

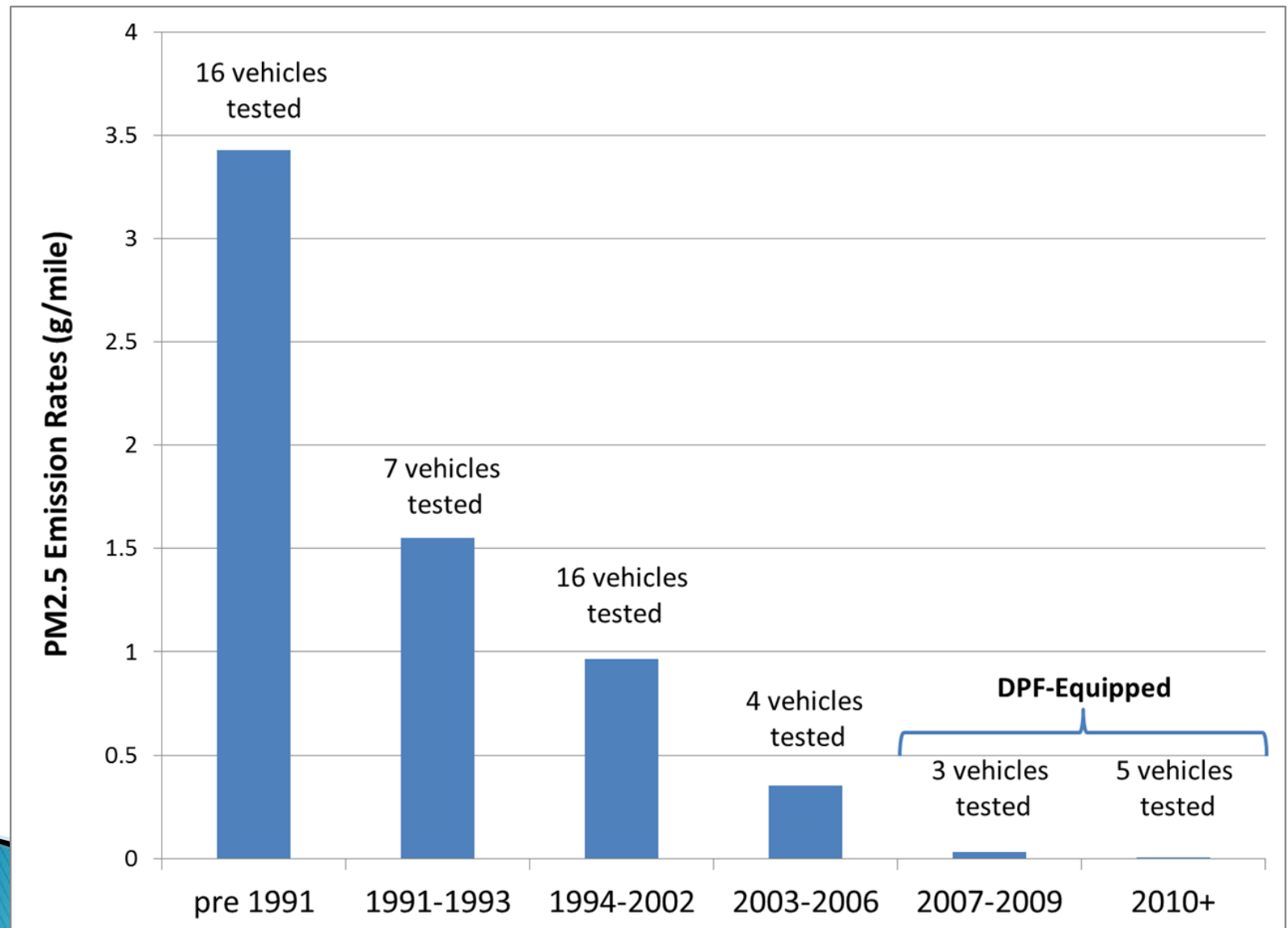
Truck Sector In-Use Emissions Technology Assessment

