



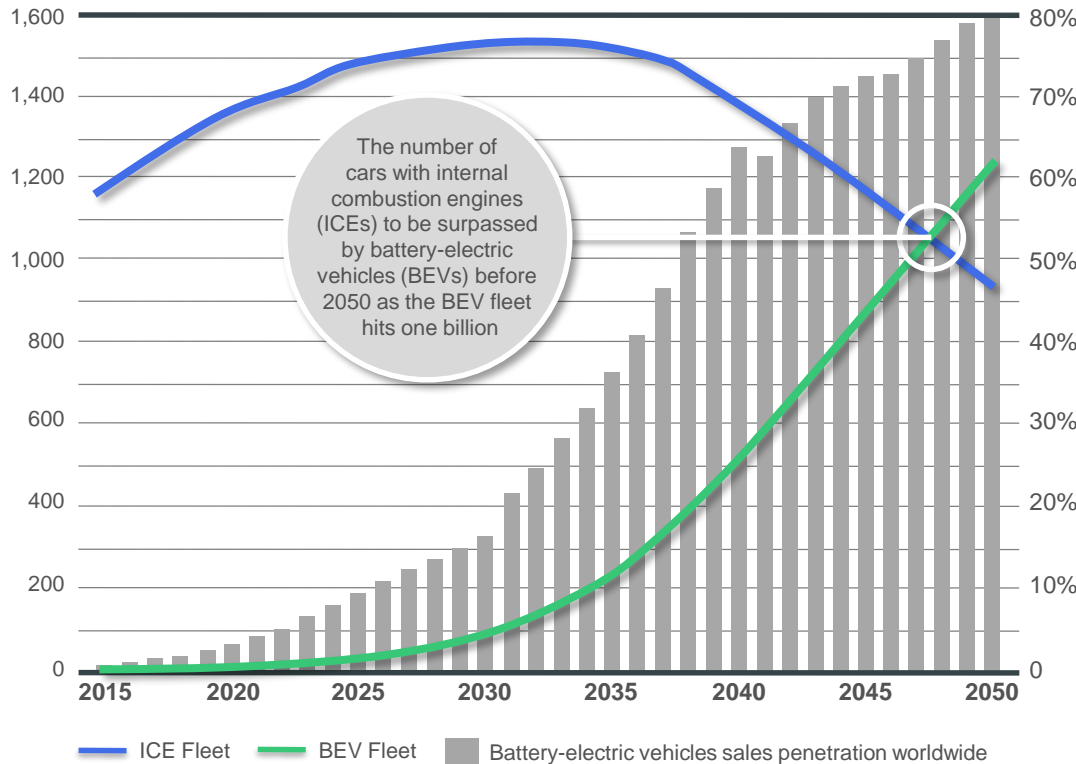
AHEAD™ Technology For Automotive Electronics

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Trend 1: Rapid Adoption of Electric and Hybrid Technology

Global Passenger Car Fleet (Millions)



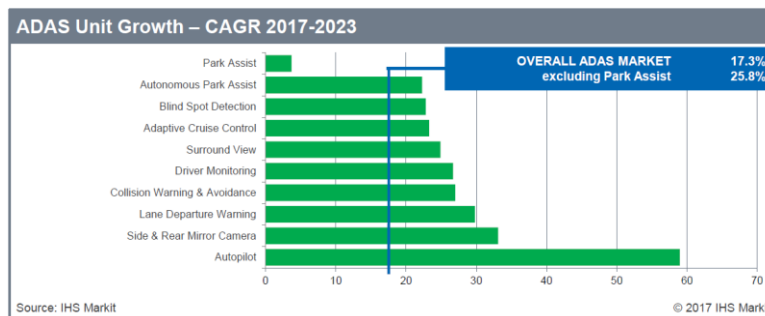
*Source: Morgan Stanley 2017

The global fleet of plug-in EV's stood at 5.4MM at the end of 2018. 2019 should bring another 3.2MM light vehicles to the total. (Source: EV-volumes.com)

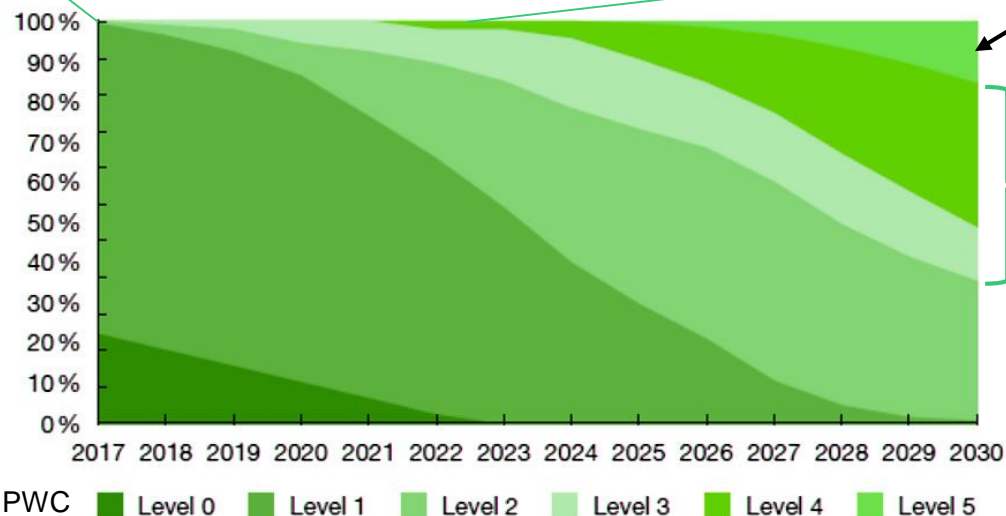
By 2030, nearly 50% of new car builds will be HEV/BEV.

