Diesel I/M SIP Credit

Peg Hanna, NJDEP

MARAMA Transportation & Air Quality Workshop

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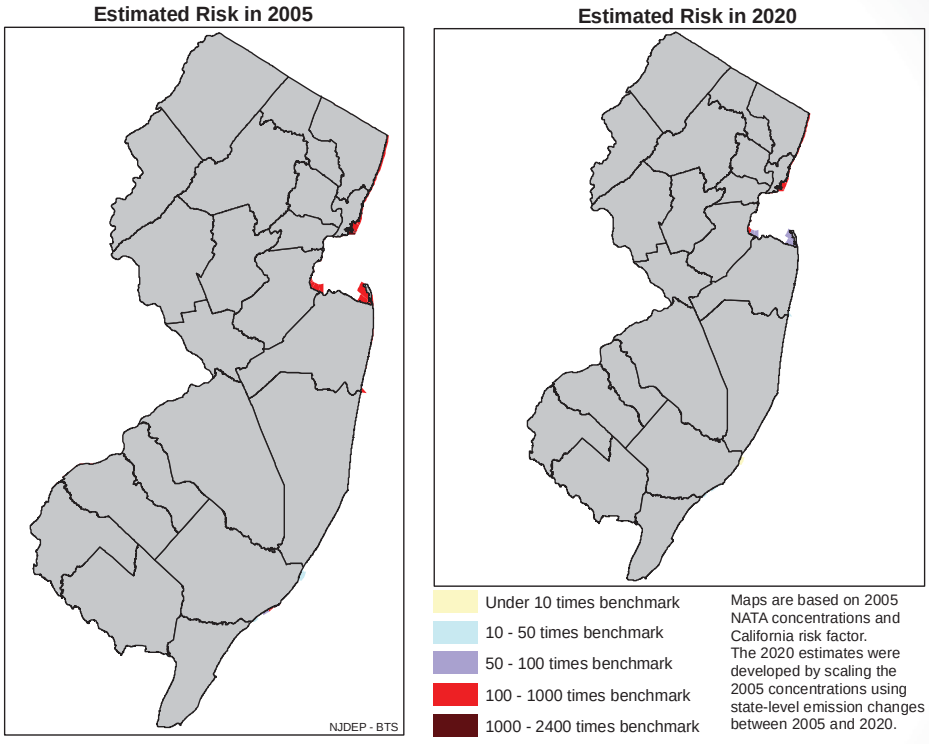
Estimated Diesel Particulate Risk in New Jersey from Mobile Sources



NJDEP, November 2012

Potential Applicability: States with Diesel I/M Programs

State	Roadside Program	Annual Program
CT	x	
ME	x	
MD	x	
MA		x
NH	x	
NJ	x	x
NY	x	x (for metro area)
RI	x	
VT	x	

Potential Applicability: States with Diesel I/M Programs

State	Roadside Program	Annual Program
AZ		x
CA	x	
CO		x
ID		x
IL		x
NV	x	x
OR		x (certain areas)
TN		x
UT		x
WA		x
WI		x

The basic concept

- Background
  - MOVES now includes emission deterioration rates based on tampering and mal-maintenance.
  - Emissions increase linearly over the useful life of the vehicle.
  - Value of I/M programs not currently recognized in MOVES.
- Task
  - Identify portion of deterioration that can be mitigated through I/M.
  - Recommend adjusted deterioration rate.
- Hurdle
  - Limited data on mass emission before and after repair.

Figure 27. Qualitative Depiction of the implementation of age effects.

