FCA
FIAT CHRYSLER AUTOMOBILES

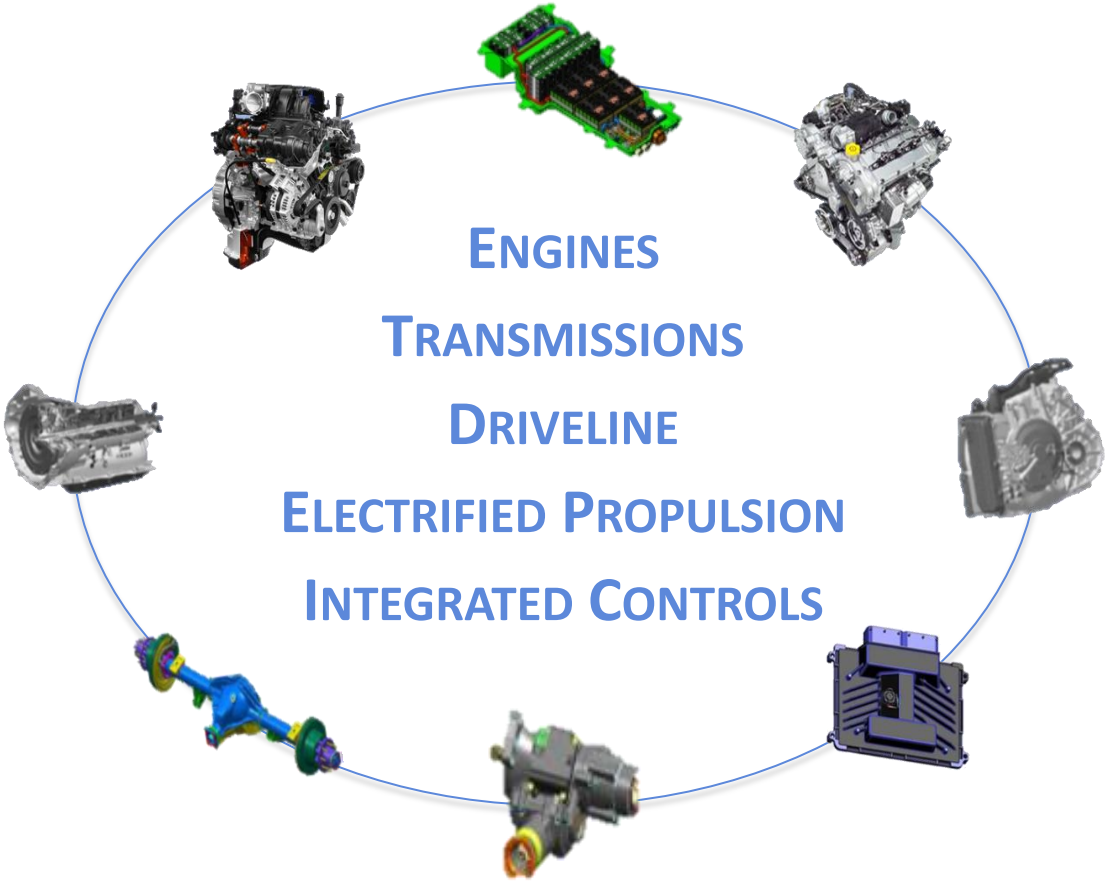
START 2014-2018

INVESTOR DAY
AUBURN HILLS
MAY 6TH-7TH, 2014

Powertrain

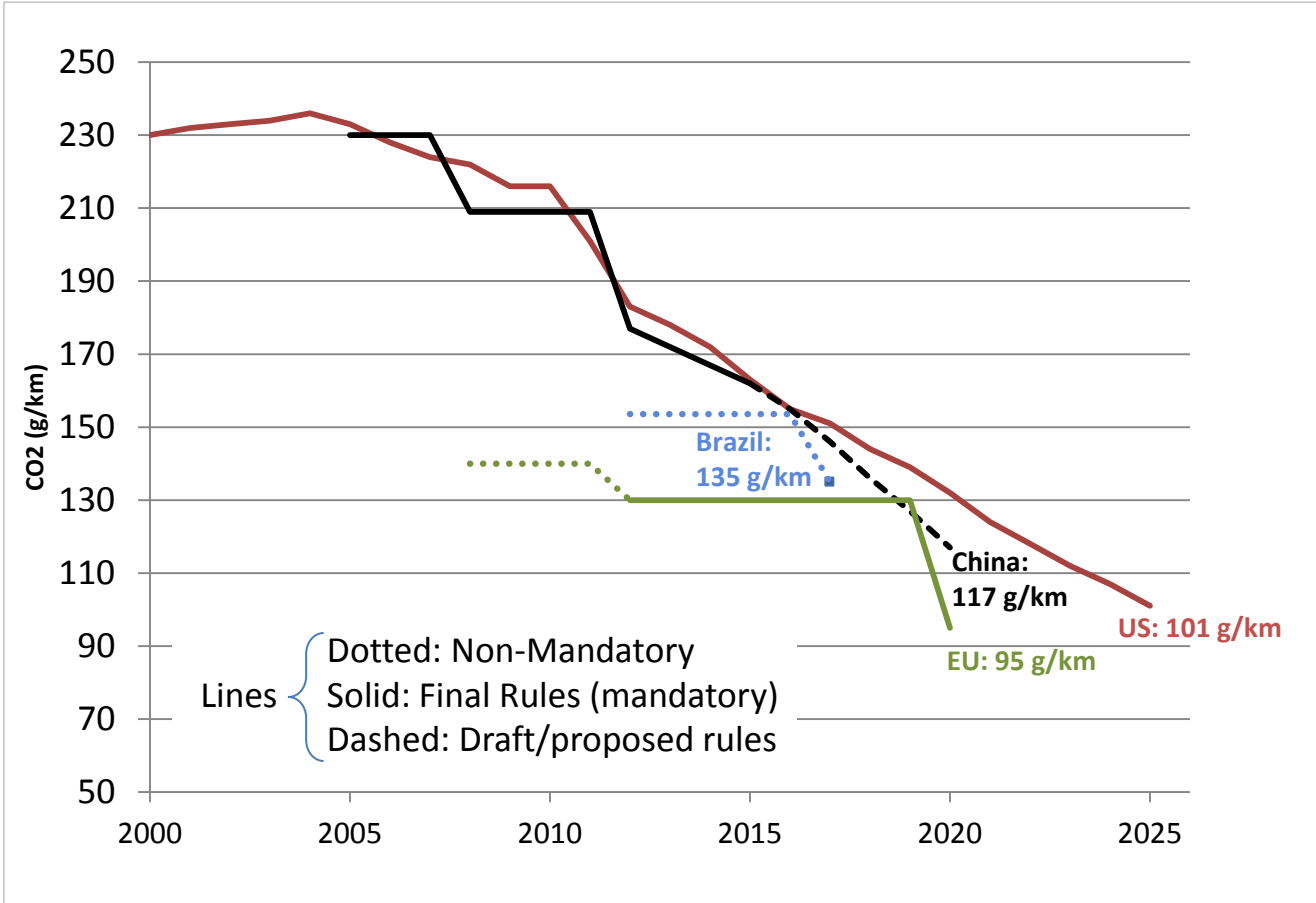
Bob Lee

The powertrain system



Regulatory CO_2 challenge

The overarching driver for powertrain technology change over the next 5+ years is CO_2. This is driven by regulation and increasingly customer preference.



