Opportunities and attractiveness of UK Automotive Sector

John Kell

Specialist – Automotive Sector Team

Department for International Trade

BUSINESS IS GREAT

BRITAIN & NORTHERN IRELAND

UK Automotive Industry - Overview

2.7m engines produced in 2017

UK auto industry turnover £71.6 billion

814,000 people employed across UK automotive industry

1.7m vehicles manufactured in 2017

25,000 new jobs to be created in automotive manufacturing to build connected & autonomous vehicles

World's largest producer of luxury cars

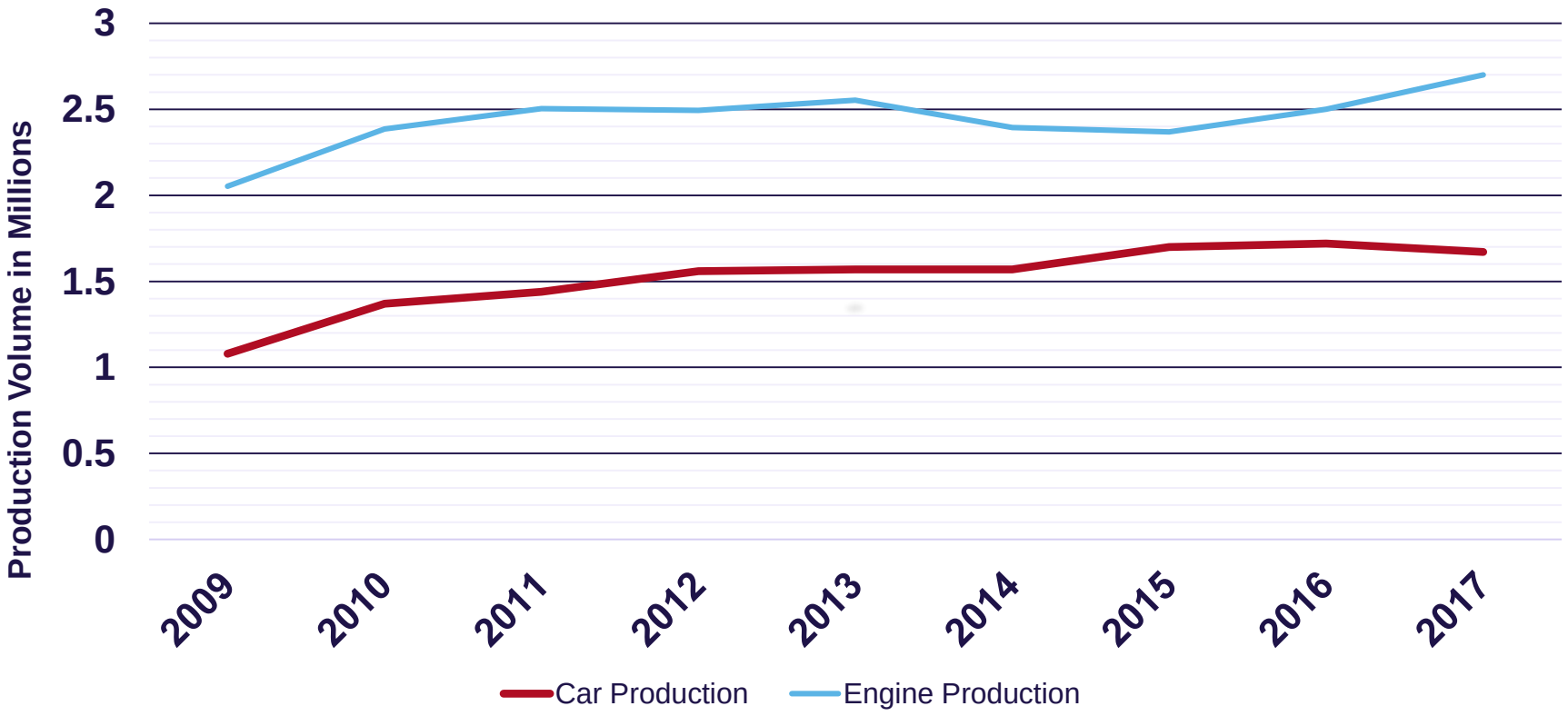
169,000 people directly employed in manufacturing