September 2, 2014
Sacramento, California

California Environmental Protection Agency

 **Air Resources Board**

Diesel PM Filters are Highly Effective

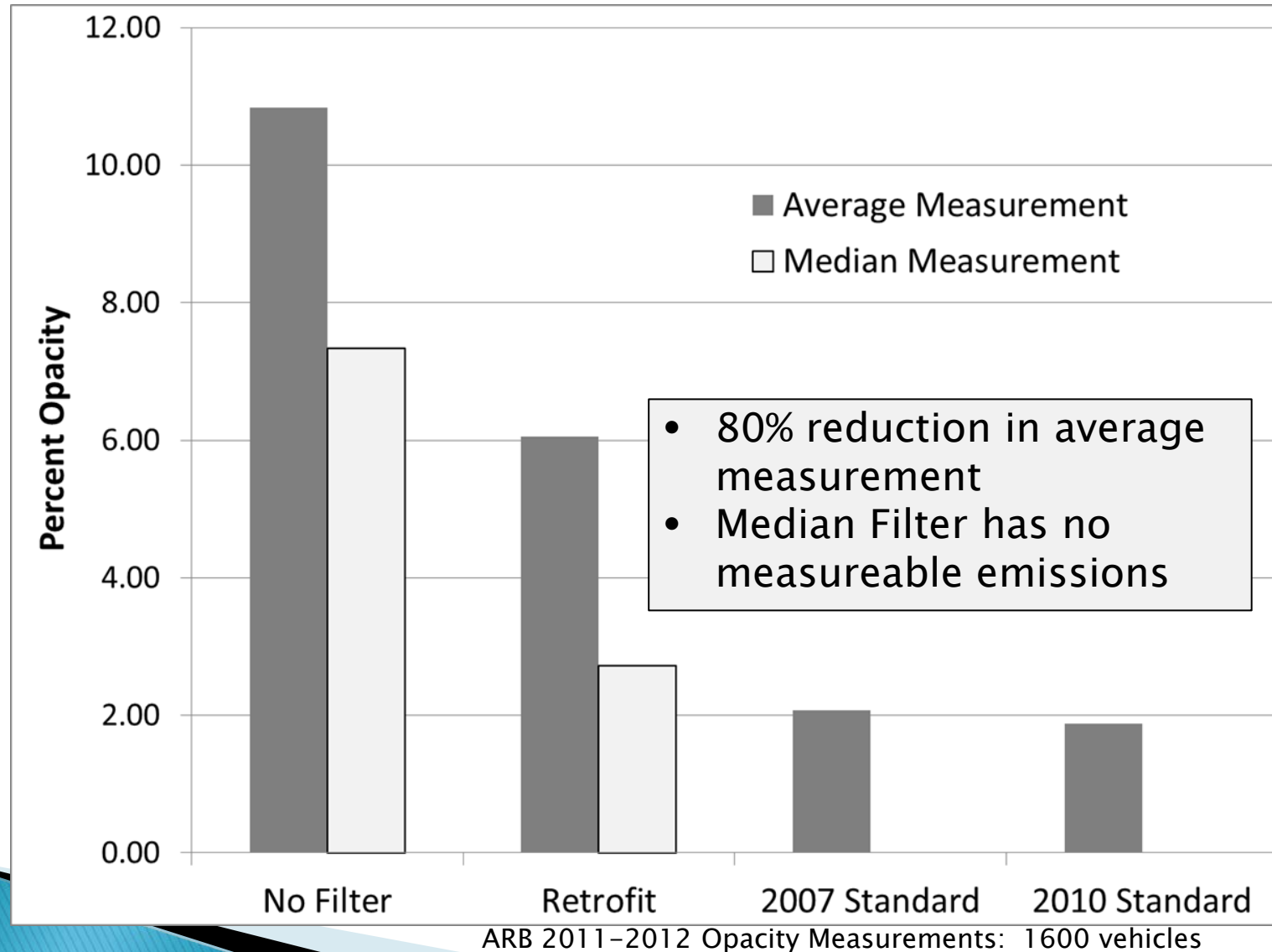


Data taken from CRC E55/59 and ARB in-house testing

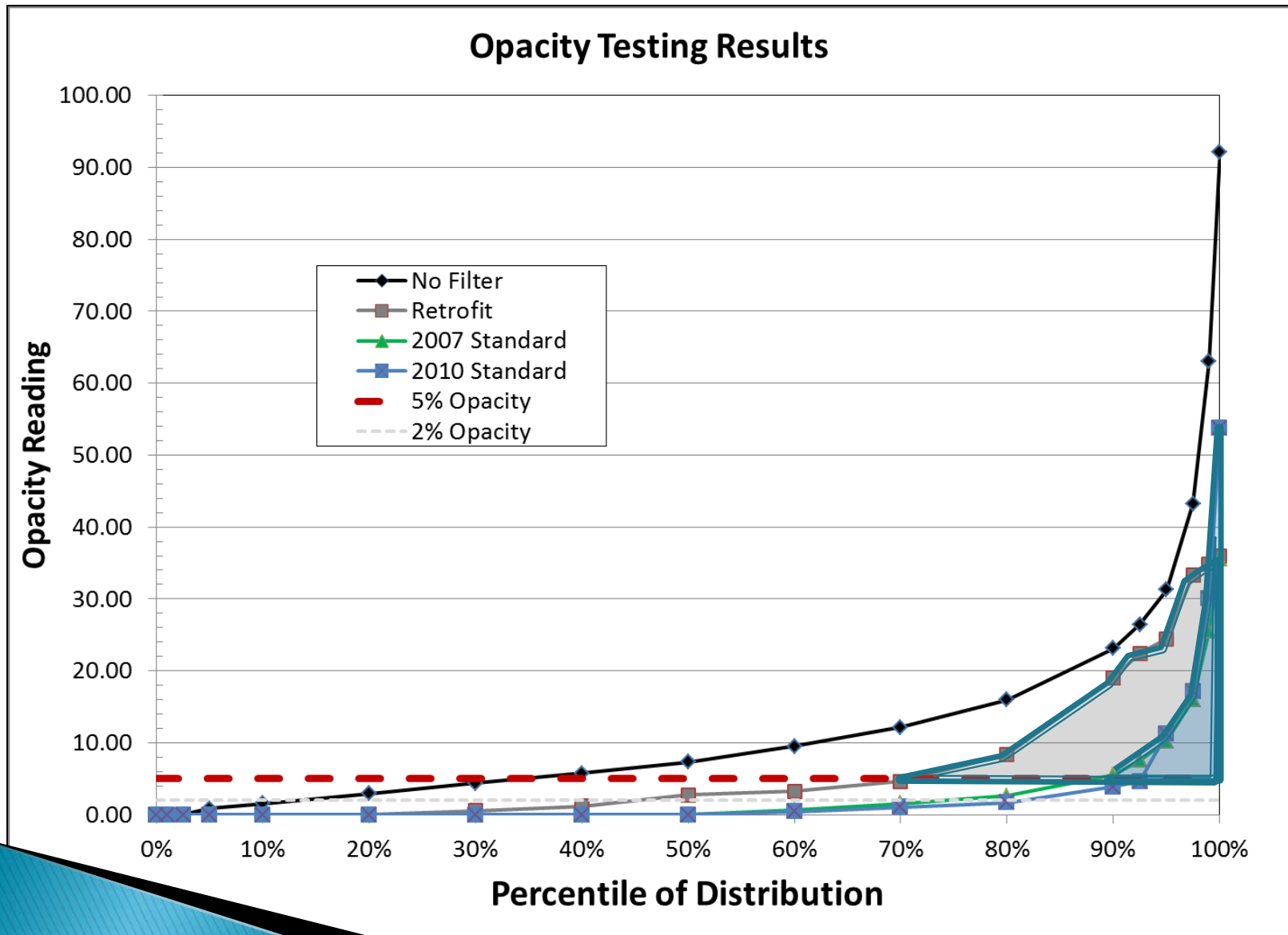
The High Emitter Issue

- ▶ California is rapidly transitioning to a 2010 compliant, after-treatment controlled fleet
