ICCT Briefing to OMB

31 January 2022

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

100% ‘emissions-free’ truck and bus sales no later than 2040

OPINION
GUEST ESSAY

These Carbon-Spewing Vehicles Must Be Stopped

Jan. 12, 2022

President Biden at the Ford Rouge Electric Vehicle Center in Dearborn, Mich. Doug Mills/The New York Times

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By Margo Oge and Drew Kodjak
Ms. Oge is the chair of the International Council on Clean Transportation and was the director of the U.S. Environmental Protection Agency’s Office of Transportation and Air Quality from 1994 to 2012. Mr. Kodjak is the executive director of the I.C.C.T.

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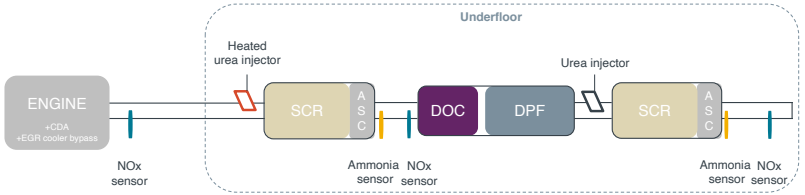
Oge, M. and Kodjak, D. (2022) *These Carbon-Spewing Vehicles Must Be Stopped.* 12 January 2022. New York, NY: The New York Times. https://www.nytimes.com/2022/01/12/opinion/climate-change-biden-trucks-buses.html

Key Points

1. A .02 NOx engine standard is technically feasible and cost-effective;
2. A targeted revision to the HDV GHG Phase II standards is necessary to meet Paris climate goals
3. These actions advance Biden Administrative objectives to secure environmental justice for disadvantaged communities and address the climate crisis

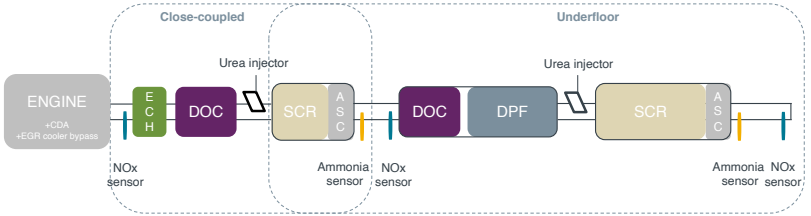
Various pathways to 0.02g/bhp-hr of NO_X

Diesel:



Demonstrated by SwRI, up to 600k miles with 30% compliance room (Status Dec/2021)

Source: SwRI 2021. Ultra Low NOXWorking Group -Webinar



Ongoing project in Europe at the vehicle level in real world use

Source: AECC 2021. https://www.aecc.eu/wp-content/uploads/2021/10/211005-AECC-presentation-Aachen-1.pdf

Gas and opposed piston engines:

Heavy Duty Engines Certified to Meet CARB's Optional Low NOx Emission Standards

Low NOx Engine	Engine Family	Displacement (Liters)	NOx Certification Standard (g/bhp-hr)	NOx Reduction Percent (%)	Fuel	Intended Service Class
2020 EOs						
PSI 8.8	LPSIE8.8LN1	8.8	0.02	90%	LPG	HDO
Cummins 6.7	LCEXH0408BBC	6.7	0.02	90%	NG	MHDD
Cummins 8.9	LCEXH0540LBN	8.9	0.02	90%	NG	HHDD
Cummins 8.9	LCEXH0540LBL	8.9	0.02	90%	NG	MHDD
Cummins 8.9	LCEXH0540LBM	8.9	0.02	90%	NG	UB
Cummins 11.9	LCEXH0729XBC	11.9	0.02	90%	NG	HHDD-UB

Source: EPA 2021, https://www.epa.gov/sites/default/files/2021-01/documents/420f21002.pdf

