

# ***PM EMISSION BENEFITS FROM A NEW U.S. LIGHT-DUTY VEHICLE STANDARD***

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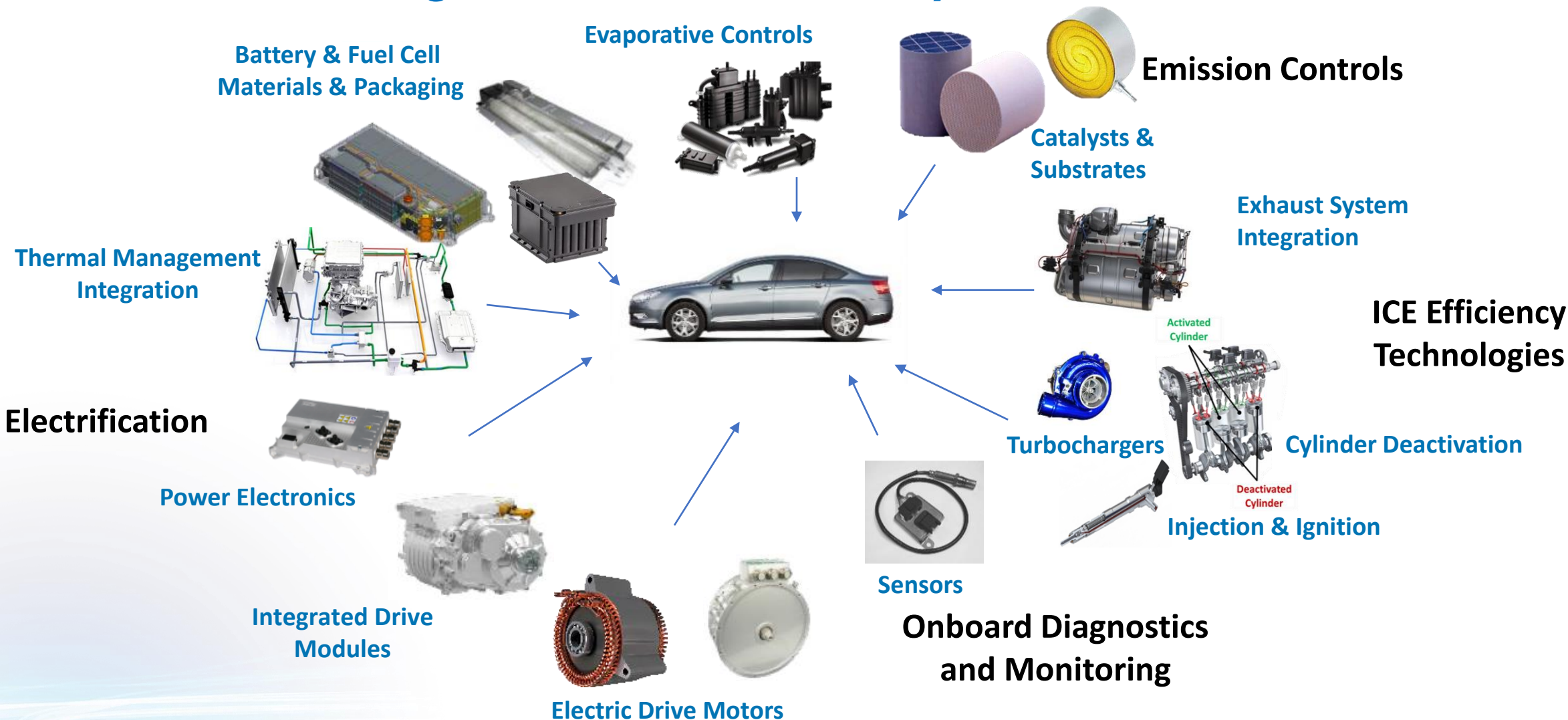
**March 27, 2023**