- ▶ A small number of vehicles with malfunctioning after-treatment could have a significant impact on emissions
 - Remote sensing data suggests this might be happening
 - Observed NO_x and PM control efficiencies across vehicle populations in the field appear lower than observed in the lab on properly functioning vehicles
 - Increasing skewness of emissions distributions across vehicle fleets in 2010 standard trucks

High Emitters Impact PM Emissions



Example: 2011 Opacity Data



ARB 2011–2012 Opacity Measurements: 1600 vehicles

Why High Emitters?

- ▶ We don't know for sure
 - DPF regeneration at time of measurement
 - Temperature impacts on the SCR
 - Vehicle aging (deterioration)
 - Tampering / Malfunction / Mal-Maintenance
 - Manufacturer variability
- ▶ Engine durability may be an issue
 - 18% of engine families, representing 4% of total engines sold between 2007 and 2010, have a warranty claim rate for at least one component exceeding 50%
 - On average 2007 standard engines have more than one claim per vehicle

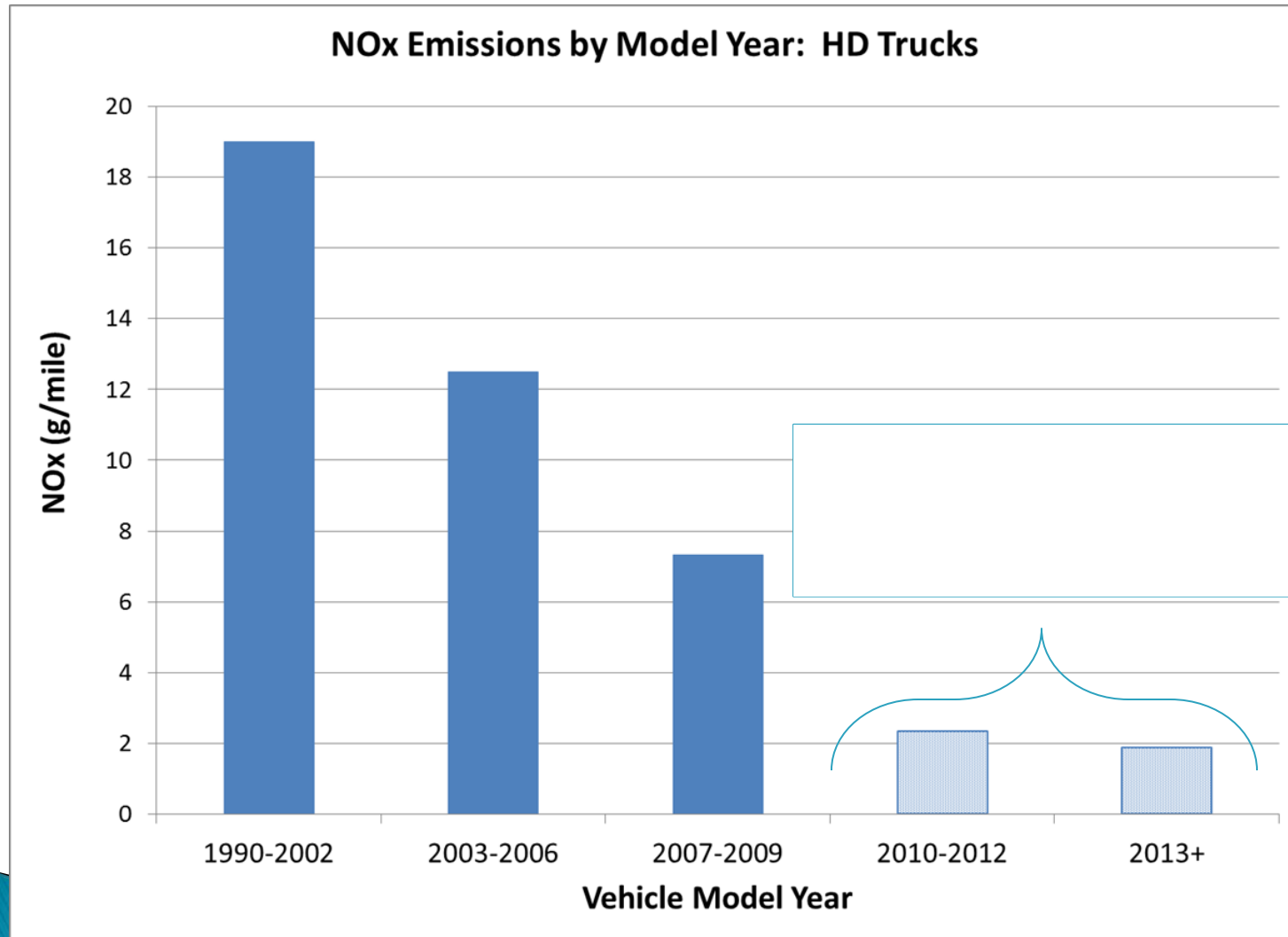
Improving Durability Could Reduce Emissions

