

Update on the Proposed Federal Phase 2 GHG and Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles



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Sacramento, California

U.S. EPA/NHTSA Phase 2 Proposal: Important Next Step

- Fuel savings of ~77 billion gallons
- Improve mileage for a line haul truck from ~6 to ~9 miles per gallon
- Cuts ~1,040 MMT CO₂eq nationally
- Per Union of Concerned Scientists, total Phase 1 and 2 reduction nearly 40%



Some Missed Opportunities

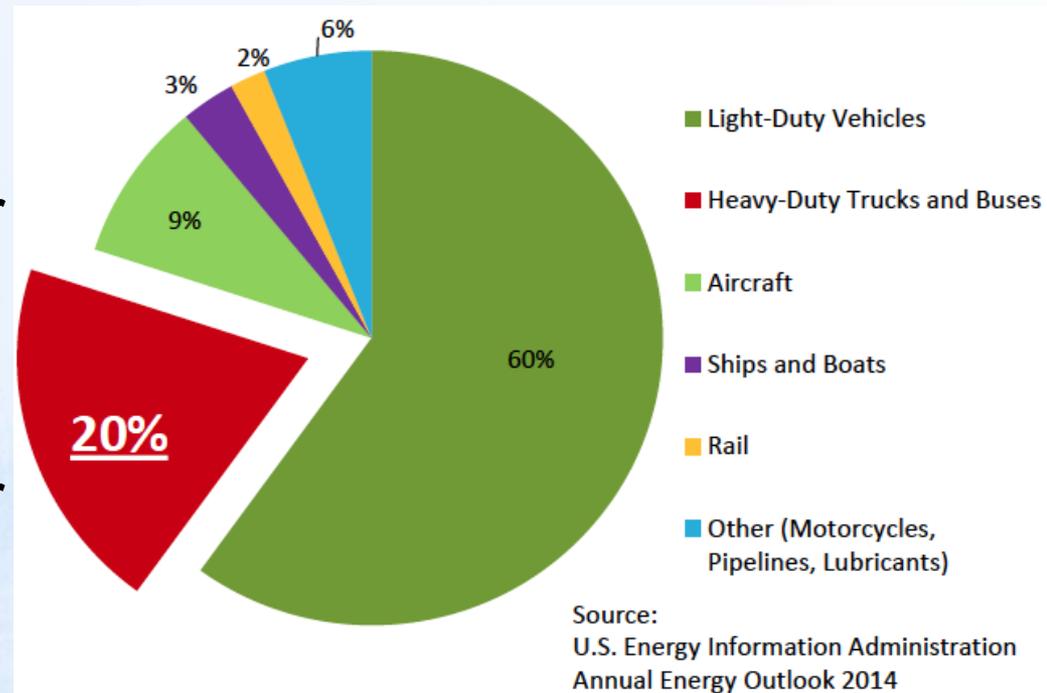
- Advanced technologies only modestly included
- Aerodynamics on vocational vehicles and some trailers not addressed
- PM 2.5 increases from increased APU use should be mitigated
- Lower Mandatory NOx standard should be discussed

Today's Presentation

- Background
- Federal Proposal Summary
- Staff's Initial Assessment
- Next Steps

National Mobile Source GHG Emissions

- Medium and Heavy-duty trucks account for 1/5 of transportation sector GHG emissions
- Fastest growing transportation sector in the US and globally



