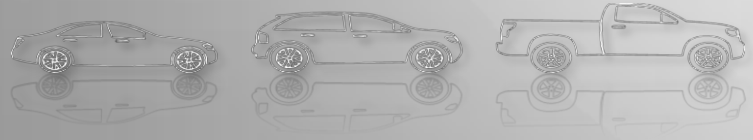
Advancements in Vehicle Technology & Alternative Fuels – OEM Overview

Curt Augustine, Director of Policy & Government Affairs,
Alliance of Automobile Manufacturers

Tri-State Transportation Commission Meeting, 6/17/16

AUTO ALLIANCE



New Vehicle Safety & Technology

Connected Cars & Driver Assists
Automated Vehicle Technology

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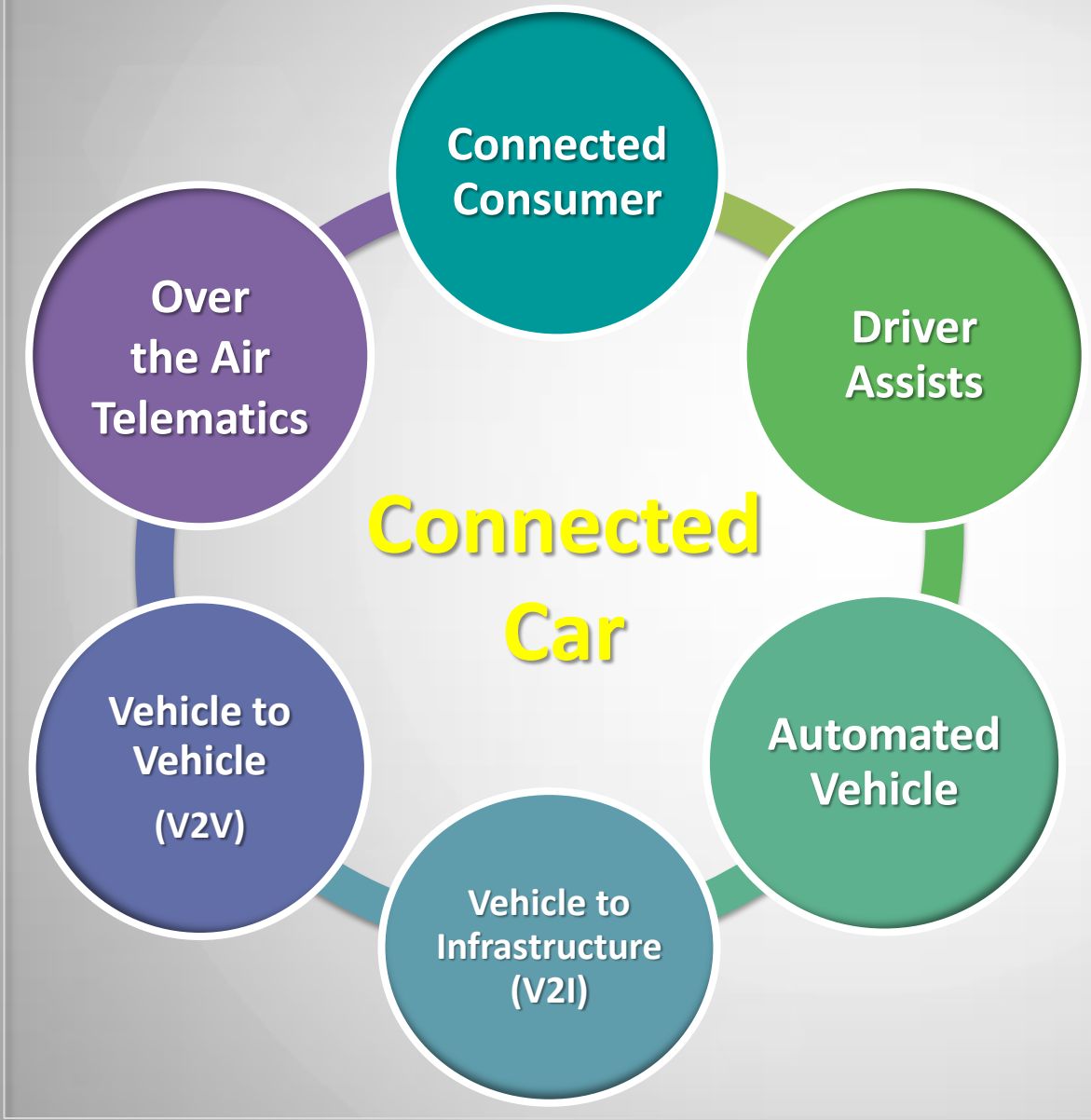
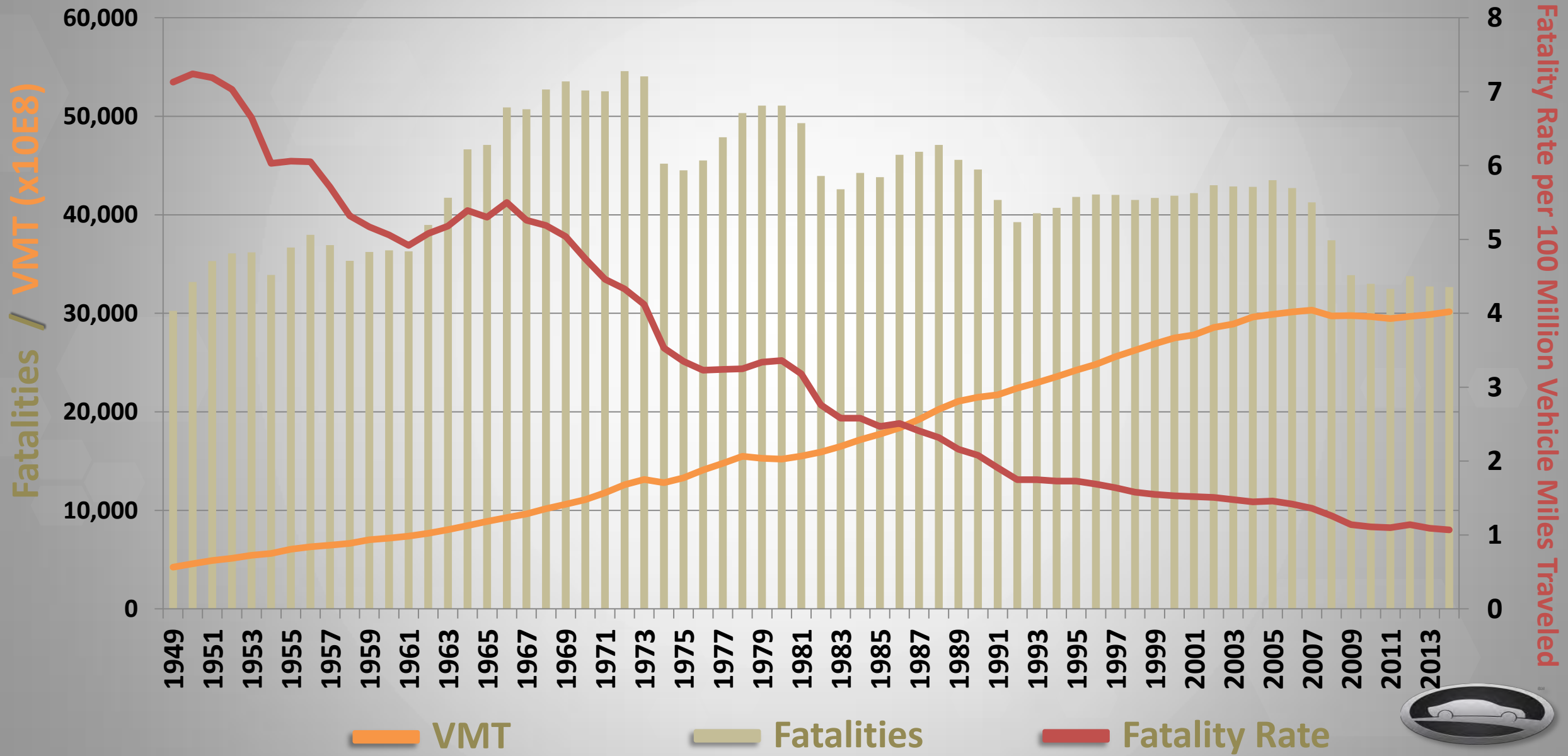
What is the Connected Car?