U. S. EPA GHG report for 2012 MY

- FCA was compliant in 2012 but had negative credit generation due to model mix
- We purchased credits and will continue to do so when appropriate to provide time to understand and decision the complex business cases associated with new technologies
- FCA is focused on:
  - Developing and producing increasingly more fuel-efficient vehicles which customers want to buy
  - Fully complying with the GHG regulation

Status of Manufacturers at the Conclusion of the 2012 Model Year – Includes the Impact of Credit Trades and Credit Transfers from Prior Model Years

Manufacturer	Credits from 2009-2011 Model Years (Mg)	Total Credits from 2012 Model Year (Mg)*	Net Credits Carried Forward to 2013 Model Year (Mg)†
Toyota	80,266,189	13,163,009	93,429,198
Honda	35,425,108	7,851,251	43,276,359
General Motors	24,564,829	2,872,354	27,437,183
Ford	15,296,436	4,333,951	19,630,387
Nissan	17,631,200	(979,937)	16,651,263
Chrysler	9,610,207	(1,892,184)	7,718,023
Subaru	5,755,171	543,316	6,298,487
Mazda	5,482,642	734,887	6,217,529
Volkswagen	6,441,405	(502,495)	5,938,910
Mitsubishi	1,449,336	57,837	1,507,173
Suzuki	876,650	(127,699)	748,951
BMW	884,903	(291,272)	593,631
Volvo	740,358	(175,195)	565,163
Porsche	-	198,348	198,348
Mercedes-Benz	428,044	(320,782)	107,262
Fisker	-	46,694	46,694
Ferrari	90,000	(40,983)	49,017
Coda	-	5,524	5,524
Tesla‡	-	576	576
Jaguar Land Rover	-	(424,032)	(424,032)
Total	**204,942,478**	**25,053,168**	**229,995,646**

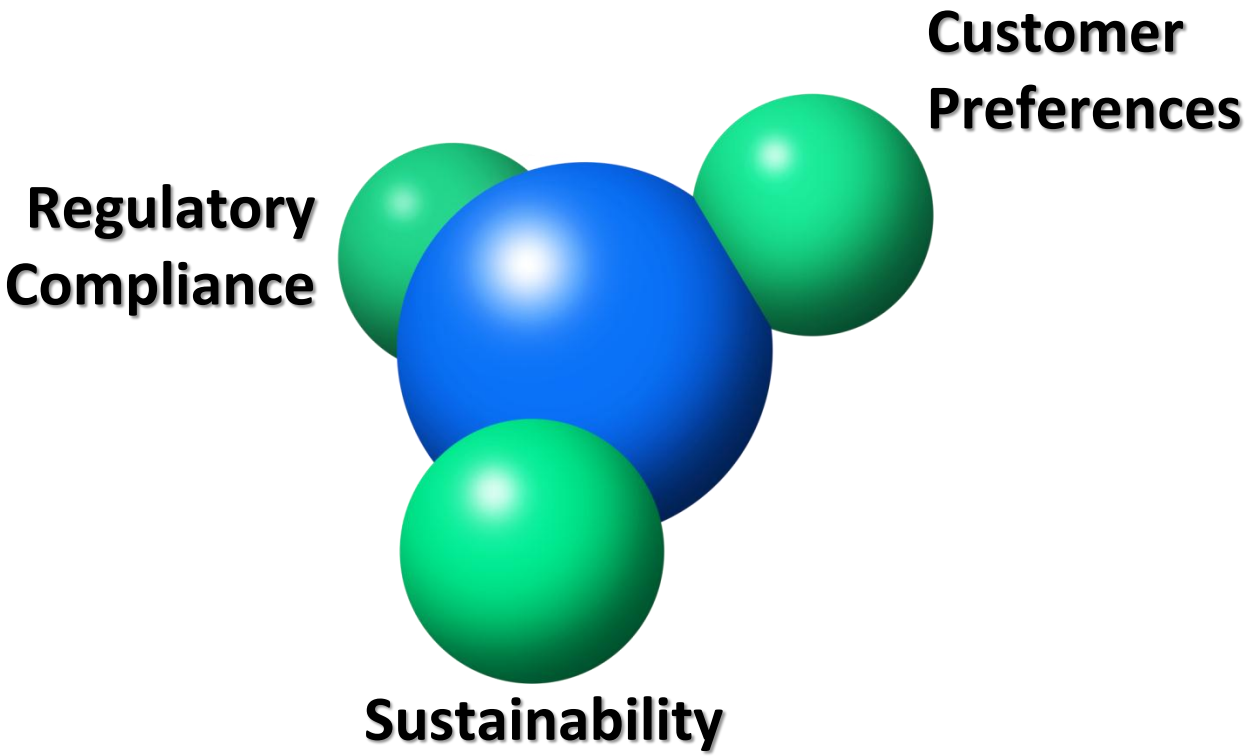
* Credits include all those available and used by the manufacturer, including credits from flexible fuel vehicles, air conditioning systems, off-cycle technologies, and deficits from CH_4 and N_2O standards.

† Includes the impact of credit trades with other manufacturers, if any.

‡ Tesla generated credits in the 2010-2012 model years, but sold all of them. They also sold most of their 2012 model year credits. See Sections 2 and 3.1.1.

Synthesis of requirements

Meeting CO_2 and other regulatory requirements is not enough. We must meet the market needs of our customers and ensure the ongoing benefit of the enterprise.