- ▶ Unscreened claims; averaged across engine families by MY
- ▶ Reported within 100,000 mile warranty period (claims/sales)

MY	All Claims	EGR	Electronics	Engine	Injectors	NOx Sensors	Filter	Turbo
2002	45%	2%	3%	21%	12%	0%	0%	4%
2003	194%	37%	13%	7%	89%	0%	10%	31%
2004	65%	17%	8%	4%	21%	0%	0%	13%
2005	77%	24%	8%	6%	21%	0%	0%	17%
2006	50%	17%	4%	3%	12%	0%	0%	12%
2007	143%	41%	22%	9%	38%	2%	7%	16%
2008	122%	41%	24%	8%	22%	1%	3%	13%
2009	104%	30%	14%	6%	31%	0%	2%	12%
2010	65%	19%	13%	8%	11%	8%	1%	4%

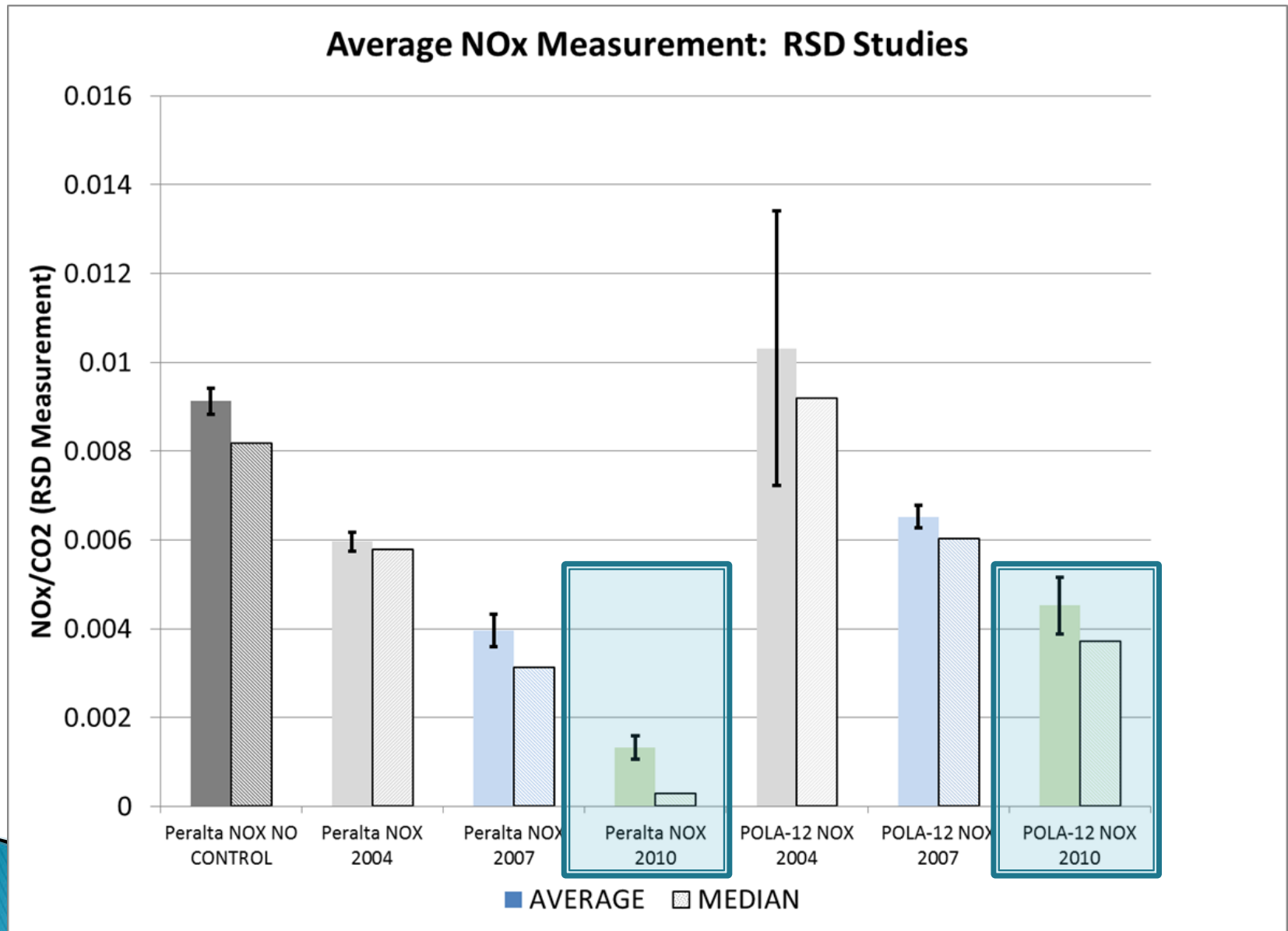
- ARB Field Study: 41 Fleets, >400 trucks
- 35% reporting having experienced engine problems
- Increasing engine durability could reduce in-use NOx emissions
- Improving in-use emissions will not provide sufficient reductions

