Continued evolution of HDV Greenhouse Gas and Efficiency Policies

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Outline

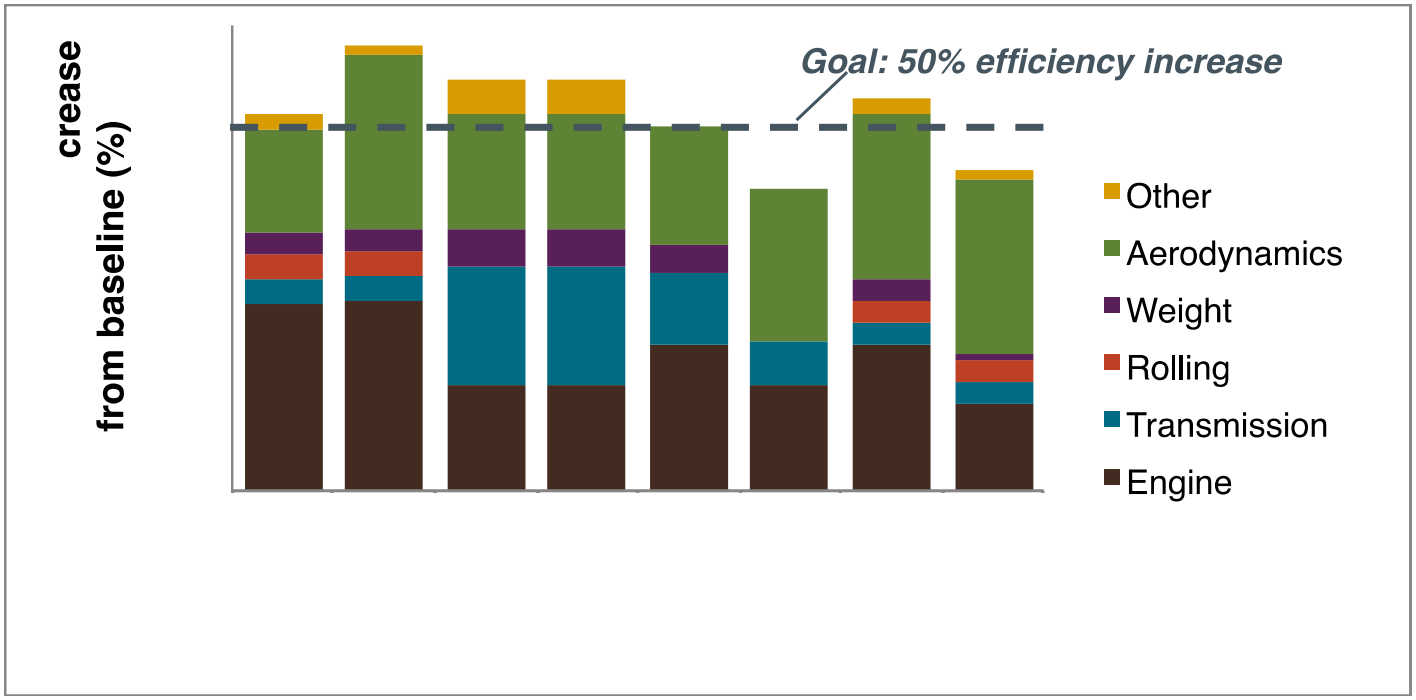
- ICCT research
  - DOE Supertruck program
  - Class 8 technology potential and payback
  - Trailers
  - Pickups and Vans (2bs and 3s)
- Phase 2 rule proposal
  - Comparison with Phase 1
  - Engine stringency
  - Accelerate timing
- Observations and conclusions

