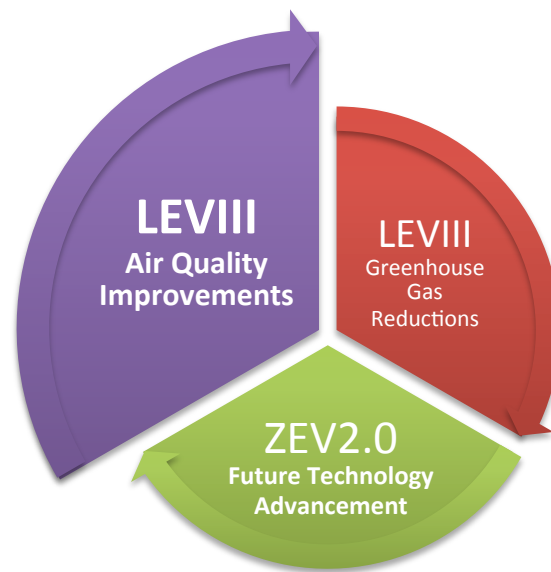


# California's Low Emission Vehicle III Program

*for reducing car air pollution*



Dr. Alberto Ayala

California Air Resources Board

# LEV III Program

Advanced Clean Cars

- Phase-in: 2015-2025 model year
- Combined, increasingly stringent NMOG + NO<sub>x</sub> fleet average standards
- 70% lower smog forming pollution
- 90% lower PM standards
- 150,000-mile durability
- New supplemental “real-world” cycle and evaporative control requirements

# Reductions cannot be achieved without clean fuels

## Advanced Clean Cars

- How clean the fuel is
    - Reduces engine out emissions,
    - Maximizes efficiency of aftertreatment (PM, NOx)
  - How well the fuel is combusted
    - Combustion chamber design, fuel control, etc.
  - How effectively the exhaust is treated
    - Advanced catalysts, aftertreatment
- Thus
    - 2006 California Phase II Diesel
      - Sulfur levels reduced to 15 ppm
    - 2002 California Phase III Cleaner Burning Gasoline
      - Prohibited use of MTBE as oxygenate - replaced by ethanol
      - Sulfur levels reduced to 15 ppm
  - Thus
    - LEVIII advances technology development that is feasible at a reasonable cost

# Six Levels Available for Certification

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Emission Category	NMOG+NOx (g/mi)
LEV160	0.160
ULEV125	0.125
ULEV70	0.070
ULEV50	0.050
SULEV30	0.030
SULEV20	0.020

