GoToWebinar Attendee Interface

1. Viewer Window

2. Control Panel
Overview

- Why have a ZEV regulation?
- History: How did we get here?
- The 2009 Regulation
- ARB’s role in ZEV Commercialization
- Section 177 States
- Looking Forward: ZEV 2.0
- Conclusion
Why have a ZEV regulation?
Over 90% of Californians Breathe Unhealthy Air at Times

Days Over State 24-Hour PM10 Standard
Days Over State 8-Hour Ozone Standard

Source: ADAM September 2006 (tfn)
Source: MRedgrave May 2006 (mln)

- 0-5 Days
- 6-50 Days
- 50-100 Days
- >100 Days
The Challenge...

- Over 23 million registered vehicles
- Over 797 million miles driven every day
- Over 37 million gallons of gasoline consumed each day
Goal is Near-Zero Emissions

- Zero Emissions

0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1994
2004
2010

(g/mile)

HC
NOx

CBG
LEV I
Phase 3
LEV II
Climate Change in California

California Projected Impacts

- 75% loss in snow pack
- 1-2 foot sea level rise
- 70 more extreme heat days/year
- 80% more ‘likely ozone’ days
- 55% more large forest fires
- Twice the drought years
California GHG Goals

- Initiated through AB 32:
  - AB 1493: Pavley Regulation
  - By 2020, reduce GHGs back to 1990 levels
  - By 2050, reduce GHG 80% from 1990 level by 2050
2002-2004 GHG Emissions (469 MMTCO2E)

- Transportation, 38%
- Industrial, 19%
- Agriculture, 6%
- Res & Com, 9%
- Recycling/Waste, 1%
- High GWP, 3%
- Electricity (Imports), 12%
- Electricity (In State), 11%
On-Road Transportation Sources 2020

Passenger Vehicles
~ 160 MMTCO2E

Heavy-Duty Vehicles
~ 50 MMTCO2E

*Preliminary ARB GHG Projections for 2020
GHG Growth with AB 1493 and LCFS

Historical and Projected Population, Vehicle Miles

Traveled (VMT) and GHG Growth

Percent of 1990 Growth

VMT

GHG Growth

GHG Growth with AB 1493

GHG Growth with AB 1493 and LCFS
History: How Did We Get Here?
Paul MacCready

1982: GM Sunraycer solar EV

1989 Santana (Impact/EV1) tested at GM proving grounds in Arizona

GM Sunraycer Photo: www.carstyling.ru

GM Impact Photo: www.greencar.com
1990: ARB LEV I

- Declining Fleet Average Requirement
- Initial ZEV requirement located within LEV I as footnote:

“While meeting the fleet average standards, each manufacturer’s sales fleet shall be composed of at least 2% ZEVs in the model years 1998 through 2000, 5% ZEVs in 2001 and 2002 and 10% ZEVs in 2003 and subsequent.”
1990: ZEV Program Rationale

- Projected improvements in conventional technology not sufficient to meet air quality standards
- ZEVs avoid ICE vehicle emissions performance deterioration with age
1996: ZEV Regulation

- 10% ZEVs in 2003
- Early requirements eliminated
- ARB established agreements with large automakers to place technology demonstration fleet (“MOA” Vehicles):
  - MOA vehicles very successful in operation
  - Automakers claimed marketability challenges
- Design distinctions:
  - Most of those with reasonable performance made use of advanced batteries, except the Panasonic EV1
  - All used 2-4 x the energy per mile as a Panasonic EV1
1998: LEV II and ZEV

- LEV II: Lower emission stds for all vehicle categories
  - New SULEV emission standard
  - Near and zero evaporative requirements
- ZEV: moved to its own section (1962)
  - Partial ZEV (PZEV) credits for qualifying technologies
  - PZEVs substitution up to 6 percent for LVMs
1998: PZEVs

- SULEV exhaust emissions
  - Dual wall exhaust manifolds, close coupled catalyst plus downstream catalyst w/ integral adsorbers, linear O2 sensor, retarded timing at cold start, electric air injection, greater catalyst loading

- Zero evaporative emissions
  - Add. trap on canister vent, carbon vent on engine inlet, improved seals at joints/junctures, consolidation of parts to minimize junctions, better materials

- 15 yr/150,000 mi emissions warranty
- On board-diagnostics
Hybrid Electric Vehicles

1997: Toyota Prius
Believed to be instigated by PNGV

1998: Honda Insight
2001: ZEV Amendments

- Maintained technology forcing mandate
- Phased in ZEV and PZEV requirements
- Allowed further offset with Advanced Technology PZEVs (AT PZEVs)
  - Technologies that lead to ZEVs
- Segregated NEVs and assigned them fractional ZEV credit
- Gradually increased future ZEV requirements
2001: ZEV Litigation

- Federal and State lawsuits
  - Linked credits to efficiency
  - Preliminary injunction issued June 2002, prohibiting ARB from enforcing the regulation in 2003 or 2004 model years
- The Board modified the regulation in 2003
- Settlement agreement for all cases signed August 2003
Fuel Cell Vehicles

FreedomCar: Cooperative research effort (Ford, GM, and DaimlerChrysler)
- Aimed at longer term goals

