



Future Regulations – A Catalyst for Technology Development

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ERC – 2017 Symposium

Impact of Future Regulations on Engine Technology

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OTAQ: Addressing Transportation Air Quality and Climate



Light-Duty



Recreational and Commercial Marine



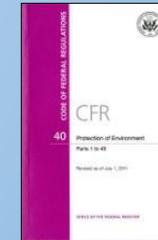
Heavy-Duty



Clean and Renewable Fuels



Aircraft



Non-Road



Locomotives

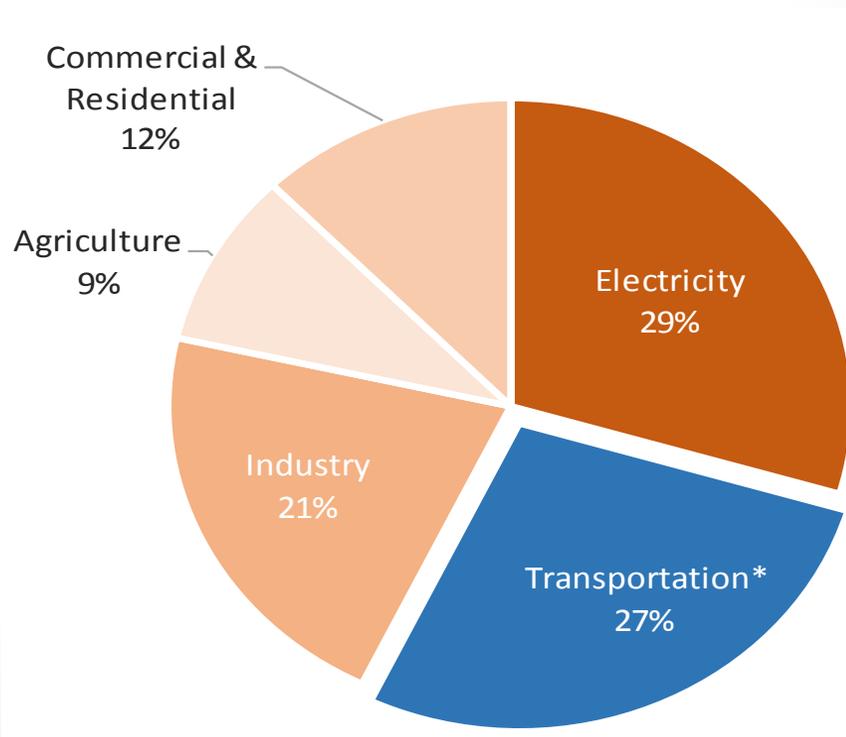


Through Standards and Partnerships

Mobile Source National Emission Contributions

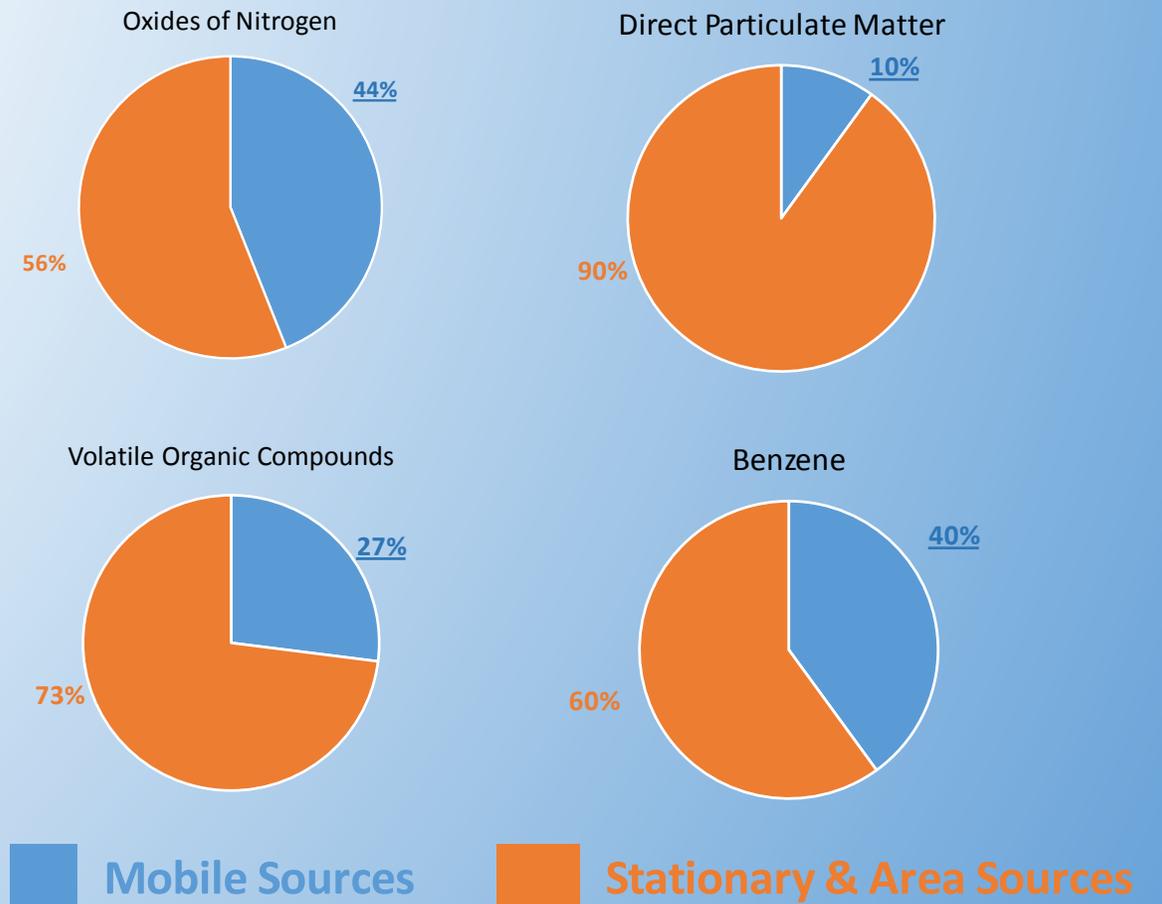
2015 for GHG inventory, 2017 for other pollutants

Share of U.S. GHG Emissions by Economic Sector



* Industry, Agriculture, and Commercial sectors include emissions from non-transportation mobile sources that fall under OTAQ's purview. **Mobile sources constituted ~31% of total U.S. GHG emissions in 2015.**

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2015 (EPA, April 2017)



What is EPA's role?



