



IHS Markit Briefing & Events at NAIAS

January 11, 2017 | 9:30-11:45
COBO Room 250A-C



- Free Coat and Bag Check until 7pm – See IHS Markit Attendant
- Hospitality suite is open all day – refreshments will be available
- Join us here for our Cocktail Reception 4:30pm-6:30pm tonight
- Complimentary WIFI - Network: [IHSMarkit](#) | SSID: [IHSM2017](#)
- Briefing Presentations will be available for download post event

Joe LaFeir

Senior Vice President, Automotive



Mr. Joe LaFeir is responsible for leading the global automotive business at IHS Markit. He oversees all aspects of the automotive business, which provides a full suite of insight and analytic solutions.

John Anton

Senior Principal Economist, Pricing and Purchasing Service



Mr. John Anton is a Senior Principal Economist on the IHS Markit's Pricing and Purchasing Service team, recognized for his expertise in the ferrous metals industry. He is responsible for evaluating the outlook for steel and specializes in commodities forecasting.



IHS Markit™

The economics driving the North American vehicle industry

Macroeconomics and commodities

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Director, IHS Markit Steel Analytics
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Macroeconomics

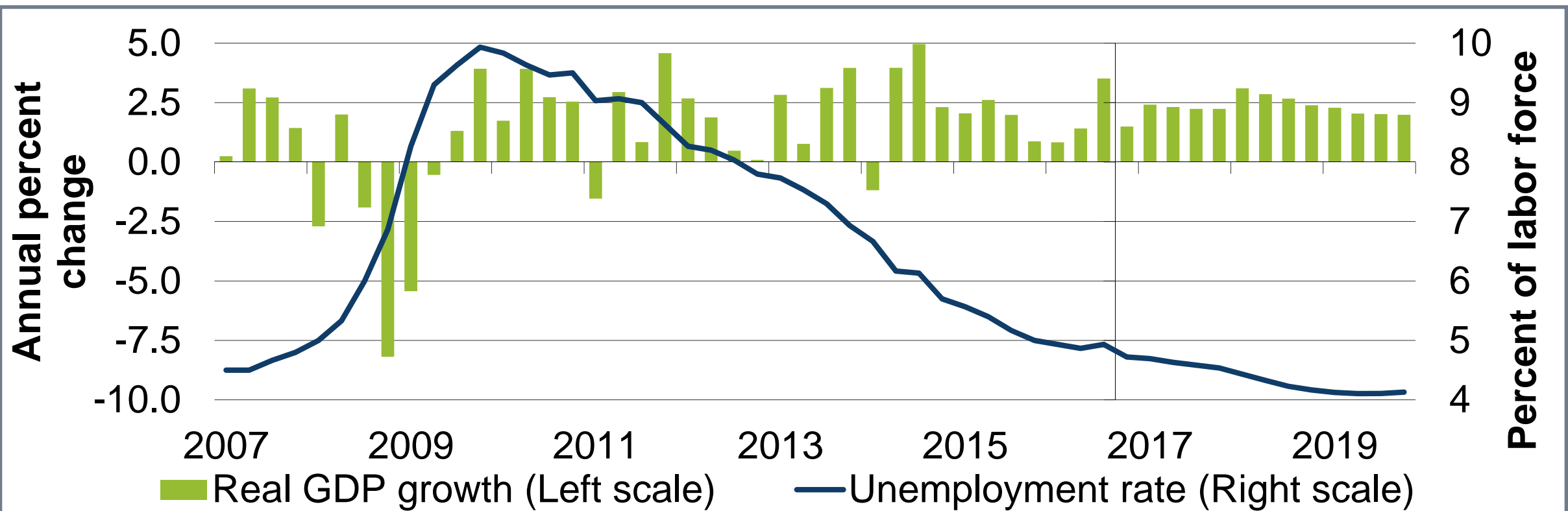
The outlook for 2017

Our theme is “hopeful”

- For vehicle makers, most key demand drivers are good
 - > Employment
 - > Wages
 - > Business activity
- Business and consumer confidence measures are high
- Investment will be necessary because some sectors are verging on tight
- Fiscal stimulus boosts spending
- Headwind is rising interest rates

A 2017–18 pickup in real GDP growth will lead to further declines in the unemployment rate

Real GDP and unemployment

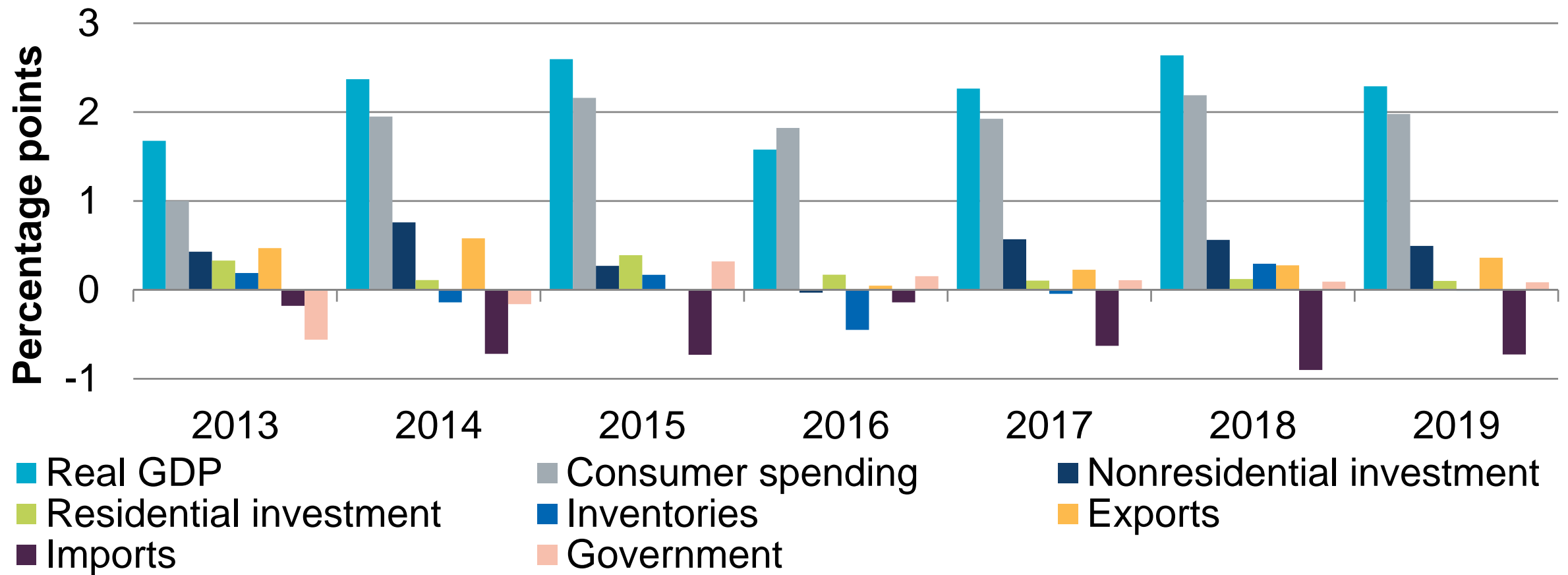


Source: IHS

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Consumer spending is driving US economic growth

Contribution to real GDP growth

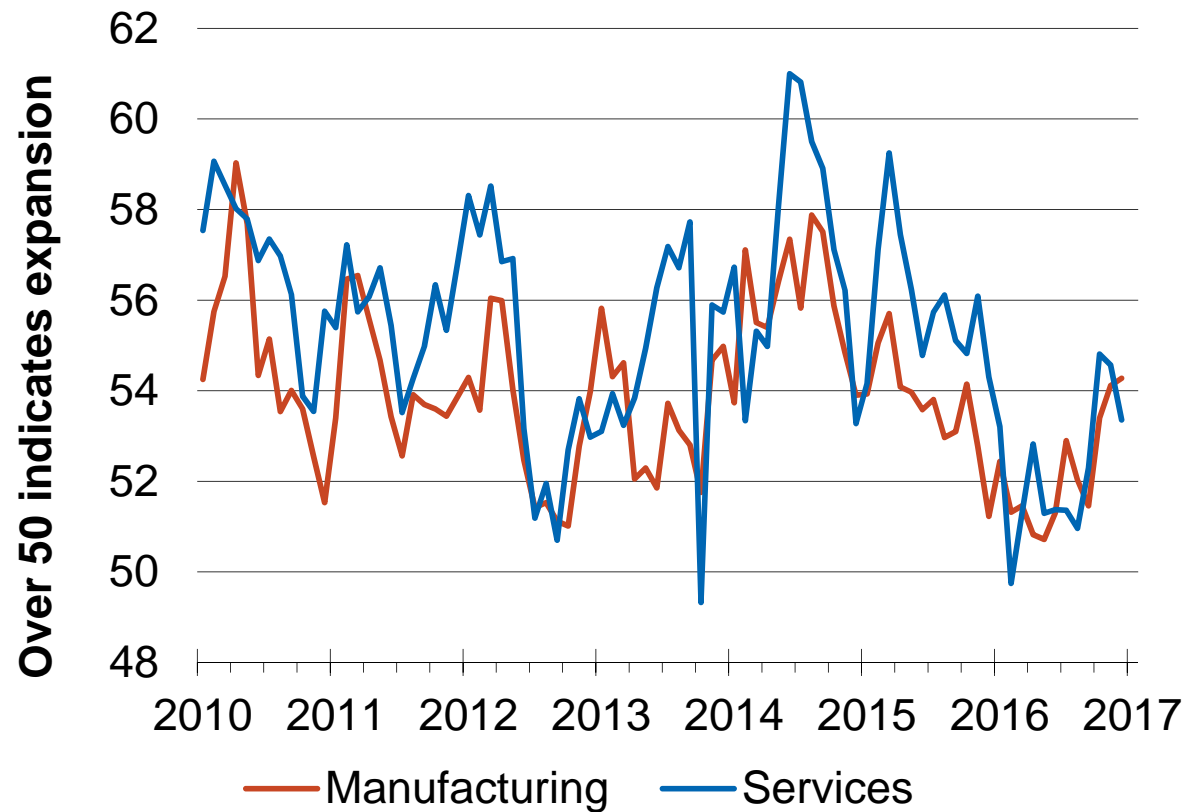


Source: IHS

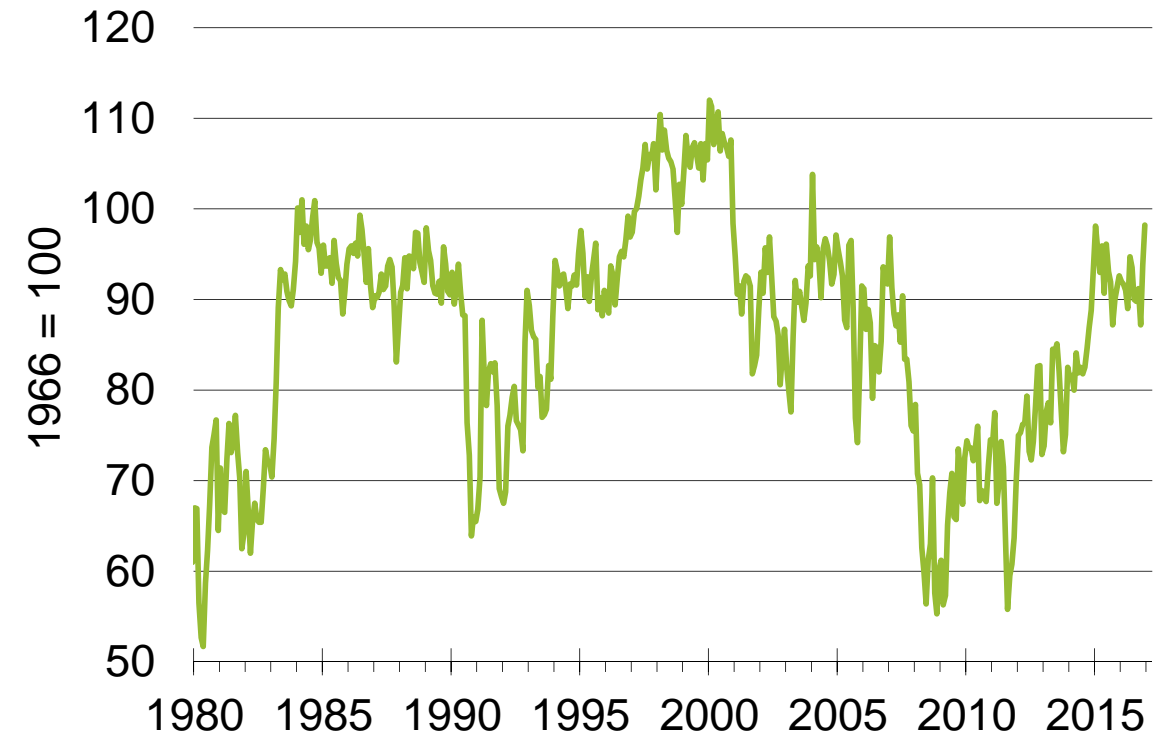
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Sentiment measures are positive

IHS Markit **business** PMI indexes

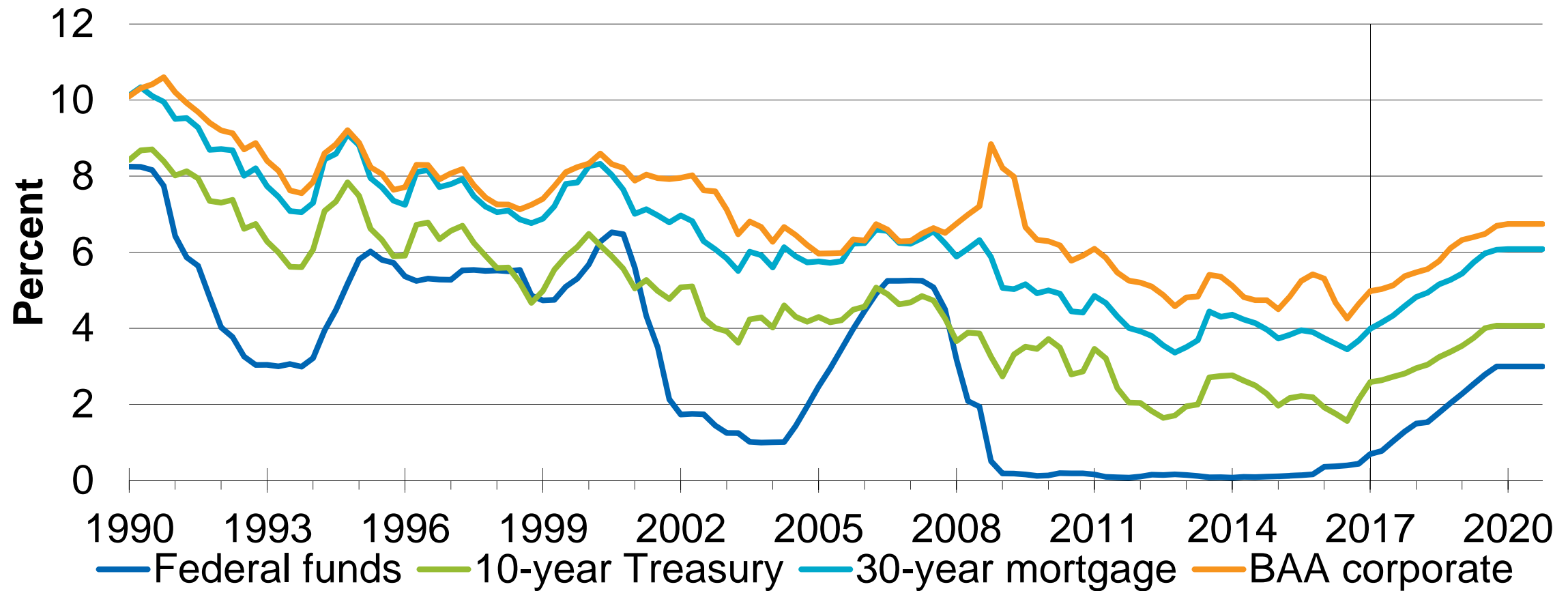


University of Michigan **consumer** sentiment index



Interest rates will continue to rise as the Federal Reserve

Interest rates



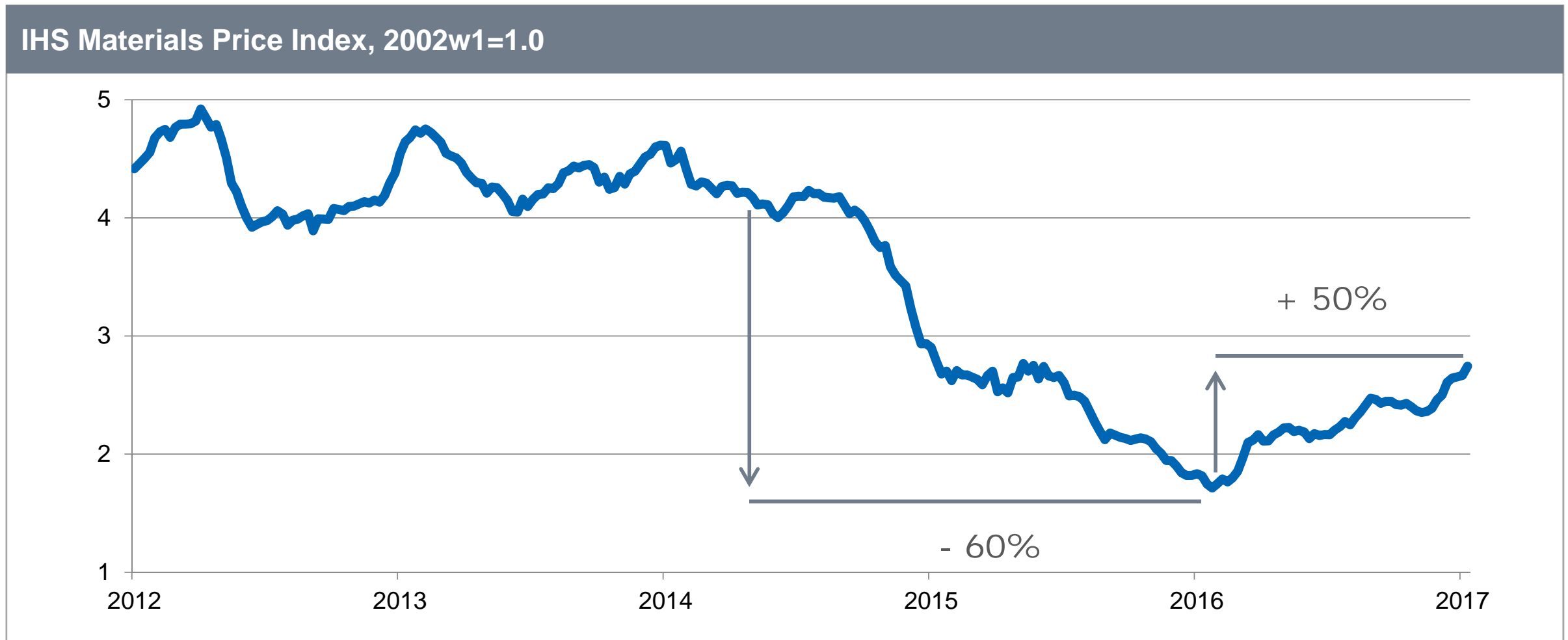
Source: IHS

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Materials and labor

Better than 2014, worse than 2016

Commodity prices roar into 2017



IHS Pricing & Purchasing - Automotive Industry

Procurement Intelligence Across Diverse Spend Categories

ENGINE & CHASSIS

Carbon, High-Strength & Stainless Steels:
 Coiled
 Plate
 Alloy Bar
 Semi-finished & Blanks

