

Warranty, Useful Life, and Durability

**Public Workshop to Discuss Potential Changes to
the Heavy-Duty Engine and Vehicle Emission
Standards, Test Procedures, Warranty, and Other
Related Heavy-Duty Programs**

November 3, 2016

Diamond Bar, California

California Environmental Protection Agency

 **Air Resources Board**

Outline

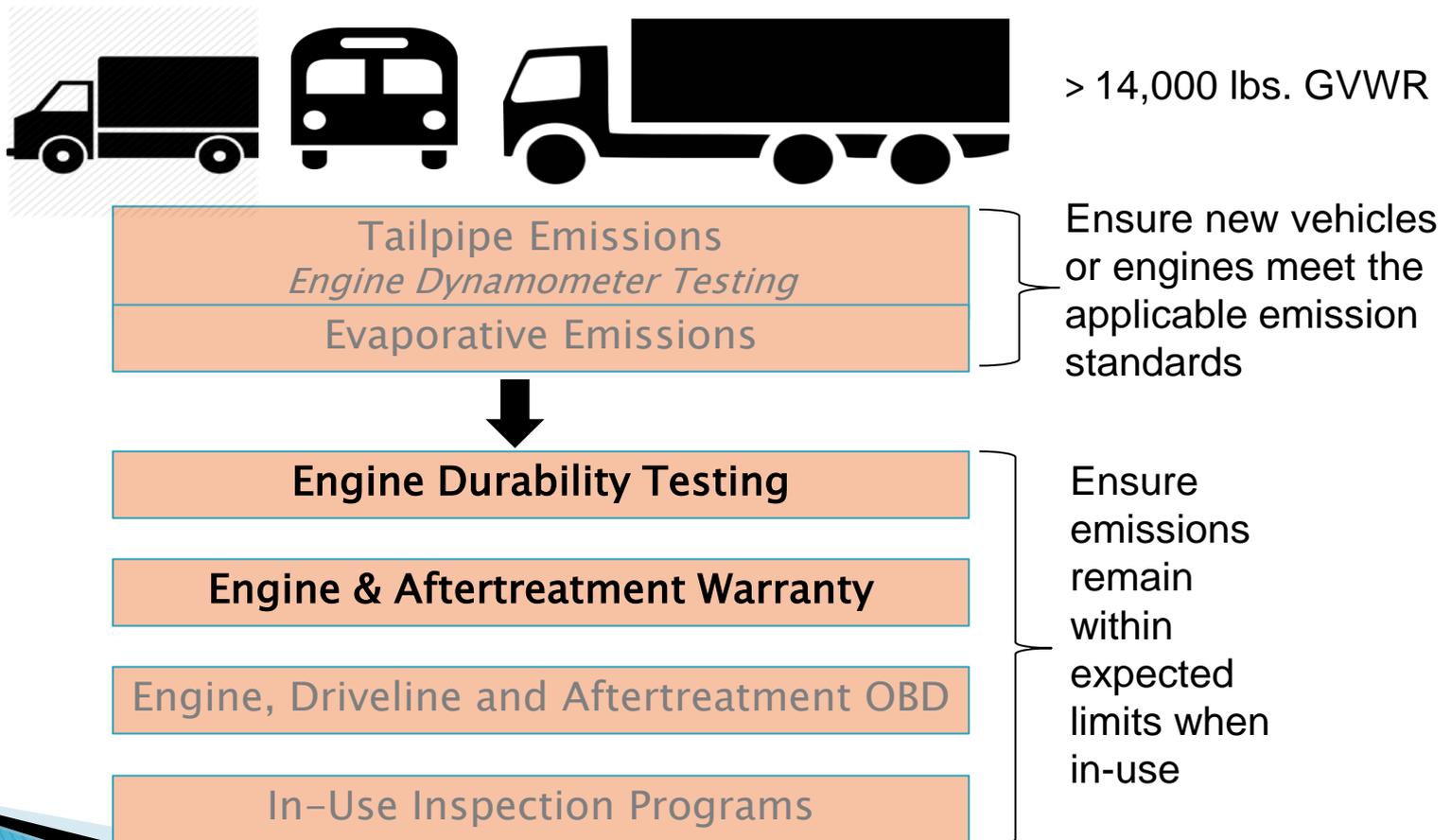
- ▶ Overview of Planned Actions for Warranty/Durability
- ▶ Certification Relevance
- ▶ Warranty/Useful-Life
 - Current Requirements
 - Goals
 - Proposal Concepts
 - Opportunities for Cooperation, Requests for Data
 - Hearing and Workshop Dates
- ▶ Engine Durability
 - Current Requirements
 - Proposal Concepts
 - Hearing and Workshop Dates

