Proposed Amendments to the Zero Emission Vehicle Regulation

March 27-28, 2003
Overview

- Background
- Description of proposed changes
- Summary and staff recommendation
Background

- Overview of regulation
- Program goals
- Program achievements
- Why are amendments needed?
- Staff objectives
Overview of Regulation

- 10% Mandate
- 6% PZEV
- 2% ZEV
- 2% AT-PZEV
## ZEV Program Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Typical Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>Battery EV, hydrogen fuel cell</td>
</tr>
<tr>
<td>Silver</td>
<td>CNG, hybrid, hydrogen ICE, grid connect hybrid, methanol fuel cell</td>
</tr>
<tr>
<td>Bronze</td>
<td>Extremely clean gasoline ICE</td>
</tr>
</tbody>
</table>
Program Goals

- Achieve significant air quality benefits
- Push research, development and deployment of zero emission vehicles
- Encourage ZEV commercialization through introduction of ZEV-enabling technology
Program Achievements

- ZEV program has resulted in
  - Significant efforts to advance battery technology
  - More than 2,500 battery electric vehicles leased or sold in California
  - Ten near-zero emission PZEV models currently certified
  - Three hybrid electric vehicles on sale, others announced
  - Air quality benefit
California Fuel Cell Partnership

- Membership
  - Ford Motor Company
  - DaimlerChrysler
  - Honda
  - Nissan
  - Toyota
  - Hyundai
  - Shell Hydrogen
  - ExxonMobil
  - UTC Fuel Cells
  - Ballard

- Goals
- Vehicles
Other Developments

• Freedom CAR

• National and international commitment to ZEV technology
Why Are Amendments Needed?

• Address legal challenges
• Align requirements with technology and market status
Address Legal Challenges

- Federal preemption lawsuit
  - Preliminary injunction issued June 2002
  - Appeal argued February 2003
- First state court lawsuit
- Second state court lawsuit
Technology Status--BEV

- 2001 Biennial Review showed incremental cost of $7k-$9k for full function EV battery pack, in volume production
- Recent advances in cycle life, but fundamental cost challenges remain
- Sustainable demand in near term appears to be small
- Major manufacturers have ceased production
Technology Status--Fuel Cell

- Technology shows great promise, and manufacturers appear to see business case
- Significant cost, manufacturing and performance challenges
- Not ready for volume production
ZEV Status--Overview

• Development needed before any ZEV technology ready for mass deployment

• 2001 requirements too ambitious
  - Force BEV production regardless of perceived long term prospects
  - Dilute manufacturer efforts

• Pace of future development difficult to predict
Technology Status--AT PZEV

- CNG vehicles in commercial production
- Three HEVs on market, others announced
  - Not yet AT PZEV, but future versions expected to qualify
- Hydrogen ICE vehicles demonstrated
- Plug in hybrid vehicles being studied
Technology Status--PZEV

• 10 models certified
• About 140,000 expected to be sold in model year 2003
Staff Objectives

• Restart program
  - Take advantage of technologies in showrooms today
  - Capture air quality benefits!
  - Build manufacturing and supplier base for pure ZEV technologies
Staff Objectives

- Avoid mismatch between program requirements and technology status
- Recognize successful compliance under 2001 rules
- Provide compliance pathway for aggressive pursuit of fuel cell commercialization
Summary of Proposed Amendments:
History

- Strawman proposal, November 2002
- Public workshop, December 2002
- Initial Statement of Reasons, January 10, 2003
- Staff’s additional proposed modifications, March 5, 2003
Summary of Proposed Amendments:
Overview

• Program start
• Category percentages
• Credit calculations
• Early production incentives
• Clarifying and balancing amendments
Summary of Proposed Amendments:
Program Start Date

- Program start in 2005 instead of 2003
- Earliest practical start date
- Allows adequate lead time
- Pick up from 2001 Amendments
Summary of Proposed Amendments: Two Paths

- Base Path
- Alternative Compliance Path
Overview of Regulation

10% Mandate

6% PZEV

2% ZEV

2% AT PZEV
Summary of Proposed Amendments: Base Path

- Preserve 2001 regulation structure
- Percentage ZEV requirements
  - 2 % Gold
  - 2 % Silver
  - 6 % Bronze
- Allow use of banked credits
  - Some manufacturers able to comply with banked credits through 2008 and may use base path
Summary of Proposed Amendments: Alternative Compliance Path

- Market share of 250 type III ZEVs (fuel cell vehicles) placed between 2001 and 2008
- Remaining gold obligation may be met with silver
- Post 2008 requirement to be determined
Manufacturer Market Share of 250 Type III (fuel cell vehicle) ZEVs

- Ford: 62
- Nissan: 17
- DaimlerChrysler: 17
- Honda: 57
- Toyota: 48
- General Motors: 51
Summary of Proposed Amendments: Independent Expert Review Panel