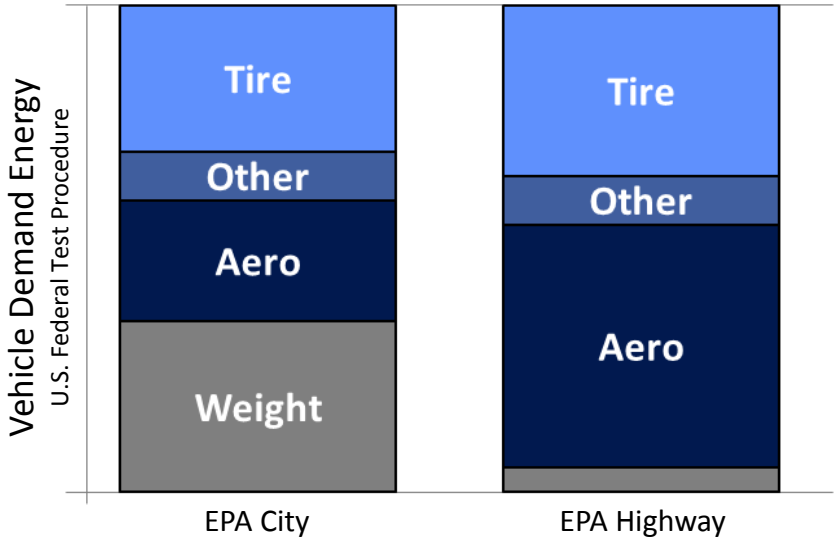


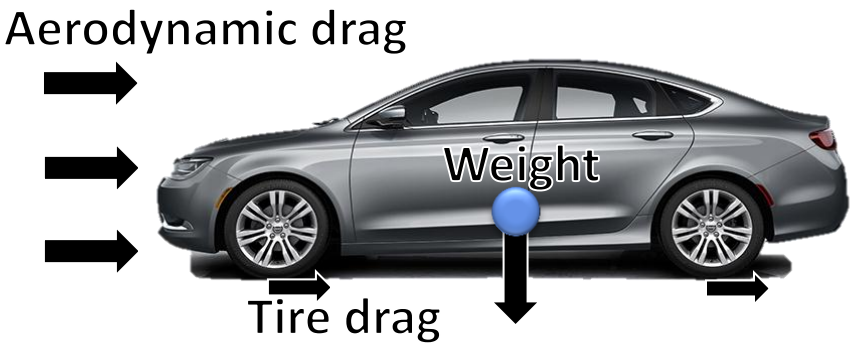
Impact of vehicle characteristics

CO_2 emissions are:

- A function of both vehicle and powertrain characteristics
- Directly proportional to Vehicle Demand Energy(VDE)
- Dependent on driving cycle

VDE = f(Aerodynamic drag, Tire drag, Weight)



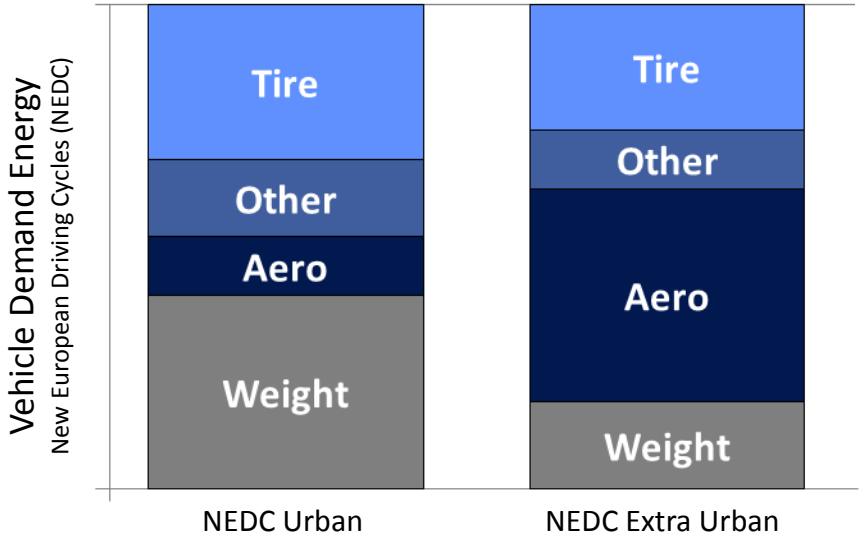


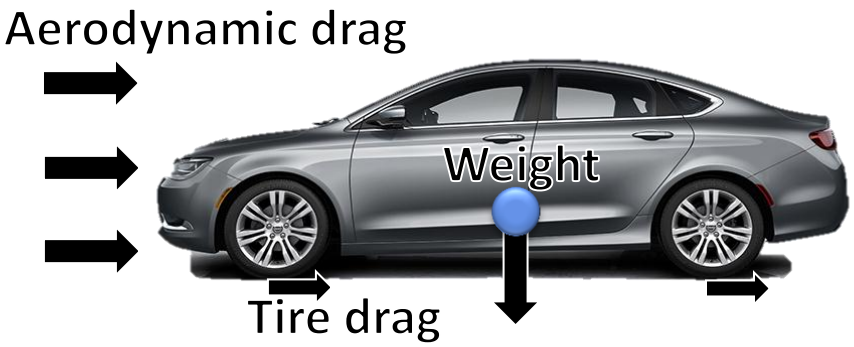
*VDE also includes brake drag, bearing friction and other spin losses. Weight included in VDE through the energy required to accelerate the vehicle

Impact of vehicle characteristics

- The European drive cycle has more dependence on weight for both the city and the highway cycles

VDE = f(Aerodynamic drag, Tire drag, Weight)





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FCA Powertrain technology usage

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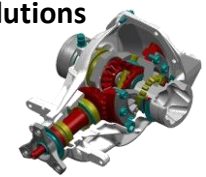
We simulate combinations of powertrain and VDE technologies to identify the best "Bang-for-the-Buck" which satisfies the "Synthesis of requirements" for the FCA fleet

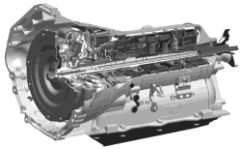
Axles & Drivelines

High efficiency axles and driveline disconnect solutions



Transmissions

Wide ratio spread and increased speeds for FWD and RWD transmissions



Engines

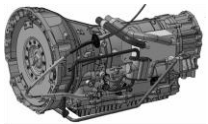
Improvement of internal combustion engines with technologies

Advanced Technologies

Multi-Air, DDCT, Start/Stop, Diesel Multi-Jet, Compressed Natural Gas (CNG)

Thermal Management

"Waste heat" recovery, intelligent thermostat, bypass system, etc.