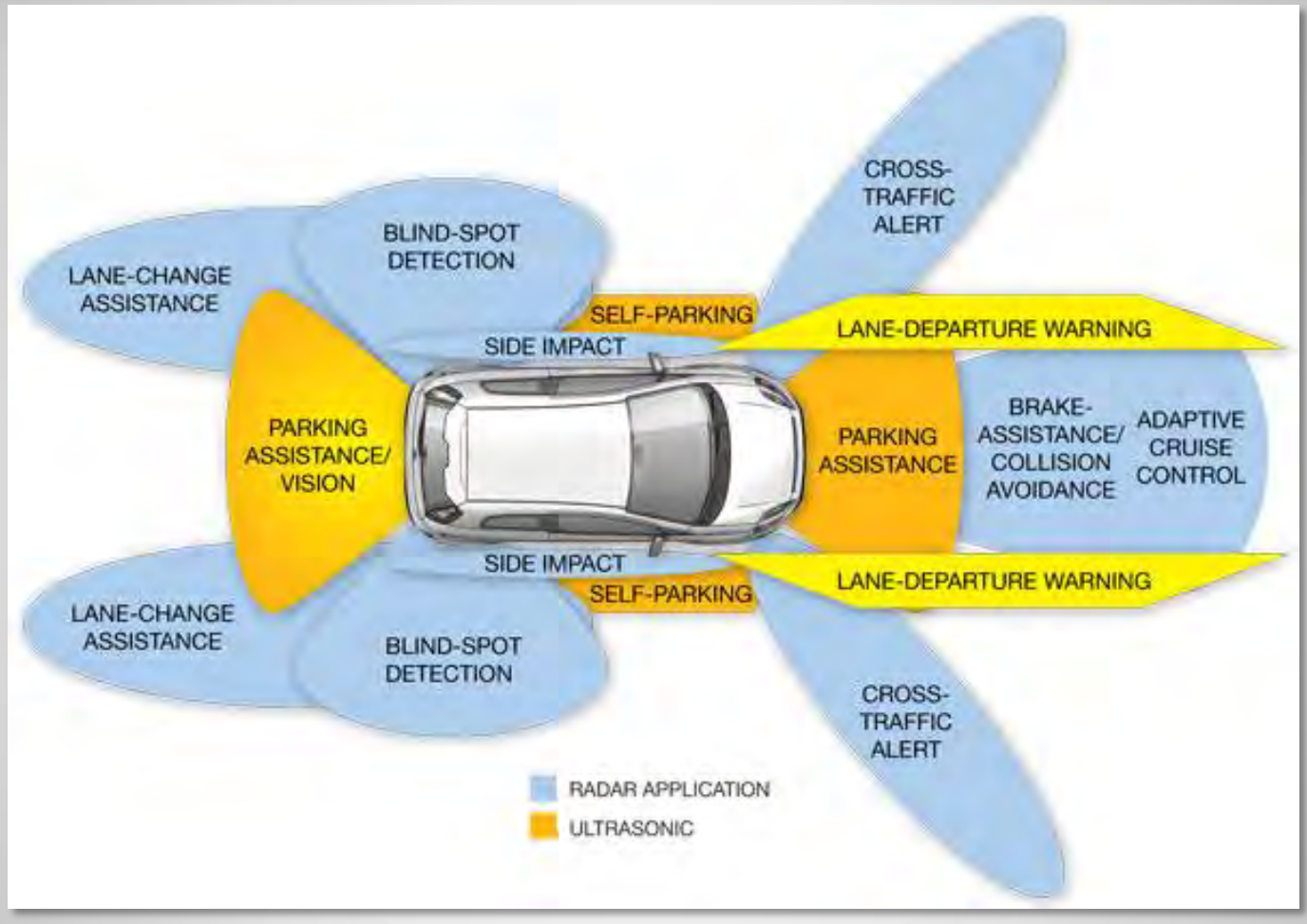


When the car moves from being a closed box to a "mobile device" with the ability to gather data and communicate it, that is a "Connected Car."

Fatality Trend Since 1949-2014 (NHTSA)



Extra Eyes on the Road…and a Co-Pilot Too

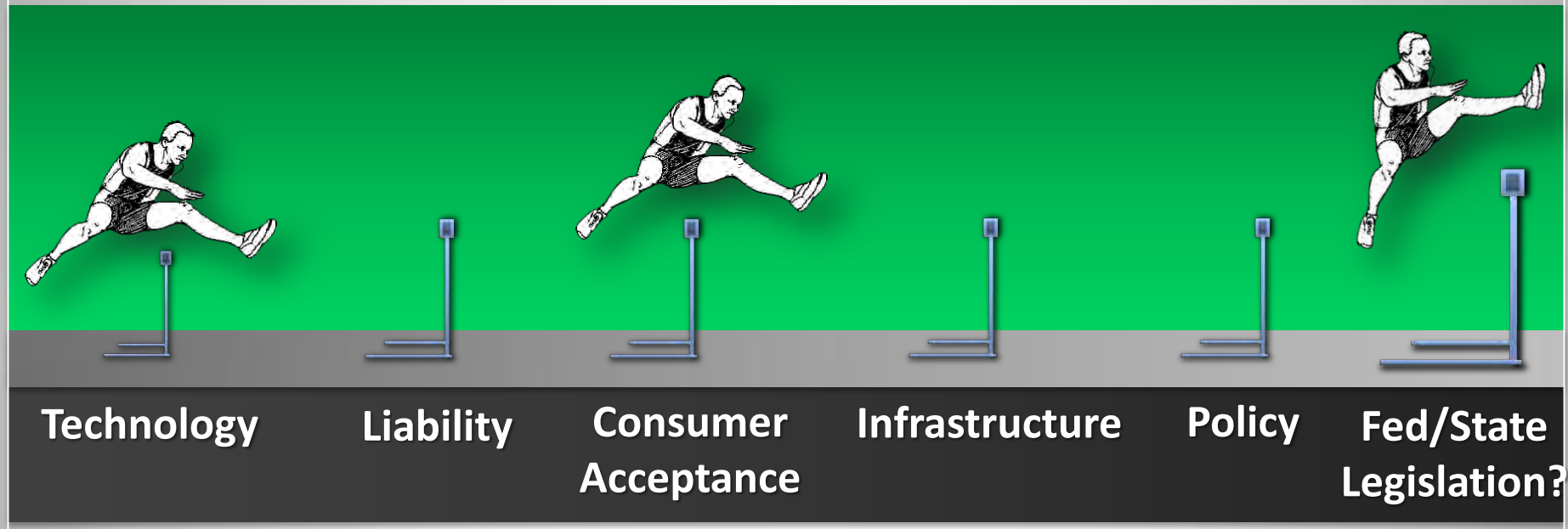


Driver-assistance systems on sale now use ultrasonic sensors, radar, cameras and other technology to provide blind-spot detection, collision avoidance and parking assistance

