timeframe. Staff is concerned that if

modifications are not made, the program credibility will suffer due to unrealistic requirements, particularly in 2012 when a large increase is required but considerable uncertainty exists regarding commercialization and production volumes of ZEVs. The ZEV program's 10-plus year history of regulatory amendments dramatizes the need to address the credibility issue head-on in order to move beyond preparation for and evaluation of the requirements and into implementation and realization of air quality benefits of the program. As a result, ARB staff is proposing modifications to the January 10, 2003 proposal that more accurately reflect what staff believes is known today regarding the current state of development and the steps that lie ahead for commercialization of ZEVs. The goals of the proposed modifications are to:

- resolve litigation issues,
- begin implementation of the regulation as soon as possible,
- reduce criteria pollutant emission through increased introduction of PZEVs and AT PZEVs,
- support development of ZEV technology through AT PZEVs,
- focus pure ZEV technology research, development and deployment steps needed to achieve commercial success,
- assure that the program is reasonable, rational and feasible.

The proposed modifications are designed to:

- Increase the near-term air quality benefits through the commercialization of large numbers of PZEVs and AT PZEVs. The revised proposal recognizes the benefits of these vehicles and provides an alternative compliance path that will result in more AT PZEVs while industry invests in pure ZEV technology research, development and deployment. Greater air quality benefits will be realized under staff's proposal by ensuring implementation and by roughly doubling the number of AT PZEVs anticipated compared to the 2001 regulation;

- Focus fuel cell research, development and deployment efforts. The program's requirements for advancing technology must be realistic and sensible. The number of pure ZEVs required under the alternative compliance approach in the near term (2005-2008) will ensure that automakers are providing serious research and development efforts toward the technology while not arbitrarily requiring higher volumes;

- Better reflect the uncertainty that exists regarding the pace of pure ZEV development. Recognizing that staff cannot, at this time, credibly forecast the volumes of vehicles appropriate for the next stage of pure ZEV development, staff recommends that the Board establish a panel of experts to periodically assess and report on technology advances. Based on input from the Panel, the ARB may respond with percentage requirements for commercialization as the technology becomes available.

Although the changes contemplated are far-reaching and may be controversial, they give the regulation a solid foundation for long-term success.

## 1.5 Review of the Regulatory Process

In preparation for a planned February 2003 Board hearing, staff developed a proposal referred to as a "strawman" for discussion and deliberation at a public workshop held on December 5, 2002. The strawman was staff's initial effort at addressing the issues raised by litigation and resolving the near-term commercialization issues resulting from the state of zero emissions technology development. Staff received considerable comment on the initial proposal both at, and subsequent to, the workshop. These comments and input were considered as staff worked to develop the proposal that was released to the public on January 10, 2003 for a 45-day public comment period. The proposed amendments were designed to push ZEV technology development in a series of stages prior to full commercialization in 2012.

The staff proposal was released with the understanding that additional amendments might be necessary to more fully meet the objectives of the ZEV program. In addition, as discussed in Chapter 8 of the January 10, 2003 Initial Statement of Reasons, staff had identified seven additional open areas of discussion that required evaluation during the 45-day comment period. In response to these issues and continued input from stakeholders since issuance of the hearing notice, ARB staff has developed additional suggested modifications to the original proposal.

To ensure adequate time for stakeholder review and input, the ARB has postponed the February 2003 hearing by one month. As a result, staff has had additional time to more thoroughly analyze the impacts of the proposed modifications and provide sufficient time for stakeholder review and comment on the modifications prior to the Board hearing. This one-month delay also provides additional time for input and comments related to the Initial Statement of Reasons released on January 10, 2003. The January 10, 2003 proposed amendments remain available for public comment and for the Board's consideration in March.

Given the complex nature of the ZEV program, it is possible that the Board will make additional modifications at the March 27, 2003, public hearing. The proposed modifications contained in this document, if accepted by the Board, and any changes made by the Board at the hearing would be included as part of revised package released for supplemental public review and comment. Interested parties would have 15 days to respond. The proposed amendments would not become final until review and approval by the Office of Administrative Law.

## 2. PROPOSED ADDITIONAL MODIFICATIONS

The following section describes staff's proposed modifications to the proposed amendments of January 10, 2003. Broadly, the areas covered include establishment of an alternative compliance path, revision of credit categories, further modification of the AT PZEV definition and a variety of clarifying and corrective modifications. Appendix A contains the proposed regulatory language with new modifications denoted by double underline and double strikeout.

### 2.1 Staff Proposal of an Alternative Compliance Strategy

This modified staff proposal includes an alternative compliance approach under which manufacturers that meet a "floor" requirement for production of Type III ZEVs in model years 2001-2008 would be allowed to use AT PZEV credit in the gold category. Thus a large number of ZEVs would not be required in this timeframe. Manufacturers would also retain the ability to achieve compliance under the terms of the 2001 regulation. An Independent Expert Review Panel would advise the Board as to the technical and market potential for commercialization of pure ZEV technologies.

The following sections outline the rationale for this alternative approach and describe its major features.

#### 2.1.1 Rationale for Alternative Approach

As noted above, the ZEV program serves a number of purposes:

- Advancing pure ZEV technology research, development and deployment (the focus of the gold category),
- Supporting the development of pure ZEV technology through volume production of ZEV-enabling advanced technology vehicles (the silver category), and
- Achieving significant criteria pollutant emission reductions (the silver and bronze categories).

The proposed changes are intended to better achieve these fundamental goals.

With regard to advancing pure ZEV technology, staff has concluded that the approach embodied in the existing regulation, which sets firm and ever-increasing production requirements as a ramp towards commercialization, is problematic given the current status of possible ZEV technologies. Battery vehicles, while technically mature and well suited from a performance standpoint for many applications, face severe cost challenges. As part of the 2000 ZEV Program Biennial Review, staff assembled a Battery Technology Advisory Panel

(Panel) to review the performance, cost and availability of advanced batteries. The Panel concluded that nickel metal hydride batteries for full function vehicles would cost EV manufacturers between $9,500 and $13,000 in quantities of 10,000 to 20,000 packs per year, and approximately $7,000 to $9,000 at production levels exceeding 100,000 packs per year. Based on these assessments, in the Initial Statement of Reasons for the 2001 amendments staff estimated the near term incremental cost for battery EVs at roughly $8,000 for a City EV and $17,000 for a full function EV.

To provide an update on current status, in late 2002 the ARB contracted with a battery expert and member of the 2000 Battery Technology Advisory Panel to provide an evaluation of the progress in battery EV technology since the Panel's work in 2000. The contractor relied in large part on information collected over the last two years during the preparation of his report entitled The 2002 Advanced Automotive Battery Industry Report – A Critical New Assessment of Automotive Battery Trends. The conclusions of the preliminary update (a final report will be available shortly) show that the cost and performance characteristics of advanced batteries have not meaningfully changed since the 2000 report and as a result the key findings of the Panel's report still hold true today.

In addition, independent of cost issues, recent marketing experience indicates that although there is a base demand from regulated electric utilities and EV early adopters, the sustainable level of demand appears to be small at least in the near term. Staff is aware of recent advances in battery performance, in particular with regard to cycle life, and will continue to track such developments and factor them in to its future consideration of program status. Battery EV development will also be assessed by the Independent Expert Review Panel described below. At present, however, any recent advances do not appear to significantly alter the fundamental cost equation.

Fuel cell vehicles are even more costly than battery EVs in their current stage of development, and face additional technical and engineering challenges involving durability, cold weather performance, and other factors. Manufacturers appear to believe there is a business case for fuel cell development. Staff concurs that the technology shows great promise and fully expects fuel cell development to proceed to commercialization. At present, however, the technology is not ready for volume production.

Thus, additional development is needed before any pure ZEV technology, which we refer to as "gold" in this report, will be ready for mass deployment. The pace of future pure ZEV technical development or cost reduction, however, is difficult to predict. Relatively modest near term vehicle improvements, such as those needed to meet incrementally more stringent emission standards, follow a well-understood path and in general have been achieved more quickly and at less cost than the original staff estimates. On the other hand, bringing a fundamentally different technology such as battery electric or fuel cell vehicles to

market requires advancements on a number of fronts, and experience to date has shown that these developments do not necessarily proceed at the pace predicted by staff. To the contrary, the 1996, 1998 and 2001 modifications to the ZEV program all resulted from a mismatch between ambitious targets established in the past and the reality of actual vehicle availability.

The rationale for maintaining an ambitious "ramp" has been that a firm goal, with specific numbers of vehicles needed by specific dates, is necessary to provide incentive for manufacturers to aggressively pursue the needed improvements. Staff recognizes the technology-forcing virtues of this approach, and as noted above, the ZEV program has been a clear success on that front. Not only has there been enormous progress on zero and near-zero electric drive technologies, but manufacturers have also been motivated to improve the emission performance of conventional vehicles to levels thought impossible not long ago.

At the same time, in reviewing the history of the program it is clear that the establishment of a firm ramp has not in itself been sufficient to result in commercialization of pure zero technologies. Some interested parties argue that this is due to a lack of commitment on the part of automakers, or lack of resolve on the part of ARB. Staff is persuaded, however, that the pace of progress is governed in large part by technical, engineering, manufacturing and cost challenges and not merely by the stringency of the regulatory requirement.

Meanwhile, rapid advances in PZEV ('bronze") and AT PZEV ("silver") development have resulted in widespread availability of extremely clean vehicles. A number of models have been certified to date and more will be available in the near future. Volume production of such vehicles will result in air quality improvement and, in the case of AT PZEVs, will also build the manufacturing and supplier base for componentry that will eventually be used on pure ZEVs.

Under these circumstances, staff believes that the best course of action is to take full advantage of the near term possibilities afforded by PZEVs and AT PZEVs, and adopt a stepwise approach towards pure ZEV commercialization that takes into account progress over time. The alternative compliance method put forth in this staff proposal is intended to maximize the air quality benefits afforded by extremely clean vehicles available in showrooms today, and use an Independent Expert Review Panel to help the Board keep the pure ZEV requirement aligned with the status of technology development over time. Staff believes the Board remains committed to the pursuit of ZEV commercialization for the simple reason that ZEVs will ultimately be necessary to meet health based air quality goals in the future.

The following sections describe the major elements of the alternative compliance approach.

### 2.1.2 Compliance Under Terms of the 2001 Regulation Remains as an Option

Section 1962(b)(2)(A)

Large volume manufacturers that choose not to pursue the alternative compliance approach discussed below would have the option to achieve compliance under the terms and conditions of the 2001 regulation's percentage requirements. For example, a manufacturer could choose to satisfy its entire ZEV obligation using banked credits, subject to the existing neighborhood electric vehicle (NEV) cap limitation in the gold category. In all cases vehicles produced in 2003 and later model years would earn credit according to the credit values defined in the most recent proposed modifications.

### 2.1.3 Minimum Floor Level for New Type III ZEV Production

Section 1962(b)(2)(B)1.

In order to take advantage of the compliance flexibility option, it is proposed that manufacturers produce Type III ZEVs (cumulative total over the 2001 through 2008 model years) sufficient to achieve a minimum floor credit level. These credits must come solely from production of vehicles (transportation system credit would not apply towards this calculation).

The minimum credit level that must be met with credits from Type III ZEVs produced in model years 2001 through 2008 is set at 1.09 percent of the manufacturer's average annual sales of PC and LDT1 vehicles over the 5 year period from model years 1997 through 2001. The obligation would be assessed against these past years in order to provide greater certainty as to the number of vehicles to be produced. As part of this modification, in order to provide greater certainty as to the number of vehicles to be produced, staff proposes that the credit level for 2006-2008 Type III ZEVs be increased from 15 to 40. This will provide for a uniform credit level throughout the 2001-2008 period. Staff had previously proposed 40 credits through 2006. This change will extend the 40 credit level through 2008. (Section 1962 (d)(5)(B))

Staff estimates that this minimum floor requirement, if met by all manufacturers, would result in a cumulative total of roughly 250 Type III ZEVs produced by the large manufacturers over the 2001-2008 model years. Staff believes that this number of Type III ZEVs is sufficient to satisfy the need for small-scale demonstration programs of fuel cell vehicles. Small-scale demonstrations are the next logical step in the path to commercialization of this technology.

ZEV credit earned by vehicles produced to satisfy the floor obligation would count towards compliance with a manufacturer's 10 percent obligation in the year in which the vehicle is produced.

Staff proposes that the regulation not contain a minimum Type III ZEV production requirement for model years 2009 and beyond. Staff believes that given the uncertainty involving pure ZEV technology development, it is difficult to set appropriate targets at this time. Rather, the Board would determine the program structure for those years at a future regulatory hearing, based on input from an Independent Expert Review Panel as described below.

The presence or absence of a fixed long-term ZEV requirement fundamentally is a policy issue because there is not sufficient technical information to make a quantitative finding. Nonetheless, many commenters have stated that post-2009 goals are important, even if they must be revised in the future. Staff expects that this issue will be discussed before the Board at its March 2003 hearing as noted in the Remaining Issues discussion below.

### 2.1.4 Use of AT PZEV Credits in the Gold Category

Section 1962(b)(2)(B)2.

Under the revised staff proposal, for model years 2005 through 2008 manufacturers that meet the minimum floor requirement for production of new Type III ZEVs would be allowed to use AT PZEV credit earned by vehicles (i.e. excluding transportation system credit) in the gold category. Manufacturers could elect to use the base program or the alternative compliance strategy in any model year, except that manufacturers that elect to use the alternative compliance strategy but fail to ultimately meet the floor production requirement for Type III ZEVs would be required to demonstrate compliance under the base 2001 program for all model years 2005-2008. Conversely, manufacturers that elect to use the base program initially but then meet the floor production requirement prior to the end of model year 2008 would have the option to retroactively take advantage of the alternative compliance strategy for all model years 2005-2008.

In model years 2009 and beyond, manufacturers would be able to use AT PZEV credit in the gold category without regard to whether they used the base program or the alternative compliance strategy for model years 2005-2008. Under the revised staff proposal there would be no minimum Type III ZEV production requirement needed in order to take advantage of the alternative compliance strategy in model years 2009 and beyond. This approach would remain in force until the Board took action to modify the program structure, based on input from an Independent Expert Review Panel as discussed below.

### 2.1.5 Independent Expert Review Panel

Under staff's proposal, the alternative compliance approach would apply until modified by the Board. Staff suggests that at least three years prior to the 2009

model year, the Board determine the appropriate regulatory approach for 2009 and beyond based in part on an assessment of the status of technology development as of that time by an Independent Expert Review Panel.

The role and composition of the Independent Expert Review Panel would not be specified in the regulation because it does not have regulatory powers. Instead, the Independent Expert Review Panel would provide input to the Board for consideration but its findings would not bind the Board in any way.

Staff envisions that this Panel would consist of independent experts with the skills and knowledge necessary to assess the status of ZEV commercialization. The Panel members would need to be free of conflict of interest concerns and would not have a direct economic interest in the technologies being assessed. The Panel would provide a factual assessment of the status of technology and the readiness of various technologies for market and consumer acceptance, but would not recommend specific compliance targets. The Panel's review would include the status of all pure ZEV technologies, including battery EVs as well as fuel cells.

