



IHS Markit™

Forecasting State Fuel Use Tax Revenue by Understanding Motor Vehicle Technology and Volume

- Confidential -

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October 2018

IHS Markit is Committed to Customers First

Our mission is to delight our customers daily by delivering a powerful combination of world-class expertise, knowledge and solutions so they can make more informed decisions to enable their long-term, sustainable growth.

12,000+

IHS Markit
colleagues

130+

Offices in
34 countries

Including 5,000+ analysts, data scientists, financial experts and industry specialists

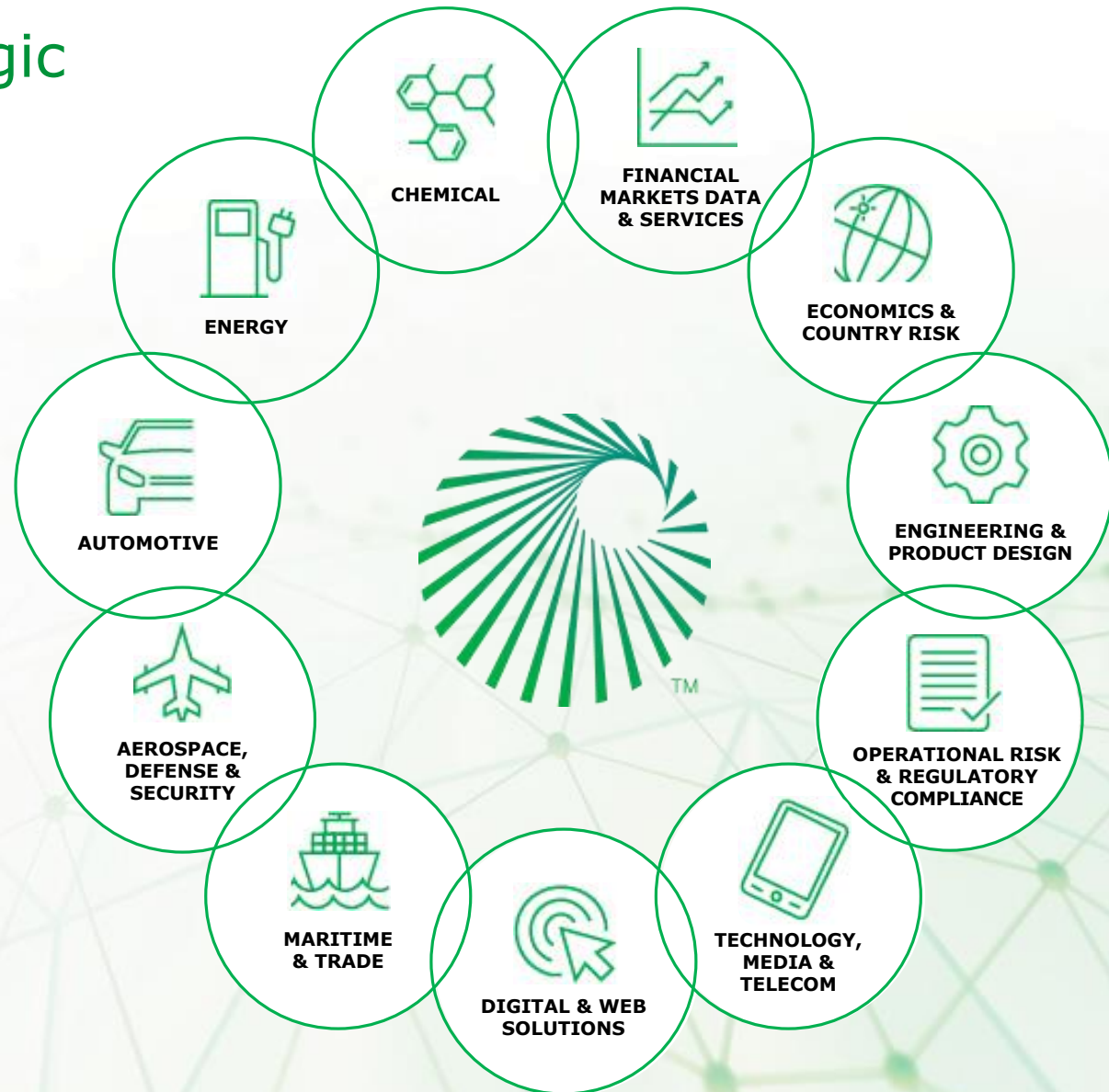
- Unsurpassed ability to interpret data
- Award-winning forecasting
- Relationships with industry leaders

Traded on the Nasdaq under the INFO symbol



Addressing strategic challenges with interconnected capabilities

IHS Markit provides leaders from multiple industries with the perspective and insights they need to make the best choices and stay ahead of their competition.






AUTOMOTIVE

The automotive sector is one of the biggest and most competitive markets in the world and relies on in-depth analysis for its daily operations.


Our extensive global team of automotive analysts located in 13 key markets supplies the depth of information and level of comprehension needed for a competitive edge.


IHS Markit automotive solutions span the entire value chain, from product inception to sales, marketing and the aftermarket.



About
The automotive group at IHS Markit

100%
of the top automakers are clients
Represents the 14 OEMs with revenues greater than \$50 billion

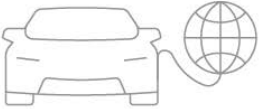






Covering the entire
Value Chain
from product planning to sales and marketing to the aftermarket

Long-term forecasts for


- 96% of global light vehicle sales
- 99% of global light vehicle production
- 95% of global medium/heavy commercial vehicle sales and production




82%
of the top automotive parts & equipment suppliers are clients
Represents suppliers with revenue greater than \$5 billion

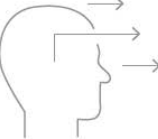
Addressing issues that drive the industry



Audience targeting for nearly **All types**
of (US) vehicles: cars, trucks, RVs, Motorcycles