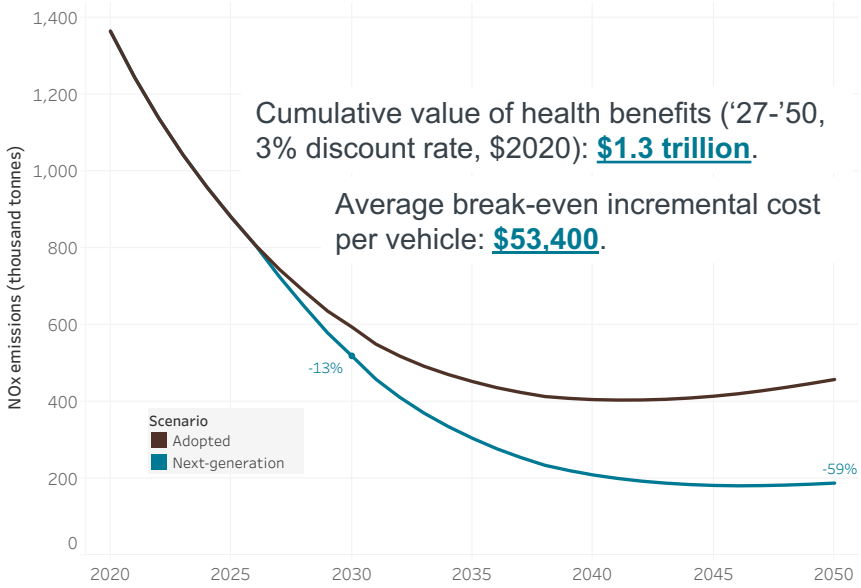
Source: Achates Power 2020, https://achatespower.com/achates-engine-reaches-2027-emissions-levels/

Benefits outweigh costs

Study	Cost range (HHDD)	Remarks
ICCT	$2,200 to $3,200	Bottom-up. No warranty included
MECA	$3,500 to $4,800	1 MM mile FUL, 800k mile warranty
CARB	$6,000 to $6,700	Range MY27/MY31. Accounting for ACT regulation
NREL	$10,000 to $50,000	Survey. 4 anonymous respondents plus EMA
ACT R. for EMA	$17,000 to $65,000 MY27 $26,000 to $80,000 MY31	Confidential industry input. Range represents low/high volume/discount.
Ricardo for EMA	$5,900 to $35,000	Low/high for current/extended UL/Warr. Methodology unknown

Source: Various. Summary: ICCT 2021, https://theicct.org/what-will-it-really-cost-to-build-the-next-generation-of-low-nox-trucks/

Annual tailpipe NO_X emissions from U.S. diesel HDV fleet



Source: ICCT 2021, https://theicct.org/publication/air-quality-and-health-impacts-of-heavy-duty-vehicles-in-g20-economies/

Warranty costs

Table I.1. Summary of Estimated Step 2 Warranty Costs and Assumptions

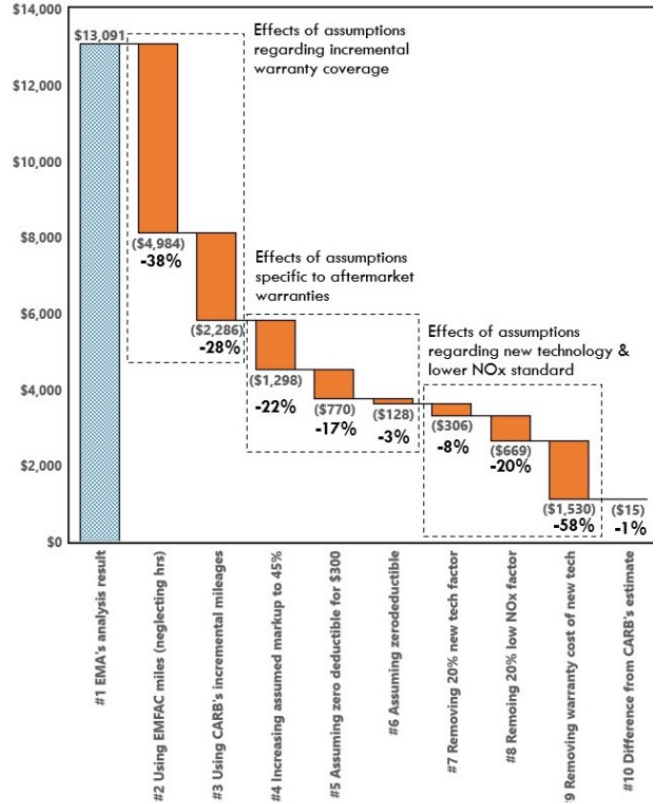
	CARB Step 2 Warranty	NREL	ACT Research	EMA
Incremental warranty cost per HHDD engine[a]	$1,104	$23,061[b]	$7,227[c]	$13,091

