California’s Advanced Clean Cars Program

A coordinated set of GHG, criteria, and ZEV regulations

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“We will go to Mexico next. California can’t do this alone.” - Governor Brown’s 2014 State of the State Address
California is squarely focused on addressing the threat of climate change

- We need to protect our natural and built environment
- Commitments for healthy air and less GHG pollution
- We need to transform our fuels, vehicles, and the way we move people and goods
- Policies, regulations, and public-private investments working in concert
Transportation is largest emission source
How did we get here?

- 2002: California Assembly Bill 1493 calls for CARB to develop car GHG emission standards
- 2010: U.S.EPA adopts California car GHG standards
- 2011: Obama Administration announces agreement between auto makers, California, Federal Government on one national GHG standard for cars
- Jan 2012: CARB adopts 2017-2025 GHG standards
- One national program is created. Oct. 2012: U.S.EPA/NHTSA adopt same standards
What is the Adv. Clean Cars Program?

Coordinated approach to meeting air quality and GHG goals from light duty vehicles.
Cumulative 870 MMTCO2e reductions through 2050

- Major impact as low-GHG vehicles replace older vehicles
- GHG reduction in California: 27% in 2035 and 33% by 2050
Benefits of the ACC Program

Source: American Lung Association

Based on EPA regulatory analysis of health endpoints/costs for CAA and NAAQS, federal estimates of societal costs of carbon emissions, and federal estimates of macro-economic impact of importing oil, disruptions in supply.

~$7 billion in avoided health and other damages
GHG Standards are not Fuel Economy Standards
GHG Standards

- Phase-in: 2017-2025 model year
- 2025 target: 166 gCO$_2$e/mile
- 4.6%/year GHG reduction
- Total reduction of 34%
- Separate car and truck standards
Flexible Footprint-Indexed Standards

All vehicles must reduce GHG emissions by about the same percent

Why footprint-based?

- Preserve all vehicle types in marketplace
- Address manufacturer competitiveness
- Promote lightweighting

Note: There are corresponding footprint-indexed standard targets for light trucks
Credit opportunities and flexibilities

- Off-cycle emission reductions
  - Recognizes reductions achieved outside of test cycles
- Truck hybridization
- A/C efficiency improvements and low GWP refrigerants
- Company sales-weighted averaging
- Footprint-indexed targets
- Separate car and truck standards
- Credit banking (5-year carryforward, 3-year carryback)
Existing technologies used more extensively

**Model year**

- **Conventional**
- **Advanced**
- **Low-GHG**
- **Electric**
- **Plug-in hybrid**
- **Fuel cell**

### ZEV technology: ultra-low GHG
- **Engine**
  - Variable valve control
  - Direct injection
  - Turbocharging
  - Cylinder deactivation
  - Cooled exhaust gas recirculation
- **Driveline**
  - Optimized controls
  - 8-speed transmission
  - Continuously variable
  - Dual clutch transmission
- **Vehicle**
  - Engine stop-start
  - Hybrid power assist
  - Aerodynamics
  - Low rolling resistance tires
  - Advanced lightweight materials
  - Low-GWP refrigerant (1234yf)
  - Electric accessories
Consumer savings exceed technology costs

- Average 2025 vehicle consumer savings
- Consumer savings greatly outweigh the cost (by 3-to-1 margin)
- “Off the lot” savings from the first month
- Overall payback within first vehicle purchaser
The end goal is zero

- 2025: 1 out of 7 new vehicles is a ZEV (CARB’s ZEV2.0 Mandate)
- Post-2025 continue at GHG reductions of ~5% per year and frame the path to 2050
- ~2040: all new vehicles sold are ZEVs
- ~2050: 9 out of 10 vehicles on the road are ZEVs
Hydrogen and electricity, the “no compromise” alternative to fossil fuel combustion

- California is investing heavily in incentives and infrastructure for ZEVs
- California has committed support for 100 H2 fueling stations
- ZEV Policy promotes specifically BEVs and FECVs