

# *Suppliers Supporting EPA's Light- and Medium-Duty Vehicle Regulation*

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**MECA Clean Mobility**

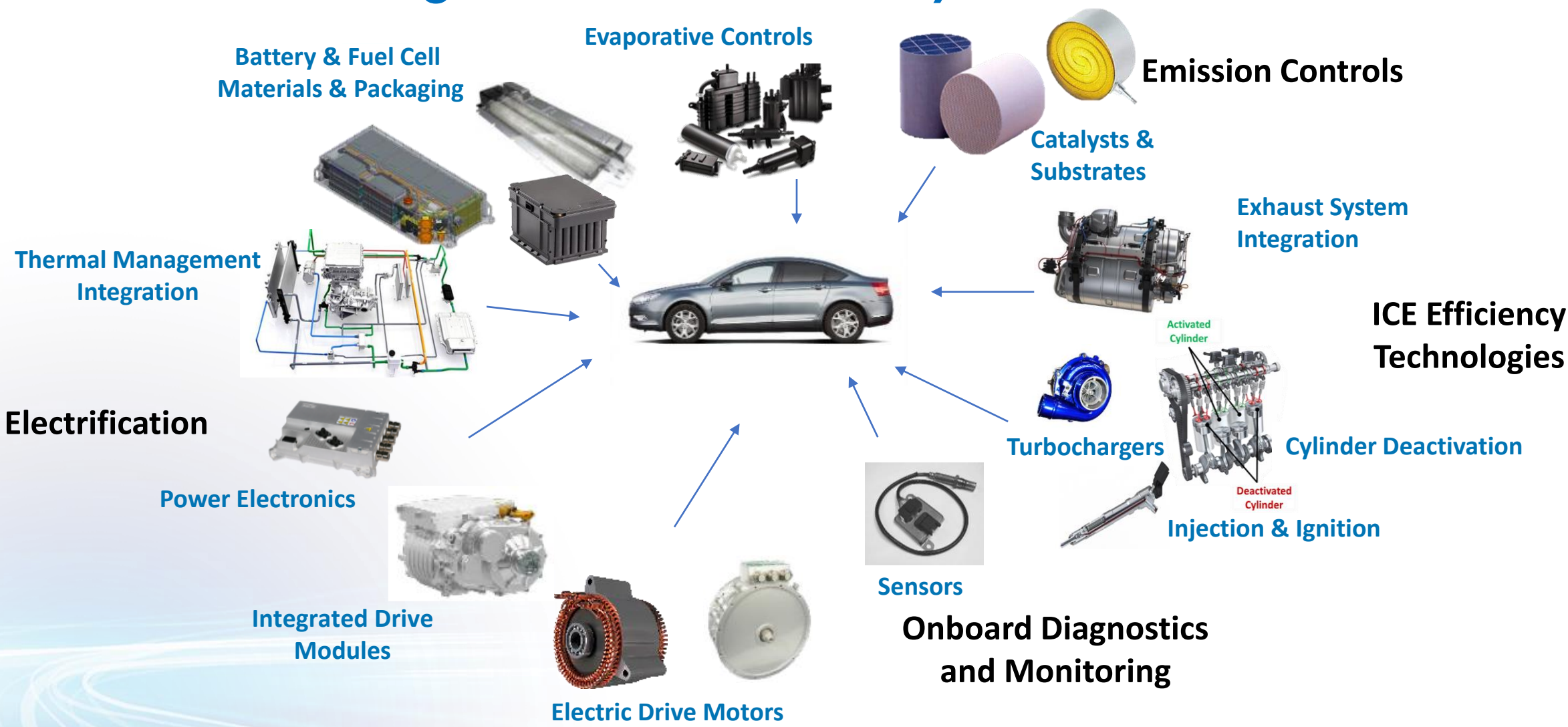
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**March 6, 2023**