CARB analyzed discrepancies with EMA's warranty cost estimates. Three areas:

1. 40% owners already purchase extended warranties voluntarily. Not all segments have high mileages. Many vehicles reach warranty hour-limits first.

2. Differences in the profit of the aftermarket service, and accounting of deductibles.

3. Extending durability is an R&D cost, not warranty. New technology costs are offset by improvements in current technologies. Increasing warranty costs for new technology does not change the CBA greatly.



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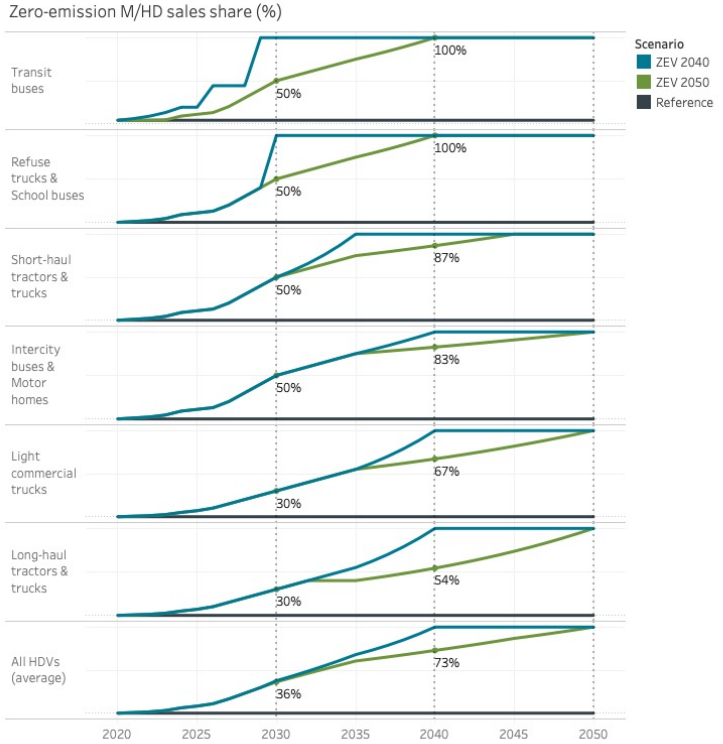
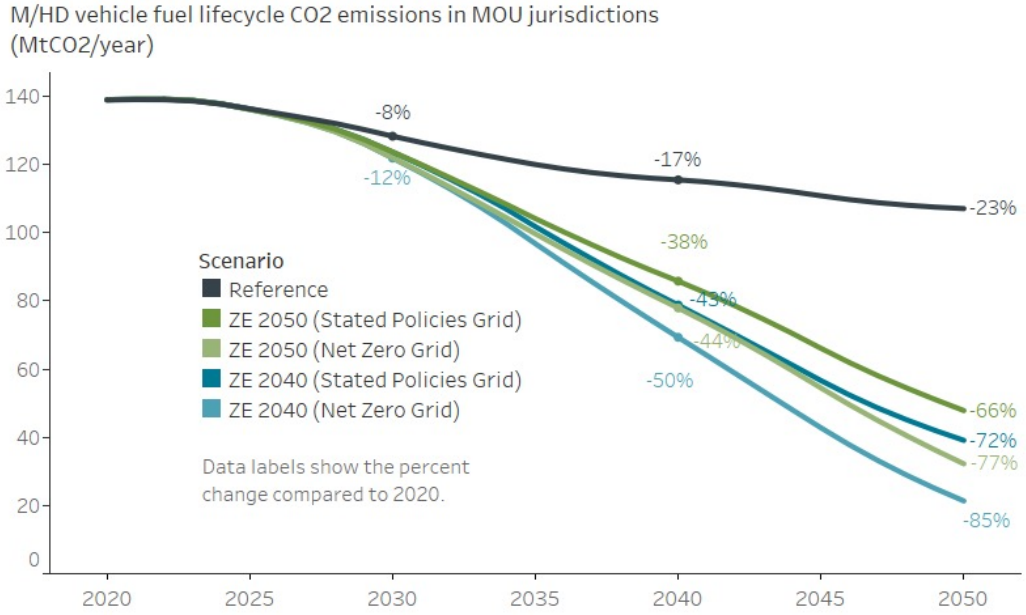
Importance for US EPA to accelerate EV penetration in key market segments