**33<sup>rd</sup> CRC Real World Emissions Workshop**

**Long Beach, CA**



# MECA – Technologies for Clean Mobility



# *Outline*

**Introduction**

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# *Introduction*

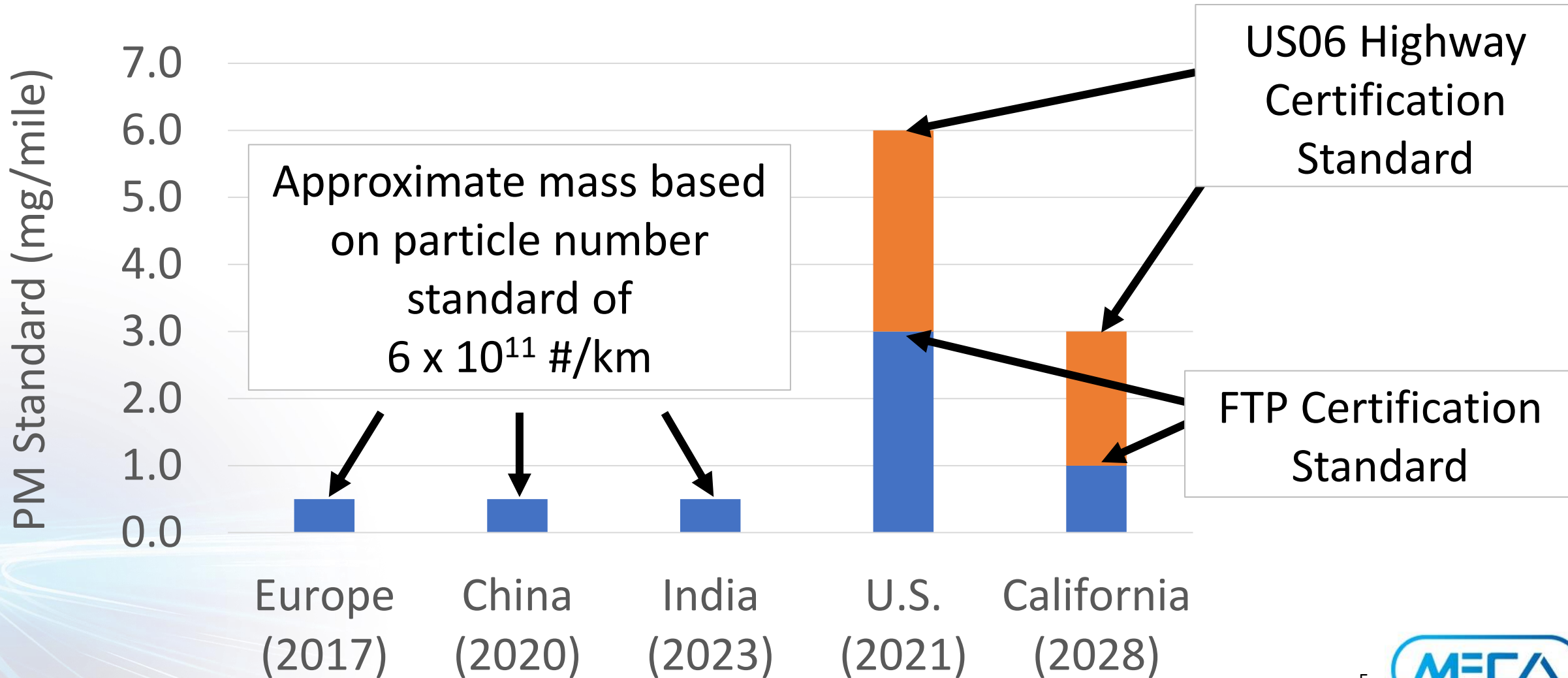
**Electrification of the passenger car fleet is projected to increase at a quick pace, but millions of ICE-vehicles will be sold during the transition**

**The U.S. EPA will soon propose new multipollutant standards for light- and medium-duty vehicles**

**Particulate limits equivalent to Europe, China and India can be met through electrification and emission controls on ICE-vehicles**