ICCT research

DOE Supertruck
Class 8 “Big Rigs”
Trailers
Class 2b/3s

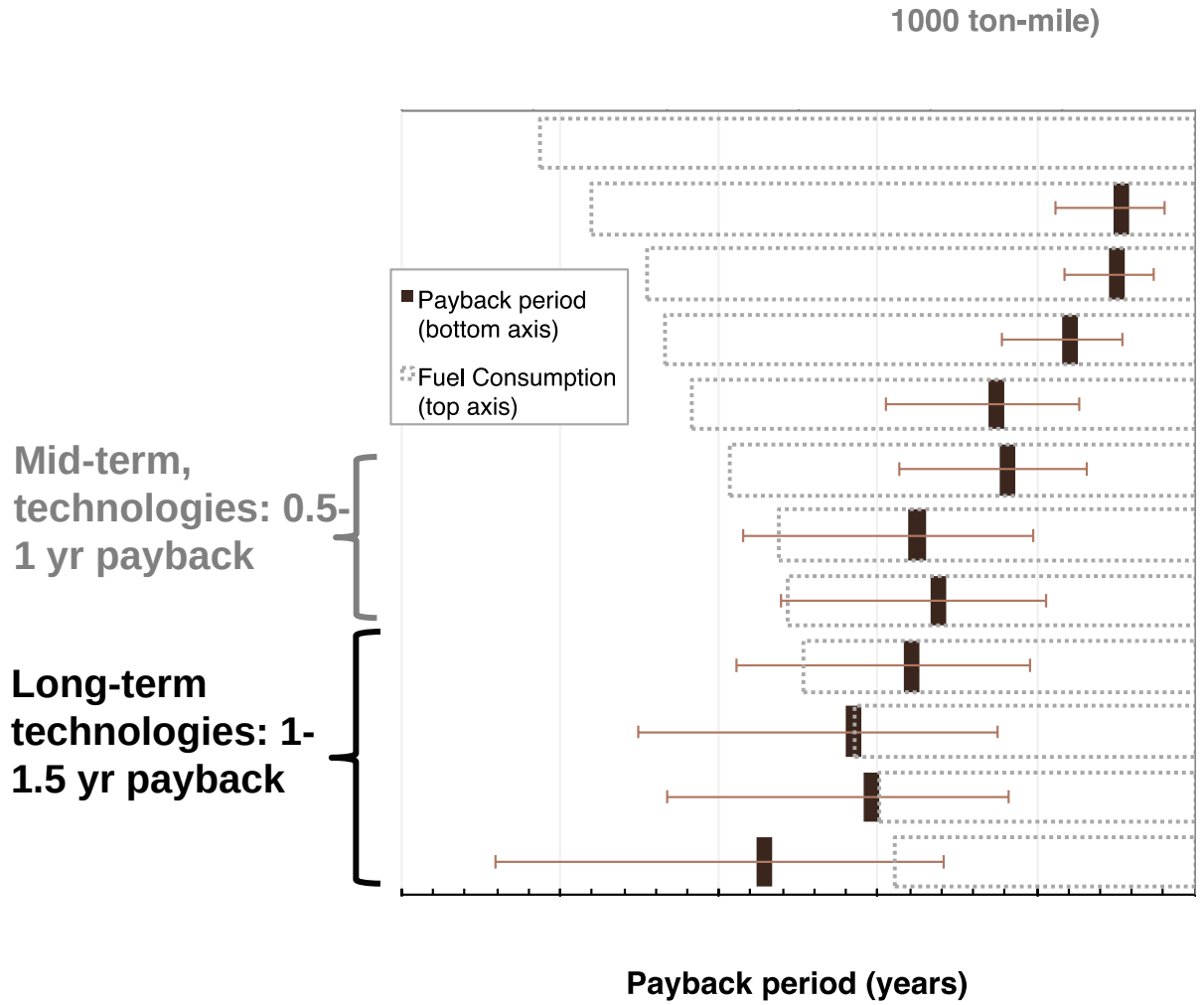
SuperTruck: Tractor-trailer efficiency progress

- Goal: Demonstrate 50% increase in freight efficiency (e.g., ton-mi/gal)
  - For a given payload, this would approximately result in 10 mpg tractor-trailers (from 6-7 mpg baseline)
- Progress to date:



Delgado and Lutsey (2014) The U.S. SuperTruck Program: Expediting the development of advanced heavy-duty vehicle efficiency technologies http://www.theicct.org/us-supertruck-program-expediting-development-advanced-hdv-efficiency-technologies

