

International developments towards more efficient trucking

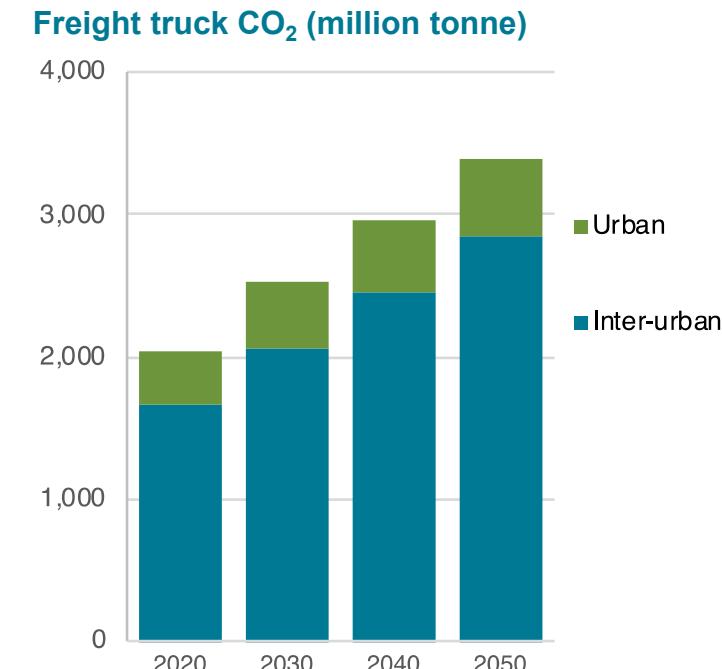
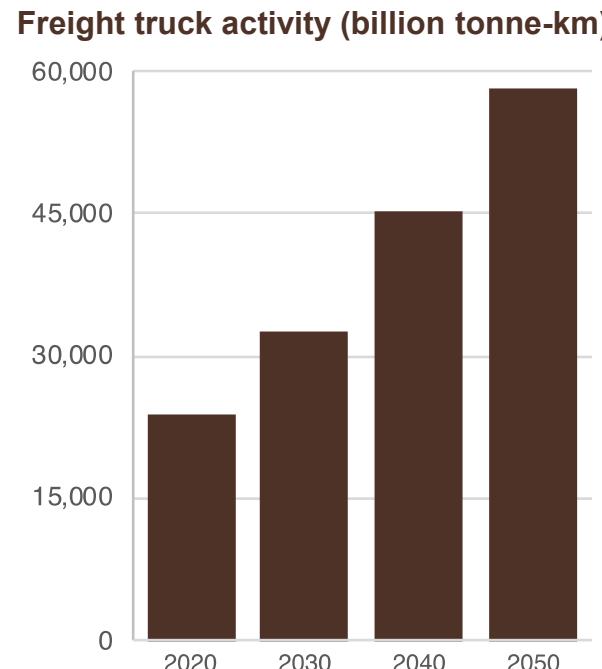
Rachel Muncrief

International Workshop on Green Freight Initiatives
Brasilia, Brazil
November 18th, 2019