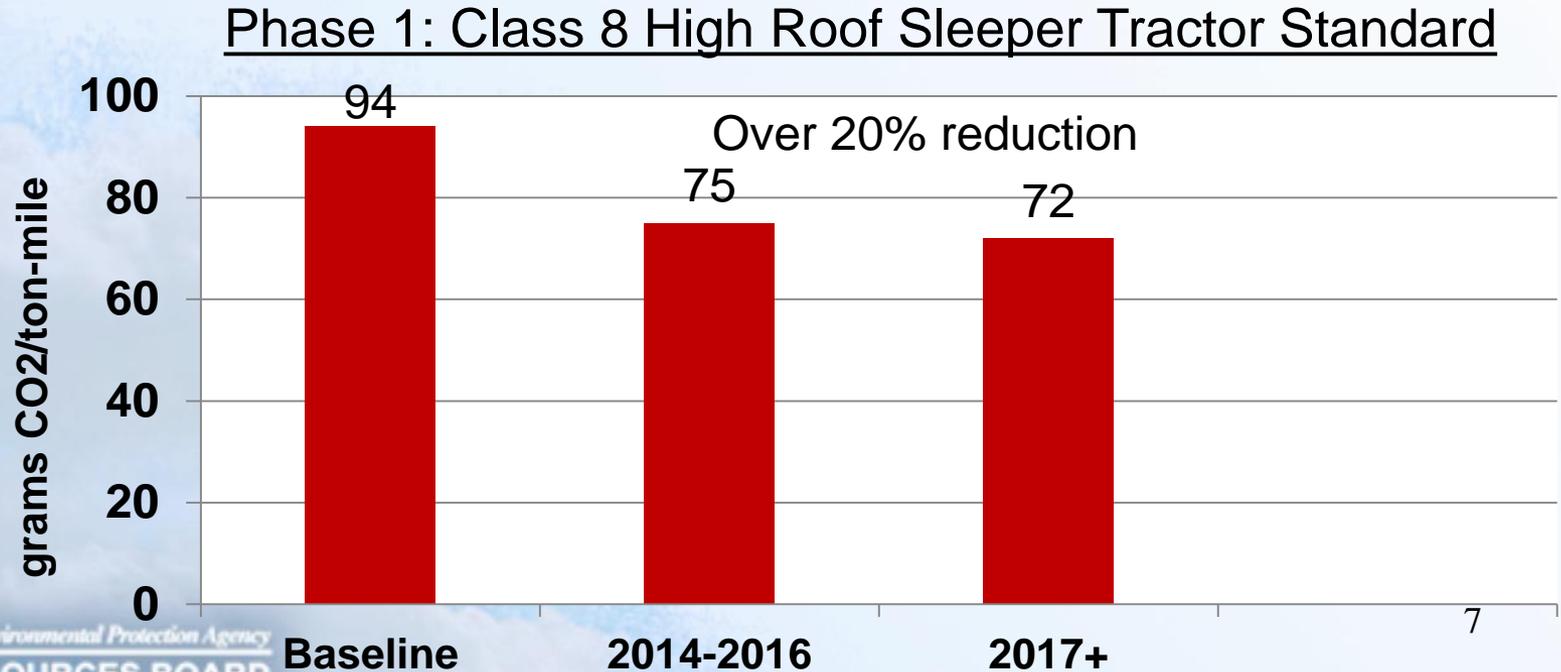
California Emissions from Medium and Heavy-Duty Trucks

- 33% of Statewide NO_x
- 26% of Statewide diesel PM
- 8% of Statewide GHG emissions
 - 21% of Transportation GHG



Phase 1 Standards

- Adopted jointly by U.S. EPA and National Highway Traffic Safety Administration in 2011
- First national GHG and fuel-efficiency standards for heavy-duty trucks (Class 2b-8)



Phase 1 Covers Three Vehicle Categories

Line-haul Tractors (Class 7-8)



Vocational Vehicles (Class 2b-8)

Pickups & Vans (Class 2b-3)



California Phase 1 GHG Regulations

- ARB harmonized with the federal Phase 1 Program in December 2013
 - Sunset redundant new tractor requirements
 - Maintained California trailer and pre-2010 tractor requirements
- Gave manufacturers ability to certify in California and ARB ability to enforce
- Will reduce CO₂ emissions in California by 11.7% in 2030

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ARB Coordination on Phase 2

- Weekly meetings with U.S. EPA and NHTSA Phase 2 teams
 - Late 2013-2014
- ARB commissioned aerodynamic testing of vocational vehicles and pup trailers
 - Up to 8% fuel consumption reduction for vocational aero
- Submitted technical letters
 - Hybrid NOx Check
 - Solar Glazing



Notice of Federal Proposed Rulemaking

- Pre-publication version of the Phase 2 Notice of Proposed Rulemaking (NPRM) issued June 19, 2015
- Final NPRM published July 13
 - Jointly issued by U.S. EPA and NHTSA
 - Triggers 60 day comment period
- Today's presentation is an initial assessment
- In-depth review on-going