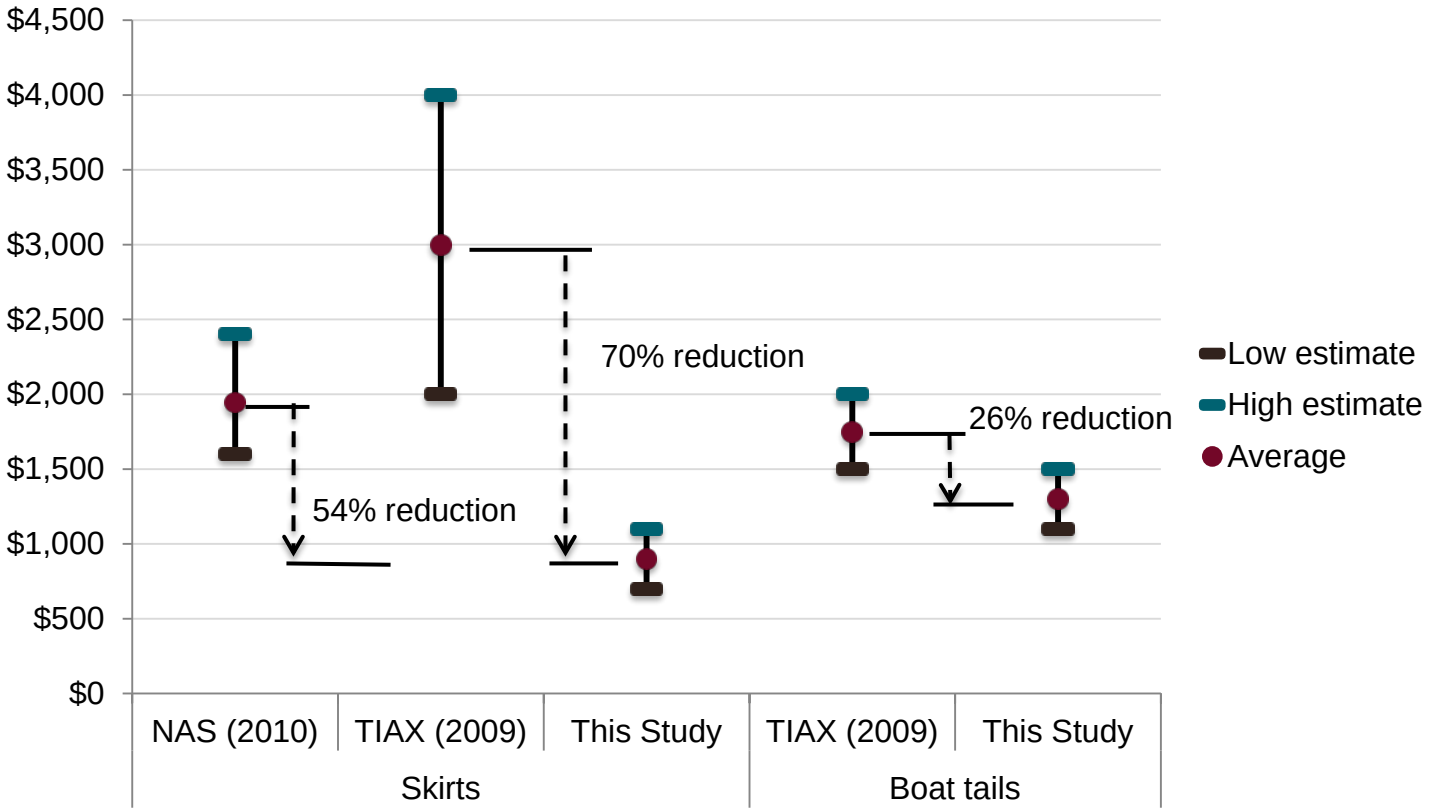
Fuel consumption and associated payback periods from selected efficiency technology packages



Meszler et al (2015). http://theicct.org/us-tractor-trailer-tech-cost-effectiveness
"Error" bars reflect range of estimates for varying technology cost, fuel price (US EIA AEO 2014 forecast, Low $3.10 to High $5.40 per gallon), and discount rates (3%-10%).

