LIGHT-DUTY VEHICLE GREENHOUSE GAS STANDARDS: 2025 AND BEYOND

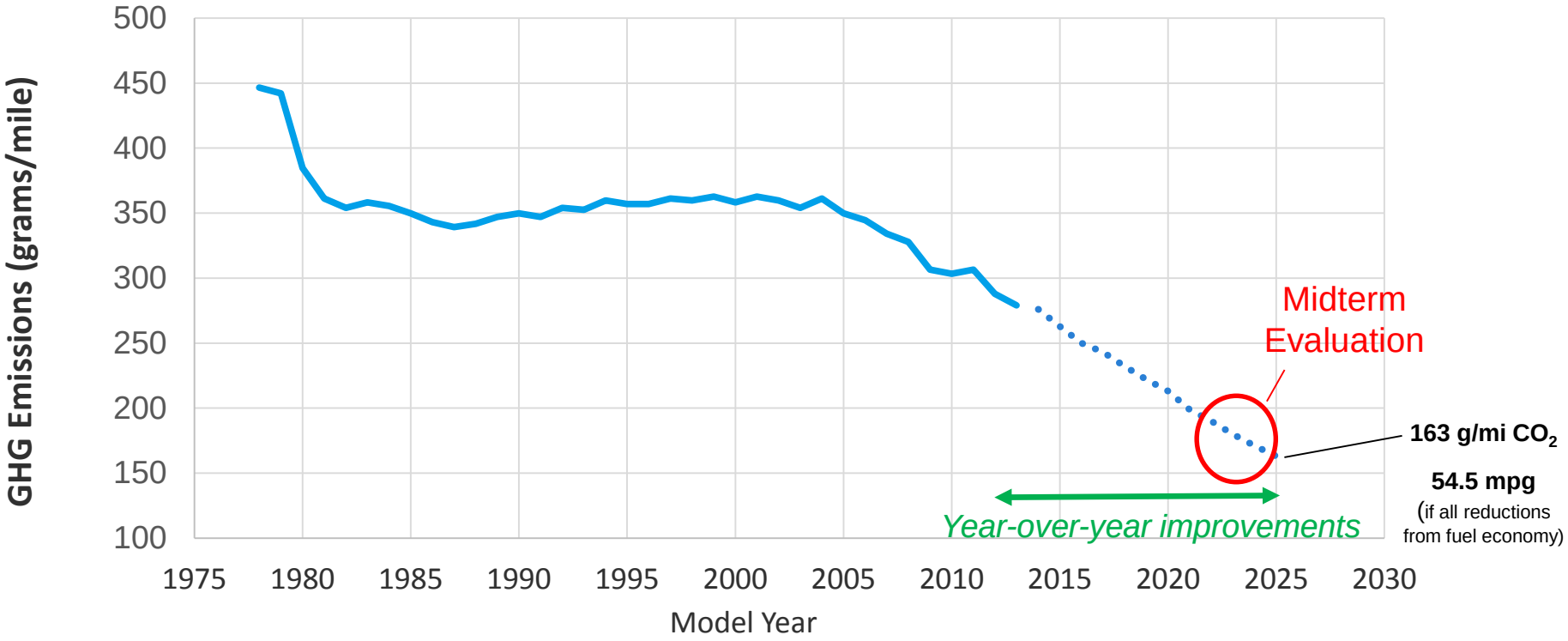
Christopher Grundler, Director
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

September 17, 2015

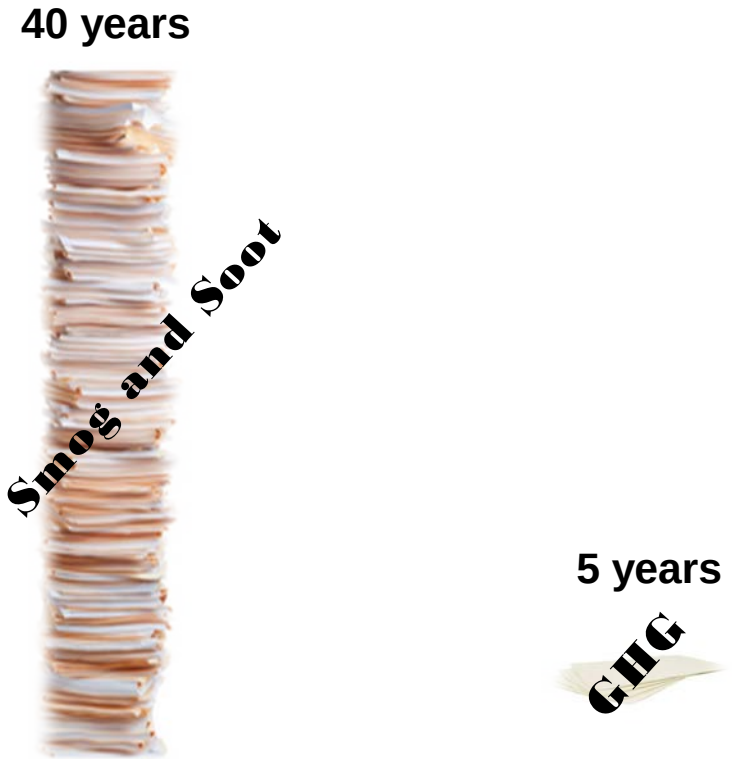
SAE INTERNATIONAL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