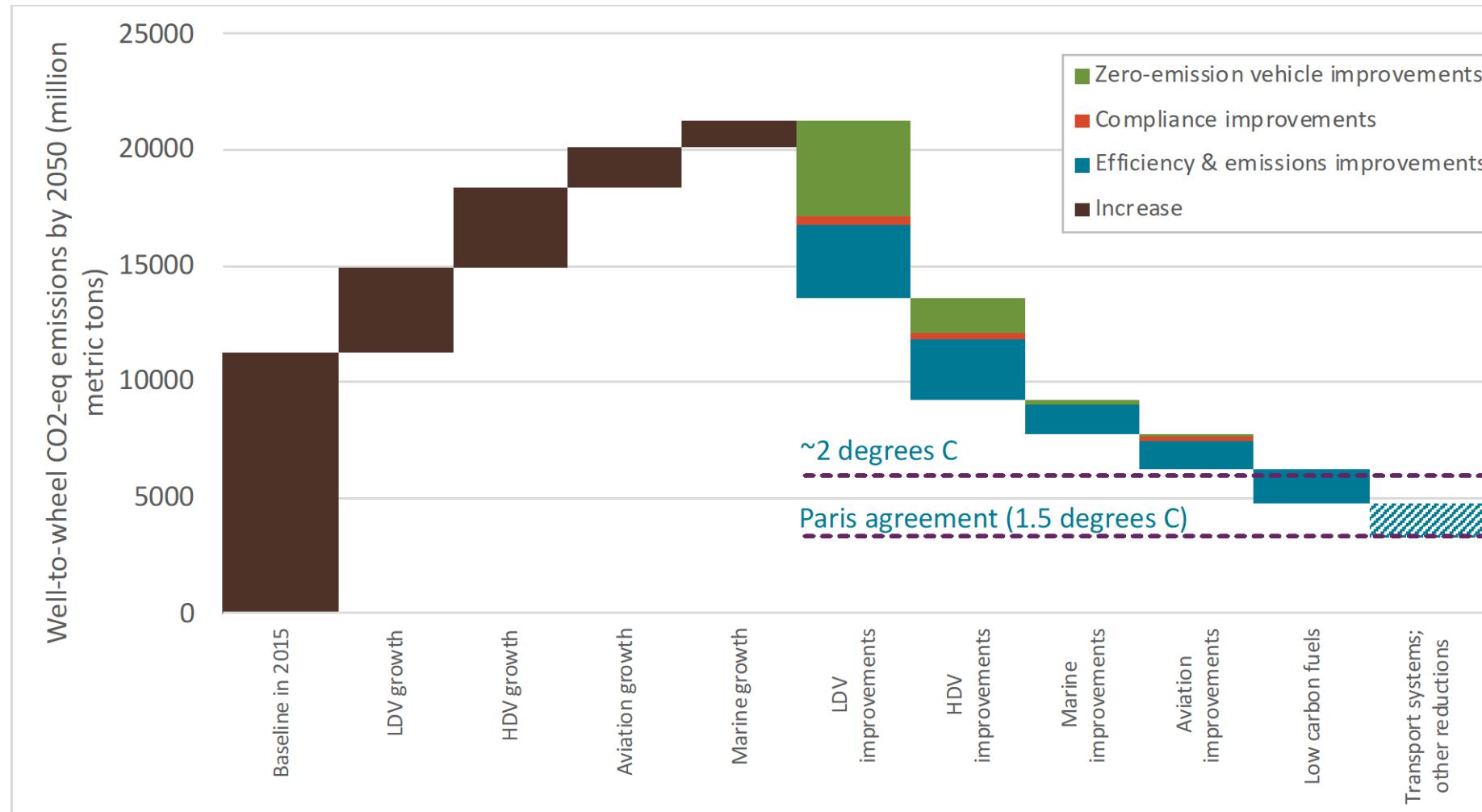


The need for improved trucking efficiency is clear

- Global freight movement – still predicted to grow dramatically
 - By 2050: 2-3 times greater freight activity
 - By 2050: 60% higher CO₂ emissions
 - Freight: 5-10% vehicles, 30-40% vehicle CO₂, 60-90% of vehicle NOx
 - Most CO₂ is inter-urban → heavy-duty trucks



Transport emissions reductions needed to meet climate goals dominated by efficiency and electrification in light and heavy-duty vehicles

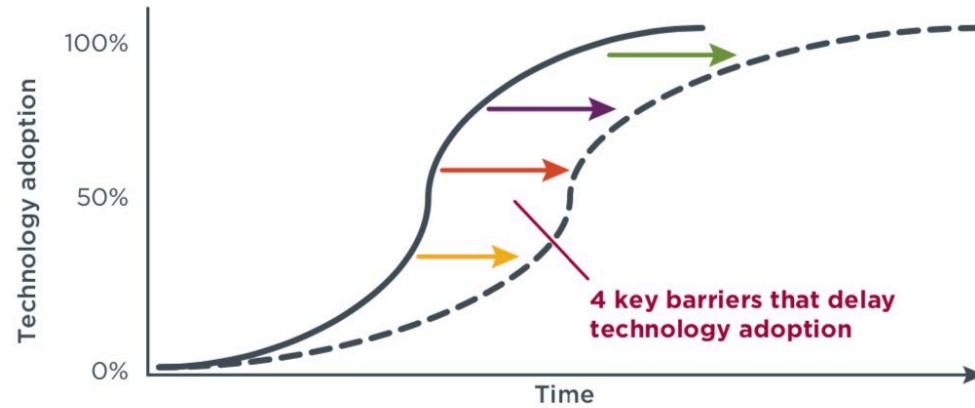


Barriers delay the uptake of fuel-saving technologies in the trucking sector – a range of policies and measures are needed to address these barriers

Barriers

Uncertain return on investment
Will the technologies perform as expected?
What will fuel prices be in the future?

Capital cost constraints
Can the fleet get access to additional capital?



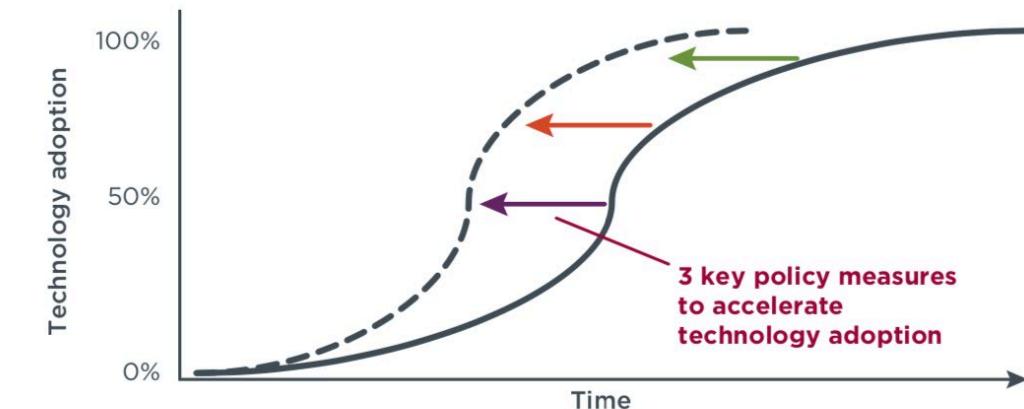
Split incentives
Are the equipment owner and operator different entities with different motivations?
Who makes the technology purchase vs. who pays for fuel?

Lack of technology availability
Are the technologies available in the market?
Are they available from a preferred supplier?

Policies and Measures

Fuel-efficiency standards
Setting and enforcing mandatory efficiency performance targets for heavy-duty vehicles

