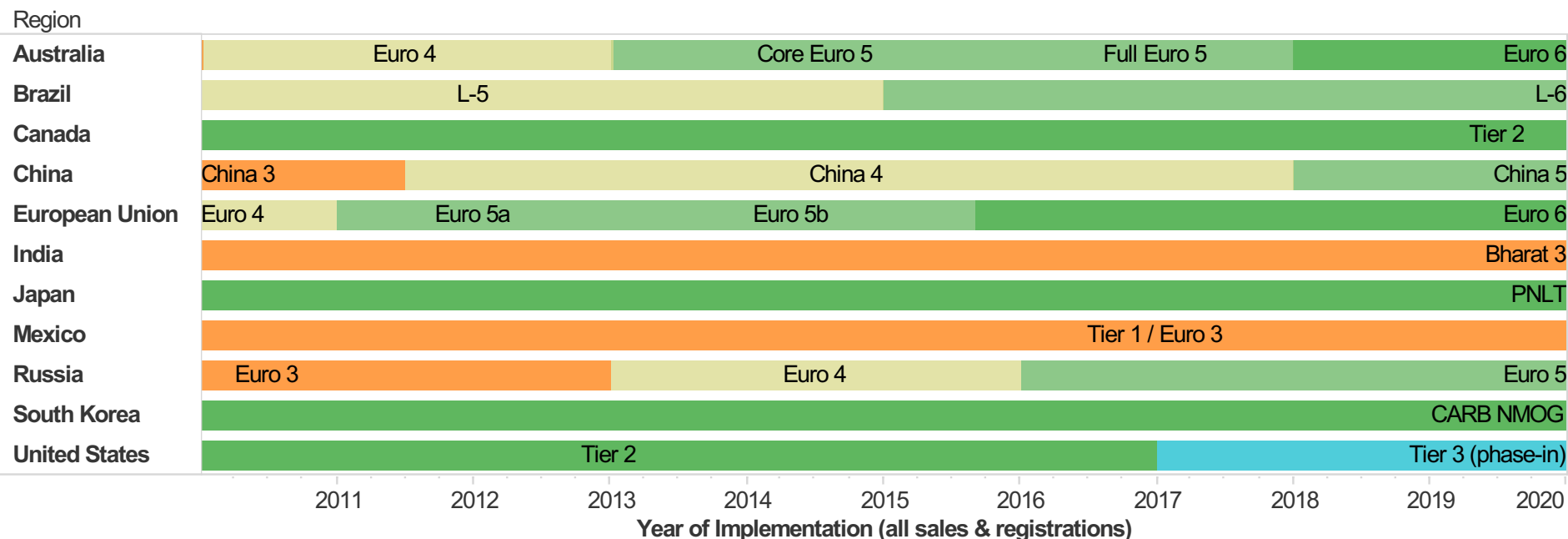


# Timeline for implementation of nationwide emissions standards for light-duty vehicles



Source: TransportPolicy.Net

# NOM-042 vigente (opciones de EPA y Euro)

Standard	Class	CO	NMHC	NO <sub>x</sub>		PM		
		All	All	Gasoline	Diesel	Diesel		
A	PC	Tier 1	Tier 1	Tier 1	Tier 1	Tier 1		
	CL1					Tier 1 (100k) <sup>a</sup>		
	CL2							
	CL3							
	CL4						Tier 1 (100k) <sup>a</sup>	
B	PC	Tier 2 Bin 5-10 <sup>b</sup>	Tier 2 Temporary Bin 10 <sup>b</sup>	Tier 2 Temporary Bin 10 <sup>b</sup>	Tier 2 Temporary Bin 10 <sup>b</sup>	Tier 1		
	CL1							
	CL2							
	CL3	Tier 2 Temporary Bin 10 <sup>b</sup>	Tier 2 Temporary Bin 10 <sup>b</sup>			Tier 1 (100k) <sup>a</sup>		
	CL4							
C	PC	Tier 2 Bin 5-8	Tier 2 Bin 5-7	Tier 2 Bin 7	Tier 2 Bin 7	Tier 1		
	CL1							
	CL2		Tier 2 Bin 8			Tier 2 Temporary Bin 9 <sup>b</sup>	Tier 2 Temporary Bin 9 <sup>b</sup>	Tier 1 (100k) <sup>a</sup>
	CL3							
	CL4							

<sup>a</sup> Tier 1 (100k) indicate values are taken from the higher emissions limits required in the US after 100,000 miles of use, but applied here after only 50,000 miles of vehicle use. As a result, these limits are less stringent than the US Tier 1 standard on which they are based.