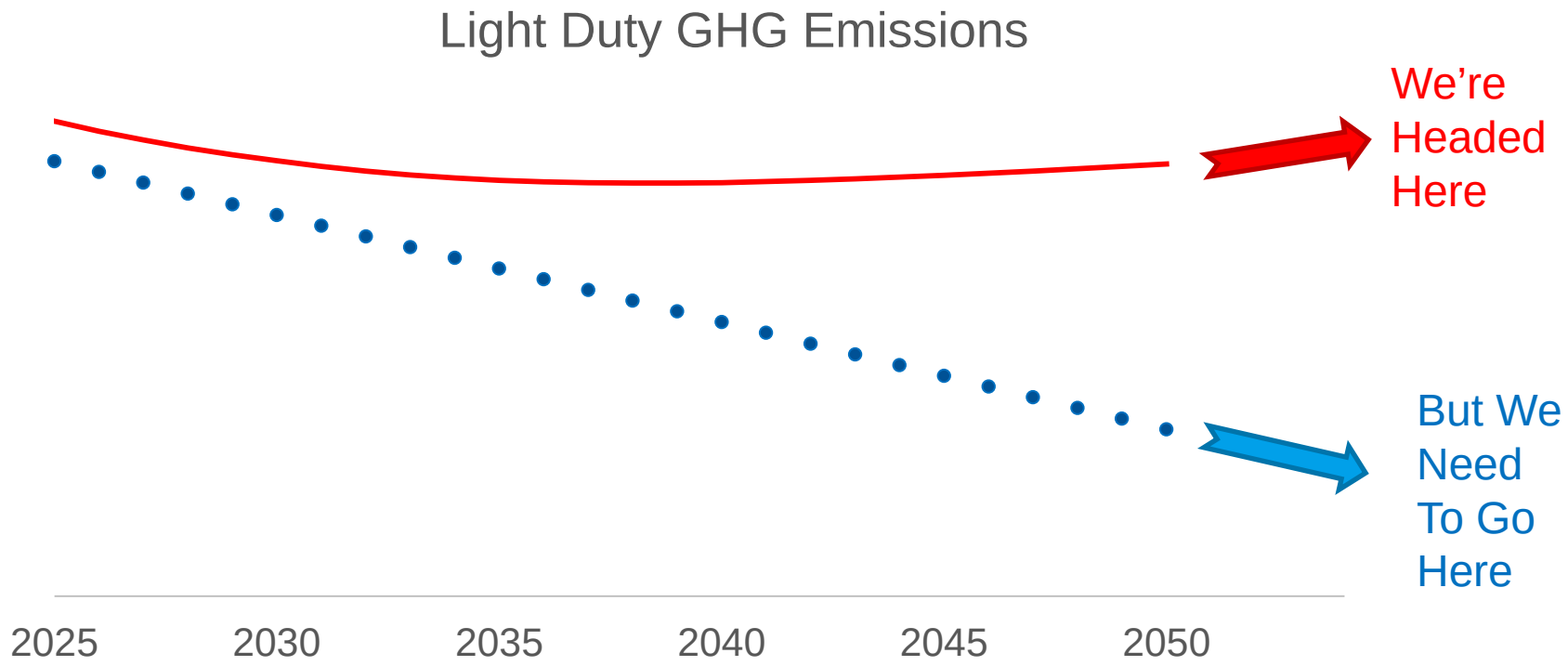
U.S. GHG/Fuel Economy standards provide significant benefits to climate, oil, consumers



We are just getting started in effort to avert the worst impacts of climate change