State-level actions could reduce 15 states' M/HDV CO_2 emissions by 50% in 2040 and 85% in 2050. But these actions are likely to only cover at most 35% of M/HDVs nationwide and likely a much smaller share of long-haul tractor trucks.



Assumed sales shares of new zero-emission M/HD vehicles in MOU signatories, not including California, from 2020–2050.



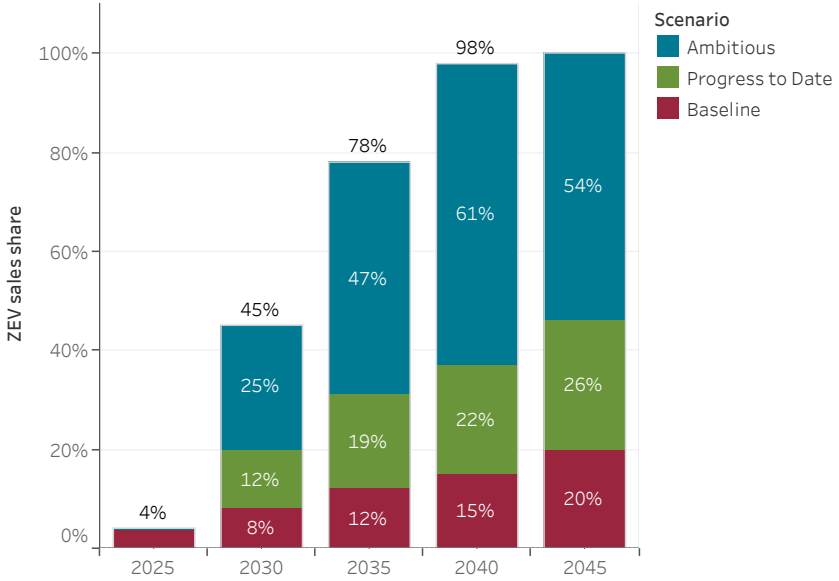
Comparison of M/HD vehicle fuel lifecycle CO_2 emissions across scenarios.
Caveat: These benefits could be undermined by out-of-state vehicles.

