Cleantech Policy in an Age of Energy Abundance

A View From the OEM Perspective…

Mitch Bainwol
Alliance of Automobile Manufacturers

Who Makes Up the Alliance?

BMW, Chrysler, Ford, General Motors, Jaguar Land Rover, Mazda, Mercedes-Benz, Mitsubishi Motors, Porsche, Toyota, Volkswagen, Volvo

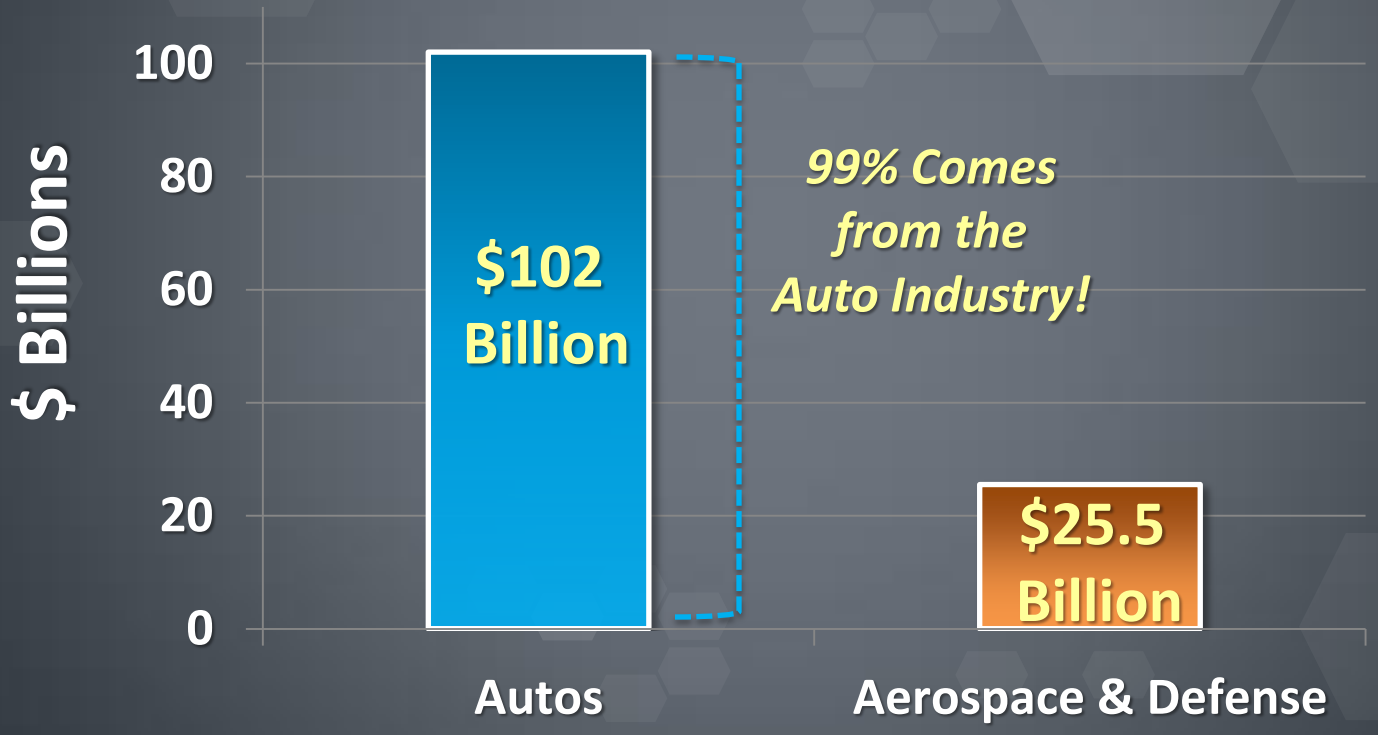
Big Picture Points:

1. Massive and consequential innovation
2. Converging societal benefits
3. Commitment to One National Program
4. Consumers “economic” not altruistic