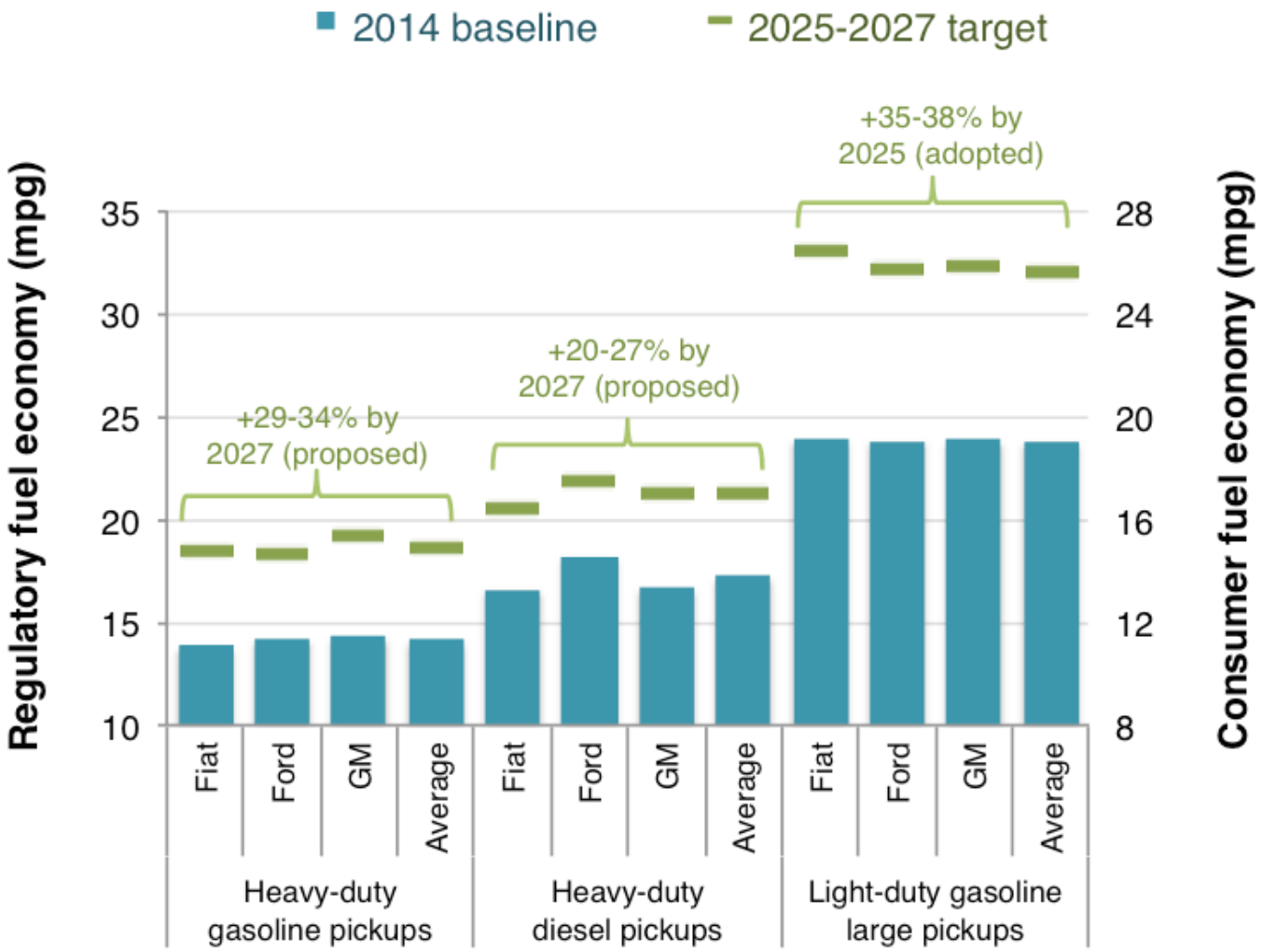
Trailer technology cost reductions in recent years (2013-2014 study)

- Nearly half of all new box trailers are sold with side skirts
- Costs of trailer aerodynamic technologies—particularly side skirts— have decreased substantially in the past 3-5 years



Sharpe and Roeth (2014). Costs and adoption rates of fuel-saving trailer technologies
http://www.theicct.org/costs-and-adoption-rates-fuel-saving-trailer-technologies

Pickups and Vans (2bs and 3)