Even With Our GHG Rules



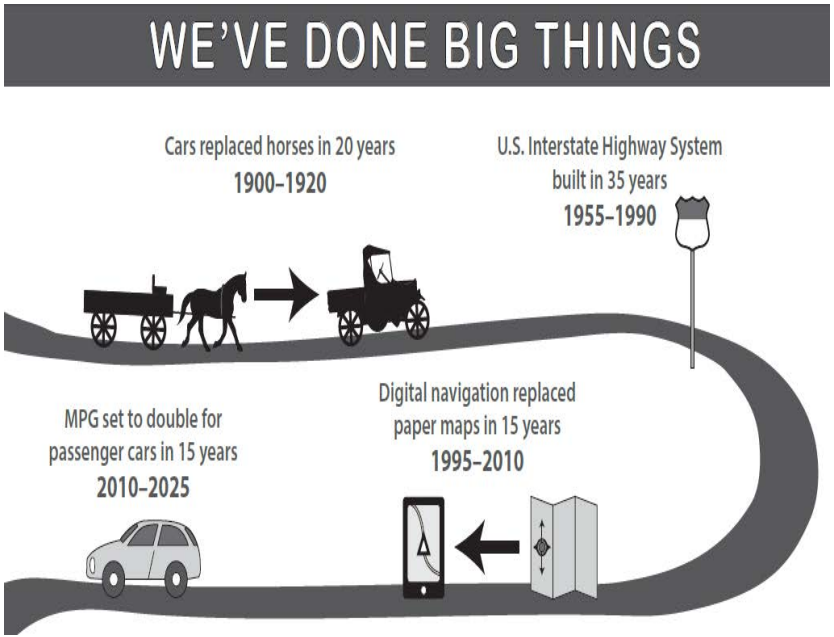
Imagination

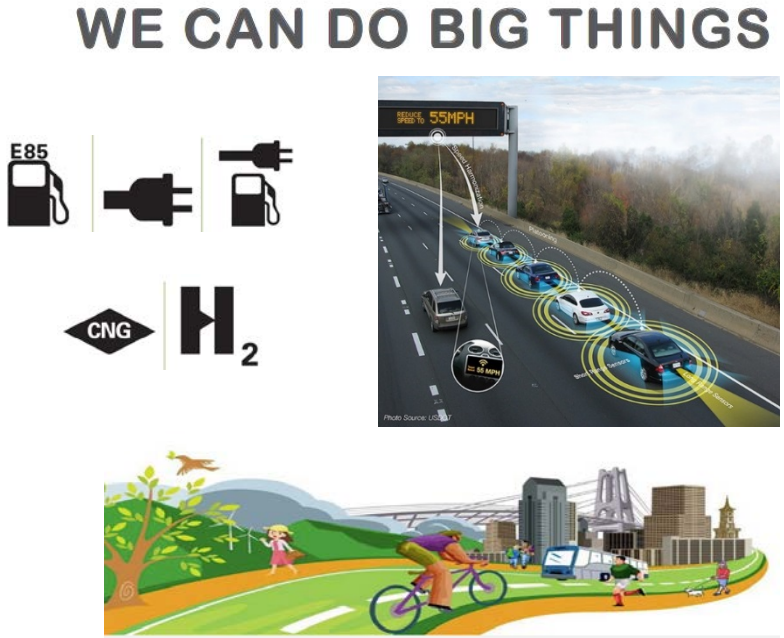
Determination

Patience

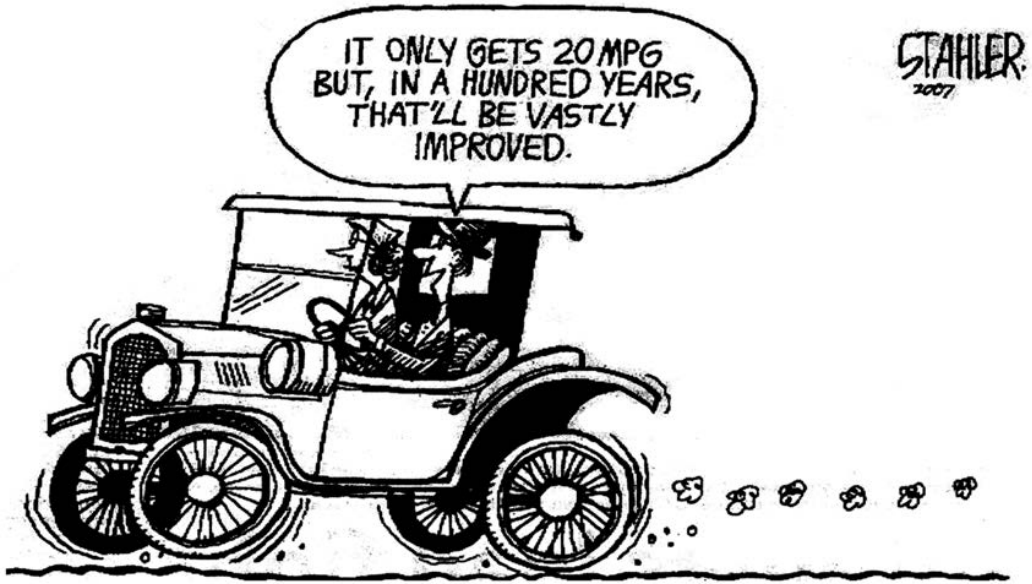
Cooperation

We Have the Imagination





Auto Industry will change more in the next 10 years than in the last 100



"Regulatory and marketplace demands with respect to ***fuel efficiency****, connectivity, and safety … may well herald a new* ***golden age of automotive innovation****"*

BCG: Accelerating Innovation: New Challenges for Automakers (January 2014)

What does the future hold …
Empty Shelf or Smorgasbord?