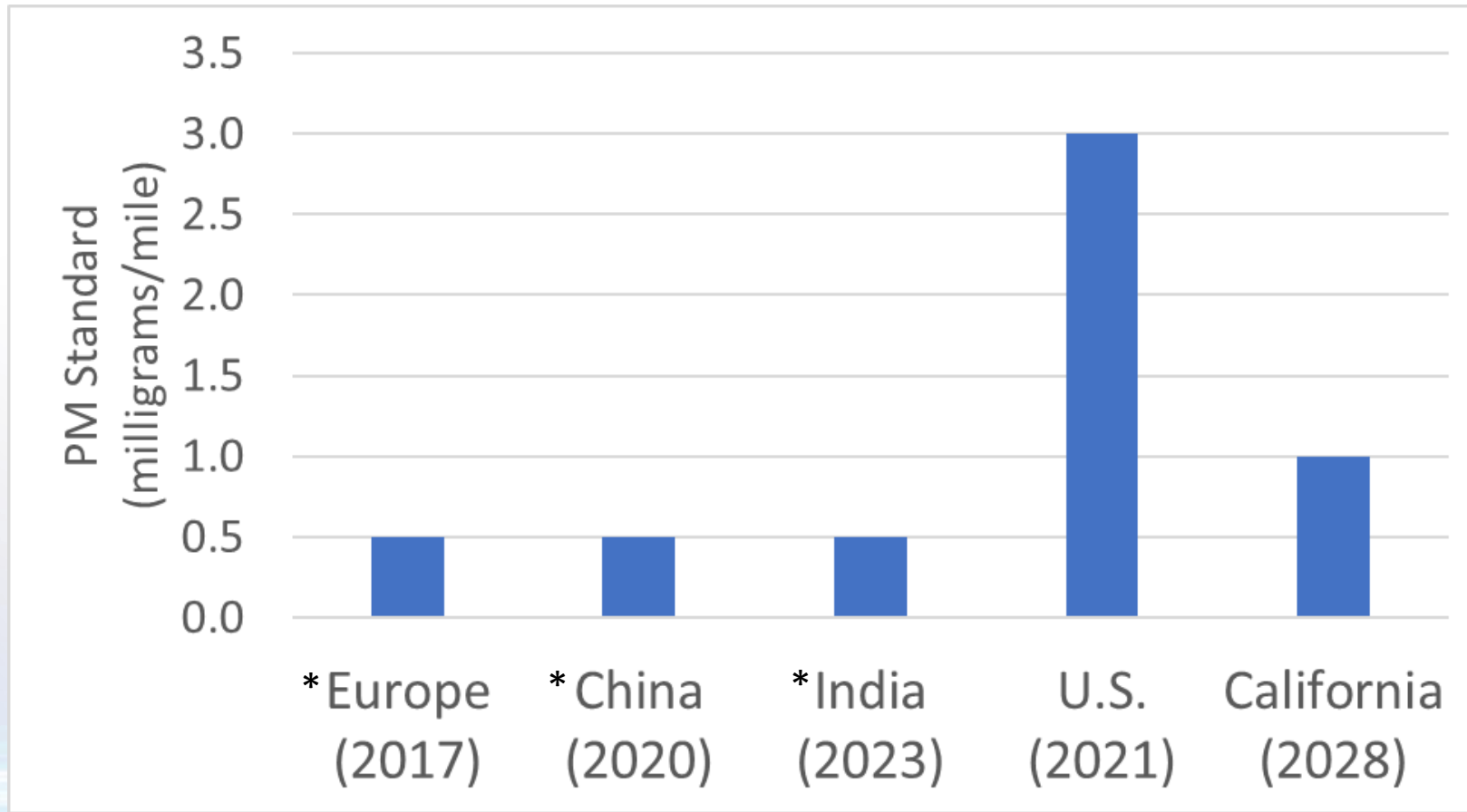
# MECA – Technologies for Clean Mobility



# Today's Focus

- Performance based standards offer the best opportunity to meet climate and air quality goals through multiple technology pathways
- Suppliers have made substantial investments in technologies that simultaneously deliver pollution and GHG reductions from engines.
- MECA members are commercializing improved battery materials, electric motors, power electronics and thermal systems to optimize electric efficiency of the vehicle.
- Mobile source pollution controls are cost effective control measures for meeting more stringent ambient air quality goals.