# Why Emission Categories?



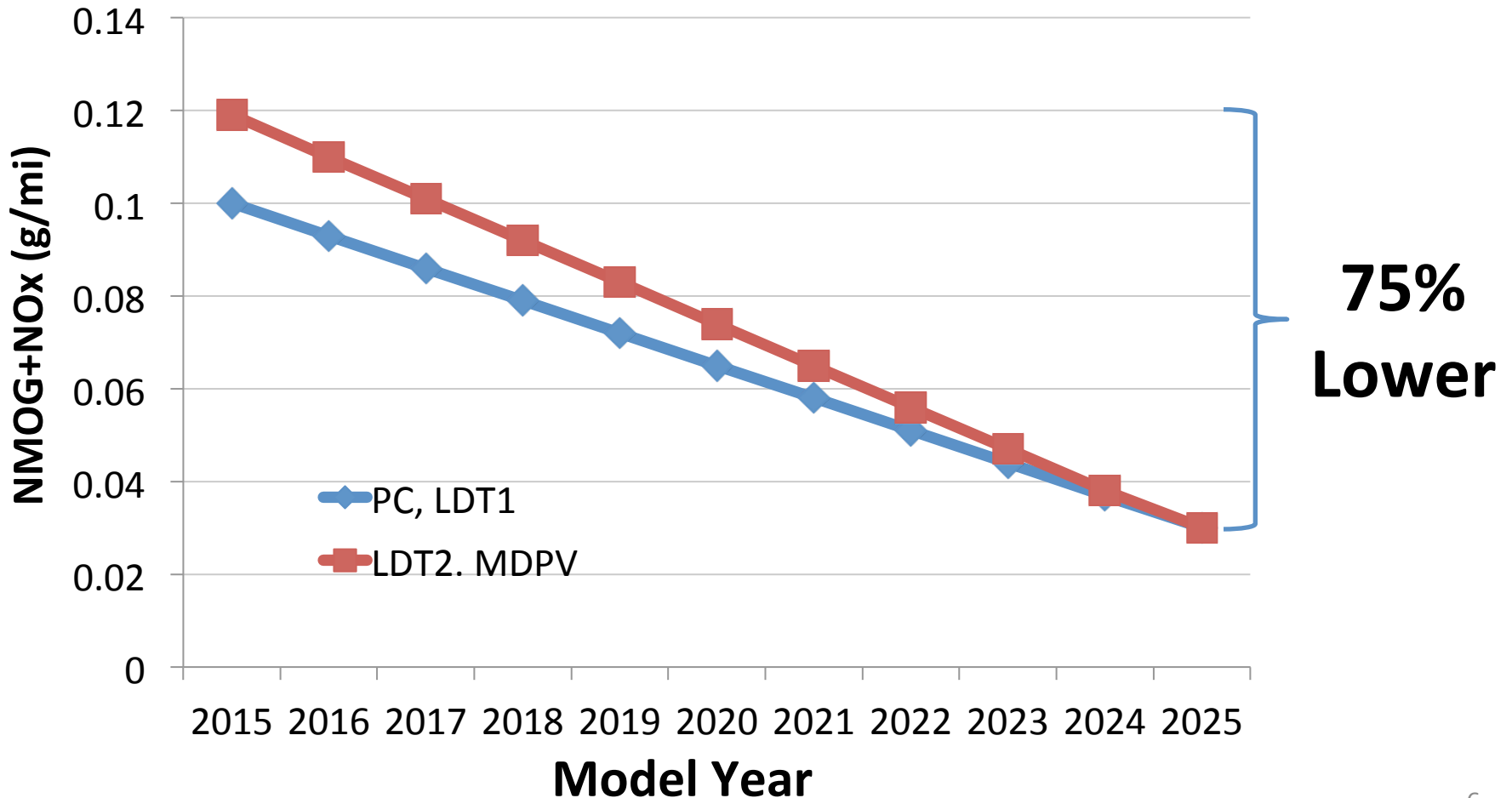
## Advanced Clean Cars

- Goal: reducing overall emissions from the vehicle fleet
- Emission categories allow manufacturers to certify vehicles to different emission standards based on technological feasibility.
- Emission reductions are achieved by declining fleet average requirement.
- Manufacturers choose the mix of vehicle standards that best meets their needs and allows them to meet the fleet average requirement.