78% of UK-built cars are exported

*SMMT

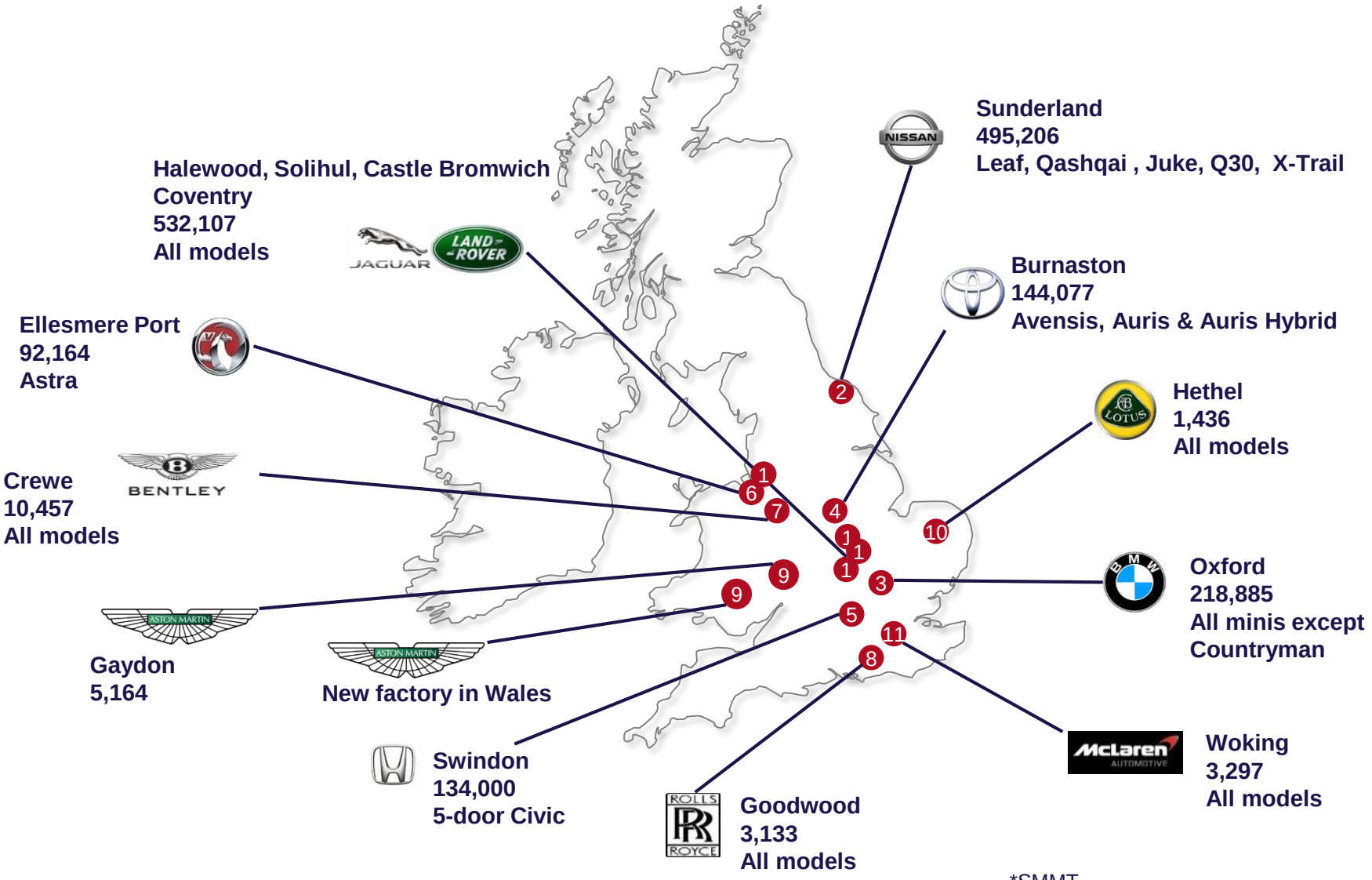
UK Car and Engine Production

- 1.67 million cars were produced in 2017, which is the second highest output in 17 years
- 2.7m engines were produced in 2017, up 6.9% compared to 2016 and an all-time high since records began in 2009



*Source SMMT 2018

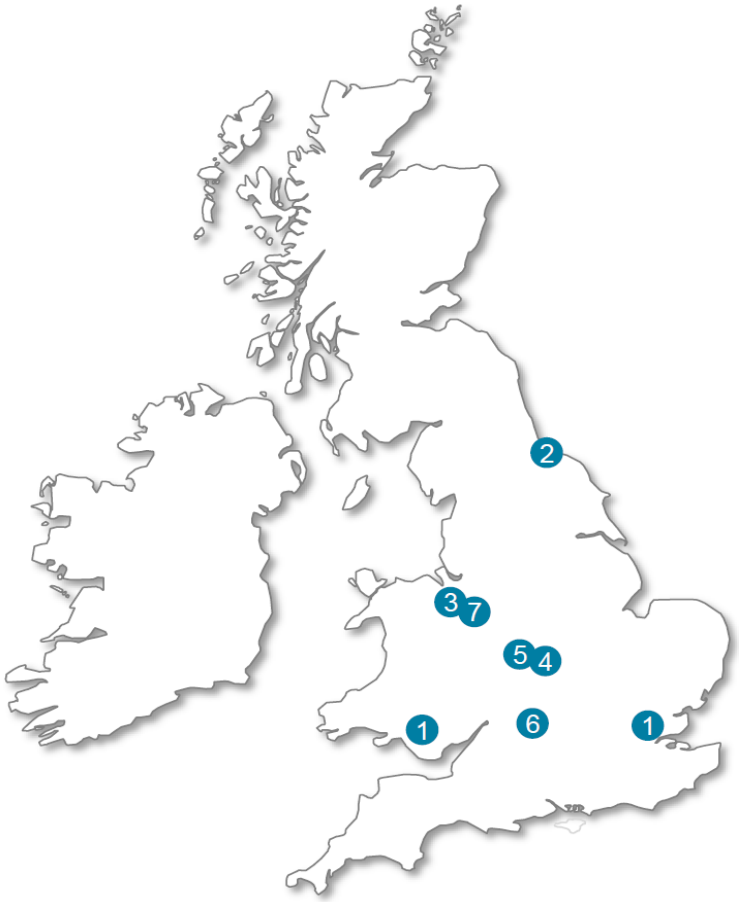
UK Automotive Industry – OEMs



*SMMT

UK Automotive Industry – Engine Manufacturing

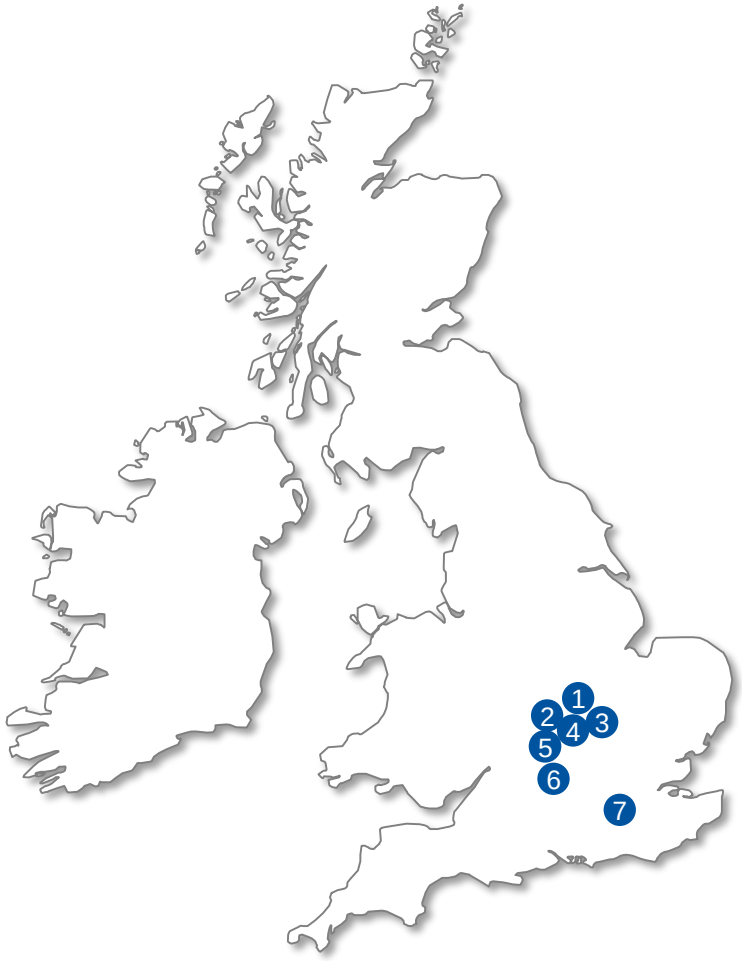
#	Manufacturer	Locations	2017 Production
1	Ford	Bridgend & Dagenham	1,323,000
2	Nissan	Sunderland	199,000
3	Toyota	Deeside	296,000
4	BMW	Hams Hall	311,000
5	Jaguar, Land Rover	Wolverhampton	311,000
6	Honda	Swindon	197,000
7	Bentley	Crewe	4,977



*MarkLines: Production figures includes some estimated values

UK Automotive Industry – Motorsport Valley

#	F1 Team	HQ Location
1	Sahara Force India	Silverstone
2	Haas F1 Team	Banbury
3	Red Bull Racing	Milton Keynes
4	Mercedes AMG Petronas	Brackley
5	Renault Sport Formula One Team	Enstone
6	Williams Martini Racing	Grove
7	McLaren Honda	Woking