Scrap:
 Heavy Melt
 Shredded

Base metals:
 Aluminum
 Copper
 Lead
 Zinc

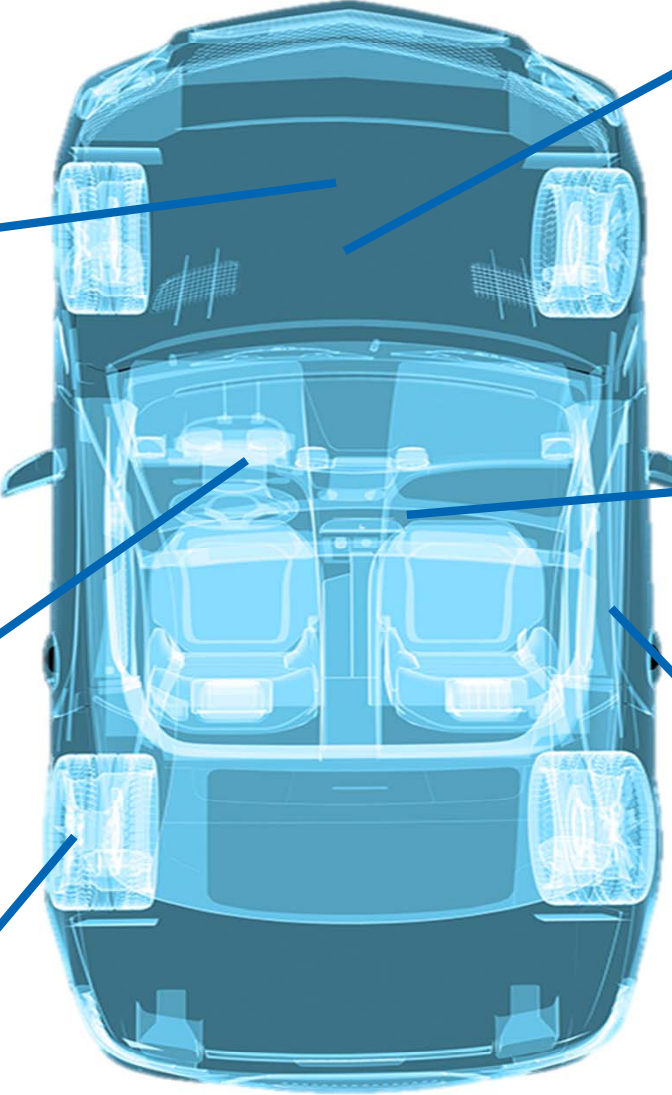
ELECTRICALS & ELECTRONICS

Airbag ECU
 Central Body Control Module
 Immobiliser
 Instrument Cluster
 Keyless Entry System
 OE Navigation

Power Closure
 Power Sunroof
 Sunroof System & Design
 Power Window
 Tire Pressure Monitoring
 Wiring Harness

TIRES & TRIM

Rubber 1712
 Rubber Natural TSR20
 Synthetic Rubber
 Nylon 66
 Natural (TSR20)



POWERTRAIN

Alternative Propulsion (incl. Stop-Start Systems)
 Camshaft Drive
 Exhaust Manifold
 Exhaust Cold End
Fuel Injector
Intake Manifold

Torque Transfer
 Turbo/Supercharger
Variable Valve Timing (VVT)

INTERIOR

Styrene
 Butadiene Ethylene
 Butadiene
 Ethylene Glycol
 Styrene
 Caprolactam

TPO/TEO,EVA,
 PC-ABS
 PET, PU, TPE, SBR
 Nylon
 Polyol & Isocyanates (MDI, TDI)

BODY PANELS

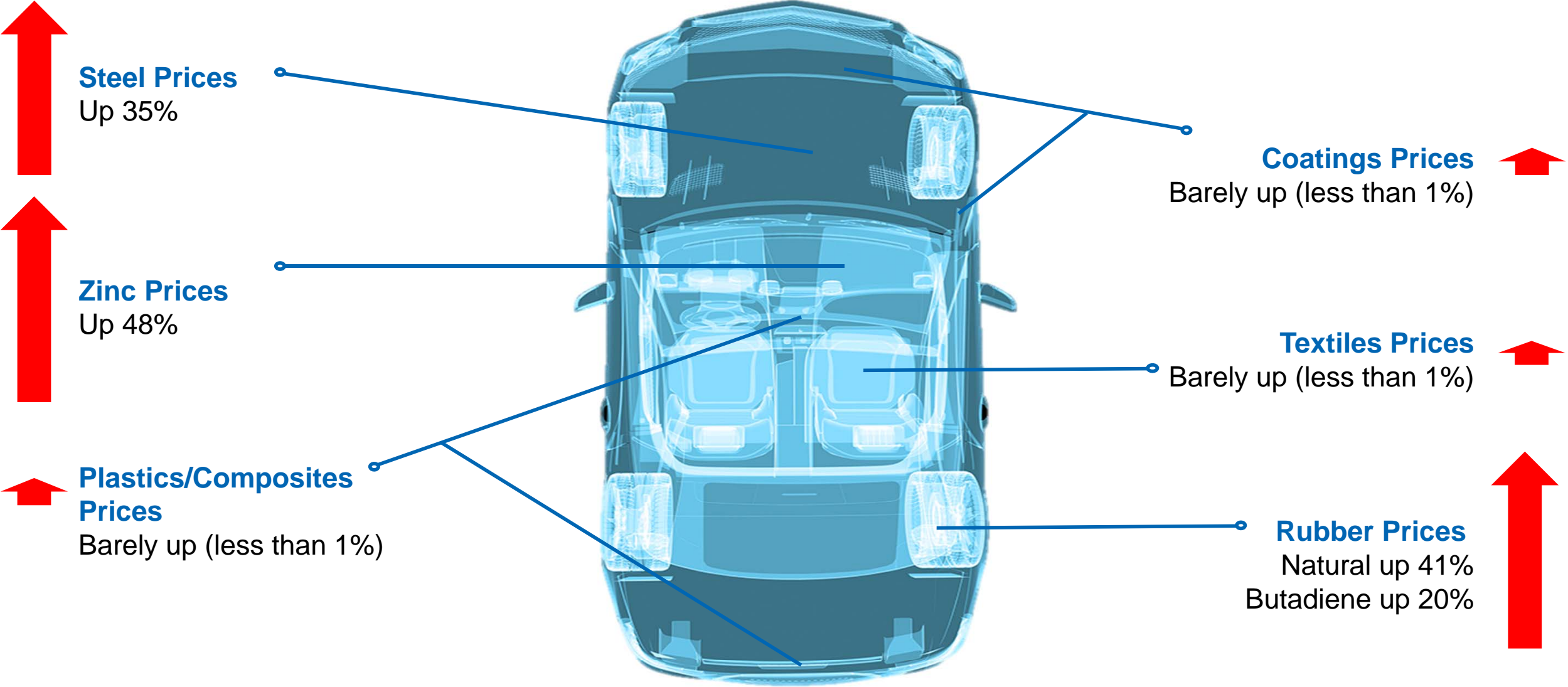
MW US Transaction + AA/AB Premium
 LME Settle
 MW US Transaction + MW US Trans Premium
 MW A-380 Alloy
 MW 319
 MW 356
 MW F132
 LME Alloy Settle

OTHER KEY COST DRIVERS

Labor
 Glass
 Rare Earths

IHS Pricing & Purchasing - Automotive Industry

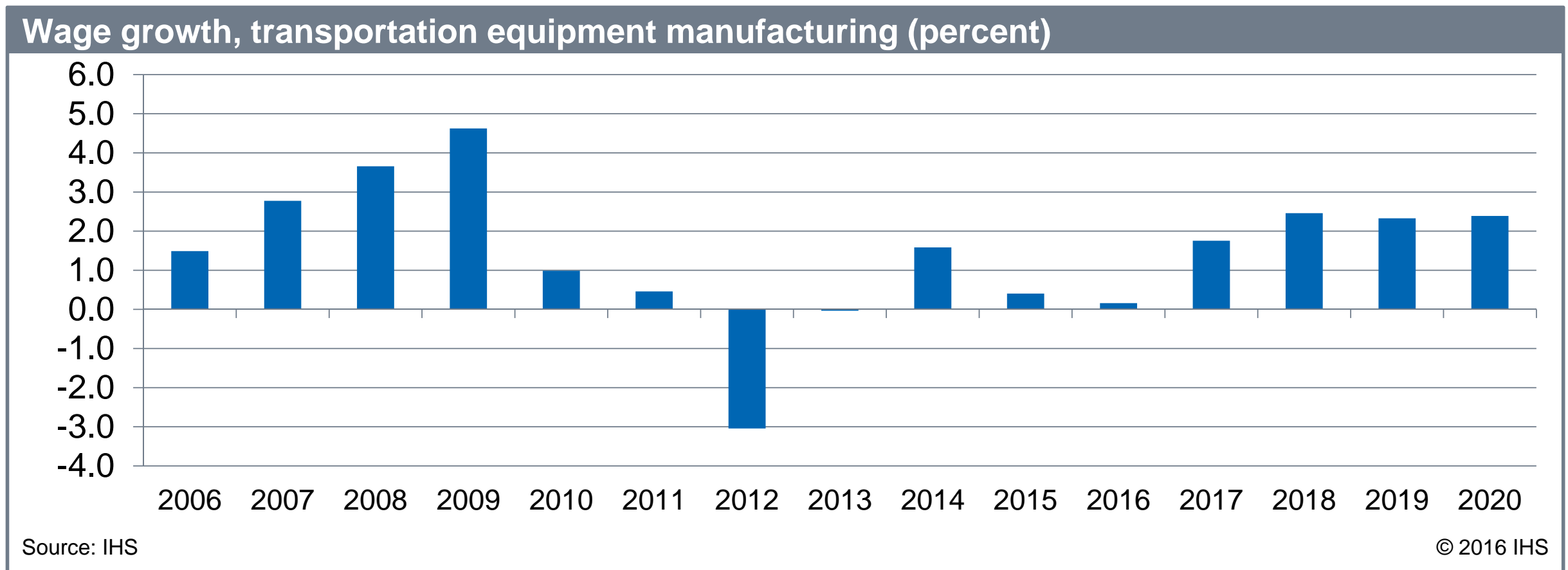
Procurement Intelligence Across Diverse Spend Categories



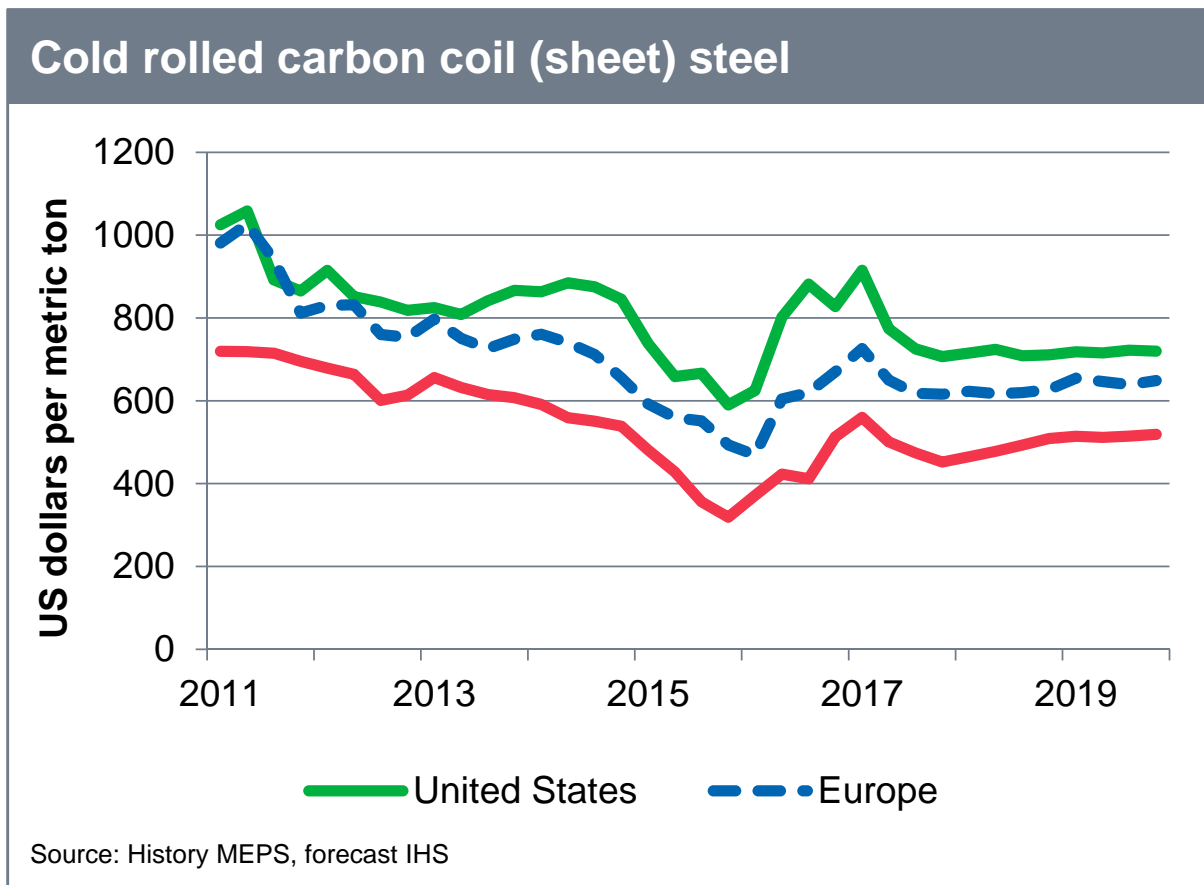
 The total raw material costs associated with manufacturing a passenger car rebounded tremendously since 16Q1, basically the golden quarter.

Transportation manufacturing wages move higher

The 2010-2016 stagnation is over



Steel is at a peak and will retreat

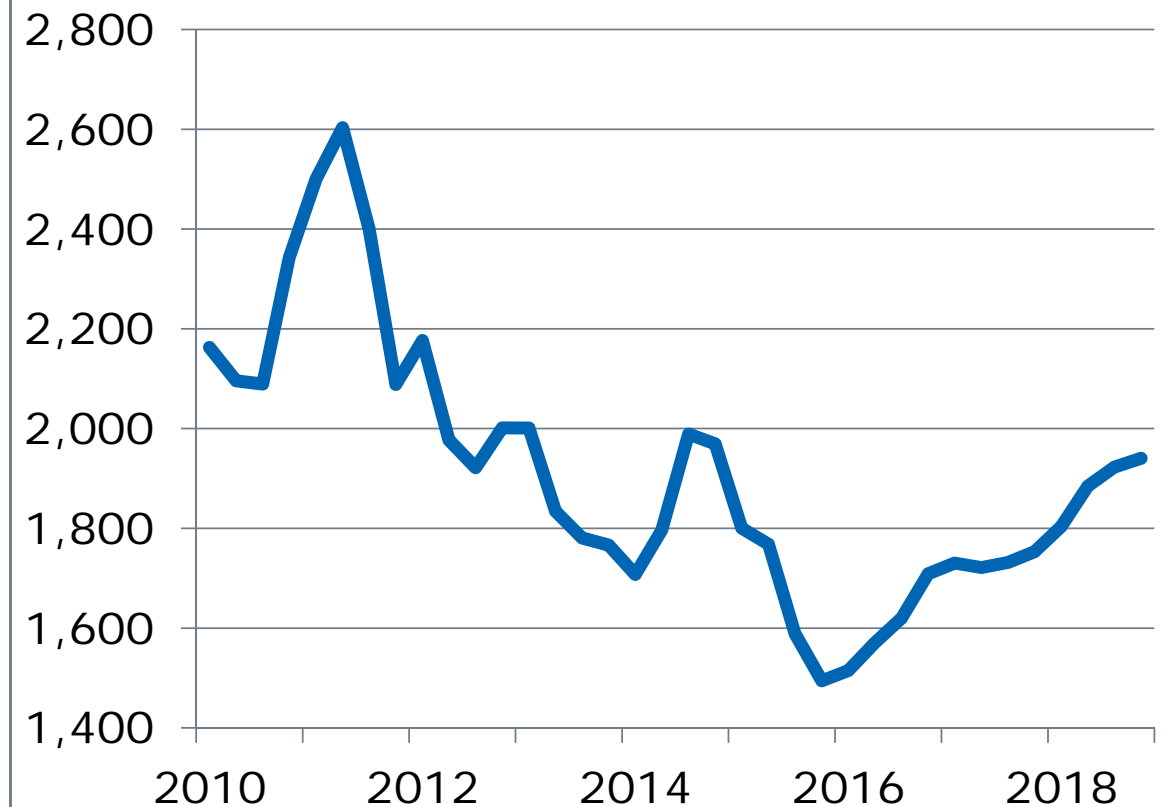


- Steel fundamentals favor buyers (you) for years to come
- But cyclical peaks will periodically occur. Like now.
- 2017 prices retreat as raw material supply disruptions are fixed
- There is a low probability/high consequence risk to the upside from adverse Australian weather
 - > In 2008 prices doubled, in 2011 increased 50%
- No product is more likely to be impacted by the trend towards protectionism
 - > So late 2017 and beyond do not fall all the way back down

Aluminum: Consider locking in immediately

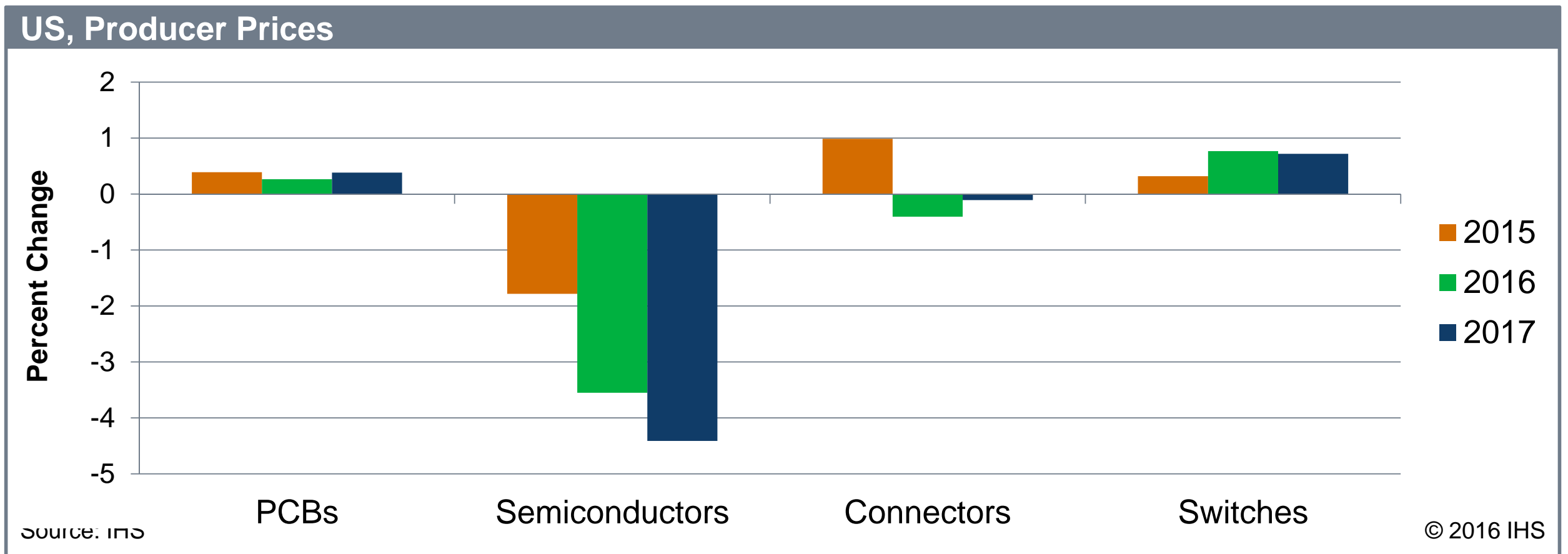
- Prices are headed slowly higher
 - > LME prices are currently at \$1,725/mt with little downside risk; we forecast them to move toward \$1,800/mt by 2017Q4
- Market remains well supplied *but* is showing the signs of tightening
- Prices will see sustained increases *only if* Chinese producers exercise discipline
- A second problem is inventory, which remains huge
 - > Contango has narrowed rendering stock financing unprofitable with metal now being released back into the market

LME Aluminum, \$ per metric ton



Source: IHS Markit

Few electronics price increases per piece, but content expansion will push total spend per vehicle >5% higher per year



Plastics: Rising feedstock costs impacting market

- The overall outlook is favorable
 - > Feedstock (oil and natural gas) are far cheaper than in past decades, and the United States is price-advantaged compared to most of the world
 - That said, feedstock costs have shifted up sharply since early 2016 troughs
 - > Strong production levels will keep price increases muted
- **ABS and other engineering plastics:**
 - > Prices have surged and will continue to rise early this year
 - > By the second quarter prices will retreat, good news for buyers

Hotspots

- Chrome

- > Prices exploded in recent months, driving stainless steel surcharges high
- > But supply is reacting so prices are already retreating

- Rubber

- > Recent sharp price increase is unsustainable, driven by temporary supply disruptions and a spike in feedstock costs.
- > Prices to retreat before the end of Q1, as underlying market supply capacity is high.