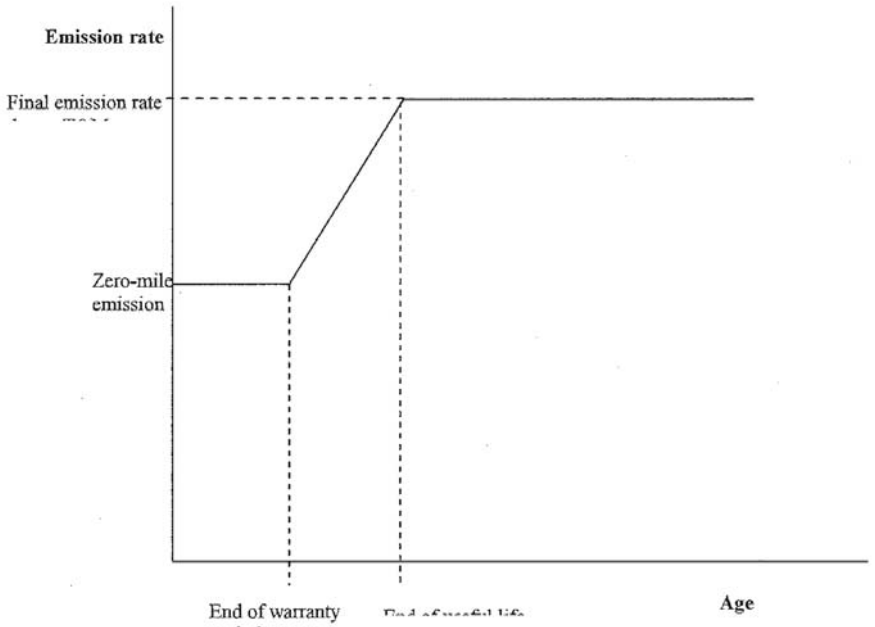


Table 36. Warranty and useful life requirements by regulatory class

Regulatory class	Warranty age (Requirement: 100,000 miles or 5 years)	Useful life mileage/age requirement	Useful life age
HHD	1	435,000/10	4
MHD	2	185,000/10	5
LHD45	4	110,000/10	4
LHD2b3	4	110,000/10	4
BUS	2	435,000/10	10

1st step: white paper

- Compiled existing studies and data on in-use heavy diesel vehicle emissions and deterioration
- Estimated potential emission benefits from I/M
  - Assumed 50-75% of excess NOx & PM emissions were identified through I/M (tampering, light check, OBD check, snap test)
  - Assumed repairs eliminated those excess emissions.
- Feedback from OTAQ: existing data insufficient

Potential TPY NOx Benefit - 2015

State	TPY benefit
CT	215
DC	15
DE	51
MA	332
MD	365
ME	135
NH	106
NJ	412
NY	887
PA	821
RI	51
VA (OTR)	117
VT	66
All Ozone Transport Region	**3574**

Potential TPY PM Benefit - 2015

State	TPY Benefit
CT	103
DC	8
DE	25
MA	160
MD	177
ME	65
NH	52
NJ	199
NY	427
PA	397
RI	25
VA (OTR)	55
VT	32
All Ozone Transport Region	**1724**

2nd step: data gathering workplan

- Recruit vehicles to undergo emission testing before and after repair.
- Questions to be resolved for workplan:
  - Type of test
  - Sample size
  - Lab vs. field
  - Representatives from each age class & weight class identified by EPA
  - Failures that correspond to EPA table

Component Problem	Frequency Rates (%)					
	1994-1997	1998-2002	2003-2006	2007-2009	2010+ HHDT	2010+ LHDT
Timing Advanced	5	2	2	2	2	2
Timing Retarded	3	2	2	2	2	2
Injector Problem	28	28	13	13	13	13
Puff Limiter Mis-set	4	0	0	0	0	0
Puff Limiter Disabled	4	0	0	0	0	0
Max Fuel High	3	0	0	0	0	0
Clogged Air Filter	8	8	8	8	8	8
Wrong/Worn Turbo	5	5	5	5	5	5
Intercooler Clogged	5	5	5	5	5	5
Other Air Problem	6	6	6	6	6	6
Engine Mechanical Failure	2	2	2	2	2	2
Excessive Oil Consumption	5	3	3	3	3	3
Electronics Failed	3	3	3	3	3	3
Electronics Tampered	10	15	5	5	5	5
EGR Stuck Open	0	0	0.2	0.2	0.2	0.2
EGR Disabled/Low Flow	0	0	10	10	10	10
NOx Aftertreatment Sensor	0	0	0	0	10	10
Replacement NOx Aftertreatment Sensor	0	0	0	0	1	1
NOx Aftertreatment Malfunction	0	0	0	0	13	16
PM Filter Leak	0	0	0	5	5	5
PM Filter Disabled	0	0	0	2	2	2
Oxidation Catalyst Malfunction/Remove	0	0	0	5	5	5
Mis-fuel	0.1	0.1	0.1	0.1	0.1	0.1

Source: Appendix A.2 Tampering and Mal-Maintenance, Development of Emission Rates for Heavy-Duty Vehicles in the Motor Vehicle Emissions Simulator MOVES2010, Final Report, August 2012.