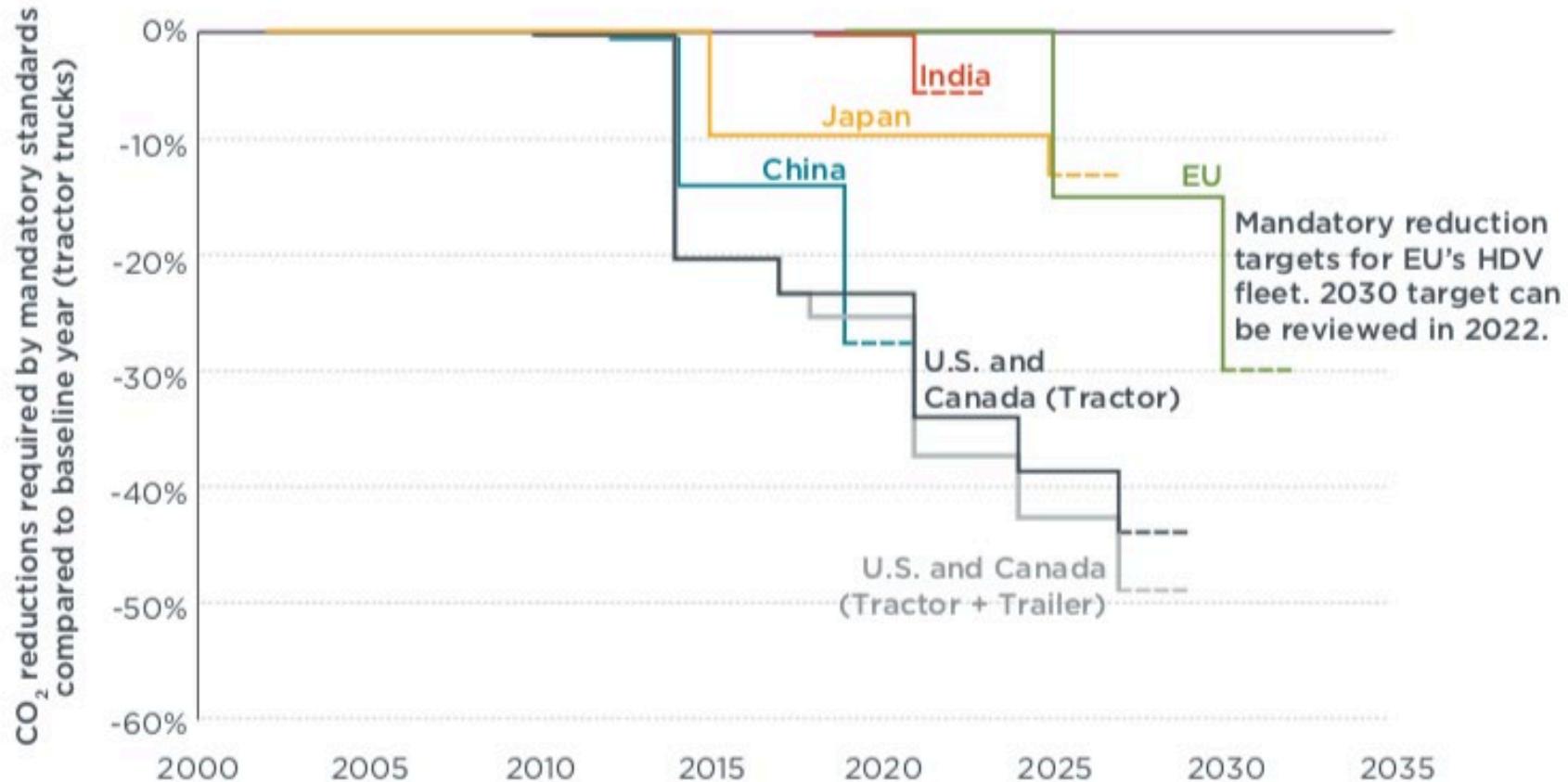
Market-based approaches
Providing fleets and shippers with better information for making decisions around fuel-saving technologies and strategies



Fiscal measures
Taxing fuels and vehicles to encourage the purchase of more fuel-efficient vehicles
Supporting infrastructure and incentive schemes for advanced technology and alternative fuel vehicles

Tractor-trailer GHG/Efficiency standards around the world – 6 markets currently have standards in place

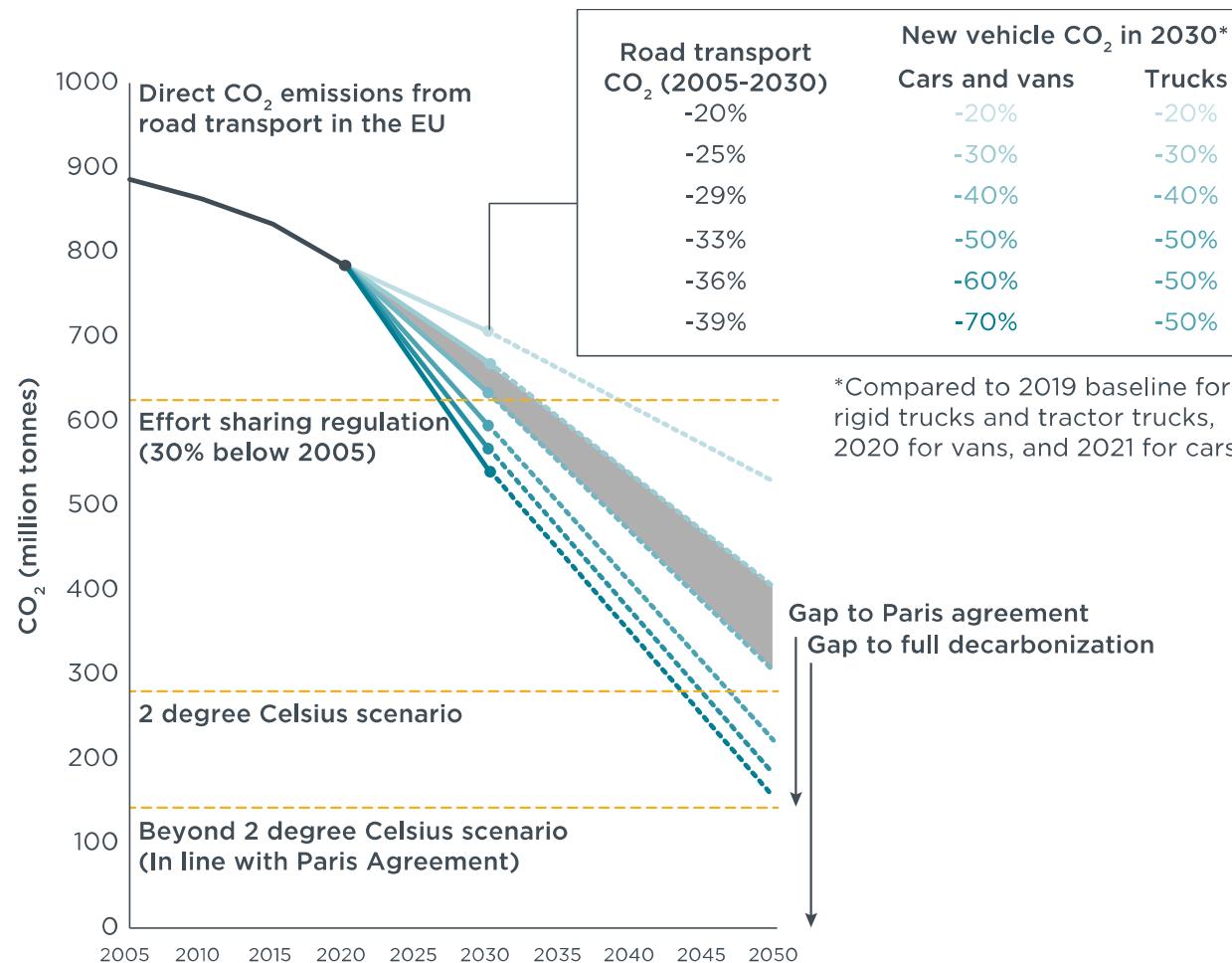
- Tractor-truck standards relative to the market-specific baseline