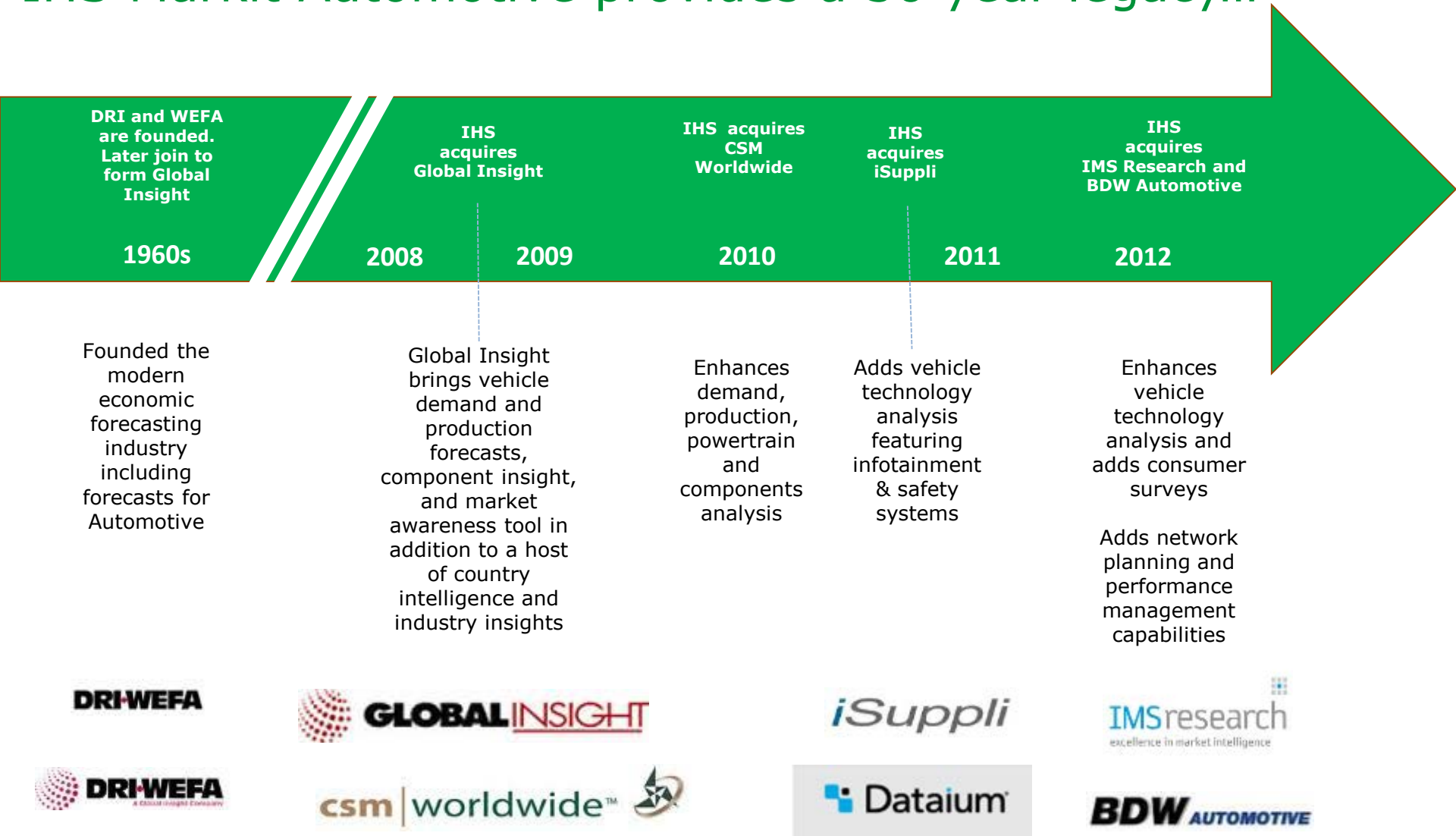


180+
Automotive experts on the ground in 13 countries, with a history dating back 100+ years