Progress in NOx emissions, but more needs to be done

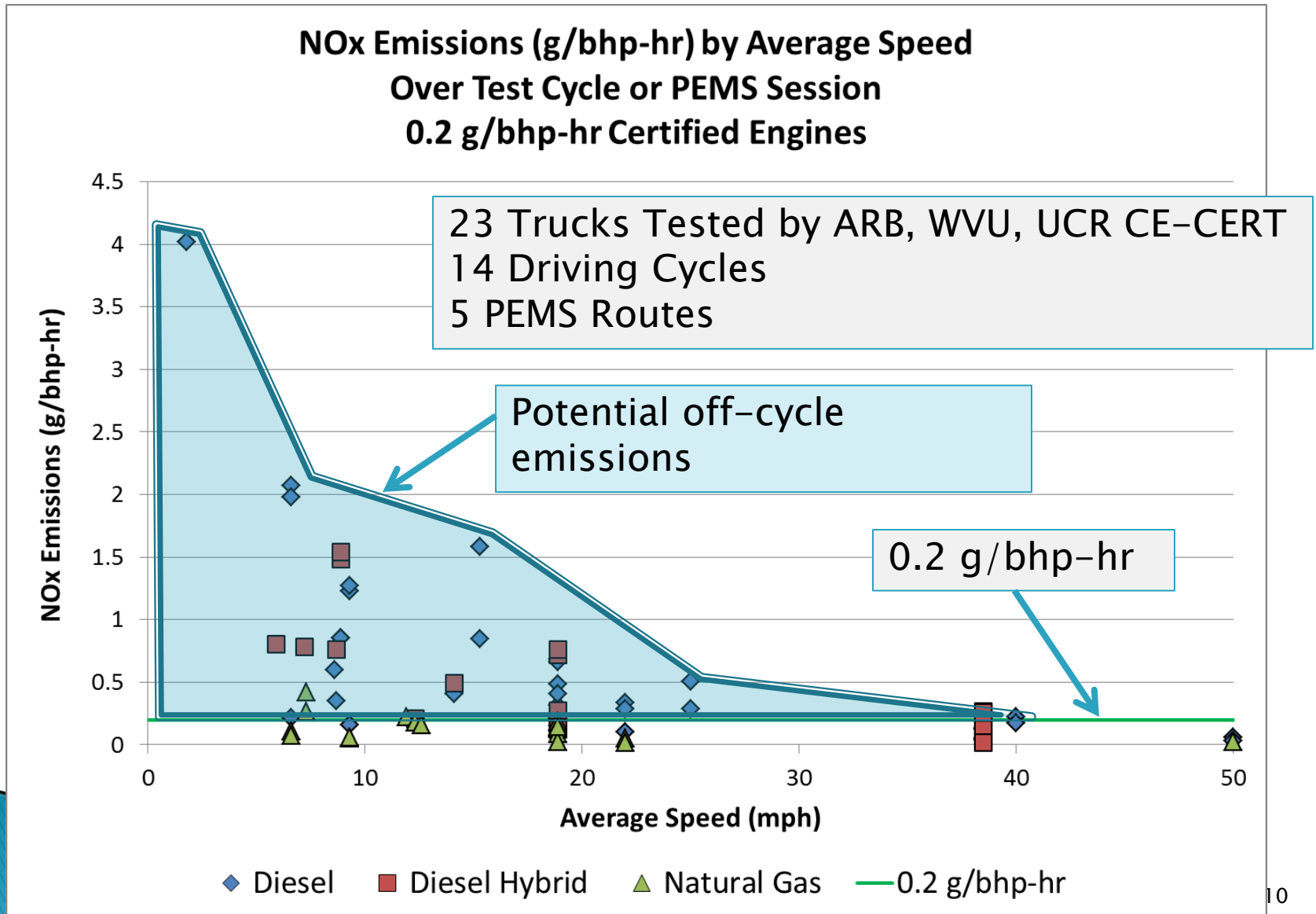


Data taken from CRC E55/59 and ARB in-house testing; UDDS cycle

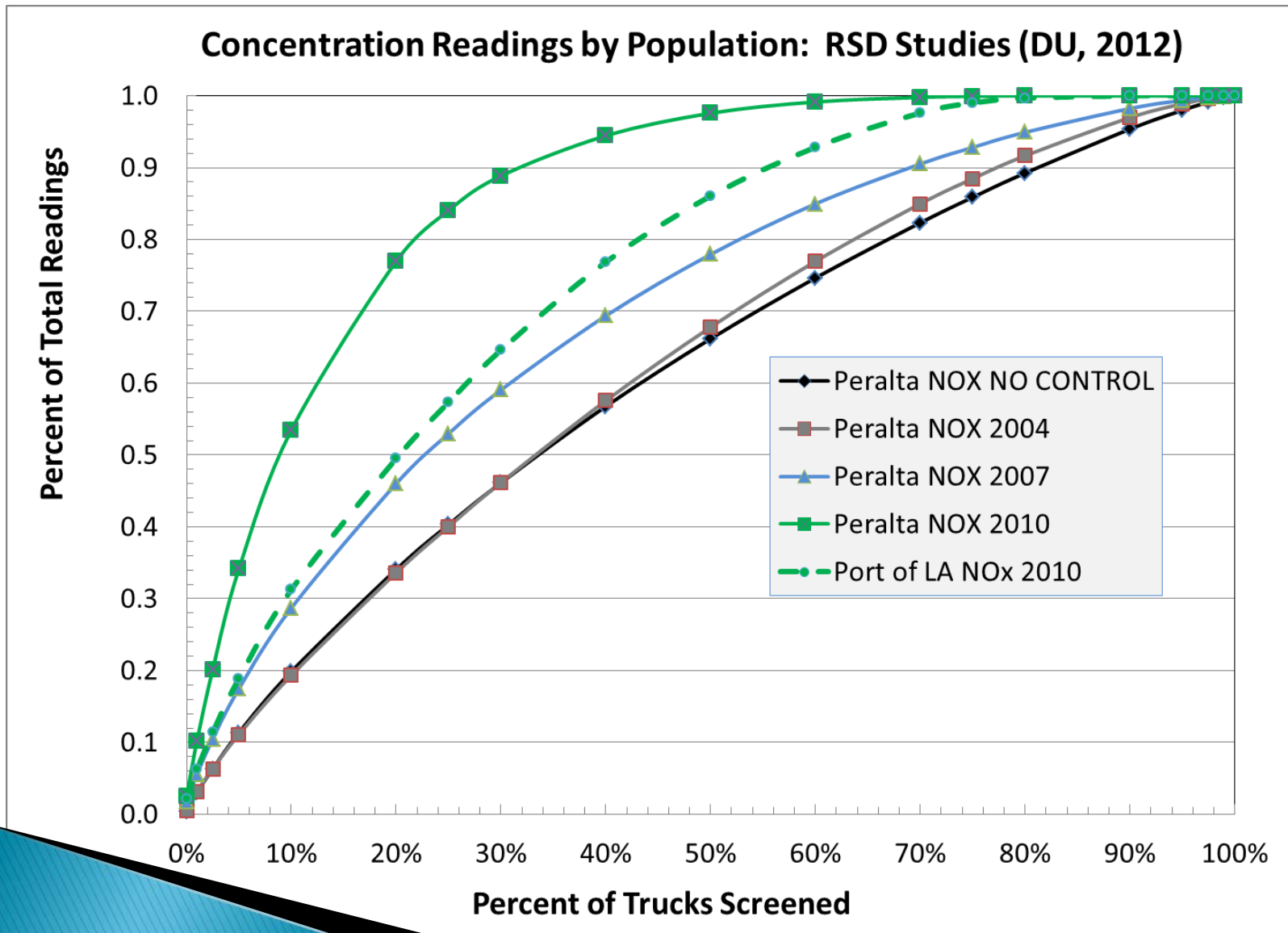
Driving Cycle Impacts NOx



Potential Excess NOx Emissions



NOx Emissions Distribution by Standard



On Board Diagnostics

- ▶ 2007–2009 MYs: engine manufacturer diagnostics (EMD) systems required
- ▶ 2010–2012 MYs: On Board Diagnostic (OBD) phase-in with reduced capability
- ▶ 2013 MY and later: OBD near final capability
 - Early OBD systems had limited diagnostic capability
- ▶ Staff working with manufacturers to ensure robust OBD systems
- ▶ OBD regulations will be updated as needed

Redesigning Inspection and Maintenance

- ▶ Cooperative approach with industry
- ▶ Modernize requirements
 - Highlight preventative maintenance procedures
 - Update vehicle inspection and reporting
 - Update opacity testing requirements or expand remote sensing
- ▶ Use On-Board Diagnostics

Contacts

- ▶ Truck Sector Lead:
 - Kim Heroy-Rogalski kheroyro@arb.ca.gov
 - (916) 327-2200
- ▶ Submit comments by Oct. 1 to:
<http://www.arb.ca.gov/msprog/tech/comments.htm>