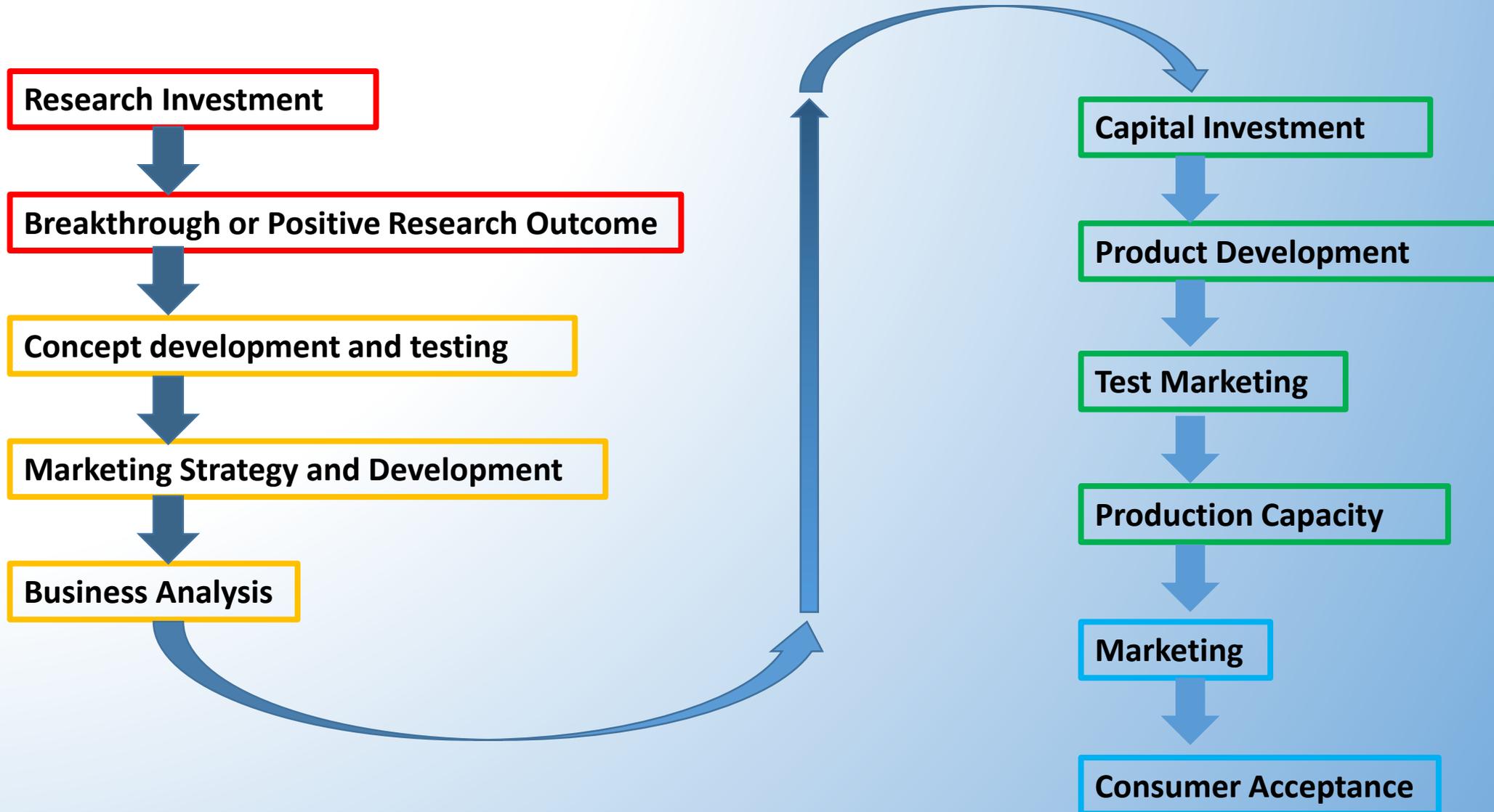
- We don't make vehicles, engines or fuels

Setting Technology-forcing Standards

- Not just following the market
 - Not setting standards that just capture what the market is already doing
- But pushing it forward – be technology forcing
 - Electronic engine management systems
 - Exhaust catalysts and particulate filters
 - Gasoline and diesel fuel hydrotreating
 - Advanced gasoline engine technologies
 - Advanced transmission technologies (CVT, 8+ sp. Transmissions)
 - Hybrids, EVs
 - Light weight materials
 - Renewable fuels
 - Etc.

Gates to Market for New Technologies

Primary driver for regulatory lead-time



EPA/OTAQ Mobile Source Statutory Responsibilities

OTAQ operates primarily under the statutory authority of the Clean Air Act, the Energy Policy and Conservation Act, and the Energy Independence and Security Act.

States Rely On EPA to address Mobile Source Air Pollution

- With a few notable exceptions, state and local governments are pre-empted from establishing or enforcing clean air standards for new mobile sources and for mobile source fuels
 - Exceptions: California (e.g., passenger car regulations predate federal CAA) and “Section 177” states

Clean Air Act (CAA)

- Set emission standards for new vehicles, equipment, engines and fuels (CAA sections 202, 211, 213)
- Create test procedures and protocols to evaluate performance against the standards (CAA section 206)
- Issue certificates annually (CAA section 206) and register fuels (CAA section 211) prior to their introduction into commerce
- Require manufacturers to recall vehicles and engines that do not comply in-use (CAA section 207)
- Prohibit noncompliance (CAA section 203)
- Take enforcement action when regulated parties violate the law (CAA sections 204-205)
- Renewable Fuel Standards (CAA section 211(o))

Energy Policy and Conservation Act (EPCA)

- Fuel economy labelling
- Responsible for CAFE test procedures, CAFE data collection, and perform CAFE compliance calculations for DOT

Energy Independence and Security Act of 2007 (EISA)

- Significantly expanded Renewable Fuels Standards program
- Approve new fuel pathways

EPA CAA Regulatory Authority

-Setting mobile source emissions standards

- 202(a)(2) “The Administrator shall by regulation prescribe...standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines...shall take effect after such period as the Administrator finds **necessary to permit the development and application of the requisite technology**, giving appropriate consideration to the cost of compliance within such period”
- 202(a)(3)(A)(i) “categories of heavy-duty vehicles or engines manufactured during or after model year 1983 shall contain standards which reflect the greatest degree of emission reduction achievable through the application of **technology which** the Administrator determines **will be available**...giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology.”

So How Does This Authority Work



Increases certainty for and reduced risk from investment in pollution reducing technologies

- EPA evaluates mobile source technologies, but we are not bringing these technologies to market
- We rely heavily on leveraging the work of others
- There are now entire companies and associations of companies devoted primarily to developing technologies that can serve as the basis for more stringent standards
- Let me have a show of hands...
 - How many of you believe that vehicle catalyst manufacturing would exist today without vehicle emission standards?

Brings hidden economic impacts to light in business decisions

- Let me have a show of hands
- How many of you, in your company's product planning decision making briefings have data and information explaining the impact of Model A vs Model B, or Fuel A vs Fuel B on:
 - The capital costs, expected sales, and expected return on investment?
 - Air quality in the town you live in?
 - Plans, costs, and impacts of complying with EPA standards that will improve air quality in the town you live in