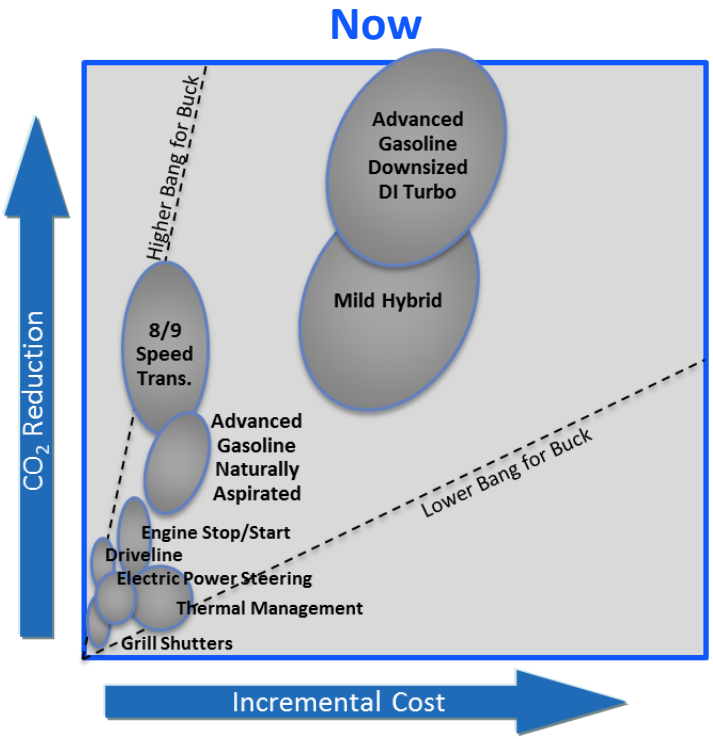
Electrified & Hybrid Systems

HEV, PHEV, BEV, ReEV, Fuel Cell

Technology assessment

Best Bang-for-the-Buck

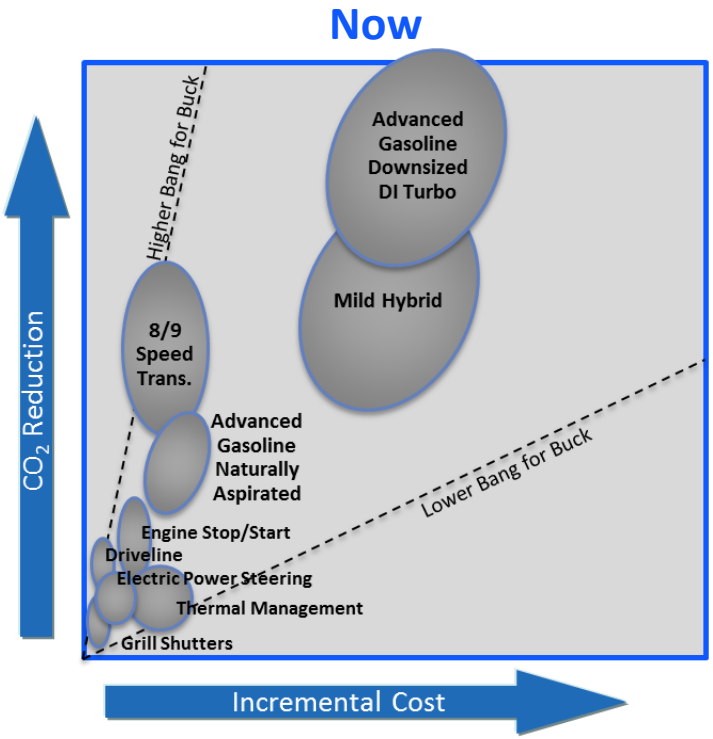
More costly technologies will be required to meet the regulatory CO_2 requirements in the 2016+ timeframe



Technology assessment

Best Bang-for-the-Buck

FCA technology selection is based on incorporating the best value considering cost and customer acceptance



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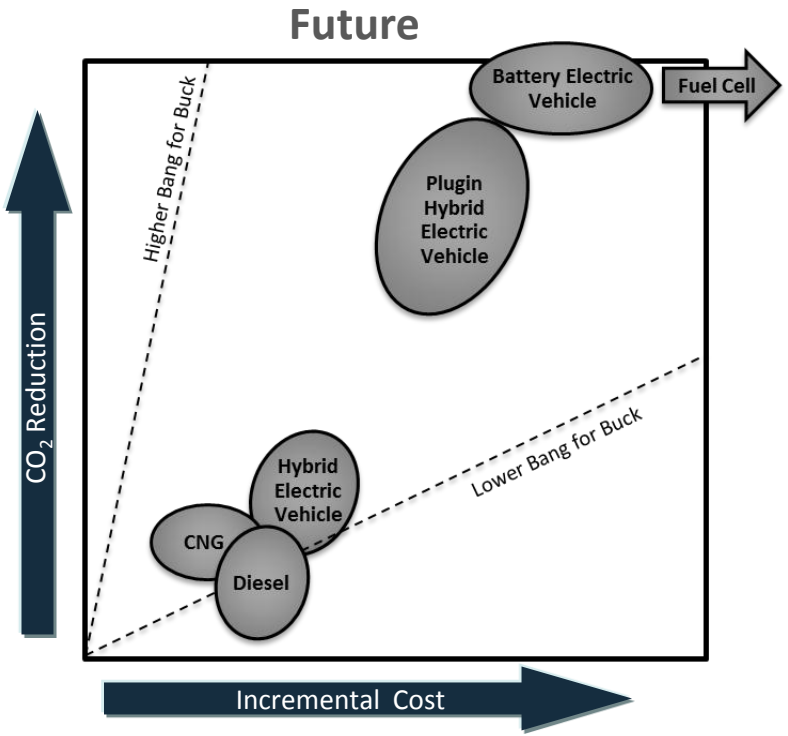
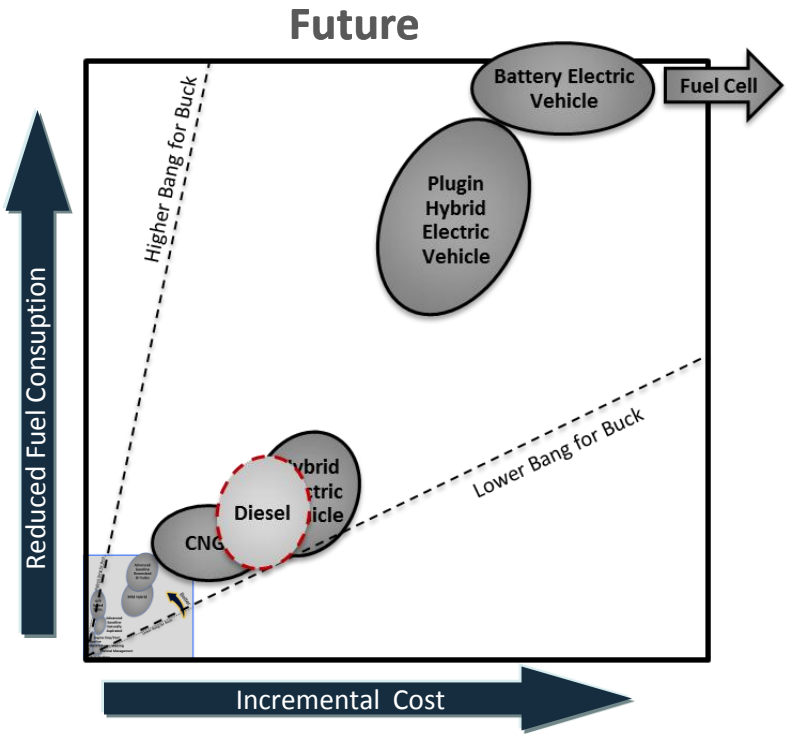


Technology assessment

Best Bang-for-the-Buck

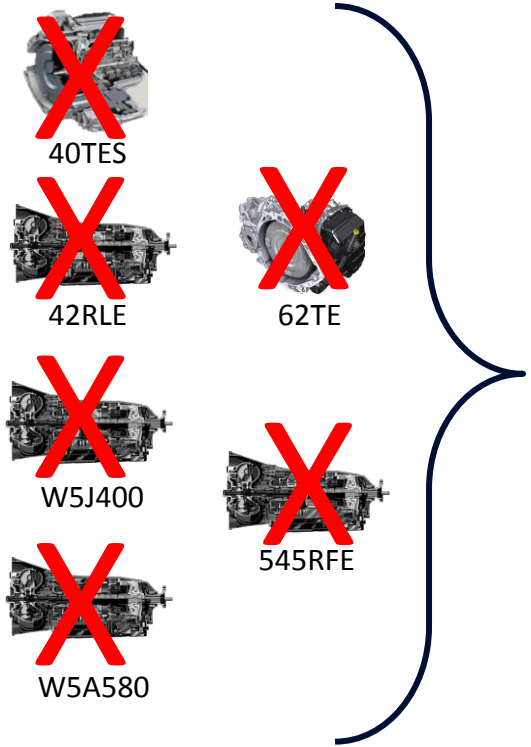
Diesel provides about the same Bang-for-the-Buck as CNG and hybrid technology when assessed on a fuel consumption rather than CO_2 basis