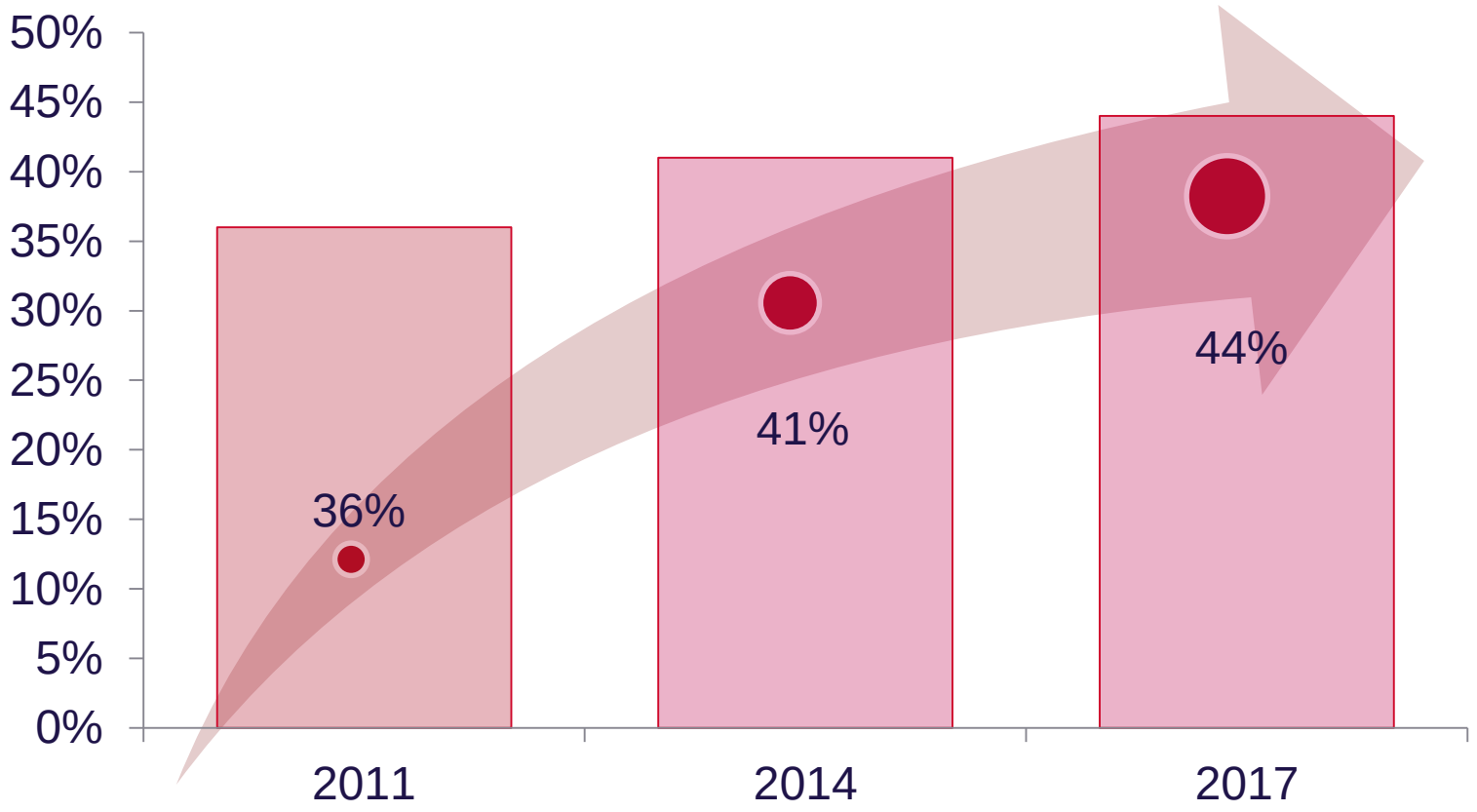


- Turnover of £9bn, R&D spend of £2.25bn
- 4,500 companies, 25,000 engineers, 87% of companies export
- 6 of 10 Formula 1 teams have a UK HQ, plus home of Formula-e

UK Content

Average UK content in British-built cars

£3.7 billion of business re-shored



The £4bn supply chain opportunity

Component	Opportunity value (£m)	Component	Opportunity value (£m)
Engine castings	550	12V Lead/Acid Battery	90
Steering systems	330	Cast aluminium sub-frames	90
Trim	255	Brakes	80
Engine forgings	255	Drive shafts	80
Pressings and hot stampings	240	Fuel tanks	75
Seat components	225	Engine accessories	75
Alloy wheels	210	HVAC assemblies	75
Lighting	210	Misc. (pedals, mirrors etc.)	60
Electronics	170	Shock absorbers	60
Plastic mouldings	150	Oil pans	30
Entertainment & navigation	135	Premium finish	50
Bearings	120	Weather strips	50
Instrument Clusters	120	Switchgear	30
Glass	110	Other	520
Hinges	105		

UK Supply Chain – Opportunities

In Delivery

- Exhausts

market requirements largely met

- Pressings

further capacity increases planned

- Plastics

further potential requirements at Tier 2+

- Castings

further capacity in progress & required

In Progress

- Alloy wheels

opportunities to build robust market

- Glass

opportunities for 'added value' processes

- Trim

further opportunities in progress

- Tyres

opportunities for 16"-19" sizes.

For the Future

- Battery

position UK as option for Giga Factory, opportunities from Faraday Challenge

- Electric Machines/Power Electronics

capitalise on UK machining, supply chain competence and academic expertise & research