### 2.2 Type III ZEVs Placed in a Section 177 ZEV State Applied to Compliance in California

Section 1962(d)(5)(C)

Section 177 of the Clean Air Act allows other states to adopt California's motor vehicle emission standards. Auto manufacturers have expressed concern that the ZEV program obligations in California are multiplied across other states that have adopted California's ZEV program. This is of particular concern when considering requirements for the production of fuel cell vehicles, as the volumes necessary to comply are challenging under the California program and even more difficult when considering other states as well. For these reasons, staff is proposing that Type III ZEVs placed in any state that has adopted California's ZEV program be allowed to count towards California's ZEV requirement. Similarly, under identical programs adopted by Section 177 states, Type III ZEVs placed in California would have to count towards the ZEV requirement in those other states.

### 2.3 Return to 2001 Regulation Percentage Requirements

Section 1962(b)(2)(A)

As described in section 2.1.2 above, a manufacturer may choose to comply under terms of the 2001 regulation. By doing so, a manufacturer would have a gold (ZEV) and silver (AT PZEV) category requirement of 2 percent each, increasing over time. In the January 2003 Staff Proposal the categories were modified to be 1 percent gold and 3 percent silver, also increasing over time.

Staff now proposes a return to the 2001 percentages. This modification is proposed in order to maintain the basic features of the 2001 regulation for those manufacturers that choose to achieve compliance based upon the 2001 regulatory structure.

This change does not affect manufacturers that take advantage of the alternative compliance method discussed in Section 2.1. Manufacturers using that method have the ability to fulfill their entire gold obligation using AT PZEV credits, and as a result the percentage limitation on the use of AT PZEV credits has no impact.

### 2.4 Allow Certain Early PZEV Placements to Earn AT PZEV Credit

Section 1962(b)(2)(D)

Under the 2001 regulation manufacturers were required to demonstrate compliance beginning with the 2003 model year. To address litigation issues, the staff proposal would delay the onset of required compliance until the 2005 model year. Because of the lead time involved in developing vehicles, however, some manufacturers have already made plans that would allow them to offer PZEVs during the 2003 and 2004 model years. Because these same manufacturers generally would have the ability to take full advantage of the PZEV option in 2005 and subsequent model years using current production in each year, banked PZEV credits would have little value and such manufacturers would have little incentive under the January 2003 staff proposal to produce PZEVs during 2003 or 2004. Meanwhile, providing the extended warranty needed to certify vehicles as PZEVs imposes additional cost on manufacturers.

In order to capture the potential air quality benefit afforded by additional PZEV production, and to provide early experience with such technologies, staff proposes that an incentive be provided to encourage manufacturers to certify 2003 and 2004 vehicles as PZEVs. Specifically, staff recommends that credits earned by "excess" PZEVs in the 2003 and 2004 model years be available for use in the AT PZEV category in the 2005 and 2006 model years. By credits from "excess" 2003 and 2004 PZEVs staff means credits from PZEV production above the number of vehicles that would be required to take full advantage of the PZEV option in each year, had the regulation been in effect. For example, if a manufacturer could use 500 credits under the PZEV option, staff recommends that credits earned in excess of 500 in each year be available for use in the AT PZEV category in model years 2005 or 2006.

Staff notes that under the optional compliance provisions in the suggested modifications, banked AT PZEV credit can be used in the gold category. Therefore the modifications already provide an incentive for early AT PZEV production, and thus staff believes that no additional change is needed.

## 2.5 Reintroduce NEV Cap in Silver Category, But Delay Until 2009

Section 1962(g)(6)

The 2001 amendments established a cap on the use of credits banked from model year 2001-2005 NEVs. Beginning in model year 2006 manufacturers could satisfy no more than 75 percent of any program category (gold, silver, bronze) using banked NEV credits. The maximum allowable use of banked NEV credits decreased to 50 percent in any program category for the 2007 and later model years.

The January 2003 staff proposal removed the NEV cap from the silver and bronze categories. The rationale for this change was to provide greater lead time and additional flexibility for manufacturers to take advantage of the AT PZEV and PZEV options. The cap was retained in the gold category to ensure that manufacturers would need to meet some minimum portion of the gold category using credits from vehicles other than NEVs.

As part of the additional proposed modifications outlined in this document, staff proposes a modification reinstating a NEV cap in the silver category, but delaying the imposition of the cap until 2009. Thus under the modifications manufacturers could satisfy no more than 75 percent of the AT PZEV category using banked NEV credits in the 2009 model year, with the percentage decreasing to 50 percent in 2010 and subsequent years. Staff proposes this change in order to ensure some minimum level of AT PZEV production in 2009 and later years without regard to the availability of NEV credits, while providing lead time and flexibility in the years prior to 2009 for manufacturers that may not have sufficient AT PZEV products available in that timeframe.

As a result of this change, manufacturers choosing the alternative compliance path would not be subject to any NEV cap prior to the 2009 model year. Through the 2008 model year such manufacturers could meet their gold obligation using any combination of new gold vehicles, banked gold credits, new silver vehicles, or banked silver credits. The cap on the use of banked NEV credits in the silver category would take effect in 2009 and subsequent model years.

## 2.6 Modifications to the AT PZEV Determination

### 2.6.1 Minimum Requirements for Advanced Componentry Credit

Section 1962(c)(4)(B)(1)

Staff proposes modifications to the criteria for determining if a hybrid electric vehicle (HEV) earns advanced componentry credit. The specific proposed criteria are set forth in Table 2.1 below. In brief, staff proposes a three-tier system:

- Low voltage, low power HEV (< 60 volts, minimum 4 kW motor power)
- High voltage, HEV (≥ 60 volts, minimum 10 kW motor power)
- High voltage, high power HEV (≥ 60 volts, minimum 50 kW motor power)

Staff's modified proposal retains the use of a maximum power rating for the electric drive system, but eliminates the use of "peak power ratio" as a criterion for advanced componentry qualification. Staff proposes the use of voltage level and rated peak power as criteria for AT PZEV credit qualification, along with traction drive boost, regenerative braking, and idle start/stop. These modifications are proposed because it is believed that HEVs equipped with high-voltage electric drive systems better advance the technology and manufacturing base for ZEVs. In order to meet the high power propulsion demands of light duty ZEVs, high voltage systems will be necessary in order to avoid excessive energy losses at impractical current levels. Staff therefore recommends that high voltage should also be a qualifier for AT PZEV advanced componentry credit. Staff proposes the establishment of three levels of credit incentive for HEVs. The first and mildest is described as a low voltage HEV. The second level is a high voltage HEV and the third is a high voltage, high power HEV. Each level of credit rewards ZEV enabling technology and increasing credit is awarded with increasing applicability to ZEVs.

Level 1 Low-Voltage Low-Power HEV AT PZEV Credit

Low Voltage HEVs are described in Table 2.1 as having system voltage less than 60 volts and a motor size of at least 4 kilowatts. Staff proposes that Low-Voltage HEVs not receive an additional advanced componentry credit but also proposes that the base 0.2 PZEV credit earned by such vehicles be available for use in the AT PZEV category through model-year 2008. These vehicles advance electric drive technology to the extent that they might be applicable in selected low power ZEV applications, and they help develop consumer recognition of HEV technology. These systems are expected to become commonplace in standard automobiles and reach technical maturity much more rapidly than the more challenging high-voltage systems. For this reason, staff believes that credit earned by low voltage systems should not be eligible for use in the AT PZEV category after model year 2008.

Level 2 High-Voltage HEV Advanced Componentry Credit

High Voltage HEVs are described in Table 2.1 as having system voltage greater than 60 volts and motor size of at least 10 kW. Staff proposes that the Board allow 0.4 credits for such HEVs for advanced componentry. Staff anticipates that in the 2012 and later timeframe, high-voltage 10+ kW systems may also become commonplace, and their benefit towards the promotion of ZEVs will diminish as volumes grow. Staff therefore proposes that the advanced componentry credit

for these systems be reduced in stages, first in 2012, and then again 2015 (See Table 2.1).

Level 3 High Voltage High Power HEV Advanced Componentry Credit

High Voltage, High Power HEVs are described in Table 2.1 as having system voltage greater than 60 volts and motor size of at least 50 kW. Staff proposes that the Board allow 0.5 credits for such HEVs for advanced componentry. Staff believes at this motor size, although the ratio of motor power to total drive system power may be quite low for selected vehicles with large engines, some hybrid electric vehicle motors may have sufficiently high power ratings to meet or exceed the power requirements for small ZEVs. For hybrid electric vehicles that are equipped with multiple motors, staff intends that the sum of these individual drive system motors rated peak powers must exceed 50 kW in order to earn the additional high power credit.

Credit Calculation for Grid HEVs

Grid rechargeable hybrid electric vehicles face substantial developmental challenges but also offer significant advantages over other AT PZEVs because of their ability to recharge directly from the electric supply grid and operate as "part-time" ZEVs. The revised staff proposal further increases credit levels for such vehicles beyond the levels outlined in the January 2003 staff proposal. Staff believes that under the revised proposal this class of vehicle is adequately encouraged through the various categories of AT PZEV credit in combination with a high phase-in multiplier that extends to 2011. High voltage grid HEVs are expected to exceed the criteria for high-voltage, high-power advanced componentry and will therefore be eligible to receive the maximum advanced componentry credit, along with a variable zero emission range and low fuel cycle emission credit. Although they have not yet been introduced in the marketplace, staff believes that grid HEVs should earn high credits through 2011 in order to encourage automakers to consider the potential benefits of this class of hybrids. Staff also believes that there is a potential synergy with fuel cell vehicles, and that grid rechargeable hybrids with fuel cell engines might someday offer performance that exceeds that of conventional fuel cell vehicles.

Credit Calculation for Hydrogen ICE Vehicles

Hydrogen internal combustion engine (ICE) vehicles likewise face significant challenges, in this case due more to infrastructure needs rather than to the vehicles themselves. Hydrogen ICE vehicles have been shown to be extraordinarily clean even without after-treatment and they offer the potential for significant air quality benefits. Widespread deployment of hydrogen ICE vehicles also will promote the development of hydrogen infrastructure that will help pave the way for eventual commercialization of zero emitting hydrogen fuel cells. For all of these reasons, staff believes that the ZEV program incentive structure

should encourage hydrogen ICE vehicles, and as is shown in Table 2.2 below, such vehicles would earn high levels of credit under the proposed credit structure.

**Table 2.1**
**Hybrid Electric Vehicle Advanced Componentry Requirements and Credit**

| | Level 1 Low-Voltage HEV | Level 2 High-Voltage HEV | Level 3 High-Voltage High-Power HEV |
|---|---|---|---|
| Traction Drive System Voltage | < 60 Volts | >= 60 Volts | >= 60 Volts |
| Electric Drive System Peak Power Output | >= 4 kW | >= 10 kW | >= 50 kW |
| Traction Drive Boost | Yes | Yes | Yes |
| Regenerative Braking | Yes | Yes | Yes |
| Idle Start/ Stop | Yes | Yes | Yes |
| 10 year/ 150k mile Battery Warranty | Yes | Yes | Yes |
| PZEV Status<br><br>Base Credit | AT PZEV (2005-2008 only)<br>0.2 | AT PZEV<br><br>0.2 | AT PZEV<br><br>0.2 |
| Maximum Advanced Componentry Credit: | | | |
| MY 2005-2011 | 0.0 | 0.4 | 0.5 |
| MY 2012-2014 | 0.0 | 0.35 | 0.45 |
| MY 2015+ | 0.0 | 0.25 | 0.35 |
| Total Credit | 0.2 | 0.6 to 0.45 | 0.7 to 0.55 |

### 2.6.2 Hybrid Electric Vehicle Energy Storage Device Warranty Requirement

Section 1962(c)(2)(D)

Low Voltage HEVs certified as AT PZEVs would be subject to the PZEV extended warranty requirement. HEV batteries and/or capacitors that provide traction power and absorb regenerative braking energy would then be subject to the HEV energy storage 10 year, 150,000 mile warranty requirement.

In the January 10, 2003 staff proposal, the regulatory language used for the proposed modifications to the battery warranty was ambiguous. Staff did not intend to imply that the On-Board Diagnostic (OBD) elements of the energy storage system could be exempted from the extended warranty provisions. Staff proposes that the Board clarify the regulatory text so that energy storage OBD monitoring systems are outside of the warranty coverage limitations and must continue to operate as required by OBD regulations. Reference to hydraulic or pneumatic systems would also be eliminated.

### 2.6.3 Limit on Maximum Zero-Emission VMT Credit Alternative Procedure

Section 1962(c)(3)(B)

The January 10, 2003 proposal, as was the case with prior versions of the regulation, allows additional credit for vehicles (such as grid connect HEVs) that operate part of the time in zero emission mode. The credit earned is based on the zero emission range of the vehicle. The regulatory language provides an alternative procedure under which a vehicle that has zero emissions of one but not all pollutants (e.g. a reformer fuel cell or hydrogen ICE) also can earn credit under this provision of up to one-half that of a vehicle with zero emissions of all regulated pollutants. Because vehicles that qualify for this alternative procedure are likely to reach the maximum range specified in the regulation, staff proposes a simplification of the alternative by removing the reference to ZEV range and incorporating a maximum credit cap of 1.5.

### 2.6.4 AT PZEVs Qualifying for Both Zero Emission Range and Advanced Componentry Credit

Section 1962(c)(4)

Staff proposes that AT PZEVs qualifying for both the Zero Emission vehicle miles traveled (VMT) credit and the advanced ZEV componentry credit be allowed to make use of both credits. Staff believes that the combined use of both features is of further benefit and should therefore be rewarded. This would allow, for example, a hydrogen internal combustion engine vehicle that is also equipped with a high voltage hybrid electric drive system, or an Indirect Methanol FCV, to be rewarded for both zero emission VMT and advanced componentry features. Table 2.2 lists example credit values for a variety of AT PZEVs to illustrate the application of this proposal.

### 2.6.5 Use of High Pressure Gaseous Fuel or Hydrogen Storage System

Section 1962(c)(4)(A)

In the January 10, 2003 proposal the regulatory language regarding hydrogen storage was unclear. Staff did not intend that hydrogen fueled high-pressure gaseous vehicles receive both the 0.1 credit for gaseous storage and the 0.2 credit for exclusive fueling on hydrogen. Therefore, staff proposes modification of this language to indicate that these are alternative, not additive, credits. However, staff also recognizes the considerable technical challenges associated with on-vehicle storage of gaseous and hydrogen fuels and proposes that the advanced componentry credit for these storage systems be increased to 0.2 for CNG and 0.3 for hydrogen. Staff proposes a further modification that will allow dual fuel CNG-hydrogen vehicles to earn the higher 0.3 hydrogen storage advanced componentry credit if these vehicles are capable of operating exclusively on 100% hydrogen. The existing regulation language unnecessarily restricts this credit to vehicles fueled exclusively by hydrogen. This change is proposed in order to reward vehicles that are equipped with hydrogen-capable storage systems that advance the technology and manufacturing capability for hydrogen systems whether or not they are fueled on hydrogen 100% of the time.

### 2.6.6 Application of Early Introduction Multiplier and Zero Emission Range Multiplier

Section 1962(c)(7)(B)

Staff proposes a modification making it clear that the Early Introduction Multiplier and the Zero Emission Range Multiplier are not to be combined. The Zero Emission Range Multiplier was a modified phase-in multiplier and was intended as an alternative to the standard PZEV introduction phase-in multiplier. These multipliers were introduced in order to accelerate the development and deployment of PZEVs and to recognize that a subset of AT PZEVs, those earning zero emission range credit, would not be ready for market introduction for several more years. The phase-in multiplier for PZEVs that earn a zero emission VMT credit was developed as a substitute for the default PZEV phase-in multiplier, so staff proposes that this point be clarified to expressly allow PZEVs to make use of only one multiplier instead of both.