OR

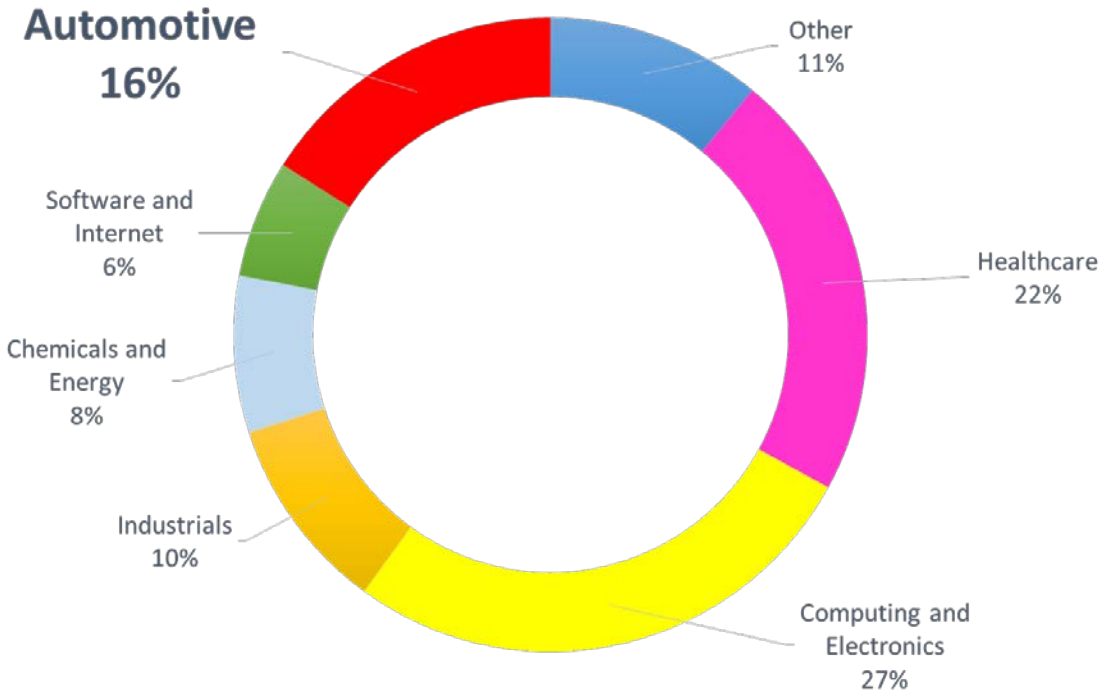
"*Yet maintaining the current pace of emissions reductions will be challenging because automakers have exhausted available technologies to reduce emissions, leaving "nothing sitting on the shelf*"
Alliance of Automobile Manufacturers, Automotive News, March 26, 2015

"We've got a whole smorgasbord or buffet of technology that can be implemented"

Mark Reuss, GM President of North America, Automotive News, February 5, 2011

Auto industry ranks 3rd largest sector for global R&D investment

Auto R&D Budget
> $100 Billion/year
(>$270 Million/day)



Source: Booz & Co.

Thompson Reuters lists Fuel Economy among the 5 "hottest areas" of automotive innovation

TABLE 1: HOTTEST AREAS OF AUTOMOTIVE INNOVATION

TOPIC AREA	DEFINITION	CATEGORY
Fuel Economy	Also knows as fuel efficiency, or the maximization of the distance traveled on a unit of fuel	Propulsion
Telematics	Global Positioning System technology integrated with computers and mobile communications technology in automotive navigation systems	Navigation
Autonomous Driving	Automobiles that are capable of driving themselves without input from a human passenger	Handling
Driver Assistance	Various systems such as auto braking, lane departure warning, and traffic sign recognition that help the driver become aware of and avoid road hazards	Safety & Security
Heads-Up Displays (HUDs)	Systems for displaying data from a smartphone to the windshield of an automobile so a driver can keep his/her eyes on the road	Entertainment

Table 2–*List of Hot Topic Areas, Definitions, and Corresponding Categories*
Source: *Thomson Innovation & Thomson Reuters Derwent World Patents Index*

"*Technology is most certainly playing a key role in developing next generation automobiles that will be more fuel efficient, safer, and fun to drive.*"

Powertrain suppliers have a key role – and opportunity – to lead innovation

"CAFE regulations are driving just about every innovation activity [in the automotive industry]."
Andy Pontius, Faurecia Chief Technologist, SAE Automotive Engineering, July 2015

Automotive News PACE AWARD

EY Building a better working world

TRC Transportation Research Center Inc.