Setting the Context: Enormous R&D

Auto Sector R&D Has Been Profound

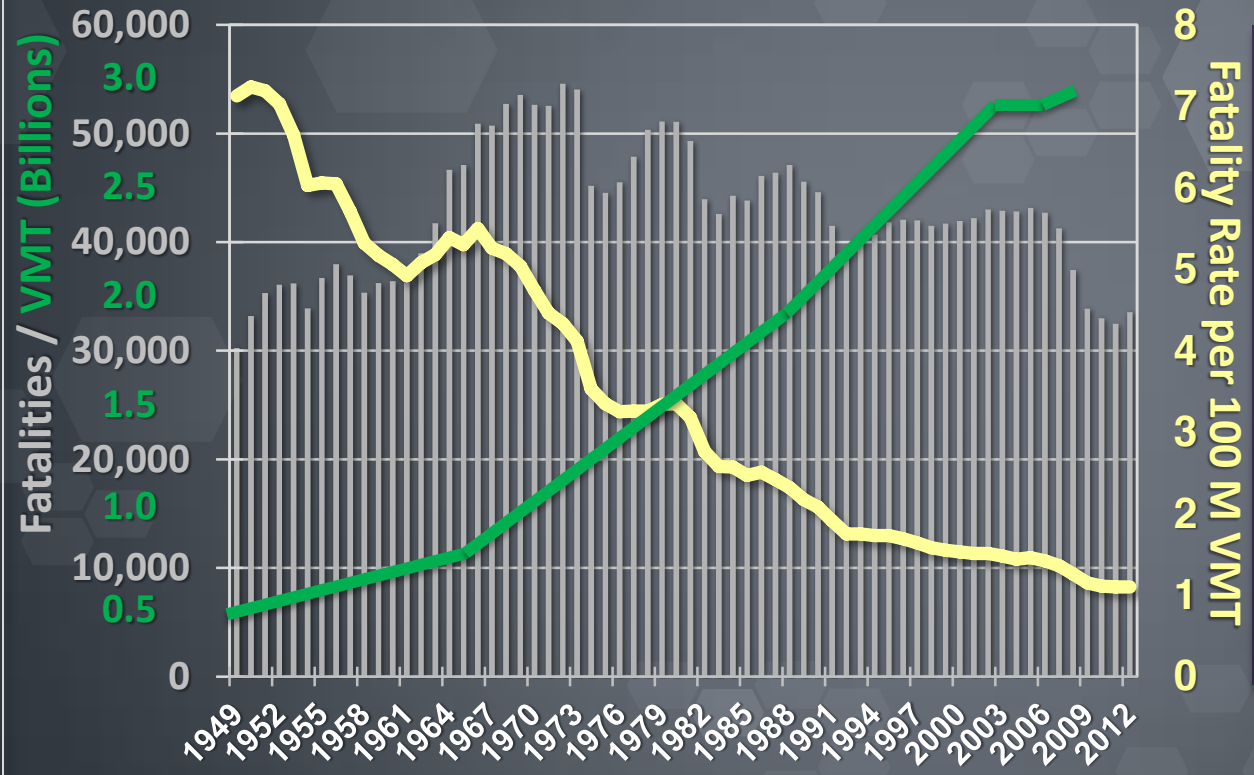
Amount Spent Annually on R&D in 2013



OEMs = Top Innovators

- Boston Consulting Group found half of world's "Most Innovative Companies" are automakers (9 of top 20)
- More automakers on the list than technology & telecom companies
- Booz & Co.'s survey of annual global R&D expenditures also found five automakers among the top 20 in corporate R&D spenders.
- INNOVATION includes AVs, connected cars and a range of driver assists that will yield profound societal gains

Innovation Saving Lives

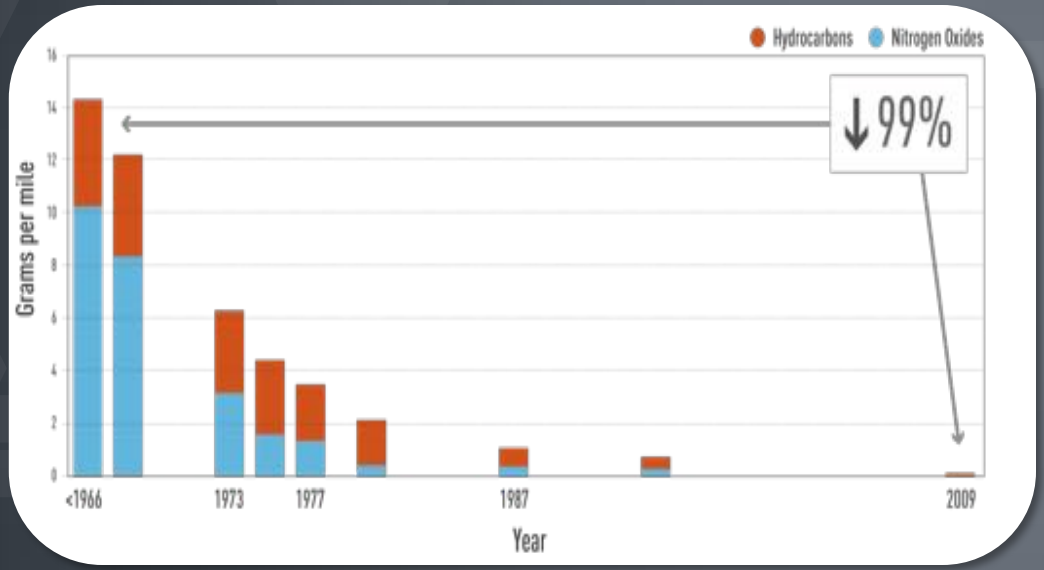


- Fatalities are at 1950s level
- Miles traveled much higher
- Fatalities as share of VMT = a multi decade pattern of massive safety gains
- As we move from crash worthiness to avoidance, we are entering a golden age of safety advances
- Technology is key