- Sensors & Cameras

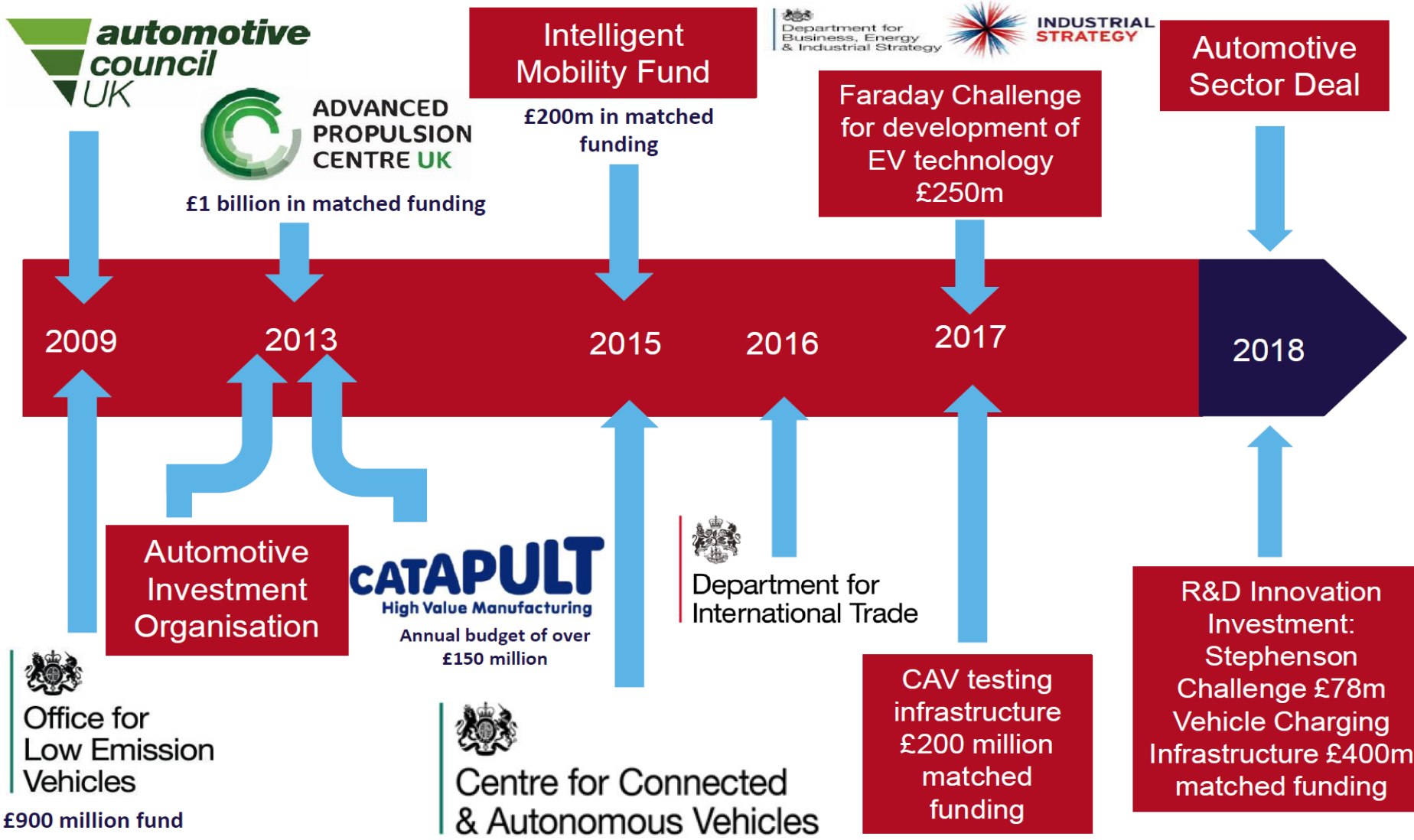
build on UK manufacturing and R&D competence

- AI & Data Processing

build on UK early leadership role in Artificial Intelligence and 'big data'

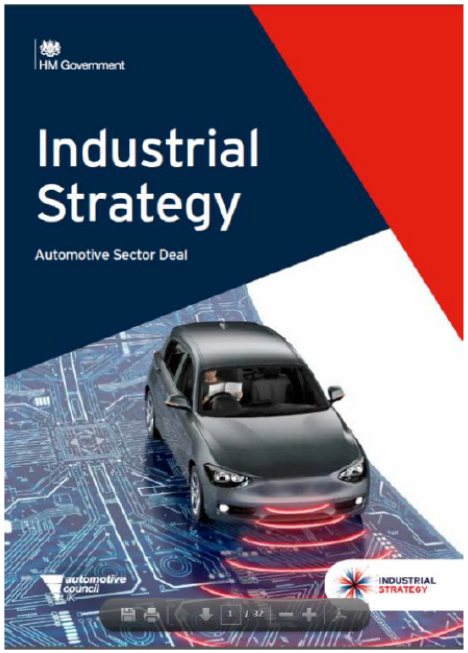
- **£4bn opportunity at tier 1 level with additional £2bn at tier 2+ level**
- **Further £4bn opportunity for the future supply chain – EV & CAV**

Government commitment:
Overall spend £2.5bn+ to automotive



UK Automotive Sector Strategy and Deal

The government wants to see fully self-driving cars on UK roads by 2021.



AI & Data Economy
We will put the UK at the forefront of the artificial intelligence and data revolution

Clean Growth
We will maximise the advantages for UK industry from the global shift to clean growth

Future of Mobility
We will become a world leader in the way people, goods and services move

Ageing Society
We will harness the power of innovation to help meet the needs of an ageing society

FUTURE OF MOBILITY GRAND CHALLENGE: Put the UK at the forefront of the design and manufacturing of zero emission vehicles, with all new cars and vans effectively zero emission by 2040.

INDUSTRIAL STRATEGY

The Sector Deal

Ideas

Advanced Propulsion Centre - £1bn over 10 years to 2023

Automotive R&D - £225m from 2023 to 2026

Faraday Battery Challenge £246m

Shaping the future of mobility - £250m to position the UK as a global leader in connected and autonomous vehicles.

Infrastructure

£23m **hydrogen transport** programme

£20m to support **vehicle-to grid projects**

A £400m electric car **Charging Infrastructure** Investment Fund

£40m R&D funding from the National Productivity Investment Fund to support new **charging technologies** for on-street and wireless charging projects.

Business Environment

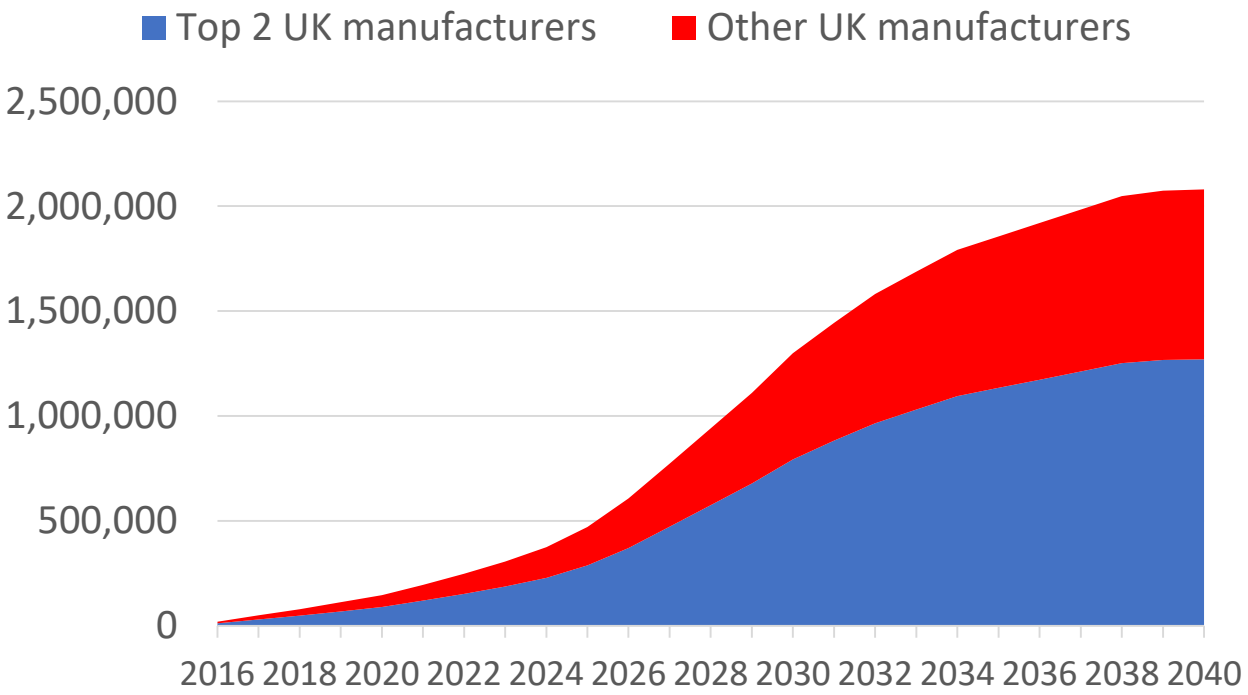
Supply chain - £16m funding for an industry-led national supplier competitiveness programme