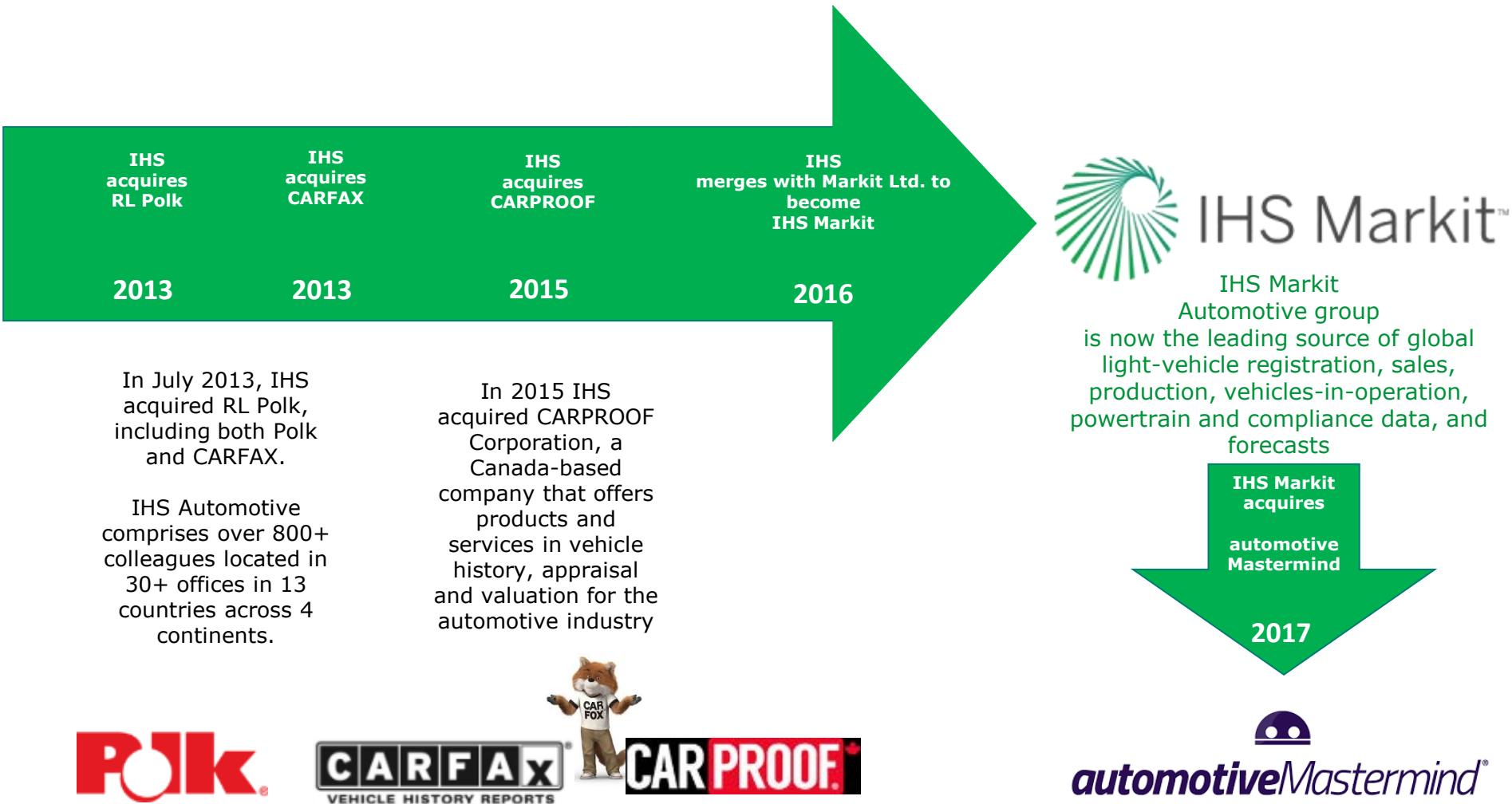


Automotive solutions by IHS Markit
Providing Insight into the Past | Supporting the Present | Guiding into the Future
Learn more at www.ihsmarket.com/automotive

IHS Markit Automotive provides a 50 year legacy...



...and is positioned to support the industry's future!



IHSM maintains expertise and forecasts in critical vehicle, powertrain and component areas



Thermal

- A/C Compressor
- A/C Condenser
- A/C Hose & Tube
- Charge Air Cooler
- Cooled EGR
- Active Grille Shutter
- Engine Cooling – Motor and MFS
- Engine Cooling – Radiator
- HVAC – Blower
- HVAC – Control Panels/Zones
- HVAC – Flap Actuator
- HVAC – Module
- HVAC – Sensor
- New Refrigerant
- Supplementary Heating
- Water Pump



Electrical/Electronics

- 12-36/48 Volt Market Study
- Central Body Control Module
- Engine Control Unit
- Immobiliser
- Keyless Entry System
- Power Door
- Power Sunroof
- Power Trunk
- Power Window System
- Powertrain Sensors
- Sunroof System & Design
- TPMS
- Transmission Control Unit
- Wiring Harness



Interior

- Airbag Module
- Door Trim Panel
- Seat Adjuster
- Seat Assembly
- Seat Climate – Seat Thermal
- Seat Ergonomics
- Seat Fabric & Leather
- Seat Power & Memory
- Seat Recliner



Lighting

- Front Lighting
- Front Lighting + ECU
- Headlamp
- Tail Lamp



Powertrain

- Alternative Propulsion
- Camshaft Drive
- Cylinder Block
- Exhaust Cold End
- Exhaust Manifold
- Fuel Injector
- Intake Manifold
- Throttle Body
- Torque Transfer
- Turbo/Supercharger
- WT



HMI

- Center Stack Display
- Head-Up Display
- Instrument Cluster Display



Infotainment

- Audio Speakers
- Headunit Systems
- Telematics



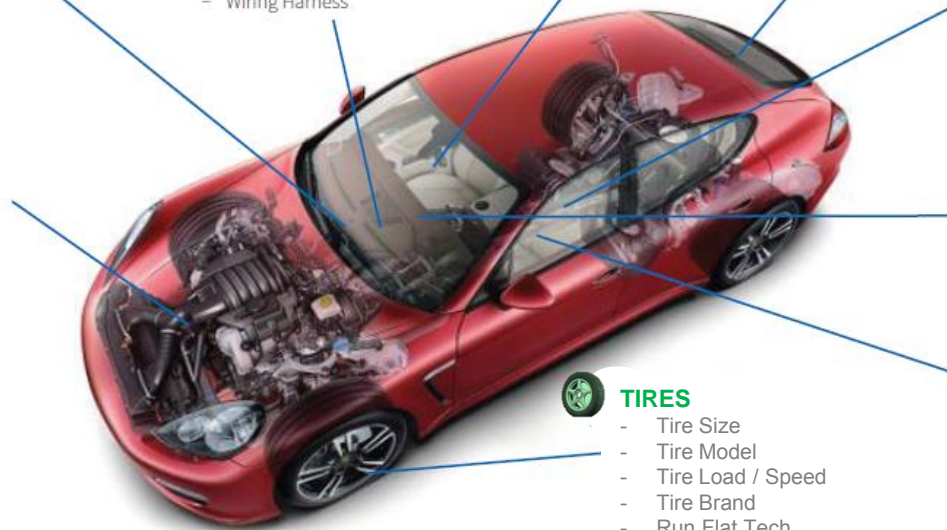
TIRES

- Tire Size
- Tire Model
- Tire Load / Speed
- Tire Brand
- Run Flat Tech
- Spare



ADAS

- Camera
- Lidar
- Radar
- Ultrasound



Why IHS Markit

IHS Markit Light Vehicle Powertrain Forecasts offer comprehensive coverage of current and future internal combustion engines, alternative propulsion systems, electric vehicles, plug-in hybrids, and other advanced forms of technology.

This expertise forms the foundation for forecasting fuel economy and state fuel use tax revenue

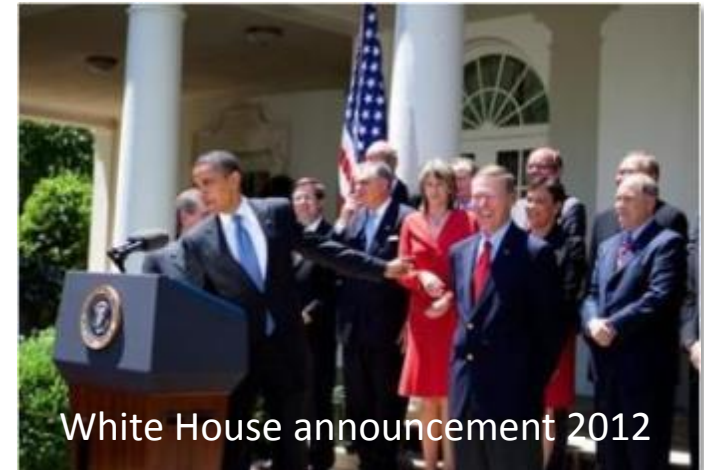


Fuel economy legislation has a critical impact on the U.S. vehicle market

- After years of preparing for a significant increase in fuel economy standards, the EPA is reevaluating the 2021-2025 requirements
- In August, the EPA & NHTSA announced plans to freeze the MPG/C02 requirements at 2020 levels through 2026
- Reasons cited for the freeze include:
 - Vehicle / technology price
 - Safety
 - A shift in consumer preference to light trucks
 - Low oil price
- This change at the federal level by itself will not delay electrified vehicles and the adoption of advanced technologies

“Our proposal aims to strike the right regulatory balance based on the most recent information and create a 50-state solution that will enable more Americans to afford newer, safer vehicles that pollute less. More realistic standards can save lives while continuing to improve the environment.”