Policy elements are market-specific:

- Test methods
- Baseline
- technology
- Duty cycles
- Allowed payloads
- Evaluated metrics

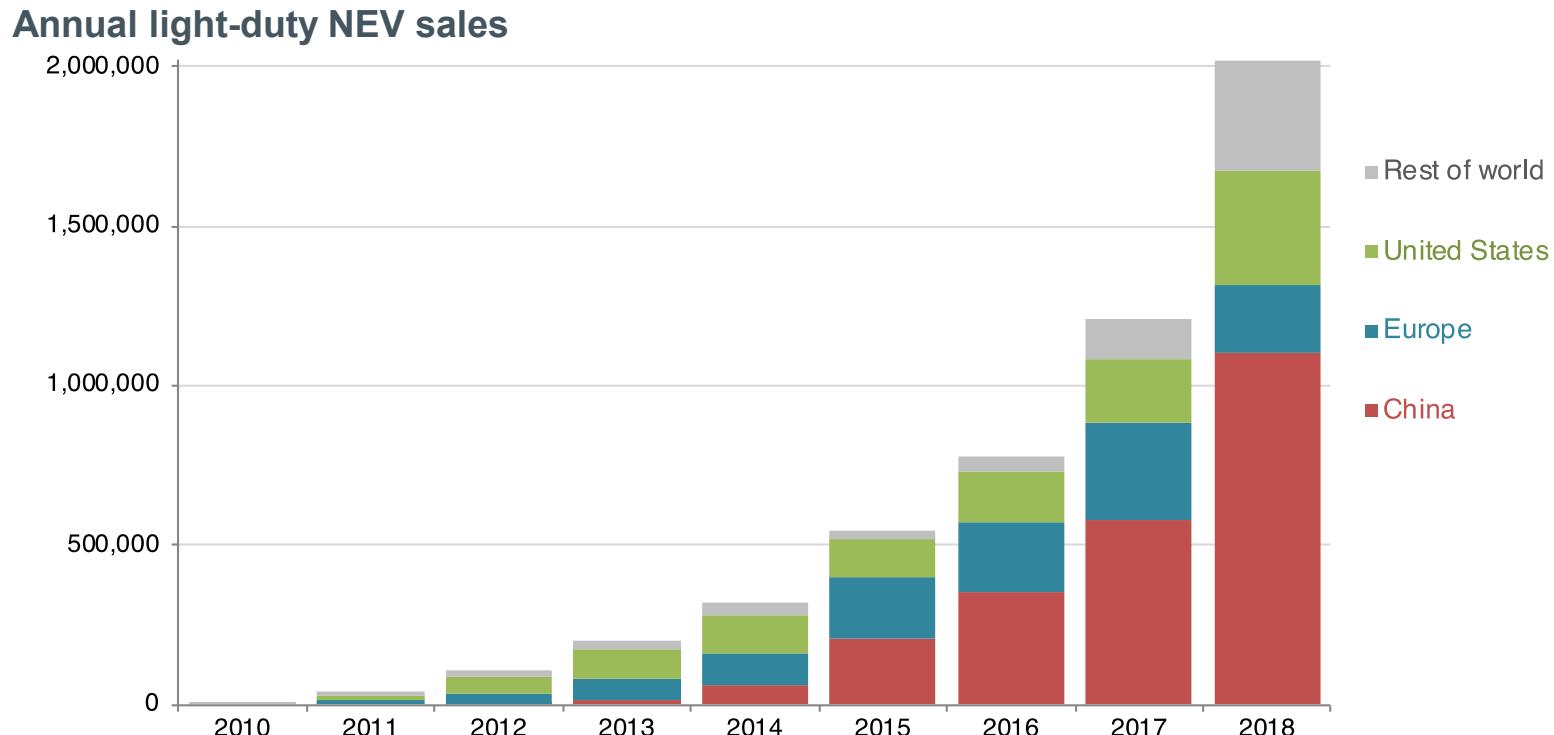
Current CO₂ standards are insufficient to meet short- and long-term targets



- For EU to meet Paris Agreement
 - 70% CO₂ reduction for new LDVs by 2030 vs 2021
 - 50% CO₂ reduction for new HDVs by 2030 vs 2019