Future Cars will Talk to each Other

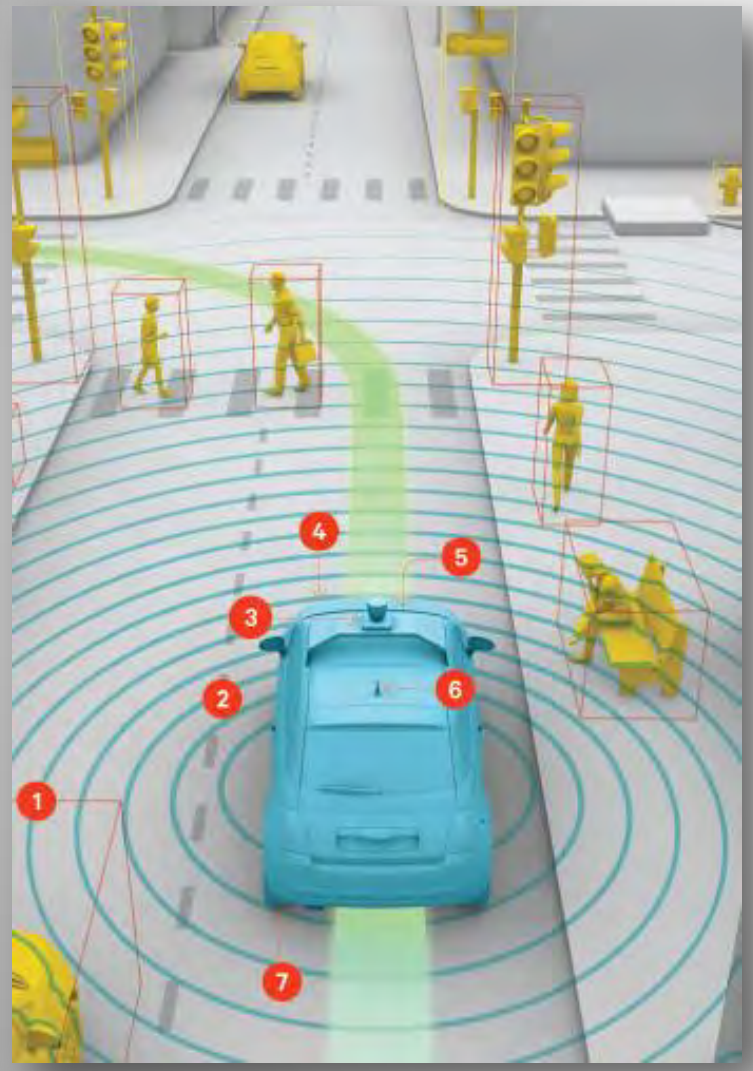
A DOT pilot in Ann Arbor, MI is testing 3000 talking vehicles…stay tuned.

What are the Key Hurdles to Clear?



Connected car technology is here and evolving; challenges are being addressed in many areas including autonomous vehicle safety, cyber-security, privacy and who pays…

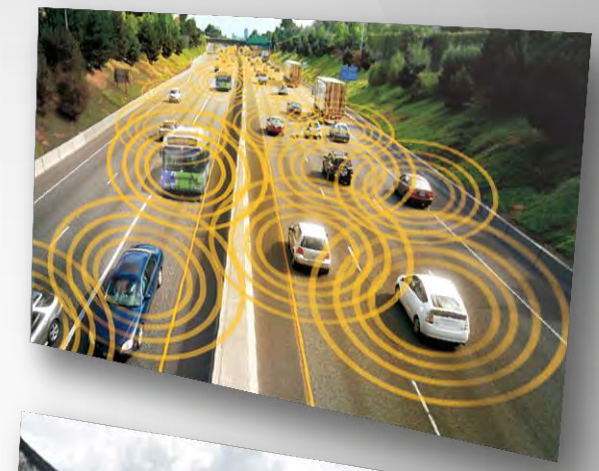
Enabling Auto Technologies

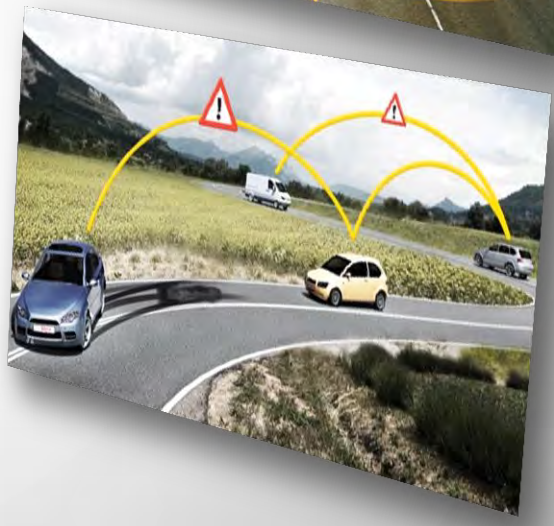


1. **Radar:** Detects objects nearby & in "blind zones"
2. **Lane-keeping Cameras:** Measure contrast between road and lines
3. **LIDAR:** Spinning lasers make a 360° real-time "map"
4. **Infrared Camera:** Detects objects ahead in the day & night
5. **Visible Light Camera:** Detects & predicts movement of objects
6. **GPS Navigation:** Tells the vehicle where to go
7. **Wheel-mounted Sensors:** Measure velocity relative to nearby objects

The Right Policy Framework…

- People expect to be connected everywhere.
- The Connected Car offers social value and provides a safer, more efficient journey.
- Many dimensions must be addressed yet: infrastructure, the FCC spectrum.
- Policymakers should be encouraged to support measures that move us closer to a Connected Car future and all its benefits.