Levels the playing field

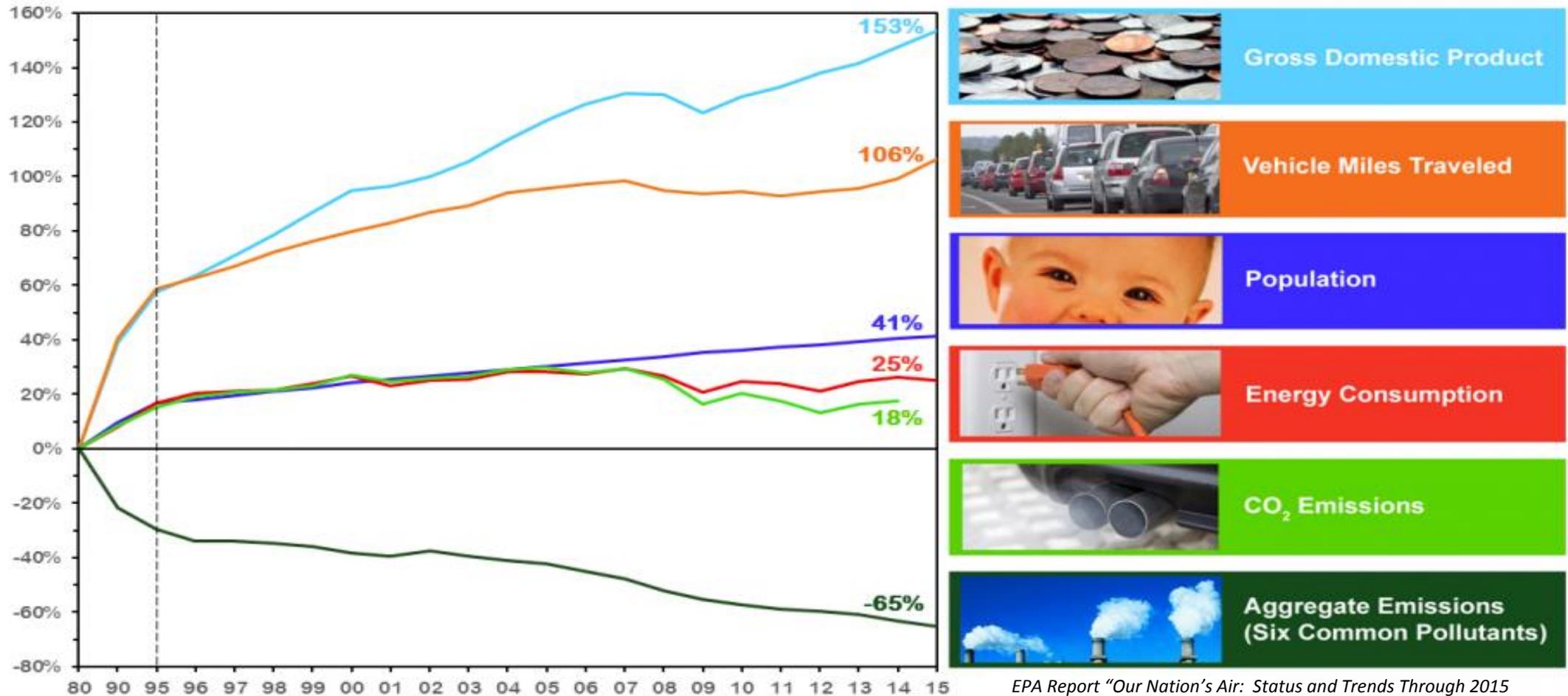
- Everyone in the market has to invest in some way shape or form
 - If it costs everyone roughly equally, the market disruptions are minimized
- Let me have a show of hands
 - How many of your companies sell products that don't meet EPA's standards in another country?
 - How many of you believe that your company would be selling products in the U.S. that meet EPA's standards if not required to do so?
 - How many of you are selling products in the US that do not meet EPA's standards

Reduces Market Risk

- Consumers will have to purchase pollution reducing technology
 - Brings hidden economic (health and environmental) impacts to light in personal decisions
- Let me have a show of hands
 - How many of you as consumers when you buy a car consider the price of the car?
 - How many of you consider the price of the emission control system separately?
 - How many of you would buy a car without an emission control system if the dealer could offer you that option for \$1000 less?

The Outcome has been Dramatic Reductions in Air Pollution – While the Economy Grows

Comparison of Growth Areas and Emissions, 1980-2015



EPA Report "Our Nation's Air: Status and Trends Through 2015"

New York City

1973

2013

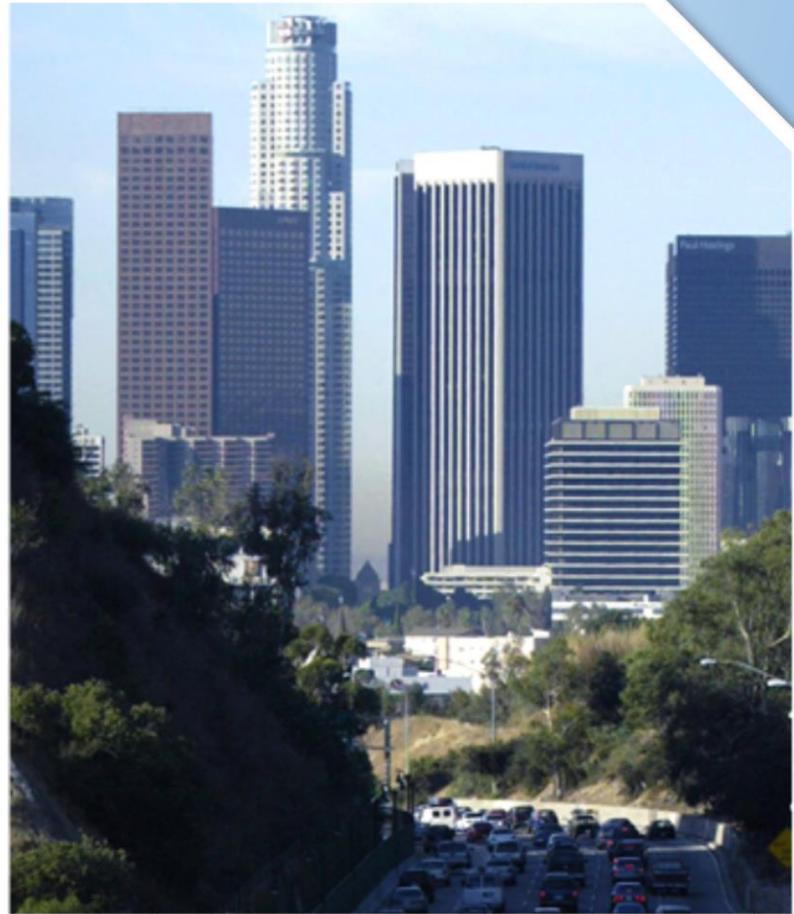


Los Angeles

Then

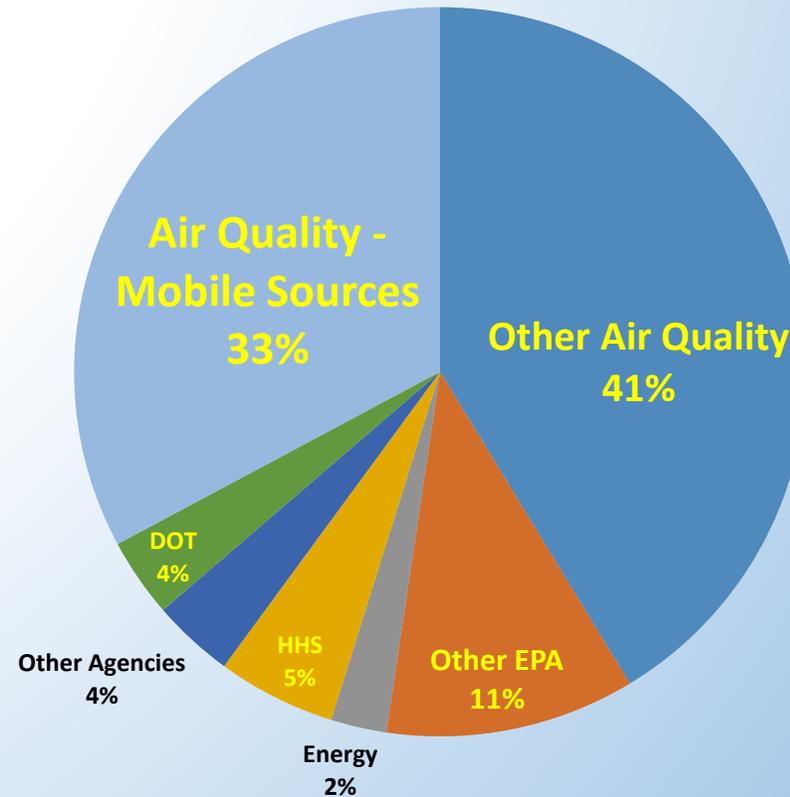


Now



OTAQ Rules Responsible for 33% of Benefits Derived from All Major Federal Rules (2000-2012)