### 2.6.7 Combined AT PZEV Credit Examples

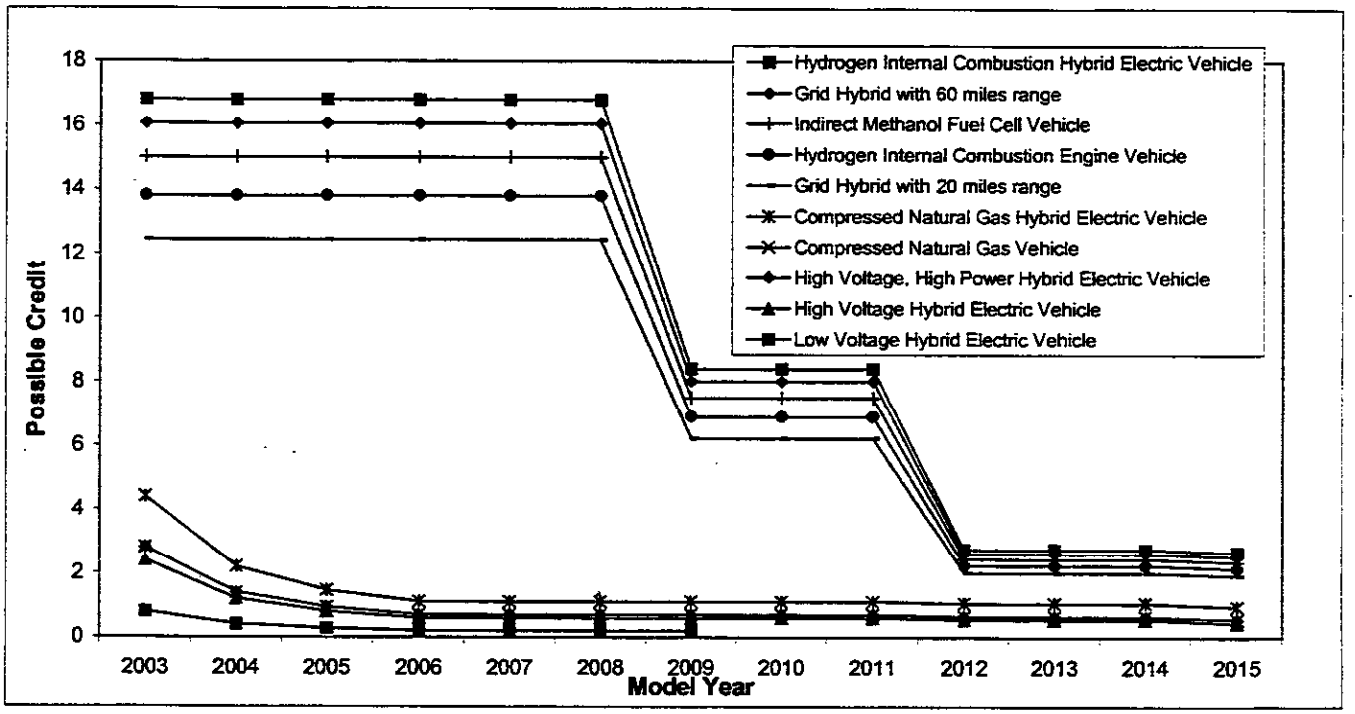
The following table provides examples of proposed credits for a variety of AT PZEV types with the proposed changes. These examples are for illustration purposes only and are, in some cases, dependent on a successful application to the Executive Officer for credits on particular vehicle configurations. It is entirely possible that different manufacturers' vehicles of the same general type may earn different AT PZEV credit.

**Table 2.2**
**2005-2011 ATPZEV Credit Determination**
**(without multipliers)**

| | Zero Emission Range | Base Credit | Zero Emission Range Credit | Zero Emission Range Credit | Advanced Componentry Credit | | Low Fuel Cycle Emission Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|
| | Miles | | Zero Emissions for single pollutant | Zero Emissions for all pollutants | Tanks | High Voltage | | Without Early Intro Multipliers |
| Low Voltage HEV | 0 | 0.2 | | | | 0 | | 0.2 |
| High Voltage HEV | 0 | 0.2 | | | | 0.4 | | 0.6 |
| High Voltage, High Power HEV | 0 | 0.2 | | | | 0.5 | | 0.7 |
| Compressed Natural Gas Vehicle | 0 | 0.2 | | | 0.2 | | 0.3 | 0.7 |
| Compressed Natural Gas Hybrid Electric Vehicle (10 kW) | 0 | 0.2 | | | 0.2 | 0.4 | 0.3 | 1.1 |
| Hydrogen Internal Combustion Engine Vehicle | 0 | 0.2 | 1.5 | | 0.3 | | 0.3 | 2.3 |
| Indirect Methanol Fuel Cell Vehicle | 0 | 0.2 | 1.5 | | | 0.5 | 0.3 | 2.5 |
| Grid Hybrid with 20 miles electric Range | 20 | 0.2 | | 1.25 | | 0.5 | 0.12 | 2.1 |
| Grid Hybrid with 30 miles electric Range | 30 | 0.2 | | 1.40 | | 0.5 | 0.15 | 2.3 |
| Grid Hybrid with 60 miles electric Range | 60 | 0.2 | | 1.82 | | 0.5 | 0.15 | 2.7 |
| Hydrogen Internal Combustion Engine Hybrid Electric Vehicle 10 kW | 0 | 0.2 | 1.5 | | 0.3 | 0.4 | 0.3 | 2.7 |
| Compressed Natural Gas Hybrid Electric Vehicle with 20 Miles Electric Range | 20 | 0.2 | | 1.25 | 0.2 | 0.5 | 0.3 | 2.5 |

Figure 2.1 below shows the credit levels for selected vehicle types over time, taking into account the applicable early introduction multipliers.

**Figure 2.1**
**AT PZEV Credit**




## 2.7 "Placed In Service" Requirement

Section 1962(d)(3)(A) and 1962 (d)(5)(B)

In the past year there have been discussions regarding the date by which a vehicle must be placed in service in order to earn the early introduction multiplier provided in section 1962(d)(3)(A) of the ZEV regulation. In order to address these issues, on November 21, 2002, the Executive Officer issued a letter to affected vehicle manufacturers informing them that early introduction credits would be available though March 31, 2003 with a similar "sell though " period for the remainder of the early introduction credits. On December 24, 2002, in a lawsuit filed by DaimlerChrysler and General Motors a Fresno County judge issued a temporary restraining order enjoining ARB from implementing the provisions of the November advisory.

To provide regulatory certainty and clarification on this issue, the staff proposes a modification providing that a 2001-2002 model year ZEV qualifies for the early introduction multiplier if placed in service by September 30, 2003. Staff proposes that for 2003 and subsequent model years ZEVs, a vehicle be considered "placed in service" if placed in service in California by June 30 following the applicable model year. Staff believes this is appropriate in light of the challenges faced in placing ZEVs and the expectations of manufacturers regarding the application of the regulation.

## 2.8 Reporting Requirement

Section D.3 California Exhaust Emission Standards and Test Procedures

Staff proposes that the Board clarify the tracking and verification of credits earned and transferred by manufacturers subject to the ZEV requirement. Staff proposes that each manufacturer submit a report at least annually, by May 1 of the calendar year following the close of the model year, to the Executive Officer. The report will include necessary delivery and placement data of all vehicles generating ZEV credits or allowances, and all transfers and acquisitions of ZEV credits. The manufacturer may update the report by September 1 to cover activities occurring between April 1 and June 30. This proposed amendment would be incorporated by reference in the "California Exhaust Emission Standards and Test Procedures for 2003 and Subsequent Model ZEVs, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes."

## 2.9 Specialty Vehicles

Section 1962(d)(5)(A)

Under the 2001 amendments, specialty vehicles are those with the same platforms, battery, and drivelines as existing ZEV platforms. In order to better address specialty vehicles that may not be identical to existing ZEVs, staff proposes that manufacturers be allowed to request additional credit for specialty vehicles that are optimized for a particular function which conflicts with optimization for maximum vehicle range. The basis for approval of such an application would be the componentry equivalence or air quality benefit demonstrated by the specialty vehicle. For example, a medium duty urban delivery van may be equipped with a battery pack that has higher energy storage capacity than other Type II battery electric vehicles, but may not achieve the range minimum that a Type II passenger car or light-duty truck would achieve. Under the staff proposal, manufacturers that obtain Executive Officer approval may promote the specialty vehicle to the next highest range-based ZEV Type, for example, from Type 0 (utility EV) to Type I (City EV).

## 2.10 Clarification of In-Service Warranty Credit

Section 1962(f)

Under the 2001 amendments vehicles on the road beyond three years of service and meeting certain other conditions earned additional credit for each year of continued operation through the 2011 model year. In the January 2003 Staff Proposal, staff intended to propose limiting the granting of such additional credit to vehicles originally placed in service prior to the 2005 model year. The

proposed regulatory language did not clearly capture this intent, and could be read to terminate the award of any additional credit as of the 2005 model year, even for vehicles placed prior to that time. Staff proposes modifications to the regulatory language to accomplish the intent of the 2001 amendments.

### 2.11 Advanced Technology Demonstration Vehicle Credits

Section 1962(g)(4)

Demonstration vehicles by their nature are moved from location to location between states and countries. Staff proposes a modification providing that for a ZEV to qualify for credit under the advanced technology demonstration provision, vehicles must be located in California the majority of the time. The proposed amendments would clarify that to qualify for these credits, the application to the Executive Officer must demonstrate that an advanced technology demonstration vehicle will be in California (or, in the case of a Type III ZEV, cumulatively in California or a "Section 177" state) at least 50 percent of the time during its first year of placement.

### 2.12 Other Miscellaneous Clarifications

For clarification purposes other miscellaneous proposed modifications include:

- NEVs are not eligible for advanced technology demonstration program credits, Section 1962(g)(4)
- ZEV credits may be acquired from third parties in addition to vehicle manufacturers, Section 1962(g)(6)
- Removal of inadvertent remaining references to the high efficiency multiplier. Section 1962(c)(6)(A) and (i)(1)
- Optional credit multiplier based on vehicle range or battery specific energy for model-year 1999 ZEVs. Section 1962 (d)(2)
- Added definitions for "regenerative braking" and "Type 0,I,II,III ZEV" Section 1962 (i)

# 3. IMPACTS OF THE PROPOSED MODIFICATIONS

## 3.1 Impacts on Vehicle Production

The additional modifications proposed in this document would affect the number of vehicles needed to comply in several ways.

### 3.1.1 Providing Increased Advanced Componentry Credit For High Voltage-High Power HEVs

Under the revised staff proposal, HEVs with a motor power greater than 50 kW would earn an advanced componentry credit of 0.5, decreasing in future years (Vehicle total credit = 0.2 PZEV + 0.5 Advanced Componentry credit = 0.7). This compares to a maximum advanced componentry credit of 0.4 under the January 2003 staff proposal. To the extent that manufacturers build such high power vehicles, fewer would be needed to meet their compliance target. If all manufacturers built 0.7 credit vehicles, the number of vehicles needed to fill the gold and silver categories would decrease by about 17 percent.

### 3.1.2 Providing AT PZEV Credit for Low-Voltage Low-Power HEVs

Under the revised staff proposal, credits earned by low-voltage HEVs could be used in the AT PZEV category through model year 2008. Such vehicles would earn a credit of 0.2, as compared to 0.6 or 0.7 for high voltage HEVs. To the extent that manufacturers used low-voltage vehicles to satisfy the AT PZEV option, the number of vehicles silver needed would increase. If all manufacturers used 0.2 credit vehicles instead of 0.6 credit vehicles, the number of vehicles needed would triple. This change would have no effect in model years 2009 and beyond because credit earned by such vehicles could only be used in the PZEV category at that point.

### 3.1.3 Decreasing Advanced Componentry Credit in 2015 and Beyond

Under the 2001 amendments and the January staff proposal, the credit earned by HEVs decreases in model year 2012. The additional modifications proposed in this document would further decrease the credit levels in model year 2015. The resulting credit levels are shown below.

| Vehicle Type | 2003-2011 Credit | 2012-2014 Credit | 2015+ Credit |
|---|---|---|---|
| High Voltage | 0.6 | 0.55 | 0.45 |
| High Voltage, High Power | 0.7 | 0.65 | 0.55 |

The credit decreases in 2015 and beyond would increase the number of vehicles required in those years by approximately 20 percent.

### 3.1.4 Alternative Compliance Option

Under the revised staff proposal, manufacturers have the option to build a demonstration-level number of Type III ZEVs in model years 2001-2008 and thereby take advantage of the alternative compliance option. The effect of this change is complex. For manufacturers with significant numbers of banked credits, the alternative compliance option would actually result in a larger number of ZEVs being produced (because manufacturers need to produce new vehicles rather than rely solely on banked credits). For manufacturers without banked credits, the alternative compliance option would result in a smaller number of ZEVs being required than under the 2001 regulation.

### 3.1.5 Future Modification by Board

Under the revised staff proposal the gold requirement for 2009 and beyond would be set by the Board based on input from an Independent Expert Review Panel. Therefore the effect of the revised staff proposal on the number of ZEVs required in 2009 and beyond cannot be determined at this time.

### 3.1.6 Possible Change to Use of Banked Credits

One other potential impact of the revised staff proposal involves manufacturer use of banked credits. Manufacturers that take advantage of the alternative compliance option under the revised staff proposal would have a reduced need for banked gold credits in the near term. (Banked credits cannot be used to satisfy the minimum floor production requirement, and the remainder of the gold obligation could be met with AT PZEV credits). Manufacturers in this situation may decide to use a greater number of banked gold credits in the AT PZEV category, rather than retaining them for future use in the gold category. To the extent that this occurred, it would reduce the number of AT PZEVs produced in the early years. Staff has reviewed the availability of banked credits and roughly estimates that the number of credits available would be sufficient to completely offset AT PZEV production for slightly more than two years, assuming trading across manufacturers and that all manufacturers took this course.

### 3.1.7 Net Effect

In general, staff expects that under the revised staff proposal the number of pure ZEVs would decrease and the number of AT PZEVs would increase as compared to the January 2003 staff proposal. It is not possible to more precisely estimate the net effect of the proposed modifications due to the number of variables involved, the different capabilities and strategies of each manufacturer, and the likelihood of future changes by the Board based upon input from the Independent Expert Review Panel.

In order to provide a rough estimate of the potential effect of the additional proposed modifications on air quality, however, staff has developed a model scenario. Under this scenario, all manufacturers take advantage of the alternative compliance option for model years 2001 through 2008. The entire remaining gold obligation in those years is met with credits from producing AT PZEVs. In model years 2009 and beyond the model scenario assumes no pure ZEV production, with the entire gold category satisfied by AT PZEV credits. (Please note that in reality staff fully expects that the Board will limit the use of AT PZEV credits in the gold category in the future; the "no pure ZEV" scenario was chosen as a bounding exercise).

In all cases all AT PZEVs produced are assumed to be high-voltage HEVs (0.6 credit in model years 2005-2011, 0.55 credit in 2012-2014, and 0.45 credit in 2015 and beyond). These estimates also assume free credit trading across manufacturers (as was the case with the emission estimates in the January staff proposal). Under the revised staff proposal some banked gold credits are used to make up a shortfall in needed AT PZEV production in the early years, but the remaining banked gold credits are retained by manufacturers for future use. Under the 2001 amendments and the January 2003 staff proposal banked gold credits are used to satisfy the gold obligation in this analysis.