Bottom Line:

Connected Cars = Intelligent Mobility

Advanced Power Trains

Consumer Trends and Consumer Choice…
Dozens of Options

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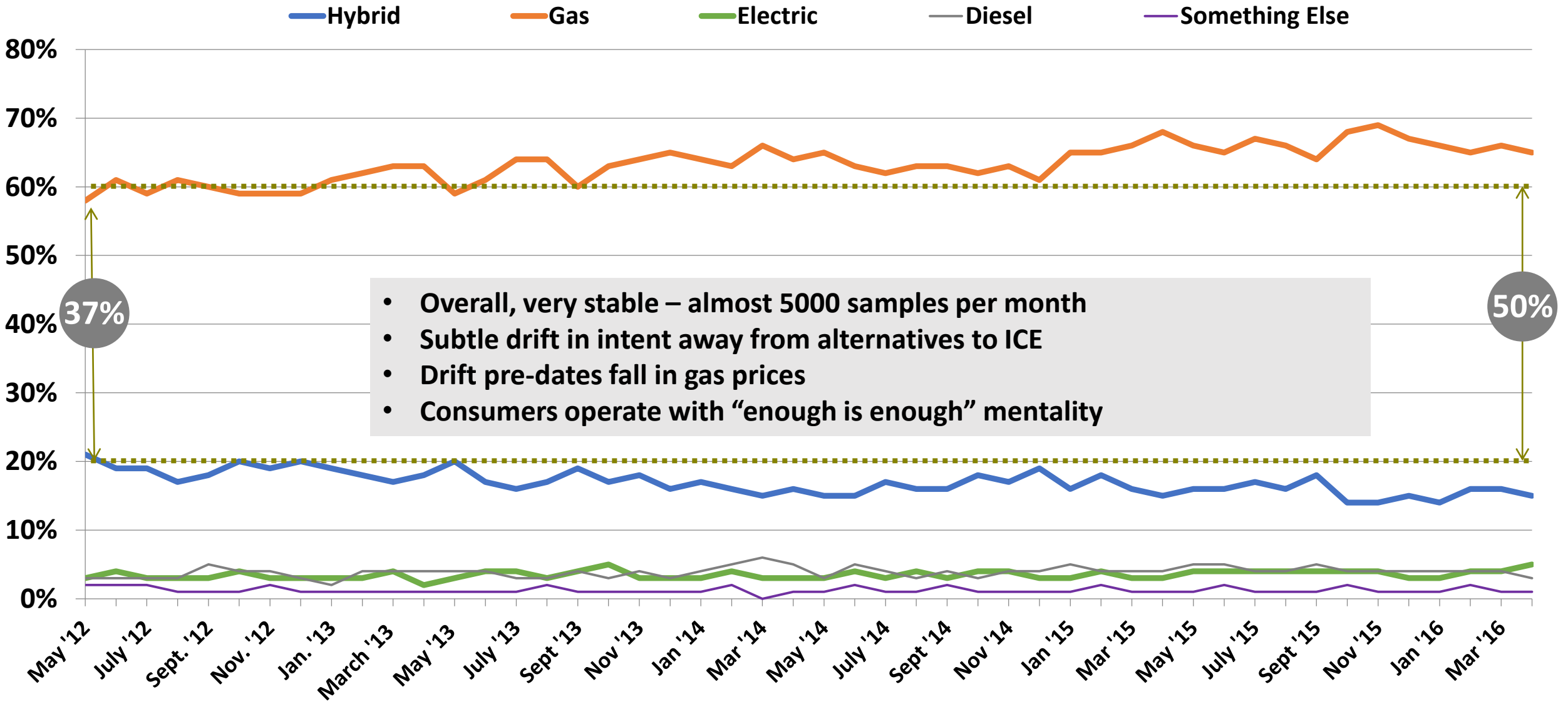
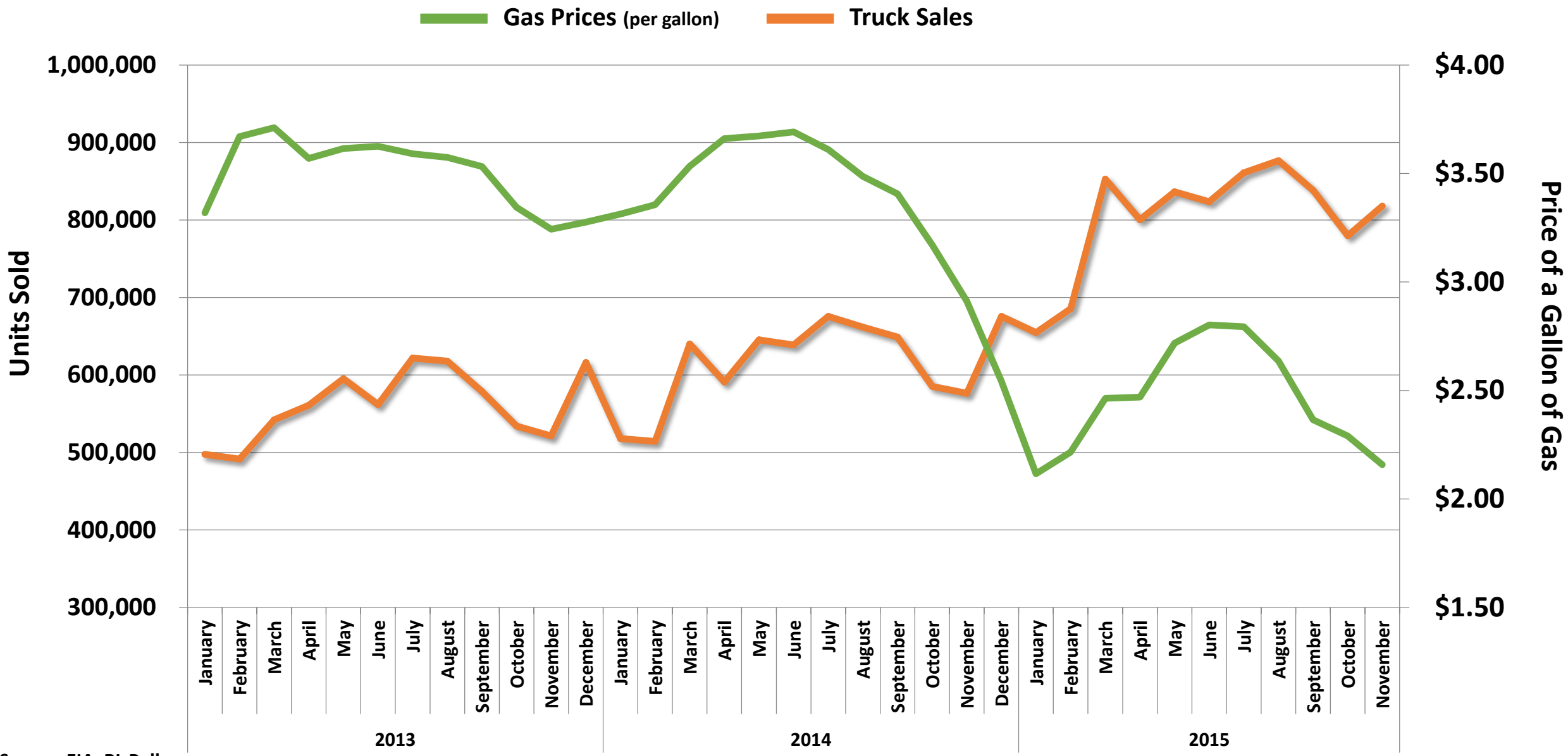
What Type of Engine Will Your Next Vehicle Most Likely Be Powered By?

