Ready 4 Electrification

19th June 2019

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WMG
THE UNIVERSITY OF WARWICK

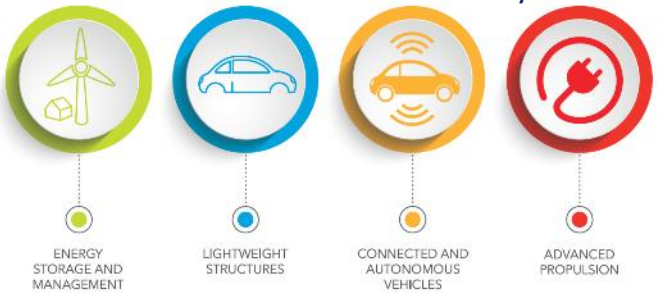
CATAPULT
High Value Manufacturing

Introduction to WMG

- Established in 1980
- University of Warwick department
- 600+ staff
- 8 centres
- Education in 7 countries
- Collaborative R&D with 1,000+ companies
- Multi-disciplinary teams
- Core research areas
- Annual programme of £180m

High Value Manufacturing Catapult

- Consortia of 7 world-class research centres
- Drive growth in manufacturing
- Accelerate & de-risk innovation
- WMG centre founding member
- Focus on Low Emissions Mobility…



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Our mission - Make more in the UK

- Develop, grow and anchor supply base capability
- Make UK manufacturing businesses grow faster
- Make innovation / R&D stick - OEMs are only as good as their supply chains

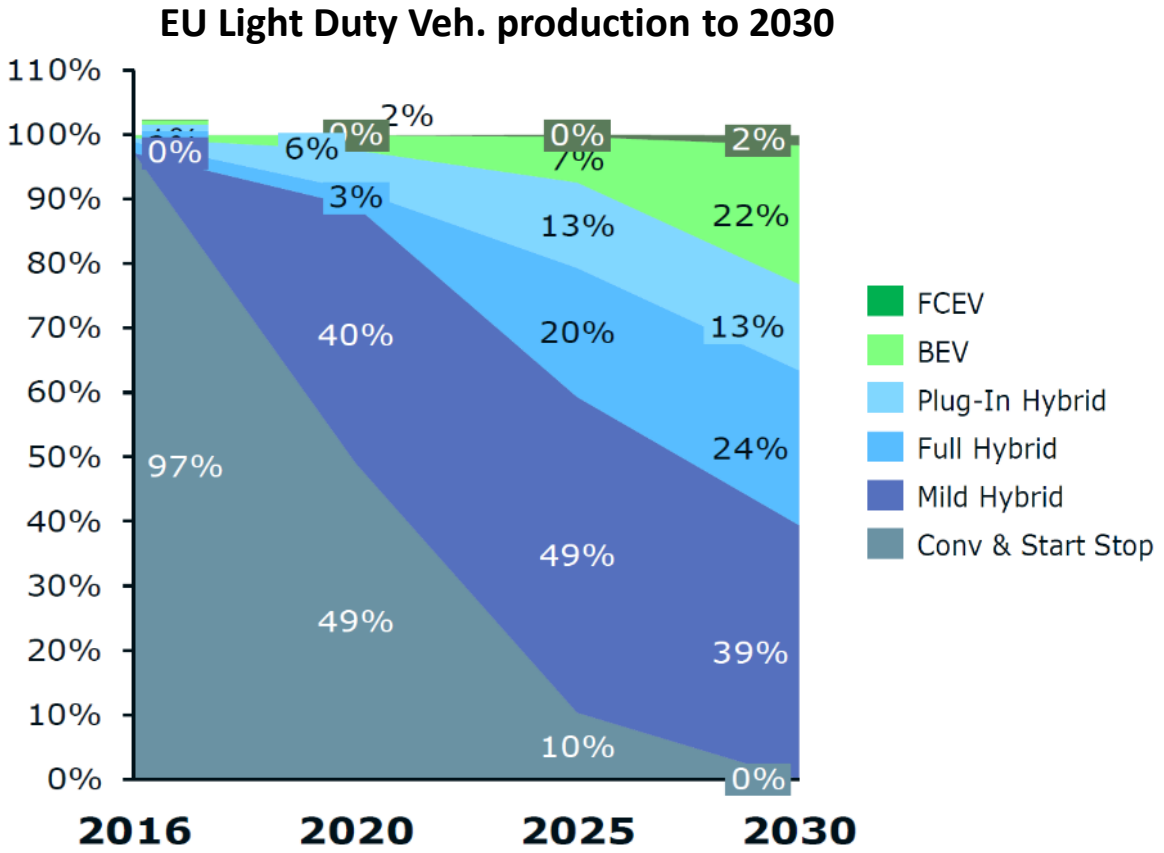
By 2030 it is expected that 100% of new EU cars will be at least partially electrified