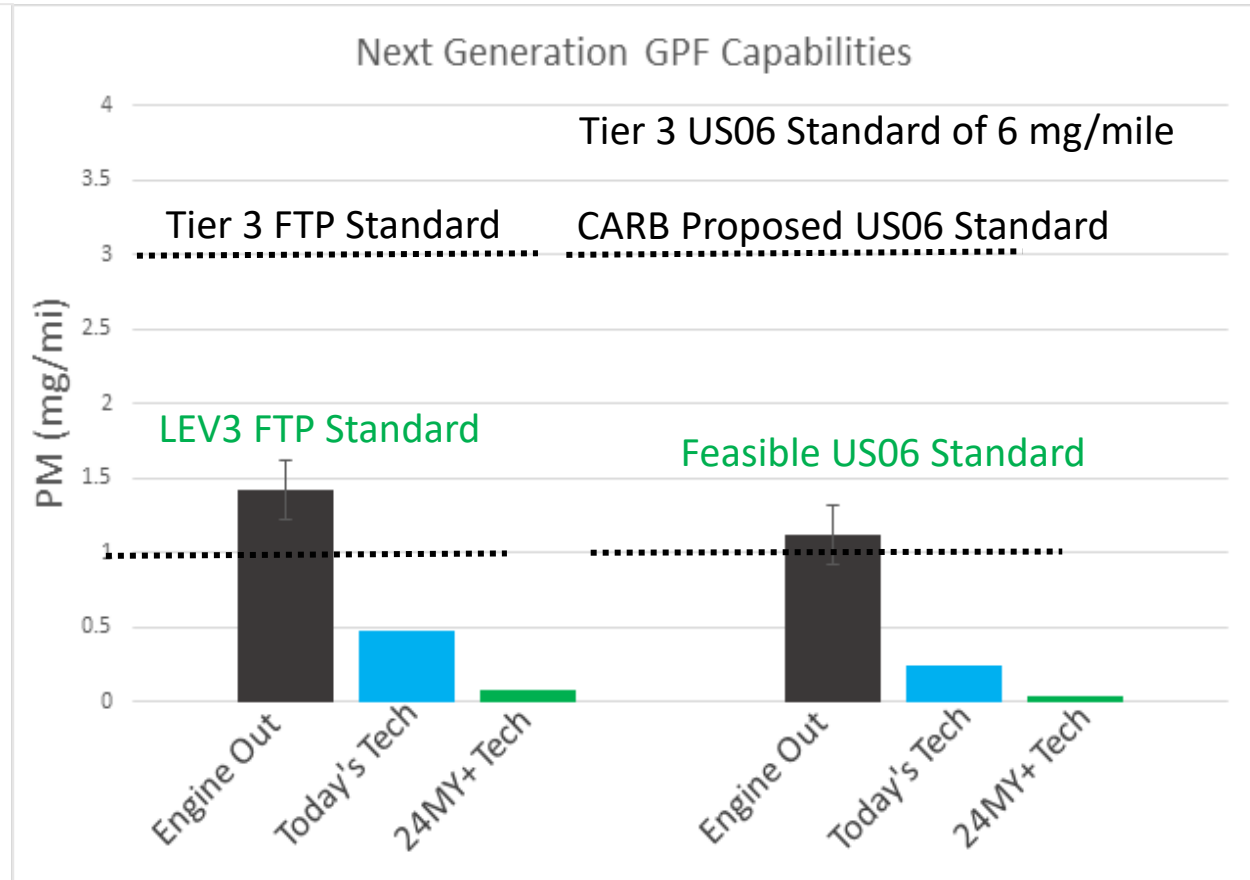
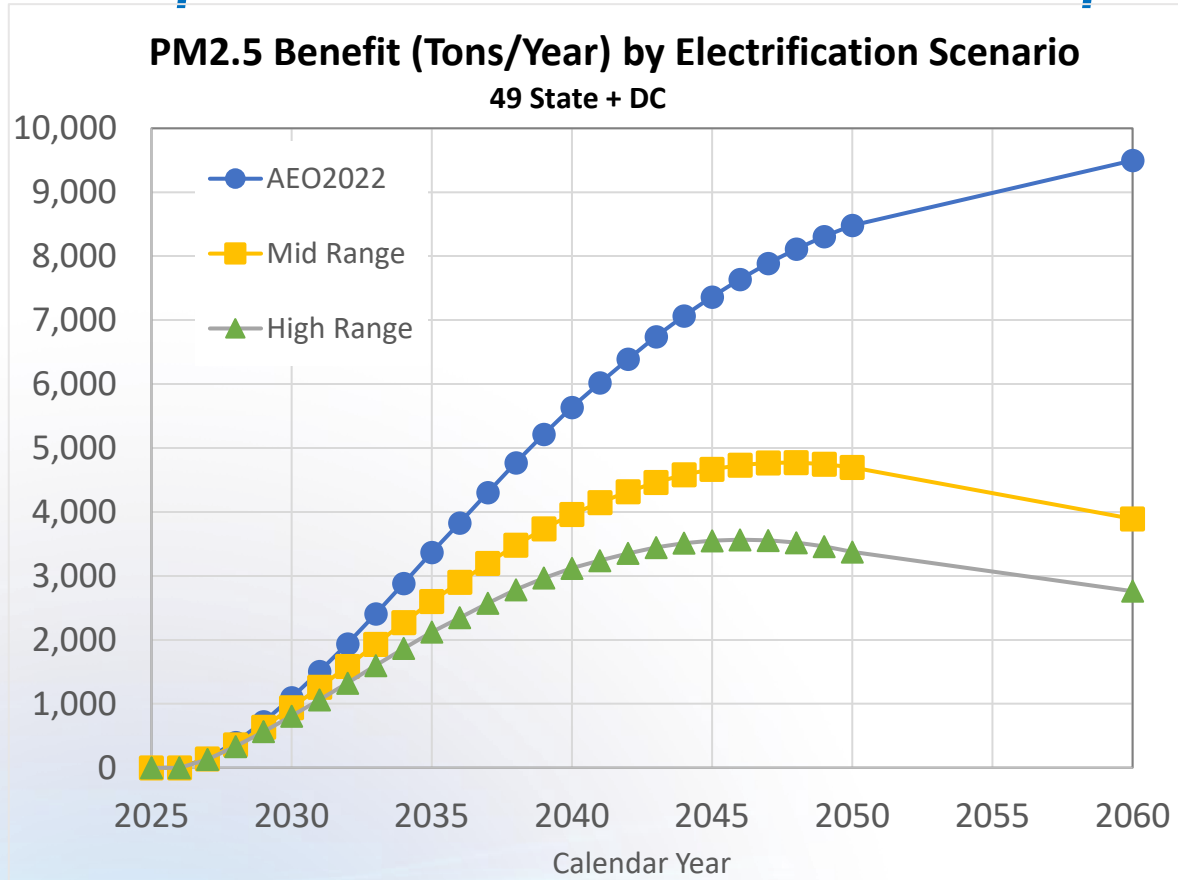
# US Lags Behind the World on Particulate Emission Standards