VMT (Billions) | Fatality Rate (per 100 million VMT) | Fatalities

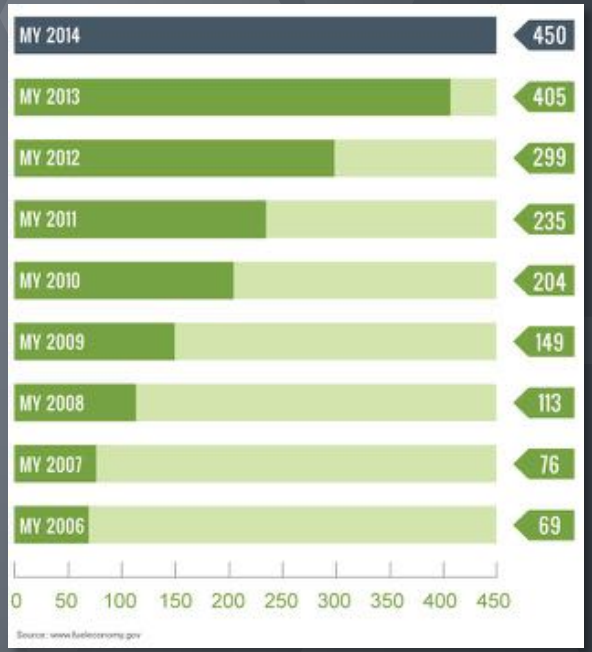
And Huge Environmental & Fuel Economy Gains

Cars are 99% Cleaner Today



Automakers have reduced smog-forming emissions like hydrocarbons dramatically since the 1960s

30+MPG Vehicles Available



Automakers increased high mileage vehicle choice by 552% in 8 years

“Convergence”

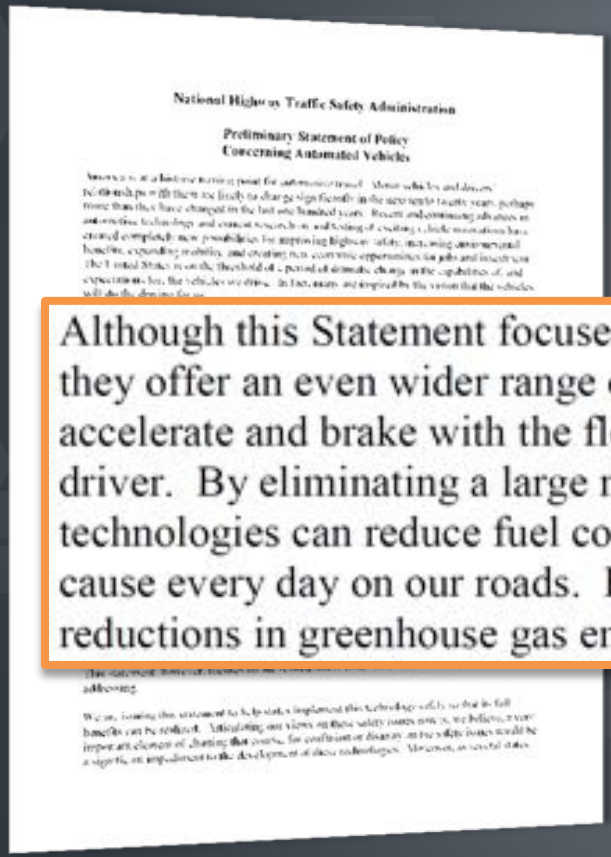
How It Use To Be…

Safety vs. Environment

How it is Today: Safety = Green

- Adaptive Cruise Control
- Real-Time Navigation
- Automatic Braking
- Driver Information Technologies
- Autonomous Cars

NHTSA Highlights Fuel/GHG Benefit of Automation


National Highway Traffic Safety Administration

Preliminary Statement of Policy
Concerning Automated Vehicles

Although this Statement focuses on the enormous safety potential of these new technologies, they offer an even wider range of possible benefits. Vehicle control systems that automatically accelerate and brake with the flow of traffic can conserve fuel more efficiently than the average driver. By eliminating a large number of vehicle crashes, highly effective crash avoidance technologies can reduce fuel consumption by also eliminating the traffic congestion that crashes cause every day on our roads. Reductions in fuel consumption, of course, yield corresponding reductions in greenhouse gas emissions. To the extent vehicles can communicate with each

Driver Assists and Automation =

A report by MIT estimates that a 20 percent reduction in accelerations and decelerations should lead to a 5 percent reduction in fuel consumption and carbon emissions.

The Texas Transportation Institute estimates that, in 2011, congestion in 498 metropolitan areas caused Americans to travel 5.5 billion hours more and buy an extra 2.9 billion gallons of fuel for a congestion cost of $121 billion.

The Federal Highway Administration estimates that 25 percent of congestion is attributable to traffic incidents, around half of which are crashes.

Driver Assists and Automation =

Morgan Stanley

After analyzing government data, Morgan Stanley observed, "to be conservative, we assume an autonomous car can be 30 percent more efficient than an equivalent non-autonomous car. Empirical tests have demonstrated that level of fuel savings from cruise control use/smooth driving styles alone. If we were to reduce the nation's $535 billion gasoline bill by 30 percent that would save us $158 billion.

ITS AMERICA

Extrapolating from several case studies and research papers, ITS America evaluates the cumulative fuel savings from a variety of technologies for light and heavy-duty vehicles, including:

- Vehicle Technologies could save 110 million barrels of oil or 20 million metric tons of CO_2 over a 10-year period.
- Traveler Information Technology could save 420 million barrels of oil or 70 million metric tons of CO_2 over a 10-year period.
- Infrastructure and Systems Operations could save 119 million barrels of oil or 19 million metric tons of CO_2 over a 10-year period.