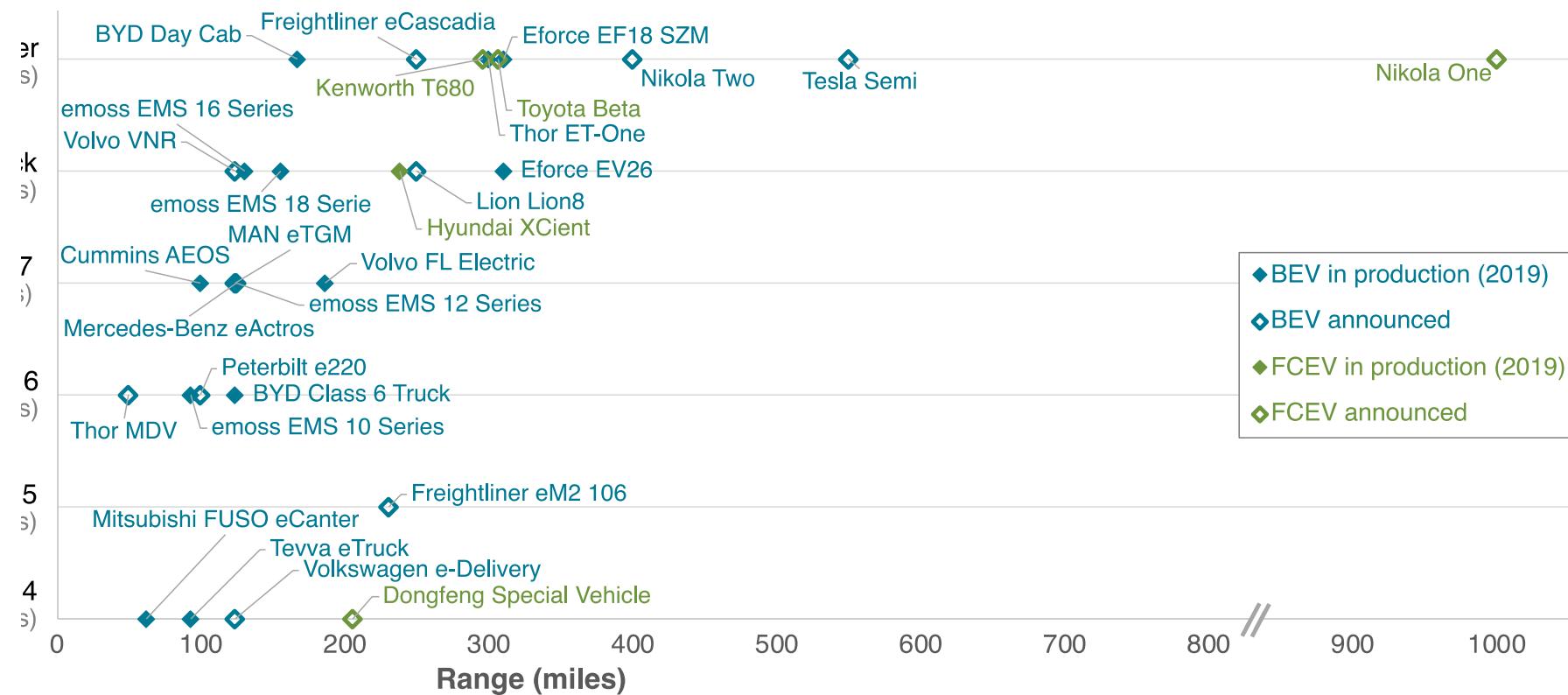
Global light-duty EVs are seeing rapid growth – over 60% growth per year on average for the last 5 years

- Global light-duty EV sales: 2 million/year - 88% of 5 million EVs in China, Europe, US
 - Due to: regulation, incentives, infrastructure, city action
 - Not shown: ~400,000 buses, ~100,000 trucks (mostly in China)



Commercialization and deployment of zero-emission commercial freight trucks is lagging passenger cars, but promising models are emerging