- Platinum: Prices rise

- > Current spot price is below mining cost. Diesel engines not dead (yet).

- Steel

- > Huge upside risk from Australian weather

Michael Robinet

Managing Director, Automotive Advisory Services



Mr. Michael Robinet serves as Managing Director for IHS Markit's automotive global advisory practice. Responsibilities include production forecasting, tracking future product programs (FPPs), and analyzing sourcing and production strategies.



2017 NAIAS Vehicle Overview

Technology and Luxury on Display

Michael Robinet, Managing Director

COBO Center Detroit, MI

January 11th, 2017

Themes

- Gap fillers & fragmentation, CUVs take center stage
- Electrification Integration
- ADAS, Infotainment, Connectivity, and Autonomy
- Further focus on interiors

Contents

- **Key Launches Form Our Future**
- Technology Leaders
- Key Concepts
- Other Notables
- The Basics

Key Launches Form Our Future



Chevrolet Traverse

- Migrating to CHI platform alongside Acadia, Enclave, XT5, and XT6, and future Blazer
- Platform: CHI expected to average 520k UPA
- Vehicle Production: Lansing Delta Twp., Michigan (105k UPA)
- 2" longer wheelbase, 3rd row seating, 362lbs lighter
- 2.0L turbo I-4 (255hp), 3.6L V-6 (305hp), w/ 9-Speed auto
- Carplay/Android Auto, 4G LTE Wi-Fi, MyLink

GMC Terrain

- Platform: Global DELTA/D2XX platform (Avg. 2M+ UPA)
- Vehicle Production: SLP, Mexico (110k UPA)
- 400 lbs lighter than first gen Terrain
- Shift-by-Wire introduced, creating more console space
- Optional 1.6L turbodiesel (236-lb-ft) with 6-speed automatic
- Std: 1.5L turbo (170 hp), Opt. 2.0L turbo (252) 9-speed auto
- Std: Carplay/Android Auto, 4GLTE Wi-Fi, and myGMC app



Key Launches Form Our Future



Honda Odyssey

- Platform: 2SL/2SF (475k UPA), utilizes HSS, aluminum, magnesium to reduce Odyssey weight by 100lbs
- BIW reduced by 300lbs, but offset by Odyssey features
- Vehicle production: Lincoln, Alabama (140k UPA)
- Active grille shutter, improved aerodynamics
- All belts to seat allows segment-leading flexibility
- New 10 speed Honda auto

Toyota Camry

- Platform: All new GA-K ramping up to 1.5M+ UPA by 2020
- Vehicle Production: Georgetown, Kentucky (386k UPA)
- Emphasis on Hybrid model differentiation, interior and exterior design improvements
- Improved driving dynamics, suspension, visibility
- Lower ride height – increase interior room
- I-4 and 3.5L V-6 powertrains



Key Launches Form Our Future



Kia Stinger GT

- M Platform: Hyundai/Kia to produce 175-200k UPA
- Vehicle Production: Sohari, South Korea (35k UPA)
- Major styling shift to create room vs. Hyundai
- Extensive use of Aluminum and high-strength steel
- Powertrain: Longitudinally mounted 2.0L turbo (252 hp), and twin turbo 3.3L V-6 (365 hp), 8-Speed Automatic
- Fastback bodystyle a departure

Volkswagen Tiguan

- Platform: MQB A/B expected to exceed 6M UPA by 2020
- Vehicle Production: Puebla, Mexico (130k UPA)
- 11" longer than outgoing Tiguan to house 3rd row seating
- 3rd row seating standard on FWD models, optional on AWD
- New customizable digital cockpit display allows drivers to choose data and Navigation configurations
- Better fills a gap below Atlas



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- Other Notables
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Technology Leaders



Audi Q8 Concept

- Based on MLB D platform – added to slate of large CIVs from Porsche, Audi and VW (SOP: 12-2017)
- Based upon Q7 structure and technology suite – 90% ready
- Length: 198 in. (-1.6*) Width: 80.4 in. (+2.9*)
2018-22 Avg. Annual Volume: 29K
- New range topper CUV to share technology leadership with A8
- Shown in 2+2 but available in 5 pass version

*difference from current Q7

Volvo V90 Wagon

- Production location: Torslanda, SWE (US models) SOP: 06-2016
- Follows the V90 Cross Country – order only, dealers will not stock
- Platform: SPA (platform debuted with Volvo XC90 in 01-2015)
- Length: 194.3 in. Width: 74.7 in.
Height: 58.1 in. Wheelbase: 115.8 in.
- Available in FWD and AWD variations



Technology Leaders



BMW 5-Series

- Production locations: Dingolfing, Germany & Graz, Austria
- Platform: LK (5-Series is platform debut) SOP=11/2016
- LK is BMW's new medium architecture.
- Substantial mass reduction versus prior offering (200lbs)
- Length: 194.3 in. (+0.9*) Width: 73.5 in. (+0.3*)
Height: 58.2 in. (+0.6*) Wheelbase: 117.1 in. (+0.2*)
- 2017-21 Avg. Annual Production Volume: 301,500 units

Lexus LS

- Production location: Tahara, Atsumi, JPN
- Platform: GA-L (platform debuted with LC) SOP: 08-2016
- Length: 206.1 in. (+6.1*) Width: 74.8 in. (+1.0*)
Height: 57.1 in. (-1.0*) Wheelbase: 123 in. (+6.1*)
- Optional Denso-supplied 24" color head-up display available.
- Innovative safety package – pedestrian avoidance
- No V8, twin-turbo V6 with 10 speed auto



*difference from previous generation

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Key Concepts



Nissan V-Motion 2.0

- Length: 191.3 in. (-1.5*) Width: 74.4 in. (+1.2*) Height: 54.3 in. Wheelbase: 112.2 in. (+2.9*)
- Evolution of Nissan's V-Motion design language; expected to underpin the design of the next Maxima and Altima, indicating Nissan's intent to remain committed to sedans.
- Will support ProPILOT autonomous driving mode, part of Nissan's Intelligent Mobility Plan.

Cadillac Escala

- Length: 210.5 in. (6 in. longer vs. CT6) Width: 76.7 in. Height: 57.3 in. Wheelbase: 127.1 in.
- Escala expected to represent design language of a future flagship models – sedans and CUVs.
- Features three OLED screens spanning the width of the instrument panel.
- Uses VSS-R RWD-focused multimaterial platform.

*difference from current Maxima



Key Concepts



Lincoln Navigator

- Concept only gull wing doors and 3 step entry
- Interior material choice carries the design driven by last year's Continental.
- Features six Perfect Position seats, first seen on the all-new Continental.
- Spiritually where the next Navigator off T3 is headed

Volkswagen I.D. Buzz

- Fully-electric range up to 270 miles on the Modular Electric Drive (MEB) platform.
- Supports Volkswagen's I.D. Pilot autonomous driving suite. – Turns yellow when in autonomous mode
- Electric all-wheel drive standard.
- Longer than the T4 Bus, longer than the LWB T4.
- Steering wheel retracts in autonomous mode.



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Other Notables



Ford F-Series MCE

- Platform: T3, Roughly 965k F-Series produced annually
- 7 new front grills, 6 wheel options, updated lights and interior improvements to differentiate trim levels
- New Std. 3.3L V-6, and new 3.0L Powerstroke V-6 turbodiesel
- All 2018 F-150's will be equipped with standard Stop/Start and 10 speed auto (designed with GM)
- Improved lighting though few interior changes

Nissan Rogue Sport (Qashqai)

- Segment: Small C-Segment Crossover Utility Vehicle (CUV)
- Platform: CMF-C/D averaging 2.7M UPA
- Vehicle Production: Kyushu, Japan (90-100k UPA)
- Gap filler – above Juke, below Rogue – essentially a Small C



Other Notables



Subaru WRX

- Platform: SI(2) 963k in 2016, reduced to 70k 2020
- Vehicle Production: Yajima, Japan (40k UPA)
- Fully electric differential system, modified shifter, clutch actuation, and EPS for improved driving feel
- Use of sound deadening materials, thick window glass – better NVH
- STI receives front 6-piston Brembo brakes

Mercedes E-Series Coupe

- Platform: MRA MID-SIZE (1.1M UPA)
- Vehicle Production: Bremen, Germany (~50k UPA)
- Increased: OAL +4.8", wheelbase +4.4"
- Twin Turbo 3.0L V6 – main US engine
- ADAS: Semi-autonomous driver assist, high speed ACC
- Will feature a 24" ICD display



Key Launches



Ford EcoSport

- Emerging markets offering, modified for US sale
- Features a unique single swing tailgate door
- Platform: B2E (1.0M+ UPA)
- Vehicle Production: Maraimalainagar, India (290k UPA)
- 6-Speed automatic transmission is paired with either the 1.0L EcoBoost I-3 on FWD models, or the 2.0L I-4 with Std. AWD



Toyota C-HR

- Platform: GA-C (1.4M UPA)
- Vehicle Production: Sakarya, Turkey (163k UPA)
- C-HR stands for Coupe-High-Rider
- 2.0L I-4 (144hp) with a CVT, FWD Only
- Considered a small C-CUV between RAV4 and an upcoming Toyota B-CUV



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IHS Markit is supporting clients in these uncertain times by examining 3 possible scenarios that may emerge from the Trump Administration



Scenario- 1 assumes President keeps his word with his “Contract with the American Voter” (CAV)

Donald Trump's Contract with the American Voter

What follows is my 100-day action plan to Make America Great Again. It is a contract between myself and the American voter — and begins with restoring honesty and accountability, and bringing change to Washington.

On the first day of my term of office, my administration will immediately pursue the following:

- Six measures to clean up the corruption and special interest collusion in Washington, DC:**
 - FIRST:** impose a constitutional amendment to prevent the Senate or all members of Congress.
 - SECOND:** a strong freeze on all federal employees to reduce the federal workforce through attrition, eliminating military, public safety, and public health.
 - THIRD:** requirement that for every new federal regulation, two existing regulations must be eliminated.
 - FOURTH:** all senior staff in White House and Congressional offices (excluding lobbyists) after they leave government service.
 - FIFTH:** a hotline ban on White House officials lobbying on behalf of a foreign government.
 - SIXTH:** complete ban on foreign lobbyists raising money for American elections.
- Seven actions to protect American workers:**
 - FIRST:** I will announce my intention to renegotiate NAFTA or withdraw from the deal under Article 2306.
 - SECOND:** I will announce our withdrawal from the Trans-Pacific Partnership.
 - THIRD:** I will ask the Secretary of the Treasury to label China a currency manipulator.
 - FOURTH:** I will direct the Secretary of Commerce and U.S. Trade Representative to request American workers and show them to our way of life and American and international law to and those who are immediately.
 - FIFTH:** I will set the maximum on the production of 500 billion dollar worth of job-creating American energy resources, including oil, natural gas, and clean coal.
 - SIXTH:** on the Obama Clean energy bills and allow vital to move forward.
 - SEVENTH:** cancel all other programs to the oil, oil, change programs and use the money to fix America's roads and environmental infrastructure.
- Five actions to restore security and the constitutional rule of law:**
 - FIRST:** I will order any unconstitutional executive action, memorandum and order issued by President Obama.
 - SECOND:** I will require the president of the United States to be sworn in on the 20th January on my list, who will attend and address the U.S. Constitution.
 - THIRD:** I will order all federal funding to sanctuary cities.
 - FOURTH:** I will require the removal from the national legal immunity from this country and cancel visas to foreign countries that seek to harm our land.
 - FIFTH:** I will suspend immigration from border areas where there is a high risk of terrorism. All selling of people coming into our country will be considered "welcome selling" (welcome/selling).

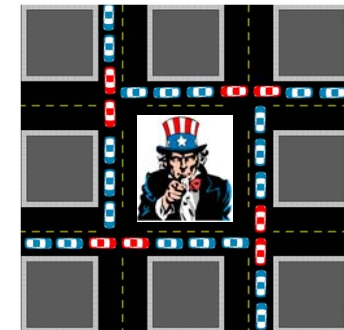
Probability?

Scenario- 2 assumes President moderates his view and adopts a more traditional GOP approach to the issues



Probability?

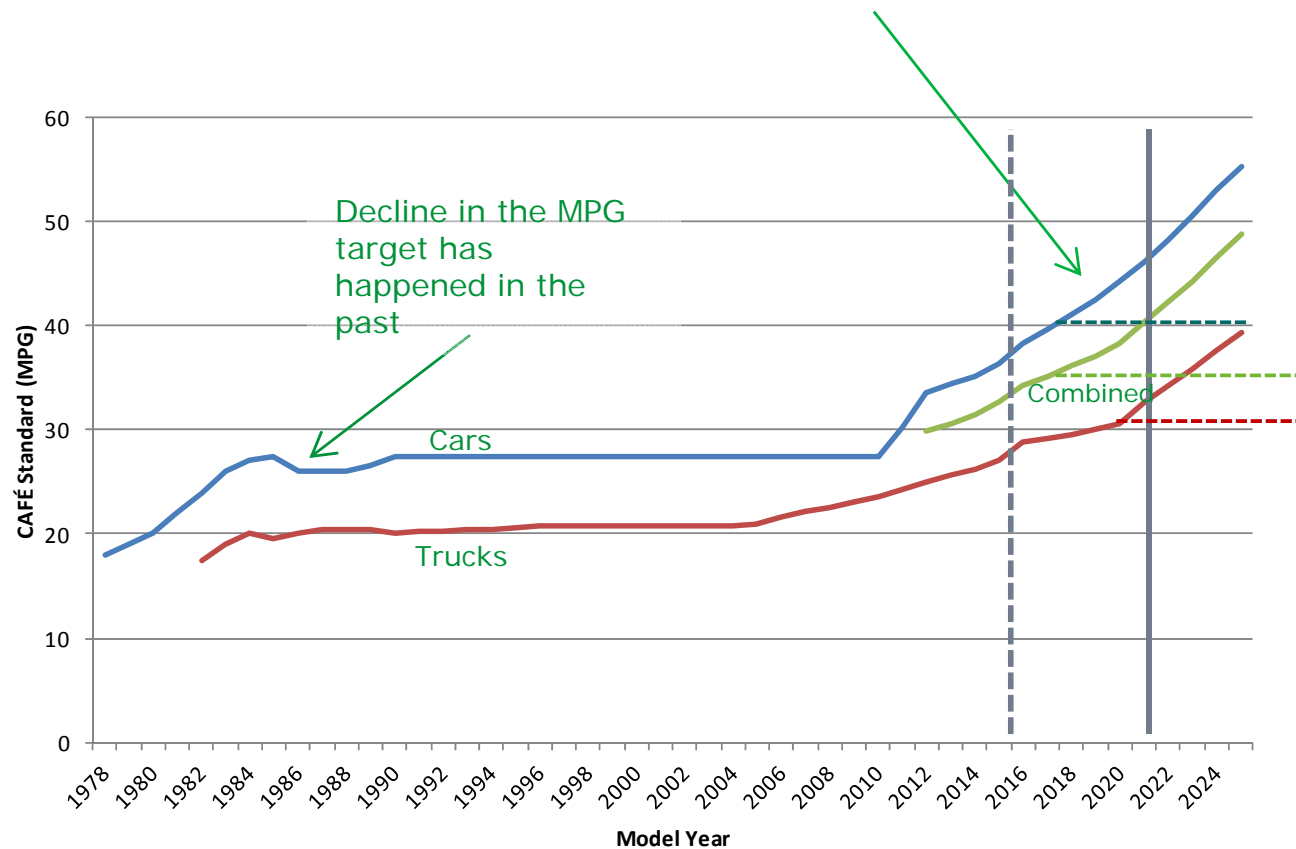
Scenario- 3 assumes Business as Usual (BAU) and anticipates continued political gridlock



Probability?

NHTSA CAFE History - We've Only Just Begun

- Two key milestones for the future are the 2016 requirement and then the more difficult 2022-2025 requirement

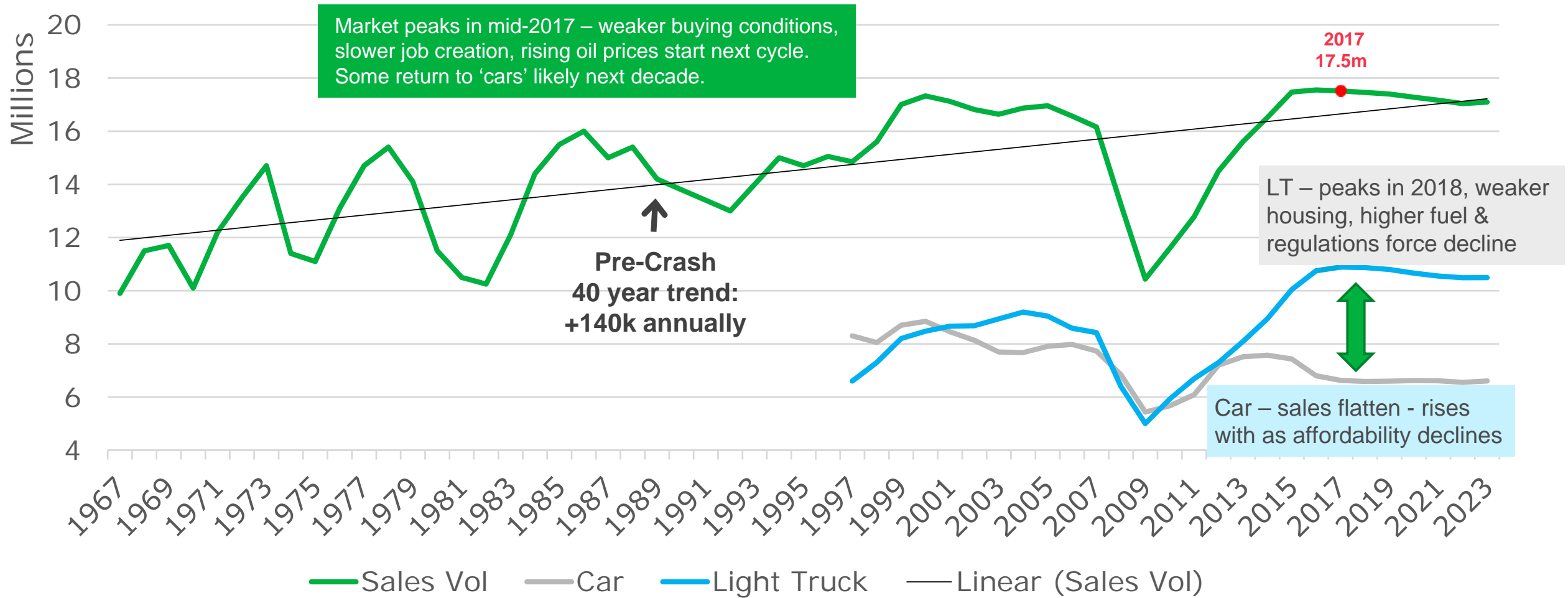


New Plan ?