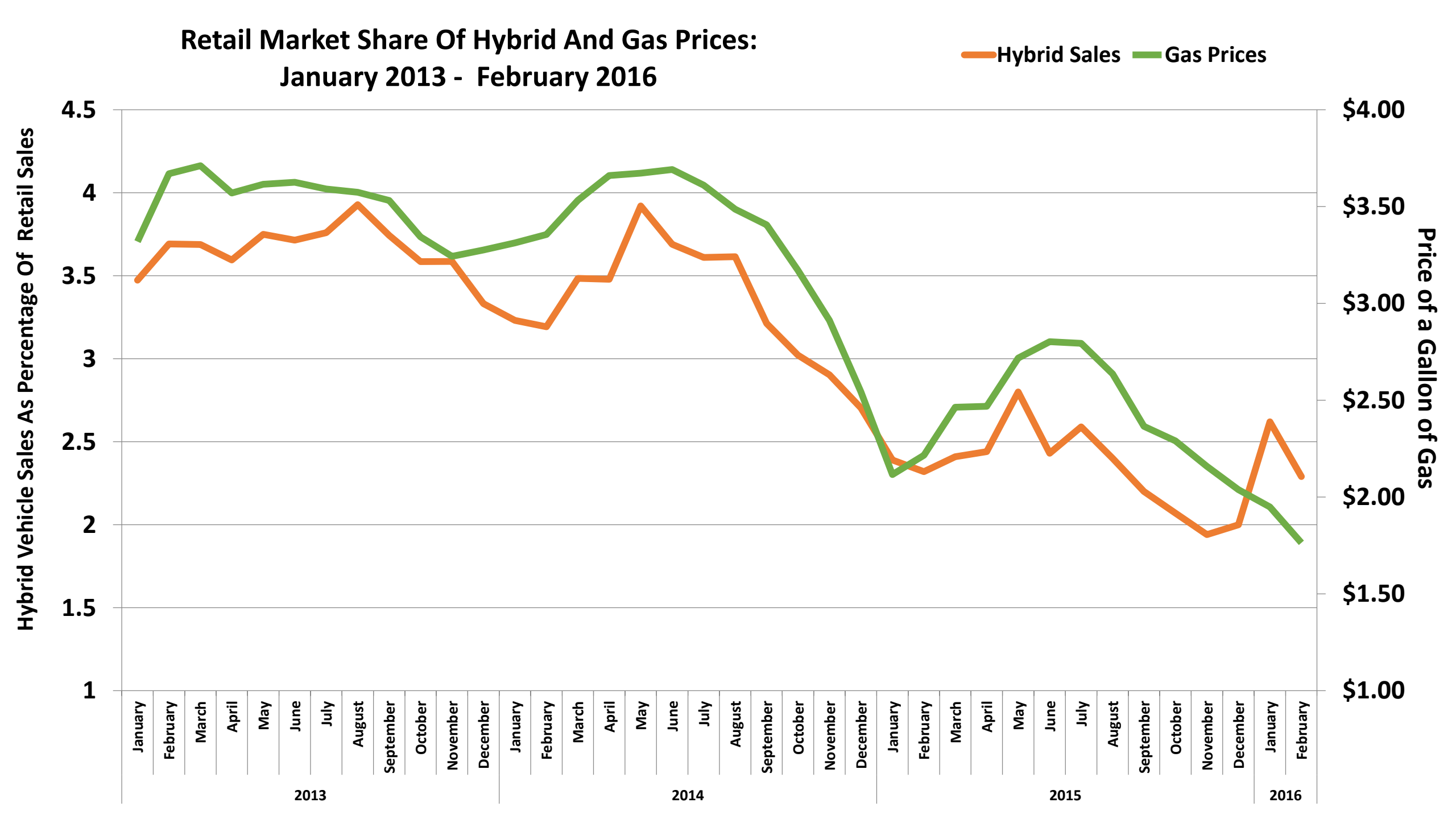


Source: Auto Index 2015

Retail Sales Of Cars And Trucks By Gas Prices

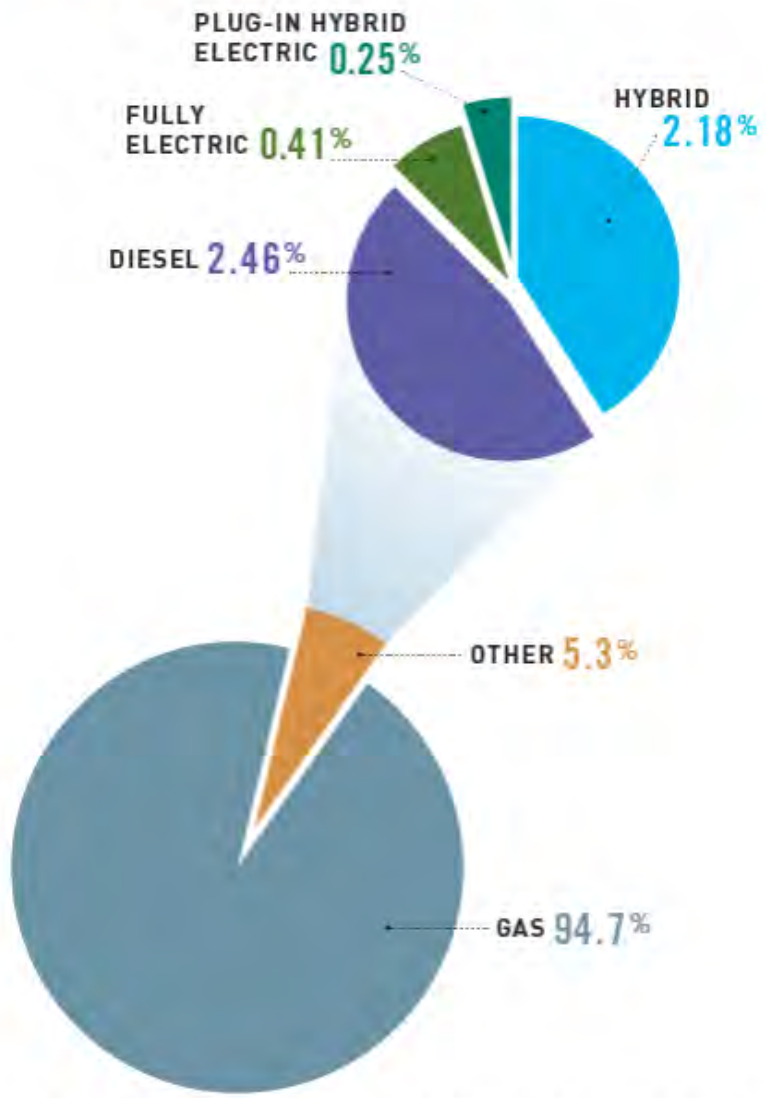


Source: EIA, RL Polk


Retail Market Share Of Hybrid And Gas Prices:
January 2013 - February 2016
Hybrid Sales
Gas Prices
Hybrid Vehicle Sales As Percentage Of Retail Sales
Price of a Gallon of Gas
4.5
4
3.5
3
2.5
2
1.5
1
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
January
February
March
April
May
June
July
August
September
October
November
December
2013
2014
2015
2016