- Zero-emission concepts, pilots, and production models span weight, range

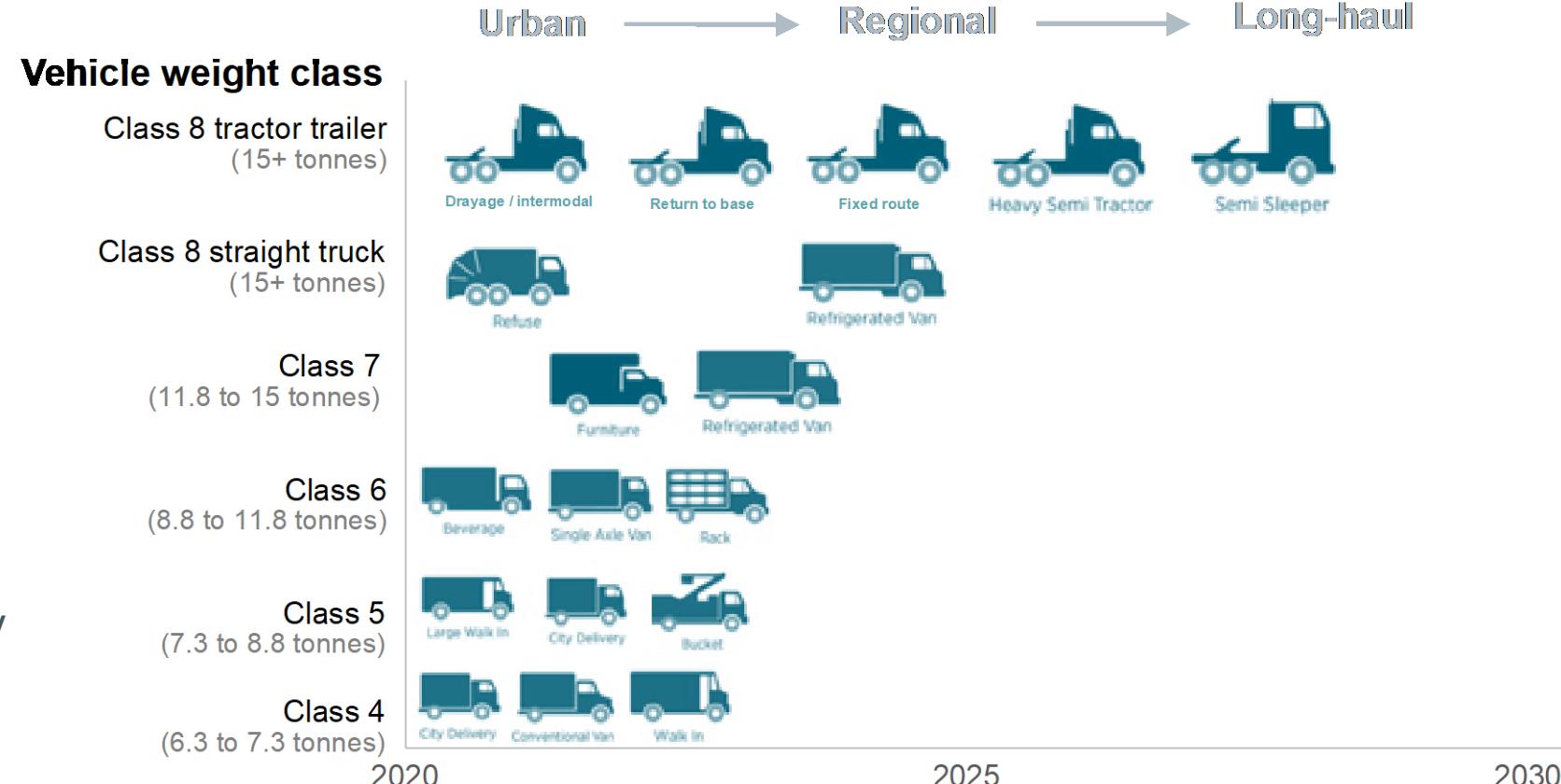


Long-haul is simultaneously the most important and most challenging segment for zero-emissions technology

Segments		Definition	Duty Cycle	Range	Payload Requirements	Battery/ Hydrogen Requirements	Infrastructure Requirements	CO ₂ Footprint	Current Availability
Freight	Urban Delivery	Medium Duty rigid (straight) trucks and vans	Low speed, transient	<200km/day	<5 ton	<100kWh <10kg H ₂	Limited	10-15%	Many models
	Drayage	Transport freight from ports Travel high volume freight corridors							
	Regional Delivery	Return to base Mix of urban and highway	High speed, constant	>500km/day	>20 ton	>800kWh >30kg H ₂	Extensive	65-75%	None
	Long Haul	Mostly tractor-trailers							

How quickly can electric vehicles be commercially launched across the various segments?

- Electric bus sales are accelerating
 - 99% are in China
 - Europe, U.S., Latin America following
- Light-commercial vans are coming
 - Models: 100+ electric models
 - These are mostly built on car platforms
- Key questions moving forward for the HDV sector:
 - Cost, infrastructure, policy
- Illustrative timeline for zero-emission truck production and early market growth



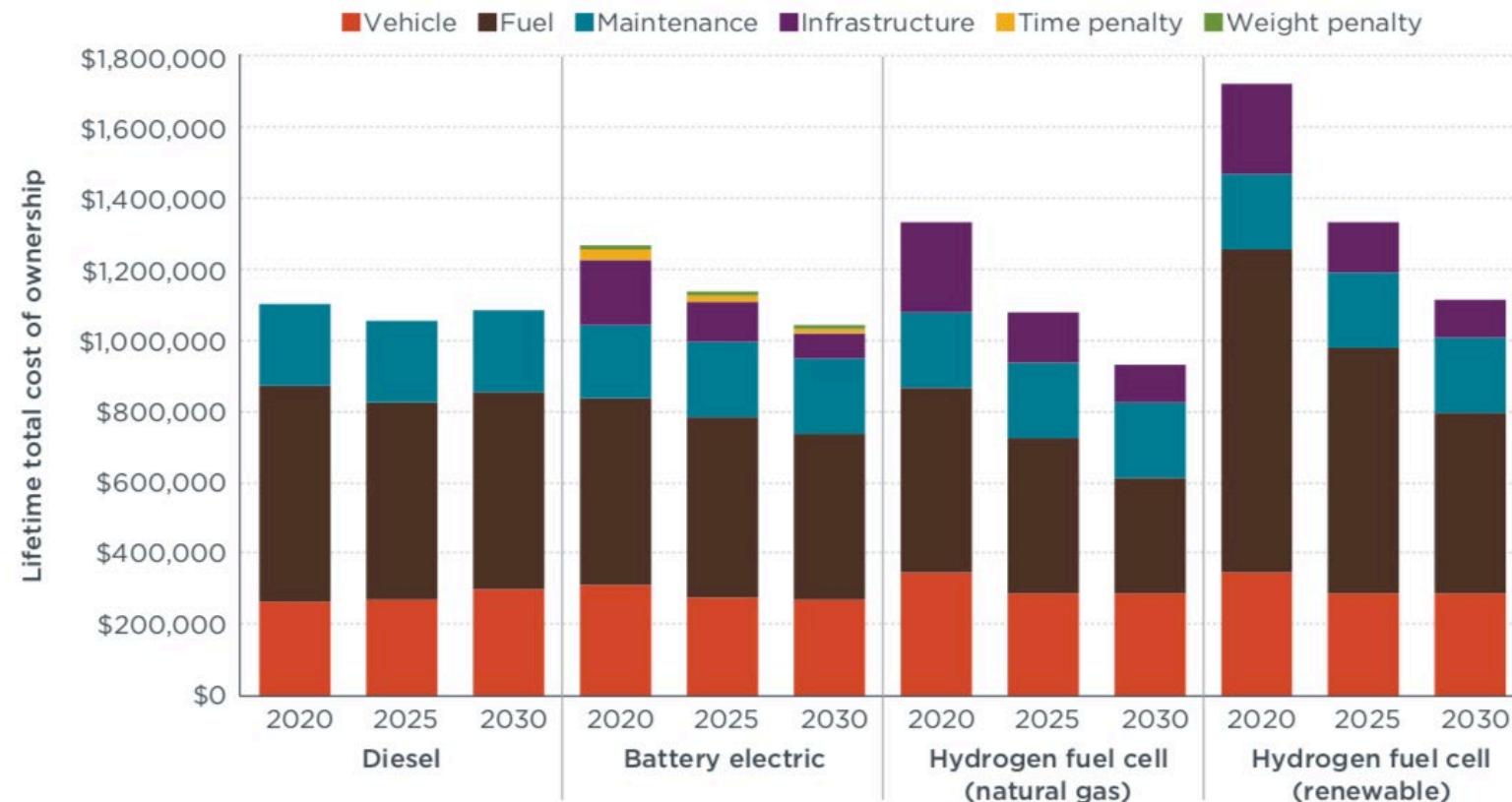
Electric truck infrastructure is costly, but economics still good