\* Europe/China/India have set particle number standards at  $6 \times 10^{11}$  particles per kilometer; equivalent to approximately 0.5 milligram/mile



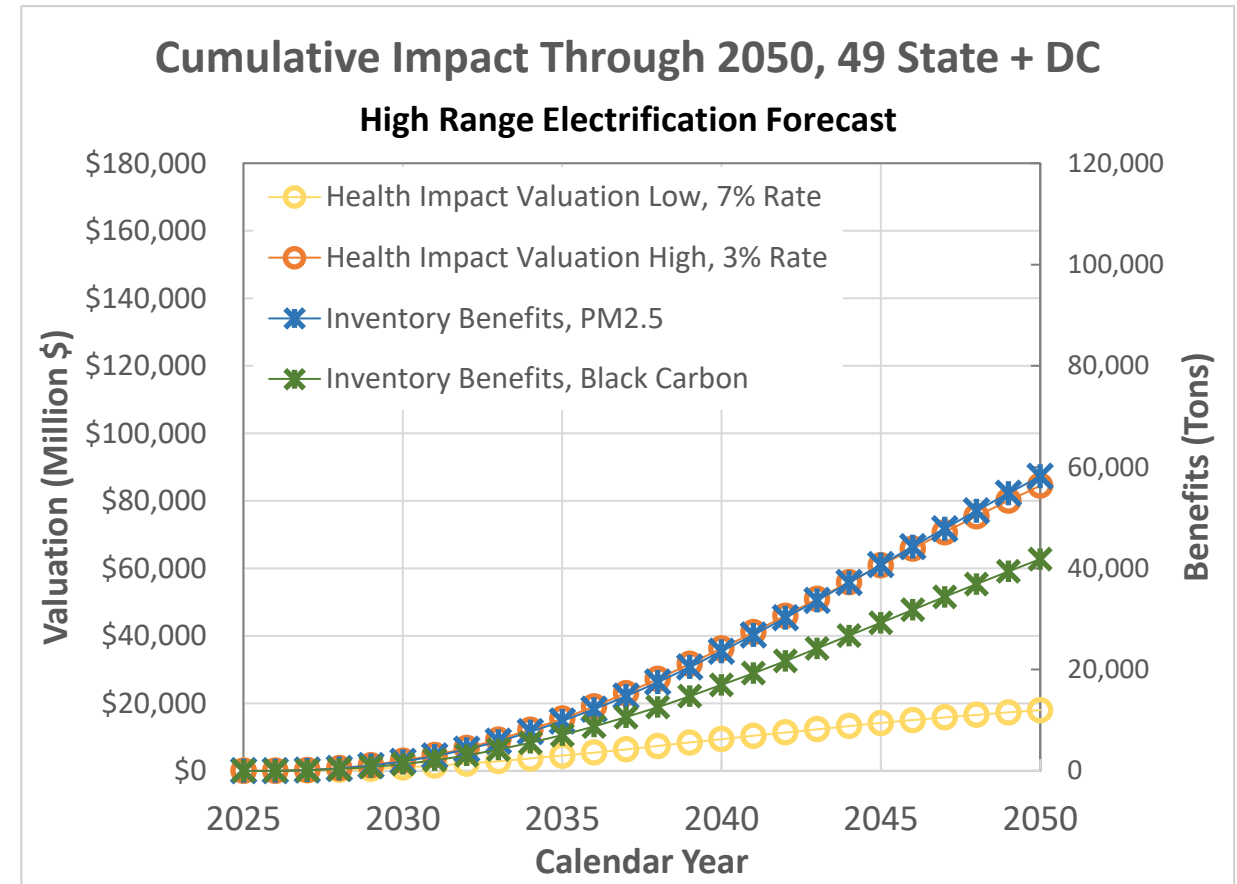