California Fuel Cell Partnership
2003: ZEV Amendments

- Changed calculation method for AT PZEVs
- Two Paths Created
  - Base Path: Banked Credits
  - Alternative Path: New placement of ZEVs
- Phases allowed vehicles to be placed in grouped demonstrations
  - Phase I: 2005-2008
  - Phase II: 2009-2011
  - Phase III: 2012-2014
  - Phase IV: 2015-2017
- PZEVs – up to 6%
- AT PZEVs – up to 2%
- 2005 Implementation
2004/2005: DOE Hydrogen Program

- Bush commits $1.7 Billion over 5 years
  - research and development, demonstrations and studies over 5 fiscal years aimed at getting hydrogen-powered autos on the road by 2020
2006 ZEV Expert Panel & 2008 Amendments

- Advances in lithium ion battery technology show great promise for battery EVs
- Plug-in Hybrid Electric Vehicles (PHEVs) likely to be commercially successful
- Encourage the production of plug-in hybrid electric vehicles (PHEV)
- Needed to be an adjustment in required number of ZEVs
- Transparency
The 2009 ZEV Regulation
ZEV Regulation Steps

- Step 1: Size Determination
- Step 2: ZEV Base Volume Determination
- Step 3: Requirement Determination
- Step 4: Allowances
- Step 5: Applicable Multiplier Determination
- Step 6: Total Credit Calculation
- Step 7: Rules on Credit Use
- Step 8: Special Provisions
- Step 9: Travel Provision
- Step 10: Demonstration of Compliance
- Step 11: Penalties
Step 1: Size Determination

Why Size Matters…

- **Small** (SVM)
  - CA sales less than 4,500; *Not Subject*
- **Independent Small** (ISVM)
  - CA sales less than 10,000; *Not Subject*
- **Intermediate** (IVM)
  - CA sales between 4,501 and 60,000; *Subject to Regulation*
  - *Can meet whole requirement with PZEVs*
- **Large** (LVM)
  - CA sales greater than 60,000; *Subject to Regulation*
Step 1: Size Determination

- Rolling average based on previous three consecutive model years sales of PC, LDTs, and MDVs

**MY 2009 Example:**

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>59,745</td>
<td>63,800</td>
<td>67,350</td>
</tr>
</tbody>
</table>

Average: **63,631**

Therefore, subject to LVM requirements
Step 1: Size Determination

What if my size changes?

- Due to Size Increase:
  - SVM → IVM = 5 year lead time
  - IVM → LVM = 5 year lead time

- Due to Size Decrease:
  - IVM → SVM = Following MY
  - LVM → IVM = Following MY

- Due to New Majority Ownership Agreements:
  - IVM+IVM = LVM : 3 year lead time
Step 1: Size Determination

Example: Increase in Size

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>45,000</td>
<td>53,000</td>
<td>59,000</td>
<td>63,000</td>
<td>64,000</td>
</tr>
</tbody>
</table>

Averages
- 2004-2006: 52,333
- 2006-2008: 62,000

<table>
<thead>
<tr>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. over 60,000</td>
<td>Still subject IVM Requirements</td>
<td>Subject to LVM Requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Still subject IVM Requirements
Step 1: Size Determination

How does ownership affect my size for ZEV?

- If one manufacturer has 50% or greater ownership in another manufacturer, their sales are aggregated for determining size.

**MY 2009 Example**

- Company A owns 60% of Company B (as of June 2003)
- Company A 2006-08 Sales Average: 43,500
- Company B 2006-08 Sales Average: 36,000
- Company A and B Aggregated 2006-08 Sales: 79,500

Both are subject to the LVM ZEV requirements.
Step 2: ZEV Base Volume Determination

What do you mean by ZEV Base Volume?

- The production volume on which your ZEV requirement is based
- Has nothing to do with your size determination calculation method
Step 2: ZEV Base Volume Determination

- A total or average of PCs, LDT1s, and LDT2s (as applicable)
- Two Methods: You can switch every year
  - Prior Years Method
    - An average of the previous 4\textsuperscript{th}, 5\textsuperscript{th}, and 6\textsuperscript{th} model year from model year in which you are complying
  - Same Year Method
    - A projection of sales for the model year in which you are complying (2009 MY, use 2009 Sales)
Step 2: ZEV Base Volume Determination

Prior Years Method

- 2009 MY Example

2009 Compliance Year

2008  1st
2007  2nd
2006  3rd
2005  4th
2004  5th
2003  6th

For the 2009 MY, manufacturers would use their 2003-2005 sales average when choosing the prior years method.
Step 2: ZEV Base Volume Determination

- “LDT2s, as applicable”
- You will add increasingly in your LDT2 production over three model years to your ZEV Base Volume

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51%</td>
<td>68%</td>
<td>85%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Prior Years Method: Add together LDT2 production from previous model years, take average, then multiply %
- Same Year Method: Multiply % to LDT2 production
Step 3: ZEV Requirement

Yearly ZEV Requirements

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>11%</td>
<td>12%</td>
<td>14%</td>
<td>16%</td>
</tr>
</tbody>
</table>

- Regulation dictates how requirement *must* and *may* be met
- Types of required and allowed vehicles: ZEVs, Enhanced AT PZEVs, AT PZEVs, and PZEVs
Step 3: ZEV Requirement

Let’s Rank the Vehicle Credits:

1. ZEVs (Gold)
2. Enhanced AT PZEVs (Silver +)
3. AT PZEVs (Silver)
4. PZEVs (Bronze)

- Higher ranked vehicle credits may fulfill lower ranked credit percentages
ZEV Requirement: The ZEV Glass

This is how the ZEV requirement is written

12% ZEV

2012 MY Example
A Manufacturer MUST fulfill their ZEV requirement, but may fulfill the rest of their ZEV requirement with Enhanced AT PZEVs
A Manufacturer MUST fulfill their ZEV requirement, but may fulfill the rest of their ZEV requirement with Enhanced AT PZEVs and AT PZEVs.
A Manufacturer MUST fulfill their ZEV requirement, but may fulfill the rest of their ZEV requirement with Enhanced AT PZEVs, AT PZEVs and PZEVs. Most manufacturers choose to meet their requirement this way because it is the most cost effective way to meet the regulation.
Step 3: ZEV Requirement

ZEVs: Alternative Path vs. Base Path

- Two paths until 2011
- Alternative Path
  - Market share of set number of ZEVs
  - New production of ZEVs
  - No banked credits
  - May be placed all at one time within 3 year window
- Base Path
  - Credits equal to 2% annually
  - Banked credits
Step 3: ZEV Requirement

2009 – 2011 Alt Path Req.:

- Credits from placed ZEVs equal to 0.82% of 2003-2005 average annual sales

  OR

- A manufacturer’s market share of 2,500 Type III ZEVs
  
  (Same Number, different ways to calculate)

- Any type of ZEV may be used
- Required # rounded to nearest whole #
Step 3: ZEV Requirement

Any type of ZEV may be used

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
<th>Credit / vehicle</th>
<th>Req. #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type V</td>
<td>300+ mi range FR*</td>
<td>7</td>
<td>1,427</td>
</tr>
<tr>
<td>Type IV</td>
<td>200+ mi range FR*</td>
<td>5</td>
<td>2,000</td>
</tr>
<tr>
<td>Type III</td>
<td>100+ FR*/200+ mi range</td>
<td>4</td>
<td>2,500</td>
</tr>
<tr>
<td>Type II</td>
<td>100+ mi range</td>
<td>3</td>
<td>3,333</td>
</tr>
<tr>
<td>Type I.5</td>
<td>75-100 mi range</td>
<td>2.5</td>
<td>4,000</td>
</tr>
<tr>
<td>Type I</td>
<td>50-75 mi range</td>
<td>2</td>
<td>5,000</td>
</tr>
</tbody>
</table>

*Fast refueling
Step 3: ZEV Requirement

2009-2011 Alternative Path (cont.)
- May fulfill the rest of their requirement with AT PZEVs and PZEVs
- May only fulfill 6% of 11% requirement with PZEVs
Step 3: ZEV Requirement

Example Alt Path ZEV Obligation Calculation

- Sales Volume = 100,000 cars
- Market share = 15%
- Total 11% credit obligation = 11,000
- **Must** place 375 ZEVs (equal to 1500 credits)
- **May** generate 3,500 credits from AT PZEVs
- **May** generate 6,000 credits from PZEVs

*Divide out credits to translate into # of required vehicles*
Step 3: ZEV Requirement

Example Base ZEV Obligation Calculation

- Sales Volume = 100,000 cars
- Total 11% credit obligation = 11,000
- **Must** generate 2,500 credits from ZEVs
- **May** generate 2,500 credits from AT PZEVs
- **May** generate 6,000 credits from PZEVs

*Divide out credits to translate into # of required vehicles*
Step 3: ZEV Requirement

2012-2014: The New Path

- **ZEV**: Credits equal to 0.93% or up to 3% of a manufacturer’s ZEV base volume
- **Enhanced AT PZEV**: Credits equal 2.07% of a manufacturer’s ZEV base volume
- **AT PZEV**: Credits equal to 2% of a manufacturer’s ZEV base volume
- **PZEV**: Credits equal to 6% of a manufacturer’s ZEV base volume
Step 3: ZEV Requirement

Example Base ZEV Obligation Calculation
- Sales Volume = 100,000 cars
- Total 12% credit obligation = 12,000
- **Must** generate 790 credits from ZEVs
- **May** generate 2,210 credits from Enhanced AT PZEVs
- **May** generate 2,000 credits from AT PZEVs
- **May** generate 6,000 credits from PZEVs

*Divide out credits to translate into # of required vehicles*
Step 4: Allowances

4 Types of Allowances

- PZEV Allowance
- Zero Emission Fuel Cycle Allowance
- Zero Emission Vehicle Miles Traveled (VMT) Allowance
- Advanced Componentry Allowance
Step 4: Allowances

PZEV Allowance

- **0.2 allowance** for vehicles that:
  - Meet SULEV emission standards
  - Have zero evaporative emissions
  - Will meet OBD requirements for 150,000 mi
  - 15 year/150,000 mi extended emissions warranty
Step 4: Allowances

Low Fuel Cycle Emission Allowance

- NMOG $\leq 0.01$ grams/mi
  - Including near-term production methods and infrastructure
- Vehicle must exclusively use fuel
- Allowance = 0.3
- Qualifying Fuels: CNG, Hydrogen
Step 4: Allowances

Zero-Emission VMT Allowance

- Equivalent All Electric Range (EAER)
  - Used for “blended” PHEVs
- Urban charge depletion range actual ($R_{cda}$)
  - Used for “non-blended” PHEVs
- Utility Factor (UF) – Found in SAE J2841
- Qualifying vehicles must have an EAER and $R_{cda} \geq 10$ miles
Step 4: Allowances

Zero Emission VMT Allowance (cont.)