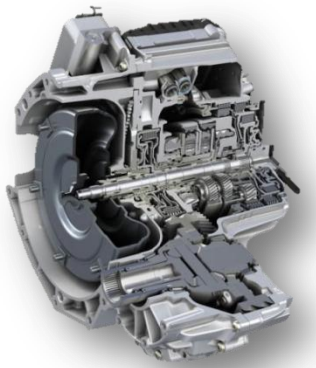


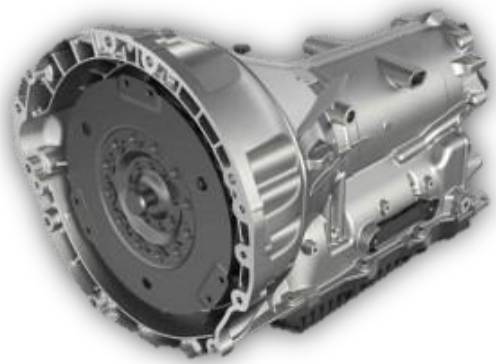
Portfolio consolidation

Transmission

We focused on transmissions first – moving from 4, 5, and 6 speeds to 8 and 9 speeds gaining efficiency, performance, and refinement







The 8 and 9 speed transmissions provide:

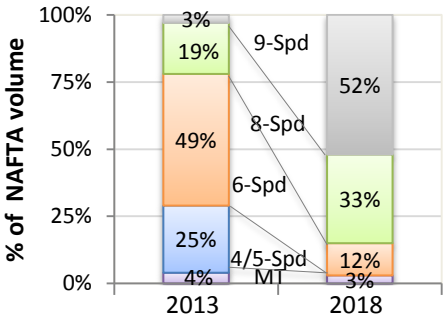
- 6-10% improvement in fuel economy over their 4, 5, and 6 speed predecessors
- Simplified manufacturing and supply base with greater scale

Global FCA transmission portfolio trends

Automated transmissions with more speeds grow in all regions

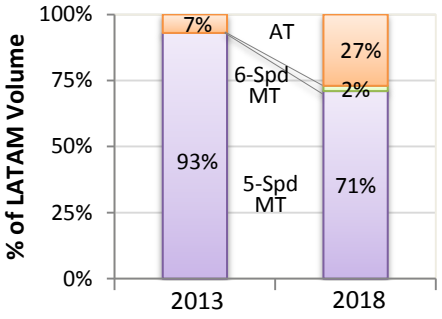
NAFTA

8 and 9 speed transmissions become main stream



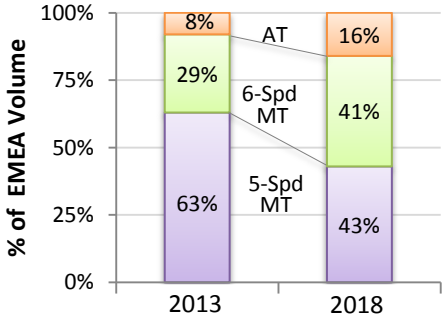
LATAM

Manual transmissions remain primary but automatics increase significantly



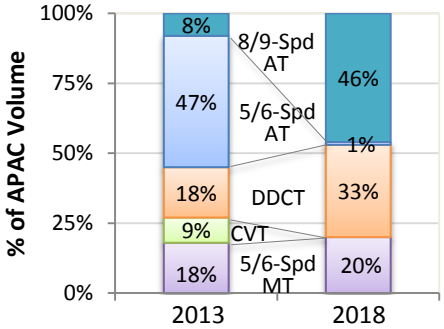
EMEA

Manual transmissions remain primary but automatics increase significantly



APAC

Automatic transmissions and DDCTs become the primary technologies



Portfolio consolidation

V-6 Engines

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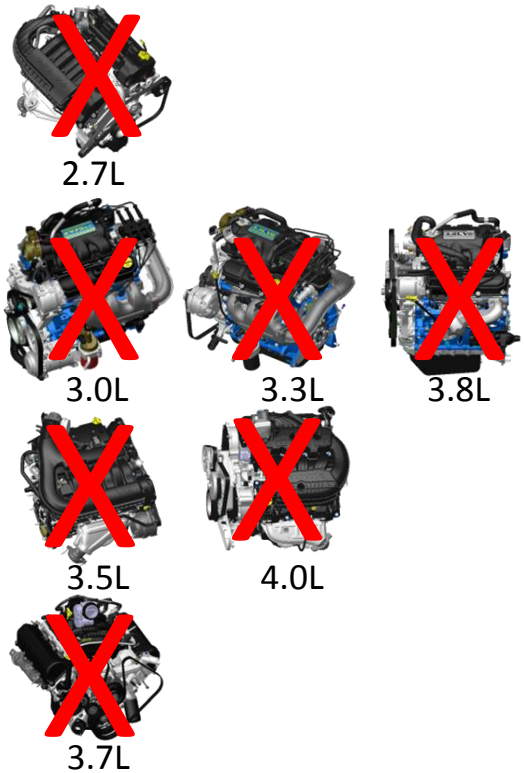
The Pentastar family replaced Seven V-6 Engines (four families) and provided significant CO_2 reduction with improvements in performance and refinement



More than *3 Million* Pentastar Engines produced since 2010CY

Three-time
"Ward's 10 Best Engines"
winner

The Pentastar engine family provided improvements in power and a 7% improvement in fuel efficiency across the fleet

Large and specialty engine portfolio

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Consolidation and improvement actions are also being applied on Large and Specialty Engines

- These applications have more fragmented usage and are dominated by special work and performance market requirements
- Same approach to consolidation:
  - Shared technologies with other engine families
  - Common engine package for full-size truck, large SUV and large sedan/coupe
- The technologies and benefits will be more substantial than cylinder deactivation was in 2003

