Zero Emission Vehicle (ZEV)

Regulation

LEV III
Air Quality Improvement

LEV III
Greenhouse Gas Reductions

ZEV
Future Technology advancement
How The ZEV Regulation Works

Requires large volume automobile manufacturers to produce zero emitting passenger vehicles

- **Battery Electric Vehicles (BEV)**
- **Hydrogen Fuel Cell (FCEV)**

May substitute some with near-zero emission vehicles

- **Plug-in Hybrid Electric Vehicles (PHEV)**
- **Conventional Hybrids**
- **Clean Gasoline Vehicles**
Regulated Manufacturers

Large Volume Manufacturers
> 60,000 sales
- Chrysler
- Ford
- GM
- Honda
- Nissan
- Toyota

Large Volume Manufacturers 2018+
> 20,000 sales
- BMW
- Hyundai
- Kia
- Mazda*
- Mercedes
- Subaru*
- Volkswagen

Intermediate Volume Manu.
- Jaguar / Land Rover*
- Mitsubishi*
- Volvo*

* Current rulemaking may adjust Intermediate Volume Manufacturer compliance requirements for companies in red
History of the ZEV Regulation

1990
ARB LEV I
ZEV Requirement born as a footnote within LEV I

1992

1996
ZEV Regulation
• The MOA
• 10% ZEVs in 2003
• Early requirements eliminated

1998
LEV II adopted
• ZEV moved to its own section
• PZEV credits permitted as substitution
• Introduction of HEVs

2000

2001
ZEV Amendments
• Allowed offset with AT PZEVs (Conventional HEVs)
• Increased future ZEV requirements

2001
ZEV Litigation
• Federal and State lawsuits
• Enforcement Prohibited (2003 and 2004)
History of the ZEV Regulation

2003
ZEV Amendments
• Alt Path Created
• Phases created for vehicle placement
• Arrival of FCEVs

2008
ZEV Amendments
• Ended Alt Path
• Reduced 2012-2014 ZEV Requirement
• Added PHEVs to AT PZEVs

2009
ZEV White Paper
• Board directed staff to return with recommendations
• Includes 2050 GHG analysis of LDV sector

2012
ZEV Amendments
• Strengthened regulation
• Reduced LVM definition to 20,000 units

2013/2014
ZEV Amendments
• Minor changes
• Closed loopholes
• Addressed equitability issues
Vehicle Technology Overview: Pure ZEV

- Full Function Battery Electric Vehicles
- Nickname: BEVs or EVs
- Most between 75 miles and 200 miles range
- Commonly on smaller platforms (exception: Tesla, RAV4)
- Treatment: Earn between 1 and 9 credits through 2017, 1 and 4 credits 2018 and beyond

GM Spark BEV: 70 miles Real World Range
Toyota Rav 4 BEV: 120 miles Real World Range
Tesla Model S 85 kW: 265 miles Real World Range
Vehicle Technology Overview: Pure ZEV

- **Fuel Cell Electric Vehicles**
  - Nickname: FCVs or FCEVs
  - Most between 200 and 400 miles range
  - Run on compressed hydrogen gas
  - Commonly on larger platforms (exception: Toyota and Mercedes)
  - Treatment: Earn 5 to 9 credits through 2017, 4 credits 2018+

Hyundai Tuscon FCV: 265 mile EPA range

Toyota Mirai: 300 mile range (projected)
Vehicle Technology Overview:

BEVx: Range Extended Battery Electric Vehicles

- **New Vehicle Category:**
  - Full Function Battery Electric Vehicles with back-up engine

- **Why?**
  - Could improve vehicle marketability, could increase total zero-emission miles driven, more flexibility

- **Treatment**
  - Credit same as BEVs, based on zero emission miles
  - Can meet up to 50% of pure ZEV requirement
Vehicle Technology Overview: TRANSITIONAL ZEV (TZEV)