Phase 2 proposal

Comparison to Phase 1

Engine Stringency

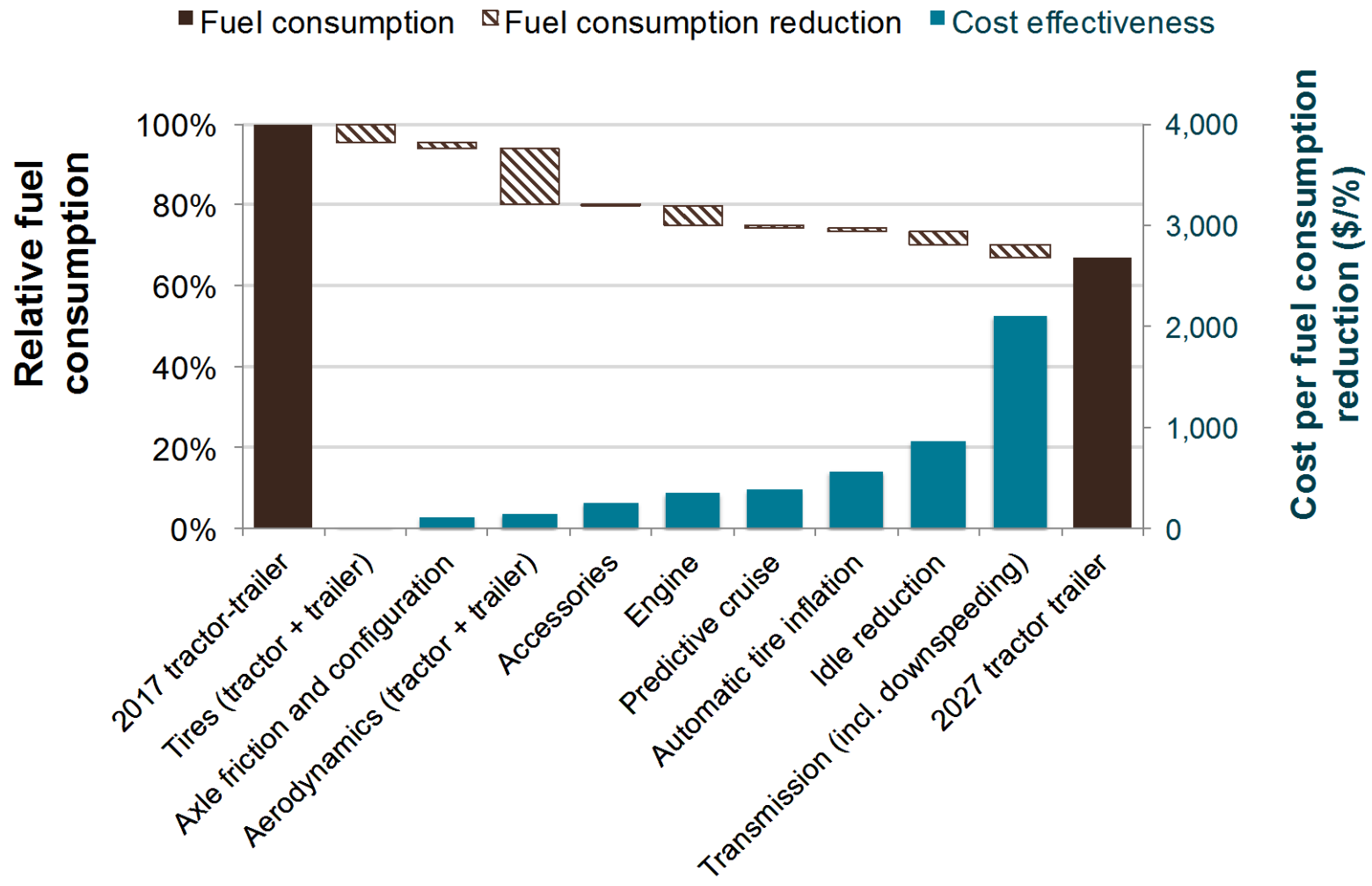
Accelerate timing

US HDV Phase 1 vs Phase 2: Overview

	Phase 1	Phase 2 (proposed)
Engine	Completely separate standard for engine	Separate standard maintained in Phase 2. Reweighted test cycles better reflect real world operation.
Trailers	Not regulated	Regulated in Phase 2
Transmission	Not accounted for under standard protocol	Accounted for through improvements to GEM model inputs or (optional) powertrain test
Vehicle simulation	Limited inputs and many defaults	Increased number of inputs including real engine fueling map and transmission information
Vocational vehicles	Three segments, only promoting tire and engine improvements	Increased number of segments (18) based on fuel type, usage profile, and GVW -- to promote additional technologies where applicable
Stringency	Weighted ~2%/year 2010-2017	Weighted ~2.8%/year 2017-2027
Real world testing	Not included	Chassis dyno testing on a subset of vehicles to validate standards impact
Natural gas	Negligible controls	Limit CH_4 emissions from engine crankcase and LNG tank
Payback	Average payback 12-18 months	Average payback is ~ 2-5 years (Lower for tractors, pickups; higher for vocational vehicles)