- 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

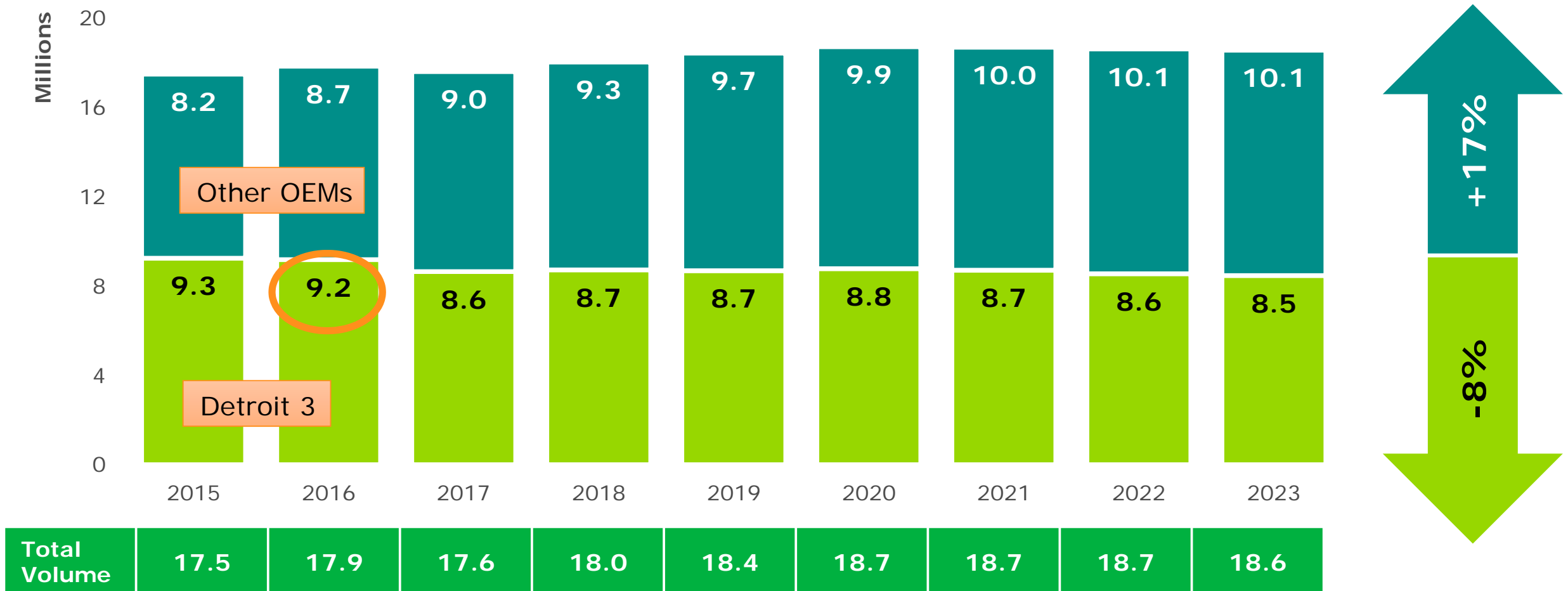
US: Light Vehicle Sales Forecast

Sales peak here; return to previous long-term trend level possible



Divergent Trajectories – NA LV Production

Detroit Three Volume Leveled in 2016



Thank You

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Devin Lindsay

Principal Analyst, North America Powertrain Forecasts



Mr. Devin Lindsay serves as a Principal Analyst at IHS Markit, where he is responsible for Alternative Propulsion forecasting and market analysis.



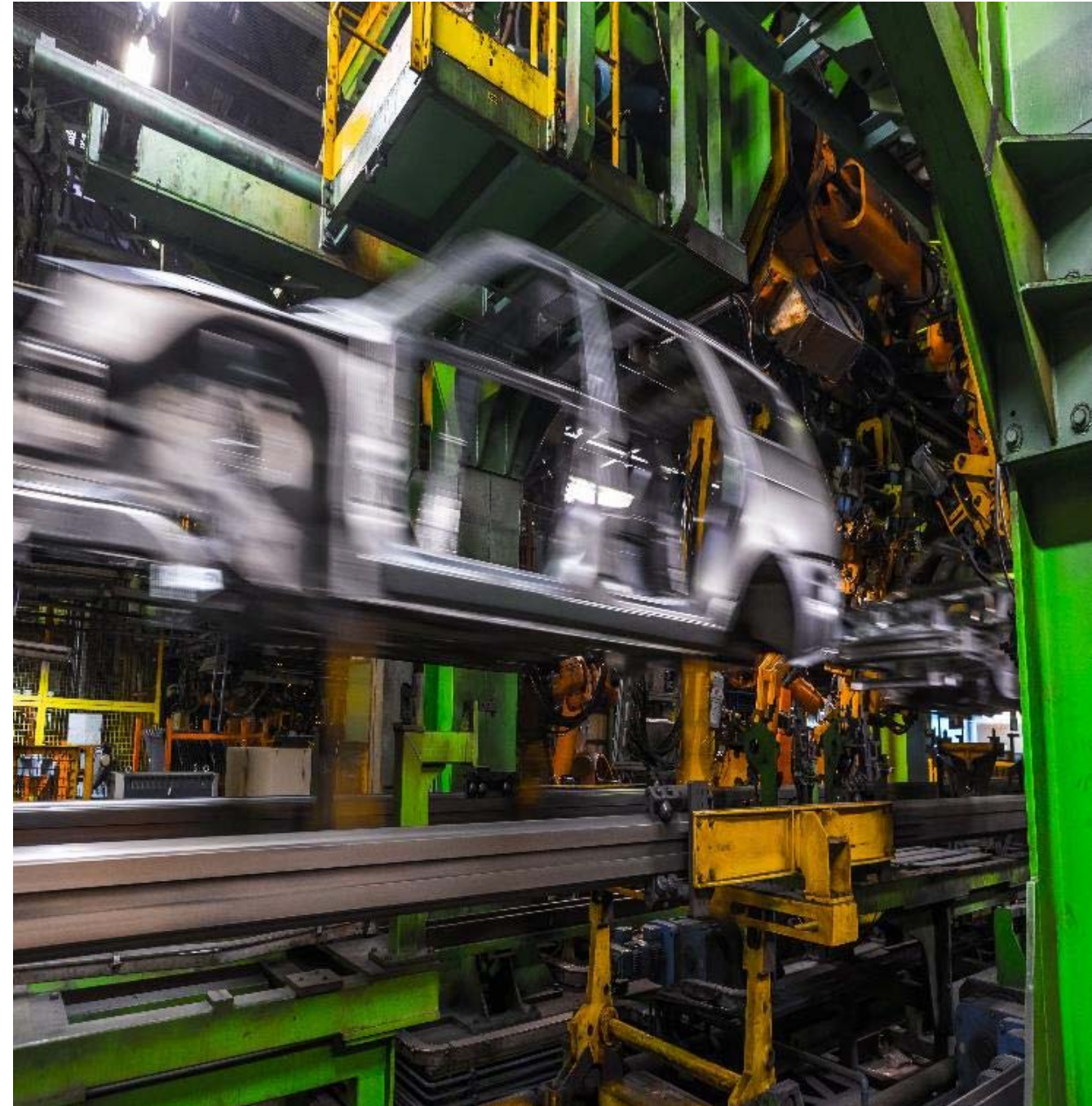
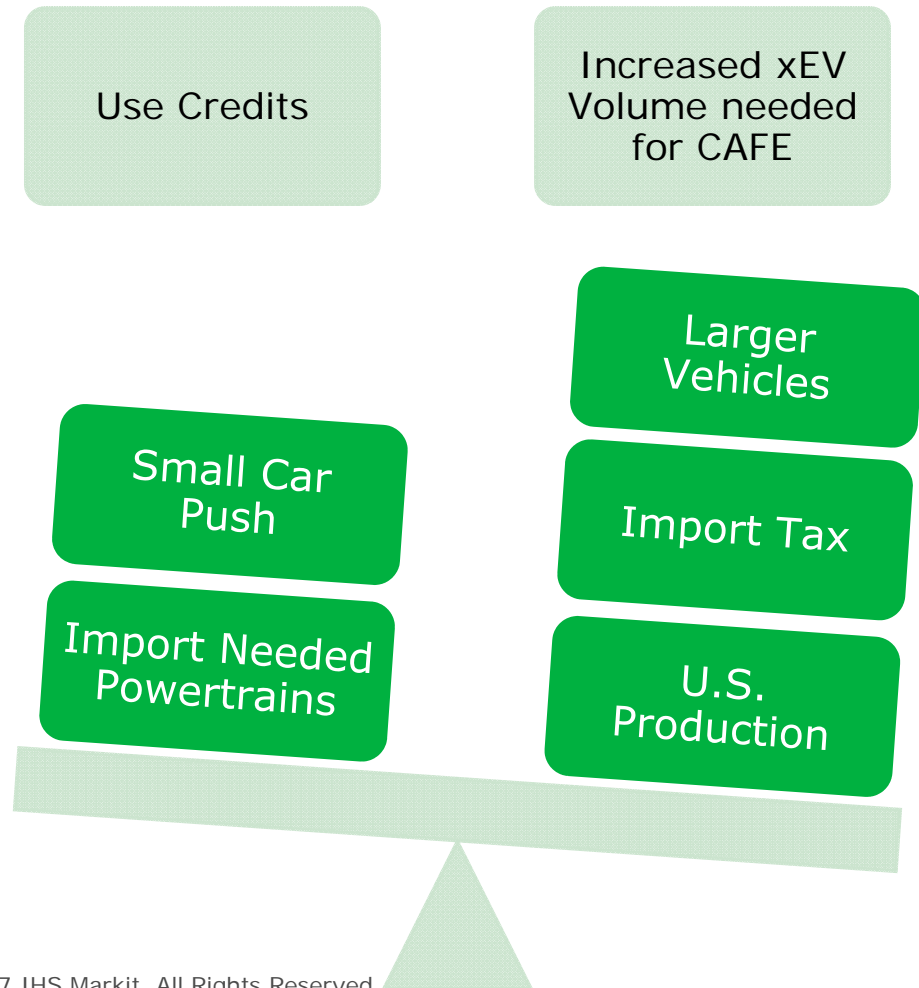
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2017 NAIAS Electrification Powertrain Highlights

Breakfast Briefing- January 11th, 2017

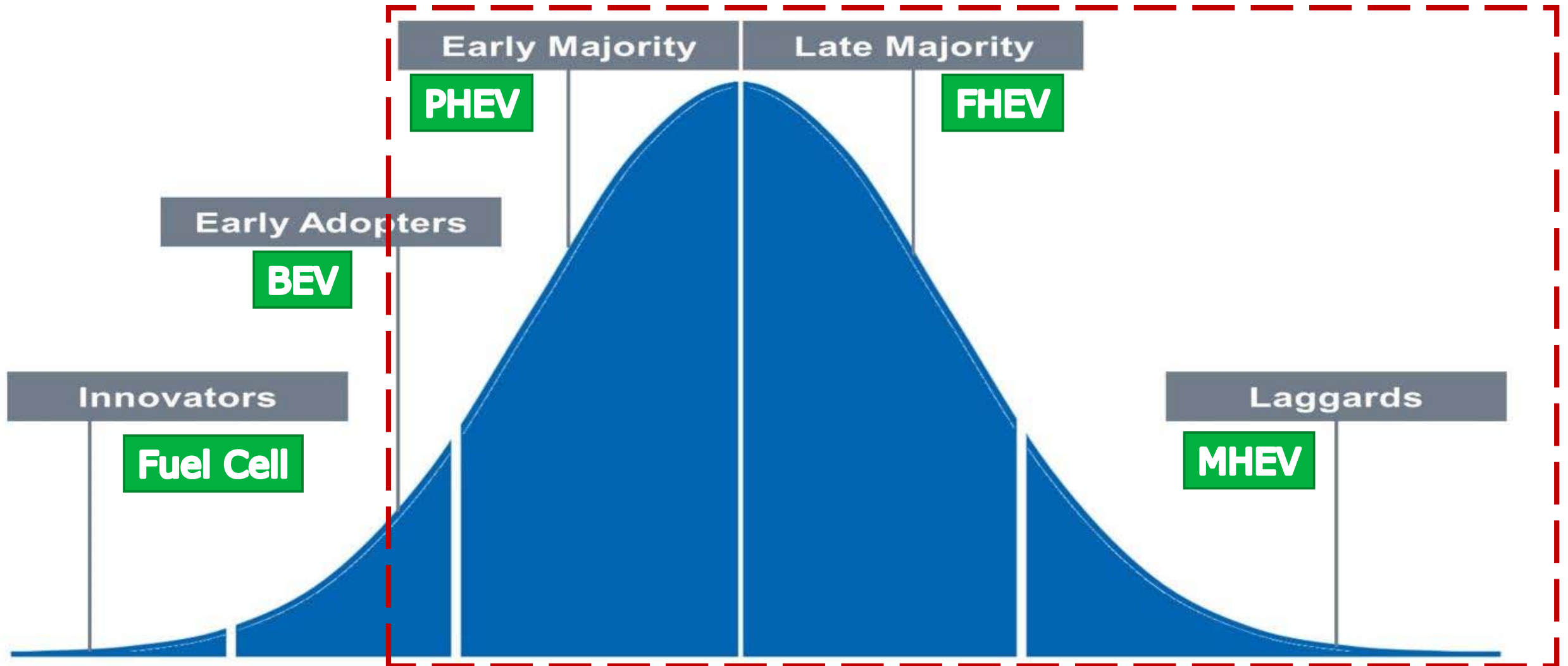
Devin Lindsay, Principal Analyst, North American Powertrain & Compliance Forecasting

Could More Localized Production Mean More Needed Electrification?



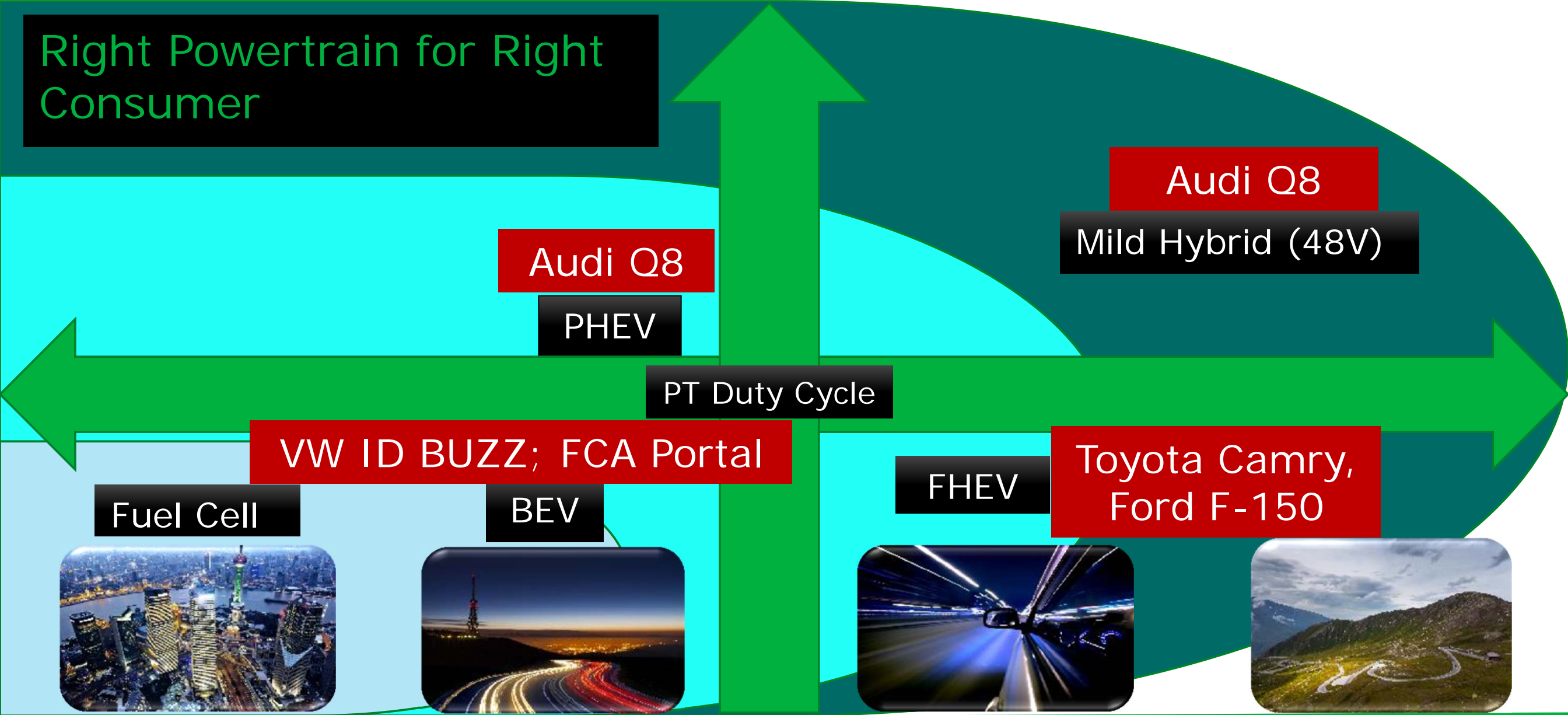
Technology Adoption Cycle

Possible curve for alternative propulsion systems



Source: IHS

Right Powertrain for Right Consumer



Audi Q8 – A New Combination

- 3.0 TFSI producing 245 kW (333 hp) and a maximum of 500 Nm (368.8 lb-ft) of torque
- electric motor generates 100 kW of power and 330 Nm (243.4 lb-ft). 8-speed Tiptronic
- 102.3 US mpg on NEDC
17.9 kWh Lithium Ion battery, electric range of 37.3 mi
- total range of 621.4 mi
- full charge with 7.2 kW output takes about two and a half hours.



Audi Predictive Efficiency Assistant

- provides hybrid management system with highly detailed information about the near surroundings
- Route data from the navigation system and Audi connect Car-to-X services are also considered.

People Movers

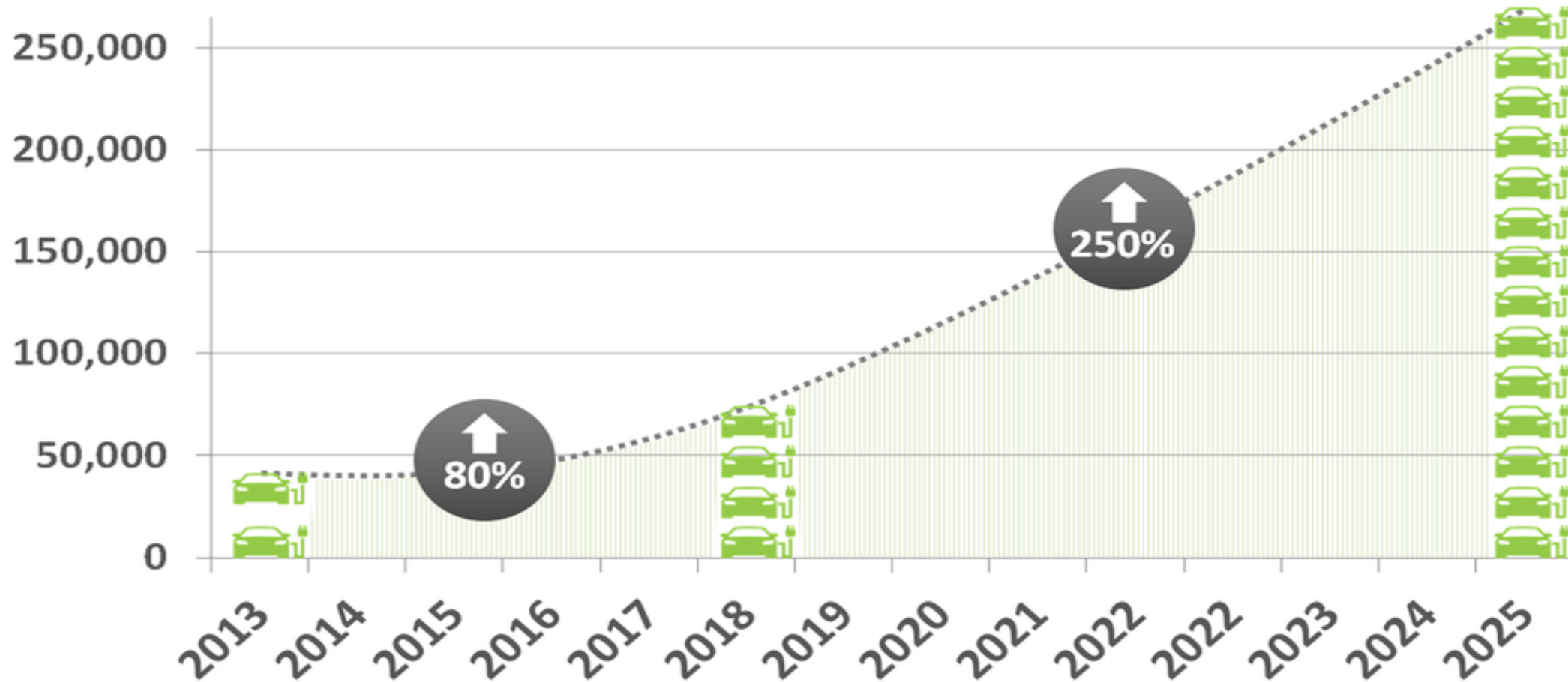
- 3.5-liter, direct-injected *i*-VTEC™ V-6 engine w/VCM™
- 280 SAE net horsepower (+32 HP)
- two new transmissions – a 9AT and, for upper grades an all-new, Honda-developed 10AT
- Hybrid in the future?