Equation for PHEVs EAER & Rcda between 10 and 40

Determined by Test Procedure

Use Fleet UF SAE J2841, Sec. 4.5.2, use given Rcda in UF equation

Determined by Test Procedure

\[
\text{EAER} \times (1 - \frac{UF}{Rcda}) = 11.028
\]
## Step 4: Allowances

Zero Emission VMT Allowance (cont.)

Examples:

<table>
<thead>
<tr>
<th>EAER</th>
<th>Rcda</th>
<th>VMT All.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>.700</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>.725</td>
</tr>
<tr>
<td>15</td>
<td>18</td>
<td>.846</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>.927</td>
</tr>
<tr>
<td>20</td>
<td>25</td>
<td>.972</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>1.094</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
<td>1.35</td>
</tr>
</tbody>
</table>
Step 4: Allowances

Advanced Componentry

- Each Type Requires: traction drive boost, regenerative braking, idle start/stop

<table>
<thead>
<tr>
<th></th>
<th>Type C</th>
<th>Type D</th>
<th>Type E</th>
<th>Type F</th>
<th>Type G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Power Output</td>
<td>≥ 10 kW</td>
<td>≥ 10 kW</td>
<td>≥ 50 kW</td>
<td>≥ 10 mi AER UDDS</td>
<td>≥ 10 mi AER US06</td>
</tr>
<tr>
<td>Traction Voltage</td>
<td>&lt; 60 V</td>
<td>≥ 60 V</td>
<td>≥ 60 V</td>
<td>≥ 60 V</td>
<td>≥ 60 V</td>
</tr>
<tr>
<td>09-11</td>
<td>0.2</td>
<td>0.4</td>
<td>0.5</td>
<td>0.72</td>
<td>0.95</td>
</tr>
<tr>
<td>12-14</td>
<td>0.15</td>
<td>0.35</td>
<td>0.45</td>
<td>0.67</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Step 4: Allowances

Advanced Componentry (cont.)

- Gaseous fuel (3600 psi) = 0.2 AC allowance
- Hydrogen fuel (5000 psi) = 0.3 AC allowance
Step 5: Applicable Multiplier Determination

PHEV Introduction Multiplier

- 1.25 Multiplier
- Available to 2009-2011 Model Year PHEVs
- Available to vehicles sold
- Available to vehicles leased for 3 years, and given the option to purchase or re-lease for an additional 2 years
Step 5: Applicable Multiplier Determination

ZEV Introduction Multiplier

- 1.25 Multiplier
- Available to 2009-2011 Model Year ZEVs
  - Excludes NEVs and Type 0 ZEVs
- Available to vehicles sold
- Available to vehicles leased for 3 years, and given the option to purchase or re-lease for an additional 2 years
Step 5: Applicable Multiplier Determination

Extended Service Multiplier

- Offered to 1997-2003 model year ZEVs and ≥ 10 mile zero emission VMT allowance PZEVs
- Vehicles qualify for multiplier in the fourth model year it is still registered in California
- Vehicles Placed after April 24, 2003
  - Receive 0.2 times the credit they would receive if placed in the compliance model year

For Example: 10 Type IIs placed in May 2003
Each vehicle still registered receives 0.6 credits in 2009
(0.2 * Credit Earned if placed in 2009 (3) = 0.6)
Step 6: Total Credit Calculation

PZEVs
- Earn 0.2 credits each
Step 6: Total Credit Calculation

AT PZEVs

0.2 PZEV Allowance + Adv. Comp. + Low Fuel Cycle

= 

Total AT PZEV Credit

For Example:

- Type D Hybrid = 0.6 Credits Total
- CNG Vehicle = 0.7 Credits Total
Step 6: Total Credit Calculation

Enhanced AT PZEV

0.2 PZEV Allowance + Zero Emission VMT + Adv. Componentry + Low Fuel Cycle Emissions = X

X * Early Intro Mult. = Total Enhanced AT PZEV Credit

For Example:
(Sold) 2009 Type F 10 mi EAER PHEV = 2.03 Credits
2012 Type F 10 mi EAER PHEV = 1.57 Credits
Step 6: Total Credit Calculation

ZEVs

- Earns 1 credit for delivery into CA
- Earns additional credit when placed in service

<table>
<thead>
<tr>
<th>Type</th>
<th>2009-17</th>
<th>2018+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Type I</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Type I.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Type II</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Type III</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Type IV</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Type V</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>
Step 6: Total Credit Calculation

NEVs

- Earn 0.3 credits
- **MY 2010 NEVs**: must meet technological requirements:
  - Acceleration
  - Top Speed
  - Constant Speed Range
  - Sealed, maintenance-free batteries
- **MY 2010 NEVs**: Must meet 24 mo. warranty requirement
Step 7: Rules on Credit Use