- Independent experts
- Assess ZEV technologies
  - Fuel cell and battery
  - Technology readiness
  - Market readiness
- California Fuel Cell Partnership a key resource
Summary of Proposed Amendments:
Independent Expert Review Panel

- Report to the Board prior to setting post-2008 ZEV requirements
- Provide Board with data necessary to define future ZEV requirement
Summary of Proposed Amendments: Credit Calculation

- Credit calculations
  - ZEVs
  - AT PZEVs
Summary of Proposed Amendments:
Proposed Changes to ZEV Credit

- Remove efficiency multiplier
- Create categories of ZEV types
  - NEV, Type 0, Type I, Type II, Type III
- Simplified calculation
- Adjust credit levels over time
Summary of Proposed Amendments:
ZEV Types

- NEV
- Type 0
- Type I
- Type II
- Type III
Summary of Proposed Amendments: ZEV Credit Calculation

<table>
<thead>
<tr>
<th>Tier</th>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III</th>
<th>2012+</th>
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<tbody>
<tr>
<td>Type 0 (Utility)</td>
<td>1.5</td>
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<td>Type 1 (City EV)</td>
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<td>Type 2 (FF EV)</td>
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<td>Type 3 (Fuel Cell)</td>
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<td>Type 7</td>
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<tr>
<td>Type 10</td>
<td>5</td>
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Summary of Proposed Amendments:
Anatomy of AT PZEV Credit

- AT-PZEVs earn PZEV base credit of 0.2 plus:
  - Zero Emission Range (ZER) credit
  - Advanced ZEV Componentry credit
  - Low Fuel Cycle Emissions credit

- Staff proposes modifications to all three of these AT PZEV components
Summary of Proposed Amendments: HEV Advanced ZEV Componentry Credit

• In 2001 amendments, HEVs treated according to
  - CO2 reduction,
  - Percent Peak Power, or
  - Efficiency

• Proposed amendments credit based only on the electric drive system
  - Voltage,
  - Peak power, and
  - ZEV-like attributes
## Summary of Proposed Amendments: HEV Advanced Componentry Credit

<table>
<thead>
<tr>
<th>Drive System Voltage</th>
<th>Drive System Min. Peak Power</th>
<th>Traction Drive Boost</th>
<th>Regenerative Braking</th>
<th>Idle Stop/ Start</th>
<th>MY ’05 – ’07 AT Credit</th>
<th>Total ATPZEV Credit</th>
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<tbody>
<tr>
<td>Low Voltage/ Low Power HEV</td>
<td>Low</td>
<td>High</td>
<td>High</td>
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<td>High Voltage HEV</td>
<td>4 kW</td>
<td>10 kW</td>
<td>50 kW</td>
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<td>Yes</td>
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</table>
Summary of Proposed Amendments:

Other Proposed ATPZEV Modifications

- **Zero Emission Range**
  - Method of calculation changed
  - Maximum credit capped at 1.5

- **Advanced Componentry**
  - May be combined with ZER
  - H2 storage increased from 0.2 to 0.3
  - Bi-Fuel CNG/H2 now earns same as H2
  - Battery warranty requirement reduced

- **Low Fuel Cycle Emissions**
  - Increased maximum credit from 0.2 to 0.3
### Summary of Proposed Amendments: Credit for CNG Vehicles

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Zero Emissions Range</th>
<th>Advanced Componentry</th>
<th>LFCE</th>
<th>TOTAL</th>
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<tr>
<td>2001 Amendments CNG</td>
<td>0.2</td>
<td>N/A</td>
<td>0.1</td>
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<td>Proposed CNG</td>
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<td>N/A</td>
<td>0.2</td>
<td>0.3</td>
<td>0.7</td>
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## Summary of Proposed Amendments: Credit for Hydrogen ICE

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<th>Base</th>
<th>Zero Emissions Range</th>
<th>Advanced Componentry</th>
<th>LFCE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
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<td>2001 Amendments H2 ICE</td>
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<td>1.0</td>
<td>N/A</td>
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<td>1.4</td>
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<tr>
<td>Proposed H2 ICE</td>
<td>0.2</td>
<td>1.5</td>
<td>0.3</td>
<td>0.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Proposed H2ICE HEV (Ford Model “U”)</td>
<td>0.2</td>
<td>1.5</td>
<td>0.7</td>
<td>0.3</td>
<td>2.7</td>
</tr>
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</table>
## Summary of Proposed Amendments: Credit for Plug-In HEVs