# Fleet Average Emission Requirement

Advanced Clean Cars

150,000-mile New Vehicle Fleet Average Emissions



# Why Fleet Average NMOG+NOx Standards?

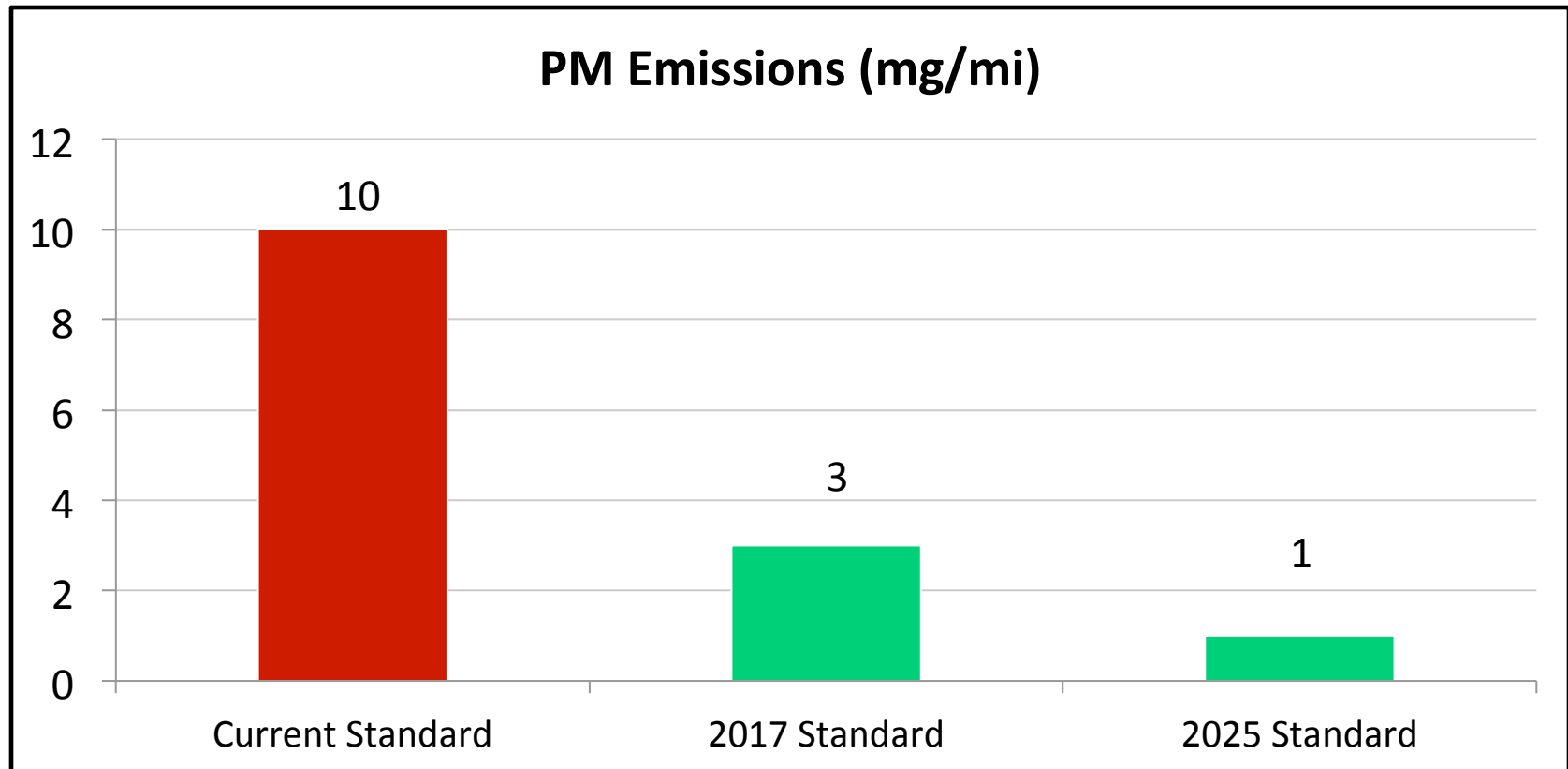


## Advanced Clean Cars

- Allows a manufacturer to choose the standards to which each vehicle is certified provided the overall fleet meets the specified phase-in requirements.
- This provides flexibility to manufacturers because they can adapt their phase-in to better fit their product development schedules, as long as the fleet average is at or below the required levels.
- Greater emission reductions from the overall fleet are possible than from a single emission standard that applies to all vehicles.