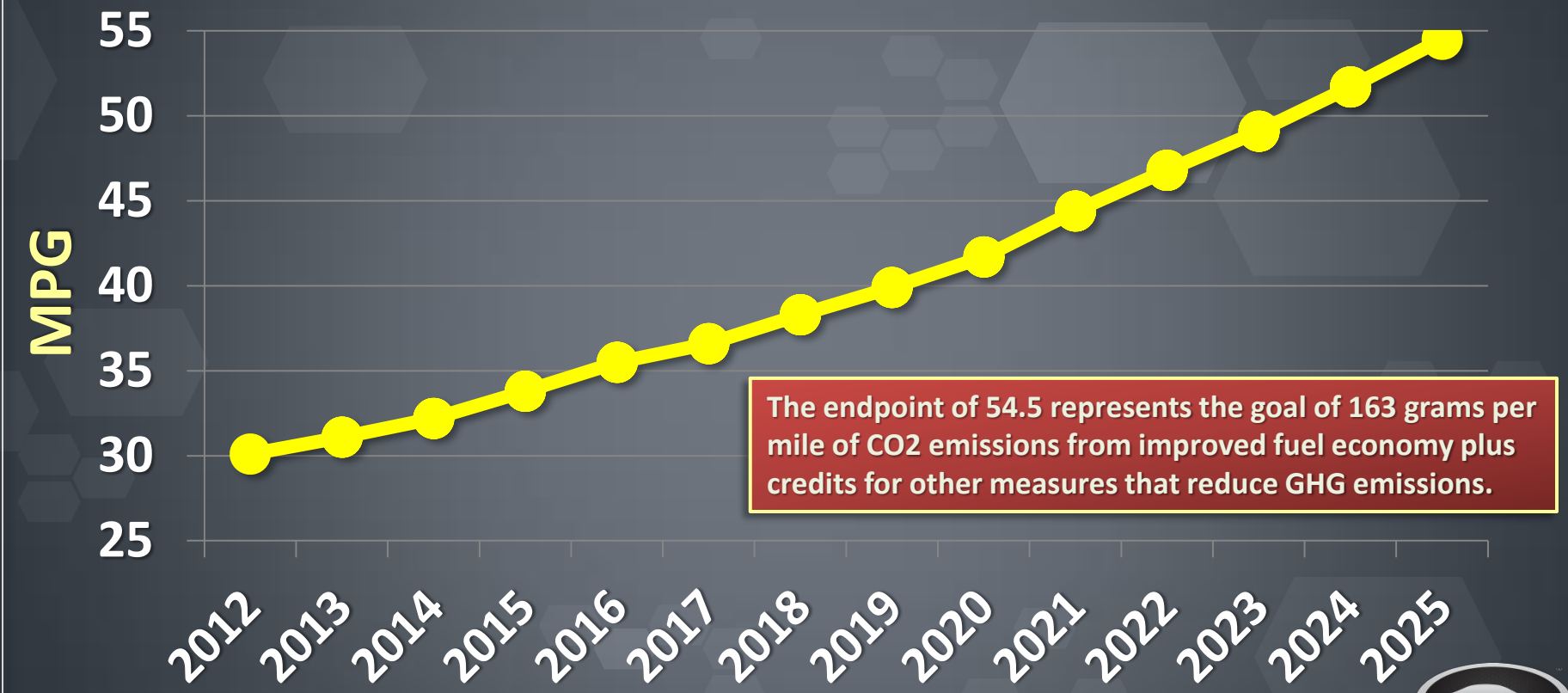
One National Program?

The Big CAFE Deal of 2011

- Cumulative cost of implementing Standards: $200 billion
- Yet OEMs embraced agreement because:
  - ✓ Single national program wraps in EPA, NHTSA & California
  - ✓ DNA of industry is to keep innovating
  - ✓ Agreement includes a midterm review to adjust if necessary

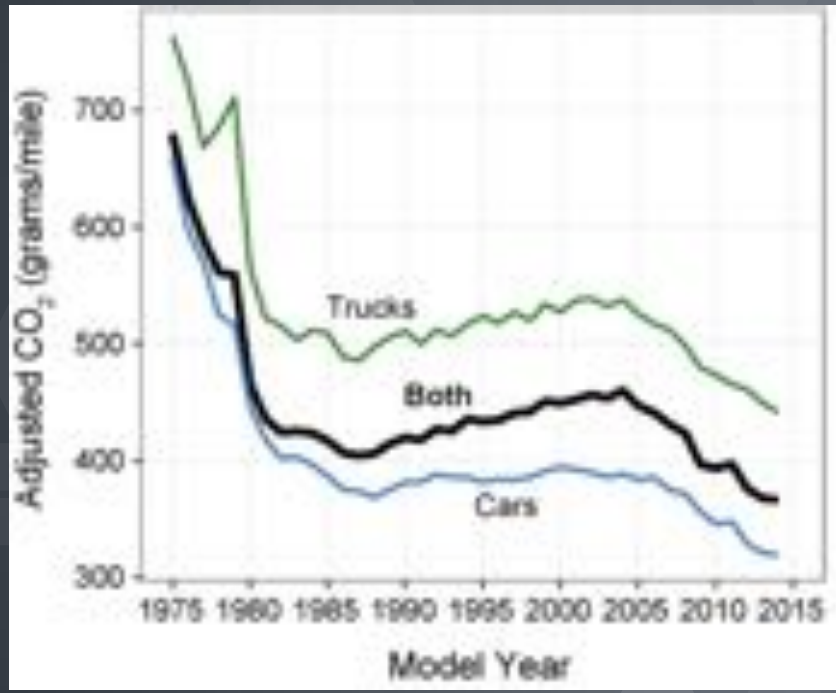
    (agencies to decide if changes warranted by 11/17; changes specified by 4/18)