Based on Midpoint of OMB Estimated Annualized Benefits Range



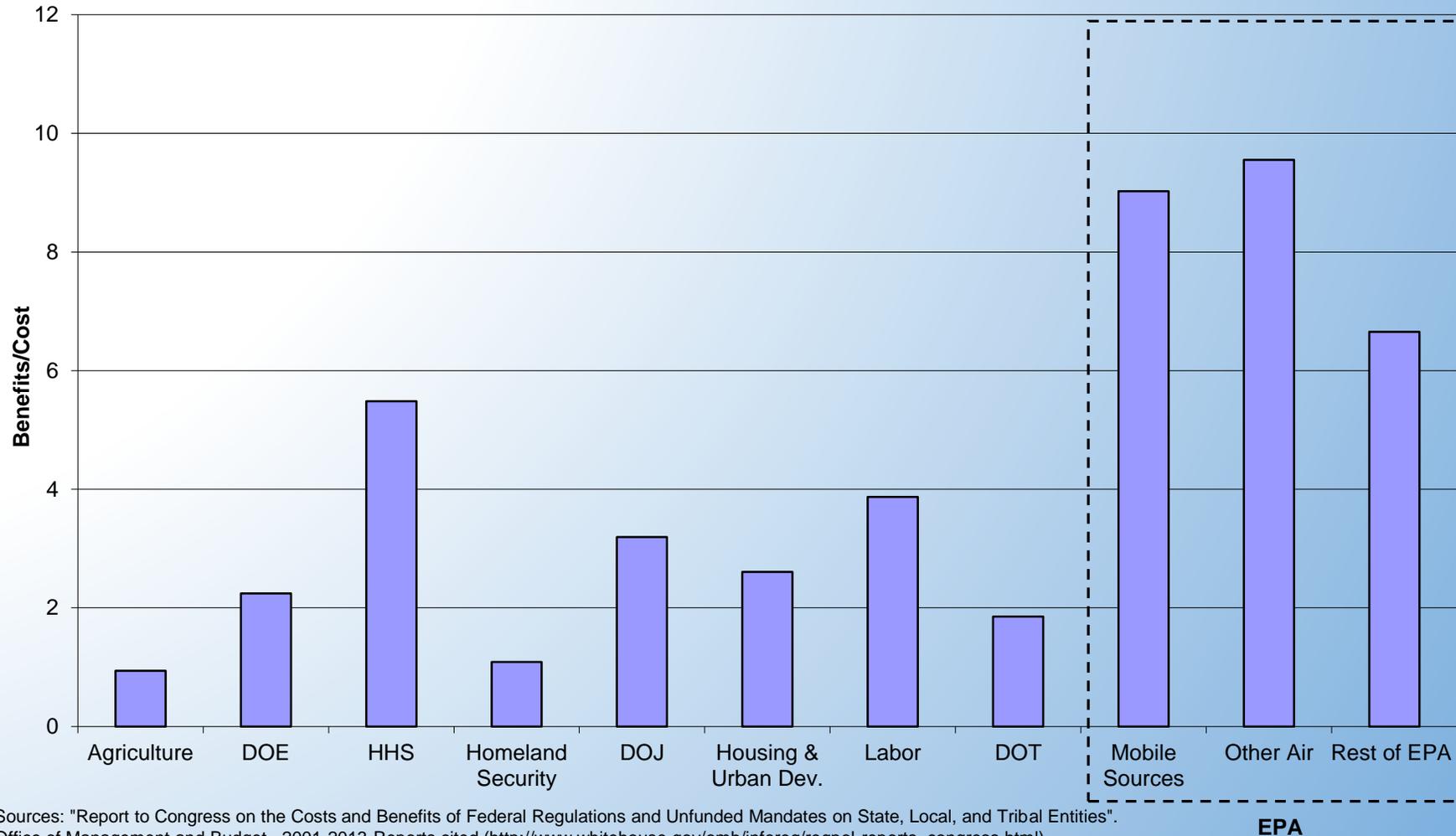
Source: "Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities". Office of Management and Budget. 2001-2013 Reports cited (http://www.whitehouse.gov/omb/inforeg/regpol-reports_congress.html)

**"Other Agencies" include Departments of Agriculture, Labor, Justice, and Housing & Urban Development

NOTE: OMB did not include the Ocean Going Vessels Rule in its Report to Congress. It is unclear how OMB would calculate an annualized estimate of those benefits. The annualized value of benefits associated with the Ocean Going Vessels Rule included in this graphic is a best guess at the method.

A Measure of Effectiveness: Benefit to Cost Ratio of Major Federal Rules by Agency (2000-2012)

Based on Midpoint of OMB Estimated Annualized Cost and Benefit Ranges



Sources: "Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities". Office of Management and Budget. 2001-2013 Reports cited (http://www.whitehouse.gov/omb/info/regpol-reports_congress.html)

Some places still struggling with emission control



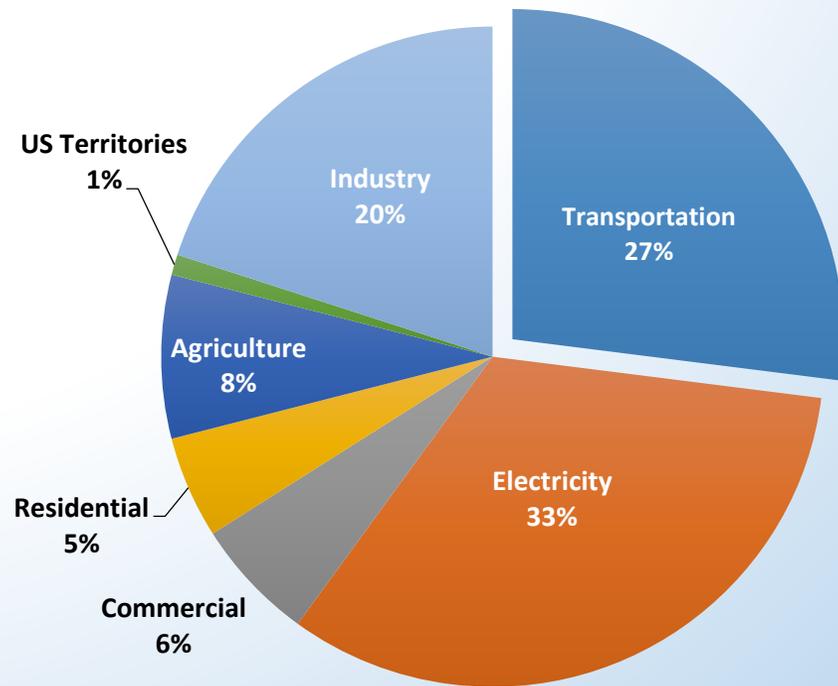
Beijing, February 2014

What Doesn't the Authority Do?

- It does NOT remove risk
 - Your R&D efforts may fail
 - Your solution may not be the most effective
 - While every engineer in every company thinks their solution is the best – they can't all be right
 - Your costs may be higher than your competitors
 - Consumers may prefer your competitor's technology solution
- It doesn't allow us to mandate something that isn't attainable
 - Regulations must consider cost, benefits, feasibility, leadtime, etc.

