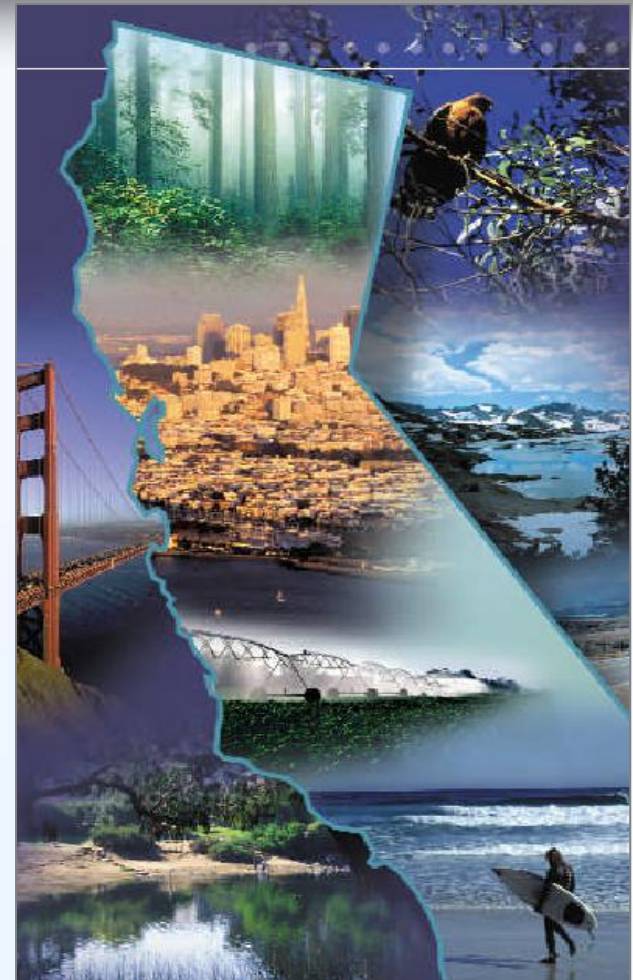


Public Workshop on Proposed Revisions to the Low-Emission Vehicle Program

El Monte, California
March 2nd, 2010



Agenda

- LEV III Program
 - Criteria Emissions
 - GHG Emissions
 - SFTP Emissions
- Evaporative Emission Requirements
- Environmental Performance Label

Low-Emission Vehicle Program (LEV II – criteria pollutants)

- Applicable to light- and medium-duty vehicles
 - LDVs up to 8,500 lbs GVW
 - MDVs 8,501-14,000 lbs GVW
- Separate NMOG fleet average requirements for PC/LDT1 (0.035 g/mi) and LDT2 (0.43 g/mi)
- Percentage certification requirement for MDVs
 - chassis certified - 40% LEV, 60% ULEV
 - engine certified - 100% - ULEV
- LEV II fully phased-in in model year 2010

Light-Duty Vehicles

Proposed Revisions to LEV Program (LDVs)

- Phase-in 2014-2022
- Fleet average requirement equivalent to SULEV by 2022
- Additional emission categories provided for flexibility
- Combined NMOG and NOx standards
- Eliminate 50,000 mile intermediate useful life standards
- Increase durability requirement from 120,000 miles to 150,000 miles
- More stringent particulate matter standard
- NMOG+NOx credit 0.005 g/mi for 15 year/150,000 mile emission warranty
- Revised baseline reactivity factor (RFA)

LEV II LDV Emission Standards

Vehicle Emission category	Durability basis (miles)	NMOG (g/mi)	NO _x (g/mi)	CO (g/mi)	HCHO (g/mi)	PM (g/mi)
LEV	50,000	0.075	0.05	3.4	0.015	-
	120,000	0.090	0.07	4.2	0.018	0.01
ULEV	50,000	0.040	0.05	1.7	0.008	-
	120,000	0.055	0.07	2.1	0.011	0.01
SULEV	120,000	0.010	0.02	1.0	0.004	0.01
PZEV ^a	150,000	0.010	0.02	1.0	0.004	0.01

^a PZEV has same test emission levels as SULEV but also includes zero-fuel evaporative emission requirement and a 150,000-mile emission warranty

Proposed LEV III LDV Emission Standards

Vehicle Emission category	Durability Basis (miles)	Existing NMOG standards (g/mi)	Existing NO _x Standards (g/mi)	Combined NMOG+NO _x Standards (g/mi)	Proposed NMOG+NO _x Emission Standards (g/mi)
LEV	150,000	0.090	0.070	0.160	0.160
ULEV	150,000	0.055	0.070	0.125	0.125
ULEV70	150,000	-	-	-	0.070
ULEV50	150,000	-	-	-	0.050
SULEV30	150,000	0.020	0.010	0.030	0.030
SULEV20	150,000	-	-	-	0.020