Arijit Sen, Ray Minjares, Josh Miller, and Caleb Braun, "Benefits of the 2020 Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding" (forthcoming)

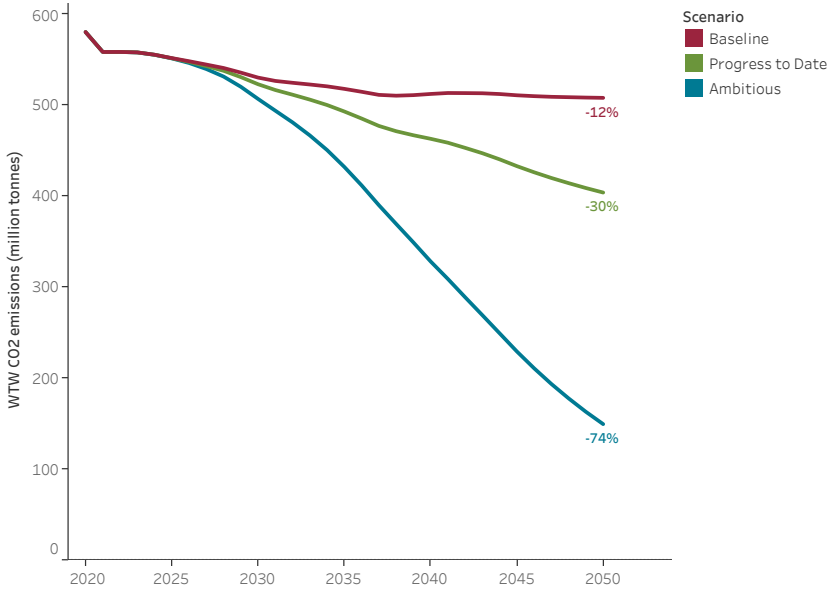
Importance for US EPA to accelerate EV penetration in key market segments

State-level actions and Phase 2 GHG standards are projected to reduce nationwide M/HDV CO_2 emissions by 30% in 2050. Federal action is needed to more than double the rate of zero-emission M/HDV uptake and align with a 2°C goal.

Sales share of zero-emission medium- and heavy-duty vehicles



WTW CO_2 emissions from medium- and heavy-duty vehicles

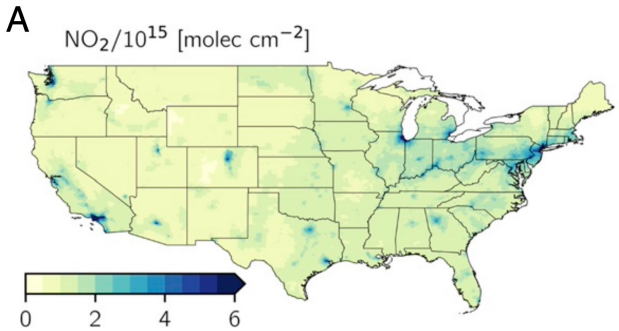


Baseline scenario: Includes federal HDV Phase 2 GHG standards to MY2027 and California's ACT, ICT, and Omnibus rules
Progress to Date scenario: Also considers California's EO-N-79-20 and the Multi-state MOU signed by 15 states + D.C.
Ambitious scenario: Also considers new federal standards for HDVs MY2027+ that achieve nearly 100% ZEV sales by 2040.
https://theicct.org/publication/zevtc-accelerating-global-transition-dec2021/

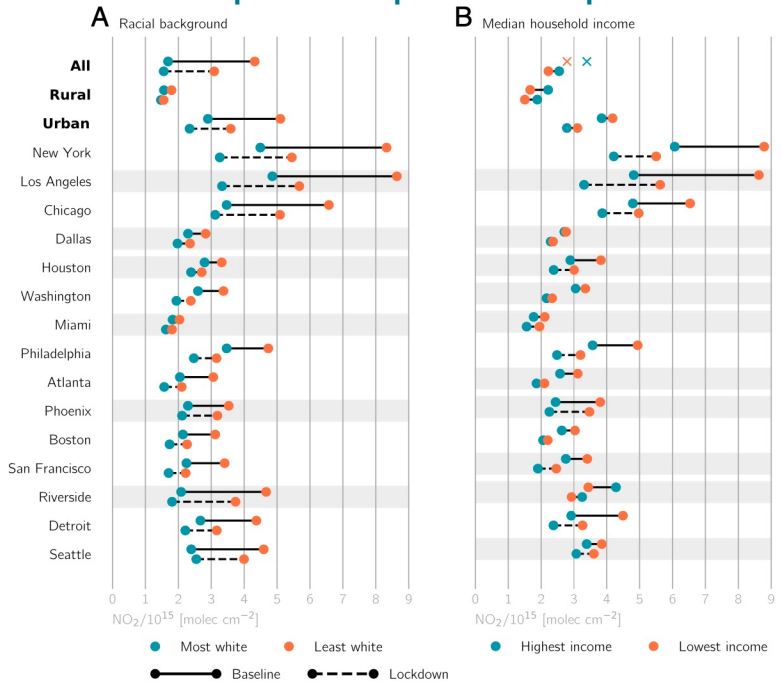
COVID19 has revealed the central role of HDVs in pollution exposure disparities