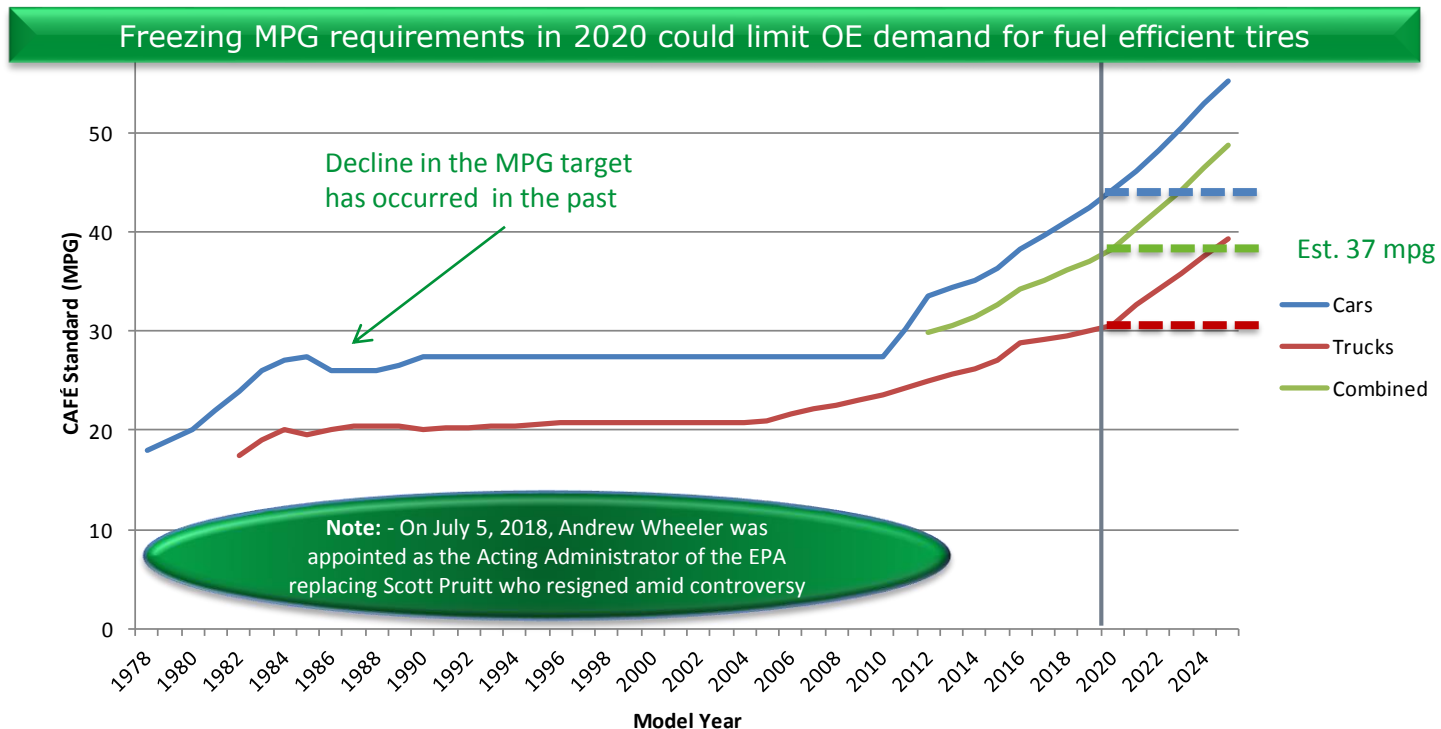
- EPA Acting Administrator Andrew Wheeler



Source: www.greencarreports.com

Even the lower 2020 targets will dramatically improve combined average MPG performance to 37 MPG

- Light Trucks will be required to average 30 MPG while Cars will average better than 43MPG