# LEV III Particulate Matter Standards

Advanced Clean Cars





# Supplemental Federal Test Procedure

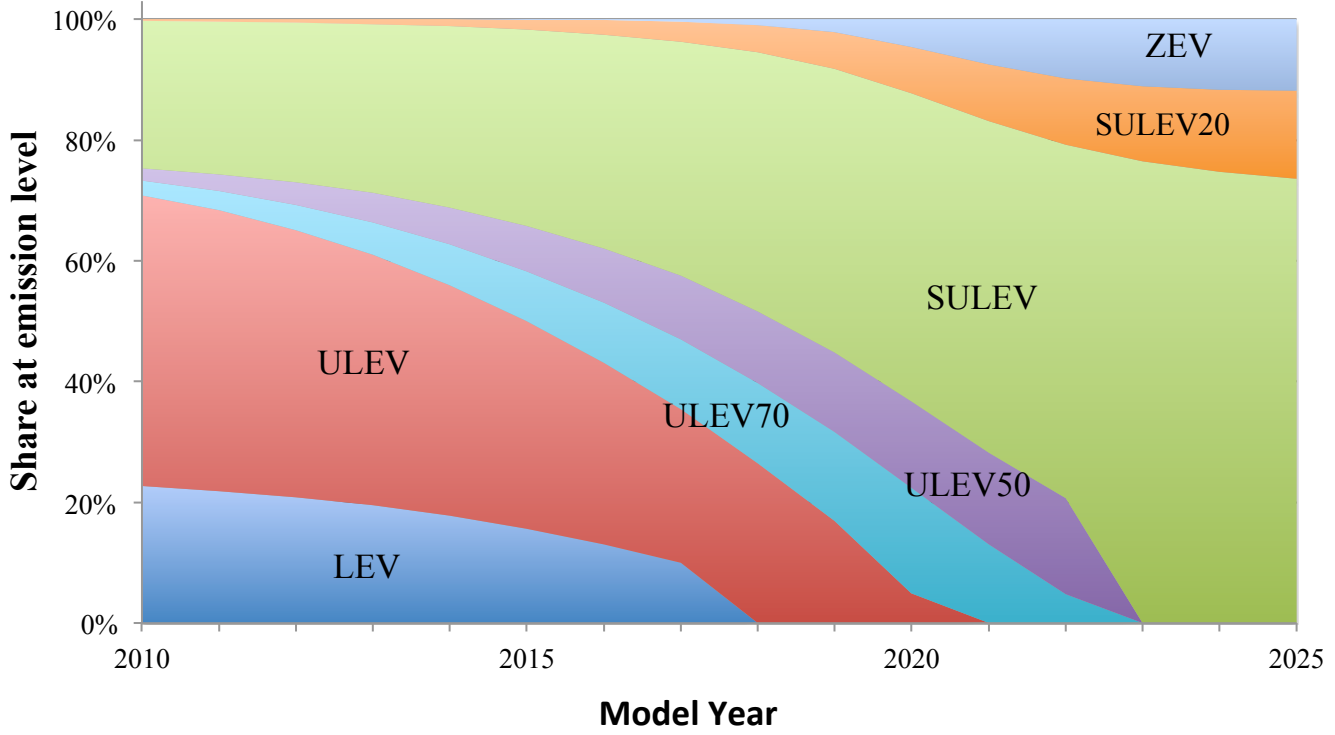
Advanced Clean Cars

- “SFTP” ensures low emissions during “real-world” higher speed and load driving conditions
- LEV III SFTP changes:
  - Increased stringency for ULEVs and SULEVs
  - Extended applicability to MDVs (8,501 lbs. – 14,000 lbs. GVWR)
  - Increased durability requirement 150,000 miles
  - Now includes PM standard

# Evaporative Emissions

- Extended “zero-evaporative” emission requirements to all light-duty by 2022 MY
  - Currently only required for PZEVs
- Added flexibility with two compliance options for certification testing
  - Full vehicle vs. partial system
- Extended Onboard Refueling Vapor Recovery (ORVR) requirements to all complete vehicles less than 14,000 pounds GVWR

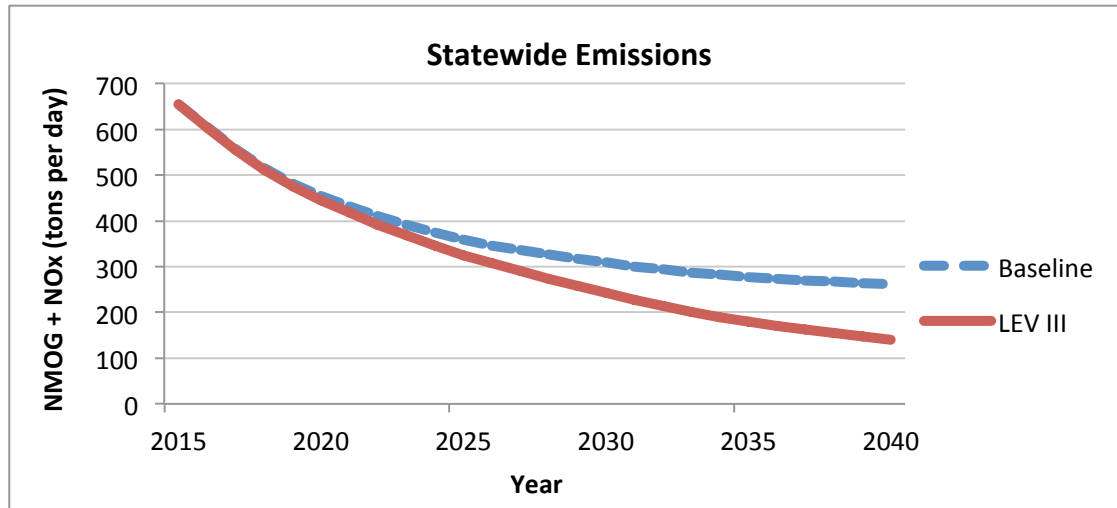
# Rapid Transition Towards the Cleanest Possible Vehicles



The first California SULEV20 already here  
(13 years ahead of requirement)