Tamper & Malmaintenance
PM Emission Effect

	1994-97	1998-2002	2003-2006	2007-2009	2010
Federal Emission Standard	0.1	0.1	0.1	0.01	0.01
Timing Advanced	-10%	-10%	-10%	0%	0%
Timing Retarded	25%	25%	25%	1%	1%
Injector Problem	100%	100%	100%	5%	5%
Puff Limiter Mis-set	20%	0%	0%	0%	0%
Puff Limiter Disabled	50%	0%	0%	0%	0%
Max Fuel High	20%	0%	0%	0%	0%
Clogged Air Filter	50%	50%	30%	2%	2%
Wrong/Worn Turbo	50%	50%	50%	3%	3%
Intercooler Clogged	50%	50%	30%	2%	2%
Other Air Problem	40%	40%	30%	2%	2%
Engine Mechanical Failure	500%	500%	500%	25%	25%
Excessive Oil Consumption	500%	500%	500%	25%	25%
Electronics Failed	60%	60%	60%	3%	3%
Electronics Tampered	50%	50%	50%	3%	3%
EGR Stuck Open/Low Flow	0%	0%	100%	5%	5%
EGR Disabled	0%	0%	-30%	-30%	-30%
Nox Aftertreatment Sensor	0%	0%	0%	0%	0%
Replacement Nox Aftertreatment Sensor	0%	0%	0%	0%	0%
Nox Aftertreatment Malfunction	0%	0%	0%	0%	0%
PM Filter Leak	0%	0%	0%	600%	600%
PM Filter Disabled	0%	0%	0%	1000%	1000%
Oxidation Catalyst Malfunction/Remove	0%	0%	0%	2%	2%
Mis-Fuel	30%	30%	30%	100%	100%

Tamper & Malmaintenance
NOX Emission Effect

	1994-97	1998-2002	2003-2006	2007-2009	2010+ HHDT	2010 LHDT
Federal Emission Standard	5.0	5.0	4.0	2.0	0.2	0.2
Timing Advanced	60%	60%	60%	60%	6%	12%
Timing Retarded	-20%	-20%	-20%	-20%	-20%	-20%
Injector Problem (all)	-5%	-1%	-1%	-1%	-1%	-1%
Puff Limiter Mis-set	0%	0%	0%	0%	0%	0%
Puff Limiter Disabled	0%	0%	0%	0%	0%	0%
Max Fuel High	10%	0%	0%	0%	0%	0%
Clogged Air Filter	0%	0%	0%	0%	0%	0%
Wrong/Worn Turbo	0%	0%	0%	0%	0%	0%
Intercooler Clogged	25%	25%	25%	25%	3%	5%
Other Air Problem	0%	0%	0%	0%	0%	0%
Engine Mechanical Failure	-10%	-10%	-10%	-10%	-10%	-10%
Excessive Oil Consumption	0%	0%	0%	0%	0%	0%
Electronics Failed	0%	0%	0%	0%	0%	0%
Electronics Tampered	80%	80%	80%	80%	8%	16%
EGR Stuck Open	0%	0%	-20%	-20%	-20%	-20%
EGR Disabled / Low Flow	0%	0%	30%	50%	5%	10%
Nox Aftertreatment Sensor	0%	0%	0%	0%	200%	200%
Replacement Nox Aftertreatment Sensor	0%	0%	0%	0%	200%	200%
Nox Aftertreatment Malfunction	0%	0%	0%	0%	500%	300%
PM Filter Leak	0%	0%	0%	0%	0%	0%
PM Filter Disabled	0%	0%	0%	0%	0%	0%
Oxidation Catalyst Malfunction/Remove	0%	0%	0%	0%	0%	0%
Mis-fuel						

Next steps

- Refine workplan with USEPA
- Gather data
- Analyze results
- Identify/discuss outstanding issues, e.g.,
  - Credit for opacity vs. DPF/SCR checks vs. OBD
  - Credit for roadside vs. annual programs
  - Benefit of repairs vs. deterrent effect

Feedback/questions?

Contact:
Peg Hanna, 609 633-2306
peg.hanna@dep.state.nj.us