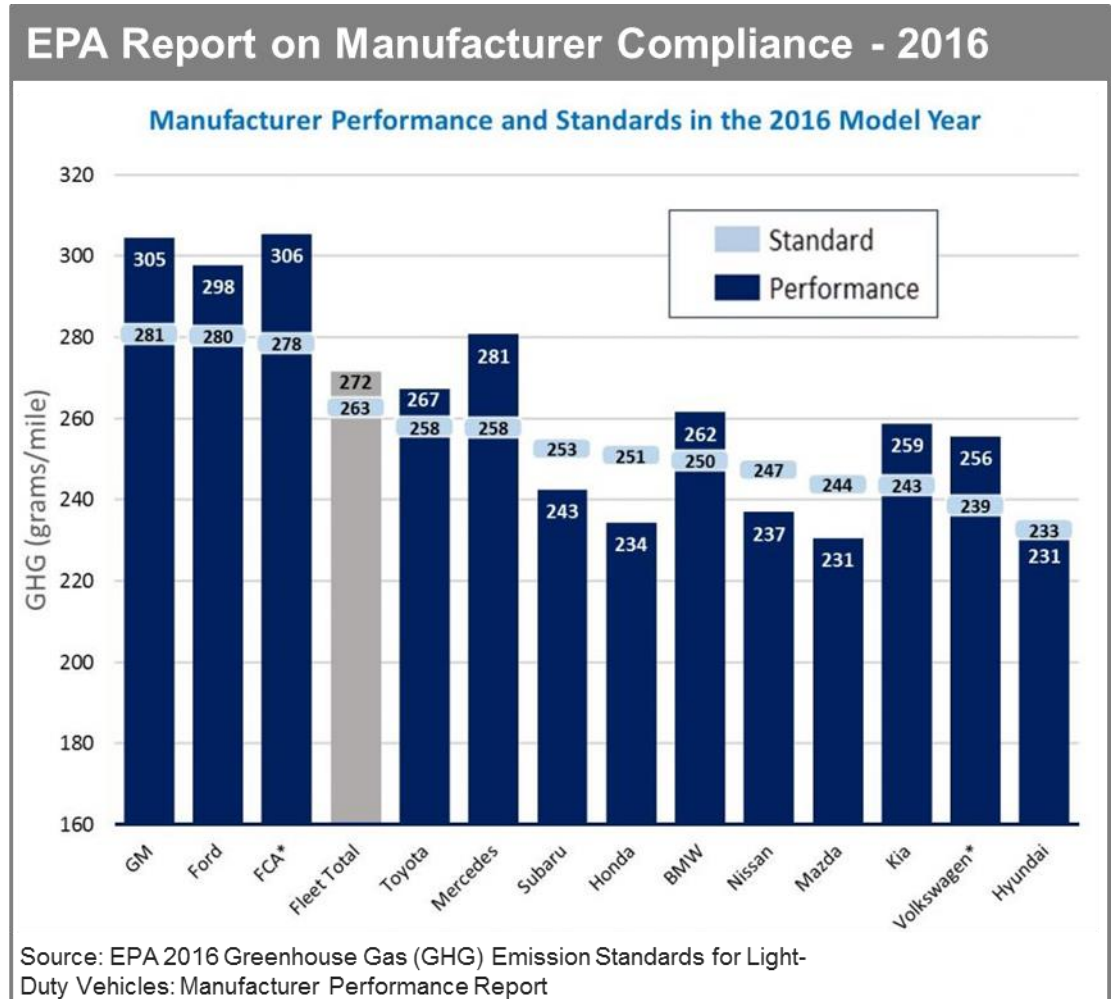


- Congress establishes CAFE 1978-1985
- DOT sets truck standard to max feasible 1979-1996
- DOT relaxes car standard 1986-1989
- DOT sets car standard to 27.5 mpg 1990-2010
- Congress freezes truck standards at 20.7 1997-2001
- Bush Administration sets new truck targets 2005-2007
- EISA changes CAFE to new footprint standard 2008- present
- Obama Administration sets new car & truck standards 2012-2016
- Obama Administration sets new car & truck standards 2017-2025
- Trump Administration may freeze CAFE at 2020 levels thru 2026

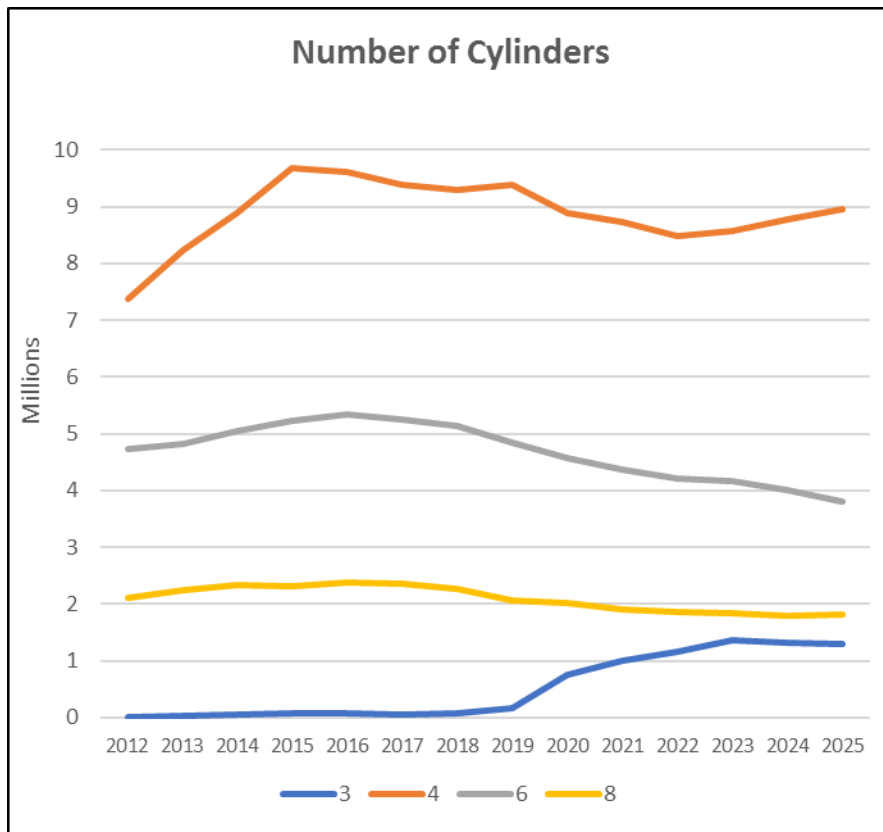
In 2016, 8 OEMs did not meet the MPG target of 34.1 MPG

This represent approximately 2/3rds of U.S. vehicle sales

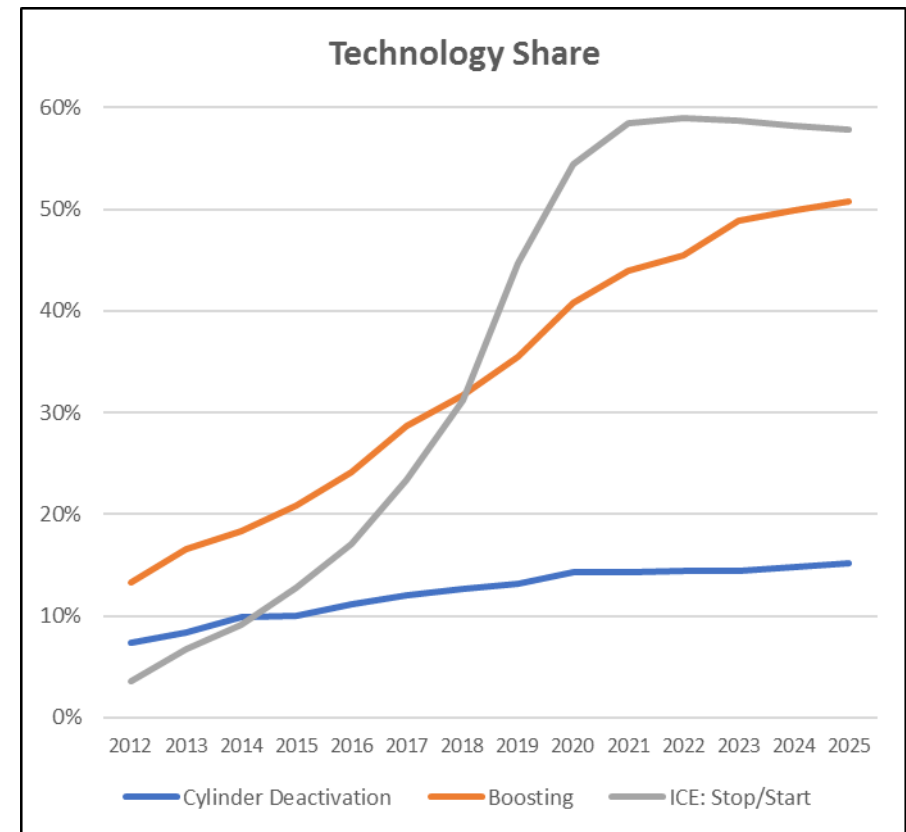
- The majority of manufacturers are expected to miss compliance in 2021
- What does this mean for the next 6 year powertrain cycle?
- More technology will need to be adopted while balancing consumer demand for performance and utility (SUVs)
- Near universal application of start/stop
- Increased number of hybrids and electric vehicles