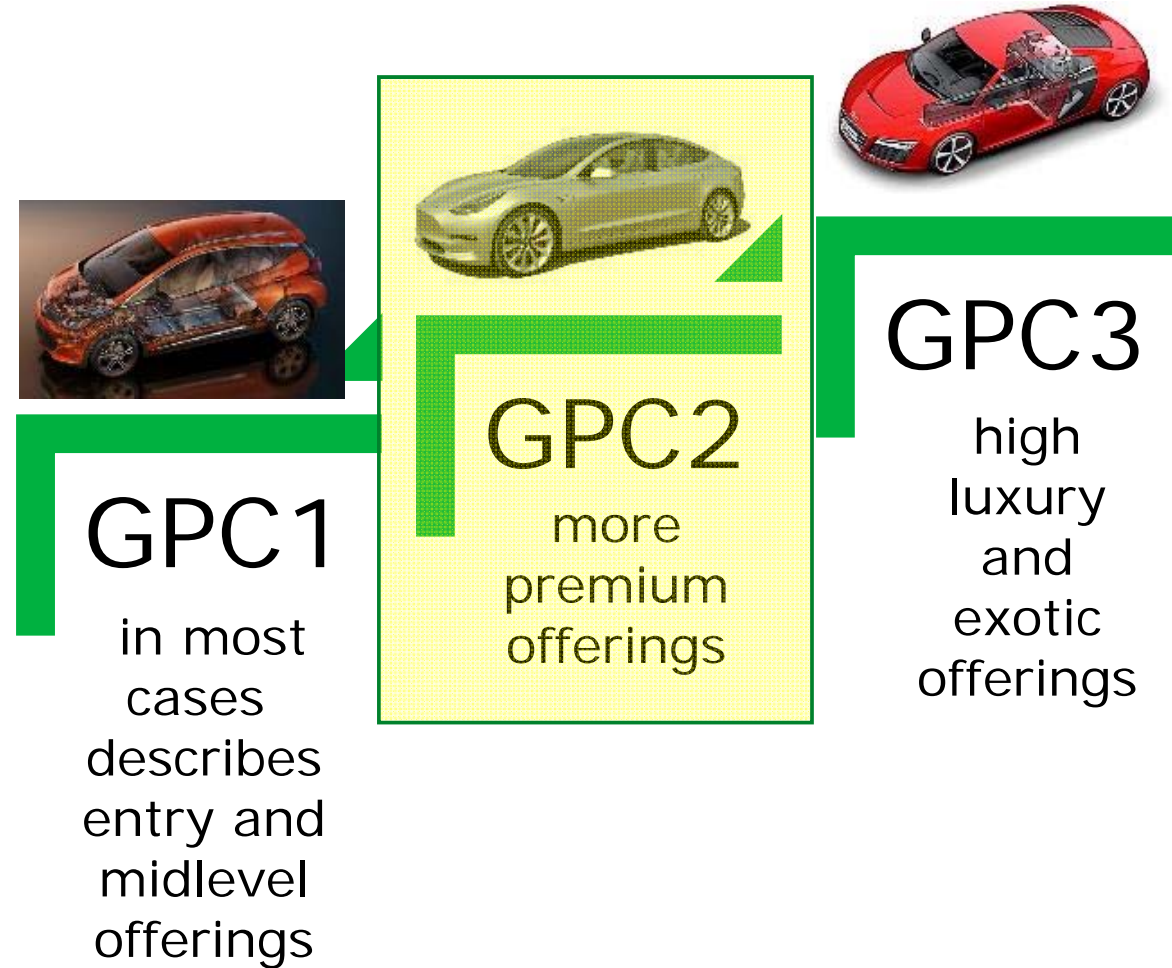
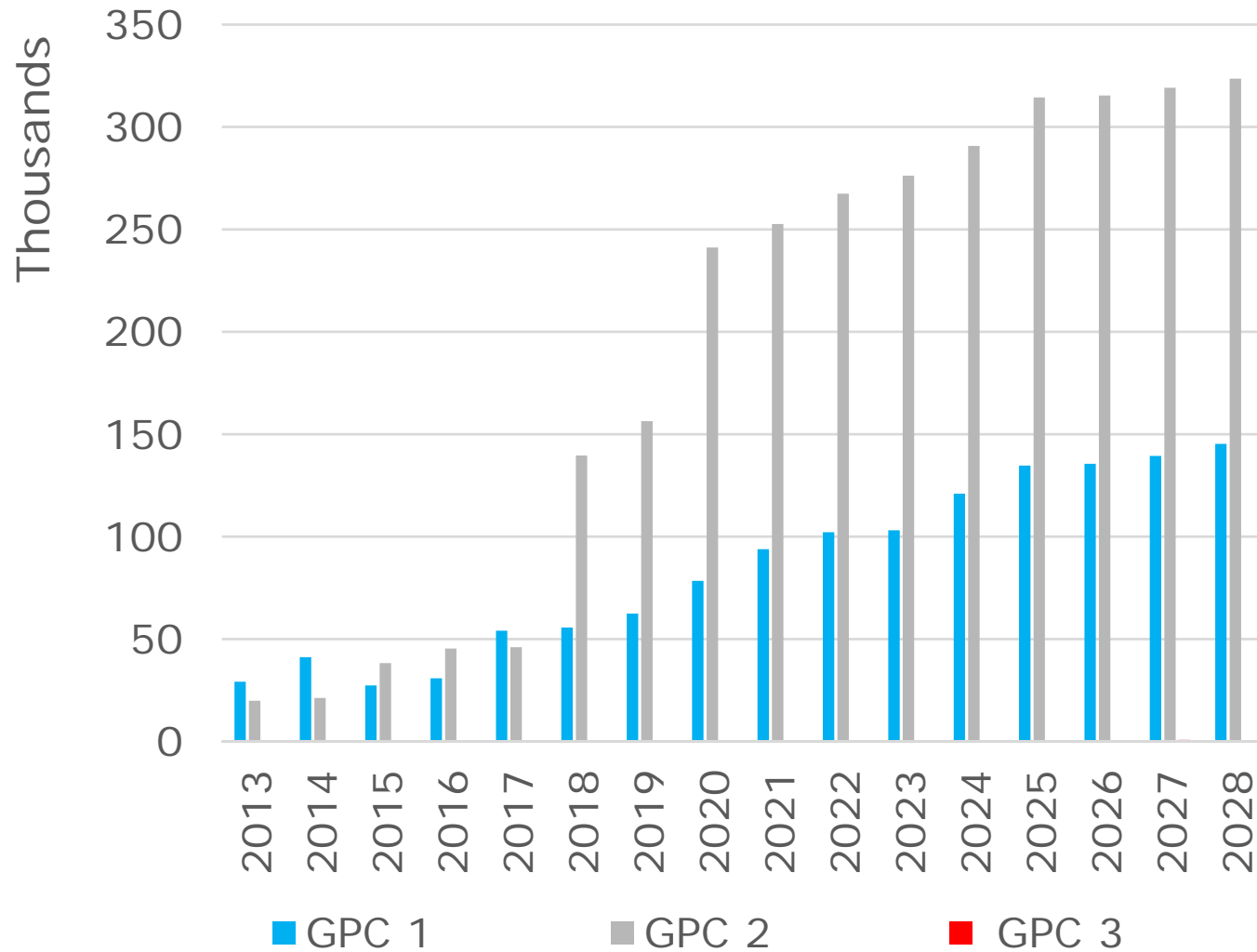
- electric motors on both axles
- 110-kWh lithium-ion battery pack
Range: 200 - 270 miles on the EPA cycle
- 150-kW charger can deliver 80 percent charge in 30 minutes.

Does the 2017 NAIAS Prove ZEV Is Working?

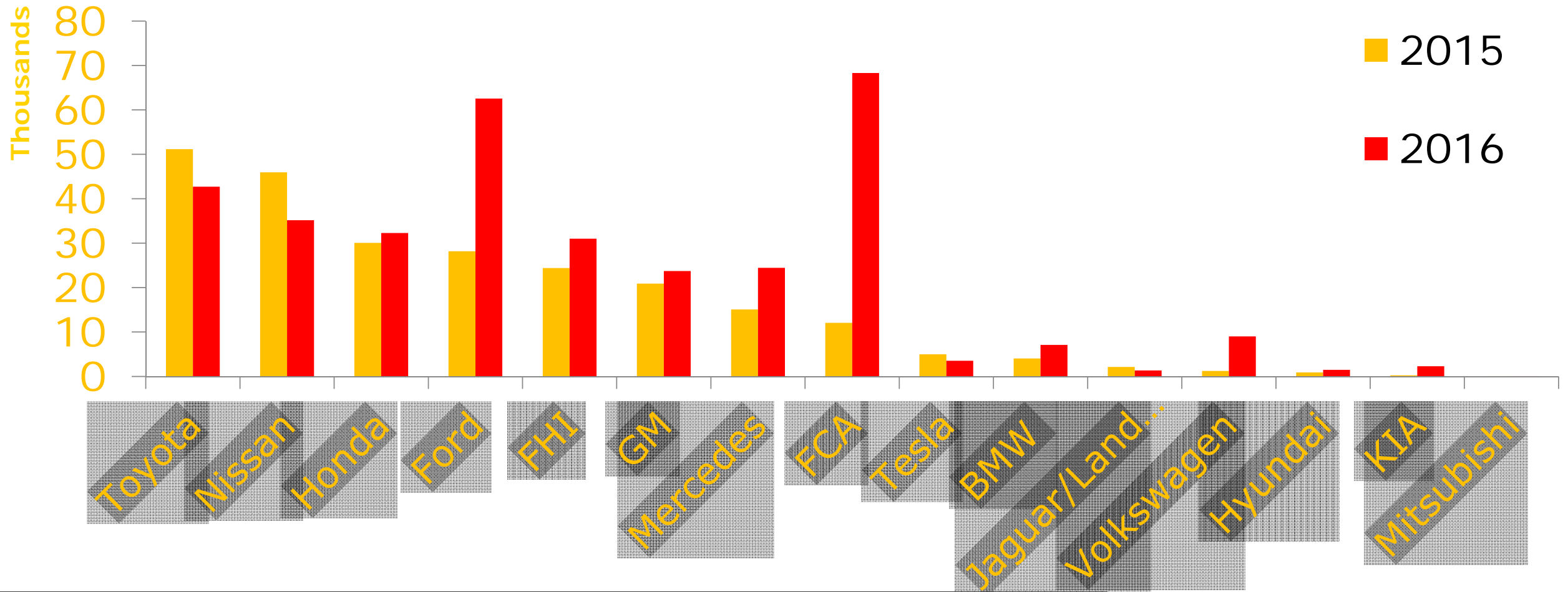
ZEV SALES IN CALIFORNIA



Global Price Class (GPC) – United States EV Sales

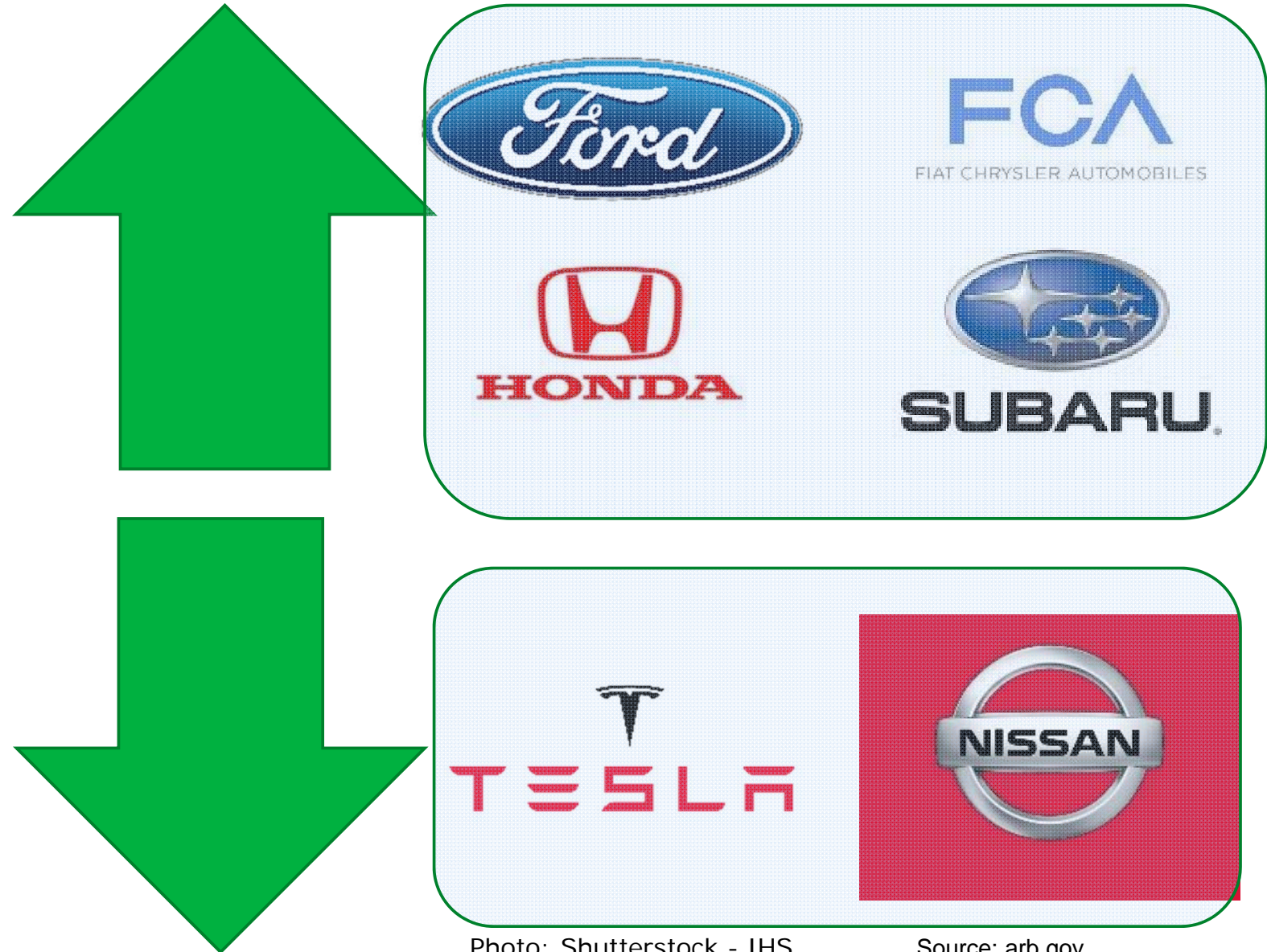


Credit Balances: September 2015 vs. August 2016*



*Manufacturer credit balances since ZEV 1990

BEV Credit - "Direct Deposit"



MILE 400



Level 4

Level 4

Nearing ICE Range Offering More Than Just Fuel Economy

MILE 300



Level 4 with Level 5 Possibility?



MILE 200

Federal
vs.
State?

Just

Right

Fuel
Economy
Autonomous
Tethered



★ Government / incentives

★ Oil prices

★ Products

Samsung Battery

- driving range of up to 370 miles
- can fast-charge electric vehicles in 20min
- lighter integrated battery module.

Chargepoint

- 400 kw for cars not yet in production
- Flexible wiring for various sites
- 200-250 miles delivered in 10 min.

Untapped Markets

- Ethnic Diversity Awards winners
- Ride sharing markets
- "xEV for all"
- Customer perception
- "Creative" financing