SALES FIGURES SHOW

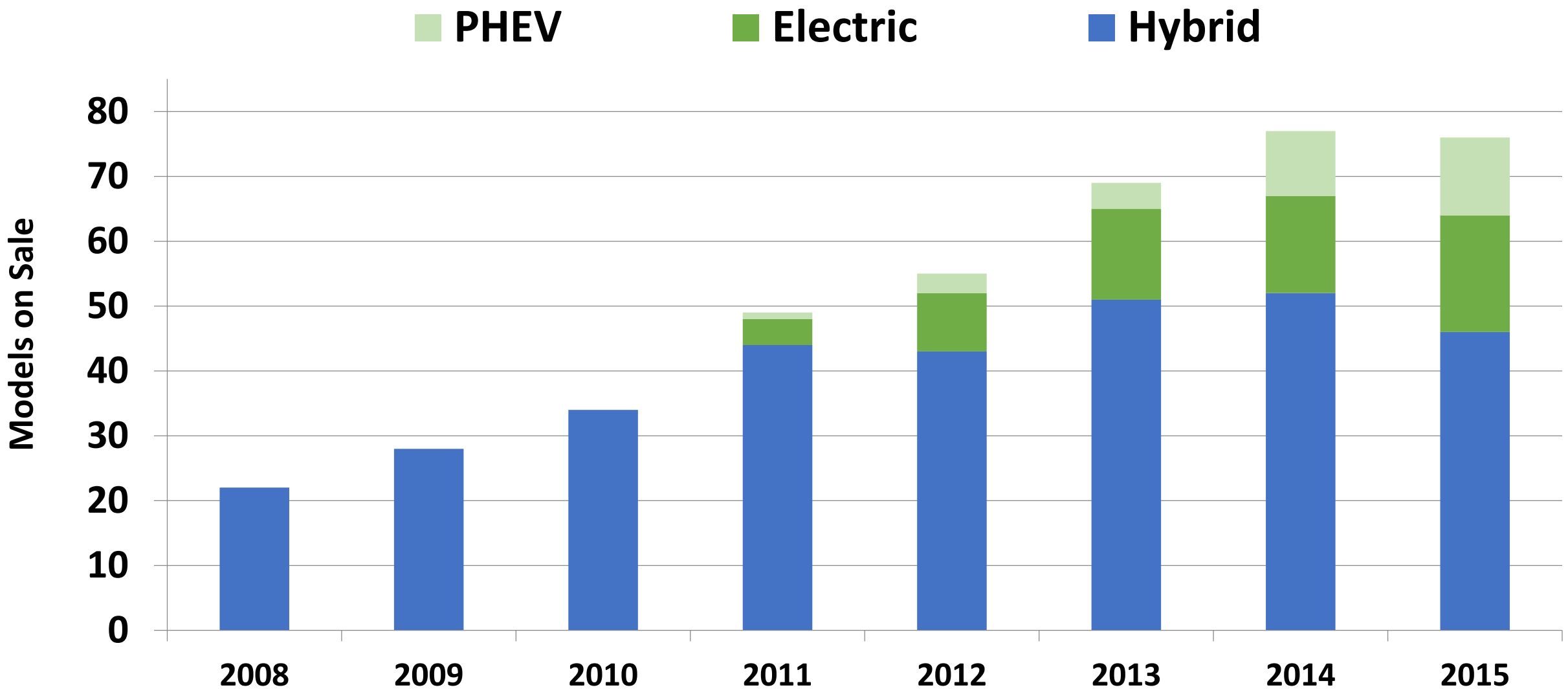
CONSUMERS STILL FAVOR TRADITIONAL GAS ENGINES



TRADITIONAL GAS-POWERED ENGINES STILL COMPRISE MAJORITY OF SALES

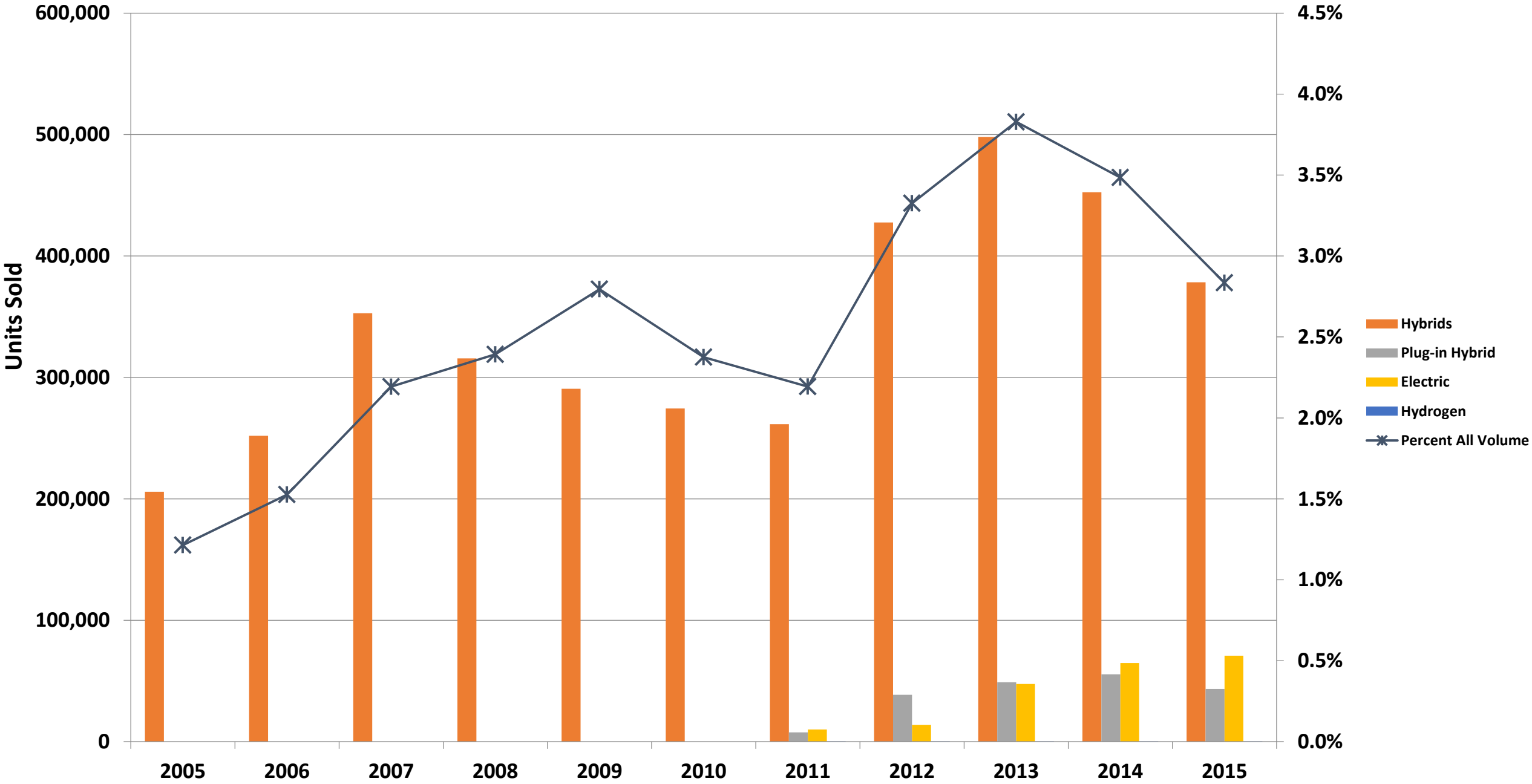
Source: Ward's Automotive (2015 sales data)