£100m new funding for the **Plug-In Car Grant**

Government will exempt **zero-emission capable taxis** from the VED supplement

Provide a **Benefit in Kind** exemption for employees offering free charging for electric vehicles at work 25% of cars in **central Government department fleets** will be ULEV by 2022

UK NEV vehicle production

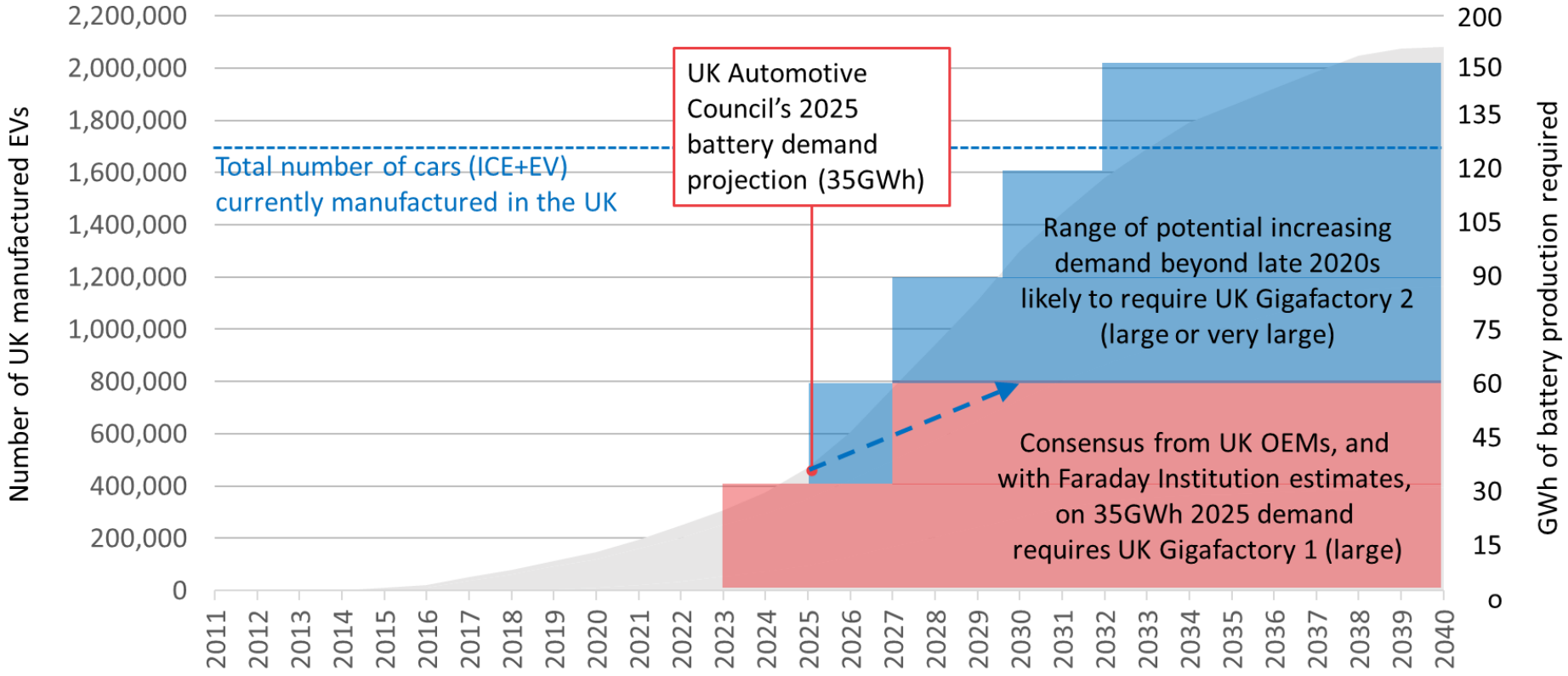


- Current top 2 UK manufacturers (JLR and Nissan) already making EVs and, in this scenario could together make >1.2m cars by 2040
- JLR has stated that it wants to offer all models in electric, hybrid and internal combustion engine by 2020 and that it is aiming to manufacture 1m cars – which would significantly increase this extrapolated number

- Extrapolation of current market share suggests the top 2 UK car manufacturers alone would produce >1.2m NEVs by 2040

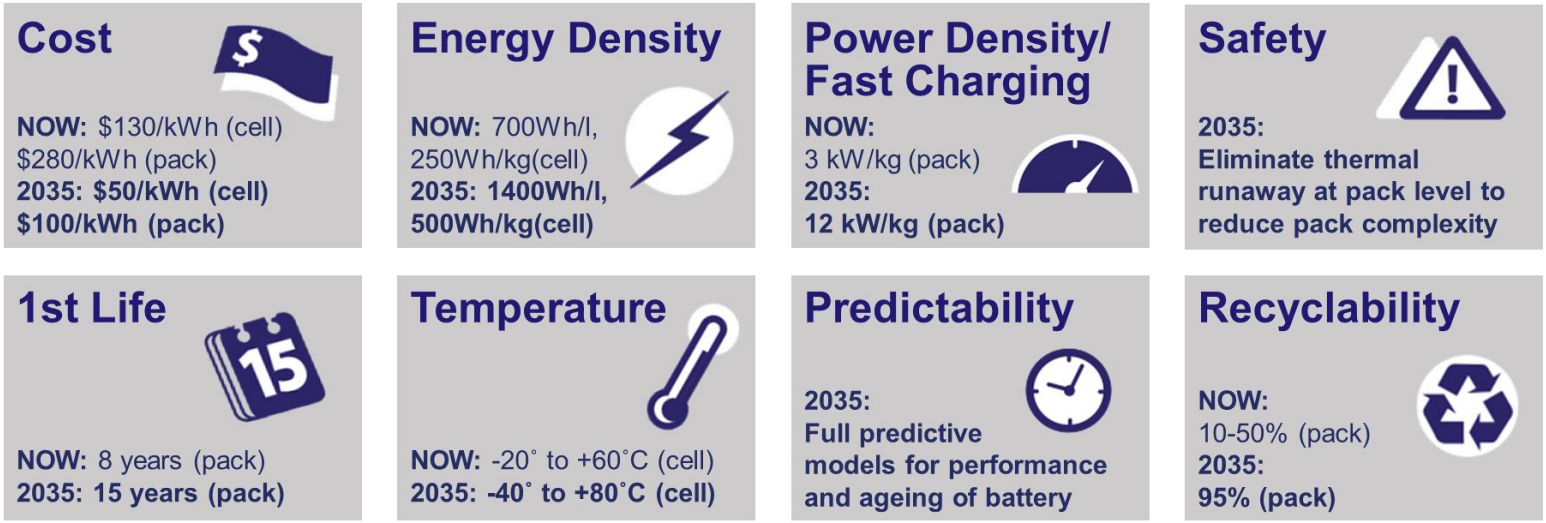
UK EV production projection by manufacturer – Source: Faraday Institution estimates