Phase 2 Sample Compliance Pathway

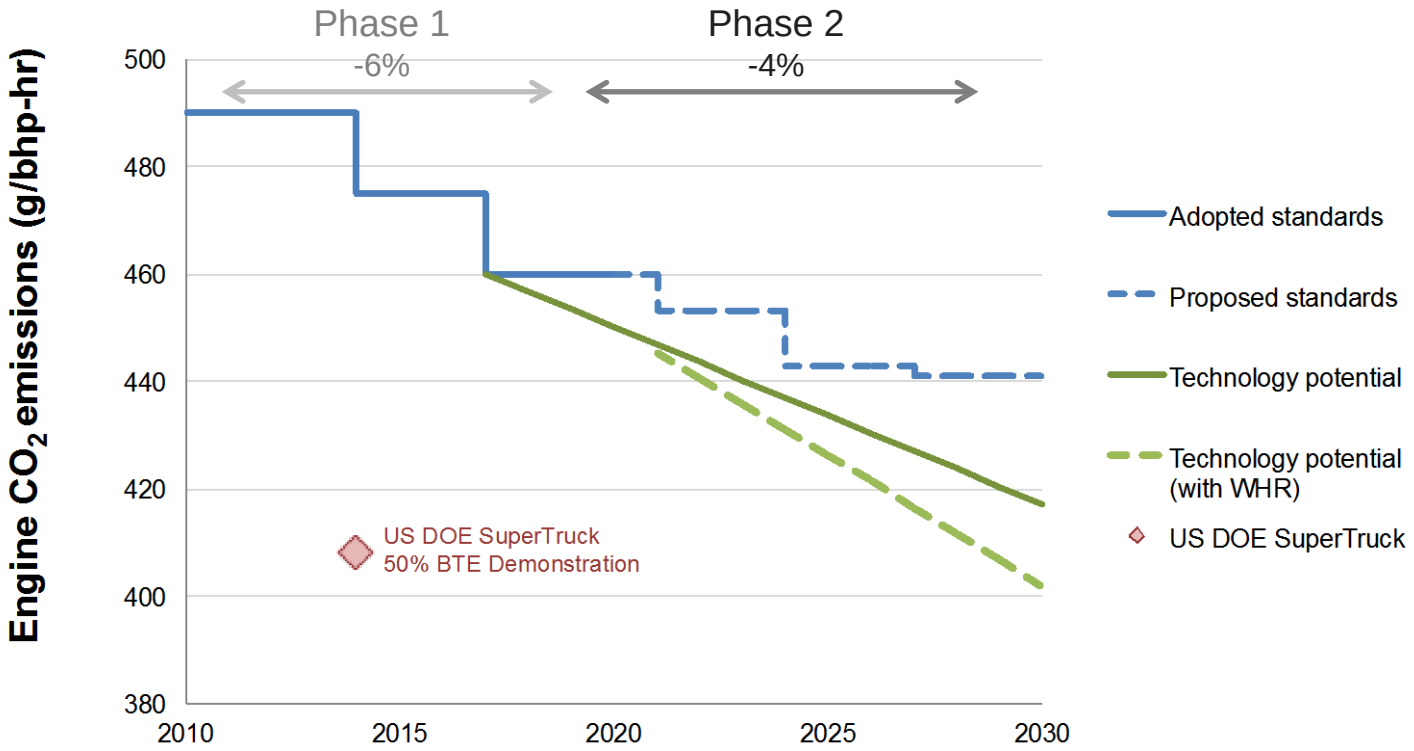
New tractor + trailer fuel consumption reduction of 34% from 2018 to 2027



Muncrief, R (2015). Parsing Phase 2: Tractor-trailers in the proposed regulationhttp://www.theicct.org/blogs/staff/parsing-phase-2-tractor-trailers-proposed-regulation