NPRM Structure

- Builds on Phase 1 structure
 - Adds trailers
 - Adds engine/transmission integration
- More ambitious and longer term standards
- Applies to MY 2018+ for trailers and MY 2021+ for engines and vehicles
- Proposed alternative phases in through MY 2027
 - Soliciting comments on phasing in by MY 2024



Proposed Phase 2 Vehicle Standards: Benefits

	CO2, Fuel Consumption Reduction vs. 2017 Phase 1 Baseline
Line-haul Tractors (including Engine Improvements)	18-24%
Trailers	3-8%
Vocational Vehicles (including Engine Improvements)	12-16%
Pickups and Vans (including Engine Improvements)	16%

Engine Standards

- Continuation of Phase 1 separate engine standards
- Staff supports separate engine standards
- Approximately 4% engine improvements for compressed ignition engines compared to Phase 1
- U.S. EPA projects the use of many technologies including:
 - Waste heat recovery
 - Reduction of parasitic losses
 - Air flow Improvements



Line-haul Tractor Requirements

- Line-haul tractors are the biggest contributor to GHG emissions
- 18-24% reduction in CO₂ emissions from Phase 1
- Vehicle standard includes the use of:
 - Aerodynamic improvements
 - Engine, transmission, and driveline improvements
 - Lower tire rolling resistance
 - Idle reduction



Box-Type Trailers

- Trailers regulated at federal level for first time
- Aerodynamic devices applied to long and short box trailers only
- Low rolling resistance tires and automatic tire inflation
- Fuel efficiency improvement ~7-8%

Box Trailers (50'+)



Short Box Trailers (<50'+)



Other Trailers

- Low rolling resistance tires and automatic tire inflation only
- Fuel efficiency improvement 3-4%

Non-box trailers



Vocational Vehicles

- Vocational vehicles include Class 2b-8 trucks that perform a variety of functions
- 12-16% reduction in CO₂ emissions beyond Phase 1
- Vehicle standard includes the use of:
 - Hybrids
 - Engine and transmission improvements
 - Low rolling resistance tires



Pickups & Vans

- ~16% reduction in CO₂ emissions beyond Phase 1
- Vehicle standard includes the use of:
 - Engine and transmission improvements
 - Aerodynamic and weight reduction
 - Gasoline hybrid technology



Phase 2 NPRM Alternatives

Alternative	Description	
1	No action	
2	Less Stringent than the Proposed Alternative applying only current off-the-shelf technologies	
3	Proposed alternative, fully phased-in by 2027 MY	U.S. EPA Preferred Alternative
4	Pulls ahead the proposed 2027 MY standards to 2024 MY	Comments Requested
5	Modest market adoption of advanced technologies	

Alternative 3 Versus 4

Both alternatives would result in fuel savings that would “pay” for the cost of the technologies

	Alternative 3 (MY 2027) [Payback in years]	Alternative 4 (MY 2024) [Payback in years]
Line-haul Tractors	2	2
Vocational	6	6
Pickups & Vans	3	4

Other Improvements in Phase 2

- Removing blanket exemption for small manufacturers
- Close loophole that allowed the use of uncontrolled engines (glider kits)
- Test procedure improvements
 - Road grade added
 - Idle cycle added for vocational vehicles
 - Improved GEM model
 - Other test cycle improvements



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Staff's Initial Assessment

- Proposal is an important next step but could be strengthened in specific areas:
 - Failed to significantly include advanced technologies
 - Alternative 4 should be chosen
 - Address PM 2.5 from APUs
 - Discuss a lower Mandatory NOx Standard
 - Other Improvements necessary

Advanced Technologies Essential to California's Air Quality

- Advanced technologies are a critical element of California's path to achieving GHG and Air Quality goals
- NPRM has modest penetration levels of hybrid technology
- Removes Phase 1 Advanced Technology credits
- Very pessimistic on the outlook for battery and fuel cells