Downsizing, boosting, cylinder deactivation, and start/stop application are just some of the technologies automakers are using to drive fuel economy improvements



Source: IHS Markit Powertrain Forecast



Source: IHS Markit Powertrain Forecast

California and other states are challenging the EPA seeking to maintain higher emission targets, while also mandating ZEVs and attempting to ban internal combustion

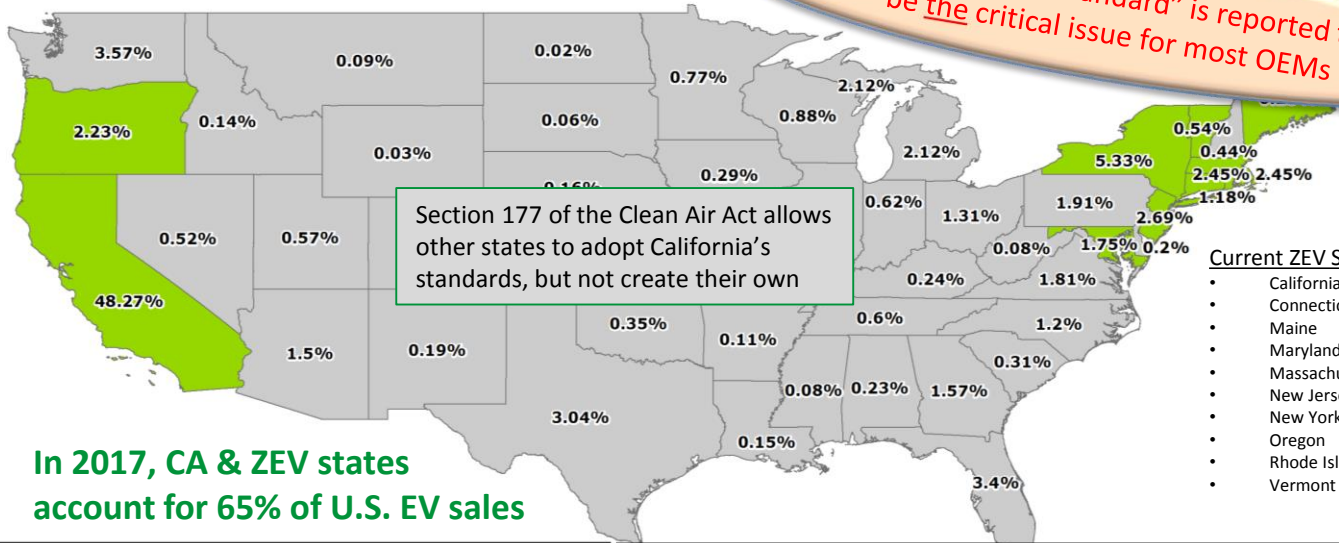
"One National Standard" is reported to be the critical issue for most OEMs

AB 1745
CLEAN CARS 2040 ACT

Assemblymember
Phil Ting
17TH DISTRICT

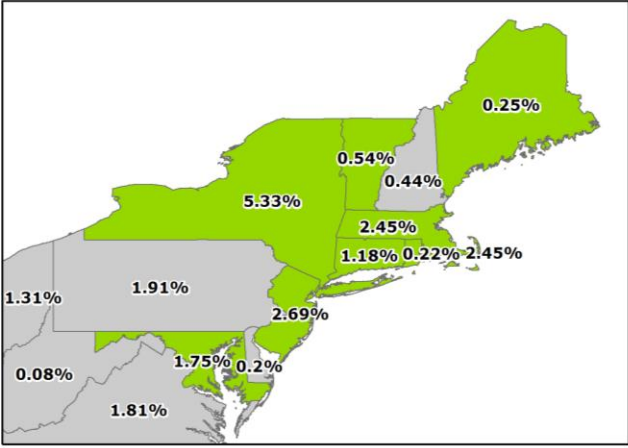
SUMMARY
California must drastically reduce air pollution and greenhouse gas emissions from the transportation sector, especially from vehicles resulting on highways and roads. While the state has made gains through its low-carbon vehicle program, current programs and targets will not be enough beyond 2030. The Clean Cars 2040 Act (AB 1745) will allow us to meet our goals by requiring all new passenger vehicles in California after January 1, 2040, to be zero-emission vehicles (ZEV). We have passed these laws and goals, and we will not waver from them without the legislature.

BACKGROUND
The transportation sector is among the largest and fastest growing sources of greenhouse gas emissions in California. California is among the few states that have set a goal to be 100% zero-emission by 2040. California has the most ambitious goal to be 100% zero-emission by 2040. California has the most ambitious goal to be 100% zero-emission by 2040. California has the most ambitious goal to be 100% zero-emission by 2040.



In 2017, CA & ZEV states account for 65% of U.S. EV sales

California state bill AB1745 if passed would ban internal combustion engines effective 2040



Historically California (CARB) has legally been able to set vehicle standard that are more stringent than the federal standards, which includes a ZEV mandate, that the "Section 177" states can also follow

If CARB is allowed to continue, the 2020 Federal revision threatens to create two sets of MPG/CO2 targets in the U.S.