Number of Alternative Powertrain Models on Sale: 2008-15

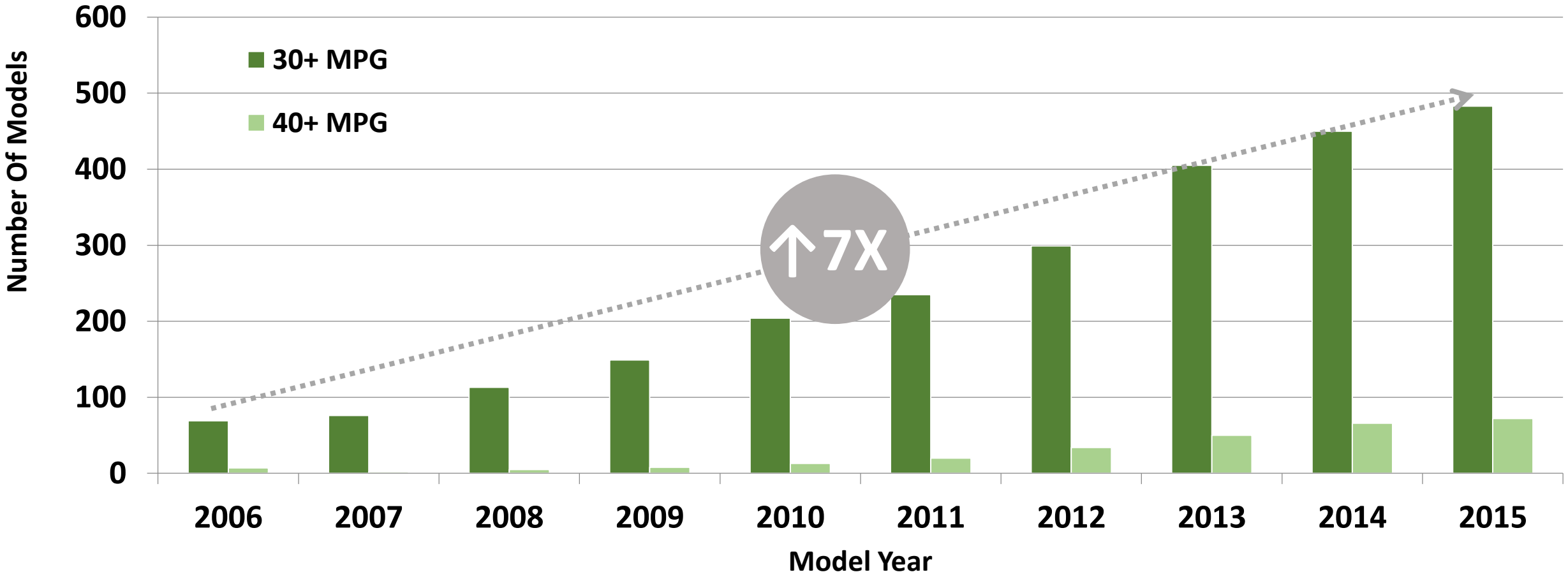


Source: FuelEconomy.gov

Alternative Powertrain Sales And Percentage Of All Volume



Models Achieving 30+ MPG and 40+ MPG



Source: fueleconomy.gov

edmunds.com

EV and Hybrid Loyalty Falls to All-Time Low, Even as Overall Fuel Economy Thrives, Says Edmunds.com

Follow-up to 2015 Earth Day Study Shows Alt-Fuel Trade-ins Are More Likely to Go Toward a SUV Purchase than another EV or Hybrid

SANTA MONICA, Calif. — April 21, 2016 — Only 27.5 percent of all hybrid and electric vehicle trade-ins in 2016 have been applied to the purchase of another hybrid or EV, according to a new analysis from car shopping destination Edmunds.com. The rate is a precipitous drop from the 38.5 percent of hybrid and EV trade-ins in 2015, and the findings reinforce a trend first identified last year by Edmunds that owners of alt-fuel vehicles are returning to traditional gasoline-powered vehicles in greater numbers than ever before.

But the trend back toward traditional vehicles is not having the negative effect on the environment that one might expect. According to the University of Michigan Transportation Research Institute, the average fuel economy of cars sold in the U.S. in March was 25.3 mpg, up 25 percent from when the institute started tracking this number in October 2007.

"This trend is not an indictment of the quality of these cars — hybrid and electric vehicles tend to be equipped with some of the most sought-after technology on the market today," says Edmunds.com Director of Industry Analysis Jessica Caldwell. "This is an economics trend, since today's low cost of gas no longer makes it worth paying the price premium of hybrids and EVs. And there are so many fuel-efficient vehicles on the market today that environmental concerns weigh less than they might have in years past. When you're buying a vehicle that can get over 30 mpg, you can still say you're doing your part to help the environment."

'From One Extreme to Another'

A detailed analysis of Edmunds' vehicle trade-in data tells a story of many hybrid and EV owners jumping from one extreme to another. In fact, Edmunds found that a hybrid or electric trade-in is more likely to go toward the purchase of a SUV (33.8 percent) than another hybrid or EV. The trend is even more apparent when looking only at EV trade-ins — 25.7 percent of EV trade-ins went toward the purchase of a SUV, compared to just 4.8 percent that went toward another EV.

Vehicles Purchased in Connection with a Hybrid or EV Trade-in (Select Segments)

Segment	2015	2016*
Hybrid or EV	38.5%	27.5%
SUV	29.0%	33.8%
Truck	4.1%	5.3%
Compact/Subcompact Car	8.9%	12.1%
Luxury	11.1%	11.5%