<sup>b</sup> Bins 9 and above are temporary bins that are no longer allowed under the US Tier 2 regulation.

Standard	Class	CO		NMHC		NO <sub>x</sub>		PM
		Gasoline, LPG, NG	Diesel	Gasoline, LPG, NG	Diesel	Gasoline, LPG, NG	Diesel	Diesel
B	PC, CL1, CL2, CL3	Euro 3 <sup>a</sup>	Euro 3	Euro 3 <sup>a</sup>	Euro 3	Euro 3 <sup>a</sup>	Euro 3	Euro 3
C	PC, CL1, CL2, CL3	Euro 4	Euro 4	Euro 4	Euro 4	Euro 4	Euro 4	Euro 4

<sup>a</sup> These standards are somewhat more stringent than Euro 3 but not as stringent as Euro 4.

# NOM 042 vigente, línea de tiempo

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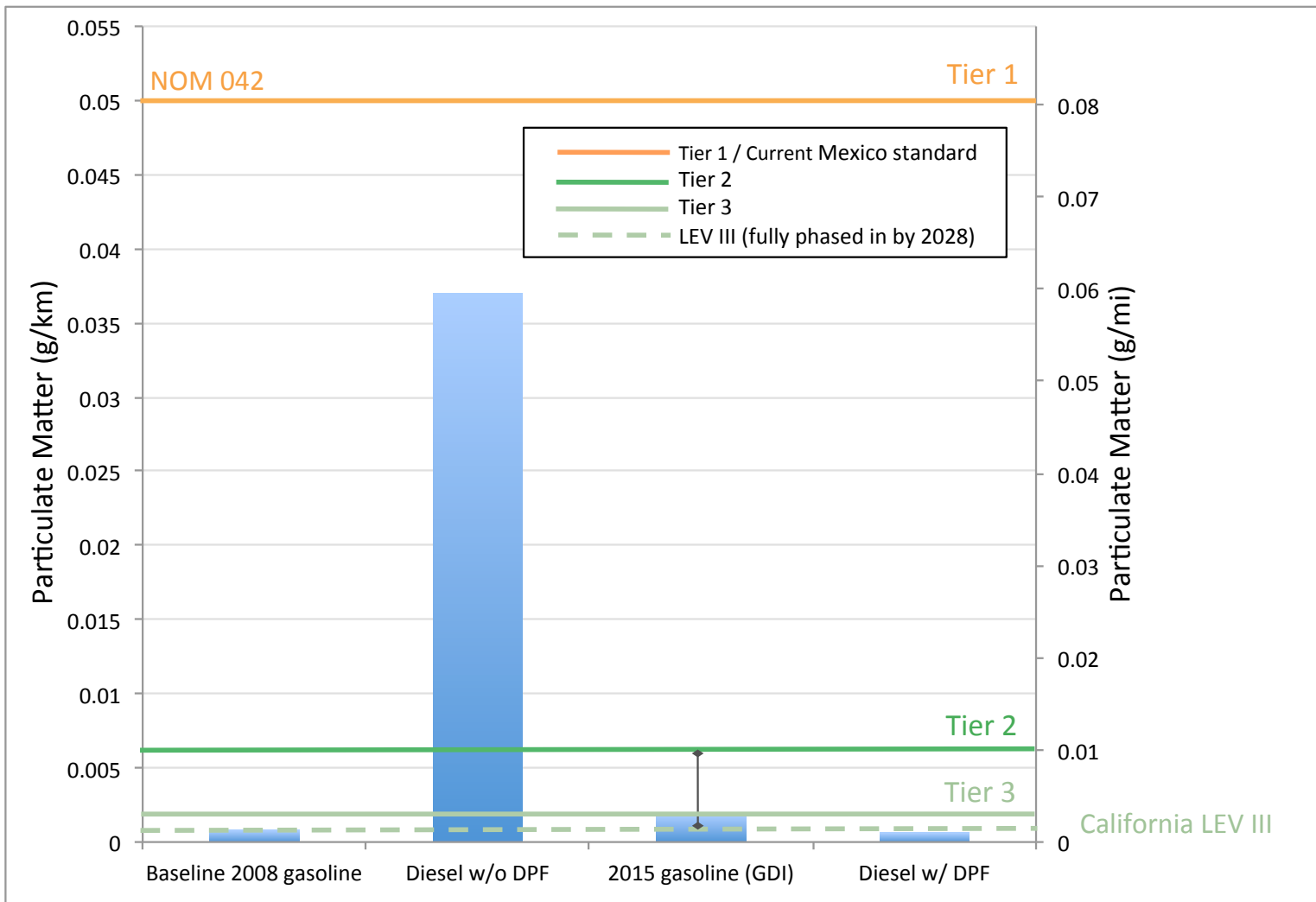
## Phase-In Schedule of Light-Duty Vehicles Meeting B Standards