General Rules

- All credits produced in excess of a manufacturer’s requirements may be “banked” for future use.
- Credits earned from all types of vehicles may be traded or sold to any other party:
  - No, we do not know how much a credit costs.
- Traded credits can be used the same way credits earned from vehicles placed.
Step 7: Rules on Credit Use

PZEVs

- 2009 – 2011: May only meet up to 55% of a manufacturer’s ZEV requirement (or up to 6% out of the 11% requirement)

- 2012 – 2014: May only meet up to 50% of a manufacturer’s ZEV requirement (or 6% out of the 12% requirement)
Step 7: Rules on Credit Use

AT PZEVs

- 2009 – 2011: May meet up to 72.5% of a manufacturer’s base ZEV requirement (or up to 8.5% out of the 11% requirement)
- 2009-2011: May meet up to 100% of their ZEV requirement, as long as their Alternative Path Requirement is fulfilled
- 2012 – 2014: May only meet up to 75% of a manufacturer’s ZEV requirement (or 9% out of the 12% requirement)
Step 7: Rules on Credit Use

Enhanced AT PZEVs

- 2012-2014: May meet up to 93.4% of a manufacturer’s ZEV requirement (or up to 11.21% out of the 12% requirement)
Step 7: Rules on Credit Use

ZEVs: Carry Forward Provision for LVMs

- 2005 – 2008 model year ZEVs
  - Credits from ZEVs earned during this timeframe may be “carried forward” and applied to entire 2009-2011 ZEV obligation
  - Beginning in 2012, these 2005-08 ZEV credits may only be applied to the Enhanced AT PZEV, AT PZEV, and PZEV categories
Step 7: Rules on Credit Use

ZEVs: Carry Forward Provision for LVMs (cont.)

- 2009 and subsequent MY ZEV credits
  - Credits from ZEVs earned may be “carried forward” for 2 additional MYs and applied towards ZEV only requirement
  - Beginning in 3rd subsequent MY, these ZEV credits may only be applied to the Enhanced AT PZEV, AT PZEV, and PZEV categories

Example

- 2010 MY ZEV credit earned
- 2010, 2011, and 2012: Same ZEV credit may go toward entire requirement, including the min. ZEV %
- 2013: Same ZEV credit may only be used towards Enhanced AT PZEV, AT PZEV, and PZEV categories
Step 7: Rules on Credit Use

ZEV: Carry Forward Provision for Other OEMs

- 2005 and subsequent MY ZEV Credits
  - Non-LVMs may earn and bank their ZEV credits until subject to LVM requirements
  - When the manufacturer becomes subject to LVM requirements, the LVM carry forward provision applies.

Example
- 2007 ZEV credit earned by IVM
- 2012: IVM becomes subject to LVM requirements
- 2012, 2013, and 2014: 2007 ZEV credit earned may go toward entire ZEV requirement
- 2015 and subsequent: 2007 ZEV credit only goes toward Enhanced AT PZEV, AT PZEV, and PZEV
Step 7: Rules on Credit Use

ZEV: Carry Forward Provision for Other OEMs
- 2005 and subsequent MY ZEV Credits
  - Trades/sales also trigger LVM carry forward provision

Example
- 2009 ZEV credit earned by SVM
- 2011: SVM sells (2009) credit to LVM
- LVM can use sold 2009 ZEV credit for min. ZEV % only in 2011
  - Carry forward provision kicks in retroactively, the SVM’s 2009 credit for min. ZEV % until 2011
- 2012 and subsequent: sold 2009 ZEV credit only goes toward Enhanced AT PZEV, AT PZEV, and PZEV
### Step 7: Rules on Credit Use

**Neighborhood Electric Vehicles**

**2001-2005 NEVs**

<table>
<thead>
<tr>
<th>Model Years</th>
<th>Obligation</th>
<th>Allowed %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2011</td>
<td>ZEVs</td>
<td>Up to 50%</td>
</tr>
<tr>
<td>2009</td>
<td>AT PZEVs, but not PZEVs</td>
<td>Up to 75%</td>
</tr>
<tr>
<td>2010-2011</td>
<td></td>
<td>Up to 50%</td>
</tr>
<tr>
<td>2009-2011</td>
<td>PZEVs</td>
<td>100%</td>
</tr>
</tbody>
</table>
Step 7: Rules on Credit Use

NEVs (cont.)

- 2001-2005 NEVs

<table>
<thead>
<tr>
<th>Model Years</th>
<th>Obligation</th>
<th>Allowed %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-2014</td>
<td>ZEVs</td>
<td>0%</td>
</tr>
<tr>
<td>2012-2014</td>
<td>AT PZEVs, but not PZEVs</td>
<td>50%</td>
</tr>
<tr>
<td>2012-2014</td>
<td>PZEVs</td>
<td>100%</td>
</tr>
</tbody>
</table>
Step 7: Rules on Credit Use

NEVs (cont.)