- Infrastructure cost per truck decreases at high volume (10,000 trucks)
- Long haul applications takes the longest to reach cost parity with diesel
- Analysis based on Los Angeles, California market

Truck application	Case	Number of trucks	Charging outlets needed	Infrastructure cost per truck (thousand)	Overall vehicle ownership cost difference vs diesel	
Delivery Class 6 8.8-11.8 tonnes	Low volume	100	115	\$82	0% to +5%	
	Medium volume	1,000	800	\$40	-10% to -15%	
	High volume	10,000	6,500	\$27	-20% to -25%	
Long haul Class 8 15+ tonnes	Low volume	100	150	\$182	+15% to +20%	
	Medium volume	1,000	1,200	\$113	+5% to +10%	
	High volume	10,000	9,700	\$70	0% to -5%	

Lifetime cost of zero-emission tractor-trailer technology – cost parity is possible, timing will depend on policy, infrastructure, more..

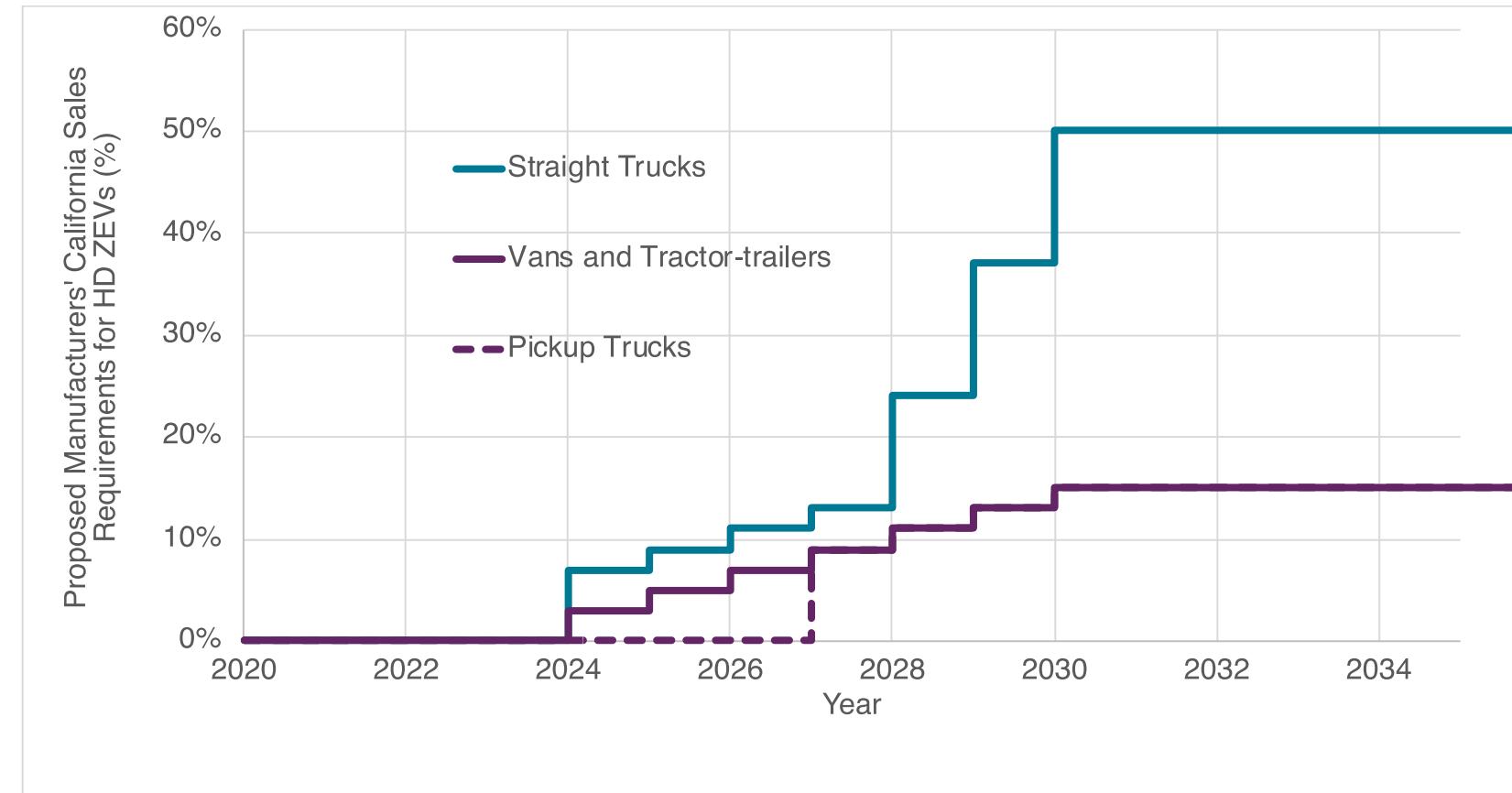
- Costs decreasing for zero-emission technology over the next decade, overall costs for diesel relatively stable
- Considering larger volumes, infrastructure costs are estimated at 7-9% of lifetime (10 year) total cost