Overview of Planned Actions

- ▶ ARB's objective is to amend current CA regulations to ensure more durable, lower-emitting on-road heavy-duty vehicles (HDV) and engines by:
 - Lengthening the mandatory emissions warranty periods for Class 4 and above HDVs (> 14,000 lbs. GVWR) as codified in 13 CCR 2036
 - Broadening the useful-life (UL) periods in 13 CCR 2036
 - Streamlining the engine durability demonstration requirements of California Exhaust Emission Standards and Test Procedures:
 - For 2004+ Model Heavy-Duty Diesel Engines and Vehicles
 - For 2004+ Model Heavy-Duty Otto-Cycle Engines and Vehicles

Relevance to Certification

Warranty and Durability in the Certification Process



Current Warranty and Useful-Life

HEAVY-DUTY CATEGORY	CURRENT WARRANTY ^{1,2} (miles)	CURRENT USEFUL-LIFE (miles)	MILEAGE ³ BEFORE REBUILD (miles)
Class 8 Heavy-Heavy 14,000 lbs. < GVWR ≤ 19,500 lbs.	100,000 5 years/3,000 hours	435,000 10 years/22,000 hours	800,000 – 1,200,000
Class 6-7 Medium-Heavy 19,500 lbs. < GVWR ≤ 33,000 lbs.	100,000 5 years/3,000 hours	185,000 10 years	400,000 – 500,000
Class 4-5 Light-Heavy GVWR > 33,000 lbs.	100,000 ⁴ 5 years/3,000 hours	110,000 10 years	310,000 – 400,000

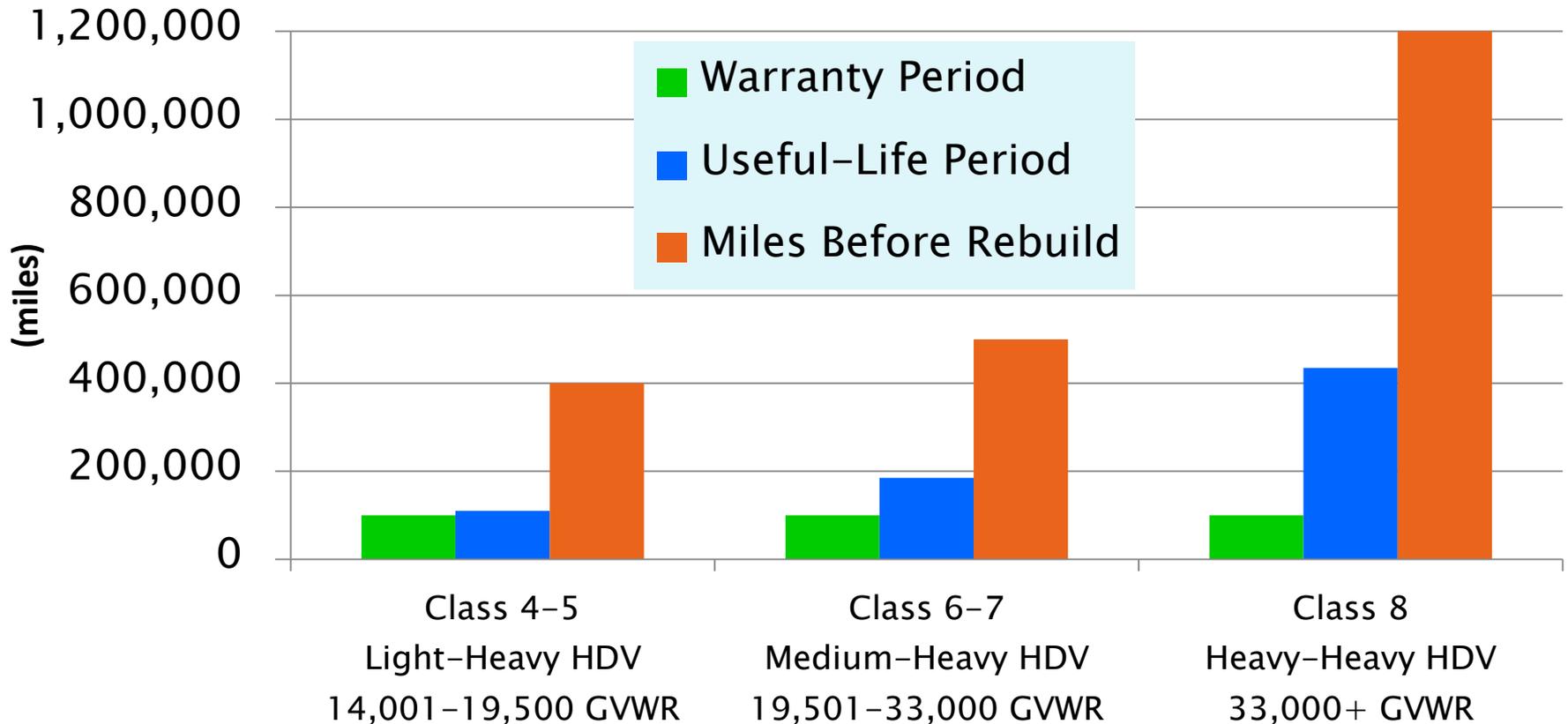
¹ Warranty is 50,000 miles / 5 years for Otto-cycle engines.