Battery evolution



Infrastructure



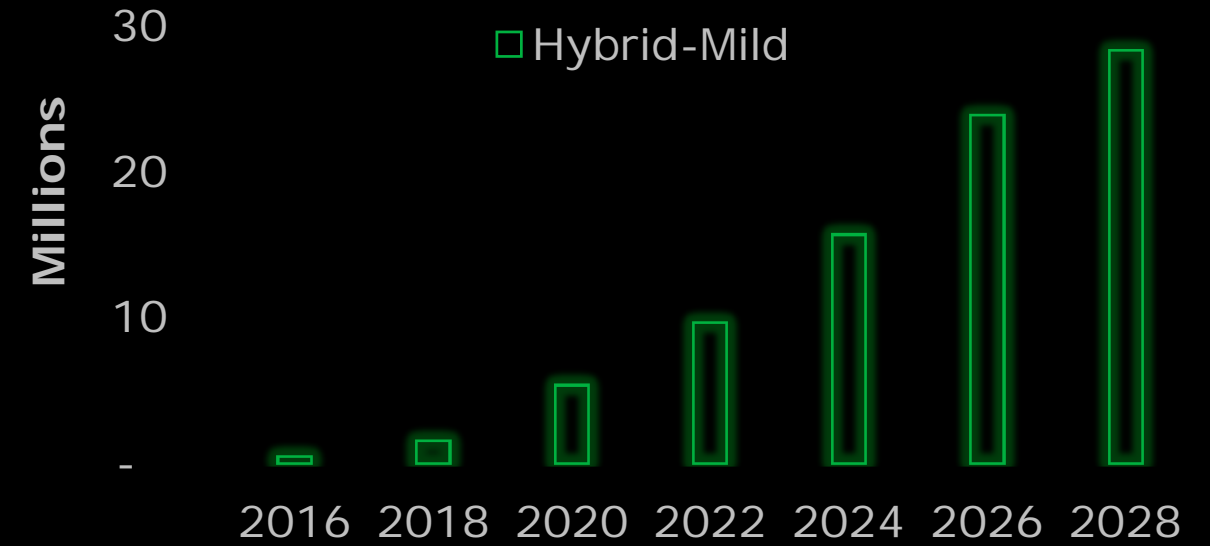
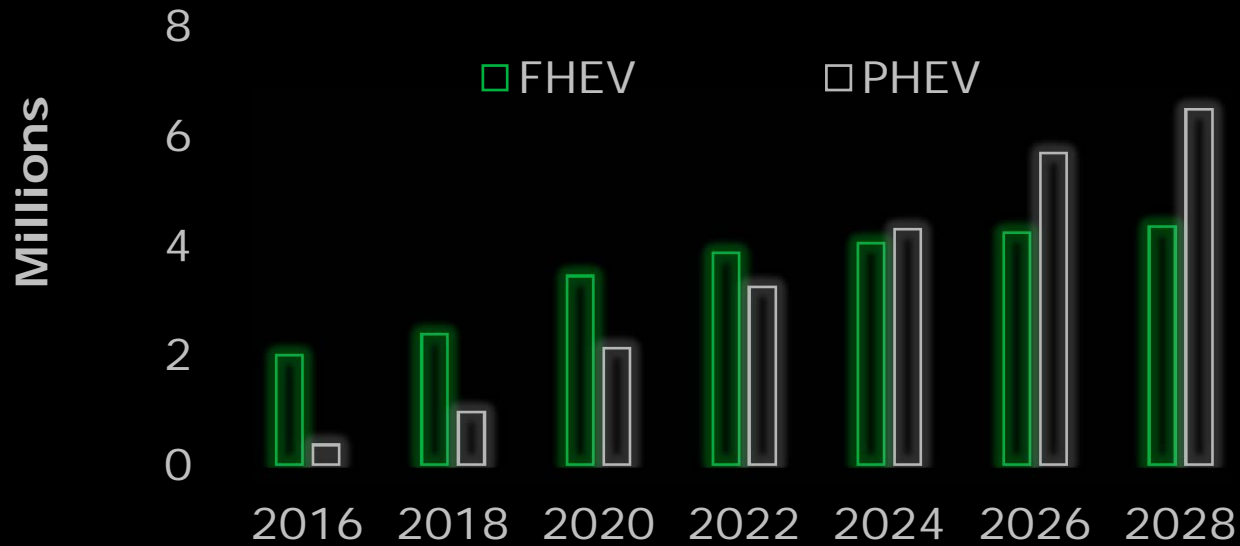
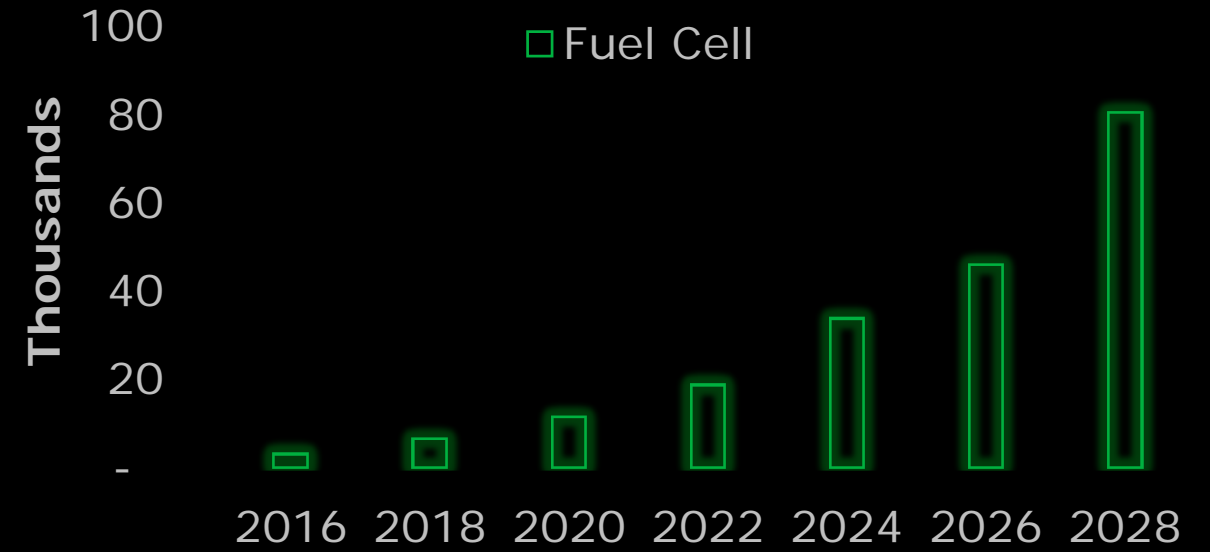
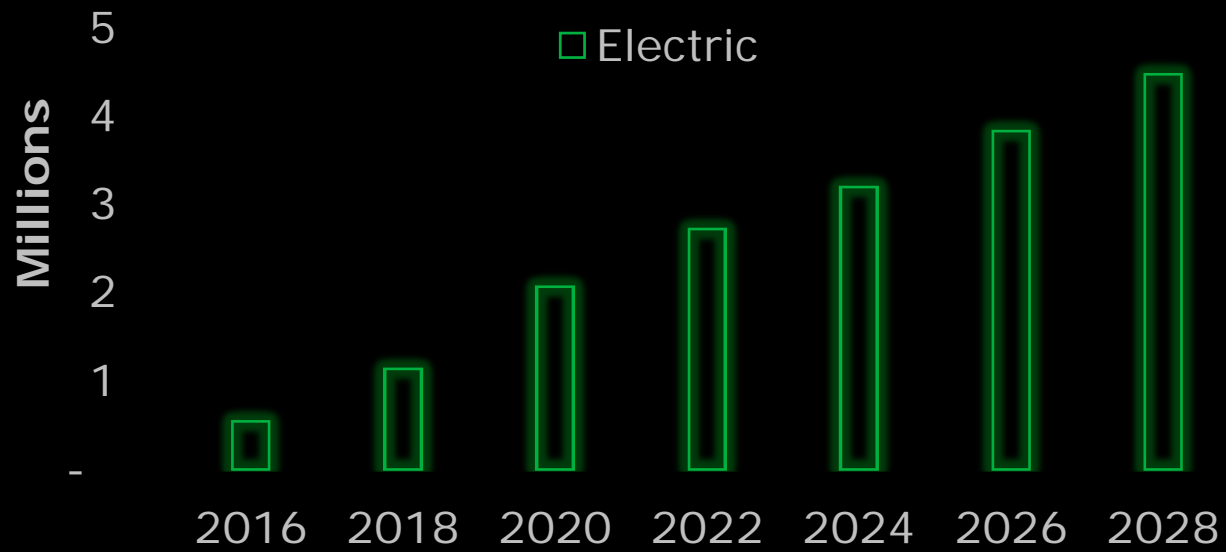
Photo By: Devin Lindsay



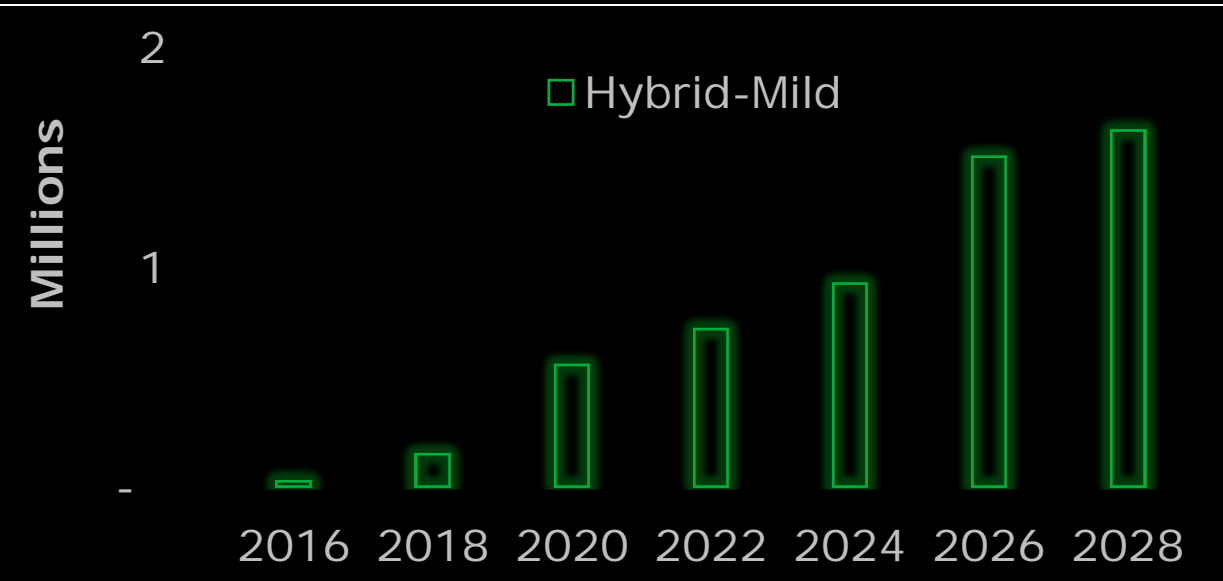
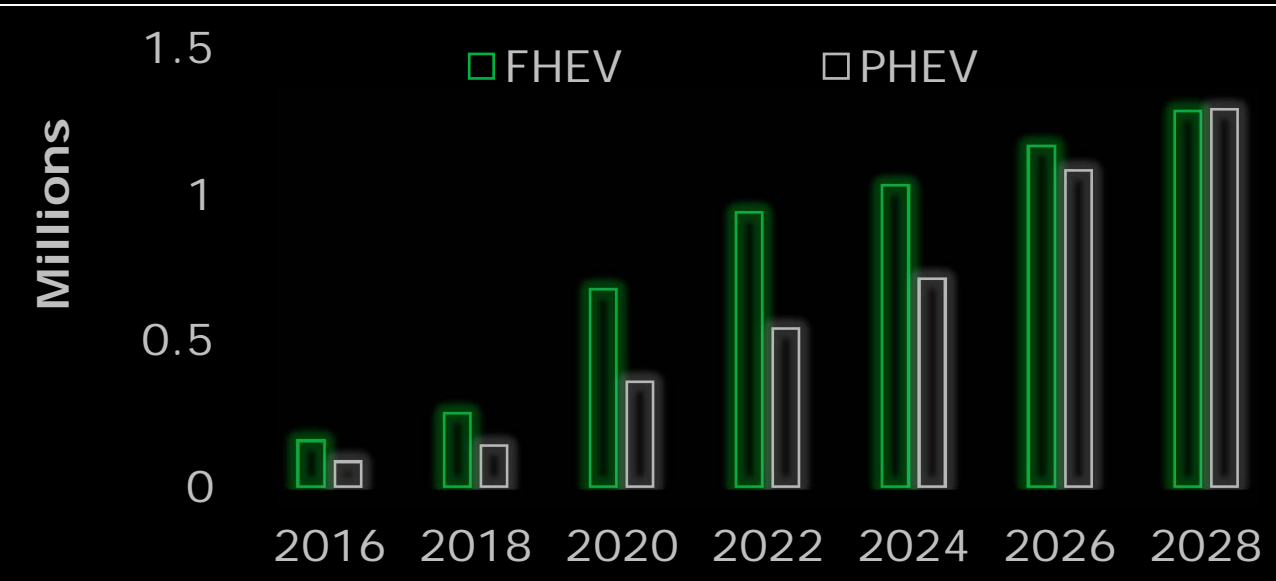
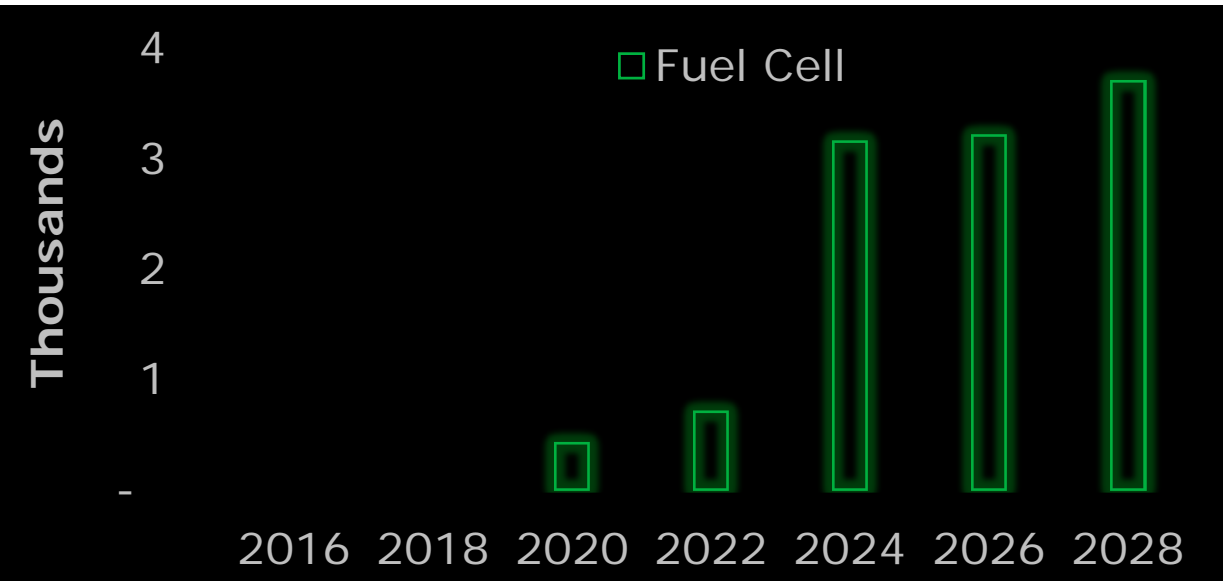
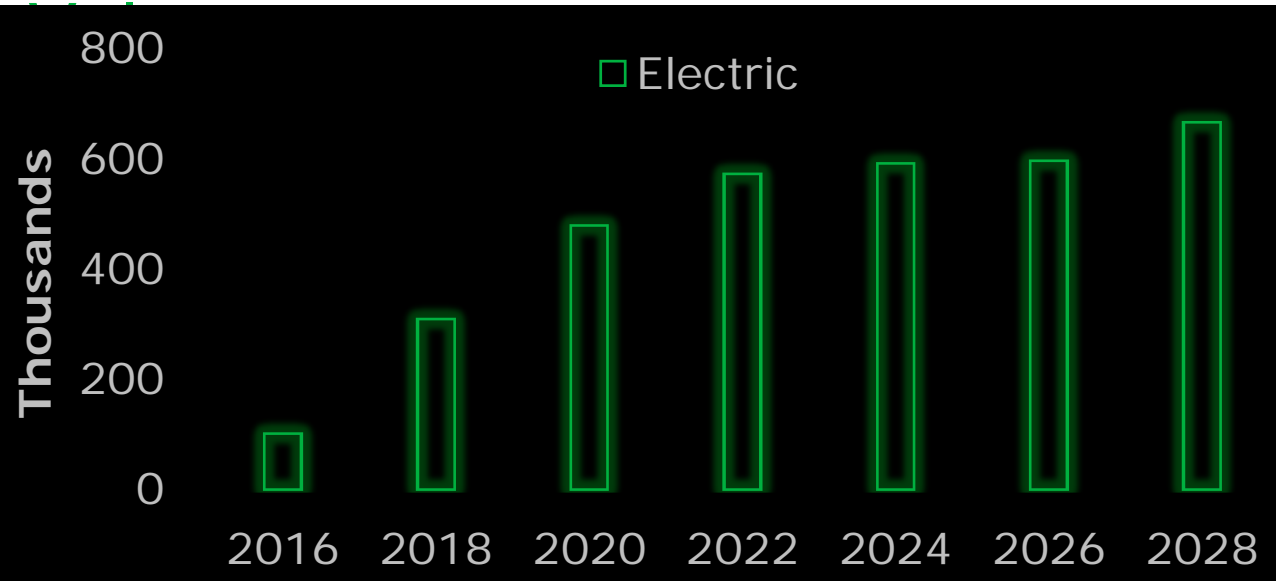
Consumer



Global xEV Production Volume



North America xEV Production



Thank You

Devin Lindsay, Powertrain & Alternative Propulsion

Jeremy Carlson

Principle Analyst, Automotive Technology Group



Mr. Jeremy Carlson is a Principal Analyst within the automotive technology group, responsible for automotive electronics market research with a primary focus on advanced driver assist systems, technologies, sensors and autonomous vehicles.

Automotive Technology at NAIAS & CES

Jeremy Carlson

Principal Analyst

jeremy.carlson@ihsmarkit.com



Mobility – Google becomes Waymo, intros Pacifica Hybrid

- Waymo launches as standalone Google self-driving company in December
 - > *“Using mass produced vehicles became a requirement”* -- John Krafcik, January 2017



- FCA – agreement in January 2016 to adapt Pacifica, engineering began in May 2016
- Honda – exploring technical collaboration

- Waymo Pacifica Hybrid
 - > 6 month ‘design’ cycle
 - > In-house sensor + software development
 - Lidar reduced by 90% from Velodyne v1
 - Simulation is predominant driver of improvement in software
 - > **“We’re also working on improving other key areas, such as ride comfort for passengers and those around us. And refining our driving to be smoother and more human-like.”**

Data & connectivity – Toyota as example

Toyota data and connectivity initiatives

- By 2020, every vehicle sold in US and Japan will include data communications module (DCM)
 - > With Toyota Connected (new data company) and Toyota Smart Center (new cloud telematics platform)
 - > Enables OEM analysis of vehicle data and monitors for cybersecurity risks
 - > Assists network operators to connect to cars
 - > Serves as Mobility Services backend platform
 - > Enables streaming maps with Dynamic Navigation and better voice recognition via cloud processing
- Entune 3.0 launches at CES in 2018 Camry
 - > Deploys Smart Device Link and becomes full member of SDL consortium
 - > Android Auto & Apple CarPlay – still an open question but deployment is less likely than two weeks ago
 - > Entune Remote app for un/lock, vehicle health report and parental parameters

Data & connectivity – HERE becoming industry standard

Foremost example of competitive collaboration

- Open Location Platform gaining industry buy-in
 - > Location-based services powered by Audi, BMW and MB data offered to all HERE customers
 - > HERE + Mobileye announced last week
 - Mobileye using HERE Open Location Platform
 - Integration of Mobileye REM with HERE HD Live Map
 - HERE ingesting raw sensor data from Mobileye
 - > HERE working with NVIDIA for map data
- Expanded consortium of ownership
 - > Wholly owned by Audi, BMW, Daimler
 - > Intel – 15% stake
 - > Tencent, NavInfo, GIC – 10% stake
 - Chinese JV with NavInfo
- **Who is next?** Automakers, mega-suppliers, niche suppliers, tech giants?



User experience – future interiors

In-vehicle interfaces

- Lexus LS features “world’s largest color HUD”
- Toyota Camry with new color HUD
- Audi Q8 Concept and the next iteration of the virtual cockpit
 - > Contact-analog HUD with augmented reality
 - > Two center touchscreens and 12.3” cluster
- BMW 5 Series offers gesture recognition
- Honda Odyssey brings new operating system and tablet-inspired drag-&-drop interface
- Nissan Vmotion 2.0 Concept features 28” display between cluster and dashboard

Premium experience

- Lexus LS extends premium flagship product with 10-year Enform safety and service connect
- Toyota makes Entune App Suite standard across all display audio systems
 - > Pandora, Slacker, iHeart Radio, Yelp, etc
- CES Highlights:
 - > Holography + gesture
 - > Pillar-to-pillar displays
 - > Virtual personal assistants

ADAS Maturing at NAIAS

Product lifecycles and brand strategies can't keep pace with state of technology

- Technology costs are coming down as scale is achieved, pushing ADAS further down market
- US NCAP additions for 2018 are helping
- Popular tech becoming common features:
 - > Forward collision warning + automatic braking
 - > Lane departure warning + lane keep assist
 - > Blind spot information + cross traffic alert
 - > Pedestrian automatic braking
 - > Surround view park assist
- Honorable Mentions:
 - > Infiniti QX50 Concept – third phase of ProPilot enables city driving; SOP planned for 2020
 - > Honda Odyssey – interior camera observing rear seat occupants
 - > Volvo XC90 – part of the Drive Me pilot in Sweden with SAE Level 3 automation

CES is North America's Premier Automotive Supplier Trade Show

521 exhibitors under the "Vehicle Technology" category

Mega Tier 1	Tech	AI	Lidar	Maps
Autoliv	Baidu	Almotive	LeddarTech	Civil Maps
Bosch	Google	Baidu	Panasonic?	HERE
Continental	NVIDIA	CEVA	Pioneer	Intel
Delphi	Intel	Denso	Quanergy	Mapbox
Denso		Intel	Velodyne	TomTom
Dura		Mentor Graphics	Valeo	
Harman		Mobileye		
Magna		NVIDIA		
Mobis		NXP		
Valeo		Renesas		
Visteon		Tata Elxsi		
ZF		Toyota		
		Visteon		