The number of ZEV and AT PZEV vehicles that result, using the above assumptions, is shown below. The numbers of vehicles resulting from the same assumptions under the January 2003 staff proposal and the 2001 regulation are also shown for comparison purposes. It is important to bear in mind that this scenario is prepared for illustrative purposes only and the actual number of vehicles produced could differ significantly from the totals shown below.

| Model Year | 2001 Regulation | | 2003 January Staff Proposal | | 2003 Revised Staff Proposal | |
|---|---|---|---|---|---|---|
| | ZEV | AT PZEV | ZEV | AT PZEV | ZEV | AT PZEV |
| 2005 | 0 | 13350 | 0 | 17244 | 250 total over this period | 22418 |
| 2006 | 0 | 19848 | 0 | 25636 | | 33327 |
| 2007 | 0 | 27905 | 0 | 43253 | | 56229 |
| 2008 | 4333 | 47110 | 0 | 64069 | | 83290 |
| 2009 | 8988 | 64768 | 2303 | 88084 | 0 | 117445 |
| 2010 | 11108 | 70648 | 4804 | 96082 | 0 | 128109 |
| 2011 | 12032 | 76529 | 5204 | 104079 | 0 | 138772 |
| 2012 | 18269 | 98061 | 17782 | 96991 | 0 | 193983 |
| 2013 | 18269 | 98061 | 17782 | 96991 | 0 | 193983 |
| 2014 | 18269 | 98061 | 17782 | 96991 | 0 | 193983 |
| 2015 | 24359 | 130748 | 23709 | 129322 | 0 | 316120 |
| 2016 | 24359 | 130748 | 23709 | 118545 | 0 | 316120 |
| 2017 | 24359 | 130748 | 23709 | 118545 | 0 | 316120 |
| 2018 | 30448 | 163435 | 29636 | 148181 | 0 | 395150 |
| 2019 | 30448 | 163435 | 29636 | 148181 | 0 | 395150 |
| 2020 | 30448 | 163435 | 29636 | 148181 | 0 | 395150 |

Please note that due to minor changes introduced late in the development of this document, the credit value for 2006-2008 fuel cell EVs used in the model scenario differs from the value recommended in the revised staff proposal. As a result, the estimated number of AT PZEVs shown above differs slightly from the totals that would result using the values recommended in the revised staff report. Such differences are small and do not materially affect the emission results discussed below.

## 3.2 Environmental Impacts

This section updates discussion of the emission impacts of the proposed regulatory amendments presented in the January 10, 2003 staff report and the additional modifications described in this document. This section also describes the model and the underlying assumptions used to determine the emissions.

### 3.2.1 Introduction

The Mobile Source Emission Inventory, EMFAC2002, was used to assess the emission impacts of the current regulation as described in the 2001 ZEV amendments adopted in final form on April 12, 2002, and the proposed modifications. Using EMFAC, staff modeled various implementation scenarios applicable to the South Coast Air Basin representing the emissions from vehicles subject to this regulation.

Assuming that all manufacturers follow the alternative compliance path, the modified proposal would reduce the required number of pure ZEVs from 2005 through 2008 to approximately 250. The number of ZEVs required starting in 2009 would depend on the state of the technology as determined by the Board with input from an Expert Review Panel. In place of the ZEV percentage requirements, manufacturers likely would produce additional AT PZEVs. There would be no change to the allowable number of PZEVs.

### 3.2.2 Emissions Scenarios and Assumptions

To determine the emission impacts of the proposed modifications, staff prepared emission estimates for the South Coast Air Basin under three scenarios: the 2001 amendments, the January 10, 2003 proposed modifications, and the additional modifications described in this document. For the 2001 amendments and the January 10, 2003 proposal scenarios, staff used the worst case scenario (free credit trading and no voluntary production). For the additional proposed modifications scenario, staff used the assumptions and resulting vehicle totals described in Section 3.1.7 above. Reference or baseline emission values are based on the assumptions used for the current regulations contained in the December 8, 2000 ZEV Program Regulations amendments staff report. The

assumptions used in this analysis are the same as those presented in the January 10, 2003 staff report with the following additions:

- The estimated number of PZEVs required.from intermediate manufacturers has been revised from the totals used in the January 2003 estimates as well as the 2001 rulemaking. The required number of PZEVs for intermediate manufacturers was held constant at 10 percent in the vehicle total estimates prepared for the proposed January 2003 amendments and the 2001 rulemaking. In reality, the intermediate manufacturer PZEV obligation increases along with the overall ZEV obligation beginning in 2009 and plateaus at 16 percent in 2018. Given the assumed intermediate manufacturer sales base, the difference in 2018 is about 100,000 PZEVs. This is a noticeable increase and would result in increased emission reductions as compared to a no-ZEV alternative. This change would not affect the 2001 to January 2003 relative comparison listed in the January 10, 2003 staff report, since the changes would cancel out.

Tables 3.1 and 3.2 below present the direct emissions for the South Coast Air Basin in 2010 and 2020 for the 2001 amendments, the staff's January 10, 2003 proposal, the current proposal, and a "No-ZEV" scenario.

**Table 3.1**

**Summertime Direct Emissions, South Coast Air Basin in 2010 (Tons per day)**

| | ROG | NOx | CO |
|---|---|---|---|
| 2001 Amendments | 155.15 | 143.28 | 1571.28 |
| Proposed January 2003 Amendments | 155.14 | 143.26 | 1571.23 |
| Proposed March 2003 Amendments | 155.12 | 143.22 | 1571.05 |
| No ZEV Program | 155.50 | 144.24 | 1574.80 |

**Table 3.2**

**Summertime Direct Emissions, South Coast Air Basin in 2020 (Tons per day)**

| | ROG | NOx | CO |
|---|---|---|---|
| 2001 Amendments | 87.62 | 65.75 | 791.04 |
| Proposed January 2003 Amendments | 87.81 | 65.74 | 791.07 |
| Proposed March 2003 Amendments | 87.58 | 65.58 | 787.50 |
| No ZEV Program | 90.86 | 67.81 | 807.38 |

Table 3.3 below presents the net changes in emissions for the modified proposal relative to the 2001 amendments, the January 2003 proposal, and a no-ZEV scenario.

Staff estimates that the modified proposal will result in a net decrease of about 0.09 tons per day of direct emissions of reactive organic gases (ROG) and oxides of nitrogen (NOx) in 2010 and a net decrease of about 0.21 tons per day of direct emissions of ROG and NOx in 2020 as compared to the 2001 amendments.

When compared to the January 2003 proposal, the modified proposed amendments will reduce approximately 0.06 and 0.39 tons per day of ROG and NOx by 2010 and 2020, respectively.

Finally, when compared to a no-ZEV scenario the modified proposed amendments will reduce approximately 1.40 and 5.51 tons per day of ROG and NOx by 2010 and 2020, respectively.

**Table 3.3**

**Net Change – Modified Proposal**
**(Tons per day)**

| | ROG | NOx | CO |
|---|---|---|---|
| Net change from 2001 Amendments | | | |
| 2010 | -0.03 | -0.06 | -0.23 |
| 2020 | -0.04 | -0.17 | -3.54 |
| Net change from January Proposal | | | |
| 2010 | -0.02 | -0.04 | -0.18 |
| 2020 | -0.23 | -0.16 | -3.57 |
| Net change from No ZEV Program | | | |
| 2010 | -0.38 | -1.02 | -3.75 |
| 2020 | -3.28 | -2.23 | -19.88 |

The proposed modifications show an increased benefit to air quality. The near term reduction of the number of ZEVs is countered by a relatively larger increase in AT PZEV vehicles, thereby increasing the number of clean vehicles in the South Coast Air Basin fleet. While the modified proposal provides an increased benefit to air quality, staff continues to emphasize that ZEVs will ultimately be needed to provide continuous clean air benefits over the life cycle of a typical car.

### 3.3 Environmental Justice Impacts

There should be no negative environmental justice or neighborhood impacts of the proposed regulatory amendments. The proposed amendments further ARB's mission of meeting health based air quality standards for all California citizens.

The ZEV regulations have already resulted in the development of a variety of automotive emission control advancements such as vehicles meeting SULEV standards, PZEV, hybrid electric vehicles, and alternatively fueled vehicles. These vehicles operate throughout California including the most highly impacted neighborhoods.

Often the most appropriate use for electric vehicles and alternatively fueled vehicles are fleet applications, particularly postal delivery and electric or gas utility meter reading and maintenance. This driving cycle takes place in all neighborhoods in California and is marked by frequent starts, stops, and idle; arguably a high emission driving cycle. Using an electric or alternatively fueled vehicle can eliminate or reduce this locally high emission source.

In addition, as these near-zero emission vehicles age their prices on the used car market will decrease making them affordable to people of lower incomes. The inclusion of a 150,000 mile warranty on the PZEV vehicle actually adds a financial advantage to such vehicles, establishing a used car market with reliable emissions performance. Depending on the manufacturer's chosen method of compliance the proposed amendments will facilitate the increased availability of the lowest emitting conventional vehicles now in production or of zero emission vehicles.

# 4. SUMMARY AND STAFF RECOMMENDATION

## 4.1 Summary of Staff Proposal

As presented, staff's proposed modifications would increase the near-term air quality benefits through the commercialization of large numbers of PZEVs and AT PZEVs. The proposal recognizes their substantial benefits and offers an alternative compliance path that will result in greater numbers of AT PZEVs while industry invests in pure ZEV technologies. At the same time, the regulation allows automakers the opportunity to focus their fuel cell research, development and deployment efforts. By establishing a panel of independent experts to assess and report on technology advances and progress towards commercialization, the ARB will be better able to respond with percentage requirements for commercialization as the technology becomes available.

The staff proposal contains the following specific amendments:

*Amend the Percentage Categories.* Return to the 2001 regulation percentage requirements for 2 percent pure ZEV, 2 percent AT PZEV, and 6 percent PZEV, increasing over time.

*ZEV Credit Amounts.* Retain the ZEV credit amounts from the January 2003 staff proposal, except that 2006-2008 Type III ZEVs (fuel cells) would earn 40 credits through 2008.

*Compliance Flexibility.* Manufacturers that meet a "floor" requirement for production of new Type III ZEVs would be allowed to use AT PZEV credit earned by vehicles (excluding transportation system credit) in the gold category in the 2005-2008 model years. For 2009 and beyond, all manufacturers would have this option. This option would remain in force until the Board took action to modify the program structure, based on input from an Independent Expert Review Panel.

*"Travel."* Type III ZEVs placed in any state that has adopted California's ZEV program would count towards California's ZEV requirement.

*Establish Independent Expert Review Panel.* The alternative compliance option would be in force until modified by the Board. Information collected by the Independent Expert Review Panel would provide a basis for Board action to modify the ZEV requirement as appropriate for post-2009 model years.

*Advanced Componentry Scoring.* Establish a 3-level system based on voltage and motor size, with larger credits for use of components that have the greatest relevance to technology needed for ZEVs.

*Sell-by Date.* Establish a sell-by-date of September 30, 2003 for the 2002 model year and June 30 of the following calendar year for 2003 and later model years.

*Additional clarifying and corrective modifications.* The proposal contains several minor clarifying and corrective modifications.

## 4.2 Issues Identified in the January 2003 Staff Proposal

Since the release of the staff proposal on January 10, 2003, staff has continued efforts to resolve the issues raised in Section 8.2 of the Initial Statement of Reasons. Some of the identified issues are addressed in the proposed additional modifications. This section discusses the two issues that are not addressed in the proposed modifications.

### 4.2.1 ZEV Credit for Fueling Infrastructure Deployment

Staff has evaluated the generation of credit from the installation of refueling stations that support ZEVs, such as hydrogen refueling stations. While discussion on the appropriateness of such credit has continued, insufficient support and justification has been presented. Therefore, ARB staff recommends that no regulatory incentives be included at this time.

### 4.2.2 ZEV Credit for Placement of Stationary Fuel Cells

It has been suggested that the development of fuel cell technology for automobile applications would benefit greatly from the improvement and demonstration of the same fuel cell stack technology in stationary applications. Staff has received requests that credit be granted for placement of stationary fuel cells as a means to further development and to reduce costs for eventual commercialization in vehicles. ARB staff believes that it is not appropriate to provide credits for stationary applications in motor vehicle regulations, because this would create troublesome precedent for all other rulemakings. Staff also believes that there is potential for adverse anti-competitive effect on the stationary fuel cell industry. Finally, there are also enforcement difficulties.

## 4.3 Issues Related to Additional Proposed Modifications

This section discusses two issues that have arisen in the context of the additional proposed modifications. Staff anticipates further discussion of these issues prior to and at the March Board hearing.

### 4.3.1 Encouragement of All ZEV Technologies in Alternative Compliance Path

In developing the alternative compliance path option, staff considered the goals of the program, including advancement of ZEV technology to further California's

vision of ZEV commercialization. Staff has chosen to propose a credit-based approach to establish vehicle volumes for fuel cell vehicles in the near term. The volume established for these Tier III ZEVs is significant and accomplishes the goal of demonstrating and deploying a meaningful quantity of fuel cell vehicles in California.

However, the ZEV regulations have traditionally been technology neutral and staff has been exploring how to define a meaningful advancement target for development and deployment of battery electric vehicles that may be integrated into the Alternative Compliance Path Option. At this stage in battery electric vehicle commercialization, what matters is cost and volume. Staff has received comment that the key to commercialization of battery electric vehicles is volume increases in order to reduce costs of componentry. At issue therefore is how to structure an Alternative Compliance Plan approach that both advances Type III ZEVs at meaningful and appropriate levels while at the same time allowing manufacturers the option to advance Type I and II ZEVs through larger volumes than demonstrated to date.

Under the proposed credit structure, manufacturers must produce a total of about 10,000 credits worth of Type III ZEVs (250 vehicles at 40 credits per vehicle). If Type I and II ZEVs were allowed to satisfy the Alternative Compliance Option credit obligation using their proposed credit levels, only about 1,000 Type II ZEVs (at 10 credits each) or about 1,400 Type I ZEVs (at 7 credits each) would be required industry wide over the four-year stage.

Staff is soliciting assistance and comment on the issue described above. Several alternatives have been discussed, including developing a credit structure for a separate Alternative Compliance Path Option for Type I (City EV) and Type II (full function BEV) ZEVs. The goal of such an alternative structure would be to have the ratio of credits as compared to Type III ZEVs establish an appropriate volume requirement for all ZEV types that reflects their state of development and progress towards commercialization.

### 4.3.2 ZEV Requirements for 2009 and Beyond

Under the modified staff proposal, manufacturers would be allowed to use AT PZEV credits in the gold category until the Board takes action to eliminate or limit this flexibility. In order to take advantage of the option, manufacturers would be required to produce a minimum number of Type III ZEVs in model years 2001 through 2008, but no such requirement exists for 2009 and later model years. Staff anticipates that some stakeholders will argue for the retention of a minimum production requirement throughout the program. In staff's view there is not sufficient information to set such a target at this point; that is why the staff proposal relies on a subsequent Board action based on input from the Independent Expert Review Panel. Staff recognizes, however, that the presence or absence of a long-term requirement has significant implications to investors, to

potential consumers, and to all who monitor technological development. This is fundamentally a policy issue, and staff expects this issue to be specifically considered by the Board at its March hearing.

### 4.4 Staff Recommendation

The ARB staff recommends that the Board amend, with the suggested modifications to the original proposal, section 1962, Title 13, California Code of Regulations, 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." The proposed modified amendments to section 1962 are set forth in the Staff's Suggested Modifications to the Proposed Regulation Order in Appendix A.