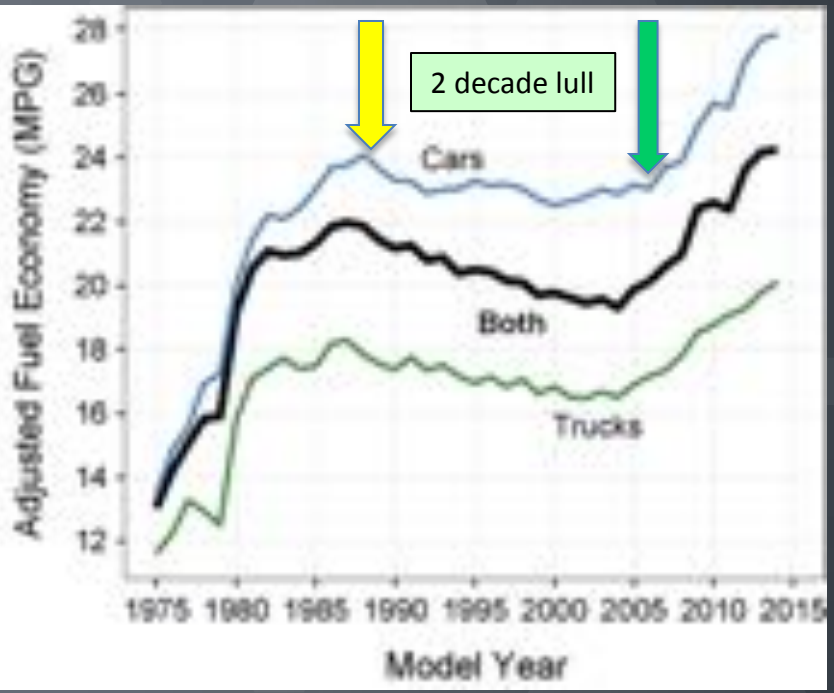
2012-2025 GHG Goal Expressed in Miles Per Gallon



The endpoint of 54.5 represents the goal of 163 grams per mile of CO_2 emissions from improved fuel economy plus credits for other measures that reduce GHG emissions.

So How Are We Doing on GHG and Fuel Economy?





Source: 2014 EPA Trends Report

EPA Chief Gives Automakers 'A' for Fuel Economy Effort

"If we don't quite get there … it is not going to be the fault of those companies... They are trying hard. They are working. They are investing."

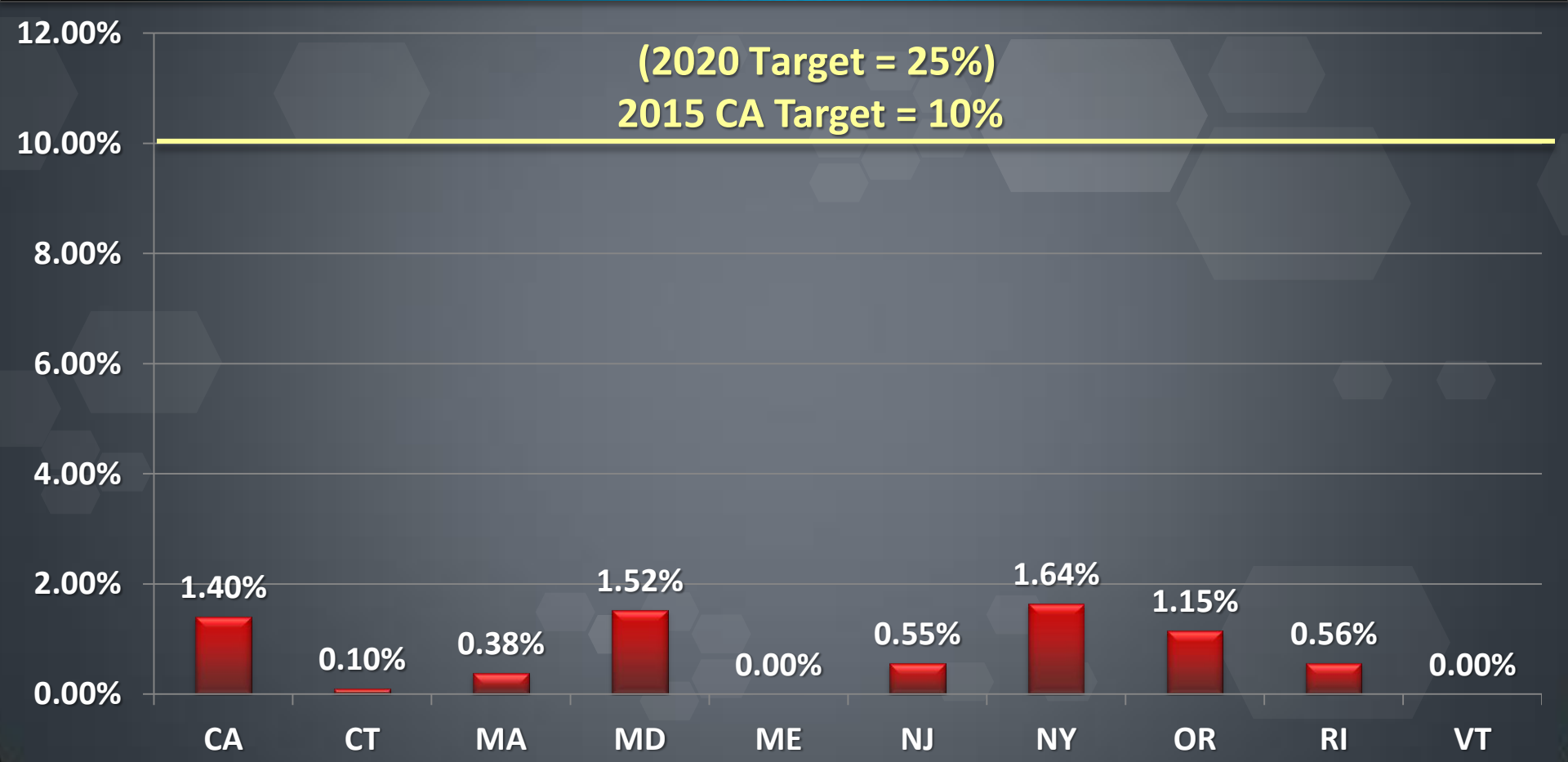
Gina McCarthy
EPA Administrator
January 13, 2014