7th Annual
GLOBAL AUTOMOTIVE INNOVATION CHALLENGE
sponsored by SAE, MIT Alliance of MI, and NextEnergy

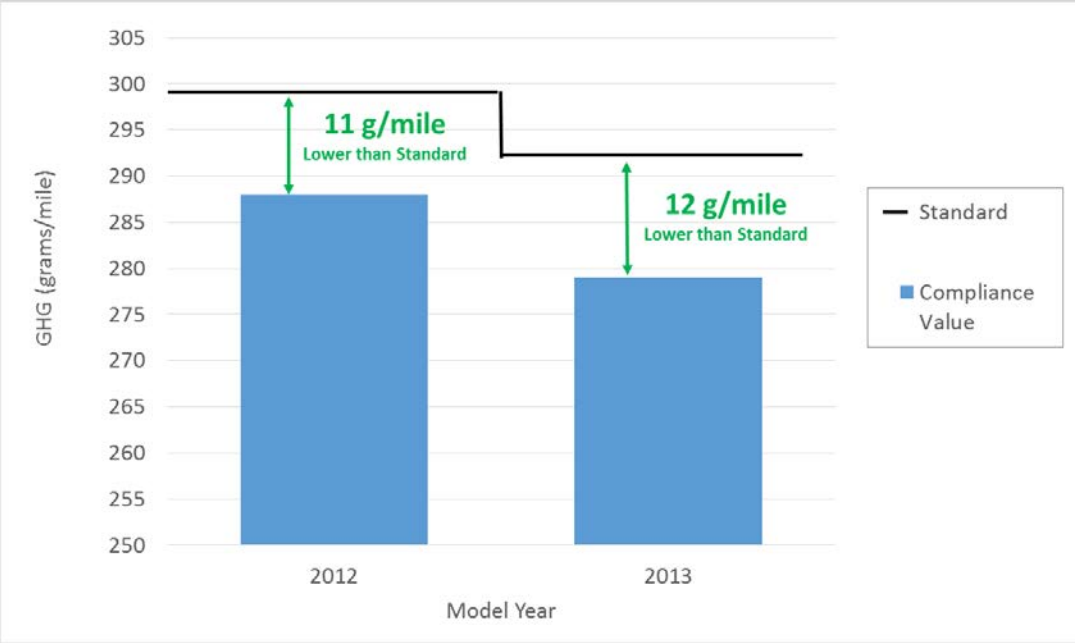
Half of the 2015 PACE awards (7 of 14) went to supplier innovations to improve fuel economy

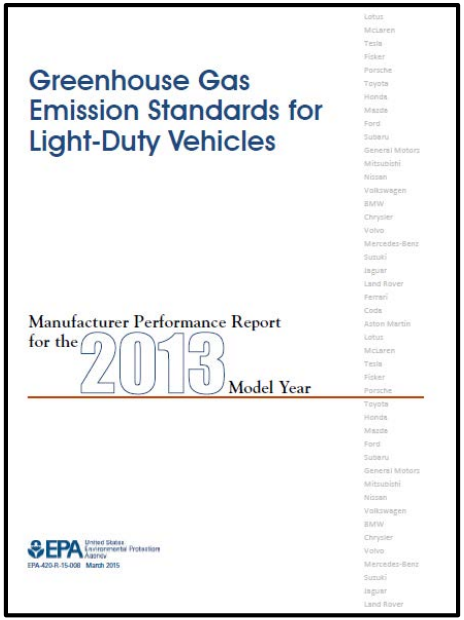
> "*A new level of efficiency is being achieved with basic science -- new materials and electronics*"
> J. Ferron, Director of Judging, PACE Awards

Half of the Global Automotive Innovation Challenge awards (6 of 12) were also related to fuel economy technologies