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Zero Emissions Range</th>
<th>Advanced Componentry</th>
<th>LFCE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 Amendments P20 HEV</td>
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<td>0.6</td>
<td>N/A</td>
<td>0.1</td>
<td>0.9</td>
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<tr>
<td>Proposed P20 HEV</td>
<td>0.2</td>
<td>1.25</td>
<td>0.5</td>
<td>0.12</td>
<td>2.1</td>
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</table>
Summary of Proposed Amendments: Overall AT-PZEV Credits

Possible Credit

Model Year

- Hydrogen Internal Combustion Hybrid Electric Vehicle
- Grid Hybrid with 60 miles range
- Indirect Methanol Fuel Cell Vehicle
- Hydrogen Internal Combustion Engine Vehicle
- Grid Hybrid with 20 miles range
- Compressed Natural Gas Hybrid Electric Vehicle
- Compressed Natural Gas Vehicle
- High Voltage, High Power Hybrid Electric Vehicle
- High Voltage Hybrid Electric Vehicle
- Low Voltage Hybrid Electric Vehicle
Summary of Proposed Amendments: Early Production Incentives

- Incentivize manufacturers to maximize PZEV production
- “Excess” PZEVs produced in 2003 and 2004 can be used for silver category until 2006
Summary of Proposed Amendments: Clarifying and Balancing Amendments

- Section 177 (travel) provision
- Addition of LDT 2
- Transportation system credit
- Placed in service date
- Banked NEV credit cap
- Severability
Summary of Proposed Amendments:
Section 177 (travel) provision

- Other states able to adopt LEV/ZEV regulations
- Result: Increases automaker obligation by $1.7X$
- Provision proposed:
  - Allow Type III ZEVs placed in any ZEV state to count towards compliance
Summary of Proposed Amendments: Inclusion of LDT 2 volumes

- Board directed staff to include LDT 2 in 2001
- Issues regarding notice requirements have been raised
- Asking the Board to reaffirm the inclusion of LDT 2 volumes
Summary of Proposed Amendments: Transportation system credit

- Additional credit awarded for ZEVs placed in transportation systems
- 2001 Amendments: Sunset credit in 2008
- Proposed Amendments: Extend credit to 2011
Summary of Proposed Amendments:
Placed in service date

- Applies to application of early introduction credits
- September 30, 2003 for model year 2002 vehicles
- June 30 for subsequent model years
Summary of Proposed Amendments: Banked NEV credit cap

- 2001 Amendments: Banked NEV credit cap applied to gold, silver and bronze
- Proposed Amendments: Banked NEV credit cap applied to gold and silver
- Banked NEV Credit Cap:
  - Up to 75% of obligation may be met with banked NEV credit
    - 2006 gold, 2009 silver
  - Up to 50% of obligation may be met with banked NEV credit
    - 2007 gold, 2010 silver
Severability

• Background
  - Severability clause expresses intent that if one element of regulation is invalidated, the remainder can still be enforced
  - Relevant to key question before court--what would agency have done if precluded from adopting invalid provision?
  - No severability clause in 2001 amendments
Severability

- Federal trial court held that AT PZEV provisions for HEVs were not severable
  - Unclear to court whether Board would have proceeded with regulation if regulation did not result in improved fuel economy
  - AT PZEV provisions critical to intended reduction in number of pure ZEVs
Severability

- Proposed regulation amendments contain both general severability clause and additional clause specifically addressing AT PZEV provisions on hybrids
- Proposed resolution contains finding that if AT PZEV provisions on hybrids or alternative compliance path are found preempted, Board chooses to enforce remainder of 2003 amendments rather than fall back on current ZEV regulation when enforcement has been enjoined
Summary and Staff Recommendation

• Effects of proposed changes
  - Number of vehicles
  - Air quality

• Major issues

• Staff recommendation
Number of Vehicles

• Not possible to provide firm estimates
  - Program provides great flexibility
  - Post-2008 ZEV requirement under alternative compliance option to be determined

• Overall effect
  - Reduce number of ZEVs and increase number of AT PZEVs
  - PZEV totals not significantly affected
Number of Clean Vehicles (ZEVs plus AT PZEVs plus PZEVs)

- 2003 Revised Staff Proposal
- 2001 Regulation
Number of Vehicles--ZEVs

- On base path
  - Requirement is 2 percent gold, but banked credits may be used
- On alternative compliance path
  - Total (for all manufacturers) is 250 fuel cell vehicles between 2001 and 2008
  - Production level for 2009 and beyond to be determined by Board after input from Independent Expert Review Panel
Number of Vehicles--AT PZEVs

- In near term, depends on manufacturer capability and strategy regarding use of banked credits
- In long term, AT PZEV total will change in response to ZEV requirement in effect at that time
AT PZEVs--2003 vs. 2001

- AT PZEV 2003 Modified Proposal
- AT PZEV 2001 Amendments
AT PZEVs--
Effect of ZEV Requirement

Full use of silver in gold
No use of silver in gold (base program)
### Air Quality Impacts