Electrification of light duty automotive is inevitable due to:

- Political drivers to lower CO_2
- Diesel gate which has had an impact on diesel sales in EU

This results in faster than expected uptake of electrification in the EU & globally

But will come in various formats



Source: AVL, IHS for APC assuming 35% emission reduction

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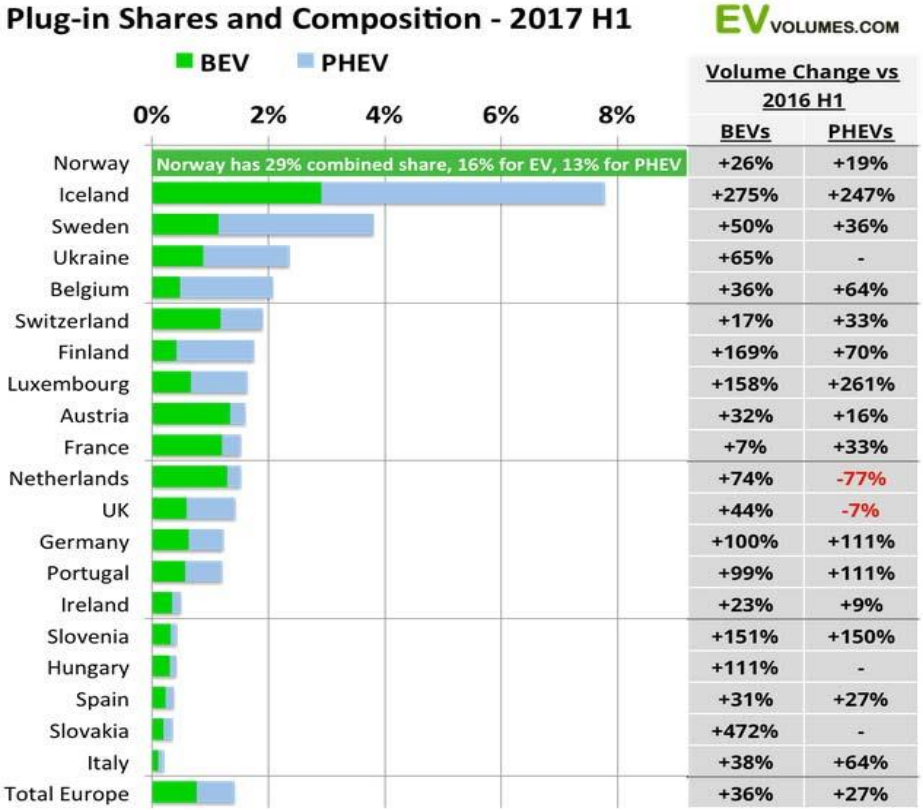
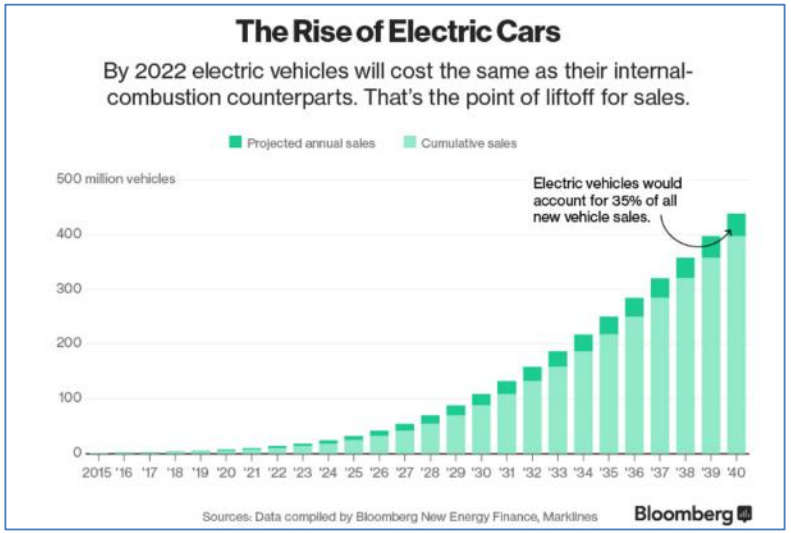
Plug-In Vehicle sales in Europe 2017