# Appendix A

## STAFF'S SUGGESTED MODIFICATIONS TO THE PROPOSED REGULATION ORDER

## PROPOSED 2003 AMENDMENTS TO THE CALIFORNIA ZERO EMISSION VEHICLE REGULATION

**Note:** Set forth below are the proposed 2003 amendments to the California zero emission vehicle (ZEV) regulation. The text of the originally proposed amendments is shown in underline to indicate additions and ~~strikeout~~ to indicate deletions, compared to the preexisting regulatory language. The staff's suggested modifications to the original proposal are shown in double underline to indicate additions and ~~double strike-out~~ to indicate deletions.

1. Amend California Code of Regulations, title 13, section 1962 to read as follows:

**§ 1962. Zero-Emission Vehicle Standards for ~~2003~~ 2005 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.**

(a) *ZEV Emission Standard.* The Executive Officer shall certify new ~~2003~~ 2005 and subsequent model passenger cars, light-duty trucks and medium-duty vehicles as ZEVs if the vehicles produce zero exhaust emissions of any criteria pollutant (or precursor pollutant) under any and all possible operational modes and conditions. Incorporation of a fuel-fired heater shall not preclude a vehicle from being certified as a ZEV provided: (1) the fuel-fired heater cannot be operated at ambient temperatures above 40°F, (2) the heater is demonstrated to have zero fuel evaporative emissions under any and all possible operational modes and conditions, and (3) the emissions of any pollutant from the fuel-fired heater when operated at an ambient temperature between 68°F and 86°F do not exceed the emission standard for that pollutant for a ULEV under section 1961(a)(1).

A vehicle that would meet the emissions standards for a ZEV except that it uses a fuel-fired heater that can be operated at ambient temperatures above 40°F, that cannot be demonstrated to have zero fuel evaporative emissions under any and all possible operation modes and conditions, or that has emissions of any pollutant exceeding the emission standard for that pollutant for a ULEV under section 1961(a)(1), shall be certified based on the emission level of the fuel-fired heater.

(b) *Percentage ZEV Requirements.*

(1) *General Percentage ZEV Requirement.*

(A) *Basic Requirement.* The minimum percentage ZEV requirement for each manufacturer is listed in the table below as the percentage of the PCs and LDT1s, and LDT2s to

the extent required by section (b)(1)(C), produced by the manufacturer and delivered for sale in California that must be ZEVs, subject to the conditions in this section 1962(b).

| *Model Years* | *Minimum ZEV Requirement* |
|---|---|
| ~~2003~~ 2005 through 2008 | 10 percent |
| 2009 through 2011 | 11 percent |
| 2012 through 2014 | 12 percent |
| 2015 through 2017 | 14 percent |
| 2018 and subsequent | 16 percent |

(B) *Calculating the Number of Vehicles to Which the Percentage ZEV Requirement is Applied.* A manufacturer's volume of PCs and LDT1s produced and delivered for sale in California will be averaged for the 1997, 1998, and 1999 model years to determine the California PC and LDT1 production volume for the model year ~~2003 to~~ 2005 ZEV requirements. For subsequent three-year periods following model years ~~2003 to~~ 2005, a manufacturer's California production volume of PCs and LDT1s, and LDT2s as applicable, will be based on a three-year average of the manufacturer's volume of PCs and LDT1s, and LDT2s as applicable, produced and delivered for sale in California in the prior fourth, fifth and sixth years (e.g. 2006 to 2008 model-year ZEV requirements will be based on California production volumes of PCs and LDT1s, and LDT2s as applicable, for 2000 to 2002 model years). This production averaging is used to determine ZEV requirements only, and has no effect on a manufacturer's size determination. As an alternative to the three year averaging of prior year production described above, a manufacturer may during model year 2005 or the first model year of a subsequent three year period elect to base its ZEV obligation on the number of PCs and LDT1s, and LDT2s to the extent required by section (b)(1)(C), produced by the manufacturer and delivered for sale in California that same year. If a manufacturer elects to use this method after model year 2005 it must be used for each year of the three-year period. In applying the ZEV requirement, a PC, LDT1, or LDT2 (beginning in the 2007 model year) that is produced by a small volume manufacturer, but is marketed in California by another manufacturer under the other manufacturer's nameplate, shall be treated as having been produced by the marketing manufacturer.

(C) *Phase-in of ZEV Requirements for LDT2s.* Beginning with the ZEV requirements for the 2007 model year, a manufacturer's LDT2 production shall be included in determining the manufacturer's overall ZEV requirement under section (b)(1)(A) in the increasing percentages shown the table below.

| *2007* | *2008* | *2009* | *2010* | *2011* | *2012+* |
|---|---|---|---|---|---|
| 17% | 34% | 51% | 68% | 85% | 100% |

(D) *Exclusion of ZEVs in ~~d~~Determining a ~~m~~Manufacturer's ~~s~~Sales ~~v~~Volume.* In calculating for purposes of sections 1962(b)(1)(B) and 1962(b)(1)(C) the volume of PCs, LDT1s and LDT2s a manufacturer has produced and delivered for sale in California, the manufacturer shall exclude the number of ZEVs produced by the manufacturer, or by a

subsidiary in which the manufacturer has a greater than 50% ownership interest, and delivered for sale in California.

(2) *Requirements for Large Volume~~, Intermediate Volume, Independent Low Volume, and Small Volume~~ Manufacturers.*

(A) *Primary Requirements for Large Volume Manufacturers.*

~~1.~~ ~~*Model Years 2005-2008.*~~ In the ~~2003~~ 2005 through 2008 model years, a large-volume manufacturer must meet at least ~~20%~~ ~~10%~~ 20% of its ZEV requirement with ZEVs or ZEV credits generated by such vehicles, and at least another ~~20%~~ ~~30%~~ 20% with ZEVs, advanced technology PZEVs, or credits generated by such vehicles. The remainder of the large-volume manufacturer's ZEV requirement may be met using PZEVs or credits generated by such vehicles.

~~2.~~ ~~*Model Years 2009-2011.* In 2009 through 2011 model years, the maximum portion of a large volume manufacturer's 11% percentage ZEV requirement that may be satisfied by 0.2 allowance PZEVs, or credits generated by such vehicles, is limited to 6% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume. The maximum portion of the ZEV requirement that may be satisfied by advanced technology PZEVs, or credits generated by such vehicles, is limited to 3.75% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume. The 1.25% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume that remains must be met only with ZEVs or credits generated by ZEVs.~~

~~3.~~ ~~*Model Years 2012 and subsequent.*~~ As the ZEV requirement increases over time ~~(from 10%~~ from ~~12%~~ 10% in model year ~~2003~~ ~~2012~~ 2003 to 16% in model years 2018 and subsequent~~)~~), the maximum portion of ~~the~~ a large volume manufacturer's percentage ZEV requirement that may be satisfied by ~~0.2 allowance~~ PZEVs that are not advanced technology PZEVs, or credits generated by such vehicles, is limited to 6% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume; advanced technology PZEVs or credits generated by such vehicles may be used to meet up to one-half of the manufacturer's remaining ZEV requirement.

(B) *Optional Requirements for Large Volume Manufacturers.*

1. *Minimum Floor for Production of Type III ZEVs.*

a. *Requirement.* A large volume manufacturer electing to be subject to the optional compliance requirements during model years 2005 through 2008 must produce, deliver for sale, and place in service in California enough 2001-2008 model-year Type III ZEVs to generate ZEV credits sufficient to meet a cumulative percentage ZEV requirement of 1.09 percent of the manufacturer's average annual California sales of PCs and LDT1s over the five year period from model years 1997 through 2001, or submit an equivalent number of credits generated by such vehicles. Any additional credits for transportation systems generated in

accordance with section 1962(g)(5) shall not be counted towards compliance with this section 1962(b)(2)(B)1.

b. *Failure to Meet Requirement for Production of Type III ZEVs.* A manufacturer that, after electing to be subject to the optional requirements in section 1962(b)(2)(B) for any model year from 2005 through 2008, fails to meet the requirement in section 1962(b)(2)(B)1.a. by the end of the 2008 model year, shall be treated as subject to the primary requirements in section 1962(b)(2)(A) for all model years from 2005 through 2008.

2. *Compliance With Percentage ZEV Requirements.* In 2005 through 2008 model years, a large volume manufacturer electing to be subject to the optional compliance requirements in a given model year must meet at least 40 percent of its ZEV requirement for that model year with ZEVs, advanced technology PZEVs, or credits generated from such vehicles. The remainder of the large volume manufacturer's ZEV requirement may be met using PZEVs or credits generated from such vehicles. As the ZEV requirement increases over time from 11% in model year 2009 to 16% in model years 2018 and subsequent, the maximum portion of the large volume manufacturer's percentage ZEV requirement that may be satisfied by PZEVs that are not advanced technology PZEVs, or credits generated by such vehicles, is limited to 6% of the manufacturer's applicable California PC, LDT1, and LDT2 production volume; ZEVs, advanced technology PZEVs, or credits generated by such vehicles may be used to meet the manufacturer's remaining ZEV requirement.

(C) *Election of the Primary or Optional Requirements for Large Volume Manufacturers.* A large volume manufacturer shall be subject to the primary ZEV requirements for the 2005 model year unless it notifies the Executive Officer in writing prior to the start of the 2005 model year that it is electing to be subject to the optional compliance requirements for that model year. Thereafter, a manufacturer shall be subject to the same compliance option as applied in the previous model year unless it notifies the Executive Officer in writing prior to the start of a new model year that it is electing to switch to the other compliance option for that new model year. However, a large volume manufacturer that has previously elected to be subject to the primary ZEV requirements for model years 2005, 2006 or 2007 may prior to the end of the 2008 model year elect to become subject to the optional compliance requirements for model years 2005 through 2008 upon a demonstration that it has complied with the requirements in section 1962(b)(2)(B)1.a. If a large volume manufacturer elects to be subject to the optional compliance requirements in section 1962(b)(2)(B) for any model year from 2005 through 2008, it shall be subject to the full floor requirements in section 1962(b)(2)(B)1.

(D) *Use of Credits from Model Year 2003-2004 PZEVs.* A large volume manufacturer may produce, and deliver for sale in California, model year 2003 or 2004 PZEVs that generate credits exceeding the number of credits equal to 6 percent of the average annual volume of 1997, 1998 and 1999 PCs and LDT1s produced and delivered for sale in California by the manufacturer. In that event, the manufacturer may use those excess credits as AT PZEV credits in the 2005 and 2006 model years.

~~(B)~~(3) *Requirements for Intermediate Volume Manufacturers.* In the ~~2003~~ 2005 and subsequent model years, an intermediate volume manufacturer may meet its ZEV requirement with up to 100 percent partial ZEV allowance vehicles or credits generated by such vehicles.

~~(C)~~(4) *Requirements for Small Volume Manufacturers and Independent Low Volume Manufacturers.* A small volume manufacturer or an independent low volume manufacturer is not required to meet the percentage ZEV requirements. However, a small volume manufacturer or an independent low volume manufacturer may earn and market credits for the ZEVs or PZEVs it produces and delivers for sale in California.

~~(3)~~(5) *Counting ZEVs and PZEVs in Fleet Average NMOG Calculations.* For the purposes of calculating a manufacturer's fleet average NMOG value and NMOG credits under sections 1960.1(g)(2) and 1961(b) and (c), a vehicle certified as a ZEV is counted as one ZEV, and a PZEV is counted as one SULEV certified to the 150,000 mile standards regardless of any ZEV or PZEV multipliers.

~~(4)~~(6) *Implementation Prior to ~~2003~~ 2005 Model Year.* Prior to the ~~2003~~ 2005 model year, a manufacturer that voluntarily produces vehicles meeting the ZEV emission standards applicable to ~~2003~~ 2005 and subsequent model year vehicles may certify the vehicles to those standards and requirements for purposes of calculating fleet average NMOG exhaust emission values and NMOG credits under sections 1960.1(g)(2) and 1961(b) and (c), and for calculating ZEV credits as set forth in section 1962(d).

~~(5)~~(7) *Changes in Small Volume, Independent Low Volume, and Intermediate Volume Manufacturer Status.*

(A) *Increases in California Production Volume.* In the 2003 and subsequent model years, if a small volume manufacturer's average California production volume exceeds 4,500 units of new PCs, LDTs, and MDVs based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, or if an independent low volume manufacturer's average California production volume exceeds 10,000 units of new PCs, LDTs, and MDVs based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, or if an intermediate volume manufacturer's average California production volume exceeds 60,000 units of new PCs, LDTs, and MDVs based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, the manufacturer shall no longer be treated as a small volume, independent low volume, or intermediate volume manufacturer, as applicable, and shall comply with the ZEV requirements for independent low volume, intermediate volume or large volume manufacturers, as applicable, beginning with the sixth model year after the last of the three consecutive model years. The lead time shall be four rather than six years where a manufacturer ceases to be a small or intermediate volume manufacturer in the 2003 or subsequent years due to the aggregation requirements in majority ownership situations, except that if the majority ownership in the manufacturer was acquired prior to the 2001 model year, the manufacturer must comply with the stepped-up ZEV requirements starting in the 2010 model year.

(B) *Decreases in California Production Volume.* If a manufacturer's average California production volume falls below 4,500, 10,000 or 60,000 units of new PCs, LDTs, and MDVs, as applicable, based on the average number of vehicles produced and delivered for sale for the three previous consecutive model years, the manufacturer shall be treated as a small volume, independent low volume, or intermediate volume manufacturer, as applicable, and shall be subject to the requirements for a small volume, independent low volume, or intermediate volume manufacturer beginning with the next model year. In determining small volume manufacturer status, vehicles produced by one manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as part of the California production volume of the sales of the marketing manufacturer.

(C) *Calculating California Production Volume in Change of Ownership Situations.* Where a manufacturer experiences a change in ownership in a particular model year, the change will affect application of the aggregation requirements on the manufacturer starting with the next model year. The manufacturer's small or intermediate volume manufacturer status for the next model year shall be based on the average California production volume in the three previous consecutive model years of those manufacturers whose production volumes must be aggregated for that next model year. For example, where a change of ownership during the 2004 model year results in a requirement that the production volume of Manufacturer A be aggregated with the production volume of Manufacturer B, Manufacturer A's status for the 2005 model year will be based on the production volumes of Manufacturers A and B in the 2002-2004 model years. Where the production volume of Manufacturer A must be aggregated with the production volumes of Manufacturers B and C for the 2004 model year, and during that model year a change in ownership eliminates the requirement that Manufacturer B's production volume be aggregated with Manufacturer A's, Manufacturer A's status for the 2005 model year will be based on the production volumes of Manufacturers A and C in the 2002-2004 model years. In either case, the lead time provisions in section 1962(b)(5)(A) and (B) will apply.

(c) *Partial ZEV Allowance Vehicles (PZEVs).*

(1) *Introduction.* This section 1962(c) sets forth the criteria for identifying vehicles delivered for sale in California as PZEVs. A PZEV is a vehicle that cannot be certified as a ZEV but qualifies for a PZEV allowance of at least 0.2.

(2) *Baseline PZEV Allowance.* In order for a vehicle to be eligible to receive a PZEV allowance, the manufacturer must demonstrate compliance with all of the following requirements. A qualifying vehicle will receive a baseline PZEV allowance of 0.2.