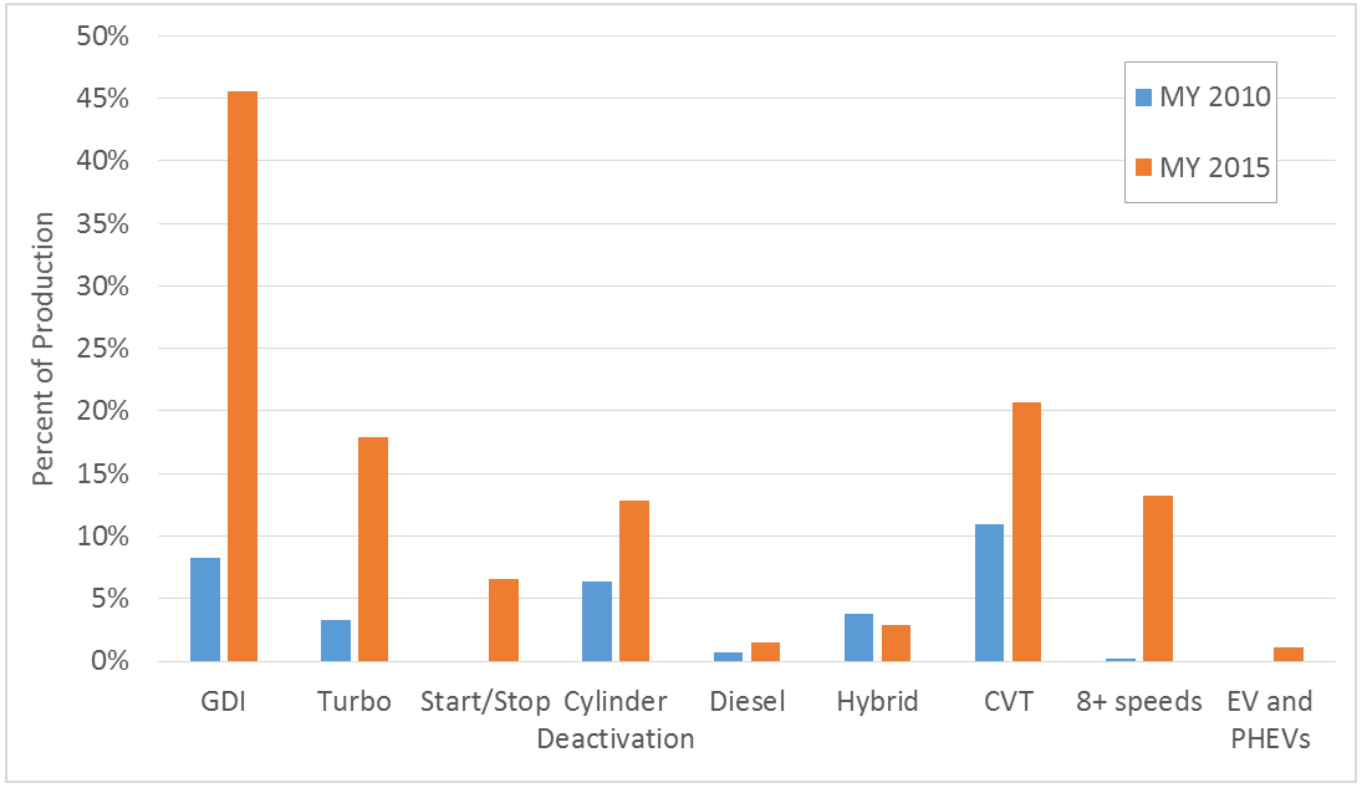
GHG Compliance … Good News So Far

- Automakers beat standards first two years
- Widespread use of credit flexibilities