	Volume Change vs 2016 H1	
	BEVs	PHEVs
Norway	+26%	+19%
Iceland	+275%	+247%
Sweden	+50%	+36%
Ukraine	+65%	-
Belgium	+36%	+64%
Switzerland	+17%	+33%
Finland	+169%	+70%
Luxembourg	+158%	+261%
Austria	+32%	+16%
France	+7%	+33%
Netherlands	+74%	-77%
UK	+44%	-7%
Germany	+100%	+111%
Portugal	+99%	+111%
Ireland	+23%	+9%
Slovenia	+151%	+150%
Hungary	+111%	-
Spain	+31%	+27%
Slovakia	+472%	-
Italy	+38%	+64%
Total Europe	+36%	+27%



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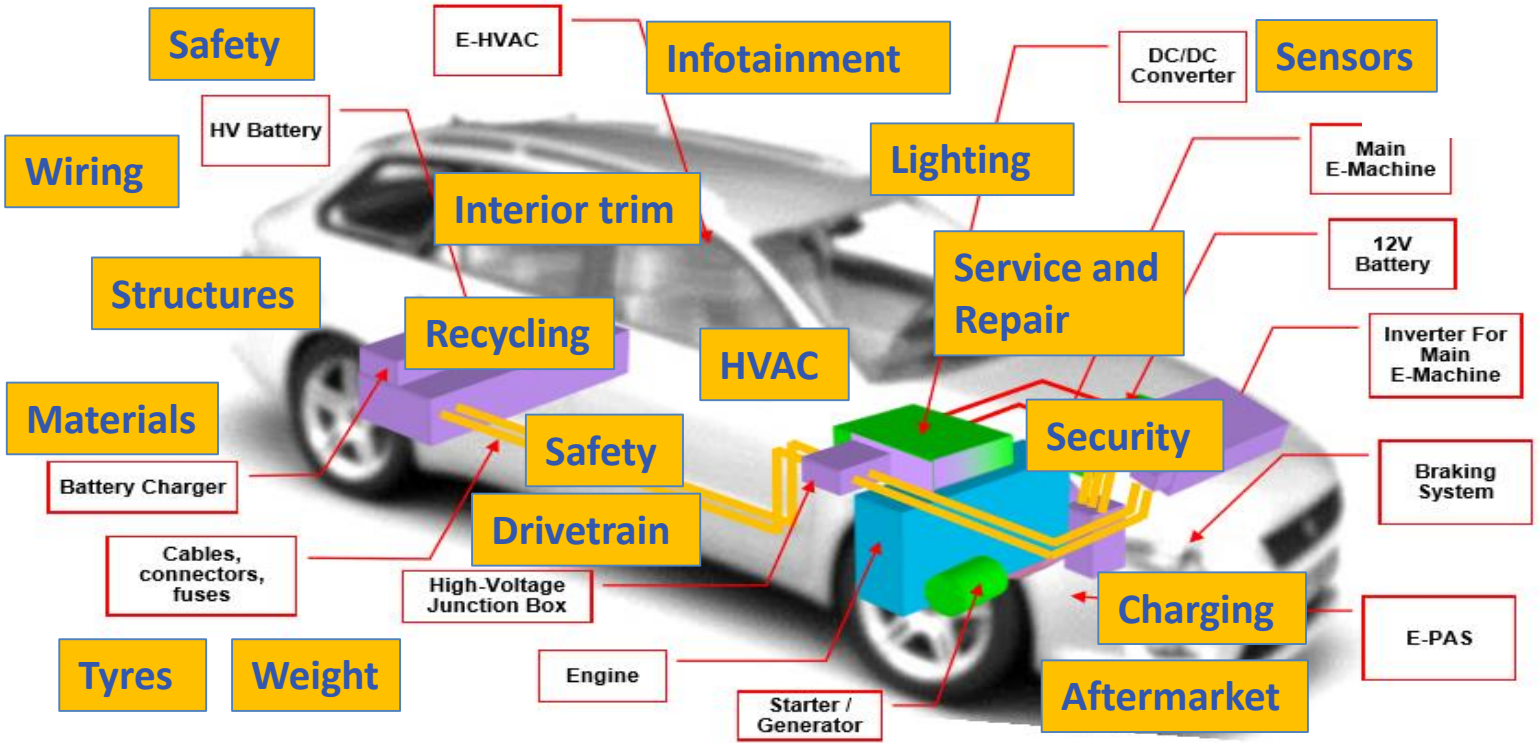
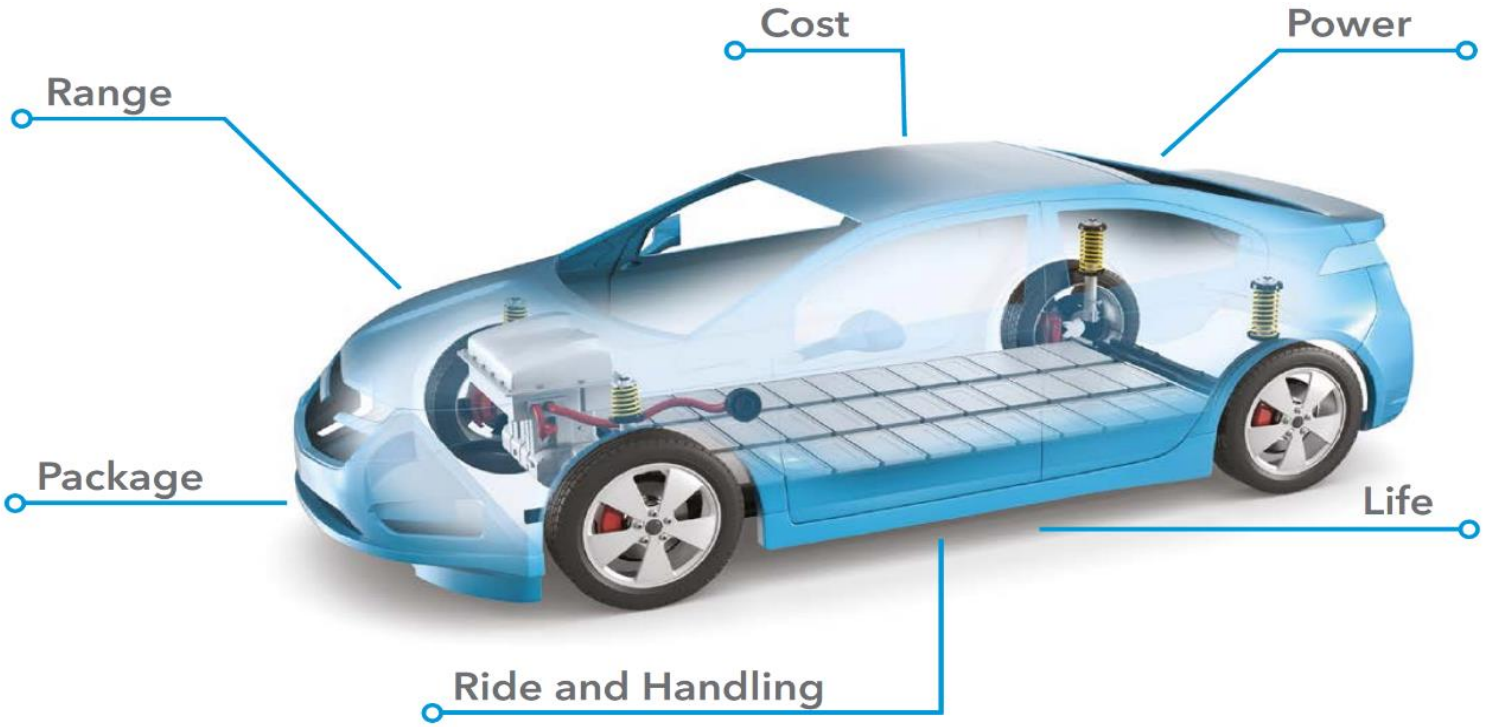
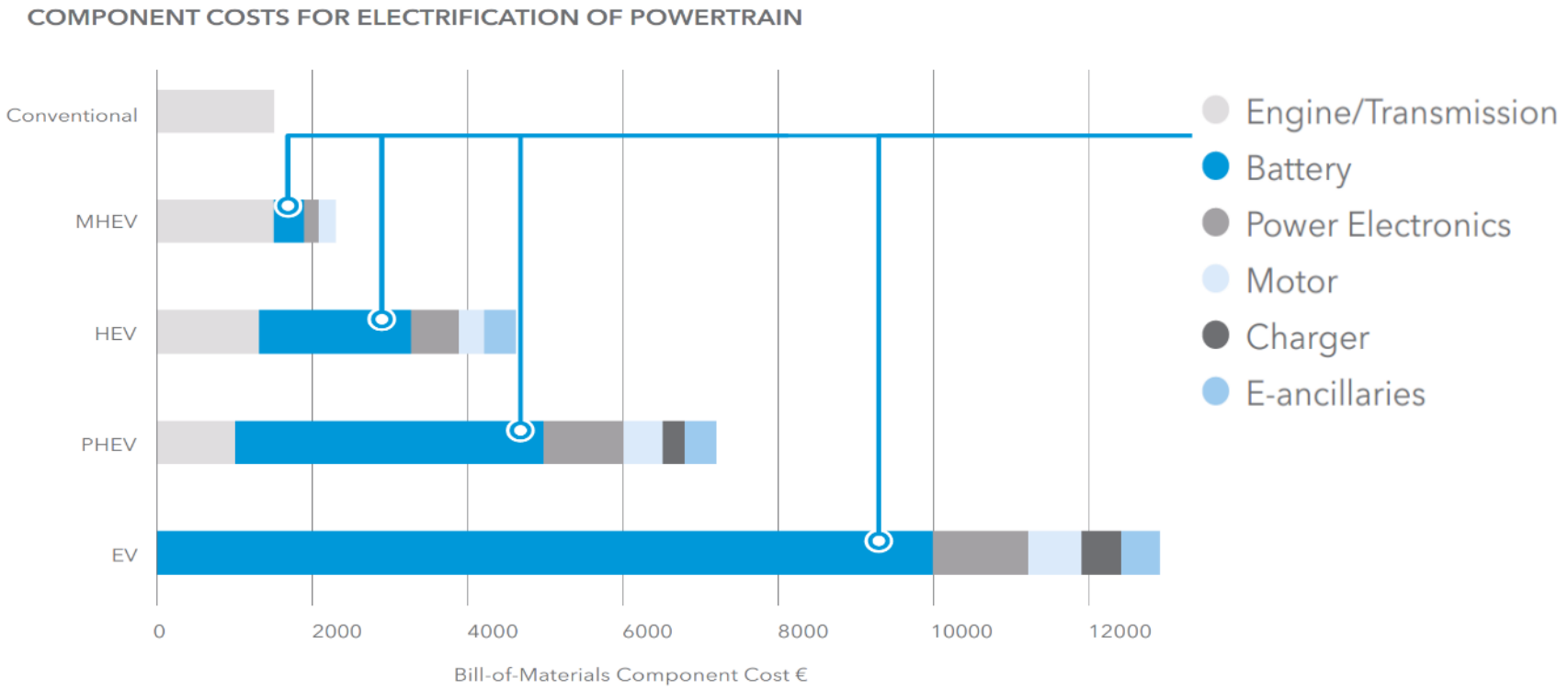
Electrification – impact on vehicle architecture:



A typical EV battery weighs 400-800kg and fits under the car floor.
It is the defining component of the electric vehicle



Biggest challenge for commercialisation is battery cost



Automotive pack construction

Lithium-ion cell

e.g. pouch or cylindrical cell

As a single unit, a '**cell**' performs the primary functions of a rechargeable 'battery'. Cells come in varied formats:

- Cylindrical Cells
- Pouch Cells
- Prismatic Cells

Module

e.g. module for pouch cells (Nissan Leaf)

A '**module**' is formed by connecting multiple 'cells', providing them with a mechanical support structure and thermal interface and attaching terminals. Modules are designed according to cell format, target pack voltage and vehicle requirements.

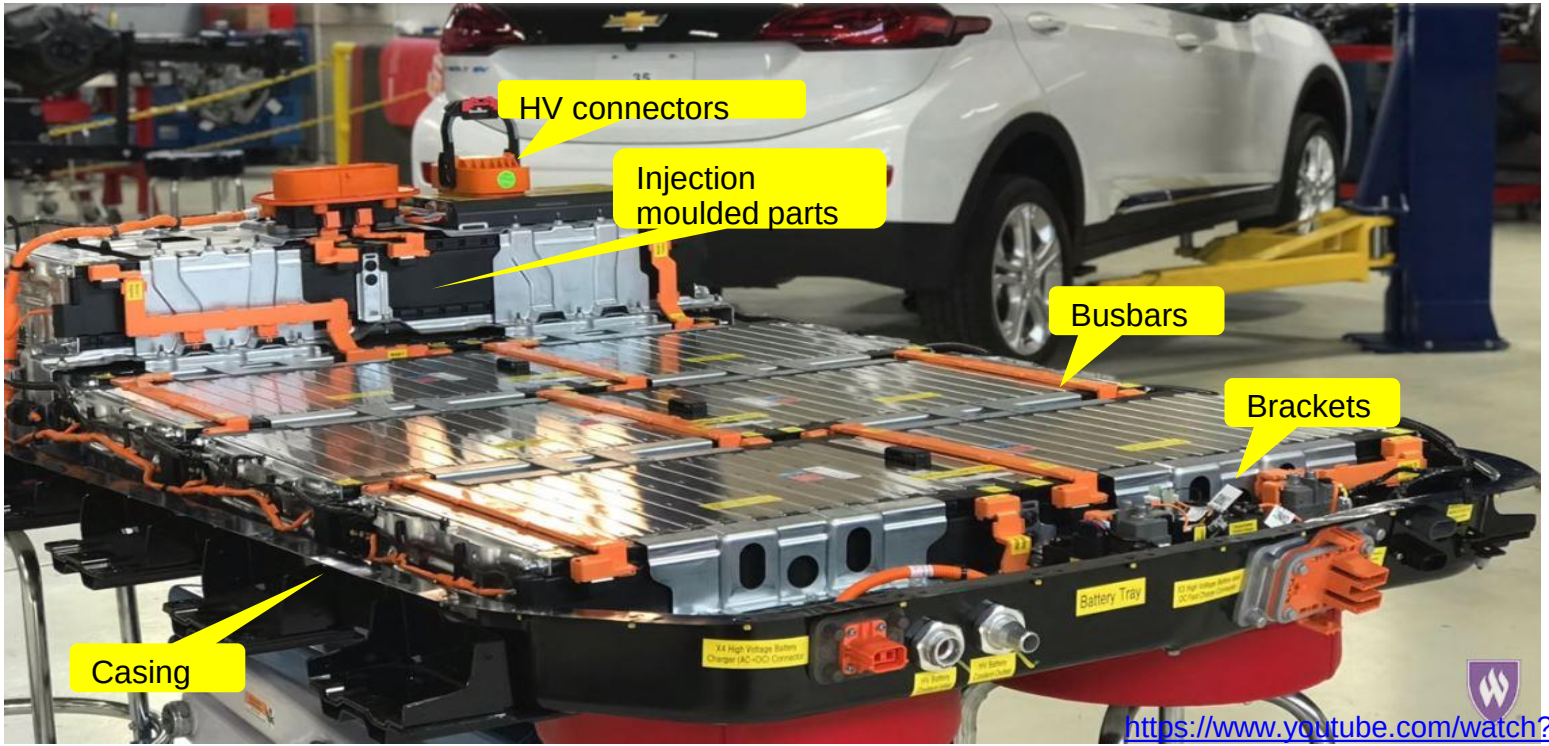
Pack

e.g. pack for pouch cells (Nissan Leaf)

A '**pack**' is formed by connecting multiple 'modules' with sensors and a controller and then housing the unit in a case. Electric vehicles are equipped with batteries in a 'pack' state which are connected to the powertrain.