Key issue: Tractor engine stringency

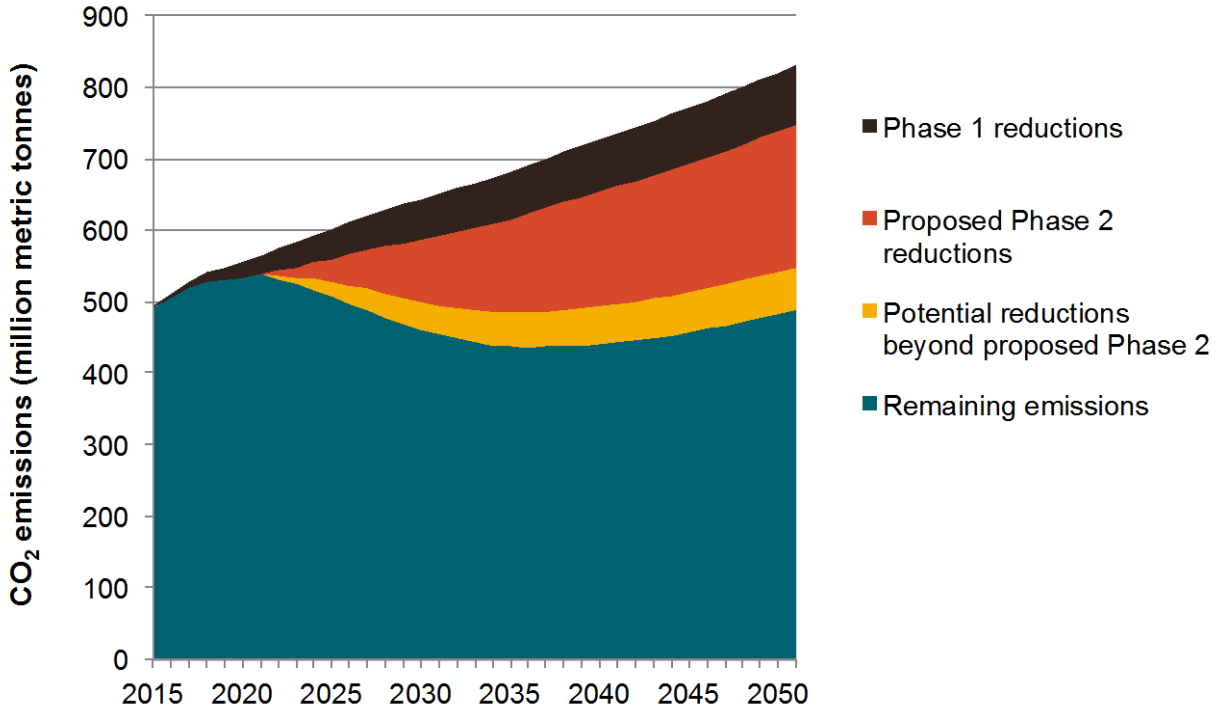
- Tractor engine stringency is modest compared to NGOs, Cummins, SwRI, ICCT, WVU, US DOE SuperTruck demonstration data



Lutsey (2015). The ever-improving efficiency of the diesel engine
http://theicct.org/blogs/staff/ever-improving-efficiency-diesel-engine

US HDV Phase 2:
Preliminary assessment of what is in play, potentially

- If standards shifted 3 years earlier, *and* with increased stringency,
- GHG and oil benefits would be roughly 30% greater than the proposed Phase 2



Sharpe (2015). What is at stake in the U.S. truck efficiency rule.
http://theicct.org/blogs/staff/what-stake-us-truck-efficiency-rule

Where are we going?