Standard	2007	2008	2009	2010
A	75%	50%	30%	0%
B	25%	50%	70%	100%

## Phase-In Schedule of Light-Duty Vehicles Meeting C Standards

Standard	Year 1	Year 2	Year 3	Year 4
A+B	75%	50%	30%	0%
C	25%	50%	70%	100%

# PM standards for diesel passenger vehicles



# Tier 3 standards

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- 80% reduction in NMOG+NOx fleet average
- 70% reduction in PM limits
- Extends useful life from 120,000 miles to 150,000 miles (241,400 km) / 15 years
- Gasoline sulfur content reduced to 10 ppm average / 80 ppm maximum (Jan 1, 2017)
- SFTP standards *should help* address high diesel NOx issues
- Phased in out to 2025, in parallel with GHG standards
- Early compliance and averaging, banking and trading

# Tier 3 and LEV III FTP standards for LDVs, LDTs and MDPVs

Tier 3	LEV III	NMOG +NOx (mg/mi)	CO (g/mi)	HCHO (mg/mi)	Tier 3 PM (mg/mi)	LEV III PM (mg/mi)
Current Tier 2 Bin 5		160	4.2	18	10	
Bin 160	LEV 160	160	4.2	4	3	1
Bin 125	ULEV 125	125	2.1	4	3	1
Bin 70	ULEV 70	70	1.7	4	3	1
Bin 50	ULEV 50	50	1.7	4	3	1
Bin 30	SULEV 30	30	1.0	4	3	1
Bin 20	SULEV 20	20	1.0	4	3	1
Bin 0	ZEV	0	0	0	0	0

PM standards phase in:

- LEV III is 100% 3 mg/mi by 2021 and 100% 1 mg/mi by 2028
- Tier 3 is 100% 3 mg/mi by 2022

# Tier 3 phase-in schedules

NMOG+NOx	2017	2018	2019	2020	2021	2022	2023	2024	2025+
LDV & LDT1	86	79	72	65	58	51	44	37	30
LDT2, 3,4 & MDPV	101	92	83	74	65	56	47	38	

PM	2017	2018	2019	2020	2021	2022
Phase-in (%)	20	20	40	70	100	100
FTP certification (mg/mi)	3	3	3	3	3	3
FTP In-use (mg/mi)	6	6	6	6	6	3

# Additional SFTP standards

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- Both Tier 3 and LEV III also include Supplemental FTP (SFTP) standards for NMOG+NO<sub>x</sub> and CO
  - US06 cycle incorporates higher speeds and acceleration rates
  - SC03 cycle simulates air conditioning with operation at 95C (35C).
  - SFTP is weighted average ( $0.35 \times \text{FTP} + 0.28 \times \text{US06} + 0.37 \times \text{SC03}$ )
- Both also include US06 standards for PM



# Evaporative emissions

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- Evaporative emissions (both LEV III and Tier 3)
  - Reduces evaporative emissions by about 50%
  - Includes limits, bleed testing, leak test and OBD requirements
  - Applies to gasoline vehicles
  - Phased in to 100% in 2022

Vehicle Class	Highest Diurnal + Hot Soak Level, g/test (over both 2-day and 3-day SHED diurnal tests)
LDV, LDT1	0.300
LDT2	0.400
LDT3, LDT4 MDPV	0.500
HDGVs	0.600