LDV Particulate Matter Standards

- Current requirement – 10 mg/mi
- PFI gasoline and filter equipped diesels at ~ 1 mg/mi
- GDI gasoline up to 8 mg/mi
 - Newer GDI vehicles tested at ~ 1 mg/mi
- Proposed – phase-in to 3-4 mg/mi
- Staff working with industry to improve and standardize PM emission measurement procedures

50°F FTP Emission Testing

- Current requirement – 2.0 times the applicable FTP NMOG and HCHO standards
- FFVs - 2.5 times the applicable NMOG+NO_x and HCHO standards when certifying to SULEV20 or SULEV30 and operating on E85

Baseline RFA Reactivity Factor

- Update baseline reactivity of RFA fuel to reflect revised MIRs
 - Approved by Reactivity Scientific Advisory Committee March 25, 2009
- RFA, or reformulated fuel A, represents industry average commercial gasoline when LEV program adopted
 - Defined by Auto/Oil study

Medium-Duty Vehicles 8,500 – 14,000 lbs GVW

Proposed Revisions to LEV Program (MDVs)

- Phase-in 2014-2022
- More stringent emission standards
 - Additional emission categories provided
- Combined NMOG and NOx standards
- More stringent PM standards
- Eliminate 50,000 mile intermediate useful life standards
- Increase durability requirement from 120,000 miles to 150,000 miles
- Complete vehicles 8,501-10,000 lbs GVW must chassis certify

LEV II MDV Emission Standards (Chassis Certified)

Weight Class (lbs GVW)	Vehicle Emission category	NMOG (g/mi)	NO _x (g/mi)	CO (g/mi)	HCHO (g/mi)	PM (g/mi)
8,501-10,000	LEV	0.195	0.2	6.4	0.032	0.12
	ULEV	0.143	0.2	6.4	0.016	0.06
	SULEV	0.100	0.1	3.2	0.008	0.06
10,001-14,000	LEV	0.230	0.4	7.3	0.040	0.12
	ULEV	0.167	0.4	7.3	0.021	0.06
	SULEV	0.117	0.2	3.7	0.010	0.06

Engine certified MDVs certify to 13 CCR Section 1956.8(g)

Proposed MDV Emission Standards (Chassis Certified)

Emission Category	8,501-10,000 lbs. GVW			10,001-14,000 lbs. GVW		
	NMOG+NO _x (g/mi)	CO (g/mi)	PM (g/mi)	NMOG+NO _x (g/mi)	CO (g/mi)	PM (g/mi)
LEV	0.395	6.4	0.012	0.630	7.3	0.012
ULEV34	0.340	6.4	0.012	0.570	7.3	0.012
ULEV20	0.200	4.2	0.008	0.270	4.2	0.008
SULEV17	0.170	4.2	0.008	0.230	4.2	0.008
SULEV15	0.150	3.2	0.008	0.200	3.7	0.008

Proposed LEV III MDV Phase-in (Chassis Certified)

Model Year	LEV	ULEV	SULEV
2014	40%	60%	0%
2015	40%	60%	0%
2016	20%	80%	0%
2017	10%	80%	10%
2018	10%	70%	20%
2019	0%	60%	40%
2020	0%	40%	60%
2021	0%	20%	80%
2022	0%	0%	100%

Engine certified MDVs 100% ULEV

Potential technologies for NMOG+NOx standard compliance

Technology	Description, examples of technology
Secondary air (SAI)	Allowing rich fuel-air mix during cold-start conditions, then adding air to exhaust gases to facilitate catalyst conversion of hydrocarbon and carbon monoxide emissions
Engine management	Lean stratified start-up; ignition retard
Turbocharging system design	For turbocharged engines, use of low thermal mass to reduce warm-up time
Engine design modification	Integration of catalyst into exhaust manifold for fast catalyst warm-up
Three-way catalyst upgrade	Increased catalyst volume, loading, and substrate cell density for increased pollutant conversion
Closed-coupled catalyst upgrade	Lower thermal mass system to reduce warm-up time

Potential technologies for NMOG+NOx standard compliance

Technology	Description, examples of technology
Heated catalyst	Electric heating of three-way catalyst during warm-up
Direct ozone reduction (e.g., PremAir ®)	Radiator treatment to facilitate oxidation of atmospheric pollutants; Emission reductions are “real-world” not on emission test cycle; emission reduction credits must modeled/estimated
HC adsorber or trap catalyst	Trap HC emissions temporarily before three-way catalyst is warm; Includes adsorber brick, exhaust diverter valve, and catalyst
Advanced exhaust gas recirculation (EGR)	Variable valve actuation and injection controls for EGR for recirculated exhaust gases for reentry at the engine intake; reduction in combustion temperatures reduces NOx formation
Lean-NOx aftertreatment	Aftertreatment for diesel and future lean gasoline engines; lean NOx trap; urea-based selective catalytic reduction (SCR)

Outstanding Issues

- Fleet average starting value in 2014
 - Need to preserve emission benefits of PZEVs
- Interim in-use standards
- Phase-in ramp
- Transfer of NMOG credit to LEV III
- Others?

Questions/Comments