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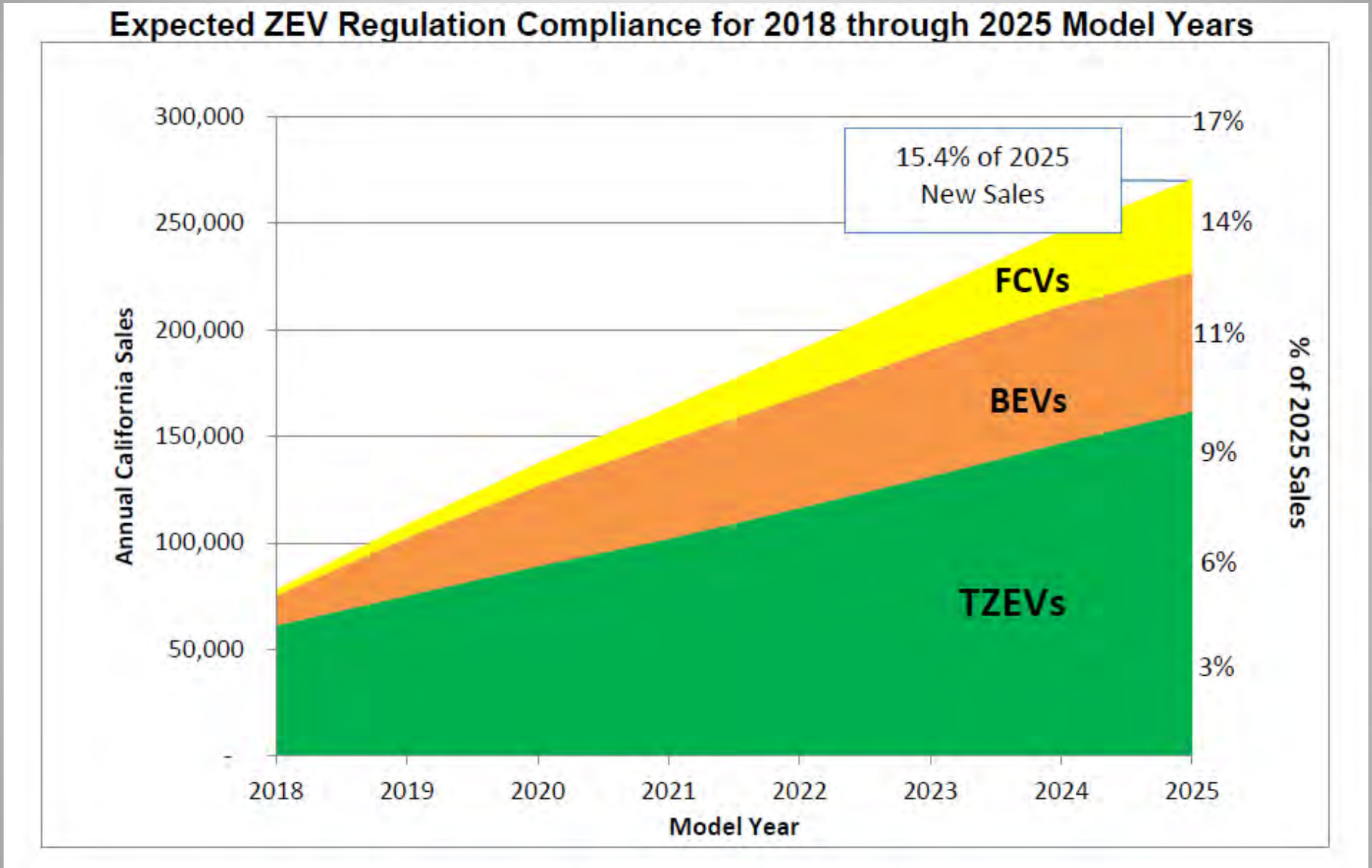
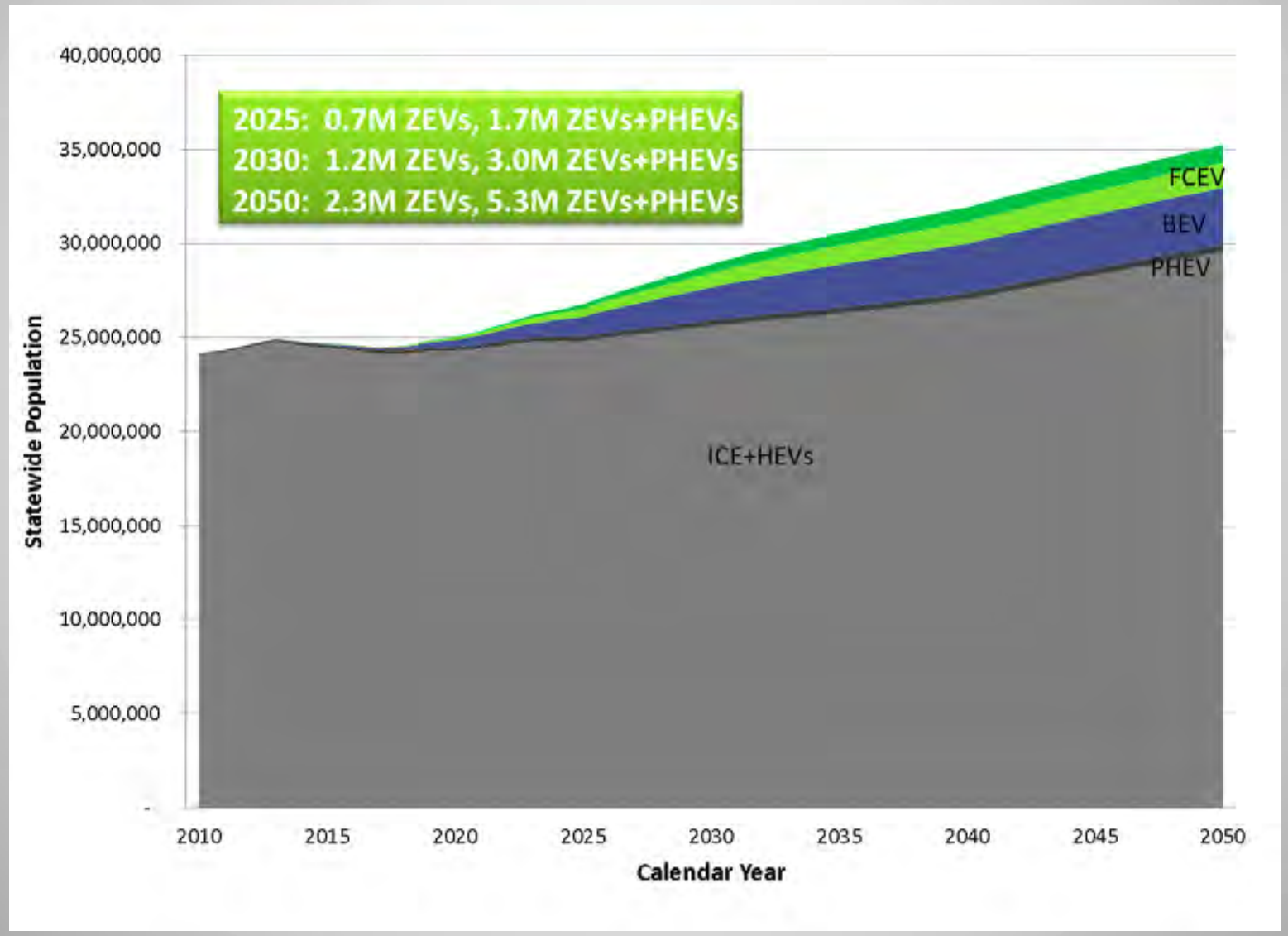
Graph Source: Ward's Automotive


Expected ZEV Regulation Compliance for 2018 through 2025 Model Years
300,000
250,000
200,000
150,000
100,000
50,000
-
17%
14%
11%
9%
6%
3%
15.4% of 2025 New Sales
FCVs
BEVs
TZEVs
Annual California Sales
% of 2025 Sales
2018
2019
2020
2021
2022
2023
2024
2025
Model Year

Vehicle Fleet w/ No Change to Current ZEV



CARB Mid Term Evaluation Results Ahead of Federal NPRM