**Significant air quality and health benefits can be achieved from further PM reductions from passenger vehicles**

# *US trails the world on particulate emission standards*

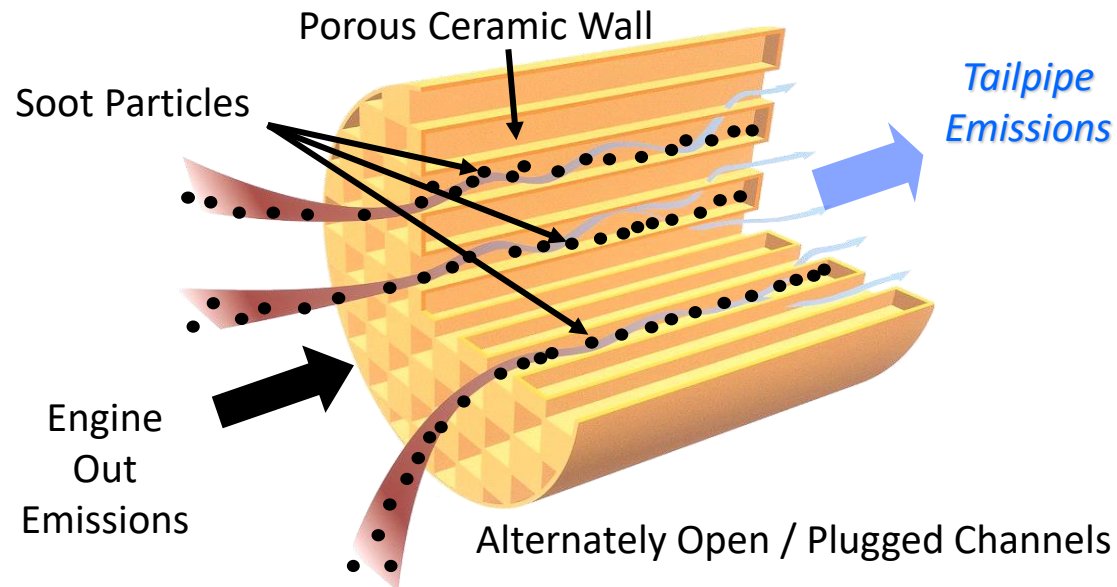
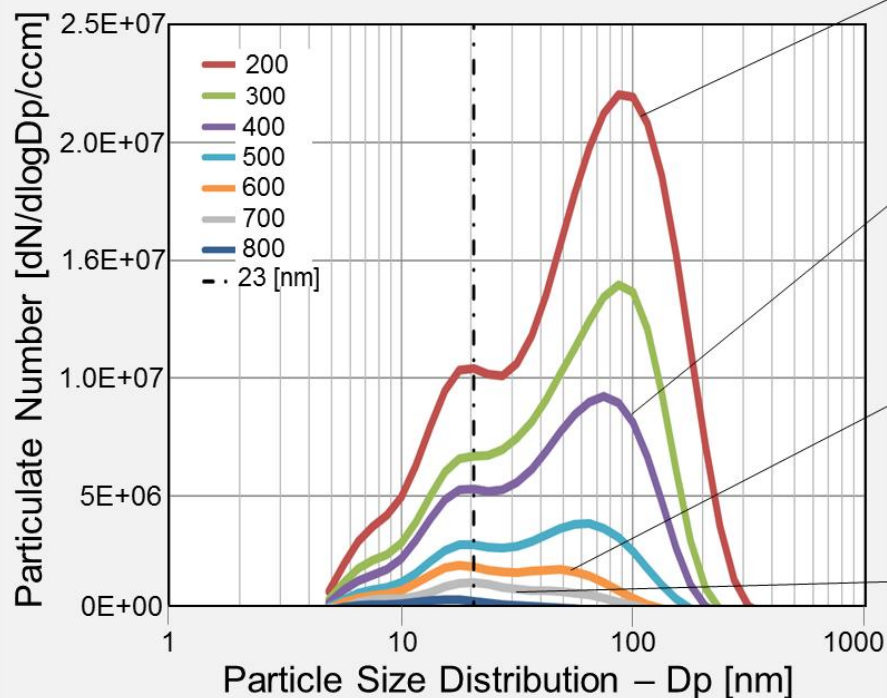




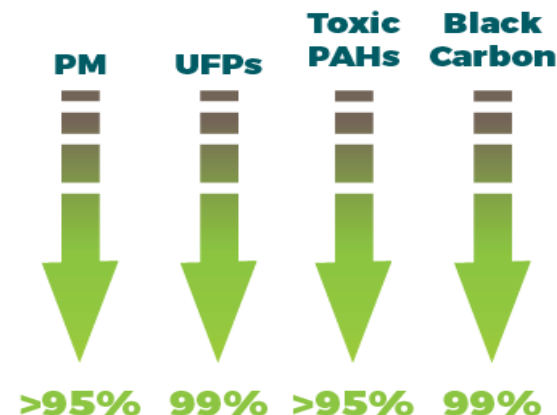
# Automakers already produce “best available” PM emission control technology for cars in Europe, China & India