UK battery demand



UK battery factory ramp up – to meet expected (to 2025) and potential (from 2025) passenger car demands – source: Faraday Institution estimates

Technical Gaps for Batteries



Faraday Battery Challenge Website

www.ukri.org/innovation/industrial-strategy-challenge-fund/faraday-battery-challenge

Faraday Institution

Seeking industry input on future calls for research projects:

www.faraday.ac.uk

UK Battery Industrialisation Centre

www.ukbic.co.uk

Areas funded by APC and CCAV - example

APC Low carbon propulsion £1 billion matched funding	CCAV Connected and Autonomous Vehicles £200 million matched funding
Energy storage/battery technology	Connectivity (V2X)
Electric machines/motors	Sensors
Power electronics	Navigation
Digital engineering and test	Control systems
ICE thermal efficiency	Driverless shuttles
ICE system efficiency	On road testing
Lightweight materials	Telematics
£589m, 36 R&D collaborative projects 140 companies involved.	**£120m, 80 R&D collaborative projects 200 companies involved**

APC 12 Call open - £20m Low Carbon Technologies: Close date 6th March 2019

CAV trials underway in UK

Three Publicly Funded Trials

1. Milton Keynes/ Coventry Autodrive UK

- Real-world evaluation of cars with increasing autonomy
- Development and evaluation of lightweight autonomous pods
- Three cars in 2016, rising to 40 by 2018

2. Greenwich – Gateway

- Shuttles are developments of successful Heathrow pods
- 2017: mixed use trials interacting with pedestrians and cyclists

3. Bristol - Venturer

- Autonomous Land Rover interacting with other road users
- Exploring legal and insurance aspects of CAV

2017: Additional £100 million for UK testing infrastructure

Private Sector: 2017: Nissan and Volvo use UK as their European centres for Autonomous Vehicle testing

2018: Four new CAV test centres

1. Horiba MIRA – Nuneaton

A purpose built environment for testing CAV up to the limit of operability.

2. Millbrook/RACE – Millbrook, Culham

Testing interactions of CAVs in a closed environment with 2,000 staff (UK Atomic Energy Authority, Culham)

3. TRL, London

The Smart Mobility Living Lab, an open innovation environment, providing a real world urban testbed

UK Smart Mobility Living Lab™ @ Greenwich

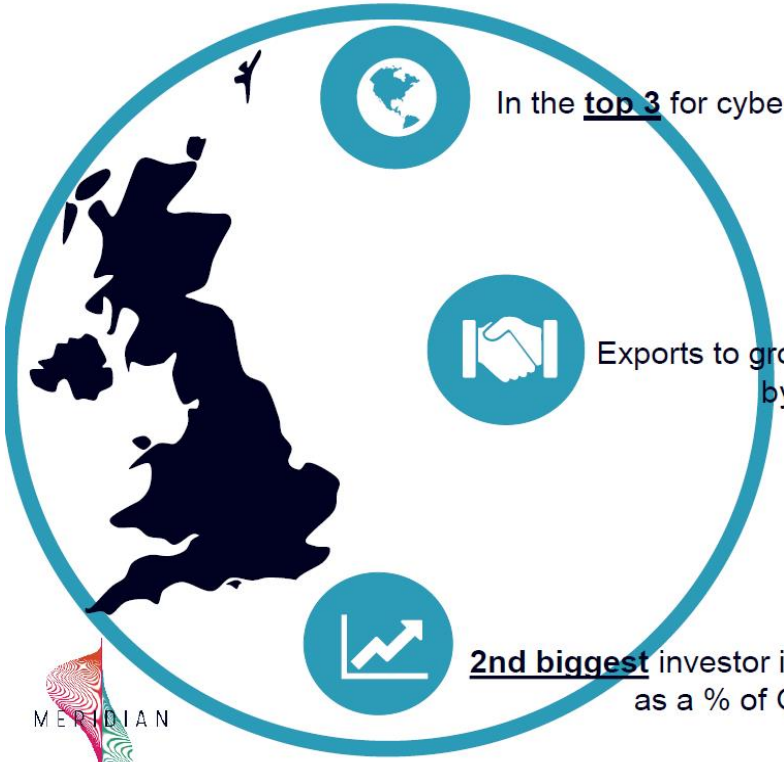
4. **Warwick Manufacturing Group (WMG)**

The UK Central CAV Testbed has 80 kilometres of urban roads, with a world-leading connected infrastructure and eco-system

The UK and Cyber Security

By 2023:
Global market for cyber security to **grow 50%**
UK cyber exports to grow by 75%

Given the **cross-sector portability** of cyber security technologies, the UK is well-placed to lead the CAV security market.