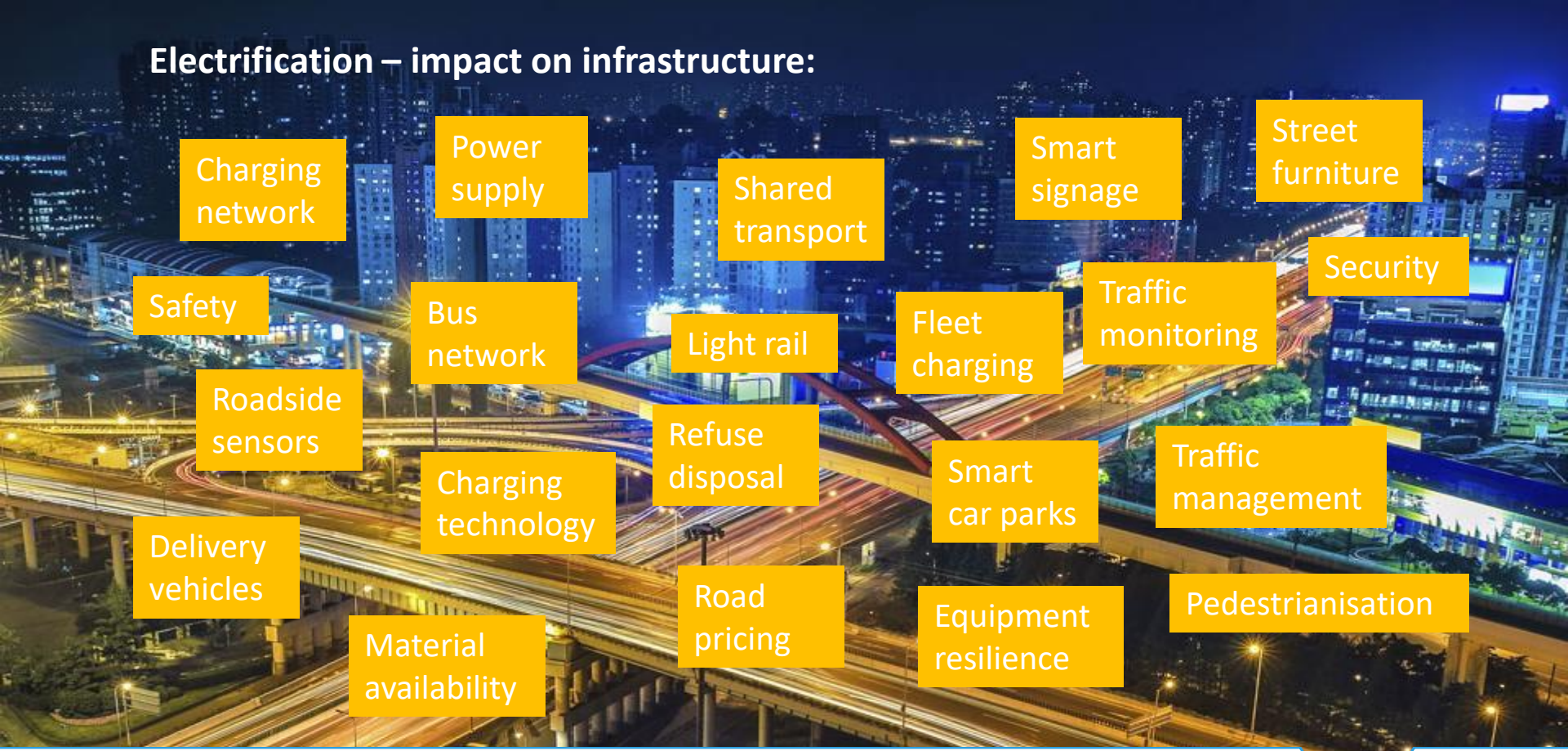
What is the opportunity?

