2015 Update to the Board: Advanced Clean Cars Program Midterm Review

Diamond Bar, CA
October 22, 2015
Role of Advanced Clean Cars

Stable Global Climate

2020 GHG Emission Target

2025

2030 GHG Emission Target

2035

2040

2045

2050 GHG Emission Target

2050

Healthy Air Quality

Ozone and PM2.5 Attainment

75 ppb 8-hr Ozone Attainment

70 ppb 8-hr Ozone Attainment

LEV III – Criteria and GHG: Improving Conventional Vehicle Technology

Advanced Clean Cars II?? Technology Commercialization and Fleet Transformation

Advanced Clean

ZEV Program: Accelerating Advanced Technology Development

100% ZEV Sales by 2050

Maintain Clean Air Act Attainment
Mobile Source Modeling Re-affirms Need for ZEVs

Required to average 60% eVMT to meet targets.
ARB’s Midterm Review

**GHG (with Federal Partners)**
- Load and mass reduction studies
- Testing and benchmarking of advanced engines and drivetrains
- Review of market acceptance of emerging GHG technologies
- Teardowns of new vehicle technologies

**ZEV Review**
- ZEV credit analysis
- Technology assessment
- Role of PHEVs/OEM Data Analysis
- Consumer awareness and attitudes
- Infrastructure Assessment

**1 mg/mi PM Standard**
- Measurement feasibility
- Vehicle feasibility and testing
Midterm Review Timeline

- **2014**: ZEV Infrastructure Update
- **2015**: PM Measurement Capability Update
- **2016**: Full CA Midterm Review Presented
- **2017**: ARB
- **2018**: EPA/NHTSA/ARB
- **2019**: National GHG Joint Technical Report
- **2020**: Joint Decision on appropriateness of National standards
  
  **Due No Later than April 1**
LEV-GHG Review Status

• Manufacturers are over-complying with current GHG standards
• Initial findings show manufacturers on track to comply with future standards
  – NAS Committee Report concluded compliance with future standards is feasible
  – ARB research shows road load reduction can contribute substantially (powertrain/engine improvements contribute remainder)
CA vs. US Compliance with One National Program for GHG Credits

Standards calculated based on sales from the six large volume manufacturers subject to CA GHG regulations for MY 2012-2013 including credits.
Conclusions

• “The committee found the analysis conducted by NHTSA and EPA in their development of the 2017-2025 standards to be thorough and of high caliber on the whole.”

• “Most of the vehicles use spark-ignition gasoline engines and demonstrate the potential for conventional technologies to meet these standards.”

• Acknowledged the California ZEV regulation in driving higher ZEV volumes than would be likely required through the GHG tailpipe and fuel economy standards alone.
ARB Research Contract on Road Load Reduction Potential

Baseline MY 2014

Improved Aerodynamics

+ Reduced Tire Rolling Resistance

+ Mass Reduction

+ Engine Resizing/Optimization

Final

Vehicle Load Scenario

Tailpipe CO₂ Emissions (g/mi)

220
225
230
235
240
245
250
255
260
265
270

2014 best-in-class of these technologies to all vehicles could yield ~25% of needed reductions for 2025 requirements.
ZEV Review Status

• Credits will continue to provide flexibility for manufacturers’ compliance, but requirements continue to push ZEV commercialization
• Pure ZEV sales are increasing
• Consumers pleased with PEV decision but many willing to pay for more electric range
• Vehicle usage data show eVMT to be highly variable, even for same vehicle type
What is the status of ZEV Credits?

Assuming current sales levels, and using all credits as quickly as possible, manufacturers would deplete credit banks after 2021 MY compliance.

![Graph showing ZEV and PHEV sales projections.](chart.png)
What is the status of ZEV Credits?

Manufacturers could supplement compliance with the ZEV requirement through 2025 with banked credits, assuming increasing sales.
Trends in California and S177 ZEV States

CA 2015 ZEV Market Growth Outpacing PHEVs

Source: IHS Automotive, Polk new vehicle registrations for CY2010-2015 as of August 2015.
Consumer ZEV Choices Continue to Expand

Expected Releases in Late 2015

Model Offerings:
- PHEV
- BEVx
- BEV
- FCV
Driver Satisfaction High for Both BEV and PHEVs

“Would you recommend your PEV to someone you know looking for a new car?”

PEV Drivers Likely to Buy Again

“If you suddenly needed to replace your PEV tomorrow, what kind of vehicle do you think you would get?”

Both BEV and PHEV Drivers Want More e-Range

“If you could, how would you change your PEV?”

Source: Ownership Experience Survey of CVRP Recipients, April-May 2015. Respondents able to choose more than one. Totals will sum to more than 100%.
Battery Costs Falling Faster Than Expected

Projected Battery Cost for 2018

- 2012 Advanced Clean Car Staff Report
- Potentially Pack Cost Range
- Nykvist and Nilson, 2015
- AABC Tesla Battery Report, 2014
- DOE 2022 Target
- Chevrolet Bolt Announcement, 2015

Wide eVMT variability across PEV platforms, design, drivers, charging usage

**PEV eVMT Distribution**

- **Criteria GHG**
- **ZEV**
- **E-Range**
  - Nissan Leaf 84
  - Ford Focus EV 76
  - Honda Fit EV 82
  - Honda Accord Plug-In 13
  - Toyota Prius Plug-In 11
  - Ford Fusion Energi 20
  - Ford C-MAX Energi 20

![Graph showing eVMT distribution across different vehicles](chart.png)
PEV eVMT Distribution

Wide eVMT variability across PEV platforms, design, drivers, charging usage

- **Ford Focus EV**: 100%
- **Honda Fit EV**: 90%
- **Nissan Leaf**: 80%
- **Tesla Model S**: 70%
- **Ford Fusion Energi**
- **Ford C-MAX Energi**
- **Honda Accord Plug-In**
- **Toyota Prius Plug-In**

Projected Annual Vehicle Miles Traveled (VMT)

E-Range

- **Tesla Model S**: 208-270
- **Nissan Leaf**: 81
- **Ford Focus EV**: 76
- **Honda Fit**: 82
- **Honda Accord Plug-In**: 13
- **Toyota Prius Plug-In**: 11
- **Ford Fusion Energi**: 20
- **Ford C-MAX Energi**: 20

Criteria GHG ZEV

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Summary and Next Steps

- On track to come back to the Board by the end of 2016 with California’s full midterm review
- 2016 ACC Technical Symposium (September)