(A) *SULEV Standards.* Certify the vehicle to the 150,000-mile SULEV exhaust emission standards for PCs and LDTs in section 1961(a)(1) (for model years 2003 through 2006, existing SULEV intermediate in-use compliance standards shall apply to all PZEVs). Bi-fuel, fuel-flexible and dual-fuel vehicles must certify to the applicable 150,000-mile SULEV exhaust emission standards when operating on both fuels;

(B) *Evaporative Emissions.* Certify the vehicle to the evaporative emission standards in section 1976(b)(1)(E) ("zero" evaporative emissions standards);

(C) *OBD.* Certify that the vehicle will meet the applicable on-board diagnostic requirements in section 1968.1 for 150,000 miles; and

(D) *Extended Warranty.* Extend the performance and defects warranty period set forth in sections 2037(b)(2) and 2038(b)(2) to 15 years or 150,000 miles, whichever occurs first.~~, For HEVs that are advanced technology PZEVs, the traction battery must be included as a warranty item.~~ except that the time period is to be 10 years for a zero emission energy storage device used for traction power (such as a battery, ~~an~~ ultracapacitor, or ~~a hydraulic, pneumatic and hydrogen~~ other electric storage device ) ~~other than the device's on-board diagnostic elements~~.

(3) *Zero-Emission VMT PZEV Allowance.*

(A) *Calculation of Zero Emission VMT Allowance.* A vehicle that meets the requirements of section 1962(c)(2) and has zero-emission vehicle miles traveled ("VMT") capability will generate an additional zero emission VMT PZEV allowance calculated as follows:

| *Urban All-Electric Range* | *Zero-emission VMT Allowance* |
|---|---|
| < 10 miles | 0.0 |
| 10 miles to ~~120~~ 90 miles | (~~10~~ 33.8 + [0.5 x Urban AER])/35 |
| >~~120~~ 90 miles | ~~2.0~~ 2.25 |

The urban all-electric range shall be determined in accordance with section E.3.(2)(a) of the "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," incorporated by reference in section 1962(h).

(B) *Alternative Procedures.* As an alternative to determining the zero-emission VMT allowance in accordance with the preceding section 1962(c)(3)(A), a manufacturer may submit for Executive Officer approval an alternative procedure for determining the zero-emission VMT potential of the vehicle as a percent of total VMT, along with an engineering evaluation that adequately substantiates the zero-emission VMT determination. For example, an alternative procedure may provide that a vehicle with zero-emissions of one regulated pollutant (e.g. NOx) and not another (e.g. NMOG) will qualify for a zero-emission VMT allowance of ~~one-half that of a vehicle with zero emissions of all regulated pollutants~~ 1.5.

(C) *Additional Allowances for Qualifying HEVs.* The Executive Officer shall approve an additional 0.1 zero-emission VMT partial ZEV allowance for an HEV with an all-electric range if the manufacturer demonstrates to the reasonable satisfaction of the Executive

Officer that the HEV is equipped with software and/or other strategies that would promote maximum use of off-vehicle charging, and that the strategies employed are reasonably reliable and tamper-proof.

(4) *PZEV Allowance for Advanced ZEV Componentry.* A vehicle that meets the requirements of section 1962(c)(2) ~~but does not qualify for any zero-emission VMT PZEV allowance under section 1962(c)(3)~~ may qualify for an advanced componentry PZEV allowance as provided in this section 1962(c)(4).

(A) *Use of High Pressure Gaseous Fuel or Hydrogen Storage System.* A vehicle equipped with a high pressure gaseous fuel storage system capable of refueling at 3600 pounds per square inch or more and operating exclusively on this gaseous fuel shall qualify for an advanced componentry PZEV allowance of ~~0.1~~ 0.2. A vehicle ~~fueled~~ capable of operating exclusively ~~by~~ on hydrogen stored in a high pressure system capable of refueling at 3600 pounds per square inch or more, or stored in nongaseous form, shall ~~also~~ instead qualify for an advanced componentry PZEV allowance of ~~0.1~~ ~~0.2~~ 0.3.

(B) ~~*Other Advanced ZEV Componentry*~~ *Use of a Qualifying HEV Electric Drive System.*

~~1. *Qualification for Allowance.* A vehicle shall qualify for an additional advanced componentry allowance of 0.4 in the 2003 through 2011 model years, and 0.35 in the 2012 and subsequent model years, if the manufacturer demonstrates to the reasonable satisfaction of the Executive Officer that the vehicle is equipped with advanced ZEV componentry such as an advanced battery integral to the operation of the vehicle power train or an electric power train and qualifies under one of the two methods listed below. The allowance earned by a vehicle shall be calculated according to one of the following methods, as elected by the manufacturer:~~

~~a. The maximum system power output available from the electrical storage device divided by the sum of the electrical storage device and the SAE net power of the heat engine is greater than 13%; or~~

~~b. The maximum system power output available from the electrical storage device divided by the sum of the electrical storage device and the SAE net power of the heat engine is greater than 8% and the maximum power rating of the zero emission drive system is at least 10 kilowatts.~~

1. *Criteria for Low Voltage, High Voltage, and High Voltage/High Power HEVs.* The criteria for a low voltage, a high voltage, and a high voltage/high power HEV are as follows:

| *Characteristics* | *Low Voltage HEV* | *High Voltage HEV* | *High Voltage/ High Power HEV* |
|---|---|---|---|
| Traction Drive System Voltage | < 60 Volts | >= 60 Volts | >= 60 Volts |
| Rated Peak Power of Electric Drive System | >= 4 kW | >= 10 kW | >= 50 kW |
| Traction Drive Boost | Yes | Yes | Yes |
| Regenerative Braking | Yes | Yes | Yes |
| Idle Start/Stop | Yes | Yes | Yes |

2. *Low Voltage HEVs.* A 2008 or earlier model-year PZEV that the manufacturer demonstrates to the reasonable satisfaction of the Executive Officer meets all of the criteria for a low voltage HEV does not receive an additional allowance for meeting those criteria but generates credits that may be used in the AT PZEV category through the 2008 model year.

3. *High Voltage HEVs.* A vehicle that the manufacturer demonstrates to the reasonable satisfaction of the Executive Officer meets all of the criteria for a high voltage HEV qualifies for an additional advanced componentry allowance of 0.4 in the 2003 through 2011 model years, 0.35 in the 2012 through 2014 model years, and 0.25 in the 2015 and subsequent model years.

4. *High Voltage/High Power HEVs.* A vehicle that the manufacturer demonstrates to the reasonable satisfaction of the Executive Officer meets all of the criteria for a high voltage/high power HEV qualifies for an additional advanced componentry allowance of 0.5 in the 2003 through 2011 model years, 0.45 in the 2012 through 2014 model years, and 0.35 in the 2015 and subsequent model years.

~~2~~5. *Severability.* In the event that ~~one of the two methods in~~ all or part of section 1962(c)(4)(B)1.-4. is found invalid, the remainder of section 1962, including the remainder of section 1962(c)(4)(B)1.-.4. if any, remains in full force and effect. ~~In the event that both of the two methods in section 1962(c)(4)(B)1. are found invalid, the remainder of section 1962 without section 1962(c)(4)(B)1. remains in full force and effect.~~

~~1. *$CO_2$ Reduction Method.*~~

~~a. *General.* A vehicle whose operation results in reduced $CO_2$ emissions as compared to the average vehicle in its class may qualify for an additional advanced componentry allowance in accordance with this section (c)(4)(B)1. The vehicle's class is determined in accordance with section 1962(e)(3).~~

~~b. *Equation for Determining Additional Allowance.* The following equation is used to calculate the additional allowance, provided that in order to earn any additional allowance, the $CO_2$ Savings must be at least 39,000:~~

~~Advanced Componentry Allowance = $CO_2$ Savings ÷ 250,000~~

~~Where: $CO_2$ Savings = (Class Average $CO_2$ Production) – (Vehicle $CO_2$ Production)~~
~~Vehicle $CO_2$ Production = (150,000 ÷ CMPEG) × 19.564~~
~~CMPEG is determined in accordance with section (e)(2)~~
~~Class Average $CO_2$ Production for the 2000-2007 model years is determined using the following table:~~

| ~~*Vehicle Class*~~ | ~~*Class Average $CO_2$ Production, 2000-2007 MY*~~ |
|---|---|
| ~~Subcompact PC~~ | ~~95,902~~ |
| ~~Compact PC~~ | ~~96,533~~ |
| ~~Midsize PC~~ | ~~108,689~~ |
| ~~Large PC~~ | ~~114,633~~ |
| ~~Small Truck~~ | ~~117,384~~ |
| ~~Medium Truck~~ | ~~137,131~~ |
| ~~Large Truck~~ | ~~161,242~~ |

~~Class Average CO2 Production for the 2008-2014 model years is determined in accordance with the following equation:~~

~~Class Average CO2 Production = (150,000 / Baseline Fuel Economy for model years 2008-2014) × 19.564~~

~~Where: Baseline Fuel Economy for model years 2008-2014 means Baseline Fuel Economy for either the 2008-2011 or 2012-2014 model years, as applicable, as determined in accordance with section (e)(5).~~

~~c. *Alternative Method for Determining $CO_2$ Savings of a Vehicle That Is Not Gasoline Fueled.* For purposes of the equation in section (e)(4)(B)1.b., the Executive Officer shall approve an alternative method for determining $CO_2$ savings of a vehicle that is not gasoline-fueled, if the manufacturer submits the alternative method with an engineering evaluation that demonstrates to the reasonable satisfaction of the Executive Officer that the alternative method fairly represents the $CO_2$ impacts of the vehicle.~~

~~2. *Alternative Efficiency Method.* A manufacturer may elect to have a vehicle's additional advanced componentry allowance determined according to the Efficiency Method, in which case the allowance shall be determined in accordance with the following equation:~~

~~Advanced Componentry Allowance = ((CMPEG / (1.3 * Baseline Fuel Economy)) – 1) * 0.5~~

~~Where: CMPEG is determined in accordance with section (e)(2).~~
~~Baseline Fuel Economy is determined in accordance with section (e)(4).~~

~~A vehicle earning an Efficiency Method advanced componentry allowance of less than zero pursuant to this subsection will be treated as having an Efficiency Method advanced componentry allowance of zero.~~

~~3. *Alternative Percent Peak Power Method For the 2000-2007 Model Years.* For the 2000-2007 model years only, a manufacturer may elect to have a vehicle's additional advanced componentry allowance determined using the Percent Peak Power method, in which case the allowance shall be determined in accordance with the following equation:~~

~~Advanced Componentry Allowance = Percentage of "maximum available power" from the electric storage device~~

~~Where: Percentage of "maximum available power" means the maximum system power output available from the electrical storage device divided by the sum of the electrical storage device and the SAE net power of the heat engine.~~

~~In order to earn any score using the Percent Peak Power method a vehicle must be able to recover kinetic energy through regenerative braking and provide at least 13 percent of "maximum available power" from the electrical storage device.~~

(5) *PZEV Allowance for Low Fuel-Cycle Emissions.* A vehicle that uses fuel(s) with very low fuel-cycle emissions shall receive a PZEV allowance not to exceed ~~0.2~~ 0.3 (0.15 in the case of an HEV that uses for propulsion any fuel that does not have very low fuel-cycle emissions). In order to receive the fuel-cycle PZEV allowance, a manufacturer must demonstrate to the Executive Officer, using peer-reviewed studies or other relevant information, that NMOG emissions associated with the fuel(s) used by the vehicle (on a grams/mile basis) are lower than or equal to 0.01 grams/mile. Fuel-cycle emissions must be calculated based on near-term production methods and infrastructure assumptions, and the uncertainty in the results must be quantified. The fuel-cycle PZEV allowance is calculated according to the following formula:

PZEV Fuel Cycle Allowance = ~~0.2~~ 0.3 x [(percent of VMT using fuel(s) meeting the requirements of the preceding paragraph) / 100]

A manufacturer's demonstration to the Executive Officer that a vehicle qualifies for a fuel-cycle PZEV allowance shall include test results and/or empirical data supporting the estimate of the relative proportion of VMT while operating on fuel(s) with very low fuel-cycle emissions.

(6) *Combined ZEV Allowance.*

(A) *Calculation of Combined ZEV Allowance for a Vehicle.* The combined PZEV allowance for a qualifying vehicle in a particular model year is the sum of the PZEV allowances listed in this section 1962(c)(6), multiplied by any PZEV introduction phase-in multiplier ~~or PZEV high-efficiency multiplier~~ listed in section 1962(c)(7) ~~(if a 2002 through 2005 model-year PZEV qualifies for both multipliers listed in section 1962(c)(7), the product of the two multipliers is used as the PZEV multiplier)~~, subject to the cap in section 1962(c)(6)(B) for ~~2002~~ 2012 and subsequent model-year vehicles.

~~(A)~~ 1. *Baseline PZEV Allowance.* The baseline PZEV allowance of 0.2 for vehicles meeting the criteria in section 1962(c)(2);

~~(B)~~ 2. *Zero-Emission VMT PZEV Allowance.* The zero-emission VMT PZEV allowance, if any, determined in accordance with section 1962(c)(3);

~~(C)~~ 3. *Advanced Componentry PZEV Allowance.* The advanced ZEV componentry ZEV allowance, if any, determined in accordance with section 1962(c)(4); and

~~(D)~~ 4. *Fuel-Cycle Emissions PZEV Allowance.* The fuel-cycle emissions ZEV allowance, if any, determined in accordance with section 1962(c)(5).

(B) *Cap for 2012 and Subsequent Model-Year Vehicles.* The maximum value of AT PZEV allowances a 2012 and subsequent model-year vehicle may earn, including the baseline PZEV allowance, is 3.0.

(7) *PZEV Multipliers.*

(A) *PZEV Introduction Phase-In Multiplier.* Each 2000 through 2005 model-year PZEV that is produced and delivered for sale in California, other than a PZEV qualifying for a phase-in multiplier under section 1962(c)(7)(B), qualifies for a PZEV introduction phase-in multiplier as follows:

| | *MY 2000-2003* | *MY 2004* | *MY 2005* |
|---|---|---|---|
| Multiplier | 4.0 | 2.0 | 1.33 |

~~(B)~~ ~~*AT PZEV High-Efficiency Multiplier.* An AT PZEV qualifies for a full high-efficiency multiplier in accordance with section 1962(e) starting with the 2002 model year.~~

~~(C)~~ (B) *Introduction Phase-In Multiplier for PZEVs ~~with > 10 Mile~~ That Earn a Zero Emission ~~Range~~ VMT Allowance.* Each 2000 through 2011 model year PZEV ~~with > 10~~

~~miles~~ that earns a zero emission ~~range~~ VMT allowance under section 1962(c)(3) and is produced and delivered for sale in California qualifies for a phase-in multiplier as follows:

| | *MY 2000-~~2007~~-2008* | *MY ~~2008~~-2009-2011* | *~~MY 2010-2011~~* |
|---|---|---|---|
| Multiplier | ~~2.0~~ 6.0 | ~~1.5~~ 3.0 | ~~1.25~~ |

(d) *Qualification for ZEV Multipliers and Credits.*

(1) *1996-1998 Model-Year ZEV Multipliers.*

(A) *1996-1998 Model-Year ZEV Multiplier Based on Vehicle Range.* 1996-1998 model-year ZEVs shall qualify for a ZEV multiplier based on vehicle range as follows:

| *ZEV Multiplier* | *Vehicle Range (miles)* | |
|---|---|---|
| | *Model Years 1996 and 1997* | *Model Year 1998* |
| 2 | any | ≥100 |
| 3 | ≥70 | ≥130 |

Range shall be determined in accordance with section 9.f.(2)(a) of the "California Exhaust Emission Standards and Test Procedures for 1988 Through 2000 Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," incorporated by reference in section 1960.1(k).