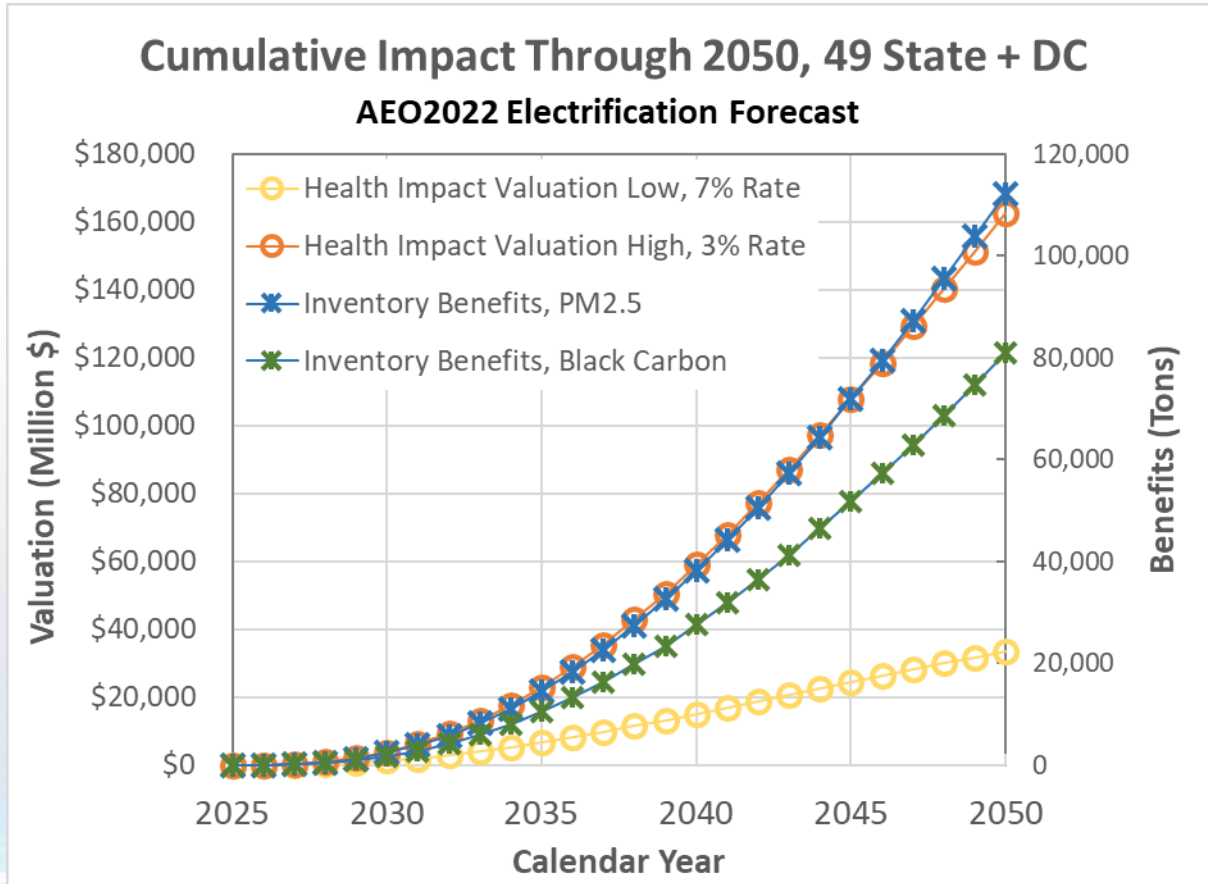
# Technologies Enable Tighter PM Standards that Provide Air Quality Benefits to Complement Electric Vehicle Adoption