Source: <https://theicct.org/publications/zero-emission-truck-infrastructure>

California recently proposed the world's first HD ZEV mandate

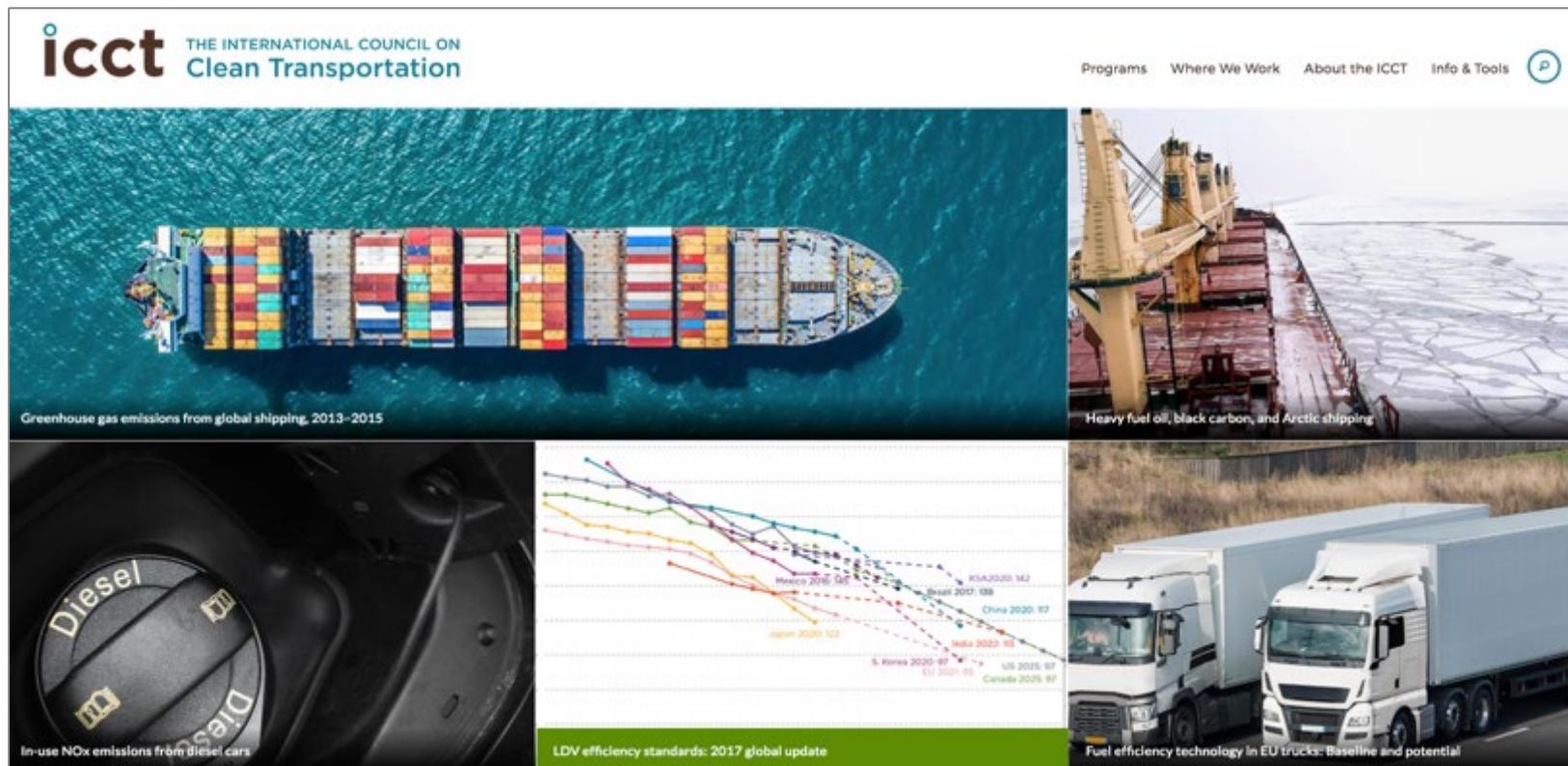
- Proposed rule released Oct 22, 2019; California Air Resources Board hearing: Dec 12, 2019
- Also includes a provision to mandate fleet reporting for all fleet owners with 100+ trucks
- Partial credits are given for Near Zero Emission Vehicles (NZEVs) based on all-electric range



Takeaways

- Efficiency improvements as well as electrification (and other zero emissions technology) will be needed for on-road trucking to meet sector-specific climate goals
 - There is still significant potential to cost effectively improve efficiency of heavy-duty vehicles
- Global electric vehicle developments have made steady progress
 - Cars, buses, vans (mostly China, Europe, U.S.)
 - So far, available models for medium and heavy-duty trucks are very limited, but promising models are increasingly becoming available
 - Long haul trucking is the most difficult (and costly segment), but the pathway for cost effectively decarbonizing this segment is emerging
- Policies and measures are needed to accelerate these trends
 - Efficiency standards
 - ZEV mandates
 - City level policies (eg. Zero-emission only urban delivery in cities)
 - Support ZEV infrastructure deployment (and other fiscal incentives)
 - Market-based measures such as green freight programs

For more detail, please visit the ICCT website



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