

Meeting FORMForum

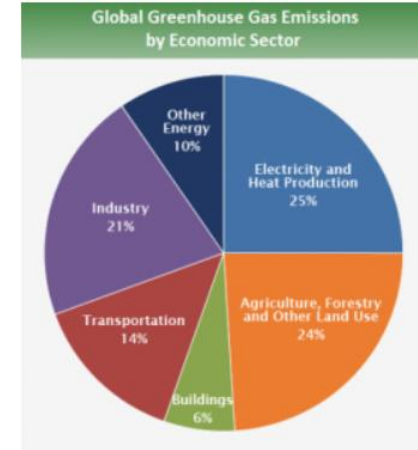
Speaker Alberto Peña

Date 19/10/2016

Powertrain 4.0

Energy for Transport: Context

- Greenhouse gases and local emissions are a raising concern for modern countries
 - Health issues in cities
 - Effects of global warning are noticeable
- Oil is being found worldwide, therefore scarcity might be not be an issue any more...
- Responsibility: How long will ICE the main alternative to propel road vehicles?



Source: EPA



Source CNN, new oil shales in Texas

Energy for Transport: Future legislation & debate

- CO2 emission reduction targets are very well known for road sector research community! (2021 95gr/km)
- Emission restrictions in cities are being accelerated, being a design driver for many urban vehicles

German Transport Minister Calls Internal Combustion Ban "Utter Nonsense"

Over the weekend, the German government proposed banning internal combustion vehicles by 2030. The nation's transport boss isn't buying it.

Source Road & Track

Energy for Transport: What Automotive Industry says...

- Paris Autoshow 2016: Electrification “Revival”, together with connectivity & automation...
- Major OEM’s introducing not only new EV’s but New sister Brands to lead a transition to electromobility
- Mid term electric vehicles offer mainly two features:
 - Range aiming at 400-500 km
 - Cost comparable to Diesel Vehicles
- No compromise for customers will enable EV adoption & rocket sales!

Energy for Transport: What Automotive Industry says...



Source Renault



Source VW



Source Daimler

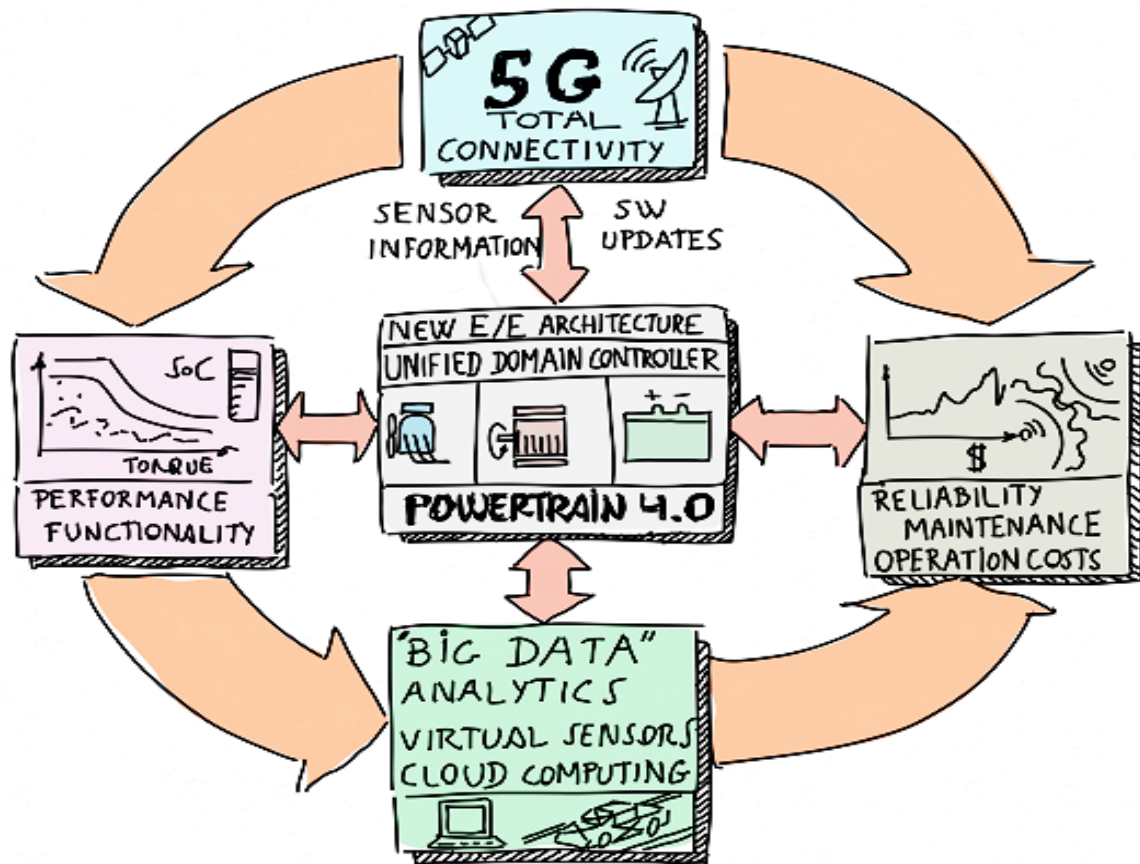
EV's from city cars to SUV's
and medium duty urban trucks



Source Daimler

Context of electrified and connected vehicle: Powertrain 4.0

- Mass production of electrified powertrains imposes challenges to automotive industry along supply chain
- During last 10 years effort on performance and robust technologies, with increasing focus on cost reduction...
- Industry activity in feasible electrification, but with mass production & **connected & automated** environment in mind!



Powertrain 4.0: Examples

Current F1 Car: Hybrid,
connected & re-configurable
on the move!



Source Renault



Source McLaren

Heavy duty fleets: Truck
Data Center (Daimler)



Source Daimler

Future trends

- Connectivity as key enabling technology for powertrain
- Novel unified E/E architectures enabled by high computing power platforms
- Virtual Sensors from holistic plant models (off line & embedded)
- Model Based Development, Maintenance & Operation
- Big Data & Analytics
- Gamification
- New business models...

Questions?