CAFE Is National - ZEV is California Plus

- California has a separate ZEV mandate that nine other "CA LEV" states follow
- Under the mandate, by 2025, 15.4% of sales in those states will have to be PHEVs, BEVs or FCVs
- Compliance with both ZEV mandate and the GHG/CAFE rules is challenging and potentially contradictory
- ZEV states are developing "action plans" to incent consumers
- OEMs want success – invested billions – yet mandate is ambitious and may not have the infrastructure / incentives to work

Is Government Practicing What it Preaches?

Data from R.L. Polk



Key Issues of the Mid-Term Evaluation

- Technology Advances and Costs
- Payback Period and Incremental Vehicle Costs
- Trends In Consumer Demand/Preferences
- Fuel Pricing
- Market Penetration of Fuel Efficient Technologies
- Availability of Alternative Fuels/Recharging Infrastructure
- Mass Reduction Methods
- Impacts on Employment
- Other Factors

“Rational” Consumer Behavior?

The EPA Perspective Heading Into The Midterm

2014 NADA
New Car Shopper Survey

Ranking of Factors Considered during New Car Purchase		
Factor	Avg. Rank	Rank
Fuel Economy	3.0	1
Cost of Ownership	3.8	2
Power & Performance	4.2	3
Advanced Safety Systems	4.8	4
Versatility & Utility	5.2	5
Build Quality & Reliability	5.8	6
Vehicle Design	6.1	7
Environmental Impact	6.6	8
Brand	7.4	9
Technology	8.2	10

With 64% of participants selecting it as important or very important, Fuel Economy received only the fourth-highest number of votes, but when forced to rank all ten factors against one another, fuel economy was clearly the top factor.

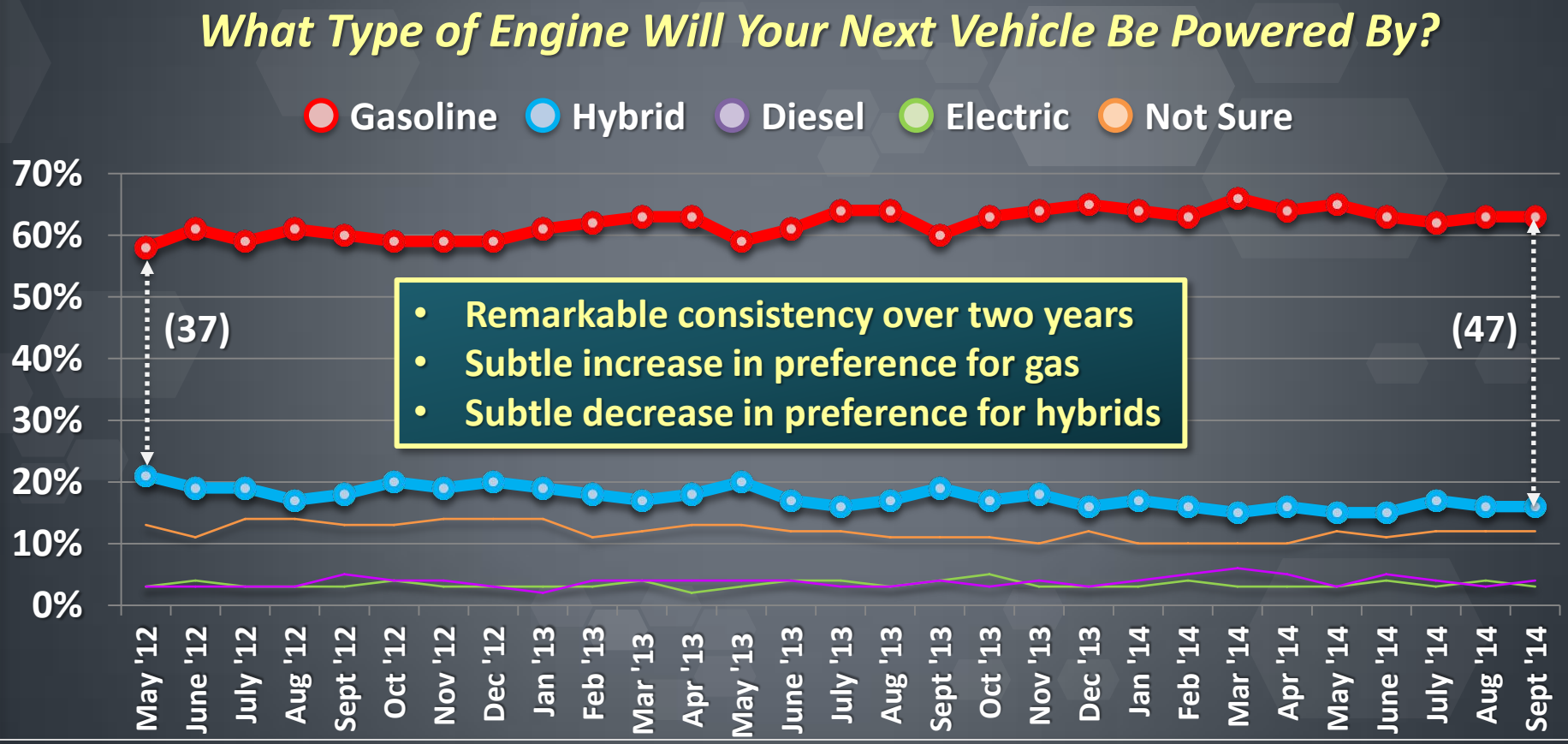
- Automakers are flourishing "thanks to our rules"
- "Consumers are on board"