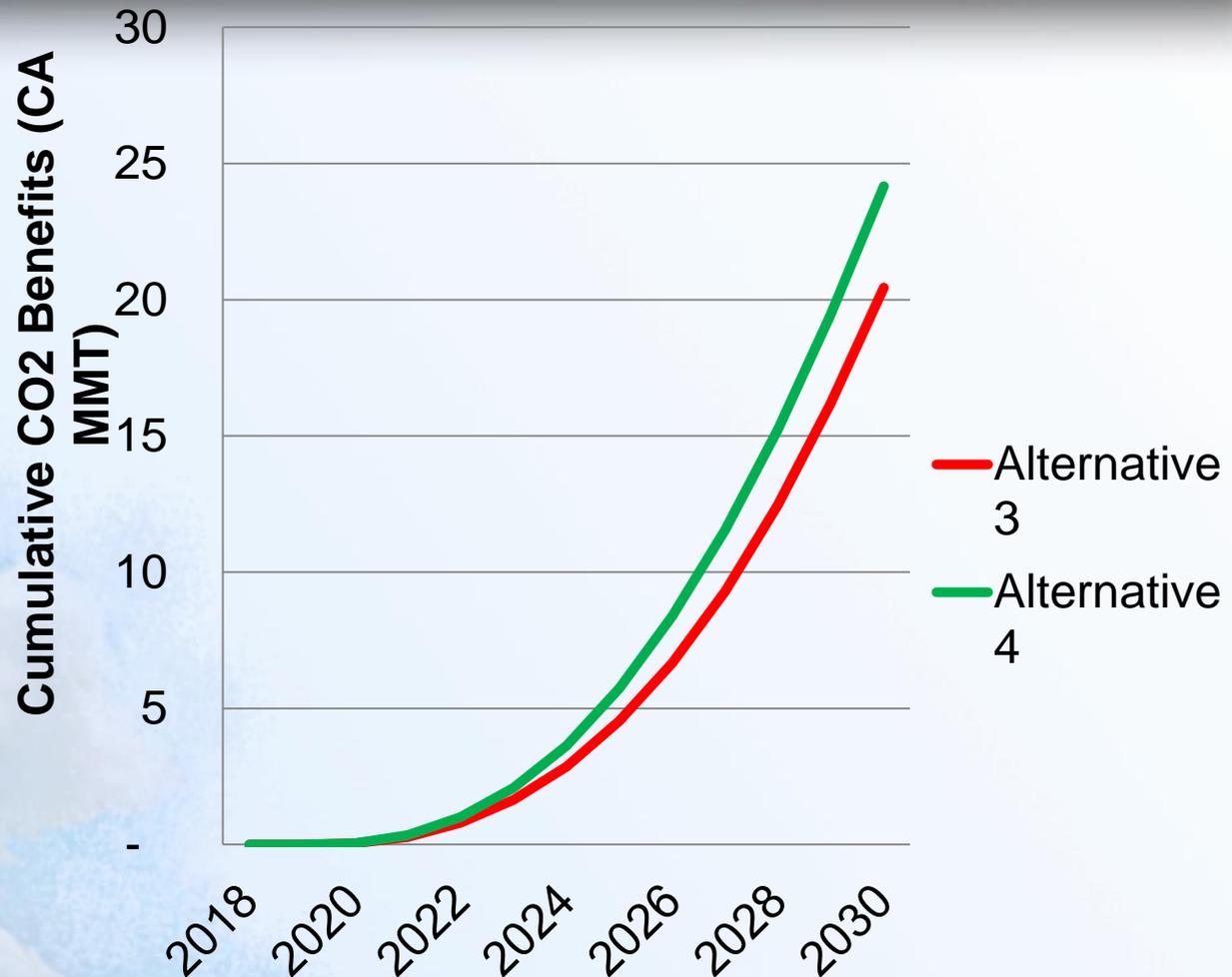
ARB Recommends Alternative 4 at Minimum

- Fully phased-in by 2024
- Technologically feasible
- Standards are technology forcing in 2024 and less so in 2027
- Potential for earlier action on NO_x
- Critical to achieving our GHG and petroleum reduction targets for 2030 and 2040



Additional Alternative 4 Benefits

- ~4 MMT more cumulative CO₂ benefit by 2030 in California
- 22% reduction in petroleum usage in 2030