# Medium- and heavy-duty vehicles

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- Tier 3 and LEV III extend regulations to vehicles between 8,501 lb and 14,000 lb (3,856-6,350 kg) gross vehicle weight rating (GVWR), vehicles that are currently regulated under NOM 044.
- Allows a choice between chassis and engine testing.
- Interim bins allow for carry-over of existing standards and do not include SFTP or longer useful life.
- First ever SFTP standards for HDVs, with test cycles tailored to HDVs

# HDV FTP standards

	NMOG +NO <sub>x</sub> (mg/ml)	NMOG (mg/ml)	NO <sub>x</sub> (mg/ml)	PM (mg/ml)	CO (g/ml)	Formaldehyde (mg/ml)
<b>Class 2b (8,501-10,000 lbs GVWR):</b>						
<b>Bin 395 (interim)</b>	--	195	200	8	6.4	6
<b>Bin 340 (interim)</b>	--	140	200	8	6.4	6
<b>Bin 250</b>	250	--	--	8	6.4	6
<b>Bin 200</b>	200	--	--	8	4.2	6
<b>Bin 170</b>	170	--	--	8	4.2	6
<b>Bin 150</b>	150	--	--	8	3.2	6
<b>Bin 0</b>	0	--	--	0	0	0
<b>Class 3 (10,001-14,000 lbs GVWR):</b>						
<b>Bin 630 (interim)</b>	--	230	400	10	7.3	6
<b>Bin 570 (interim)</b>	--	170	400	10	7.3	6
<b>Bin 400</b>	400	--	--	10	7.3	6
<b>Bin 270</b>	270	--	--	10	4.2	6
<b>Bin 230</b>	230	--	--	10	4.2	6
<b>Bin 200</b>	200	--	--	10	3.7	6
<b>Bin 0</b>	0	--	--	0	0	0

# Phase in of HDV standards

Phase-in of NMOG+NOx standards (mg/mi)

	Voluntary		Required Program				
Model Year	2016	2017	2018	2019	2020	2021	2022+
<b>Class 2b</b>	333	310	278	253	228	203	178
<b>Class 3</b>	548	508	451	400	349	298	247

- Manufactures can average across fleets using credits
- PM standards are phased in with the same timing as LDV standards

# Details, details, details

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- Thousands of pages of details. For example:
  - LDVs and LDT1 can have use a 120,000 mile durability but then must have a 15% lower emissions
  - Interim 4000 mile SFTP standard
  - Highway test standards, In-use phase-in period
  - Credits, averaging, etc, etc
- High altitude standards
  - Test margins are so low under new standards that they needed to specify standards for cold start at high altitude, where there is insufficient hot combustion exhaust to quickly heat the catalyst. (More relevant to Denver than Mexico City.)
  - Allows manufacturers to comply with next highest bin for certification at high altitude (above 1,600 meters).

# Impact of fuel sulfur

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- Diesel fuel quality
  - 15 ppm required for Tier 2 and beyond diesel vehicles.
  - Higher sulfur will increase emissions rapidly and could damage vehicle.
- Gasoline fuel quality
  - 30 average / 80 maximum for Tier 2
  - 10 average / 80 maximum for Tier 3
  - Sulfur locks up the precious metal sites on the catalyst, reducing catalyst efficiency. Important benefits from better catalysts even with higher sulfur fuels.
  - Impacts of higher sulfur fuels are completely reversible. Possible to phase in cleaner fuels and vehicles at the same time.

# Why not just a straight emissions limits?

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- Tier 3 and LEV III standards are complicated!
- Emissions are going so low that there is little margin of error
- Majority of emissions are in cold starts
- Real driving conditions can also lead to higher emissions
- Bins allow regulators to introduce more stringent standards and provide incentives for manufacturers to phase in cleaner vehicles
- Phase in gives time to manufacturers to develop more cost-effective approaches for emissions control
- Flexibilities are what allow for stringent standards, especially when emissions reach such low levels

# References

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- <http://www.TransportPolicy.Net>
- <http://www.theicct.org/us-tier-3-vehicle-emissions-and-fuel-quality-standards-final-rule>
- <http://www.theicct.org/tier-3-nprm>