- **Blended Plug-In Hybrids**
  - Engine comes on before battery is fully depleted
  - Example: Plug-In Prius, Ford CMAX
- **Non-Blended Plug-in Hybrids**
  - Also called Range Extended Electric Vehicles (REEV), Extended Range Electric Vehicles (EREV)
  - Car maximizes electric range
    - Engine does not come on before battery is in charge sustaining mode
  - Example: Chevy Volt
- **Why does it matter?**
  - Environmental advantages
    - Volt proponents say its all about max e-miles
    - Blended says its all about overall fuel economy
  - Non-Blended = More “BEV”- like
  - Blended = Lower cost per vehicle
Neighborhood Electric Vehicles (NEV)

- BEV with limited range and top speed
- Not freeway capable
- Widespread fleet application
- Considered a “loophole” by some during the late 1990s; fixed in the 2001 amendments, added technical requirements in 2008
- **Treatment**
  - 0.15 credits each, treated as a TZEV
  - Can meet up to 25% of TZEV category
MEETING 2050 GOALS:
NEW PASSENGER VEHICLE SALES

ZEV sales reach 100% by 2040, but on-road fleet is still mixed: ZEVs are 87% of on-road fleet in 2050
<table>
<thead>
<tr>
<th>Type of ZEV</th>
<th>Through MY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Gasoline Vehicles (PZEVs)</td>
<td>3,100,000</td>
</tr>
<tr>
<td>Conventional Hybrid (e.g. Prius)</td>
<td>560,000</td>
</tr>
<tr>
<td>Plug-In Hybrid</td>
<td>33,000</td>
</tr>
<tr>
<td>Battery Electric</td>
<td>33,000</td>
</tr>
<tr>
<td>Hydrogen Fuel Cell</td>
<td>500</td>
</tr>
</tbody>
</table>
Simplified ZEV Regulation
Credits (2018 +)

- 100 Mile BEV: 1.5 Credits
- 300 Mile FCV: 3.5 Credits
- Plug-in Hybrid Credits
Mechanics of How it works

1. Annual Credit Percentage Requirements
2. LVMs MUST produce pure ZEVs (BEVs/FCVs)
3. Everything else (i.e. PHEVs) is an option or a “flexibility”
4. Each vehicle earns an amount of credit
   • Linear scale based on range
2015-2025 ZEV Requirements

Annual ZEVs

Projected: ZEVs

Projected: Plug-in Hybrids

Previous Regulation - ZEVs

Previous Regulation - PHEVs

15.4% of Annual Sales in 2025
## 2018-2025 Likely Compliance, Vehicles

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZEV, annual LVM</strong></td>
<td>16,816 (1.0%)</td>
<td>33,465 (2.0%)</td>
<td>48,298 (2.9%)</td>
<td>61,689 (3.8%)</td>
<td>74,189 (4.5%)</td>
<td>87,266 (5.2%)</td>
<td>99,405 (5.9%)</td>
<td>108,972 (6.4%)</td>
</tr>
<tr>
<td><strong>TZEV, annual LVM + IVM</strong></td>
<td>61,259</td>
<td>75,263</td>
<td>89,095</td>
<td>101,896</td>
<td>116,391</td>
<td>131,158</td>
<td>146,906</td>
<td>161,683</td>
</tr>
<tr>
<td><strong>Total, annual</strong></td>
<td>78,075 (4.7%)</td>
<td>108,728 (6.4%)</td>
<td>137,393 (8.1%)</td>
<td>163,585 (9.7%)</td>
<td>190,580 (11.2%)</td>
<td>218,424 (12.7%)</td>
<td>246,311 (14.1%)</td>
<td>270,655 (15.4%)</td>
</tr>
<tr>
<td><strong>Total, cumulative</strong></td>
<td>78,075</td>
<td>186,803</td>
<td>324,196</td>
<td>487,781</td>
<td>678,361</td>
<td>896,785</td>
<td>1,143,096</td>
<td>1,413,751</td>
</tr>
</tbody>
</table>
Section 177 States – ZEV Adoption