(B) *1996-1998 Model-Year ZEV Multiplier Based on Specific Energy of Battery.* 1996-1998 model-year ZEVs shall qualify for a ZEV multiplier based on specific energy of the battery as follows:

| *ZEV Multiplier* | *Specific Energy of Battery (w-hr/kg)* |
|---|---|
| 2 | any |
| 3 | ≥40 |

(C) *Election of Multiplier.* A 1996-1998 model-year ZEV may qualify for a ZEV multiplier according to section 1962(d)(1)(A) or section 1962(d)(1)(B), but not both.

(2) *1999-2000 Model-Year ZEV Multiplier Calculation for Extended Electric Range Vehicles.* Each ZEV that is produced and delivered for sale in California in the 1999-2000 model years and that has an extended electric range shall qualify for a ZEV multiplier as follows:

| *All-electric range* | *MY 1999-2000* |
|---|---|
| 100-175 | 6-10 |

ZEV multipliers under the above schedule will be determined by linear interpolation between the values shown in the above schedule. Range shall be determined in accordance with Section E.3.(2)(a) of the "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," incorporated by reference in section 1962(h). ZEVs that have a refueling time of less than 10 minutes and a range of 100 miles or more shall be counted as having unlimited all-electric range, and shall consequently earn the maximum allowable ZEV multiplier for a specific model year. ZEVs that have a range of 80 to 99 miles shall qualify for ZEV multipliers in the 1999-2000 model years in accordance with the following equation:

ZEV multiplier = (6) x (AER equivalent to a 10 minute recharge/100) x 0.5.

As an option to the above mechanism, the manufacturer of a 1999 model-year ZEV may elect to have its multiplier based on the regulatory requirements pertaining to multipliers based on range or specific energy in section 1960.1(g)(2) and (h)(2), title 13, California Code of Regulations that were applicable to 1999 model-year ZEVs immediately before this section 1962 became operative on November 27, 1999 as a result of the "LEV II" rulemaking.

(3) *ZEV Multipliers for 2001-2002 ~~and Subsequent~~ Model Years.*

(A) *ZEV Phase-In Multiplier.* Each 2001 ~~to 2005~~ and 2002 model-year ZEV that is placed in service in California by ~~April 15~~ September 30, 2003 qualifies for a ZEV phase-in multiplier ~~as follows:~~ of 4.0. A 2001 ~~to~~ or 2002 model-year ZEV that is placed in service in California after ~~April 15~~ September 30, 2003 earns credits in accordance with section 1962(d)(5) instead of section 1962(d)(3).

| | ~~*MY 2001-2002*~~ | ~~*MY 2003-2005*~~ |
|---|---|---|
| ~~Multiplier~~ | ~~4.0~~ | ~~1.25~~ |

~~(B) *ZEV Discount Multiplier for NEVs.* Each 2004 and subsequent model-year NEV that is produced and delivered for sale in California is subject to a ZEV discount multiplier for NEVs as follows:~~

| | ~~*MY 2004 - MY 2005*~~ | ~~*MYs 2006 and Subsequent*~~ |
|---|---|---|
| ~~Discount Multiplier~~ | ~~0.5~~ | ~~0.15~~ |

~~(C)~~(B) *ZEV Extended Electric Range Multiplier.*

1. *Basic Multiplier Schedule.* Each 2001 and ~~subsequent~~ 2002 model-year ZEV that is placed in service in California and that has an extended urban electric range qualifies for a ZEV extended electric range multiplier as follows:

| *Urban All-Electric Range* | *Multiplier* |
|---|---|
| < 50 miles | 1 |
| > 50 miles to < 275 miles | (Urban AER-25)/25 |
| > 275 miles | 10 |

A NEV is not eligible to earn a ZEV extended electric range multiplier. In determining ZEV range multipliers, specialty ~~electric vehicles~~ ZEVs may, upon Executive Officer approval, be tested at the parameters used to determine the ZEV multipliers for the existing ~~electric vehicle~~ ZEV.

2. *Fast refueling.*

a. *Full Fueling in 10 Minutes or Less.* A ~~2008 and earlier~~ 2001-2002 model-year ZEV with the demonstrated capability to accept fuel or electric charge until achieving at least 95% SOC or rated fuel capacity in 10 minutes or less when starting from all operationally allowable SOC or fuel states is counted as having unlimited zero emission range and qualifies for the maximum allowable ZEV extended electric range multiplier.

b. *At Least 60-Mile Range in Less Than 10 Minutes.* A ~~2008 and earlier~~ 2001-2002 model year ZEV with the demonstrated capacity to accept fuel or electric charge equivalent to at least 60 miles of UDDS range when starting from 20% SOC in less than 10 minutes is counted as having 60 additional miles (up to a 275 mile maximum) of UDDS range in the range multiplier determination in section 1962(d)(3)(C)1.

~~3. *Multiplier Phase Down.* Starting with the 2005 model year, the ZEV extended electric range multiplier is phased down to 0.15 of its value in accordance with section 1962(e)(6).~~

~~(D)~~(C)*Combined ZEV Multiplier.* ~~Starting with~~ During the 2001-2002 model years, the combined ZEV multiplier for each ZEV in a specific model year is the product of:

1. The ZEV phase-in multiplier if any as set forth in section 1962(d)(3)(A), times

~~2. In the case of a NEV, the ZEV discount multiplier for NEVs if any as set forth in section 1962(d)(3)(B), times~~

~~3~~2. The extended electric range multiplier if any as set forth in section 1962(d)(3)~~(C)~~(B)~~, times~~.

~~4. The high efficiency multiplier if any as set forth in section 1962(e).~~

(4) ~~(E)~~ *Effect of ZEV Multipliers in the 1996-2002 Model Years.* In calculating the number of ZEVs produced and delivered for sale in California by a manufacturer in ~~a~~ the 1996-2002 model years and the ZEV credits from such vehicles, the number of ZEVs qualifying for a particular ZEV multiplier shall be multiplied by the combined ZEV multiplier.

(5) *ZEV Credits for 2003 and Subsequent Model Years.*

(A) *ZEV Tiers for Credit Calculations.* Starting in the 2003 model year, ZEV credits from a particular ZEV are based on the assignment of a given ZEV into one of the following five ZEV tiers:

| *ZEV Tier* | *Common Description* | *UDDS ZEV Range* | *Fast Refueling Capability* |
|---|---|---|---|
| NEV | NEV | No minimum | N/A |
| Type 0 | Utility EV | <50 miles | N/A |
| Type I | City EV | >= 50, <100 miles | N/A |
| Type II | Full Function EV | >= 100 miles | N/A |
| Type III | Fuel Cell EV | >= 100 miles | Must be capable of replacing 95% maximum rated energy capacity in <= 10 minutes |

A specialty ZEV that has the same zero emission energy storage device and chassis as an existing ZEV from which it was modified may, upon Executive Officer approval, be categorized on the basis of ~~the~~ that existing ZEV ~~from which it is modified~~. A specialty vehicle that is optimized for a particular duty cycle that conflicts with optimization for maximum vehicle range may be promoted to the next higher ZEV tier upon a determination by the Executive Officer that the specialty vehicle has ZEV componentry equivalent to that utilized by ZEVs in the next tier and would meet the requirements for the next tier if optimized for maximum range.

(B) *ZEV Credits for 2003 and ~~s~~Subsequent ~~m~~Model-~~y~~Year ZEVs.* A 2003 and subsequent model-year ZEV, other than a NEV, earns 1 ZEV credit when it is produced and delivered for sale in California. A 2003 and subsequent model-year ZEV earns additional credits based on the earliest model year in which the ZEV is placed in service (not earlier than the ZEV's model year). The following table identifies the credits that a ZEV in each of the five ZEV tiers will earn, including the credit not contingent on placement in service, if it is placed in service in the specified model year or by ~~March 31~~ June 30 after the end of the specified model year.

| *Tier* | *Model Year in Which ZEV is Placed in Service* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012+* |
| NEV | 1.25 | 0.625 | 0.625 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| Type 0 (Utility) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1 | 1 | 1 | 1 |
| Type 1 (City) | 8 | 8 | 8 | 7 | 7 | 7 | 2 | 2 | 2 | 2 |
| Type II | 12 | 12 | 12 | 10 | 10 | 10 | 3 | 3 | 3 | 3 |
| Type III | 40 | 40 | 40 | ~~15~~ 40 | ~~15~~ 40 | ~~15~~40 | 4 | 4 | 4 | 3 |

(C) *Counting a Type III ZEV Placed in a Section 177 State.* A Type III ZEV that is certified to the California ZEV standards and is placed in service in a state that is administering the California ZEV requirements pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507) applicable for the ZEV's model year may be counted towards compliance with the California percentage ZEV requirements in section 1962(b) as if it were delivered for sale and placed in service in California.

~~(e) *ZEV and Advanced Technology PZEV High Efficiency Multipliers*~~

~~(1) *Eligibility.* Beginning with the 2005 model year for ZEVs and the 2002 model year for advanced technology PZEVs, both ZEVs and advanced technology PZEVs are eligible for a high efficiency multiplier. A NEV is not eligible to earn an efficiency multiplier. A vehicle earning an efficiency multiplier value of less than 1.00 pursuant to section 1962(e)(3) will be treated as having an efficiency multiplier of 1.~~

~~(2) *Calculation of CMPEG Rating.* For all vehicle types, a CMPEG (California miles per equivalent gallon) rating is determined as follows:~~

~~(A) For gasoline-fueled vehicles and HEVs with < 10 mile zero-emission range, CMPEG = Combined Fuel Economy determined in accordance with 40 CFR Part 600 = 1/ [.55 / (EPA city mpg, unadjusted) + .45 / (EPA highway mpg, unadjusted)].~~

~~(B) For BEVs and off-vehicle charge capable HEVs with ≥ 10 mile zero-emission range, CMPEG = [ 33,705 AC whr/gal / (.55 (AC whr/mile UDDS) + .45 (AC whr/mile HFEDS))] where AC whr/ mile values are determined in accordance with section E.3. "Determination of All-Electric Range-Urban," and "Determination of All-Electric Range-Highway" of the "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," as incorporated by reference in section 1962(h). Qualifying HEV CMPEG determination shall be~~

~~based solely on electric mode operating efficiency for vehicles that are able to maintain test cycle speed and time tolerances for the entire zero-emission range test.~~

~~(C) *Alternative Fuel Vehicles.*~~

~~1. For vehicles operating on an alternative fuel other than hydrogen, including CNG or alcohol, CMPEG = Combined Fuel Economy as determined in accordance with 40 CFR Part 600. Alternate fuel vehicle CMPEG shall not be compensated with the federal (1/0.15) "fuel content" factor used in determining average fuel economy.~~

~~2. For vehicles operating on hydrogen, CMPEG shall be determined by converting the combined fuel economy value measured on the basis of miles per kg of hydrogen (MPkg) into CMPEG as follows:~~

~~Hydrogen MPkg x (1.0 kg H2/gallon gasoline) = CMPEG~~

~~(D) For flexible fuel or dual fuel vehicles, CMPEG is the lowest of the federal combined fuel economy values determined for any fuel or fuel mixture on which the vehicle is certified to operate.~~

~~(3) *Vehicle classes.*~~

~~(A) *List of vehicle classes.* Efficiency multipliers will be determined based on assignment of a vehicle to one of the following vehicle classes; interior volume is determined in accordance with SAE Recommended Practice J1100 and U.S. EPA Fuel economy regulations, 40 CFR 600.315-82.~~

| ~~*Vehicle Class*~~ | ~~*Class Description*~~ |
|---|---|
| ~~City Vehicle (effective beginning in 2008 model year)~~ | ~~2 passenger electric vehicle with length < 3 meters~~ |
| ~~Subcompact PC~~ | ~~Interior volume up to 99 ft^3, and not a City Vehicle~~ |
| ~~Compact PC~~ | ~~Interior volume 100-109 ft^3~~ |
| ~~Midsize PC~~ | ~~Interior volume 110-119 ft^3~~ |
| ~~Large PC~~ | ~~Interior volume over 120 ft^3~~ |
| ~~Small Truck~~ | ~~LDT 1~~ |
| ~~Medium Truck~~ | ~~LDT 2~~ |
| ~~Large Truck~~ | ~~LDT 3 & 4~~ |

~~(B) *Assignment of derivative or converted vehicles.* A derivative station wagon shall be placed in the same class as the sedan on which it is based. A minivan shall be placed in the appropriate truck category based on adjusted or adjusted loaded vehicle weight. A derivative or conversion ZEV that shares a production platform.with one or more gasoline engine versions shall be placed in the same class as the smallest or lightest gasoline version of the same platform for that model year.~~

~~(4) *High efficiency multipliers for the 2002-2007 model years.* For model years 2002-2007, the efficiency multiplier for each vehicle class is determined according to the following equation:~~

~~High Efficiency Multiplier = CMPEG / (1.5 * Baseline Fuel Economy)~~

~~Where: Baseline Fuel Economy is determined in accordance with the following table:~~

| ~~*Vehicle Class*~~ | ~~*Baseline Fuel Economy MY 2002-2007*~~ |
|---|---|
| ~~Subcompact PC~~ | ~~30.6~~ |
| ~~Compact PC~~ | ~~30.4~~ |
| ~~Midsize PC~~ | ~~27.0~~ |
| ~~Large PC~~ | ~~25.6~~ |
| ~~Small Truck~~ | ~~25.0~~ |
| ~~Medium Truck~~ | ~~21.4~~ |
| ~~Large Truck~~ | ~~18.2~~ |

~~(5) *High efficiency multipliers for the 2008 and subsequent model years.* For the 2008 and subsequent model years, the efficiency multiplier for each vehicle class is determined in accordance with the following equations:~~

~~For ZEVs and PZEVs with > 10 mile Zero Emission Range: Efficiency multiplier = CMPEG / (2.0 * Baseline Fuel Economy)~~

~~For all other AT PZEVs: Efficiency multiplier = CMPEG / (1.5 * Baseline Fuel Economy)~~

~~Where: *Baseline Fuel Economy* for model years 2008-2011 is the model year 2004 unadjusted combined federal sales-weighted fuel economy for the vehicle class as determined by U.S. EPA. For a City Vehicle, the baseline fuel economy is 45.9.~~

~~*Baseline Fuel Economy* for Model Years 2012-2014 is the model year 2008 unadjusted combined federal sales-weighted fuel economy for the vehicle class as determined by U.S. EPA. For a City Vehicle, the baseline fuel economy is 45.9.~~

~~*Baseline Fuel Economy* for model years 2015 and beyond shall be determined using the same methodology.~~

~~(6) *Phasing in the High Efficiency Multiplier for ZEVs.*~~

~~(A) *Range and Efficiency Phasing Factors.* For ZEVs, the high efficiency multiplier is phased in, and the extended electric range multiplier is phased down to 0.15 of its initial value, using the phasing factors in the following schedule:~~

~~*Range and Efficiency Phasing Factors for Each Model Year*~~

| | ~~2004~~ | ~~2005~~ | ~~2006~~ | ~~2007~~ | ~~2008~~ | ~~2009~~ | ~~2010~~ | ~~2011~~ | ~~2012+~~ |
|---|---|---|---|---|---|---|---|---|---|
| ~~Range~~ | ~~1.000~~ | ~~0.825~~ | ~~0.600~~ | ~~0.450~~ | ~~0.300~~ | ~~0.250~~ | ~~0.200~~ | ~~0.200~~ | ~~0.150~~ |
| ~~Efficiency~~ | ~~0.000~~ | ~~0.100~~ | ~~0.350~~ | ~~0.550~~ | ~~0.600~~ | ~~0.700~~ | ~~0.800~~ | ~~0.800~~ | ~~0.825~~ |

~~(B) *Application of the Range and Efficiency Phasing Factors.* The range and efficiency phasing factors are applied as follows:~~

~~Phased range multiplier = ((range multiplier − 1) × range phasing factor) + 1~~

~~Phased efficiency multiplier = ((efficiency multiplier − 1) × efficiency phasing factor) + 1~~

(f) *In-Service Warranty Multiplier for 2001-2004 Model-Year ZEVs and PZEVs With ≥ 10 Mile Zero Emission Range.* Except in the case of a NEV, an additional ZEV or PZEV multiplier will be earned ~~for the~~ by a 2001 through ~~2011~~ 2004 model-year~~s~~ ~~by a~~ ZEV, or ~~a~~ PZEV with ≥ 10 mile zero emission range, whose zero-emission energy storage or conversion system is under an original warranty from the vehicle manufacturer beyond three years of service and is registered for operation on public roads in California. ~~For the 2001 through 2007 model years, a~~ The manufacturer will receive 0.1 times the ZEV credit that would be earned by the vehicle if it were leased or sold new in that year, including multipliers, on a year-by-year basis beginning in the fourth year after the vehicle is initially placed in service. ~~For the 2008 through 2011 model years, a manufacturer will receive 0.05 times the ZEV credit earned by the vehicle if it were leased or sold new in that year, including multipliers, on a year-by-year basis beginning in the fourth year.~~ The warranty multiplier is reported and earned in the year following each continuous year of service. ZEVs, other than NEVs, re-leased prior to January 25, 2001 for a period beyond three years of service will earn an additional ZEV multiplier of 0.1 times the ZEV credit earned by the vehicle if it were leased or sold new in that year, including multipliers, for each additional year that they are in service and registered for operation on public roads in California. Such vehicles are not required to have the zero emission energy storage or conversion system under an original warranty from the vehicle manufacturer.