Consumers See CAFE as Pretty Aggressive

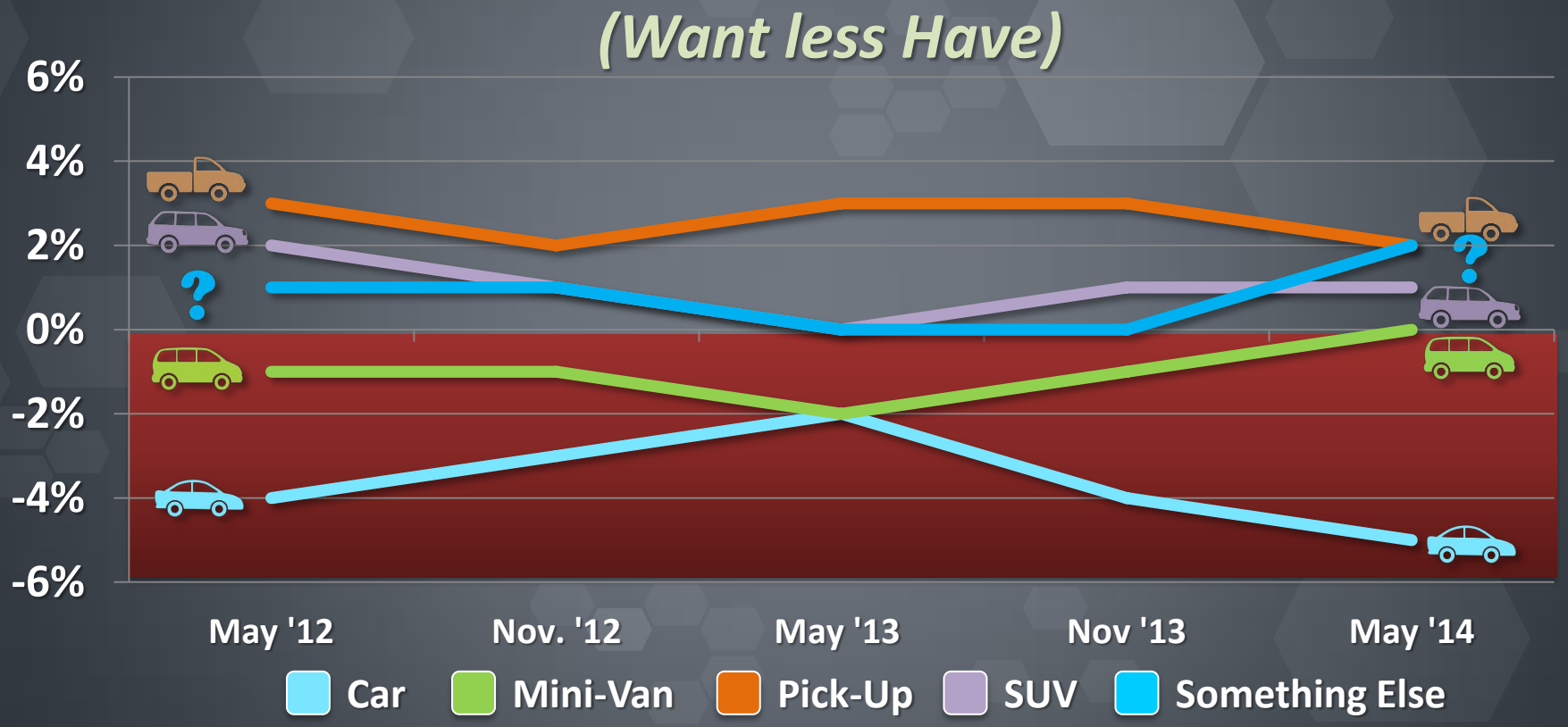
Which best reflects your view about the federal government requiring automakers to build cars that reach 54.5 mpg by 2025?