## Fuel pressure and particulate number

Improved injector tip cleaning



Catalyzed GPFs reduce:



# Modeled emission standards

**Table 1. On-road PM certification standards: current & modeled (mg/mile)**

Agency, Standard	LDV, LDT, MDPV			Class 2b			Class 3		
	FTP Limit	SFTP		FTP Limit	SFTP		FTP Limit	SFTP	
		Limit	Cycle		Limit	Cycle		Limit	Cycle
<b>Current EPA/CARB ACC (2021+ MY)</b>	3	6	US06	8	7/10	Mix	10	7	Mix
<b>CARB ACC2 (2027+ MY)*</b>	1	3	US06	8	6	US06	10	5	Unified Cycle
<b>Modeled EPA (2027+ MY)*</b>	0.3/0.6†	1.0	US06	0.8/1.6†	2.0	US06	1.0/2.0†	1.7	Unified Cycle

\* Includes 1 mg FTP standard from ACC (starting MY2025) and 25/50/75 % phase in for first 3 model years, 100% thereafter

† FTP standards at 75 / 20 degrees Fahrenheit

# *Modeling analysis methods*

<b>Evaluation Years:</b>	<b>2016, 2023, 2025 – 2050, 2060</b>
<b>Pollutants:</b>	<b>PM2.5, Black Carbon</b>
<b>Domain:</b>	<b>49-States + District of Columbia</b>
<b>Temporal Basis:</b>	<b>Annual (Monthly Aggregation)</b>
<b>Fleet Coverage:</b>	<b>Modeled standards apply to automobiles and trucks up to 14,000 lbs. GVWR (complete vehicle certifications only)</b>
<b>Regulatory Context:</b>	<b>Federal certification region (32 states + DC) Section 177 states (17 states)</b>
<b>Electrification:</b>	<b>3 tiers of electrification rates/targets modeled</b>

**Notes:** Black Carbon (BC) not directly reported by MOVES; standard practices are to use Elemental Carbon (EC) as a surrogate for BC.  
EMFAC is the official inventory model for California; EMFAC was not applied in this project and thereby CA was omitted from study.