- 2006 and Subsequent NEVs

<table>
<thead>
<tr>
<th>Model Years</th>
<th>Obligation</th>
<th>Allowed %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2011</td>
<td>Alt Path ZEV Req.</td>
<td>0%</td>
</tr>
<tr>
<td>2009-2011</td>
<td>ALL Base Path and AT PZEV and PZEV Req.</td>
<td>100%</td>
</tr>
<tr>
<td>2012-2014</td>
<td>ZEV</td>
<td>0%</td>
</tr>
<tr>
<td>2012-2014</td>
<td>Enhanced, AT PZEV, PZEV</td>
<td>100%</td>
</tr>
</tbody>
</table>
Step 8: Special Provisions

Advanced Demonstration Credits

- Available for ZEVs and Enhanced AT PZEVs
- Available for 2009-2014 MY vehicles
- For vehicles not delivered for sale or registered with the DMV
- Must be placed for 2 years, 50% of time in CA
- Limited to 25 vehicles per model per ZEV state per year
Advanced Demonstration Credits (cont.)

Manufacturer’s Advisory Compliance (MAC) 06-02 specifies guidelines for Advanced Demos:
http://www.arb.ca.gov/msprog/macs/macs.htm
Step 8: Special Provisions

Transportation System Credits

- For vehicles placed in projects with innovative transportation systems

Types of Credits Earned

- Shared Use and Intelligent Technologies
- Linkage to Transit

Manufacturers must have EO approval in order to earn these credits

- ZEVs: Can earn credit for either or both
- Non-ZEVs: Can earn credit only for Shared Use or for both, but not just for linkage to transit
## Step 8: Special Provisions

Transportation System Credits (cont.)

<table>
<thead>
<tr>
<th></th>
<th>2009-2011</th>
<th>Shared Use/Intelligence</th>
<th>Link to Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZEV</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>AT PZEV</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Enhanced AT PZEV</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>ZEV</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2012 and beyond</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhanced AT PZEV</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ZEV</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Step 8: Special Provisions

Transportation System Credits (cont.)

- Caps placed on use of these credits
- ZEVs TSCs = up to $\frac{1}{10}$th of ZEV Req.
- Enhanced AT PZEVs TSCs = up to $\frac{1}{10}$th of Enhanced AT PZEV Req.
- AT PZEVs TSCs = up to $\frac{1}{20}$th of AT PZEV Req.
- PZEV TSCs = up to $\frac{1}{50}$th of PZEV Req.
Step 9: Travel Provision

- **“Section 177 State”**: a state that is administering the California ZEV requirements pursuant to section 177 of the federal Clean Air Act (42 U.S.C. Sec. 7507)

- Applies to ZEVs
  - Excludes Type 0s and NEVs
  - Type I, I.5, and II ZEVs: 2009-2014
  - Type III, IV, or V ZEVs: 2009-2017

- Can be Advanced Demos or placed in service
  - In California or in Section 177 State
Step 9: Travel Provision

2009 Model Year

- ZEV credits can be used to meet CA ZEV requirements and “traveled” to meet Section 177 States’ requirements
- ZEV credits “travel” to and from CA at full value
Step 9: Travel Provision

2010 through 2017 Model Years

- ZEVs placed in CA “travel” at proportional value to Section 177 States
  - Multiply the ratio of the manufacturers’ Section 177 state sales to the manufacturers’ CA sales

Example

- Manufacturer X’s NY sales = 50% of CA sales
- 10 Type V ZEVs placed in CA = 40 credits
- “Traveled” Type V ZEV credits in NY = 20 credits
Step 9: Travel Provision

2010 and 2011 Model Years

- For manufacturers on the Alt Path
  - ZEV credits earned from vehicles placed in CA can “travel” at full value up to meeting the manufacturer’s Section 177 State Alt Path req.
  - Any vehicles above and beyond the Section 177 State Alt Path req. travel at a proportional value
Step 9: Travel Provision

2010 and 2011 Model Years

- Example
  - Manufacturer B: 300 Type III ZEVs Placed in CA (1200 credits earned in CA)
  - Manufacturer B’s NY Alt Path Req. = 50 Type III ZEVs (or 200 credits)
  - Manufacturer B’s NY sales = 50% of CA sales
  - 50 Type III ZEVs “travel” at full value to NY to meet NY Alt Path req. (worth 200 credits)
  - Other 250 Type III ZEVs “travel” at proportional value to NY (worth 500 credits)
Step 10: Demonstration of Compliance

- For manufacturers subject to the regulation, all compliance reports are due May 1 of the calendar year following the compliance model year
  - for 2008 MY, reports are due May 1, 2009
- Manufacturers may update reports until September
- Manufacturers not subject may submit credits at any time
- Credit trades or sales may be reported at anytime
Step 10: Demonstration of Compliance

Manufacturer’s Advisory Compliance 06-03

- Document outlines all reporting forms and guidelines for reporting compliance

- MAC 06-03 may be found here:
  [http://www.arb.ca.gov/msprog/macs/macs.htm](http://www.arb.ca.gov/msprog/macs/macs.htm)
Step 10: Demonstration of Compliance

Public Disclosure

- 2009 MY: Each manufacturer’s annual production and ZEV credits earned per vehicle will be available to public
- 2010 MY: Each manufacturer’s annual ZEV credit balances, including credits from transportation systems, advanced demonstrations, and trades and sales from other parties will be available to public
Step 11: Penalties

What happens if you don’t fully comply?