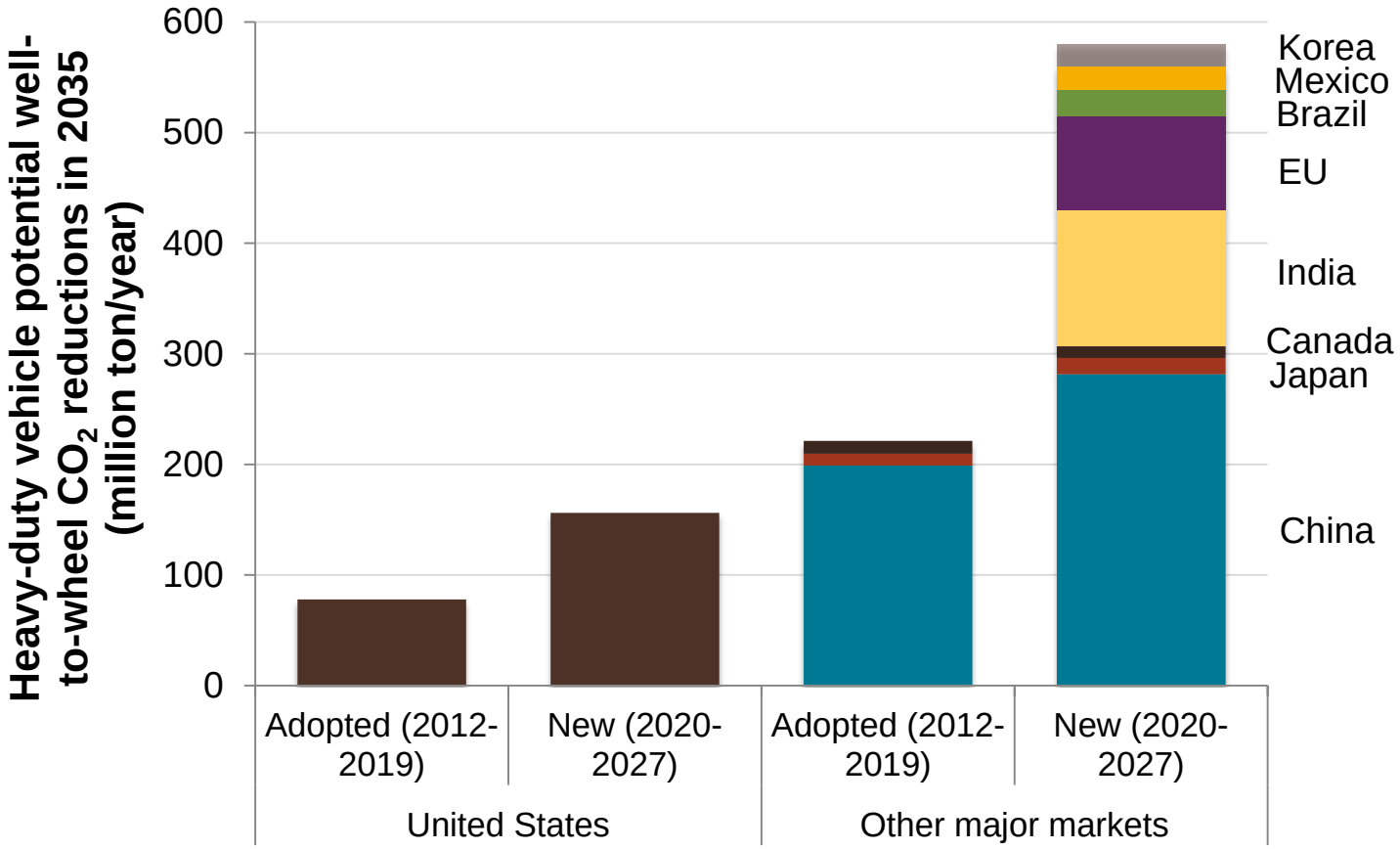
Global landscape

Observations and

Conclusions

US and California are playing an important role in the evolution of global HDV CO_2 /efficiency policies

”New” policies are proposed or under development



Source: ICCT Roadmap model: http://www.theicct.org/initiatives/global-roadmap
Miller and Façanha (2014). http://www.theicct.org/state-of-clean-transport-policy-2014

Observations and conclusions

- Regulatory action to address CO_2 emissions and fuel use from heavy-duty vehicles is accelerating around the world.
  - Japan, US, China and Canada currently have programs while India, Mexico, Korea and Europe are actively developing programs.
- Low volumes of heavy-duty vehicles and engines create economic incentives for global alignment of standards.
  - Global harmonization of regulatory programs is challenging due to diverse vehicle types and drive cycles, but shared use of simulation models holds promise.
- US Phase 2 rule proposal offers significant improvements over Phase 1, but challenges remain.
  - Added grade to simulation modeling, compliance testing, broader application to trailers and vocational, integrated engine and transmission are all positive improvements.
  - Increased engine stringency and accelerated implementation should be considered by the Agencies.
- Revised ambient air quality standards are likely to add pressure for further reductions of NOx emissions from heavy-duty vehicles.

Resources

- US EPA and NHTSA pages
  - http://www.epa.gov/oms/climate/regs-heavy-duty.htm
  - http://www.nhtsa.gov/fuel-economy
- ICCT US HDV resource page:
  - http://theicct.org/policies/us-heavy-duty-vehicle-standards
- ICCT US HDV Phase 2 policy update:
  - http://theicct.org/us-phase2-hdv-efficiency-ghg-regulations-policy-update