## Technology advancing LDV PM standards provide additional benefits on top of EV penetration

- Based on high range estimates of EV penetration, PM standards on ICE would double the PM benefit from electrification alone in 2045

# Health Benefits of More Stringent PM Standards Effectively Double the Benefit of Electrification Alone



9,894 - 22,319

314,393

1,154,828

Avoided Lives Lost

Avoided Asthma Attacks

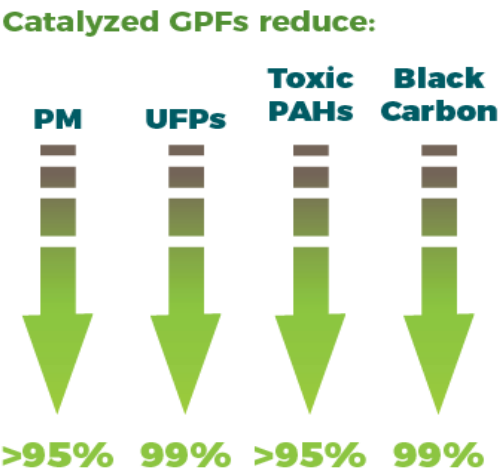
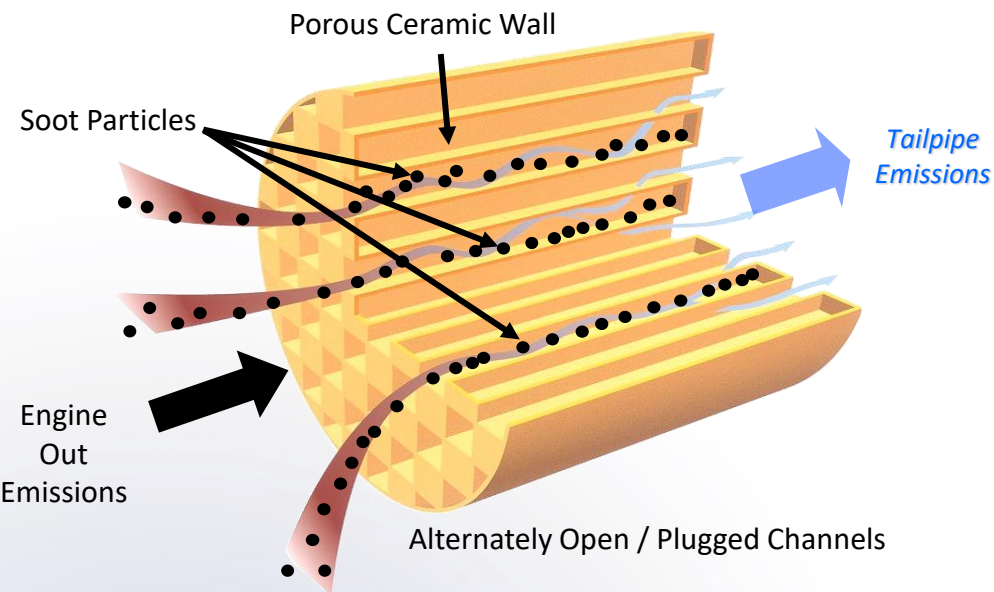
Avoided Lost Work Days