6.4L Big Gas

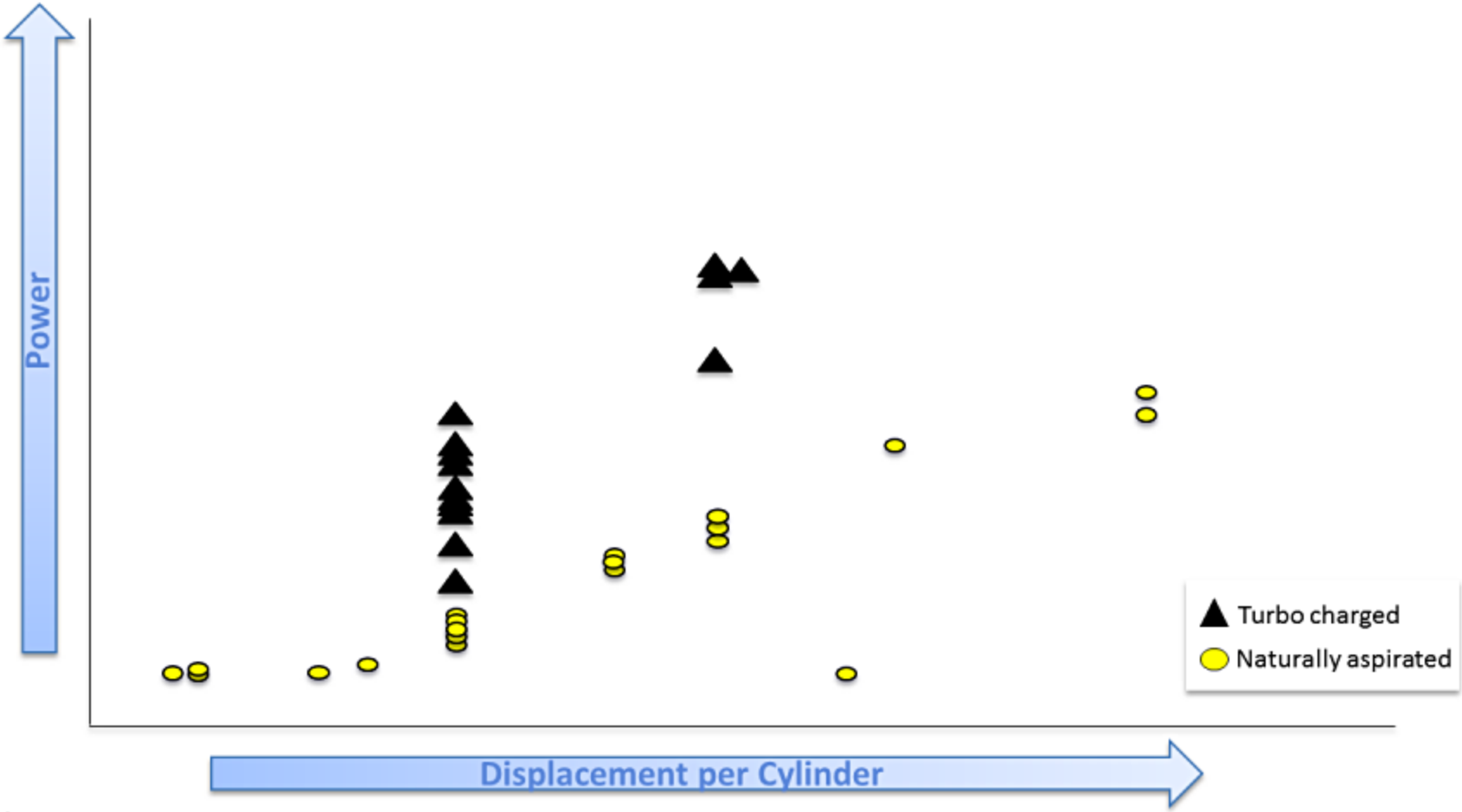
5.7L HEMI

6.4L SRT

Work ← → Performance

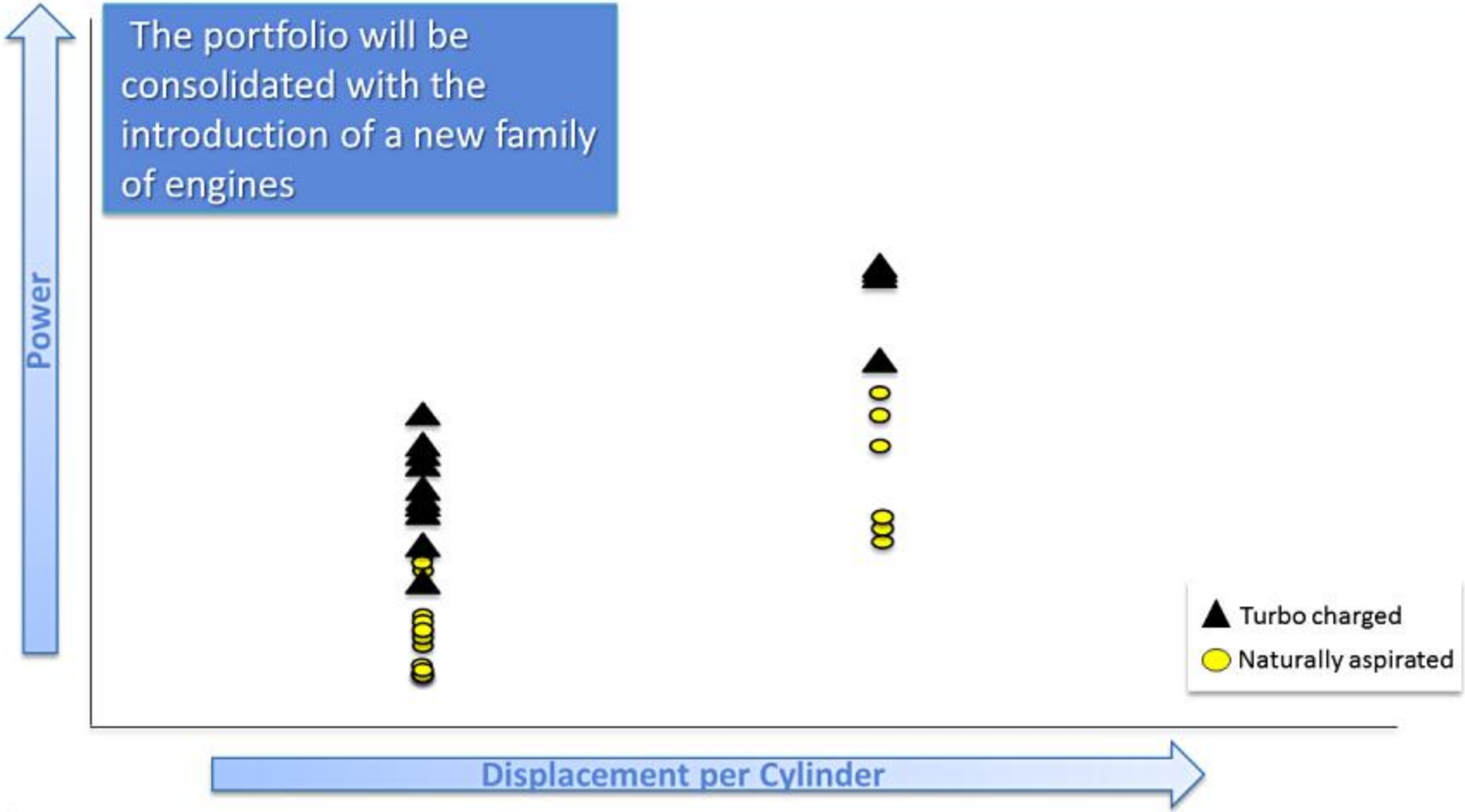
Portfolio consolidation

Small gasoline engines



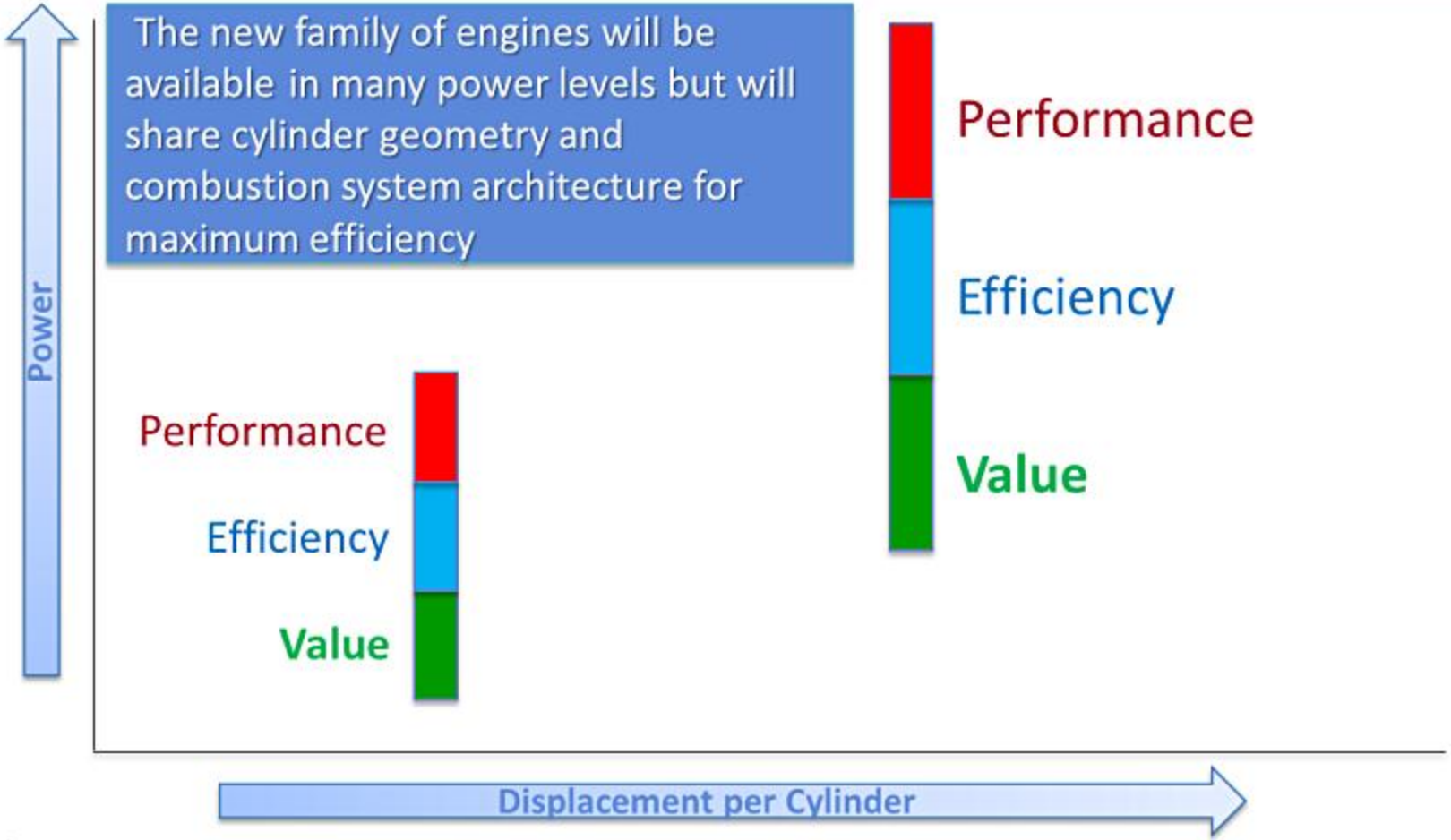
Portfolio consolidation

Small gasoline engines



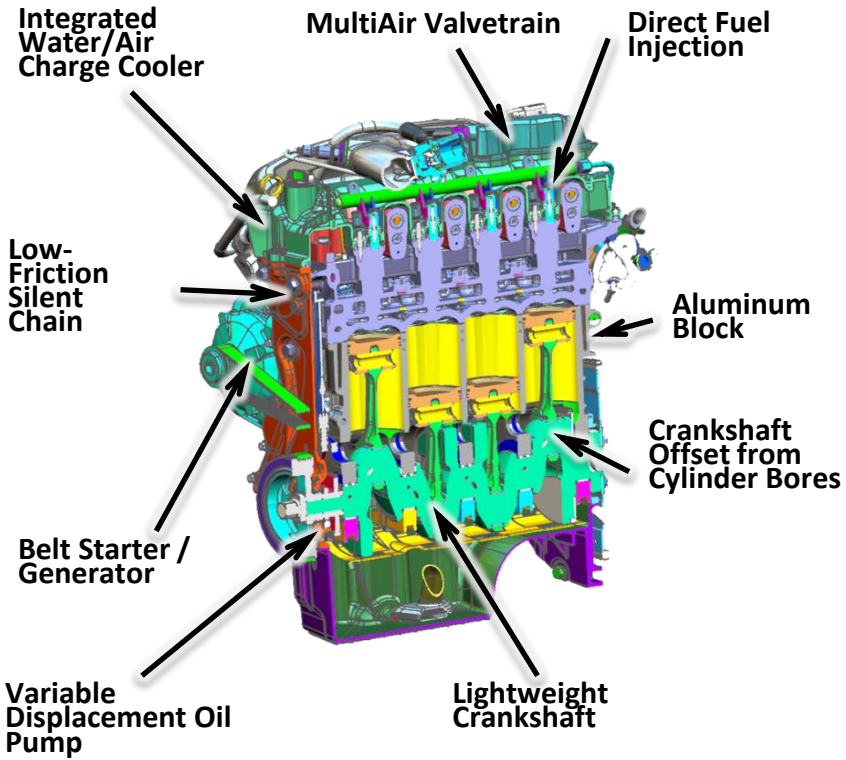
Portfolio consolidation

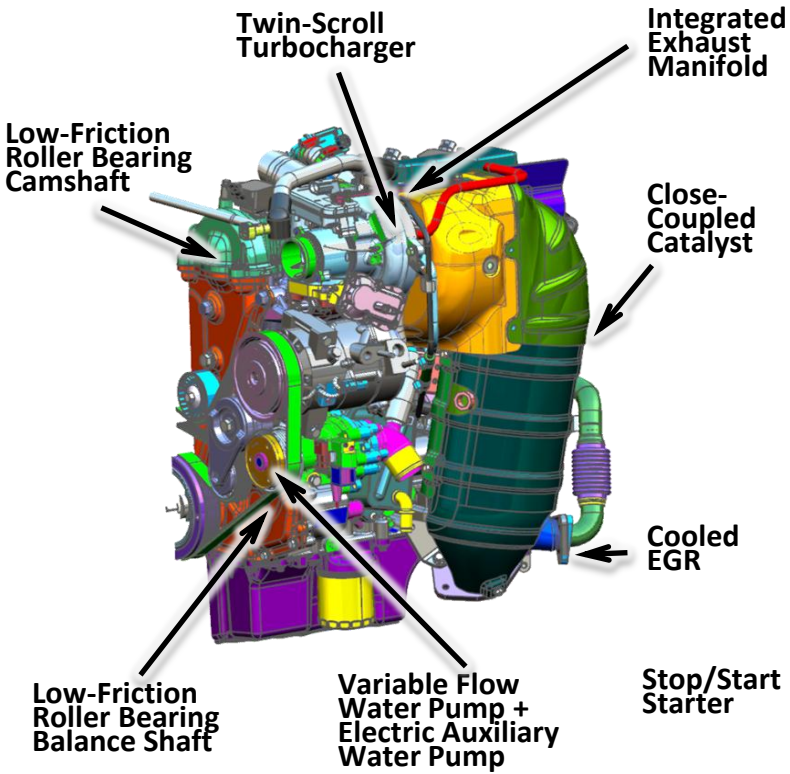
Small gasoline engines



New small engine family technology

The new gasoline engine family will incorporate numerous technologies





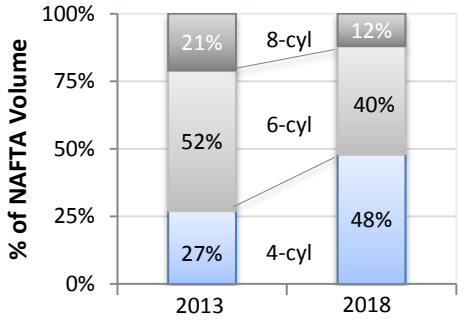
Global FCA gasoline engine portfolio trends

FCA FIAT CHRYSLER AUTOMOBILES | START 2014-2018

The portfolio is transforming to smaller displacements with greater technology content for improved efficiency

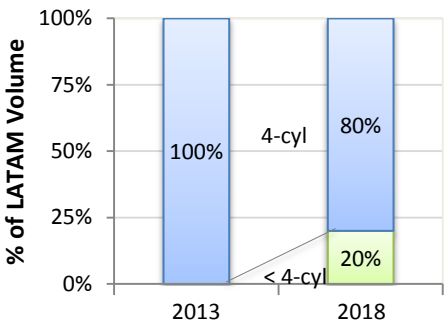
NAFTA

Reduced vehicle demand energy enables smaller engines



LATAM

CO_2 regulations drive higher content engines



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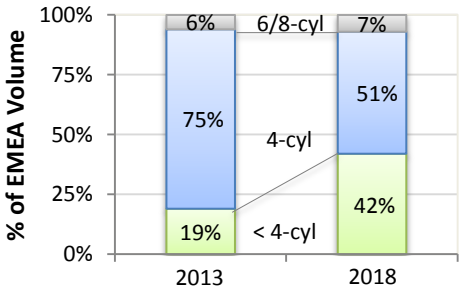
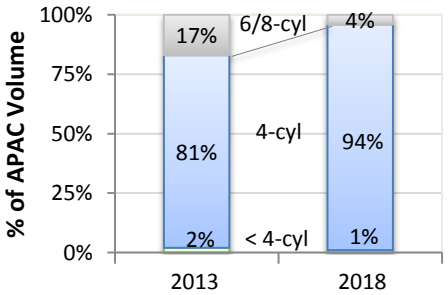
Positioning the portfolio to meet 2020 CO_2 requirements



APAC

Regional CO_2 and displacement regulations drive smaller engines with higher technology content

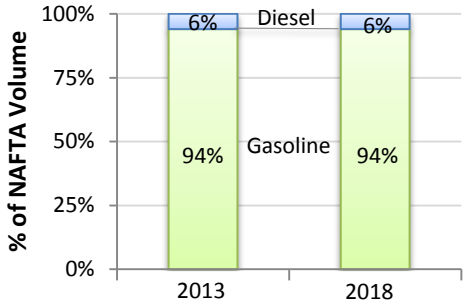


Global FCA gasoline vs. diesel portfolio trends