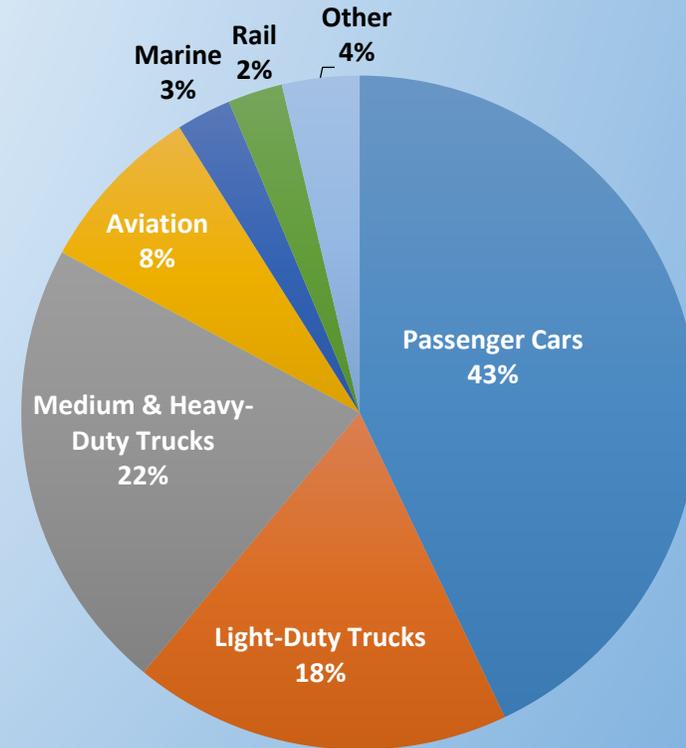
Mobile Source Climate Change Program

- On April 1, 2007 U.S. Supreme Court ruled that EPA's CAA authority covers greenhouse gases including CO₂
 - In 2009 EPA issued an endangerment finding for six GHGs along with the finding that motor vehicles cause or contribute to this harm



All Sectors

2011 Data



Transportation

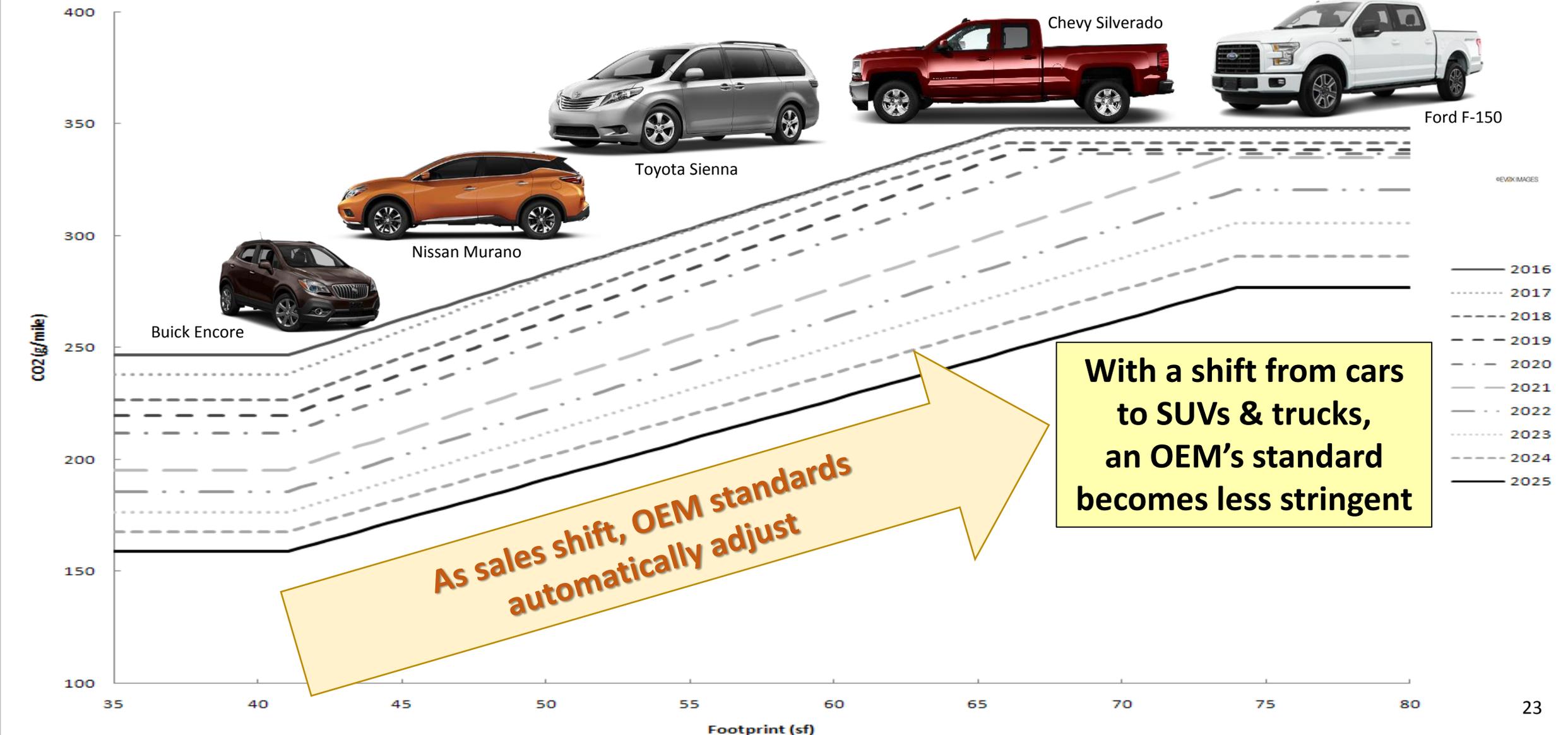
Progress in the U.S...

- Light-duty GHG Phases 1 & 2
- Heavy-duty GHG Phases 1 & 2
- Aircraft Endangerment Finding
- Renewable Fuels Program on track



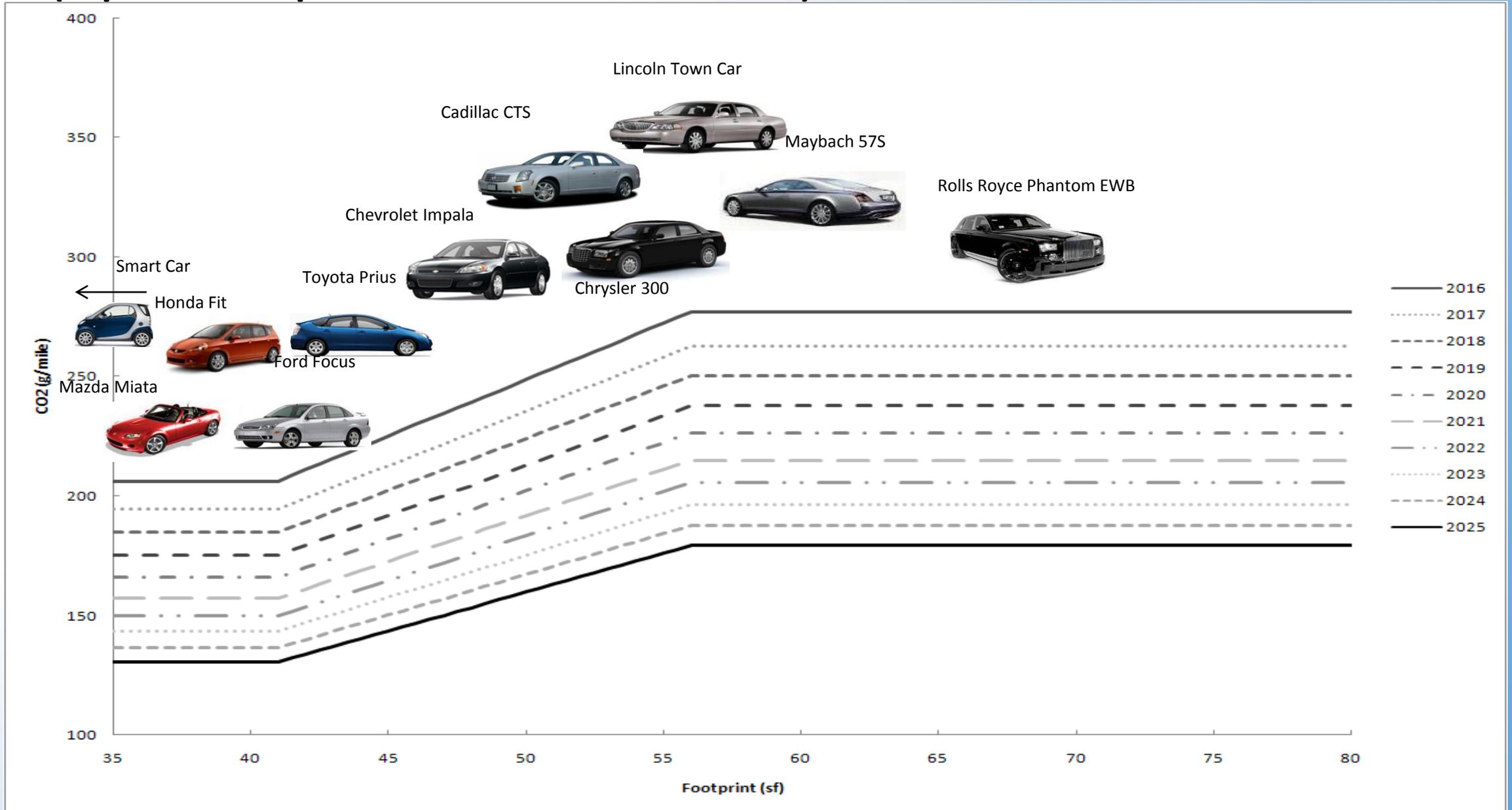
Footprint-based CO₂ Target Curves for Trucks – “The Standards”