OEMs must plan for the very real possibility of a Fed. vs. State requirement, which is likely to also support state based electric vehicle (EV) demand

Global markets are also banning internal combustion engines which indirectly impacts the U.S. market

“Britain to ban sale of new diesel, gasoline cars by 2040”

MEMA News

“France to end sale of diesel, gasoline vehicles by 2040”

Automotive News

“China moves towards banning the internal combustion engine”

The Economist

Germany
United Kingdom
India
Norway
France
Netherlands
China



Electric
Hydrogen



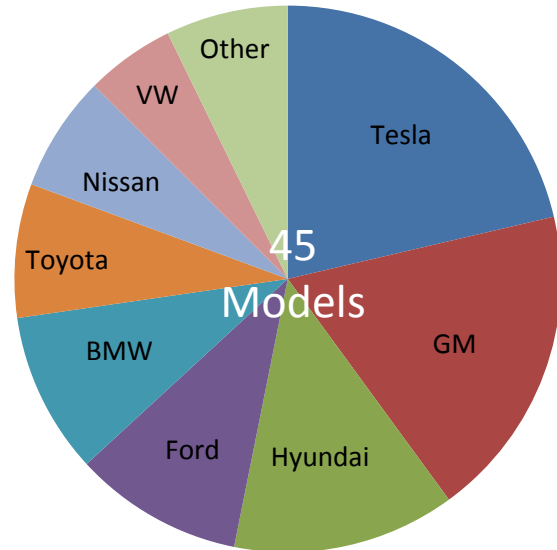
No Diesel
No Gasoline

Vehicle OEMs operate globally and must meet global regulatory requirements that drive EV development which continues despite potential U.S. rollbacks

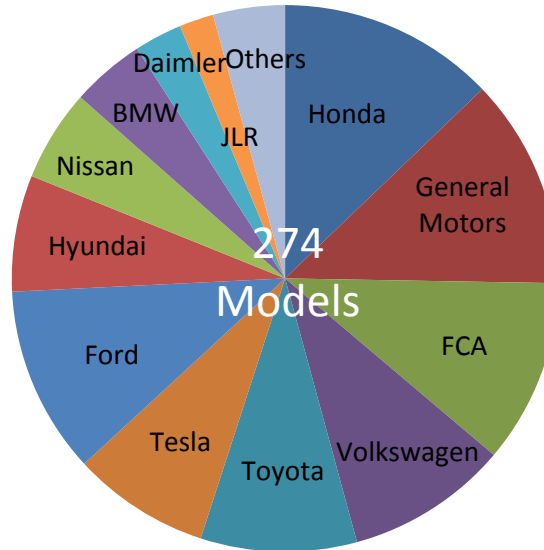
Despite low U.S. demand for electric vehicles (EV), global legislative pressures will add more EV choice in the U.S.

- The number of EVs (EV, PHEV, FC) on sale in the U.S. climbs from 45 models in 2017 to 274 models in 2028
- New entrants from brands FCA, VW, and Honda greatly increasing brand market share

2017 U.S. EV Sales by Manufacturer



2028 U.S. EV Sales by Manufacturer



Source: IHS Markit Powertrain Forecast

“GM to ramp up electric vehicle plans, 20 new models over next 6 years”
CNBC

“Mercedes-Benz speeds up the launch timeline for 10 new electric vehicles”
Atlanta Business Journal

“Volkswagen, Mercedes-Benz launch electric cars, ‘anything Tesla can do, we can do better’”
U.S.A Today

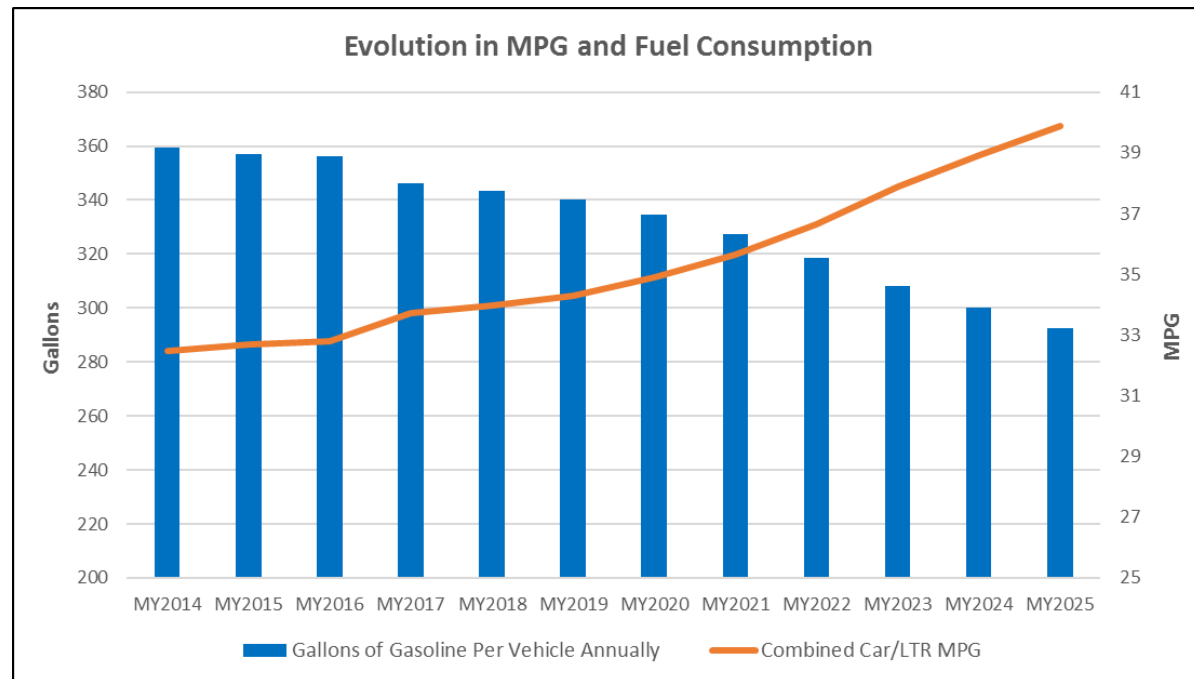
“BMW plans to offer 12 full-electric cars by 2025”
Automotive News