- Nine additional states implementing ZEV Regulation: CT, MA, MD, ME, NJ, NY, OR, RI, VT
- S177 Compliance 1.4x CA compliance
- California working with sibling states in developing and supporting activities
Electric Vehicle Charging Requirements

- 2001: Charging requirements adopted
- California PEVs and PHEVs must be equipped with Society of Automotive Engineering (SAE) J1772 charge connector “inlet” connectors
- On board charger requirement (≥3.3kW)
- No DC charging connector requirement
## Vehicles Currently Available

<table>
<thead>
<tr>
<th>Vehicle Model</th>
<th>Technology</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BMW i3 or i3 Rex</td>
<td>BEV</td>
<td>Tesla Roadster</td>
<td>BEV</td>
</tr>
<tr>
<td>BYD e6</td>
<td>BEV</td>
<td>Toyota RAV4 EV</td>
<td>BEV</td>
</tr>
<tr>
<td>Chevrolet Spark EV</td>
<td>BEV</td>
<td>Volkswagen e-Golf</td>
<td>BEV</td>
</tr>
<tr>
<td>Fiat 500 EV</td>
<td>BEV</td>
<td>Cadillac ELR</td>
<td>PHEV</td>
</tr>
<tr>
<td>Ford Focus Electric</td>
<td>BEV</td>
<td>Chevrolet Volt</td>
<td>PHEV</td>
</tr>
<tr>
<td>Honda Fit EV</td>
<td>BEV</td>
<td>Ford C-Max Energi</td>
<td>PHEV</td>
</tr>
<tr>
<td>Kia Soul EV</td>
<td>BEV</td>
<td>Ford Fusion Energi</td>
<td>PHEV</td>
</tr>
<tr>
<td>Mercedes-Benz B-Class Electric Drive</td>
<td>BEV</td>
<td>Honda Accord Plug-in</td>
<td>PHEV</td>
</tr>
<tr>
<td>Mitsubishi i-MiEV</td>
<td>BEV</td>
<td>Toyota Prius Plug-In Hybrid</td>
<td>PHEV</td>
</tr>
<tr>
<td>Nissan LEAF</td>
<td>BEV</td>
<td>Honda FCX Clarity</td>
<td>FCEV</td>
</tr>
<tr>
<td>smart ED</td>
<td>BEV</td>
<td>Hyundai Tucson Fuel Cell</td>
<td>FCEV</td>
</tr>
<tr>
<td>Tesla Model S</td>
<td>BEV</td>
<td>Mercedes-Benz F-Cell</td>
<td>FCEV</td>
</tr>
</tbody>
</table>
It Takes More Than a Regulation

• The ZEV Regulation in and of itself does not guarantee success

• To assist the Regulation, the ARB has established a holistic support program that includes:
  – Providing consumer incentives
  – Establishing a robust support infrastructure
  – Supporting ZEV requirements in other states
Consumer Incentives

• **Clean Vehicle Rebate Project (CVRP)**
  – Funded by AQIP and LCTI
    • AQIP created by AB 118; Reauthorized by AB 8
    • LCTI associated with AB 32 GHG Reduction Fund
  – Expected FY 15-16 budget of $116 million
  – 90,000+ rebates totaling ~ $190 million issued

• **Single Occupant Carpool Lane Access**
  – BEVs and FCEVs get white decal (unlimited)
  – PHEVs get green decal (currently capped at 70K)
Building a Fueling Infrastructure

• Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP)
  – Funded by AB 118

• Both electric and hydrogen infrastructure
  – $44 million to date for chargers
  – $4 million for regional planning
  – $47 million to more than double the number of H2 fueling stations to 54 on path to goal of 100
Multi-State ZEV Action Plan

- CA, CT, MA, MD, NY, OR, RI, and VT
- Informed by intensive stakeholder process
- Released May 2014
- 11 priority actions to:
  - support MOU goals
  - guide interstate coordination
  - advise state-specific action