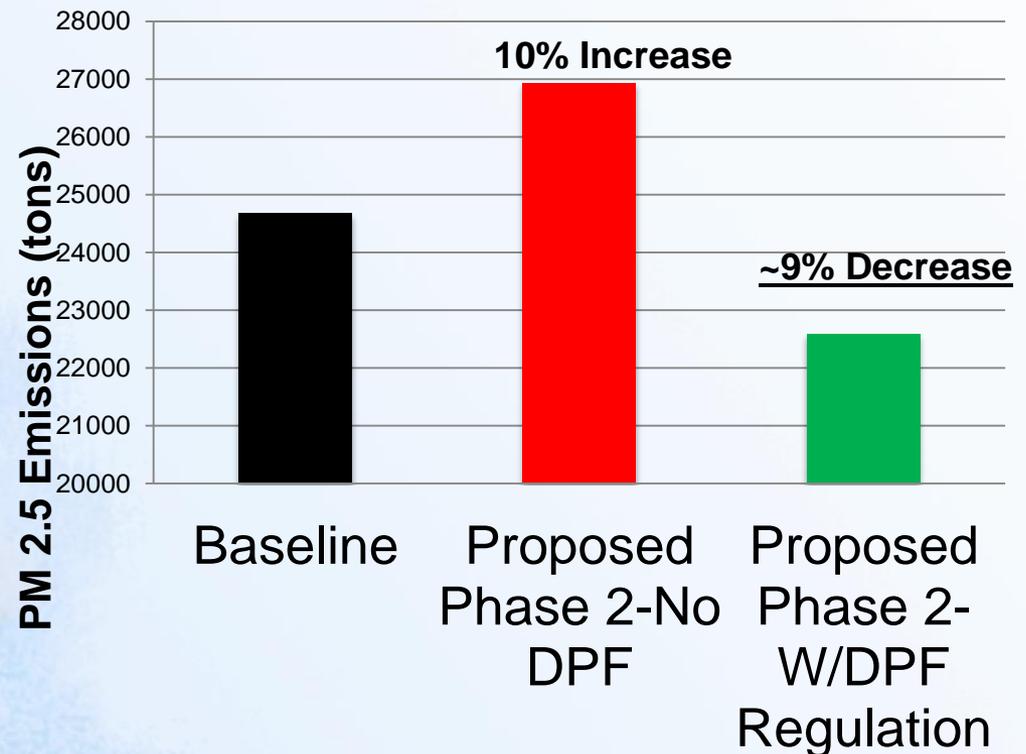


Phase 2 Projected to Increase Diesel PM

- Manufacturers are expected to shift to the use of auxiliary power units (APU) to comply with Phase 2
- Projected to increase diesel PM 2.5 outside of California
- APUs are not equipped with diesel particulate filters nationally
- Issue recognized but no action proposed

DPFs Needed on APUs

- U.S. EPA should require DPFs for APUs as part of Phase 2
 - ARB regulations already require DPFs
 - Multiple filters currently verified for APUs



Lower Mandatory NOx Standards Should be Addressed

- Proposal lacks a commitment for future NOx control
- GHG/NOx tradeoff can be avoided with a systems based approach
- ARB commissioned work to demonstrate feasibility of low NOx heavy-duty diesel and natural gas engines, while meeting GHG standards
- Staff to formally petition U.S. EPA

Other Potential Areas for Improvements

- Strengthen engine standards in conjunction with a stronger vehicle standard
- Expand trailer standards to include additional trailer types
- Expand use of aerodynamic devices on vocational vehicles



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ARB Staff Next Steps on NPRM

- Continuing in-depth review of the proposal
- Will testify at federal public hearing
- Will submit formal comments in the next 60 days

Next Steps

- Staff will continue to engage with Section 177 States and other stakeholders
- Staff will continue to work with U.S. EPA and NHTSA staff
- Final federal rule expected Spring 2016

California's Phase 2 Proposal

- Remain committed to a strong and single national program which will support California's GHG reduction commitments
- Planning to propose a California Phase 2 program approximately 6-12 months after the finalization of a federal rule
- Tentatively mid-2017
- May include California only elements