(separate footprint curve for Cars & Trucks)



Footprint-based CO₂ Target Curves for Cars – “The Standards”

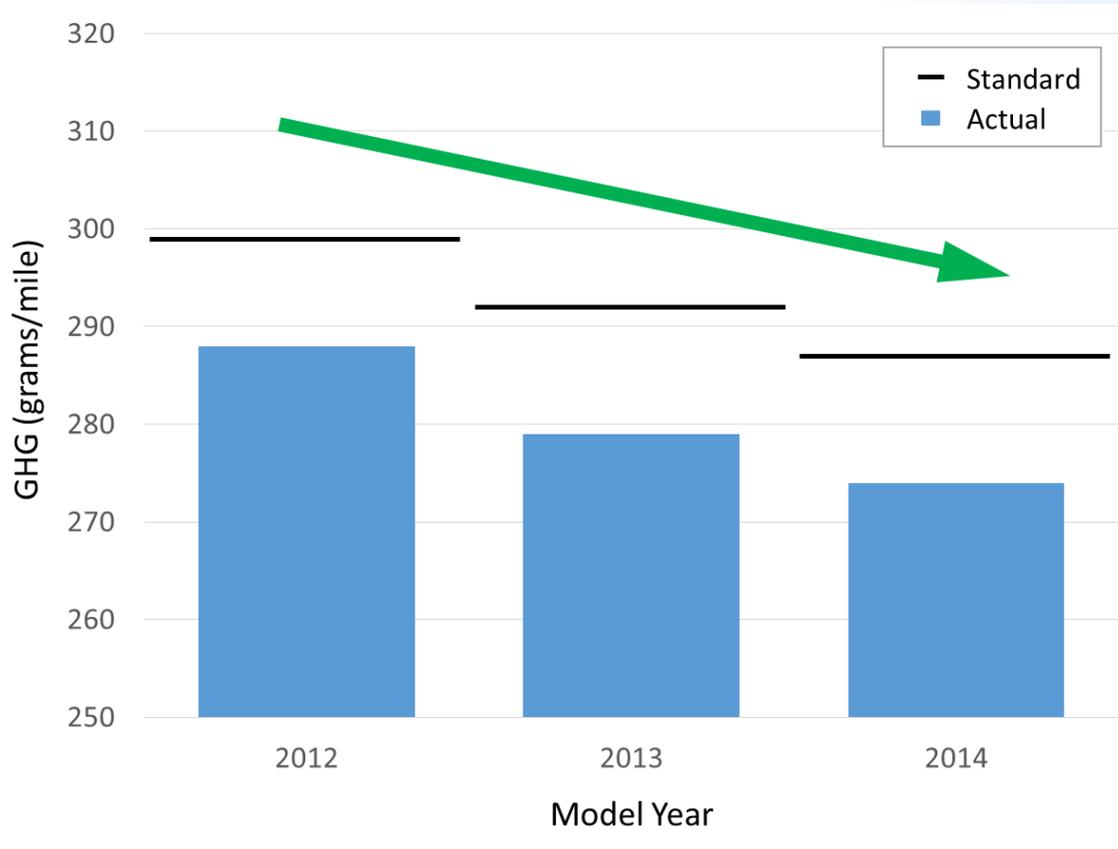
(separate footprint curves for Cars & Trucks)