1. Manufacturers have 2 additional years to make up a ZEV deficit

2. If the manufacturer still fails to comply, the manufacturer is subject to financial penalties outlined in HSC 43211
Step 11: Penalties

Health and Safety Code 43211
- $5,000 penalty per vehicle not produced
- 1 ZEV credit = Type 0 ZEV (default ZEV)
- 1 ZEV credit = 1 vehicle
- Therefore, $5,000 penalty per each ZEV credit not produced
Step 11: Penalties

Example

- Manufacturer X’s 2009 ZEV Requirement: 6,000 Credits
- Manufacturer X produces 5,500 Credits and does not make up their deficit
  - Does not matter which type of vehicle the manufacturer fails to produce
- 500 Credits $\times$ $5,000 = $2.5 million
ARB’s Role in ZEV Commercialization
Environmental Performance Label

Protect the environment, choose vehicles with **higher scores:**

**Global Warming Score**

- Average new vehicle: 1
- Cleanest: 10

**Smog Score**

- Average new vehicle: 1
- Cleanest: 10

Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on this vehicle’s measured emissions. See [www.DriveClean.ca.gov](http://www.DriveClean.ca.gov) for more information.

**Global warming score** is based on greenhouse gas emissions from vehicle operation and fuel production.

**Global Warming pollutants** include: Nitrous Oxide (N₂O), Methane (CH₄), A/C refrigerant, Carbon Dioxide (CO₂).

**Smog score** is based on smog forming emissions from vehicle operation.

Smog pollutants include: Non Methane Organic Gases (NMOG), Oxides of Nitrogen (NOₓ), Hydrocarbons (HC).

The higher the score, the cleaner the vehicle. 10 is the best possible.

Scales compare emissions between all vehicle classes.
Environmental Performance Label

- Required to be on all new vehicles as of January 1, 2009
- Includes both Smog score and Global Warming Score
  - Based on 1-10 scale, 10 being the cleanest
  - Smog score based on vehicle operation
  - Global Warming score based on upstream and vehicle operation
- All vehicles compared to avg. vehicle in a given model year
Purpose

- A clean car buying guide
- Educate and influence California consumers about current and future clean technology vehicles and alternative fuels
- Provide Smog and Global Warming scores on cars certified in California
- Search incentives
Features

- Environmental Performance scores
- Search clean cars by make and model
- Search by category type
- Compare vehicles side by side
- Search by technology and fuel types
- Popular searches
Enhanced Interface

Coming July 2009
Alternative Fuel Vehicle Incentive Program

- AB 1811
- Clean vehicle incentives
  - Battery EVs
  - Fuel Cell Vehicles
  - NEVs
  - CNG Vehicles
- Up to $5,000 rebate for eligible vehicles
Air Quality Improvement Program

- ARB’s portion of funds from AB 118
  - Termed AQIP
- Similar to Alternative Fuel Vehicle Incentive Program
  - Includes High Speed Freeway Capable Motorcycles
- Funding will become available Q3 2009
California Fuel Cell Partnership

Driving for the Future
California Fuel Cell Partnership

- Collaboration of 30 member companies working together to promote the commercialization of hydrogen fuel cell vehicles
  - automobile manufacturers
  - energy providers
  - government agencies
  - fuel cell technology companies
  - transit authorities
CaFCP 2009 Action Plan

46 Stations
Santa Monica, Irvine, Torrance, Newport Beach, San Francisco, Sacramento

3 Focus Areas
- Passenger vehicles
- Transit buses
- Regulations, Codes & Standards

4 Years
Funding 2009-2012
Stations begin operation 2009-2014

$180 Million
Industry and government investment
California Hydrogen Highway

- ARB co-funding: 7 stations awarded to date ($14.4M)
- CEC through AB 118
- Hydrogen communities
  - Placed with vehicle rollouts
  - Full retail setting
  - 350/700 bar dispensing
- SB 1505: 33% renewable and cleaner than gasoline well-to-wheel
Section 177 States
Presentation Overview

- Clean Air Act authority (Section 177)
- State actions and status
  - New York, Massachusetts, Maine, Vermont, New Jersey, Connecticut, Rhode Island, Maryland
- Alternative Compliance Plan and Proportional Credits
- Travel Provision
Clean Air Act Section 177

- States may adopt and enforce motor vehicle standards if:
  - Standards are identical to CA standards for which a waiver has been granted for that model year, and
  - CA and state adopt standards at least two years before commencement of model year
- Cannot limit sale of CA vehicles in state
- Cannot create “third vehicle”
Clean Air Act Section 177

- **“Standards”**
  - A standard is numerical limit on emissions
  - State must adopt all standards in a weight class

- **“Identical”**
  - Numerical limits must be same as CA
  - Enforcement procedures may differ

- New York case established when states can adopt and enforce
  - Adopt after CA adopts (Board hearing)
  - Enforce after CA waiver approved by EPA
## Northeast State Actions*

<table>
<thead>
<tr>
<th>Program Attribute</th>
<th>CT</th>
<th>ME</th>
<th>MA</th>
<th>NJ</th>
<th>NY</th>
<th>RI</th>
<th>VT</th>
<th>MD</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEV I Start (first model year)</td>
<td>n/a</td>
<td>2001 for Passenger cars 2003 for Medium duty vehicles</td>
<td>1994</td>
<td>n/a</td>
<td>1996 (previously adopted 1993 CA standards)</td>
<td>n/a</td>
<td>2000 for 0 – 5750; 2004 for 0 - 14000</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