But OEMs remain prominent

Automakers at CES

Nissan and Honda first time at CES

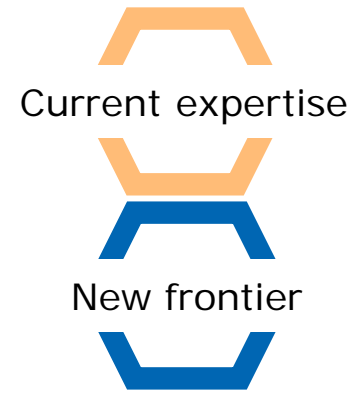
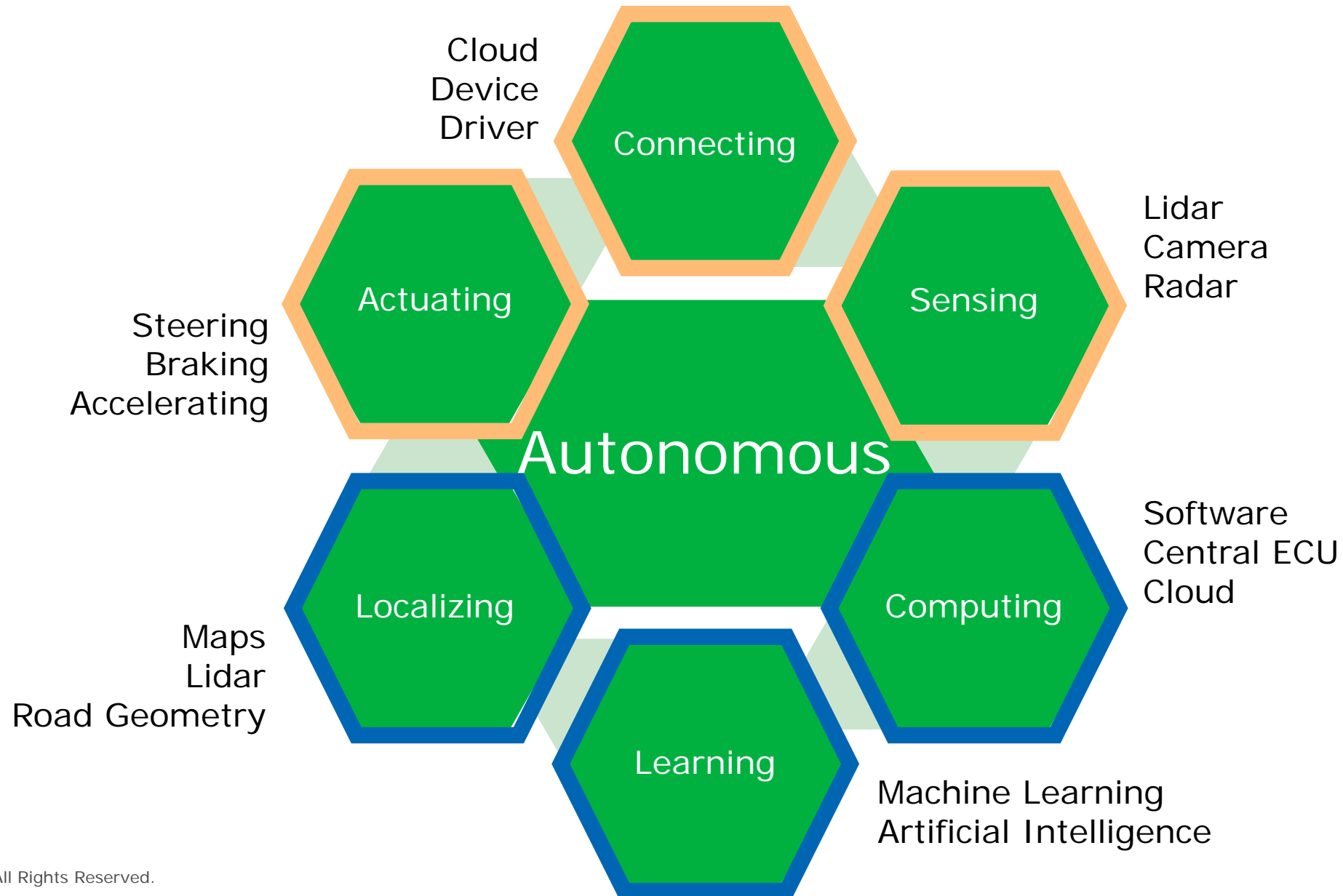
- Vehicle Highlights:

- > **Toyota Concept-i** featuring Yui AI digital assistant
- > **Chrysler Portal** bringing 'off the shelf' components in an impressive package
- > **Honda NeuV** combines electric, automated, connected in mini-vehicle with AI digital assistant
- > **Ford semi-autonomous Fusion** continues to push on the research front
- > **Faraday Future FF91** and **Lucid Air** break cover

- Keynote Highlights:

- > Carlos Ghosn outlines Intelligent Mobility plan
 - Seamless Autonomous Mobility, using connectivity and a human in a remote command center to handle difficult situations
 - Exploring driverless shuttles with DeNA in Japan
- > NVIDIA's Jen-Hsun Huang
 - Commercializing DRIVE PX2 in-vehicle compute platform with ZF, Bosch
 - AI-enabled vehicles coming from Mercedes in 2017 and Audi in 2020
 - Mapping partnerships with HERE, Zenrin

The autonomous ecosystem comes together at CES





2017 Automotive Technology Foresight

Autonomy & AI

Sensor advances, artificial intelligence, innovative interiors and platform development towards public deployment

Electronic Architectures

Sensor fusion ECUs and central ADAS domain controllers will drive further advances in autonomy, reduce cost and save weight

Electrification

Improvements in battery density and cost improvements drive xEV deployments, despite low fuel costs

New Automotive UX

Developments in UI technologies, design, or service models aim to reinvent the automotive UX

2017
Foresight

Collaboration and M&A

OEMs acquiring new competencies, more supplier consolidation possible, achieving scale in data and services

Disruptors

Mobility providers & start-ups push OEMs and suppliers to diversify products and business models

Q&A

Michael Robinet, Advisory Services

Devin Lindsay, Powertrain & Alternative Propulsion

Jeremy Carlson, Automotive Technology

Mark Seng

Global Aftermarket Practice Leader, Automotive



Mr. Mark Seng is Global Aftermarket Practice Leader responsible for leading the company's global aftermarket product development strategy.



Key Trends Impacting the N.A. Automotive Aftermarket

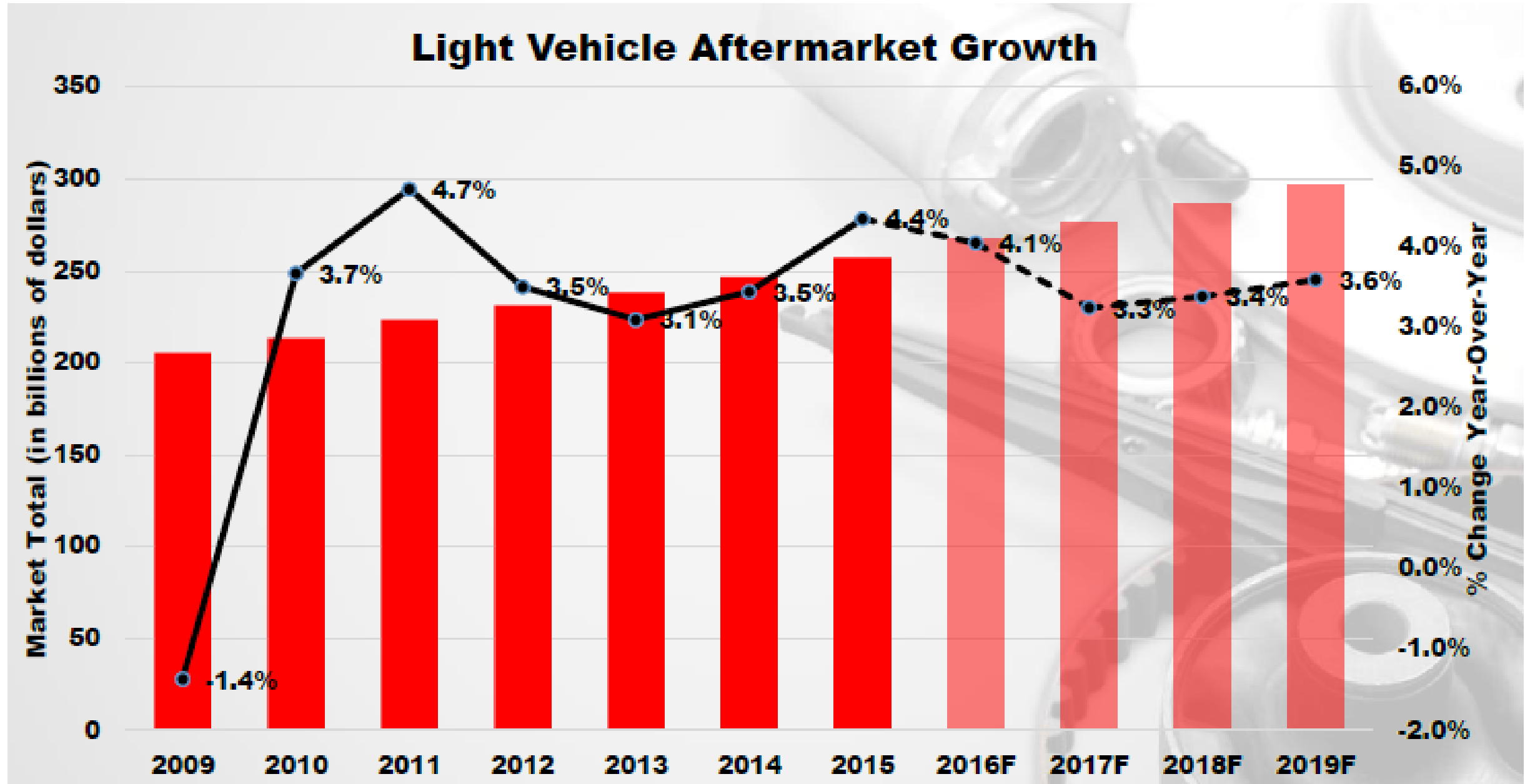
Adapting to an ever-changing light vehicle market

NAIAS Briefing - January 11th, 2017

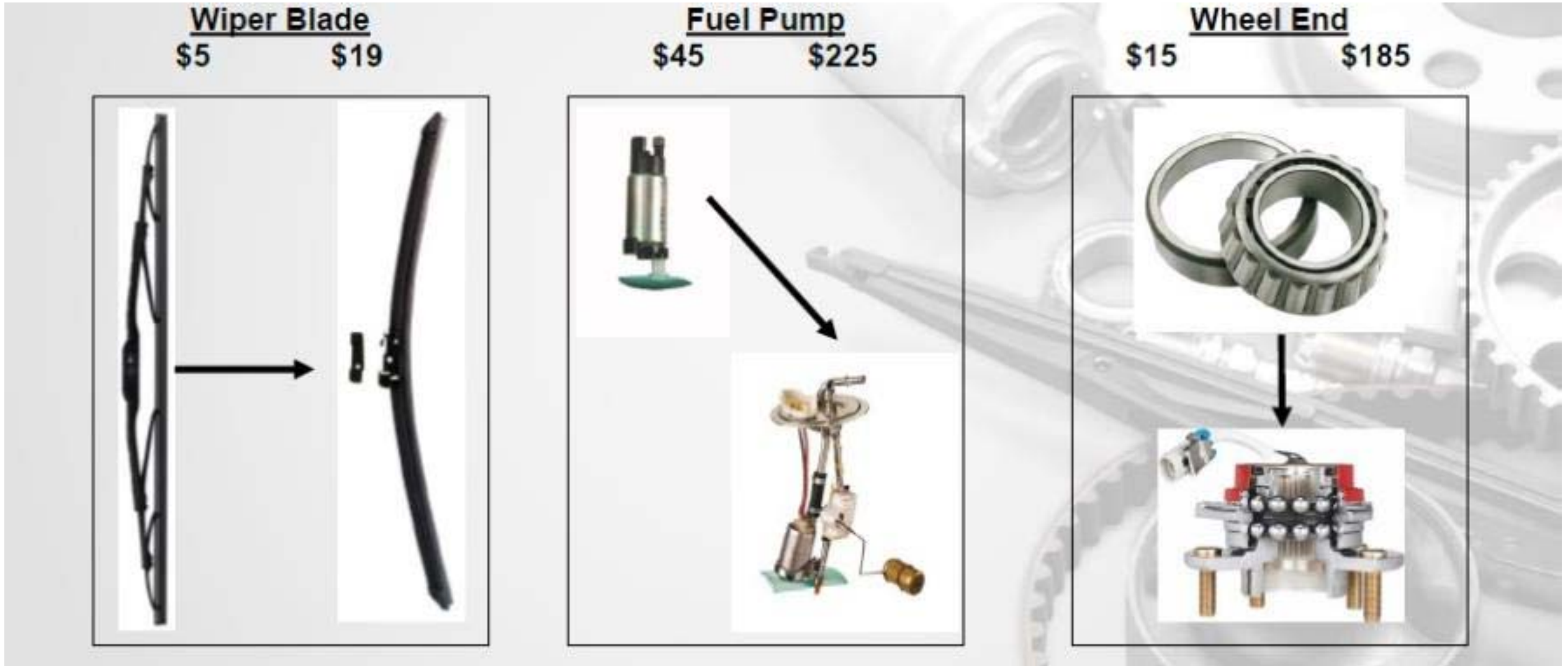
Mark Seng, Global Aftermarket Practice Leader

Contents

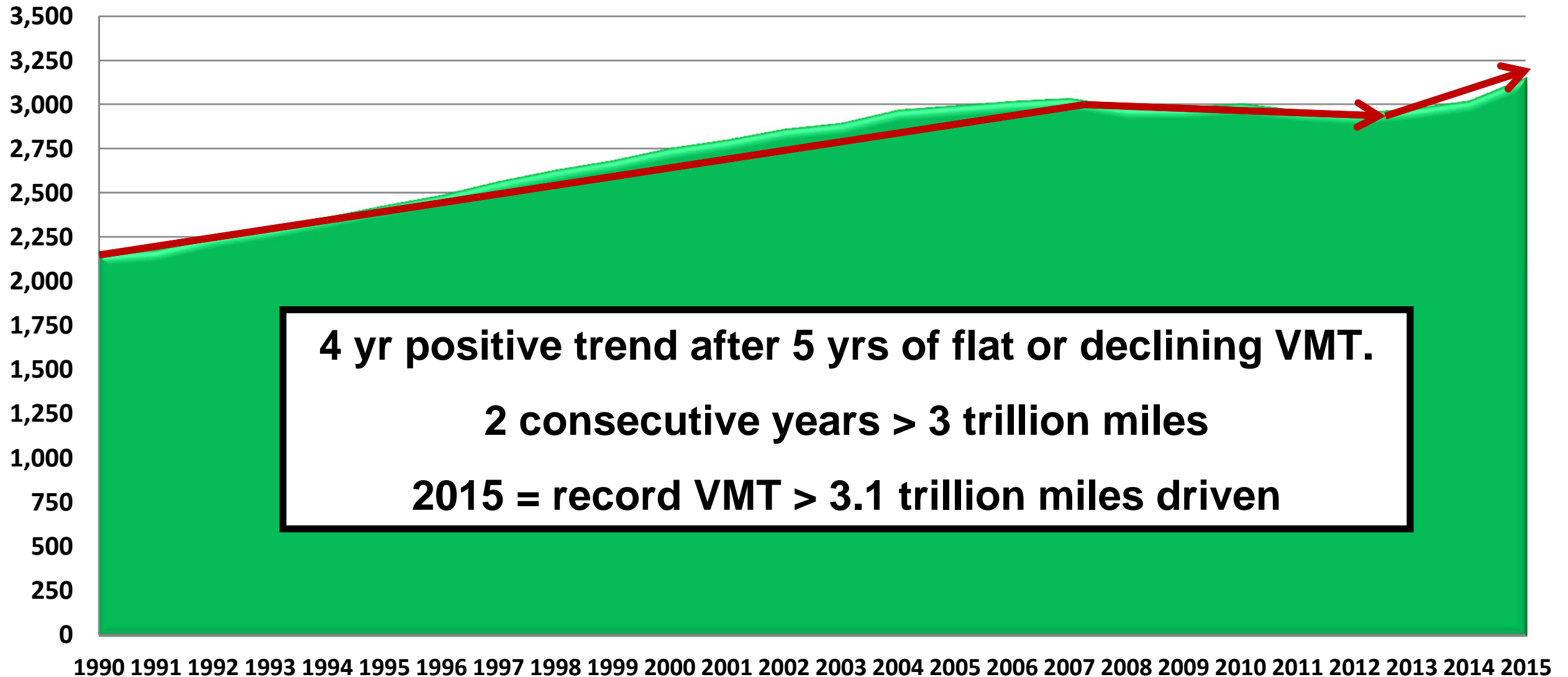
- **Aftermarket Outlook**
- **Vehicle Miles Traveled – U.S. Trend**
- **U.S. VIO Growth**
- **Changing VIO Mix**
- **Aging of the U.S. Fleet**
- **Summary**