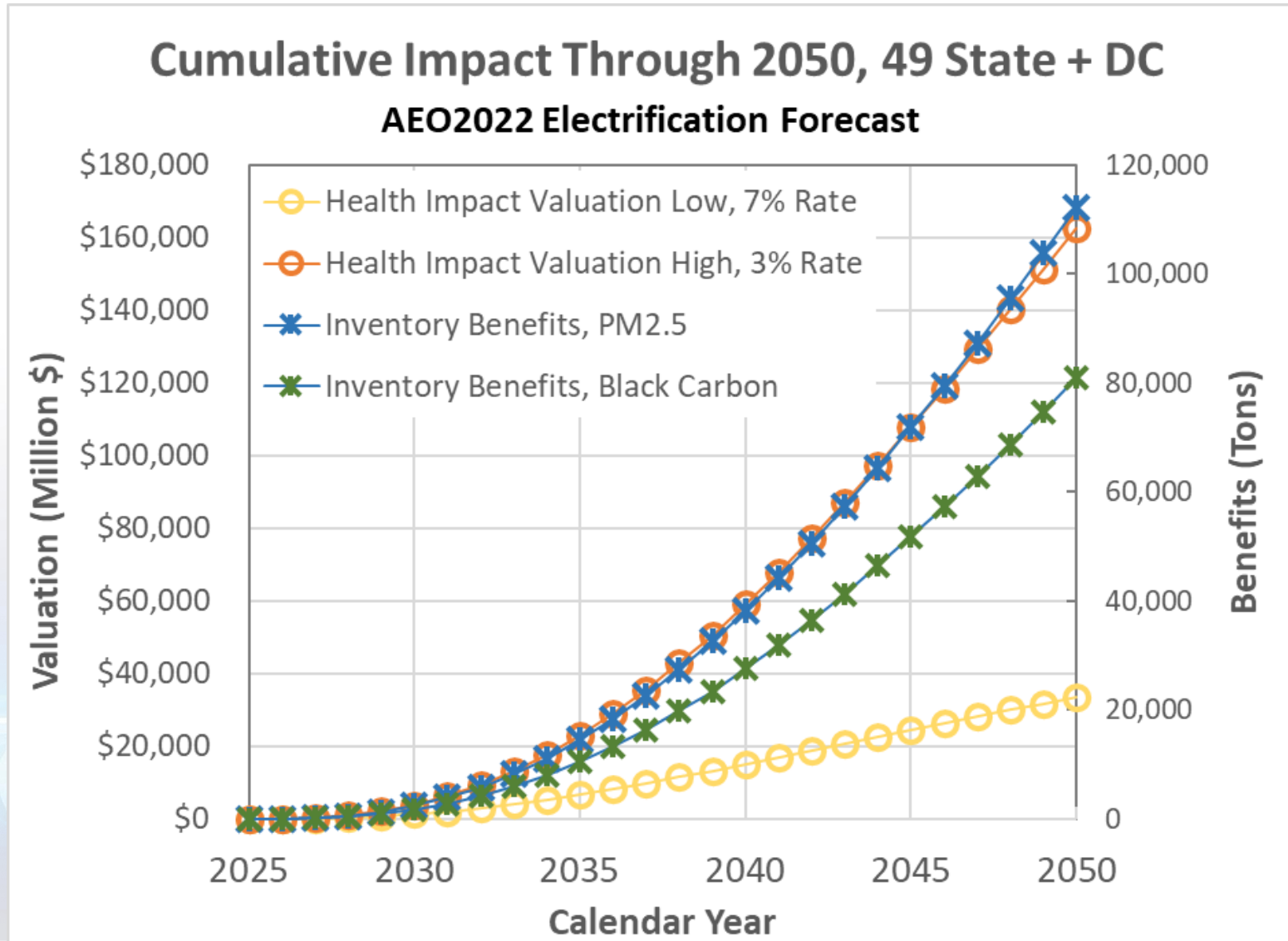


# Electrification assumptions

Domain	Electrification Case		
	AEO2022	Mid Range	High Range
<b>Section 177 States Following CARB ZEV Mandate</b>	AEO projections assigned to CA+177 States based on 2019 MY sales; CA+177 state share of national EVs increased linearly to 85% by MY2030 and held at 85% thereafter.	Modification of the “High Range” case assuming that 100% electrification will not be met until MY2050.	California ACC II regulation plus linear growth to achieve 100% electric by MY2040; passenger car electrification occurs more quickly than LDT.
<b>Balance of United States (Federal Certification Region)</b>	AEO national projections less vehicles assigned to CA+177 states. EVs account for 13% of passenger cars sales in 2050.	50% of national total sales electrified by MY2035 (5 years after Biden Executive Order); linear growth thereafter to reach 100% electrification by MY2060.	Biden Executive Order of 50% of national total sales electrified by MY2030; linear growth thereafter to reach 100% electrification by MY2050; passenger car electrification occurs more quickly than LDT.

[1] Automobile electrification rate about twice that of light-duty trucks as observed in historic AEO data; faster automobile electrification also agrees with qualitative summary of ARB’s ACC II.