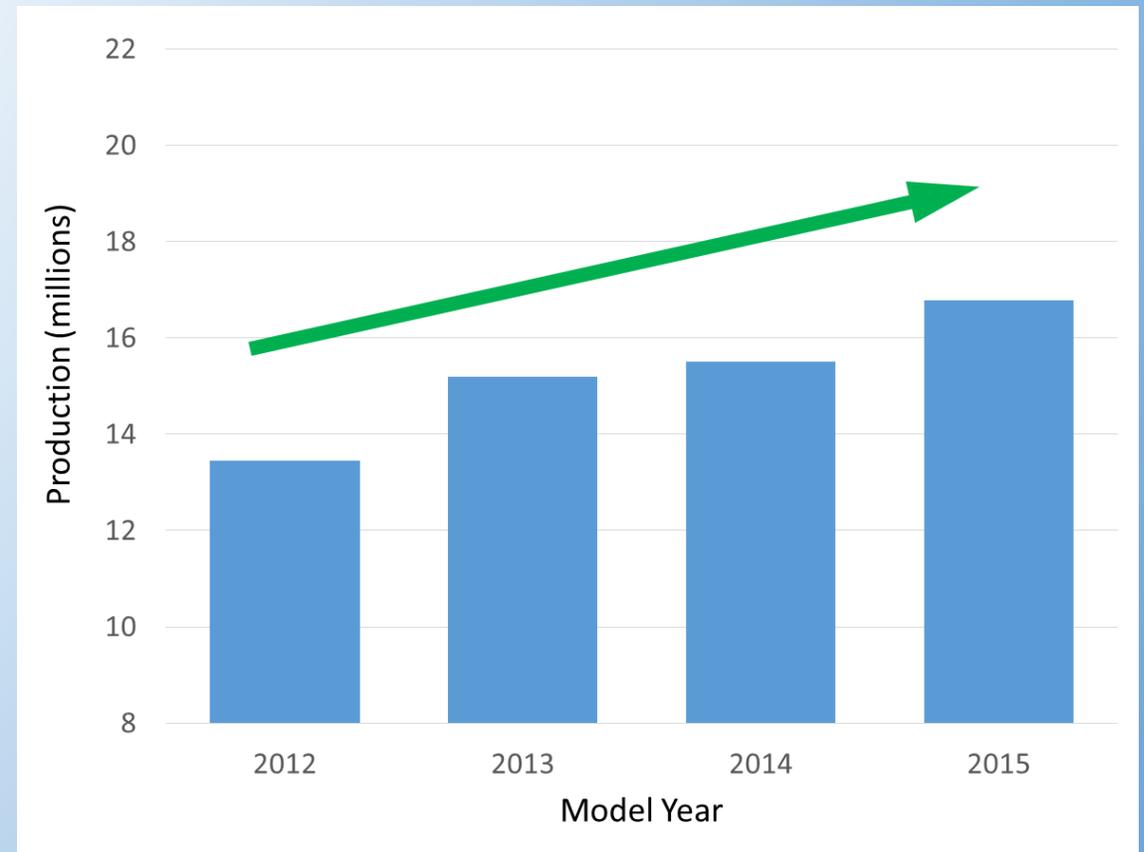
GHG Standards Are Working

Automakers beating standards while vehicle sales rising

Auto Manufacturer Compliance

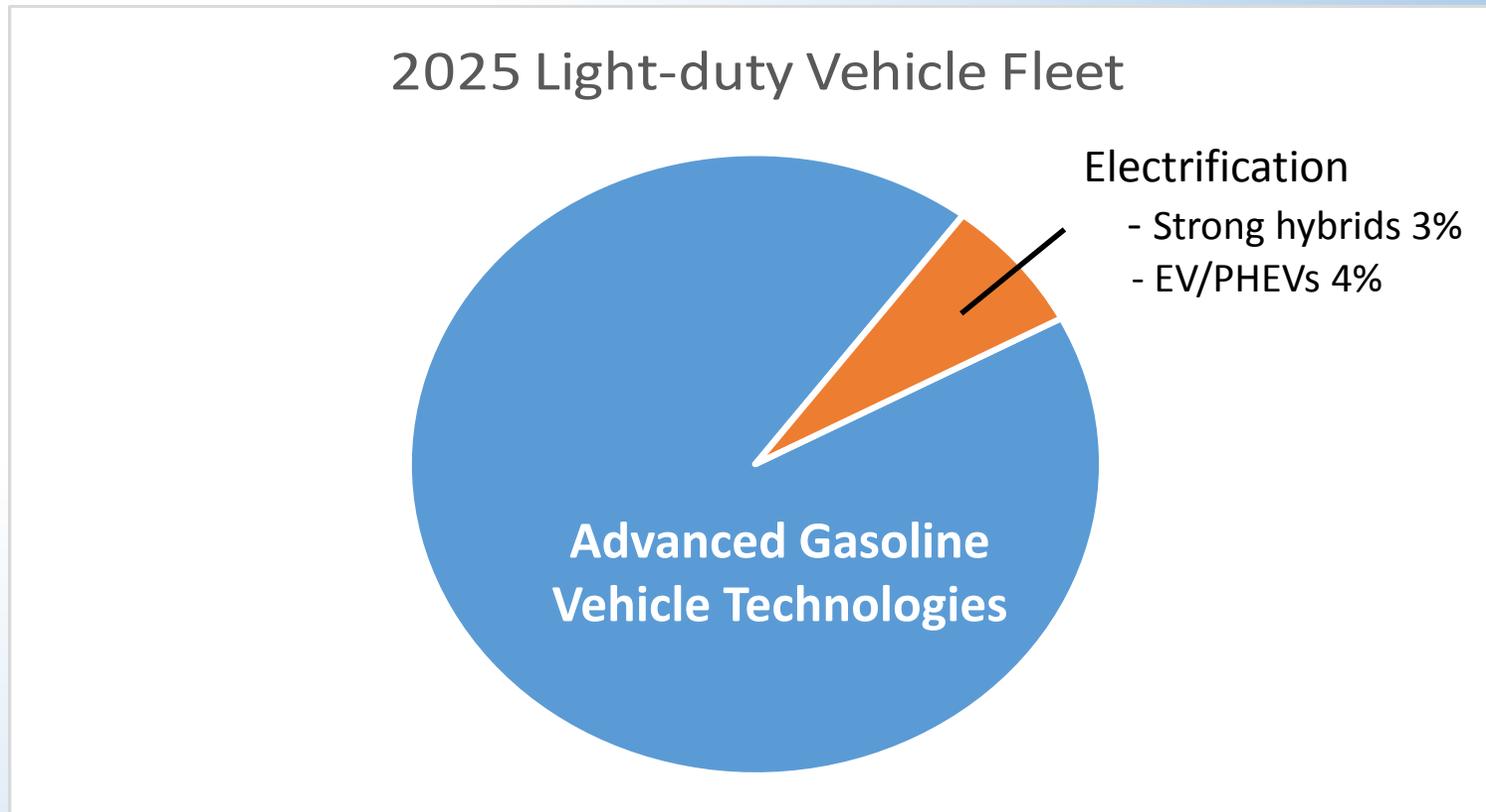


Auto Manufacturer Production

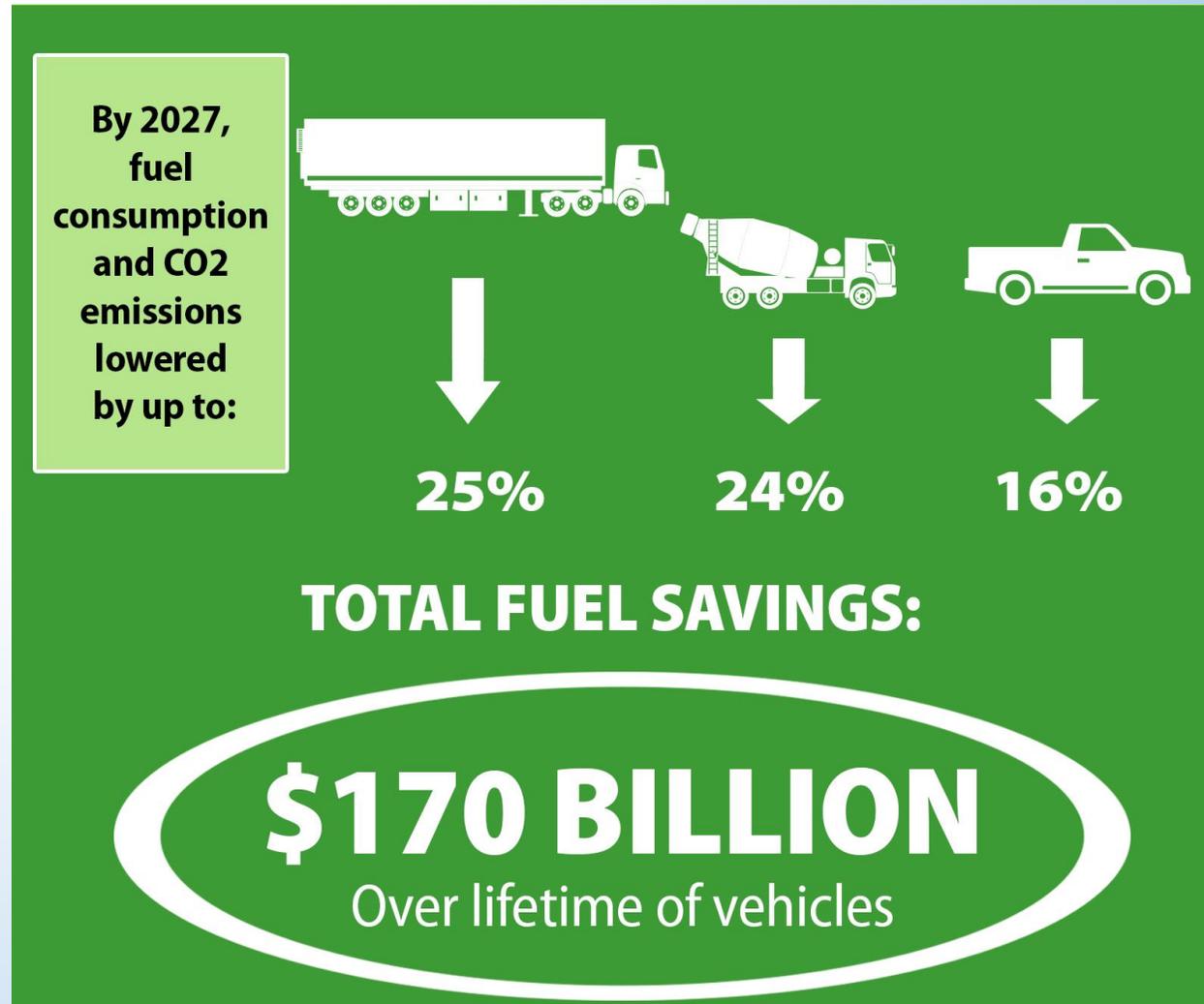


TAR: Automakers' innovation rapidly spurring technology

2025 standards can be met mostly with advanced gasoline engines and transmission improvements



EPA's Medium & Heavy Duty GHG Standards

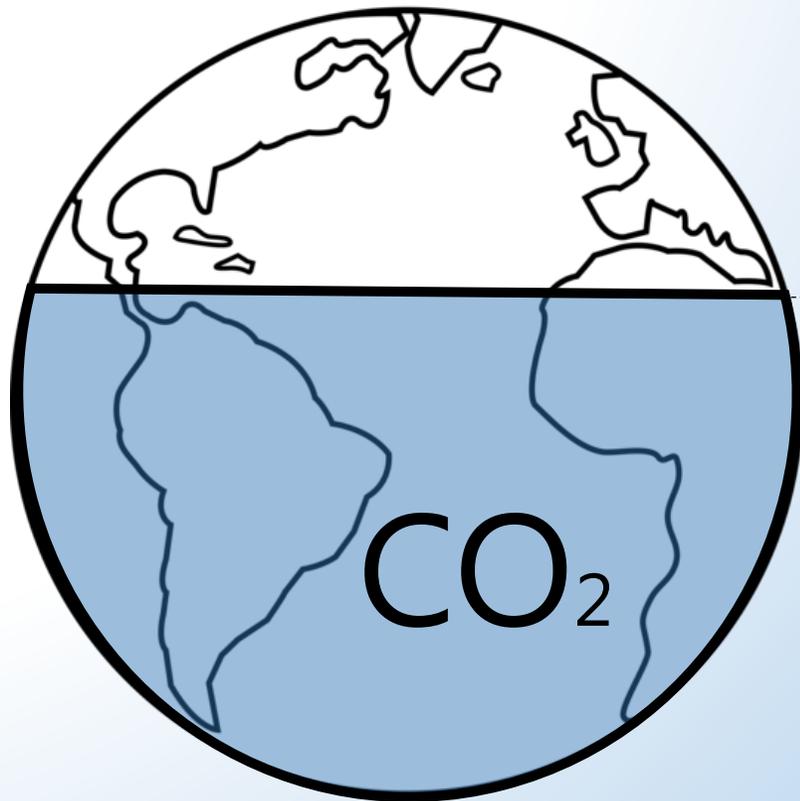


HDGHG Phase 2 Standards

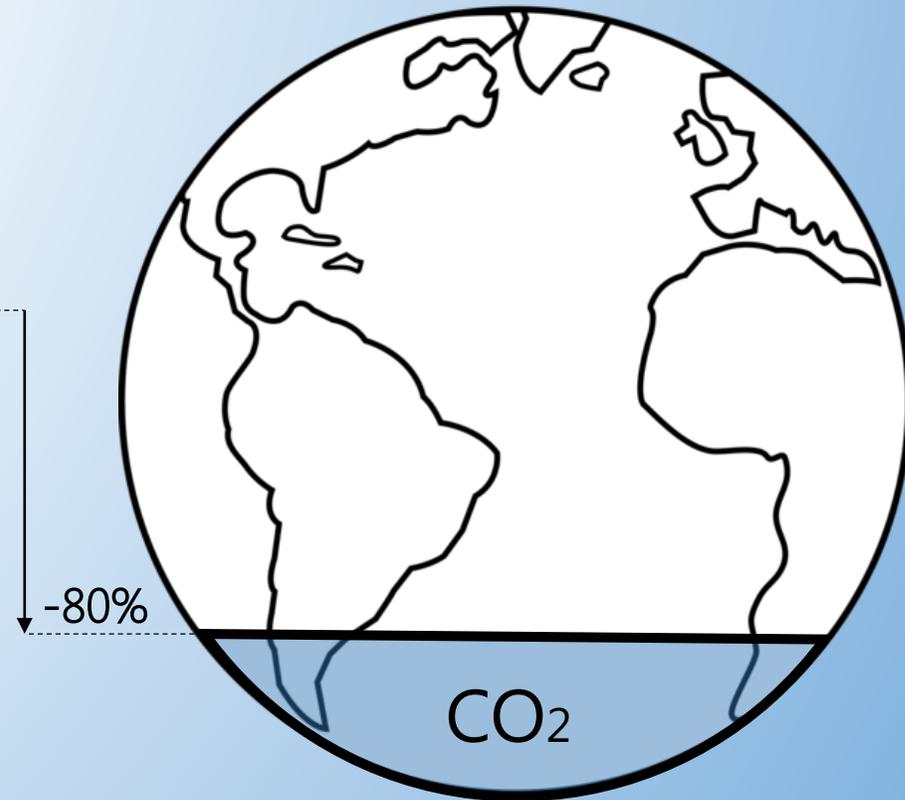
Ambitious and Significant: The Phase 2 standards are expected to lower CO2 emissions by approximately 1.1 billion metric tons, save vehicle owners fuel costs of about \$170 billion, and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program. The technology-advancing Phase 2 program goes beyond the successful Phase 1 program, **with standards based not only on currently available technologies but emerging technologies that are not yet in widespread use.**