Trend 2: Safety Systems to Assist Human Drivers

Near term growth driven by ADAS (25% CAGR)



>50% of vehicle L3+ Capabilities (EU/USA, 2030)



LEVEL 5



LEVEL 3-4

Common features include blind spot detection, automated braking, stability control, speed/steering assist, etc.

Full autonomy will emerge.

Industry Challenges in the Face of Rapid Change



Thermal management: Higher energy-density batteries; small, powerful e-motors and ultra-fast charging create thermal management challenges in safety and efficiency.



Safety: Thermal/electrical safety of EV drivetrains combine with passenger and pedestrian safety standards requiring integration of active and passive safety systems.



NVH: Ride experience is more important than ever as autonomous vehicles become work and social environments.



Charging Infrastructure: Networks of fast-charging infrastructure will be integral to the proliferation of electric vehicles. Durable, upgradeable and user-friendly charge points will be necessary.



Lightweighting: Driven by consumer desire for parity between the driving range of electric and fossil-fueled vehicles, further weight reduction in EV chassis, drivetrain and batteries is of paramount importance.

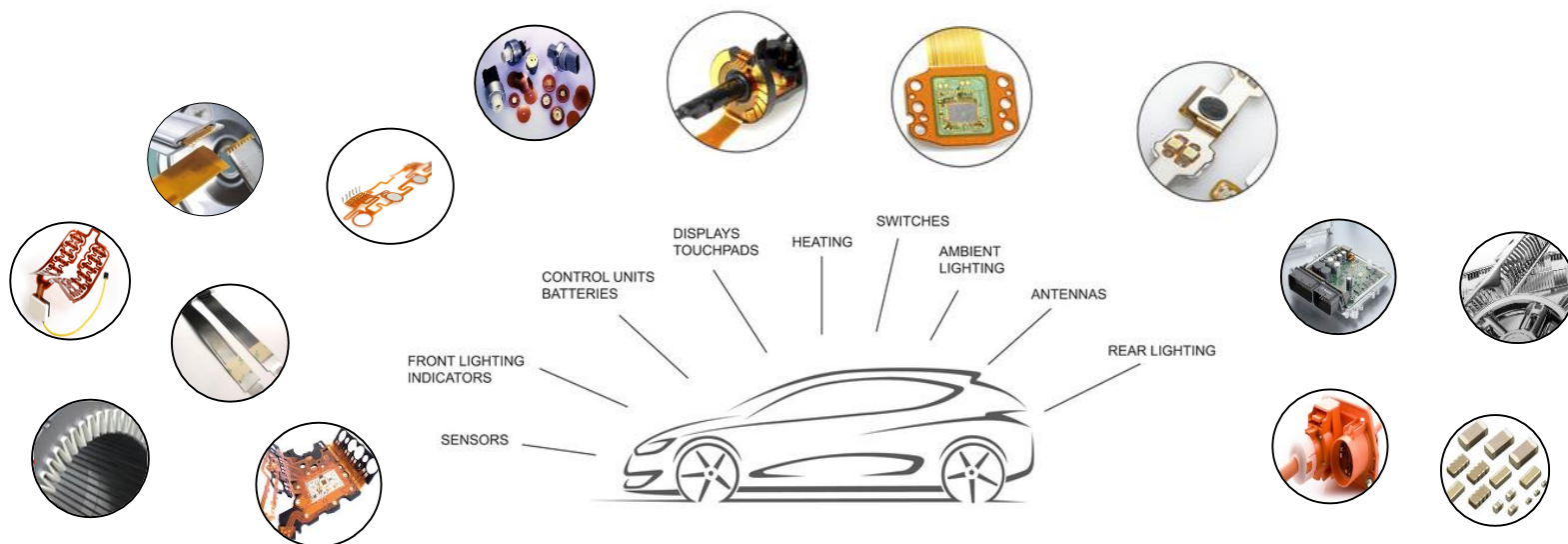


Connectivity, sensing and control: Accurate, upgradeable and reliable data acquisition systems and electro-mechanical actuators will dictate powertrain electrification acceptance as well as autonomous driving.



Durability: Autonomy and car/ride sharing will increase life cycle expectations for future vehicles, requiring improvements in durability for chassis, electronic and interior components.

DuPont Materials are Found Throughout the Automobile's Electronic Systems



Flexible Circuit and Protective Materials are Found in

- **Antennas**
- **Cable and Wire:** brake pad cable, high voltage e-motor wire insulation
- **Sensors:** RADAR, LIDAR, camera modules
- **Electric Motors**
- **Insulation Film:** oil sensor membranes, slot liner, bus bars, PTC heater insulation
- **EMI Shielding:** ECU package, battery pack, e-motor, connectors
- **Seat Heaters**

Metal Plating Technology is Found in

- **Connectors:** infotainment, brake sensors, engine sensors, engine starter, switches
- **Passives:** infotainment, brake sensors, engine sensors
- **PCB :** control units, radar, infotainment, lighting, sensors, switches, navigation
- **Plated Plastics:** door handles, logos, internal and external panels, rear-view mirrors, dashboard panels, buttons
- **Semiconductor Leadframes**
- **EMI Shielding**