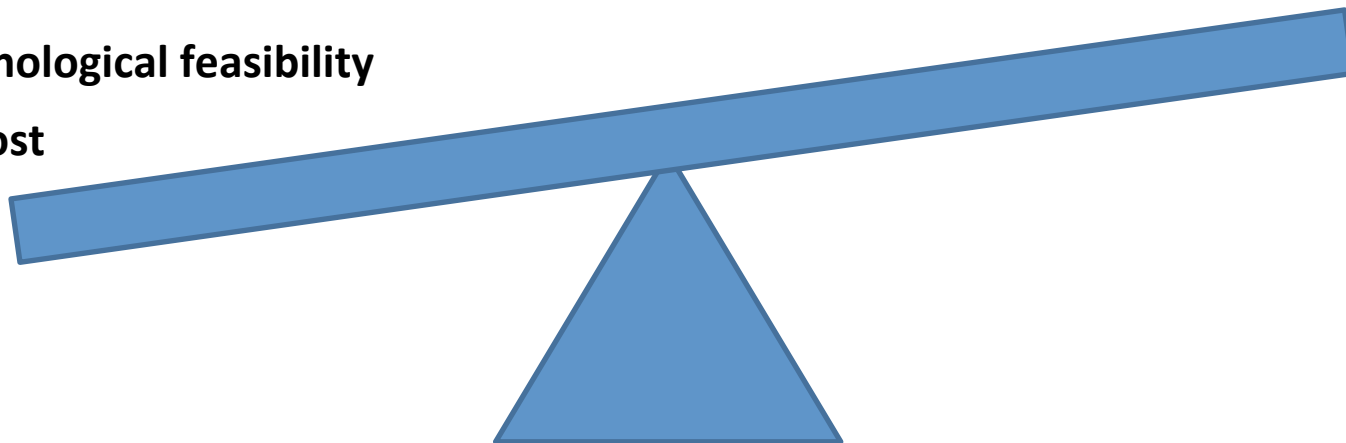
# Defensible quantification of benefits is essential



Benefits

Technological feasibility

Cost



# Technology and Costs (Gasoline)

## Advanced Clean Cars

Based on manufacturer input, tear-downs, projections of learned costs and design evolution, include cost of design, manufacturing, calibration, warranty, and analyze consumer costs and economic impacts

	Technology Component	From ULEV to SULEV					
		PC/LDT1			LDT2		
		4-cyl	6-cyl	8-cyl	4-cyl	6-cyl	8-cyl
<b>Systems with additional technology costs</b>	Greater catalyst loading	\$23	\$31	\$39	\$23	\$31	\$39
	Optimized close-coupled catalyst(s)	\$0	\$0	\$0	\$0	\$0	\$0
	Secondary air	\$0	\$19	\$58	\$0	\$19	\$58
	HC adsorber (active)	\$0	\$0	\$17	\$0	\$0	\$17
	Optimized thermal management	\$6	\$6	\$6	\$6	\$6	\$6
	Low thermal mass turbocharger	\$0	\$0	\$0	\$0	\$0	\$0
	Evaporative equipment	\$13	\$13	\$13	\$13	\$13	\$13
<b>Total incremental cost</b>		\$42	\$69	\$134	\$42	\$69	\$134
<b>Total incremental price</b>		\$50	\$83	\$161	\$50	\$83	\$161

# Vehicle Cost (Gasoline)

Advanced Clean Cars

Vehicle Category	Initial baseline certification level	Engine size			Average incremental price <sup>a</sup> (\$/vehicle)	Average incremental price <sup>b</sup> (\$/vehicle)
		4-cyl	6-cyl	8-cyl		
PC/LDT1	LEV	\$87	\$142	\$248	\$130	\$55
	ULEV	\$50	\$83	\$161	\$68	
	SULEV	\$0	\$0	\$0	\$0	
LDT2	LEV	\$87	\$142	\$248	\$159	\$117
	ULEV	\$50	\$83	\$161	\$111	
	SULEV	\$0	\$0	\$0	\$0	

<sup>a</sup> Sales-weighted average for each initial certification level

<sup>b</sup> Sales-weighted average for vehicle category



# A word about LEV III and Tier 3

Advanced Clean Cars

## SIMILARITIES

- NMOG+NOx fleet average identical for 2017-2025
- Emission categories/bins essentially identical\*
- Certification fuel specifications very similar (E10) and have reciprocity
- Evaporative emission standards essentially identical\*

\*Some minor differences may exist relative to early phase-in/first years of implementation

## DIFFERENCES

- **California Zero Emission Vehicle (ZEV) Program**
- LEV III starts in MY 2015; Tier 3 starts in MY 2017
- Full useful life standards:
  - LEV III - 150k miles; Tier 3 – 120k miles w/ optional 150k
- LEV III 1 mg/mi PM standard starting in MY 2025
  - Tier 3 remains at 3 mg/mi from MY 2017+
- LEV III fleet average based on CA+S177 state sales
- Tier 3 fleet average based on 50-state sales