Diesels are not just for Europe anymore

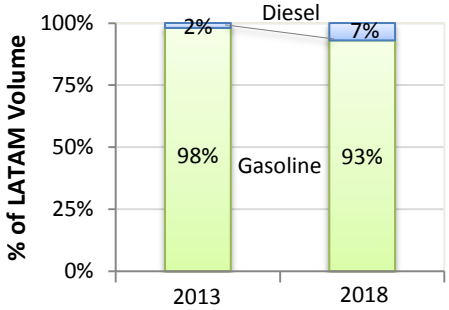
NAFTA

Diesel mix remains constant



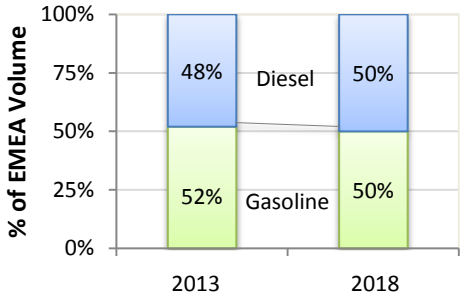
LATAM

Diesel grows in SUV and pickup segments



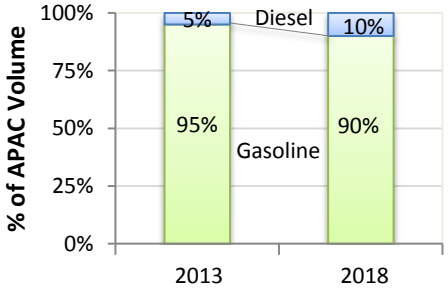
EMEA

Diesel share grows in C and higher segments



APAC

Diesel growth in Indian market



Electrification strategy

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The FCA strategy is to introduce electrification for regulatory compliance and where market-based customer demand is forecast

	2012CY	2015CY	2016CY	2017CY	2018CY
BEV		**ZEV mandate regulation**			
HEV/PHEV				**Market opportunity**	
Mild HEV (BSG)				**Broad market penetration**	

Leverage Start/Stop technology → Belt Starter Generator (BSG)
Plug-in Hybrid Electric Vehicle (PHEV) → Maximize economies scale

Perspective

- The overarching driver for powertrain technology change over the next 5 years is CO_2 reduction – driven mainly by regulation but increasingly by customer preference

- FCA and the industry in general have made great strides in improving the efficiency of the internal combustion engine. Much more progress will come as gasoline and diesel engine technologies converge. FCA will start the global roll out of a new small gasoline engine family in 2015 which incorporates these new and emerging technologies

- Diesel, a Fiat core technology, will increase outside of Europe. The RAM 1500 and Grand Cherokee applications in NAFTA are two recent examples

- CNG can play a significant role in reducing emissions and dependence on oil. Although widespread usage is not expected to develop in the U.S. primarily due to the lack of a public distribution infrastructure, CNG remains strong in other global markets

Perspective

- FCA has established a leadership position in transmission technology. Much of the work is behind us but we will continue to improve efficiency and extend 8 and 9 speed applications on a global scale

- Electrification has been over-blown by the media. With the exception of a relatively small group of early adopters, the market continues to be primarily driven by regulatory requirements. FCA will launch a PHEV minivan in 2016 to comply with ZEV requirements. Several mild hybrid applications will come to market shortly thereafter

- Despite the strong regulatory push by CARB's ZEV mandate, fuel cells still are not commercially viable for mainstream automobiles. The technology is too expensive and the infrastructure to create and distribute hydrogen with a net CO_2 footprint reduction is not in place

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