5,026 – 11,340

161,048

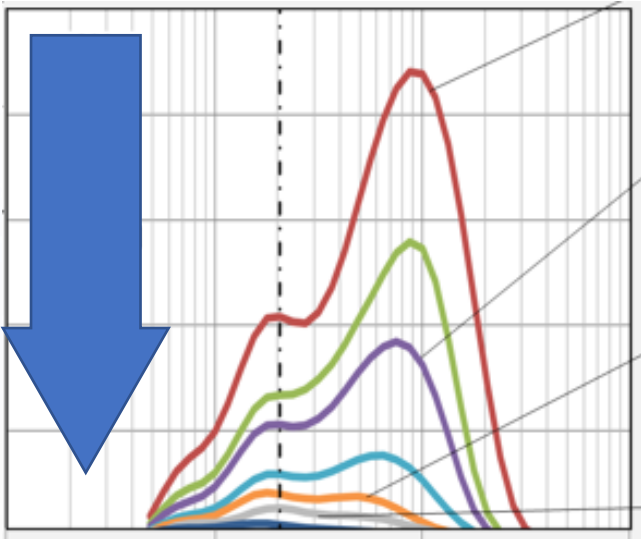
589,850

# Automakers Already Produce “Best Available” PM Emissions Control Technology for Cars in Europe, China and India.



		<div> <div></div> <div>Europe</div> </div>	<div> <div></div> <div>China</div> </div>	<div> <div></div> <div>US</div> </div>
		GPF installed ?		
<div> <div></div> <div>MADE IN THE USA</div> </div>	Ford Mustang	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✗</div> </div>
<div> <div></div> <div>MADE IN THE USA</div> </div>	Grand Cherokee	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✗</div> </div>
<div> <div></div> <div>MADE IN THE USA</div> </div>	BMW X-series	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✗</div> </div>
	Audi, other VW	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✓</div> </div>	<div> <div></div> <div>✗</div> </div>

Particle emissions decrease with state-of-the-art high pressure fuel injection technology



# Medium-Duty Vehicles Should Adopt Best in Class Technology

MY2022 Medium-Duty Certified Levels

	EPA FTP Certification Level (mg/mile)	
	NMOG+NOx	PM
Class 2B Best	24	0.4
Class 2B Worst	176	4
Class 3 Best	74	1
Class 3 Worst	241	8



Significant improvement for NMOG+ NOx and PM standards are feasible.

Best in class versus worst in class has range of 8-10X

Electrified (HEV & PHEV) could provide further improvements especially in low speed urban delivery routes.

Tighter standards will expand adoption of Best Available Control Technologies on remaining ICE vehicles