“Nearly 100 electrified models slated to arrive through 2022”
Automotive News

The IHS Markit powertrain / fuel economy forecast reveals a significant increase in MPG and a decline in demand for gasoline

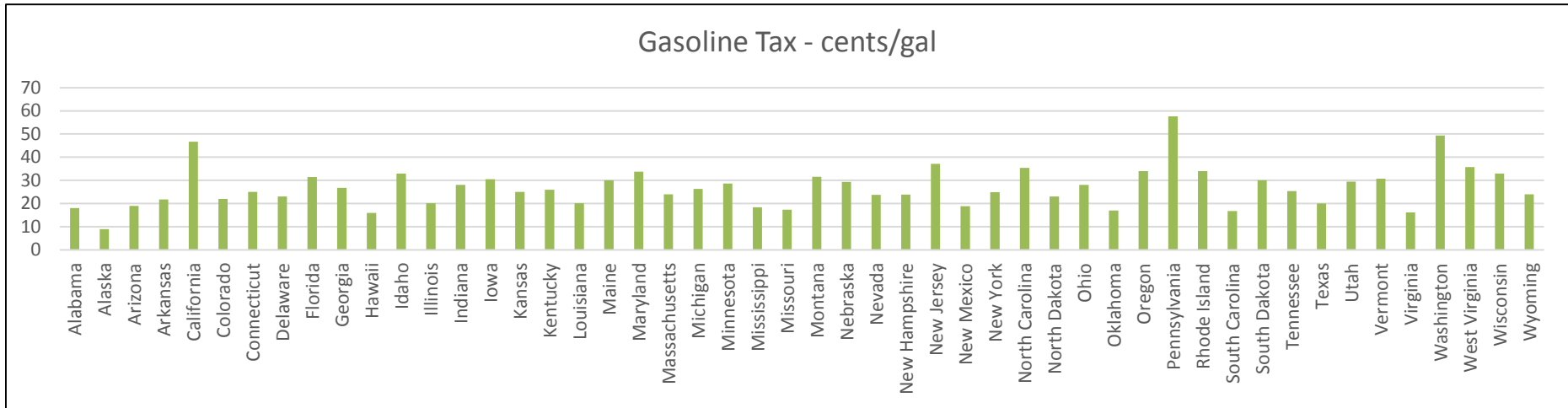
- IHS Markit powertrain forecast is based on known future programs and reflects the continued shift from cars to light trucks
- Calculated national MPG for cars and light trucks improves by 6 MPG when comparing 2018 to 2025
- In 2017, Americans drove an average of 11,673 miles per vehicle or 3.2 trillion total miles traveled
- Comparing model years 2018 vs. 2025, annual gasoline consumption per vehicle falls from 344 gallons per year to just 293 gallons
- Each new model year produces measurable improvements in MPG
- Cumulative model year reduction of gallons consumed per vehicle lowers the fuel demand of the total vehicles in operation (parc)
- This reduction negatively impacts fuel use tax collection

**What does this mean
for your State?**

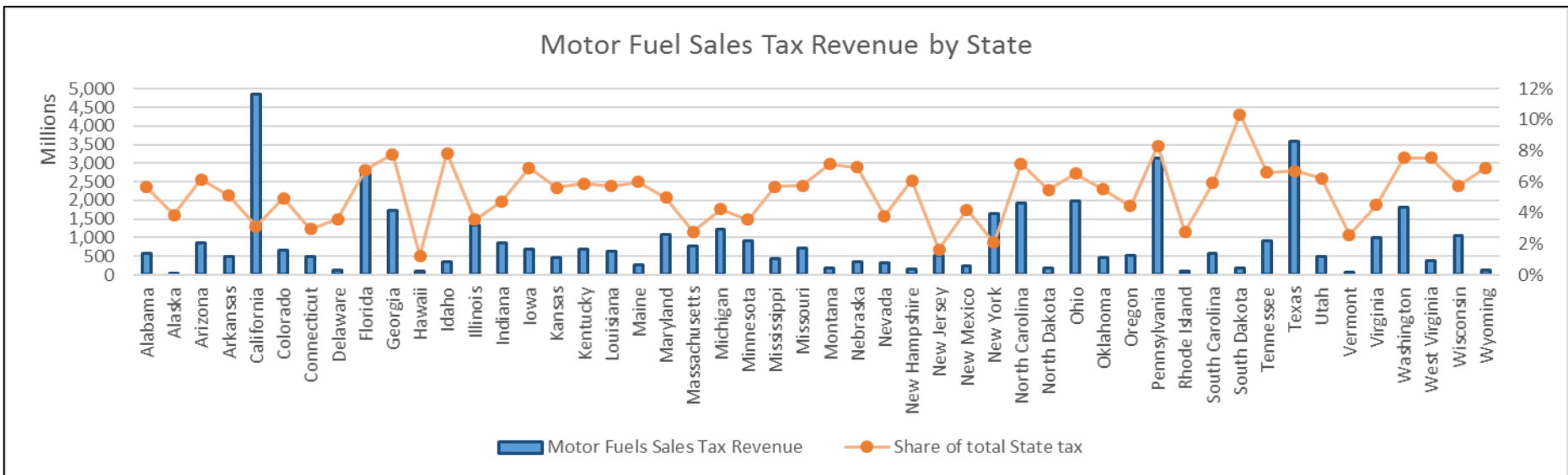


Source: IHS Markit Powertrain Forecast

At the state level, some are being impacted more than others by this powertrain revolution



Source: Federation of Tax Administrators, January 2018



In Summary

- Fuel economy will continue to improve
 - Electric vehicles and hybrid cars will accelerate the process
- Americans continue to prefer light trucks to cars
- Total vehicles in operation is expected to grow
- Miles traveled is forecast to remain steady or decline on a per vehicle basis
- Federal funding will be impacted (\$0.184 per gallon)
- State level exposure varies by local vehicle count, age of the fleet, pace of fleet renewal, local VIO MPG improvements, state level fuel consumption, tax rate
- Each individual state needs to identify how large an issue fuel economy improvement is at a local level and support advocating for sources of substitute funding
 - New taxes
 - Move to variable-rate gas tax
 - New or expanding fees
 - New methods for measuring road use
 - New methods for tracking energy consumption
- No one size fits all solution





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