'… targeting NOx emissions from heavy-duty diesel vehicles is likely the most effective strategy for reducing disparities nationwide.'

- Hunter et al. (2021)



Disparities in NO2 exposure pre- and post COVID19



Kerr, Gaige Hunter, Daniel L. Goldberg, and Susan C. Anenberg. 2021. "COVID-19 Pandemic Reveals Persistent Disparities in Nitrogen Dioxide Pollution." *Proceedings of the National Academy of Sciences* 118 (30): e2022409118. https://doi.org/10.1073/pnas.2022409118.

One more lesson from Dieselgate: *excess NOx from HDVs in the U.S. linked to ~ 1,000 premature deaths annually in 2015 – 10x greater than from light-duty vehicles*

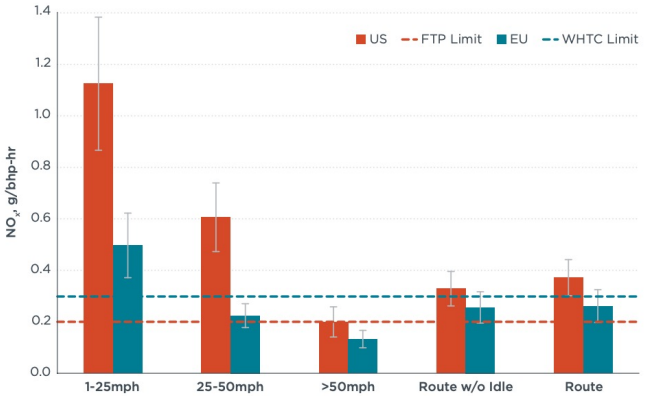


Figure ES-1. NO_x emissions by speed bin for European and U.S. HDVs. Dotted lines represent engine emission NO_x limits for U.S. and European HDVs. Error bars show confidence intervals at 95%.

Annual premature deaths attributable to on-road diesel vehicle NOx emissions, 2015

	Total deaths	*Share of deaths by source*
China	31,397	30% / 66%
EU-28	28,456	24% / 16% / 60%
India	26,739	33% / 65%
Rest of world*	8,968	13% / 24% / 63%
Russia	3,380	9% / 15% / 77%
U.S.	2,982	34% / 63%
Japan	1,970	10% / 16% / 74%
Brazil	1,818	28% / 71%
Mexico	907	15% / 84%
South Korea	788	5% / 30% / 65%
Canada	220	39% / 58%
Global	107,626	10% / 26% / 65%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

*Counts only those premature deaths resulting from NOx emissions produced in the other regions shown here.

NOx within regulated limits
Excess NOx from trucks and buses
Excess NOx from cars and vans

https://theicct.org/publication/in-use-nox-emissions-and-compliance-evaluation-for-modern-heavy-duty-vehicles-in-europe-and-the-united-states/

Anenberg, S., Miller, J., Minjares, R. *et al.* Impacts and mitigation of excess diesel-related NO_x emissions in 11 major vehicle markets. *Nature* **545,** 467–471 (2017). https://doi.org/10.1038/nature22086

Questions

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