Achievable and Flexible: **The performance-based standards provide multiple technological pathways to compliance and were informed by a comprehensive assessment of advanced technologies and extensive stakeholder outreach.** The standards phase in beginning in model year 2021 and culminate in standards for model year 2027. First-time GHG and fuel efficiency standards for trailers start in 2018 for EPA and in 2021 for NHTSA. The long phase in and incremental increases in stringency give industry time to ensure products are reliable and durable, and provide long-term regulatory certainty.

Transformational Change is Needed



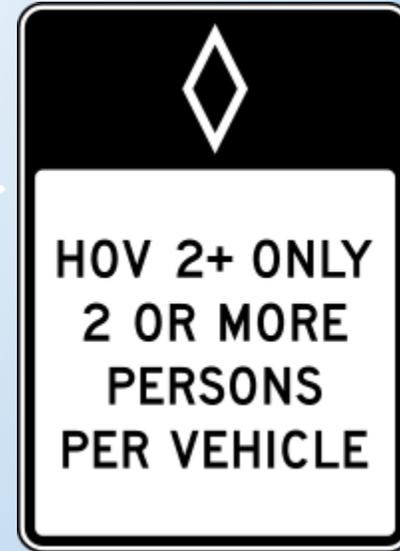
We are headed here



But we need to go here

The Clean Air Act is Not the Only Tool in the Tool Box

Voluntary Measures



Local, State, & Regional Partnerships

Transport Sector Transformation