# MECA Members are Developing Components for Next Generation Electric Vehicles



Inverter

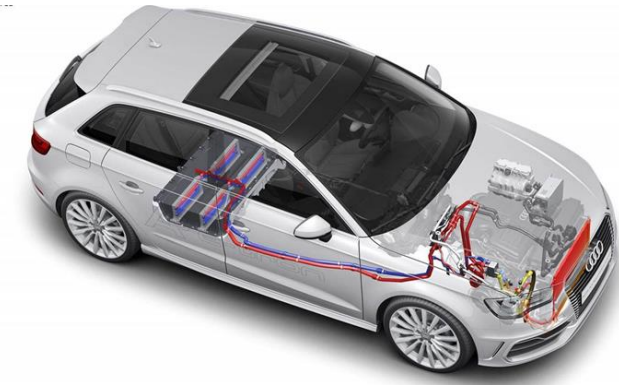
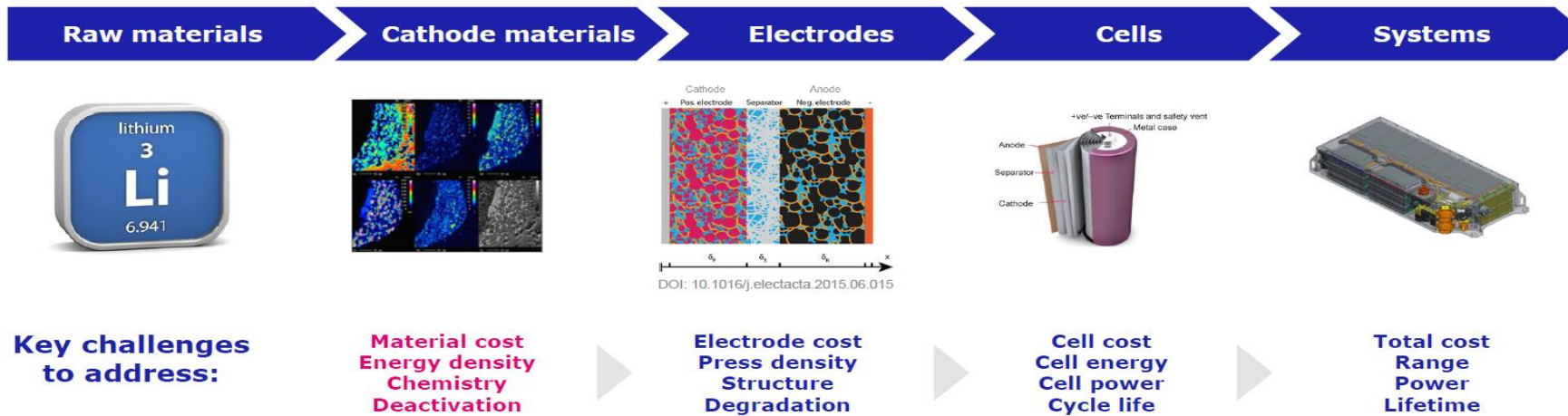
More efficient 800V architectures, electric drive units that combine power electronics with motors, multi-speed transmissions



Design flexibility, reduced complexity, simplified vehicle integration, simplified cooling, increased efficiency and reduced cost.



Integrated motor



New battery materials and thermal management provide higher range, extended battery durability and safety

# Electric Efficiency of Vehicles will Become More Important as more Electric Vehicles Enter the Fleet

**LD BEV / PHEV EV Efficiencies Range from 1.25 to 4 miles/kWh**

BETTER



Tesla Model Y AWD EV  
Battery pack: 75 kWhr  
Range: 279 miles  
Effic: 3.6 miles/kWhr



Toyota RAV4 Prime PHEV  
Battery pack: 18.1 kWhr  
Range: **AER- 42 miles**, Total- 600 miles  
Effic: 2.8 miles/kWh



2022 Ford F-150 Lightning EV  
Battery pack: 98, 131 kWhr  
Range: 230 to 320 miles  
EPA Effic: 2 miles/kWh

COULD BE BETTER



Volvo XC40 Recharge Twin EV  
Battery pack: 75 kWhr  
Range: 223 miles  
Effic: 2.6 miles/kWh



Land Rover Range Rover Sport PHEV  
Battery pack: 12 kWhr  
Range: AER- 19 miles, Total- 480 miles  
Effic: 1.25 miles/kWh



GMC Hummer EV  
Battery pack: 212.7 kWhr  
Range: 329 miles  
Effic: 1.55 miles/kWh

**Sustainable transportation will require consideration of vehicle electric efficiency (miles/kWh) for grid resiliency, material security and infrastructure.**

# Summary

**Performance based regulations** have a 50-year track record of delivering real emission and GHG reductions.

Suppliers are developing and commercializing the components for the **next generation of electric vehicles** by reinvesting revenue from today's technology.

Stringent and technologically feasible emission regulations will ensure that **millions of ICE vehicles sold by 2035 are as clean as possible.**