# Projected benefits from clean ICE vehicles – AEO2022 EV forecast (13% EV sales in 2050)



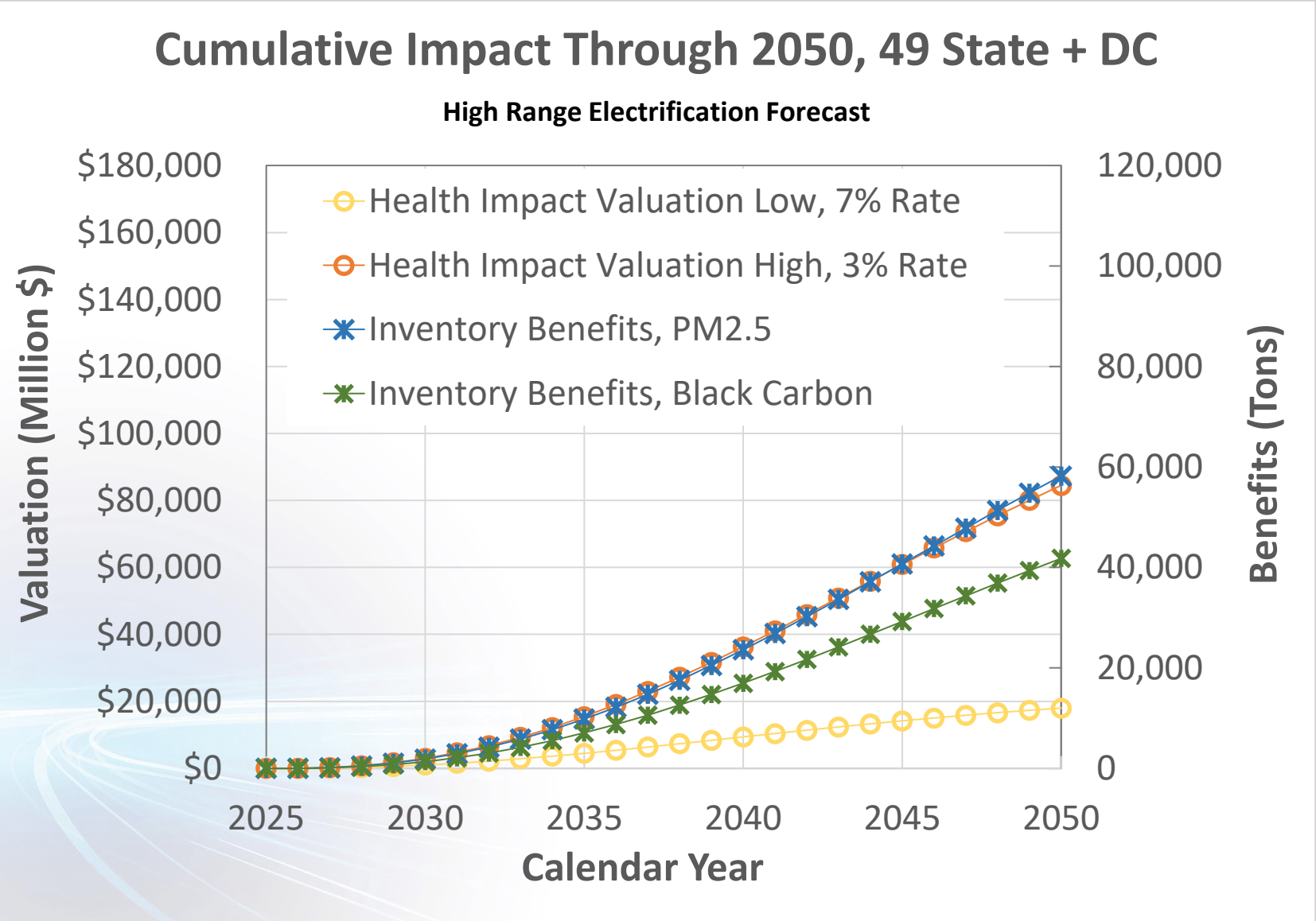
**115,000 tons of PM  
reduced**

**Avoided Lives Lost:  
9,894 - 22,319**

**Avoided Asthma  
Attacks:  
314,393**

**Avoided Lost Work  
Days:  
1,154,828**

# Projected benefits from clean ICE vehicles – high EV forecast (100% EV sales in Section 177 states/rest of U.S. in 2040/2050)



**60,000 tons PM  
reduced**

**Avoided Lives Lost:  
5,026 – 11,340**

**Avoided Asthma  
Attacks:  
161,048**

**Avoided Lost Work  
Days:  
589,850**

# Conclusions

- Emission benefits were modeled based on a potential national light- and medium-duty vehicle PM standard set at 90% below current limits
- Results indicate nearly 120,000 tons of PM benefits (cumulative) from ICE vehicles based on low rates of electrification and 60,000 tons of PM benefits (cumulative) from ICE vehicles based on high rates of electrification
- Valuation of corresponding health benefits ranges from \$30-160B and \$20-85B for the low and high range electrification cases, respectively
- Application of best available emission controls on passenger cars, light and medium-duty trucks roughly doubles the PM reductions and health benefits from a high rate of electrification alone
- A parallel technology pathway allows all vehicles to meet stringent standards and delivers maximum PM health benefits

# ***Acknowledgements***

**Rasto Brezny – MECA**

**Ameya Joshi – Corning**

**Jeremy Heiken – Oak Leaf Environmental**





***THANK YOU.***

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# *Supplemental*

# PM emissions greater in urban centers and affects near-road and disadvantaged communities disproportionately

Gasoline particle emissions is a leading contributor to environmental injustice

Location-specific strategies can eliminate PM2.5 exposure disparities