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<tr>
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<th>ROG</th>
<th>NOx</th>
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<tr>
<td><strong>Net change from 2001 amendments</strong></td>
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<tr>
<td>2010</td>
<td>-0.03</td>
<td>-0.06</td>
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<tr>
<td>2020</td>
<td>-0.04</td>
<td>-0.17</td>
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<tr>
<td><strong>Net change from no ZEV program</strong></td>
<td></td>
<td></td>
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<tr>
<td>2010</td>
<td>-0.38</td>
<td>-1.02</td>
</tr>
<tr>
<td>2020</td>
<td>-3.28</td>
<td>-2.23</td>
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</table>

- Will also reduce CO and air toxics
Major Issues

- ZEV requirement under alternative compliance option in MY 2009 and beyond
- Role of BEVs
- Long term silver production levels
- ZEV credit for infrastructure
ZEV Requirement for MY 2009 and Beyond

• Issue
  - ZEV requirement for model years 2009 and beyond under alternative compliance option is “to be determined”, following input from Independent Technical Advisory Panel
  - Staff recommends this approach because timing for ramp up of vehicle production is difficult to predict
ZEV Requirement for MY 2009 and Beyond

• Stakeholder views--environmental
  - Long term technology-forcing goal is needed to promote competition to achieve the next generation of ZEV technologies
  - Manufacturer public statements predict rapid pace of development
ZEV Requirement for MY 2009 and Beyond

- Stakeholder views--automaker
  - Appropriate goal for 2009 timeframe cannot be predicted at this time
  - Overly ambitious goal is not credible and if enforced will waste resources
ZEV Requirement for MY 2009 and Beyond

- Options
  - Retain staff proposal (future quantity to be determined)
  - Continue demonstration level requirement (e.g. 250 vehicles)
  - Establish higher target level (e.g. 10 x first stage)
ZEV Requirement for MY 2009 and Beyond

- **Staff response**
  - To achieve commercialization, a ramp up must occur
  - The question is when
  - Staff has explained rationale for our approach, but recognizes Board may wish to establish a firm target
Role of BEVs

• Issue
  - Manufacturers must build Type III ZEVs (fuel cells) in order to qualify for alternative compliance option
  - Should proposal allow for other types of ZEVs?
Role of BEVs

• Stakeholder views
  - Proposed requirement does not provide incentive for ongoing development of BEV technology
Role of BEVs

• Options
  - Require BEV production in addition to fuel cells
  - Allow BEVs to meet some portion of required minimum production requirement
Role of BEVs

- Staff response
  - Staff recommends that BEVs be allowed to satisfy portion of minimum production requirement
  - Should be option rather than requirement
  - Keep minimum number of fuel cells (e.g. one half of obligation)
  - Set appropriate credit ratio
Silver Production Levels

- **Issue**
  - Long term silver production levels will vary with ZEV requirement
  - If ZEV requirement remains at low levels, silver volumes are high in 2012 and beyond
  - Purpose of silver category is to push design improvement and cost reduction for ZEV-enabling technologies
Silver Production Levels

• Stakeholder views--automaker
  - Long term silver production exceeds what is necessary to achieve design improvement and economies of scale
  - Market may not absorb the required number of vehicles
Silver Production Levels

• Stakeholder views--environmental
  - High volume silver production needed to bring down ZEV cost
  - Requirement should be more stringent, not less
Silver Production Levels

- **Options**
  - Use Independent Expert Review Panel to assess silver technology status
  - Amend silver requirement
Silver Production Levels

• **Staff response**
  - Levels shown in staff report will decline as ZEV production expands
  - Staff recommends that long term silver status be included in Independent Expert Review Panel review
    - Have economies of scale been achieved?
    - Is technology optimized?
    - Does additional silver production contribute to ZEV commercialization?
Credit for Infrastructure

• Issue
  - Emerging interest in “smart mobility corridors”
  - ZEV regulation already supports some aspects (clean mobility, station cars)
  - Are there opportunities for further synergy?
Credit for Infrastructure

- Stakeholder views--automaker
  - Regulatory structure should not imply that infrastructure is manufacturer responsibility
  - Some indication of interest if properly structured
Credit for Infrastructure

- Stakeholder views--environmental
  - Providing option increases manufacturer flexibility and helps enable ZEV commercialization
Credit for Infrastructure

• Options
  - Allow ZEV credit for placement of hydrogen infrastructure
  - Explore other incentives and non-regulatory approaches
Credit for Infrastructure

- Staff response
  - Fruitful area to investigate, but many complex issues
  - Staff recommends report back to Board in three months
Staff Recommendation

- Staff recommends approval of the proposed amendments
  - Increase air quality benefit
  - Address litigation issues
  - Maintain progress towards transforming California’s vehicle fleet to zero emissions