(g) *Generation and Use of ZEV Credits; Calculation of Penalties*

(1) *Introduction.* A manufacturer that produces and delivers for sale in California ZEVs or PZEVs in a given model year exceeding the manufacturer's ZEV requirement set forth in section 1962(b) shall earn ZEV credits in accordance with this section 1962(g).

(2) *ZEV Credit Calculations.*

(A) *Credits from ZEVs.* The amount of g/mi ZEV credits earned by a manufacturer in a given model year from ZEVs shall be expressed in units of g/mi NMOG, and shall be equal to the number of credits from ZEVs produced and delivered for sale in California that the manufacturer applies towards meeting the ZEV requirements for the model year subtracted from the number of ZEVs produced and delivered for sale in California by the

manufacturer in the model year and then multiplied by the NMOG fleet average requirement for PCs and LDT1s for that model year.

(B) *Credits from PZEVs.* The amount of g/mi ZEV credits from PZEVs earned by a manufacturer in a given model year shall be expressed in units of g/mi NMOG, and shall be equal to the total number of PZEVs produced and delivered for sale in California that the manufacturer applies towards meeting its ZEV requirement for the model year subtracted from the total number of PZEV allowances from PZEVs produced and delivered for sale in California by the manufacturer in the model year and then multiplied by the NMOG fleet average requirement for PCs and LDT1s for that model year.

(C) *Separate Credit Accounts.* The number of credits from a manufacturer's [i] ZEVs, [ii] advanced technology PZEVs, and [iii] all other PZEVs shall each be maintained separately.

(3) *ZEV Credits for MDVs and LDTs ~~o~~Other ~~t~~Than LDT1s.* ZEVs and PZEVs classified as MDVs or as LDTs other than LDT1s may be counted toward the ZEV requirement for PCs and LDT1s, and included in the calculation of ZEV credits as specified in this section 1962(g) if the manufacturer so designates.

(4) *ZEV Credits for Advanced Technology Demonstration Programs.* A vehicle, other than a NEV, that is placed in a California advanced technology demonstration program may earn ZEV credits even if it is not "delivered for sale." To earn such credits, the manufacturer must demonstrate to the reasonable satisfaction of the Executive Officer that the vehicles will be regularly used in applications appropriate to evaluate issues related to safety, infrastructure, fuel specifications or public education, and that for more than 50 percent of the first year of placement the vehicle will be situated in California. Such a vehicle is eligible to receive the same allowances and credits that it would have earned if placed in service. To determine vehicle credit, the model-year designation for a demonstration vehicle shall be consistent with the model-year designation for conventional vehicles placed in the same timeframe.

(5) *ZEV Credits for Transportation Systems.*

(A) *General.* In model years 2001 through ~~2007~~ 2011, a ZEV, advanced technology PZEV or PZEV placed as part of a transportation system may earn additional ZEV credits, which may used in the same manner as other credits earned by vehicles of that category, except as provided in section (g)(5)(C) below. A NEV is not eligible to earn credit for transportation systems. To earn such credits, the manufacturer must demonstrate to the reasonable satisfaction of the Executive Officer that the vehicle will be used as a part of a project that uses an innovative transportation system as described in section (g)(5)(B) below.

(B) *Credits Earned.* In order to earn additional credit under this section (g)(5), a project must at a minimum demonstrate [i] shared use of ZEVs, AT PZEVs or PZEVs, and [ii] the application of "intelligent" new technologies such as reservation management, card systems, depot management, location management, charge billing and real-time wireless information

systems. If, in addition to factors [i] and [ii] above, a project also features linkage to transit, the project may receive further additional credit. For ZEVs only, not including NEVs, a project that features linkage to transit, such as dedicated parking and charging facilities at transit stations, but does not demonstrate shared use or the application of intelligent new technologies, may also receive additional credit for linkage to transit. The maximum credit awarded per vehicle shall be determined by the Executive Officer, based upon an application submitted by the manufacturer and, if appropriate, the project manager. The maximum credit awarded shall not exceed the following:

| *Type of Vehicle* | *Shared Use, Intelligence* | *Linkage to Transit* |
|---|---|---|
| PZEV | 2 | 1 |
| Advanced Technology PZEV | 4 | 2 |
| ZEV | 6 | 3 |

(C) *Cap on Use of Credits.*

1. *ZEVs.* Credits earned or allocated by ZEVs pursuant to this section (g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-tenth of a manufacturer's ZEV obligation in any given model year.

2. *AT PZEVs.* Credits earned or allocated by AT PZEVs pursuant to this section (g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-twentieth of a manufacturer's ZEV obligation in any given model year, but may only be used in the same manner as other credits earned by vehicles of that category.

3. *PZEVs.* Credits earned or allocated by PZEVs pursuant to this section (g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-fiftieth of the manufacturer's ZEV obligation in any given model year, but may only be used in the same manner as other credits earned by vehicles of that category.

(D) *Allocation of Credits.* Credits shall be assigned by the Executive Officer to the project manager or, in the absence of a separate project manager, to the vehicle manufacturers upon demonstration that a vehicle has been placed in a project. Credits shall be allocated to vehicle manufacturers by the Executive Officer in accordance with a recommendation submitted in writing by the project manager and signed by all manufacturers participating in the project, and need not be allocated in direct proportion to the number of vehicles placed.

(6) *Submittal of ZEV Credits.* A manufacturer may meet the ZEV requirements in any given model year by submitting to the Executive Officer a commensurate amount of g/mi ZEV credits, consistent with section 1962(b). These credits may be earned previously by the manufacturer or acquired from another ~~manufacturer~~ party, except that beginning with the 2006 model year credits earned from NEVs offered for sale or placed in service in model years 2001 through 2005 cannot be used to satisfy more than the following portion of ~~any program category (ZEV, AT PZEV, PZEV)~~ a manufacturer's percentage ZEV obligation that may ~~not~~ only be

satisfied with credits from ~~AT PZEVs or PZEVs~~ ZEVs and, starting with the 2009 model year, the manufacturer's percentage ZEV obligation that may be satisfied by credits from AT PZEVs but not PZEVs:

| *ZEV Category* | | *AT PZEV Category* | |
|---|---|---|---|
| *2006* | *2007 and beyond* | *2009* | *2010 and beyond* |
| 75% | 50% | 75% | 50% |

This limitation applies to credits earned in model years 2001 through 2005 by the same manufacturer or earned in model years 2001 through 2005 by another manufacturer and acquired. The amount of g/mi ZEV credits required to be submitted shall be calculated according to the criteria set forth in this section 1962(g).

(7) *Requirement to Make Up a ZEV Deficit.*

(A) *General.* A manufacturer that produces and delivers for sale in California fewer ZEVs than required in a given model year shall make up the deficit by the end of the next model year by submitting to the Executive Officer a commensurate amount of g/mi ZEV credits, except that credits generated from PZEVs may be used to offset deficits for two model years. The amount of g/mi ZEV credits required to be submitted shall be calculated by [i] adding the number of ZEVs produced and delivered for sale in California by the manufacturer for the model year to the number of ZEV allowances from partial ZEV allowance vehicles produced and delivered for sale in California by the manufacturer for the model year (for a large volume manufacturer, not to exceed that permitted under section 1962(b)(2)), [ii] subtracting that total from the number of ZEVs required to be produced and delivered for sale in California by the manufacturer for the model year, and [iii] multiplying the resulting value by the fleet average requirements for PCs and LDT1s for the model year in which the deficit is incurred.

~~(B) *Additional Time to Make Up ZEV Deficits for the 2003-2004 Model Years.*~~

~~1. *Model Year 2003 ZEV Deficits.* A manufacturer that produces, and delivers for sale in California, model year 2003 or earlier PZEVs that generate at least twice as many credits as are necessary to take full advantage of the manufacturer's 60% PZEV option for the 2003 model year has through the 2007 model year to fully exercise its option to meet an additional 20% of its ZEV requirement for the 2003 model year with credits from advanced technology PZEVs.~~

~~2. *Model Year 2004 ZEV Deficits.* A manufacturer that qualifies under section 1962(g)(7)(B) 1., and produces, and delivers for sale in California, model year 2004 or earlier PZEVs that generate at least twice as many credits as are necessary to take full advantage of the manufacturer's 60% PZEV option for the 2003 and 2004 model years, has through the 2008 model year to fully exercise its option to meet an additional 20% of its ZEV requirement for the 2004 model year with credits from advanced technology PZEVs.~~

(8) *Penalty for Failure to Meet ZEV Requirements.* Any manufacturer that fails to produce and deliver for sale in California the required number of ZEVs or submit an appropriate amount of g/mi ZEV credits and does not make up ZEV deficits within the specified time period shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer that sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the ZEV deficits are not balanced by the end of the specified time period. For the purposes of Health and Safety Code section 43211, the number of vehicles not meeting the state board's standards shall be calculated according to the following equation, provided that the percentage of a large volume manufacturer's ZEV requirement for a given model year that may be satisfied with partial ZEV allowance vehicles or ZEV credits from such vehicles may not exceed the percentages permitted under section 1962(b)(2)(A):

> (No. of ZEVs required to be produced and delivered for sale in California for the model year) - (No. of ZEVs produced and delivered for sale in California for the model year) - (No. of ZEV allowances from partial ZEV allowance vehicles produced and delivered for sale in California for the model year) - [(Amount of ZEV credits submitted for the model year) / (the fleet average requirement for PCs and LDT1s for the model-year)].

(h) *Test Procedures.* The certification requirements and test procedures for determining compliance with ~~the~~ this section 1962 are set forth in "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," adopted by the state board on August 5, 1999, and last amended ~~July 30, 2002~~ [Insert date of amendments], which is incorporated herein by reference.

(i) *ZEV-Specific Definitions.* The following definitions apply to this section 1962.

(1) "Advanced technology PZEV" or "AT PZEV" means any PZEV with an allowance greater than 0.2 before application of the PZEV early introduction phase-in multiplier ~~or the high efficiency multiplier~~.

(2) "Battery electric vehicle" means any vehicle that operates solely by use of a battery or battery pack, or that is powered primarily through the use of an electric battery or battery pack but uses a flywheel or capacitor that stores energy produced by the electric motor or through regenerative braking to assist in vehicle operation.

(3) "Neighborhood electric vehicle" means a motor vehicle that meets the definition of Low-Speed Vehicle either in section 385.5 of the Vehicle Code or in 49 CFR 571.500 (as it existed on July 1, 2000), and is certified to zero-emission vehicle standards.

(4) "Placed in service" means having been sold or leased to an end-user and not to a dealer or other distribution chain entity, and having been individually registered for on-road use by the California Department of Motor Vehicles.

(4.5) "Regenerative braking" means the partial recovery of the energy normally dissipated into friction braking that is returned as electrical current to an energy storage device.

(5) "Specialty ~~electric vehicle~~ ZEV" means a ~~version of an existing~~ ~~electric vehicle~~ ZEV that is designed for a commercial or governmental fleet application, and either [i] has the same ~~battery pack~~ zero emissions energy storage device and chassis as ~~the~~ an existing ~~electric vehicle~~ ZEV from which it is modified, or [ii] in the case of a vehicle that is not based on an existing ZEV platform, is optimized for a particular duty cycle, such as urban delivery service, that conflicts with optimization for maximum vehicle range.

(6) "Type 0, I, II, and III ZEV" all have the meanings set forth in section 1962(d)(5)(A).

(j) *Abbreviations.* The following abbreviations are used in this section 1962:

"AER" means all-electric range.
"BEV" means battery electric vehicle.
~~"CMPEG" means California miles per equivalent gallon.~~
"HEV" means hybrid-electric vehicle.
"HFEDS" means highway fuel economy driving cycle.
"LDT" means light-duty truck.
"LDT1" means a light-truck with a loaded vehicle weight of 0-3750 pounds.
"LDT2" means a "LEV II" light-duty truck with a loaded vehicle weight of 3751 pounds to a gross vehicle weight of 8500 pounds, or a "LEV I" light-duty truck with a loaded vehicle weight of 3751-5750 pounds.
"MDV" means medium-duty vehicle.
"Non-Methane Organic Gases" or "NMOG" means the total mass of oxygenated and non-oxygenated hydrocarbon emissions.
"MY" means model year.
"NEV" means neighborhood electric vehicle.
"NOx" means oxides of nitrogen.
"PC" means passenger car.
"PZEV" means any vehicle that is delivered for sale in California and that qualifies for a partial ZEV allowance of at least 0.2.
"SOC" means state of charge.
"SULEV" means super-ultra-low-emission-vehicle.
"UDDS" means urban dynamometer driving cycle.
"ULEV" means ultra-low emission vehicle.
"VMT" means vehicle miles traveled.
"ZEV" means zero-emission vehicle.

(k) *Severability.* Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of this article remains in full force and effect.

Note: Authority cited: Sections 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43204, and 43205.5, Health and Safety Code.

2. Make comparable amendments to the "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." In addition, add section D.3. reading as follows:

3. **ZEV Reporting Requirements.** In order to verify the status of each manufacturer's compliance with the ZEV requirements for a given calendar year, each manufacturer shall submit a report to the Executive Officer at least annually, by May 1 of the calendar year following the close of the model year, that identifies the necessary delivery and placement data of all vehicles generating ZEV credits or allowances, and all transfers and acquisitions of ZEV credits. The manufacturer may update the report by September 1 to cover activities occurring between April 1 and June 30.