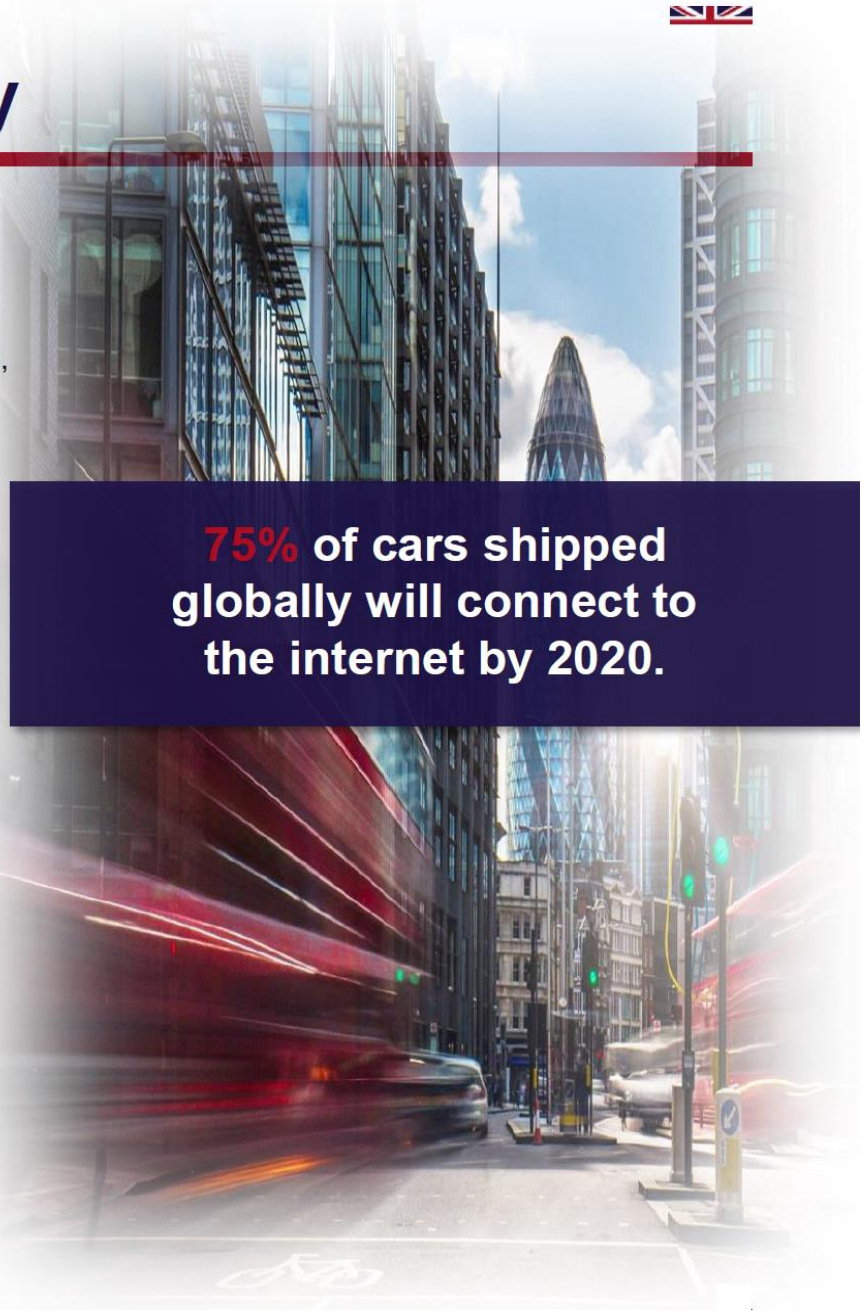


In the **top 3** for cyber security globally

Exports to grow to **over £2.5bn** by 2021

2nd biggest investor in cyber security as a % of GDP

UK Government will invest £1.9bn into cyber security with a focus on the ecosystem and skills.



75% of cars shipped globally will connect to the internet by 2020.

£3.7bn annual automotive R&D spend

SMMT data 2018

Global R&D Centre for OEMs

- Global centre for diesel engine design
- Growing development centre for hybrid technology
- Design centre for world-leading small petrol engines. E.g. Fox 1.0 Ecoboost – World Engine of the Year three consecutive years

- Global centre for fastest growing premium OEM
- Most intensive aluminum car manufacturer in world
- Most modern engine design and engine factory – Ingenium
- New I-Pace is the world's most advanced electric SUV

- UK is centre of battery development and production
- With design (London) and Development (Cranfield), Nissan can now design and develop an entire car in the UK
- World beating Qashqai was conceived and developed in the UK

R&D Strategy for Automotive - Three Priorities

Low Carbon Propulsion

- UK invented lithium-ion battery at Oxford University in 1980s
- All cars in UK to be hybrid or full electric by 2040
- Britain to be a world leader in battery development/manufacture

Lightweight materials and structures

- JLR is the most intensive aluminum car manufacturer in world
- UK developed carbon fibre for automotive in 1981
- New lighter battery packs under development

Connected and Autonomous Vehicles

- Most progressive testing environment of any major country
- European leader in IT and AI
- Open data approach by public sector for MaaS

Light weighting - Composites

- Over £300 million of government funding into composites in recent years – mostly to aerospace and automotive
- UK is leader in motorsport and aerospace composites
- 2016: New factory under construction in Sheffield – 10,000 bodyshells per year
- 2017: Major new project for composite volume vehicles – "FLAVA"

McLaren Composites Technology Centre - Sheffield

A partnership to develop and manufacture carbon fibre chassis for future McLaren models.

Penso Composites Factory - Coventry

A new carbon fibre high volume plant for lightweight structures and machining centres for rapid tooling.

R&D Support for Automotive

Long Term Programmes

- APC - £1 billion matched funding over ten years (low carbon propulsion)
- CCAV - £200m matched funding (Connected and Autonomous Vehicles)
- OLEV (Office for Low Emission Vehicles) - £900m to incentivise purchases of ULEVs
- Innovate UK - £500m per year across all industries, including automotive
- Faraday Battery Challenge - £246m for EV battery development
- Stephenson Challenge - £78m for EV motors and power electronics development
- Charging Infrastructure Investment Fund - £400m matched funding for EV charge-points

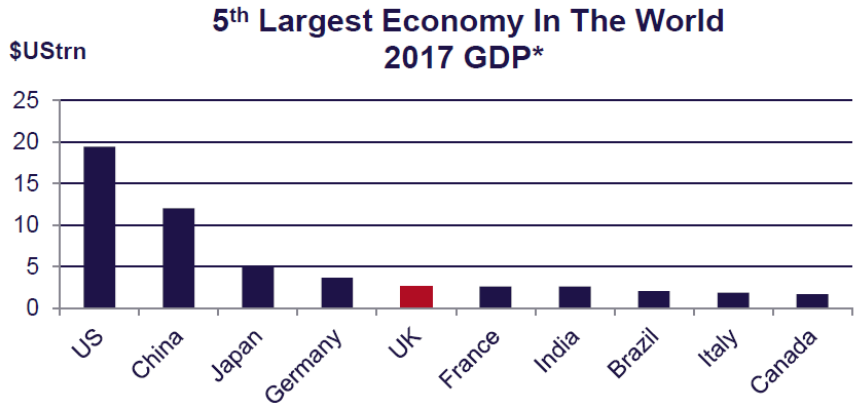
R&D government grants 2018 - £160 million

- £85m for APC competitions
- £30m for CAV competitions and test beds
- £22m for OLEV/IDP (integrated Delivery Programme) competitions
- £23m for Faraday Battery Challenge