*states outside of the northeast have adopted the California standards with the ZEV requirements*
Northeast States Alternative Compliance Plan

- Vehicles sold and marketed in CA must be available in Northeast states
- Manufacturer compliance plans approved and enforced on state-by-state basis
- Alternative Compliance Plan does not affect other aspects of LEV program
- Alternative Compliance Plans ended in 2009
Elements of ACP

- Core credit scheme
  - Same as CA
- Northeast phase in multipliers
  - Three year phase-in
- ZEV and AT PZEV percentage requirements
  - Three year phase-in
- Infrastructure and transportation system projects
  - Credit available for special projects
  - Capped at 25% of manufacturer obligation
  - Sunset at end of 2006 model year
Proportional ZEV Credits

- 5 states have “proportional credit” programs
- ME, MD, RI, CT, NJ
- Manufacturers have a bank of credit in each of these states equal to:

\[
\text{S 177 vehicle sales/CA vehicle sales} \times \text{Number of ZEV credits banked in CA}
\]
Proportional Credits (continued)

- S. 177 state credits are based on the amount of credit banked in California in the year prior to the start of the S. 177 state ZEV program
- Some states provide more credit for ZEVs placed in the S. 177 state than for transferred credits
Travel Provision

- Travel provision allows manufacturers to count ZEVs placed in any S. 177 state towards the ZEV obligation in California, and vice versa.
- Credit transfers from state to state are done “proportionally”
- Travel provision now includes battery electric vehicles in addition to fuel cell vehicles.
- Sunset years for travel provision changed in latest ZEV program revision.
- Impact of travel provision on the northeast ZEV programs will depend on how manufacturers comply with the ZEV program requirements.
Looking Forward: ZEV 2.0
ZEV 2.0 Guiding Principles

- ZEV mass commercialization is essential in meeting California’s long term GHG, air quality, and petroleum independence goals
- ZEVs still need to be mandated
- Simplicity is necessary
- Transparency makes for an effective and ethical regulation
- There is no “silver bullet”
ZEV 2.0 Vision Statement

To ensure cost effective zero emission vehicle alternatives are available to California consumers.
Resolution 08-24

- At the March 2008 hearing, the Board directed staff to consider and incorporate the following into a redesigned ZEV regulation:
  - Review LEV, ZEV, and Pavley from smog and GHG perspective
  - Redesign 2015 and subsequent model year requirements
  - Strengthen and focus requirements on “gold” vehicles, that is ZEVs and Enhanced AT PZEVs
  - Move from demonstrations to commercialization in order to meet California’s GHG goals
  - Look at different parameters for blended PHEVs
  - Return to the Board by the end of 2009
What does this mean?

- PZEVs → LEV III
- AT PZEVs (HEVs) → Pavley II

- ZEV regulation focuses on Enhanced AT PZEVs and ZEVs
  - Much greater numbers than currently required
  - Based on GHG and criteria pollutants
ZEV 2.0 Action Items

- White Paper
  - GHG Analysis Document
  - Plug-in and Battery EV Infrastructure Document
  - Technical Support Document
- Update to the Board
ZEV 2.0 Timeline

- September: Draft Technical Support Document and EV Infrastructure Document Released
- September 21 & 22: ZEV Symposium
- September 23: Infrastructure Workshop
- November 10: Final White Paper with all attachments released
- December 10: Staff provides update to the Board
- Q3 or Q4 2010: Regulatory Proposal Goes to Board
Conclusion
ZEVs are here…

Honda Clarity
Hydrogen Fuel Cell Vehicle
Range: 300+ mi
Available to Public for Lease

Tesla Roadster
Battery Electric Vehicle
Range: 200+ mi
Available to Public for Sale
BMW Mini E
Battery Electric Vehicle
Range: 100+ mi
Available to Public for Lease
...and ZEVs are coming...

Chevrolet Volt
Plug-In Hybrid Electric Vehicle
Range: 40 mi All Electric
Publicly Stated Release: 2010

Mitsubishi iMiev
Battery Electric Vehicle
Range: 75 mi
Publicly Stated Release: 2010
...and coming...

**Toyota EV**

Battery Electric Vehicle

Range: Unknown

Publically Stated Release: 2012

**Jaguar XJ**

Plug-In Hybrid

Range: 30 mi All Electric

Publically Stated Release: 2011
...and coming!

Nissan EV
- Battery Electric Vehicle
- Range: 100 mi
- Publically Stated Release: 2010

Ford Plug-in Hybrid Escape
- Plug-in Hybrid
- Range: 10-20 All Electric
- Publically Stated Release: 2012

Ford Transit Connect
- Battery Electric Vehicle
- Range: 100 mi
- Publically Stated Release: 2010

Mercedes B Class Fuel Cell
- Fuel Cell Vehicle
- Range: 300 + mi
- Publically Stated Release: 2015

Toyota Plug-In Prius
- Plug-In Hybrid
- Range: 10-20 All Electric
- Publically Stated Release: 2010

Smart Electric Vehicle
- Battery Electric Vehicle
- Range: 100 mi
- Publically Stated Release: 2010 (Europe)

Chrysler
- Battery Electric Vehicle
- Range: Unknown
- Publically Stated Release: 2010