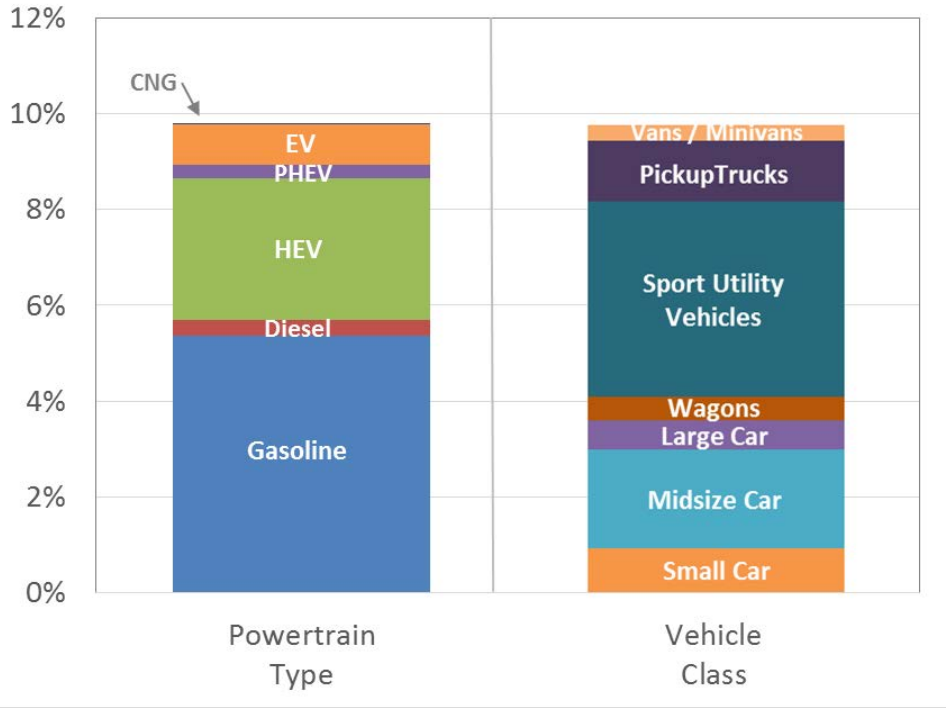


Manufacturers are aggressively adopting technology

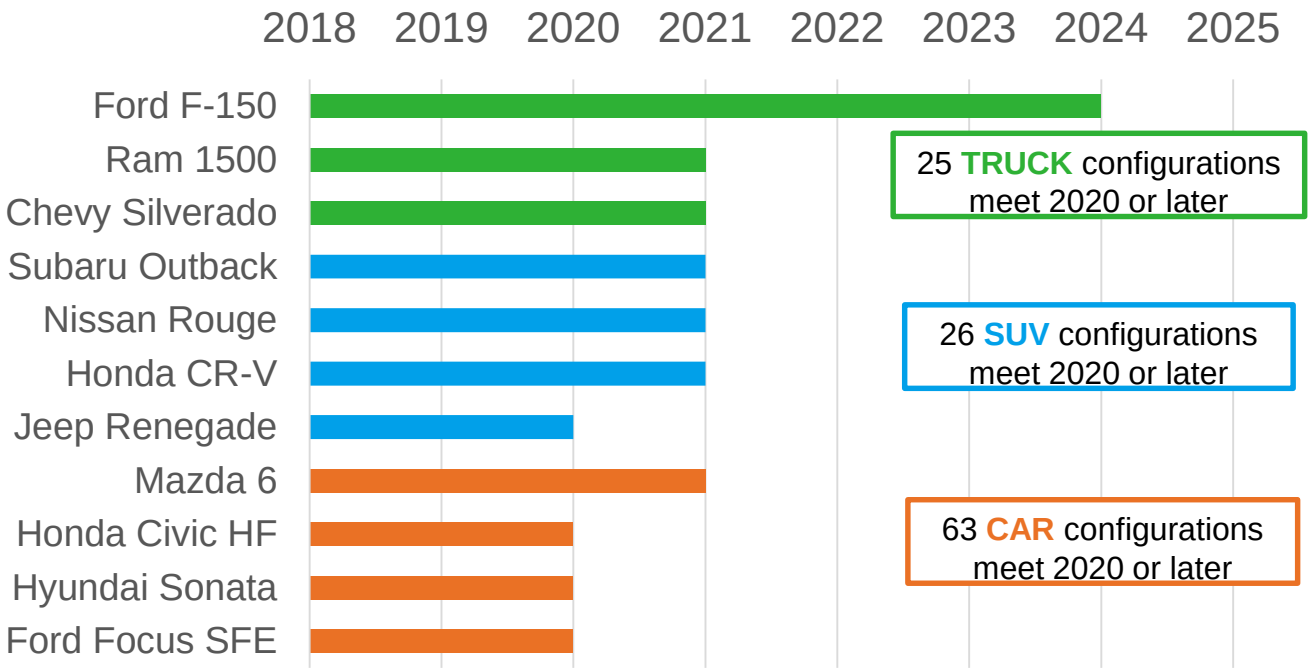


Vehicles are meeting future standards -- with mostly gasoline powertrains, across segments

MY2015 Fleet Volume That Meets MY2020 Standards



Many of today's top-selling vehicles* can already meet future standards



25 **TRUCK** configurations meet 2020 or later

26 **SUV** configurations meet 2020 or later

63 **CAR** configurations meet 2020 or later

**At least one variant of vehicle model*

Vehicles are meeting future standards with a variety of technologies

		Trucks			SUVs				Cars			
		Ford F-150	Ram 1500	Chevy Silverado	Subaru Outback	Nissan Rouge	Honda CR-V	Jeep Renegade	Mazda 6	Honda Civic HF	Hyundai Sonata	Ford Focus SFE
Engine	Diesel		X									
	Turbocharging	X						X			X	X
	High Compression Atkinson								X			
	GDI	X		X			X		X		X	X
	Cylinder Deactivation			X								
	Stop-start	X										
Transmission	8+ Speed Transmissions		X									
	CVT				X	X	X			X		
Road Loads	Mass Reduction*	X					X		X			
	Tires**		X			X	X		X	X	X	
	Aero**	X	X	X							X	X

*compared to MY2008 curb weight
** Top 25% of class + other active/passive features

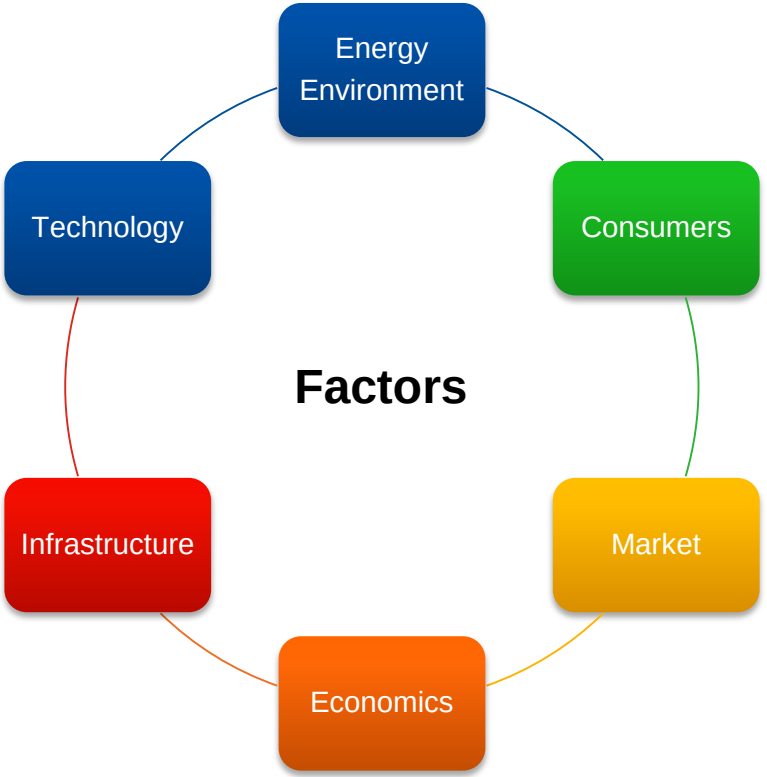
NAS Report on Fuel Economy Technologies

The National Academies of SCIENCES • ENGINEERING • MEDICINE

- **Comprehensive study – good early input to MTE process**
- **Consistent with the Agencies' 2012 rule analysis, affirmed that 2025 standards can be met through advanced gasoline vehicle technologies**
- **Many recommendations in line with our research plan already underway, others help prioritize**