One Key Driver of Growth



Historical Vehicle Miles Traveled – U.S. – billions of miles



Global Light Vehicle Population

Global LVO
is Growing

27%

Over the
next 6-7
years

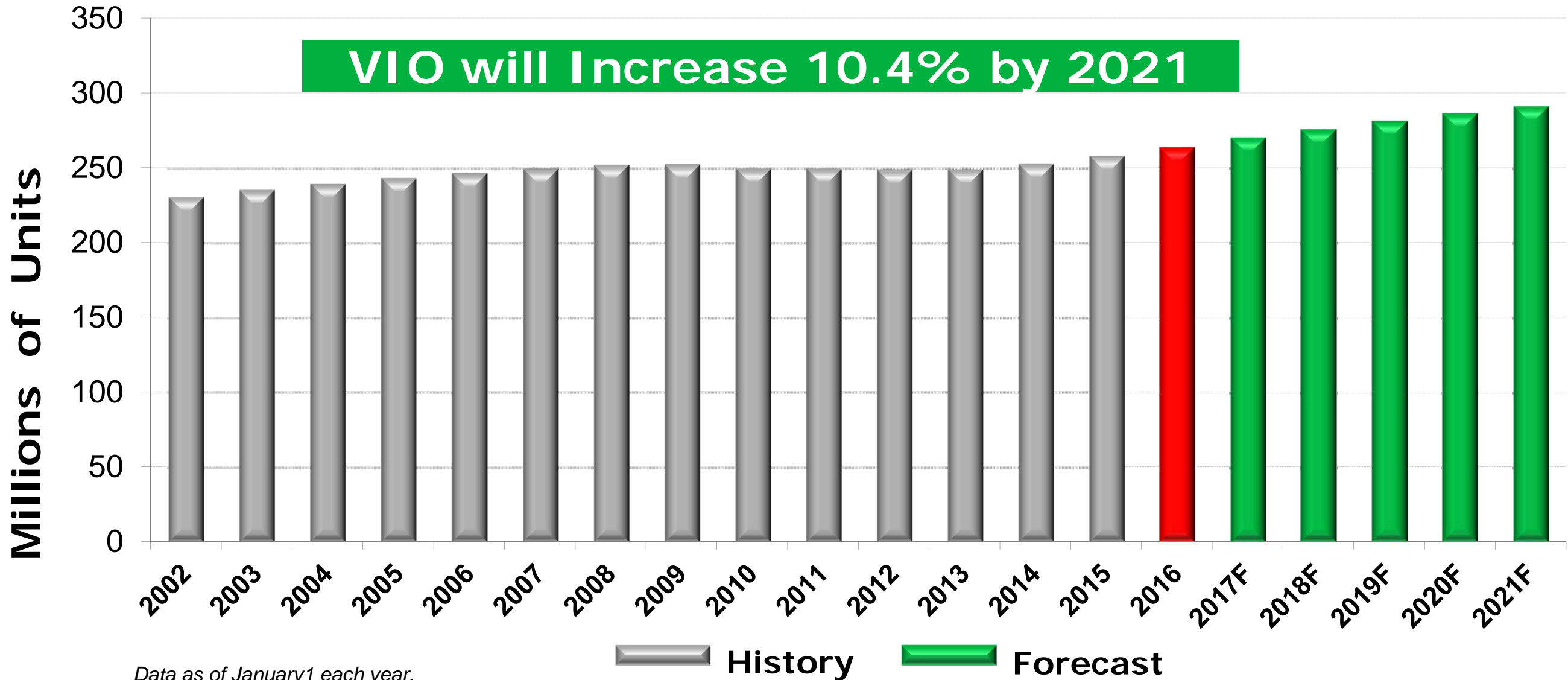
2.0 Billion vehicles by 2040

1.4 Billion vehicles by 2021

U.S. Light
VIO is
Growing
10%
By 2021

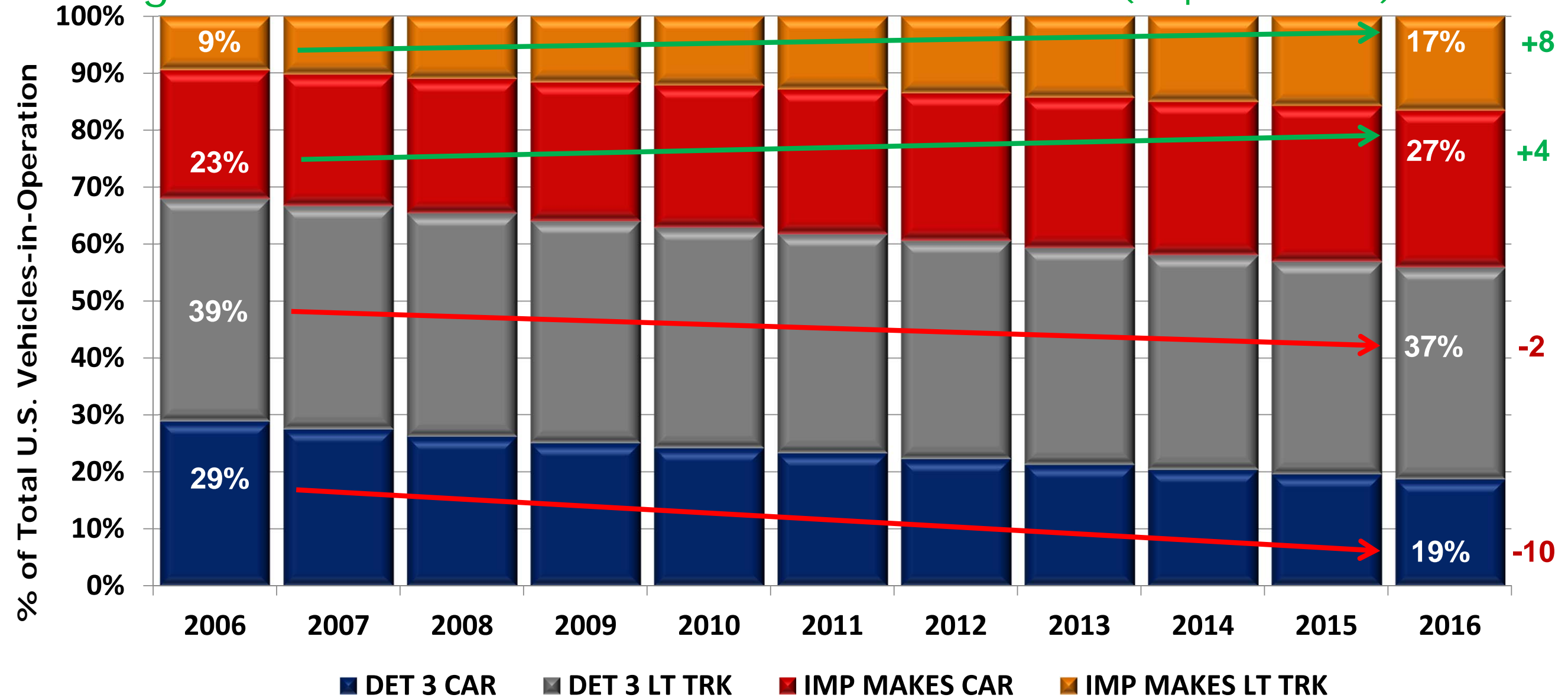


U.S. Light Vehicles in Operation

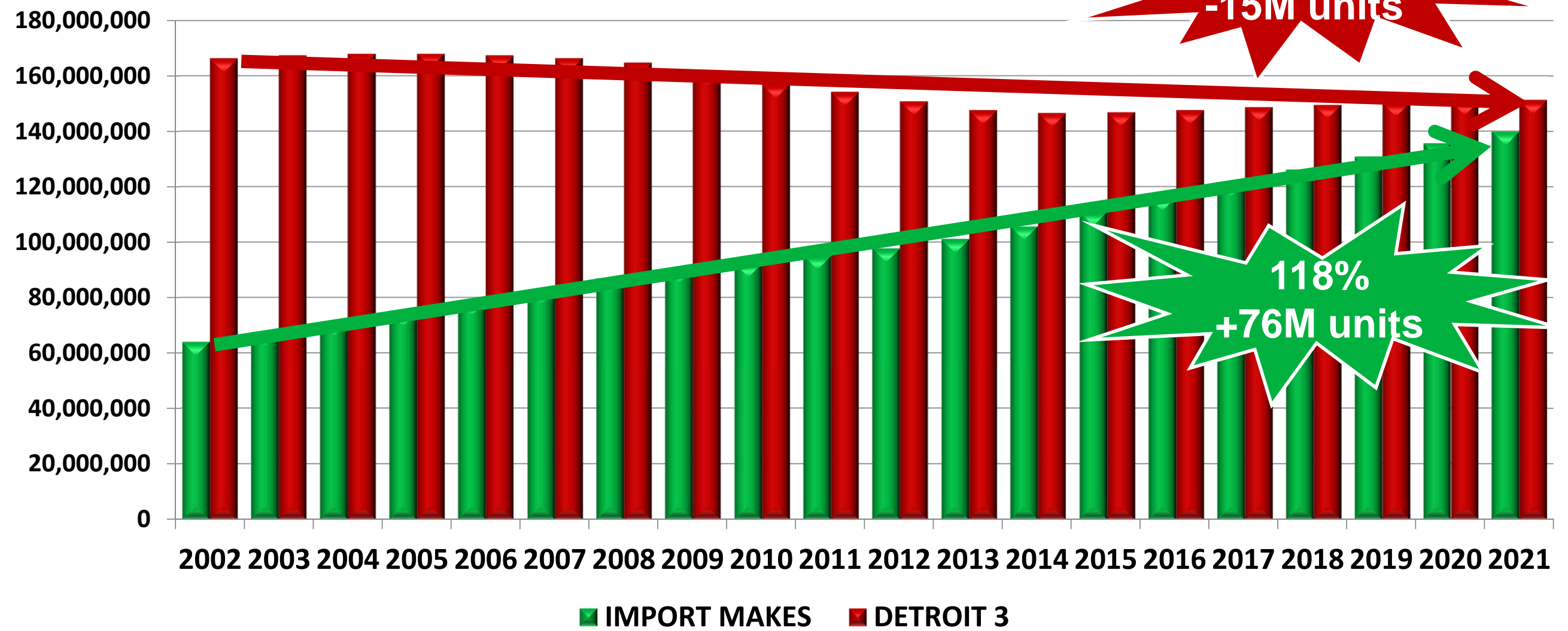


Data as of January 1 each year.

Change in U.S. VIO Mix – Detroit 3 vs All Others (Import Makes)

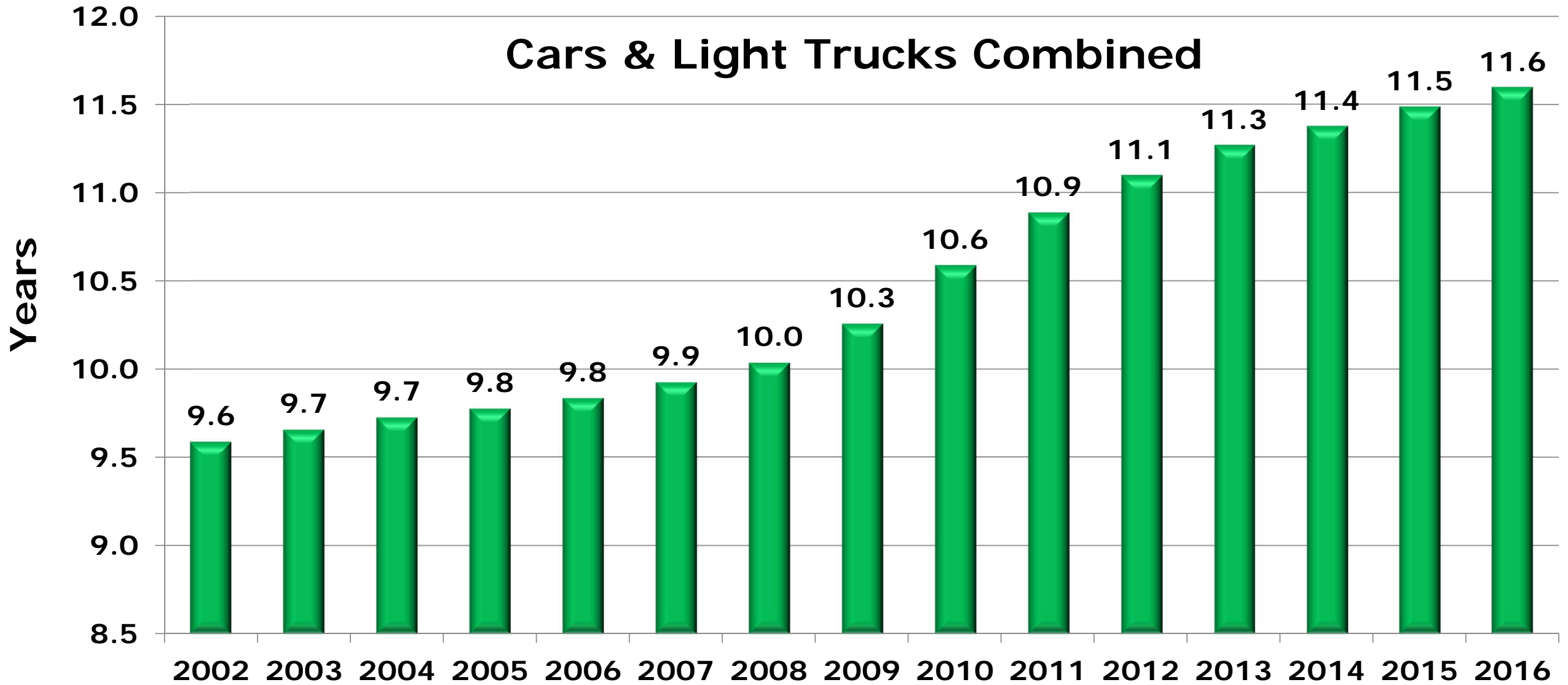


VIO Growth Forecast

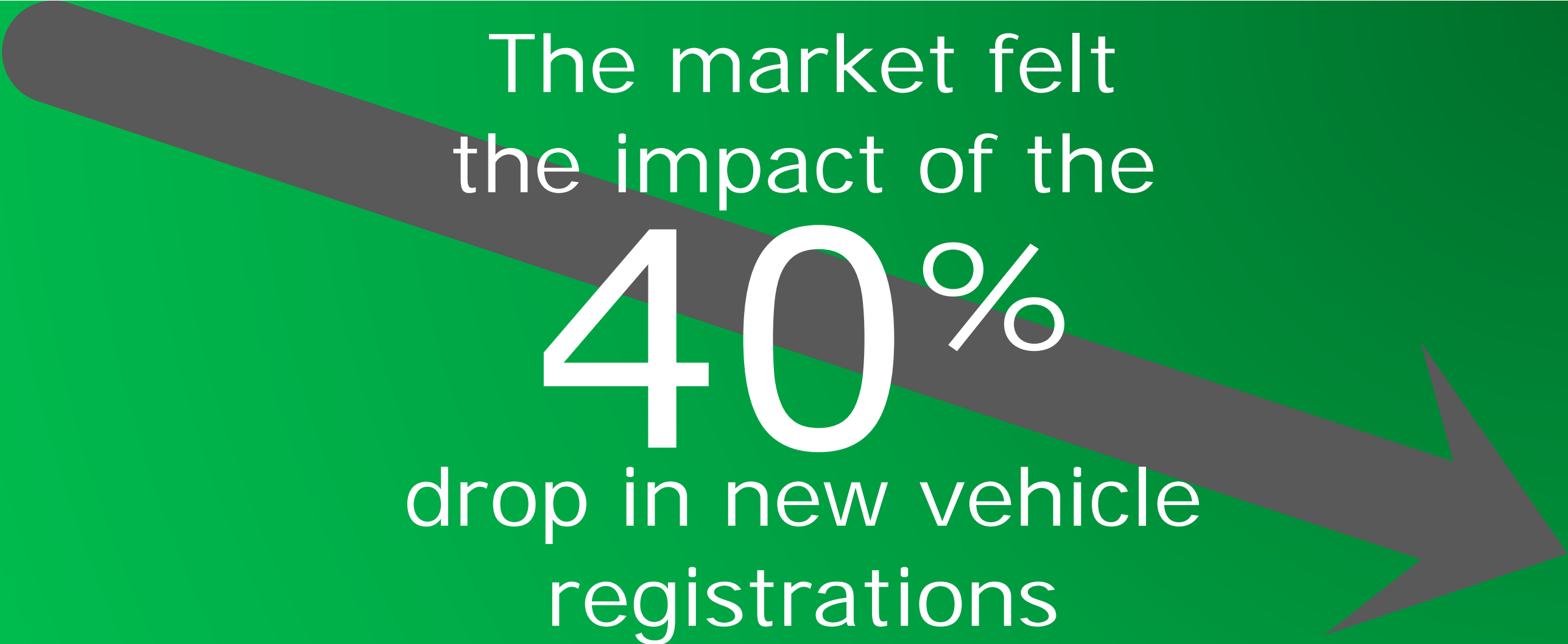


Average Age History

Cars & Light Trucks Combined



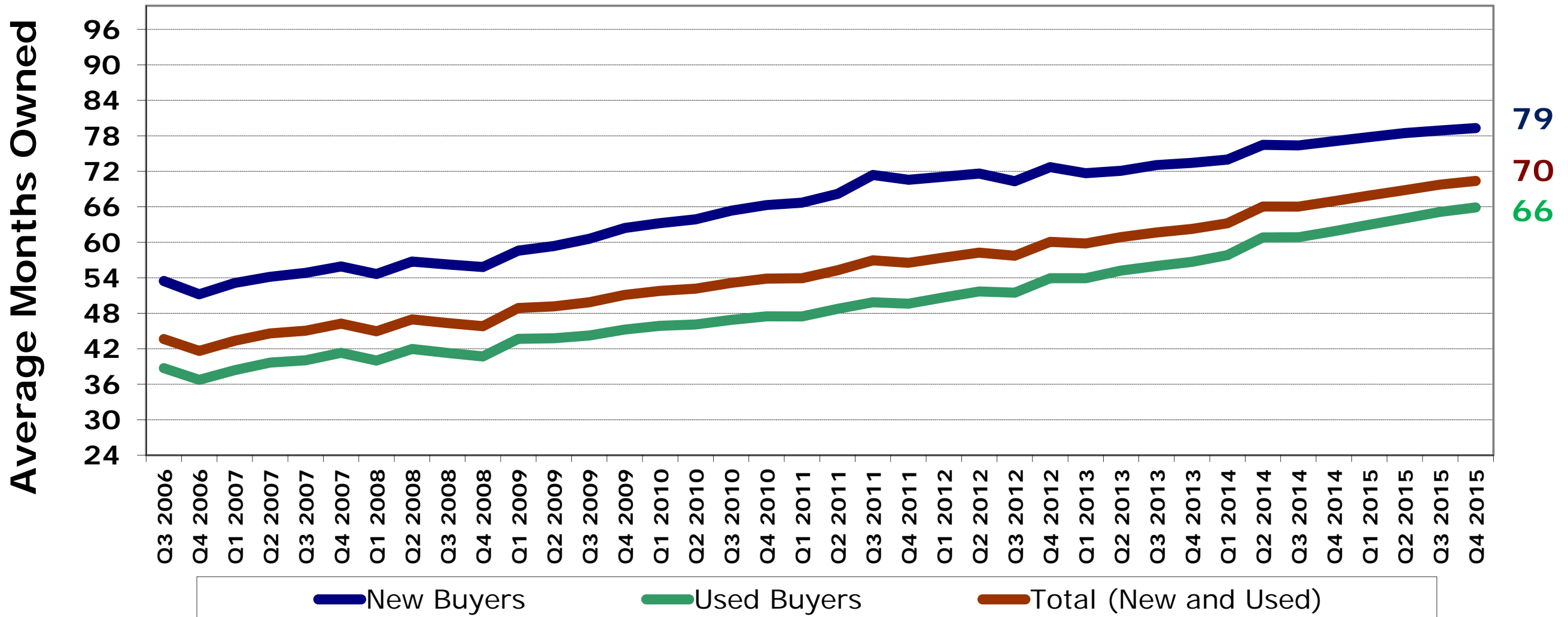
Impact of New Vehicle Drop Off



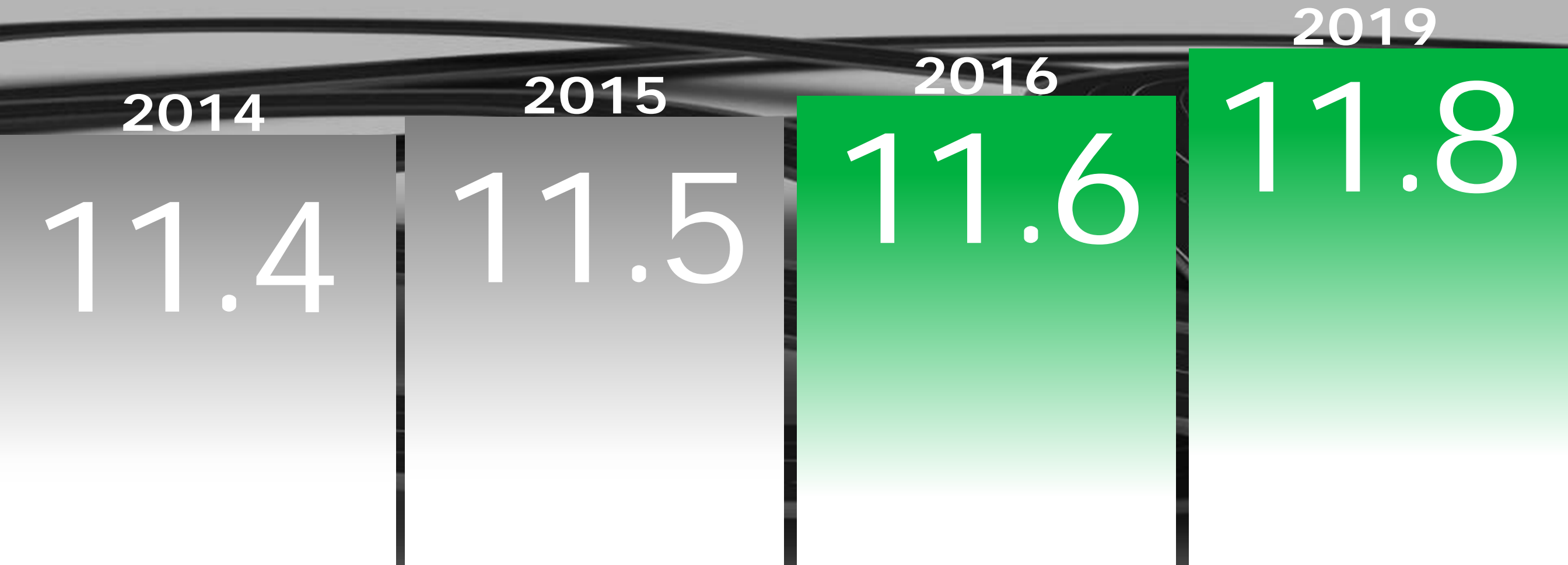
The market felt
the impact of the
40%
drop in new vehicle
registrations

Change in Consumer Behavior

Average Length of Ownership Trend



Average Age – Slowing Down



Impact on VIO Age Groups - 2016-2021

**Vehicles
new to 5 years
old grow**

16%

**Vehicles
6-11 years
old grow**

5%

**Vehicles
12 + years old
grow**

10%

Oldest Vehicles Growing the Fastest – 2016-2021



Vehicles
16+ years old
growing fast
30%

If 6-11 year old vehicles are growing at such a slower rate - is the aftermarket “sweet spot” shrinking?

Average Age Impact on VIO Units

2002	New – 5 Year Old	84m units
2016	New – 5 Year Old	75m units
2021	New – 5 Year Old	88m units

Segment remains relatively flat after decline due to recession's impact on new vehicle sales.

Average Age Impact on VIO Units

2002	16+ Year Old	35m units
------	--------------	-----------

2016	16+ Year Old	62m units
------	--------------	-----------

2021	16+ Year Old	81m units
------	--------------	-----------

20 million units will be 25 years or older by 2021!

Summary

Some positive trends behind forecasted growth in aftermarket business:

- **Increasing vehicle miles traveled**
 - > Positive trend back on track
 - > More wear & tear = more repair opportunities
- **Growing fleet**
 - > More cars & light trucks on the road than ever before
 - > Must understand how the mix is changing to leverage the growth
- **Aging fleet**
 - > Vehicles staying on the road longer...*more aftermarket repair opportunities!*

Thank You

Mark Seng

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Thank you!

Question & Answer Segment
Closing Remarks