For that you need to look a bit closer (GM Bolt EV battery pack teardown)



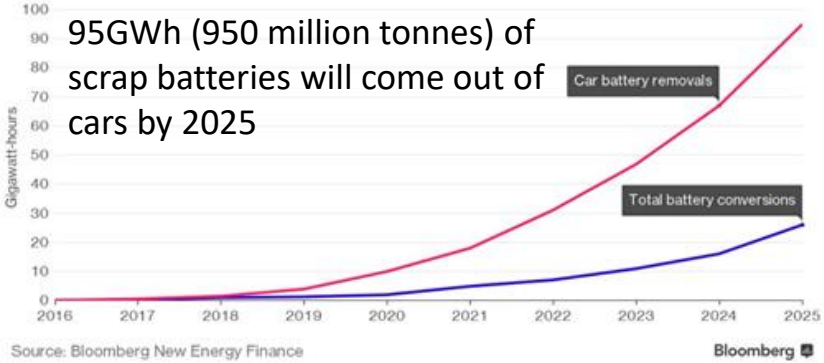
https://www.youtube.com/watch?v=ssU2mjiNi_Q

Electrification – impact on infrastructure:



And we must think sustainably from the outset

- Recycling
  - EV battery pack weighs 300-900kg
  - Typical life 8-10 years
  - Net cost at disposal around £1000/T
  - Pack design should allow easy dismantling
  - New processes needed to recover cell materials
  - And deployment at scale required



Opportunities:

- Huge impact on vehicle architecture
- Charging infrastructure
- “Smart” roads and navigation
- Autonomous vehicle capability
- Battery and fuel cell technology
- Data generation and management

- **What are the implications of these for your Business and products?**

Ready 4 Electrification journey:

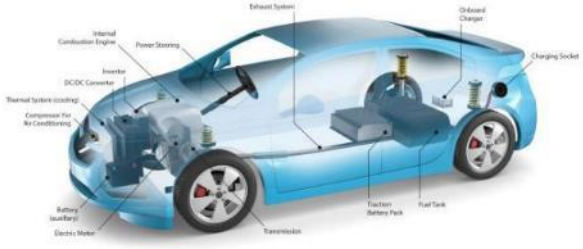
Awareness:
Network
Workshops
Demonstrators

Feasibility Projects:
Assess current status
Identify Opportunities and Barriers
Action Plan.
Masterclasses.

Strategic Projects:
Deliver action plan
Internships, Knowledge Transfer Partnerships (KTPs),Collaborative R&D

WMG R4E programme:

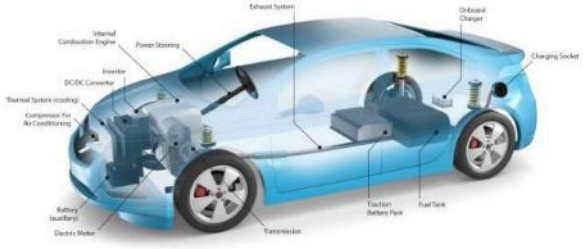
- R4E Network to facilitate and promote awareness of electrification
- Feasibility projects
  - Understand the opportunity
  - Assess how best to exploit the landscape
  - Develop your EV roadmap -
  - Masterclasses (Batteries, Motors, Power Electronics, Supply Chain, Leadership)
- Strategic projects
  - Deliver the action plan
- Technical support -
  - materials, production processes, rapid prototyping, access to expertise, research and knowledge transfer



Success =

- **More companies in supply base**
- **Technology leadership in key areas**
- **Maximise opportunities for the UK supply base**
- **Increased UK content in future EV**
- **Export growth in EV technologies**

WMG R4E programme findings:



- There has been an increase in awareness levels.
- A development of Automotive and EV strategy.
- The Network is acting as a catalyst.
- Management coaching has led to broader horizons.
- Access to specialist expertise gained.
- Infrastructure opportunities are not known.
- Standards are still emerging, with a chance to influence.
- There are new entrants to the market.
- New products and processes are coming to market.

The Ready 4 Electrification Programme:

WORKSHOP PROGRAMME:

- Wednesday 25th September 2019 - Beacon of Light, Sunderland
- Thursday 17th October 2019 - Brighton University

More dates to be confirmed

To register your place and to keep up to date with future workshops, visit our website.

Contact details

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