Midterm Evaluation – Overview

- **Technical review of longer term standards for 2022-2025**
- **In coordination with NHTSA and CARB**
- **EPA's decision could go one of 3 ways:**
  - Standards remain same; more stringent; less stringent



Midterm Evaluation – Technology Assessment

- **Advanced technology assessment**
- **Mass reduction feasibility/cost study**
- **Cost teardowns**
- **Modeling tools**
- **Collaboration: NHTSA, CARB, DOE, Canada**

Midterm Evaluation – Powertrain Benchmarking

- Testing 20+ vehicles/engines across a wide range of powertrains and segments
  - Cars, SUVs, pickups
  - Naturally aspirated and boosted engines
  - Gasoline and diesel
  - I4 and V6 engines
  - 6 and 8+ speed AT/DCT transmissions and CVTs

Midterm Evaluation – Market Research

- Vehicle sales
- Fleet mix changes (cars v. trucks)
- Technology penetration in fleet
- Consumer satisfaction surveys
- Automotive reviews

Automotive Reviewers Like Fuel Economy Technologies

- **EPA study finds 4 out of 5 mentions of MY 2014 FE technologies in auto reviews have positive or neutral ratings**
- **For all technologies, positives outweigh negatives**
- **Most positives (80-100%)**
  - active aero, mass reduction, cylinder deactivation, LEDs, GDI, turbocharging
- **Least positive (but still >50%)**
  - CVTs and stop-start
- **But no universal issues with technologies -- some manufacturers implementing better than others**

edmunds.com

CAR AND DRIVER

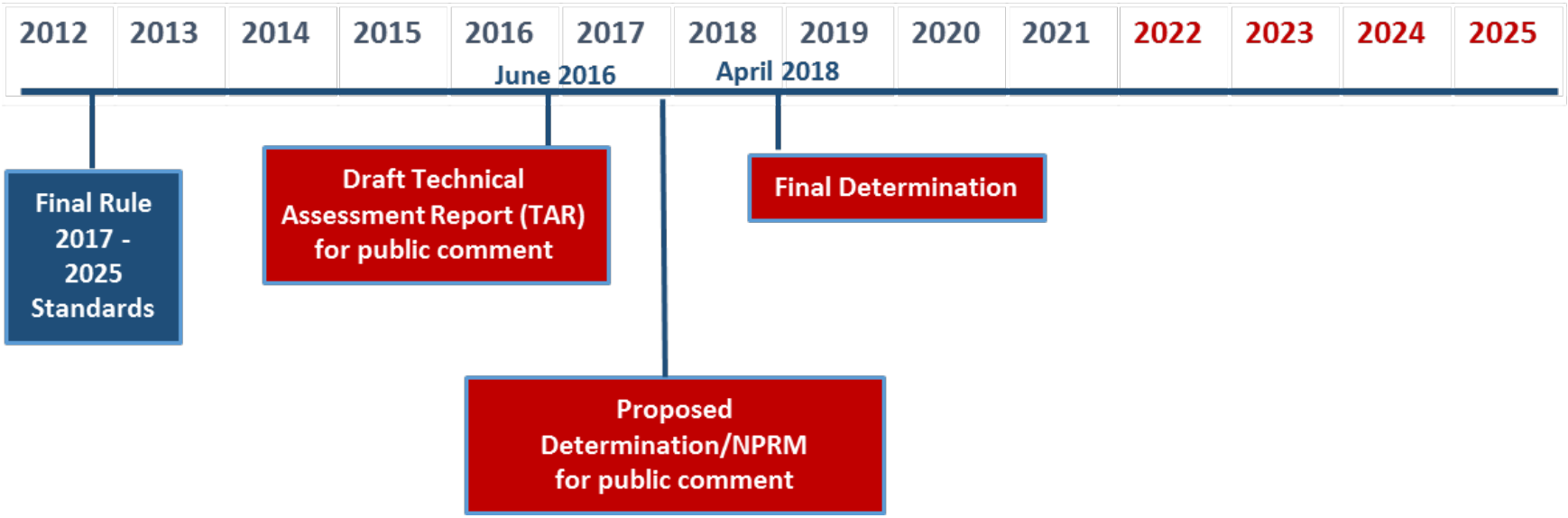
AutoTrader

Automobile magazine

MOTOR TREND

Consumer Reports

Midterm Evaluation Timeline



Going forward

- **Extensive stakeholder outreach**
- **Data-driven**
- **Transparent: we'll share results of technical work along the way**

www.epa.gov/otaq/climate/mte.htm

“There is such a thing as being too late when it comes to climate change.”

- President Obama, August 3, 2015