Tax Advantages

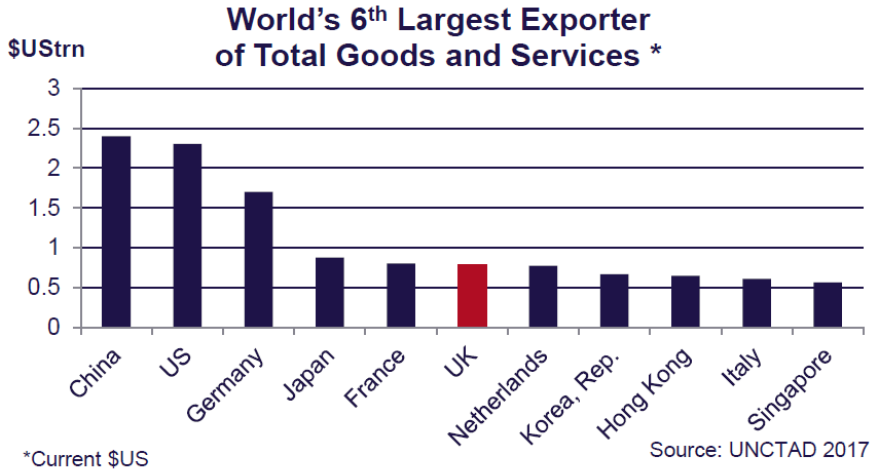
- Patent Box: Reduced 10% tax rate on profits attributable to patents
- R&D Expenditure Credit: “Above the line” credit, representing 12% of qualifying R&D

Britain's Strong Economy



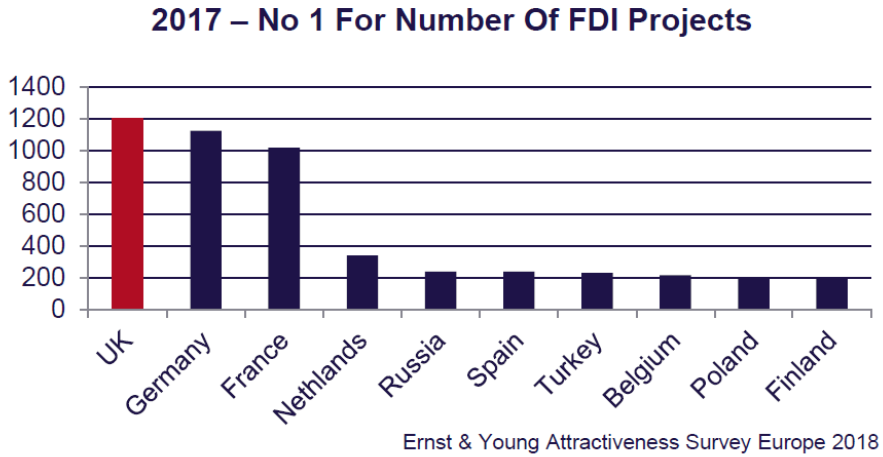
*GDP at current $US

Source: IMF World Economic Outlook Database Apr 2018

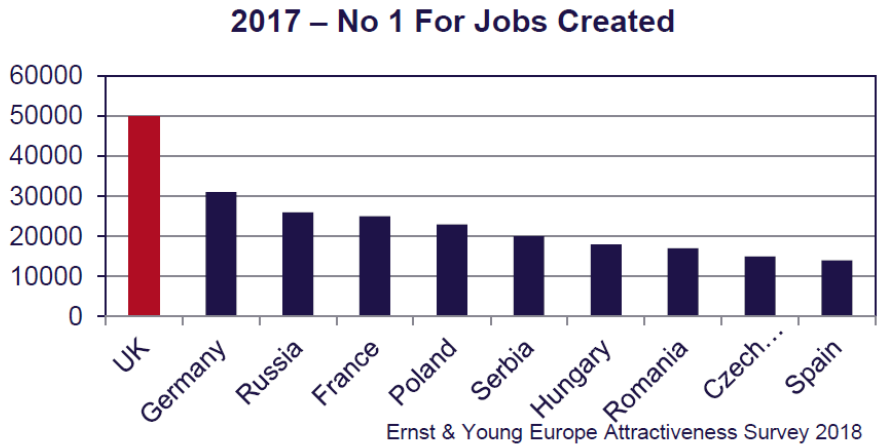


*Current $US

Source: UNCTAD 2017



Ernst & Young Attractiveness Survey Europe 2018

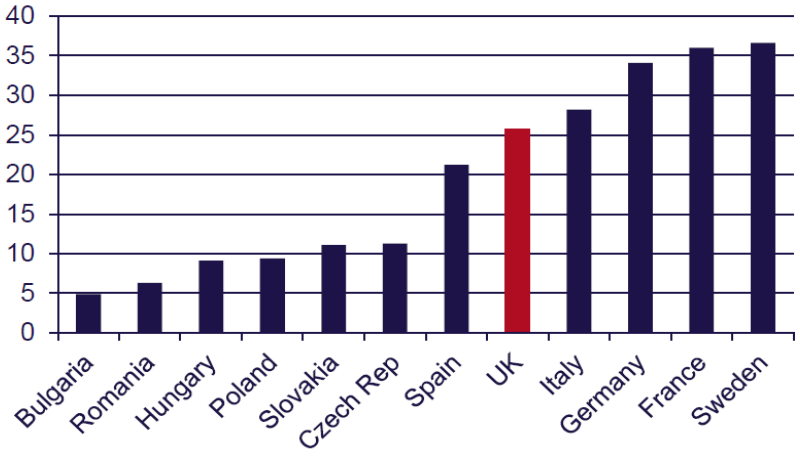


Ernst & Young Europe Attractiveness Survey 2018

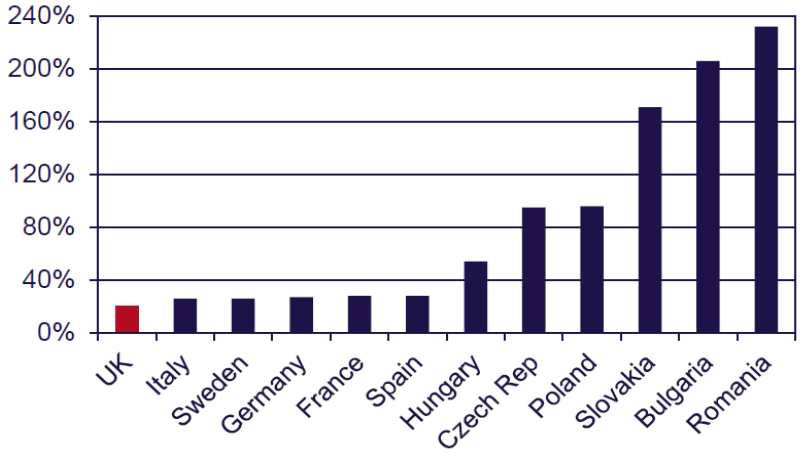
European Labour costs

- UK labour costs are the most stable in Europe
- UK labour costs are lower than Germany, France and Italy
- The gap between Eastern Europe and UK is steadily closing

Labour cost 2017 (€/hour)



Labour cost increase 2004 - 2017 (€/hour)



Source: Eurostat

Britain is open for business

Lowest corporation tax in G7
Falling to 17% by 2020

Patent Box: 10% tax rate on profits from R&D done in the UK

World-class research base:
4 of world's top 10 Universities,
18 of top 100

Top 10 economy for global competitiveness

No 1 major European economy for global talent

Ranked 5th in the Global Innovation Index

Department for International Trade