² Hourly limits do not apply to Otto-cycle engines or engines certified to the GHG emissions standards in 17 CCR 95663.

³ Mileage before rebuild data obtained from online industry publications (mixture of B10, B50, and other sources including manufacturers' websites).

⁴ Warranty is 50,000 miles / 5 years for diesel engines certified to the greenhouse gas emission standards of 17 CCR 95663.

Warranty and Useful-Life Periods vs. Miles Before Rebuild



Goals – What's to be Accomplished

- ▶ NOx and PM reductions
- ▶ More durable emissions-related components
- ▶ Longer in-use control of emissions
- ▶ Extended window of incentivized emission repairs
- ▶ Reduced vehicle downtime
- ▶ Reduced vehicle repair costs

Warranty/UL Proposal Concepts

- ▶ **Applicability**
 - New HDVs and Urban Buses
 - Classes 4 – 8 (> 14,000 lbs. GVWR)
 - Diesel and Otto-Cycle Engines
 - Applicable to both Criteria and GHG regulations
- ▶ **Revised warranty periods**
 - Will take into consideration emissions cost-effectiveness
 - Some manufacturers already offer 300,000 mile warranties
 - Hour limits not typically relevant and could be eliminated

Warranty/UL Proposal (cont'd)

- ▶ Revised useful-life periods
 - Will take into consideration emissions cost-effectiveness
 - Likely to be based on industry's B10 and B50 numbers
- ▶ Benefits
 - Potential for significant reductions in NOx and PM
 - May reduce the repair cost burden on owners
 - May reduce lost revenue due to downtime
- ▶ Implementation
 - Reasonable lead-time of two to four years after adoption
 - Phase-in schedule may be an option

Opportunities for Cooperation

- ▶ ARB invites industry to participate in developing a cost-effective and comprehensive regulation
 - Help us better understand the warranty cost structure
 - Identify durability-challenged components
 - Address atypical warranty situations and handling
 - Suggest meaningful implementation incentives
 - Improve the serviceability of frequently replaced parts
- ▶ Workgroup
 - Forum to discuss policy and procedure
 - Sharing ideas on reasonable warranty and useful-life

Requests

- ▶ ARB requests data from the HDV industry to supplement our emissions modeling:
 - Fine-tuning the emissions inventory
 - Incidences of mal-maintenance and tampering
 - Denied warranty claims
 - Part specific repair rate histograms outside of warranty
 - Typical malfunction intervals
 - Failure rates, histograms, for warranty claims less than 1%
 - Emissions data for all FIR and EIR claims

Requests (cont'd)

- ▶ ARB requests data from the HDV industry to supplement our economic analyses:
 - Determining the expense of lengthening warranty
 - Average costs of extended/supplemental warranties
 - Impacts on dealers/repair facilities
 - Honoring warranty claims
- ▶ ARB additionally requests that industry join our warranty workgroup

Warranty Rulemaking Schedule

(Does not Include Useful-Life or Durability)

▶ Board Hearing

- December 14-15, 2017
- Cal-EPA Byron Sher Auditorium
- Sacramento, CA 95814

▶ Workshops

- May 2017 (tentative)
- October 2017 (tentative)
- Locations TBD

- ▶ Contact: Jeff Lowry, Staff Air Pollution Specialist
jlowry@arb.ca.gov (626) 575-6841

Applicable Engine Durability Requirements for Criteria Emissions

- ▶ Durability testing establishes deterioration from low-hour emission rate to end of useful life
 - Deterioration factor (D.F.) established for each pollutant
- ▶ Engine manufacturer submits D.F. Plan to ARB - Test engine run over manufacturer-specified “Service Accumulation Cycle”
- ▶ Current heavy-heavy duty engine service accumulation cycle test can require thousands of hours of testing

Engine Type	Current Full Useful Life (FUL) for Criteria Pollutants	Service Accumulation Test Duration
Heavy-Duty Diesel Engines (Class 4 -8)	HHDE= 435,000 miles	50% FUL Optional : 35% FUL+
	MHDE= 185,000 miles LHDE = 110,000 miles Urban Bus= 435,000 miles	50% FUL
Heavy-Duty Otto-Cycle Engines (Class 4-8)	110,000 miles	FUL
California Medium-Duty Engines (Class 3)	120,000 miles	FUL

Engine Durability Proposal Concepts

- ▶ Currently, on-road heavy-duty engine durability protocols from manufacturers are approved by ARB on a case-by-case basis for each applicant
- ▶ Streamline the durability protocol to one that can be used by all manufacturers for ease of durability testing and certification
- ▶ Require engine manufacturers to validate accelerated aging protocol used in establishing D.F.s by collecting emissions data from actual high mileage engines

Engine Durability Rulemaking Schedule

(Includes Useful-Life)

- ▶ Board Hearing
 - 2019
- ▶ Workshops
 - TBD
- ▶ Contact: Alex Santos, Staff Air Pollution Specialist
asantos@arb.ca.gov (626) 575-6682
- ▶ ARB requests that industry join our Durability/Useful-life Workgroup