		Republican	Democrat
34%	Too aggressive	47%	23%
41%	About right	33%	51%
16%	Not aggressive enough	12%	19%
9%	Not sure	8%	7%

Success with Gas Powertrains Inhibits Appetite to Switch?



And Consumers Want More Pick-ups / SUVs



Bunch of Factors Motivating Consumers…

Historically, Fuel Economy importance and the price of gas in the US have been directly connected. Customers have felt (and complained) of pain when operational costs increase.

However, in recent years, even though gas price has been more stable, there has been an increase in demand of all aspects of Value.

Purchase Reasons *(% Extremely Important - Top Box)*

Model Year	Warranty Coverage	Technical Innovations	Value for the Money	Fuel Economy	Price of Gas
2014	56%	44%	64%	50%	$3.38
2013	52%	34%	59%	45%	$3.49
2012	49%	30%	55%	45%	$3.60
2011	45%	26%	53%	39%	$3.56
2010	46%	24%	60%	37%	$3.07
2009	48%	26%	59%	39%	$2.13
2008	48%	27%	57%	49%	$3.57
2007	45%	31%	46%	43%	$2.39
2006	44%	31%	48%	42%	$2.24

STRATEGIC VISION

Source: Strategic Vision - 2014 New Vehicle Experience Study (NVES)

Fuel Economy May Not Be a Top Priority

Balancing the vehicle experience with other priorities in one's life, including overall value, are greater considerations for most new vehicle buyers than fuel economy – which places 10th out of the top ten customer attitudes.

Customer Attitudes *(% Extremely Important - Top Box)*

Rank (of 45)	Customer Attitudes	Top Box
1	I prefer a balance of comfort and performance	53%
2	When I drive for fun, I mainly prefer to relax and listen to music or talk	50%
4	I prefer vehicles that provide superior handling and cornering agility	43%
5	Value equals balance of costs, comfort & performance	42%
7	I want [a vehicle] that I love so much that I look forward to nice enjoyable drives	37%
9	I want a vehicle that provides the quietest interior	34%
10	Fuel economy is a leading consideration in my purchase decision	33%

STRATEGIC VISION

Source: Strategic Vision - 2014 New Vehicle Experience Study (NVES)

Altruism Not Terribly Compelling For Most

Other aspects of value and ownership have a greater impact on owners' daily lives, making more removed environmental considerations a sincere — albeit secondary — consideration. Interest in paying significantly more for this is among the least important customer attitudes.

Customer Attitudes *(% Extremely Important - Top Box)*

Rank (of 45)	Customer Attitudes	Top Box
11	Driving is one of my favorite things to do	32%
12	I prefer a vehicle that has the capability to outperform others	30%
13	I need my vehicle to work as hard as I do	29%
14	I prefer vehicles that provide superior straight ahead power	28%
…	…	…
43	I would pay significantly more for environmentally friendly vehicle	8%
45	I really don't enjoy driving	6%

STRATEGIC VISION

Source: Strategic Vision - 2014 New Vehicle Experience Study (NVES)

Technology Comparison

Characteristic	Conventional	PHEV	BEV	FCV
Cost*	~$25,000	$42,818	$42,562	$48,472
Annual Fuel Cost**	$1,150	$550	$400	?
Range (Summer)	350 miles	350 miles	75-100 miles	300 miles
Range (Winter)	350 miles	350 miles	45 miles	300 miles
Refueling Time	5 minutes	5 minutes	4-8 hours	10 minutes
Fuel Stations	120,000	120,000	6,500	10

* Costs based on CARB cost projections

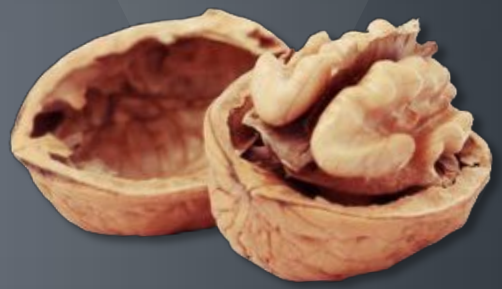
** Assuming 10k miles/year

Customer Questions

Questions	Responses / Readily Available Information
Range	Depends (Freeway, streets, hills, temperature)
Fed. & State Financial Incentives	Known
State Non-Financial Incentives	Known, but importance to customer will vary (e.g., parking, HOV usage)
Local Incentives	Depends on where the customer lives and/or works
Home Charging	Depends (Apartment? Street parking? House? Garage? Current service?)
Cost of Charger	Depends ($495 - $1,500)
Expense to Install Charger	Depends (contractor rates, house layout, age of home, sub-meter, etc.)
Permit	Depends (local jurisdictions can range from 1 hour to 30 days)
Cost to Recharge	Depends on time of charging, local utility rate, rate plan, current usage, sub-meter
Workplace charging	Depends on workplace or close proximity to workplace

In a Nutshell

- The next 11 years will mark an unprecedented time in increasing FE standards.
- Automakers are rapidly adopting new technologies to meet future requirements.
- The success of CAFE and Greenhouse Gas Programs is dependent on consumer adoption.
  - Many options are currently available for the fuel economy conscious buyer
  - Reliability, quality, and durability are the top three purchase reasons.



THANKS