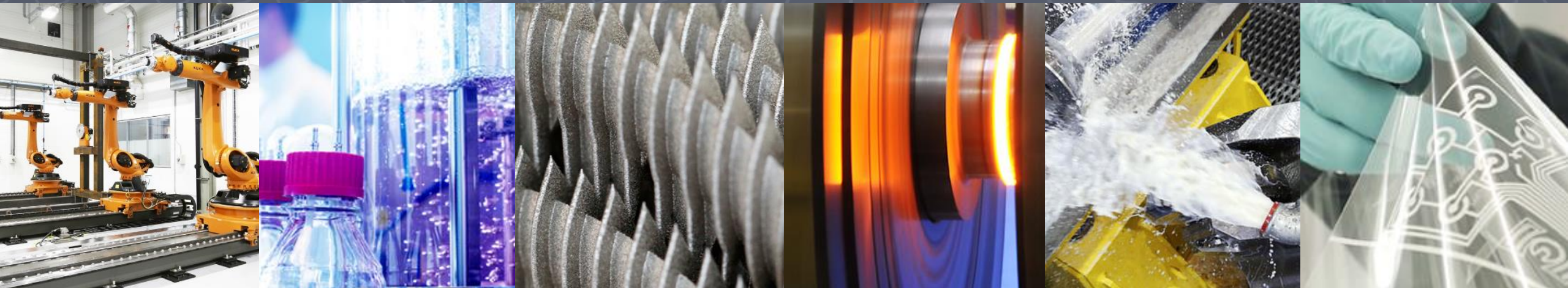


High Value Manufacturing Catapult (HVMC) Innovation to Impact

Ian Collier
Director of Operations
HVMC

1 November, 2018



The Catapult Network

Government/Public Bodies



Department for
Business, Energy
& Industrial Strategy

UK Research
and Innovation

Innovate UK

CATAPULT

- A network of technology and innovation centres
- Tackling the environmental, social and economic challenges of the 21st Century.
- Focusing on areas where the UK has inherent strengths and where market potential is significant.
- Bringing the best of the UK's innovative businesses and researchers together to bring new products and services more quickly to commercialisation.
- HVMC was the First Catapult formed Oct 2011

High Value Manufacturing Catapult

Energy Systems Catapult

Cell and Gene Therapy Catapult

Offshore Renewable Energy Catapult

Transport Systems Catapult

Digital Catapult

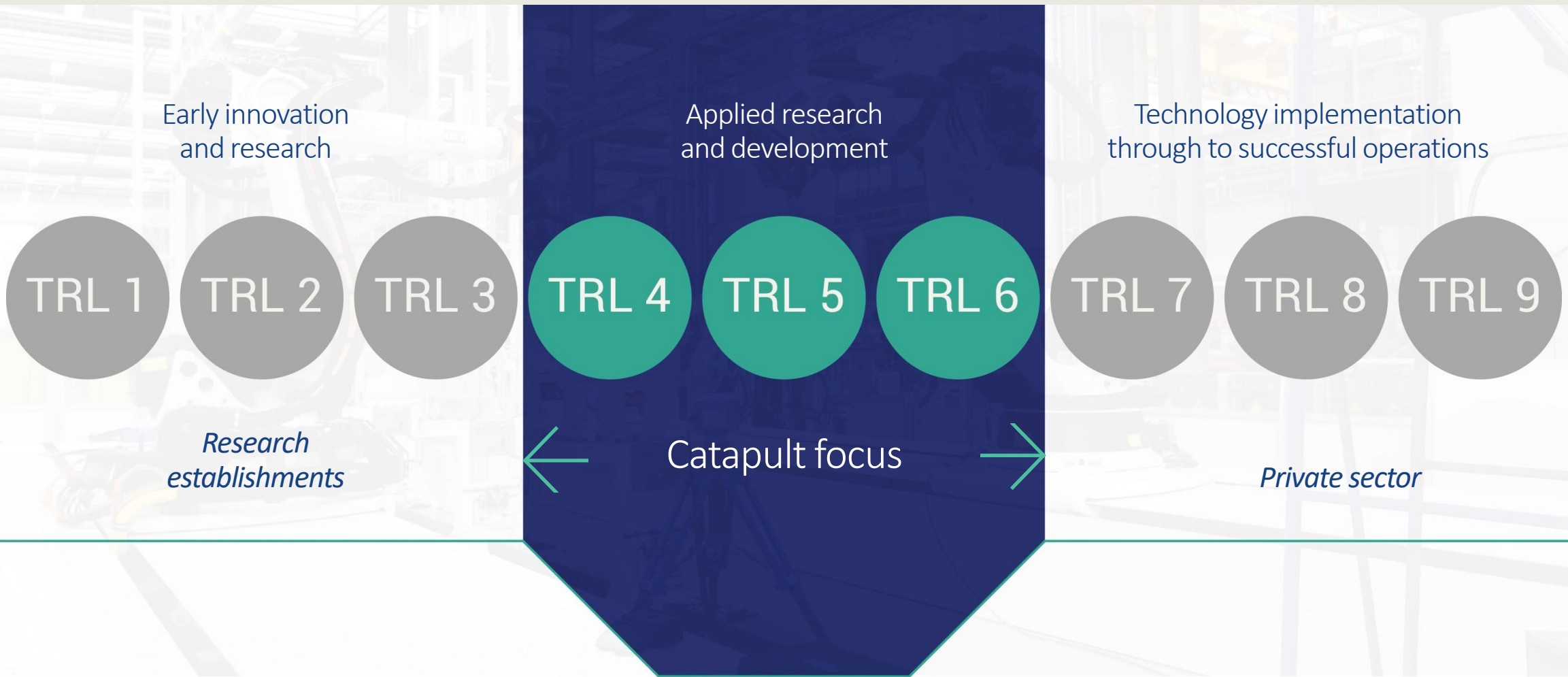
Future Cities Catapult

Medicines Discovery Catapult

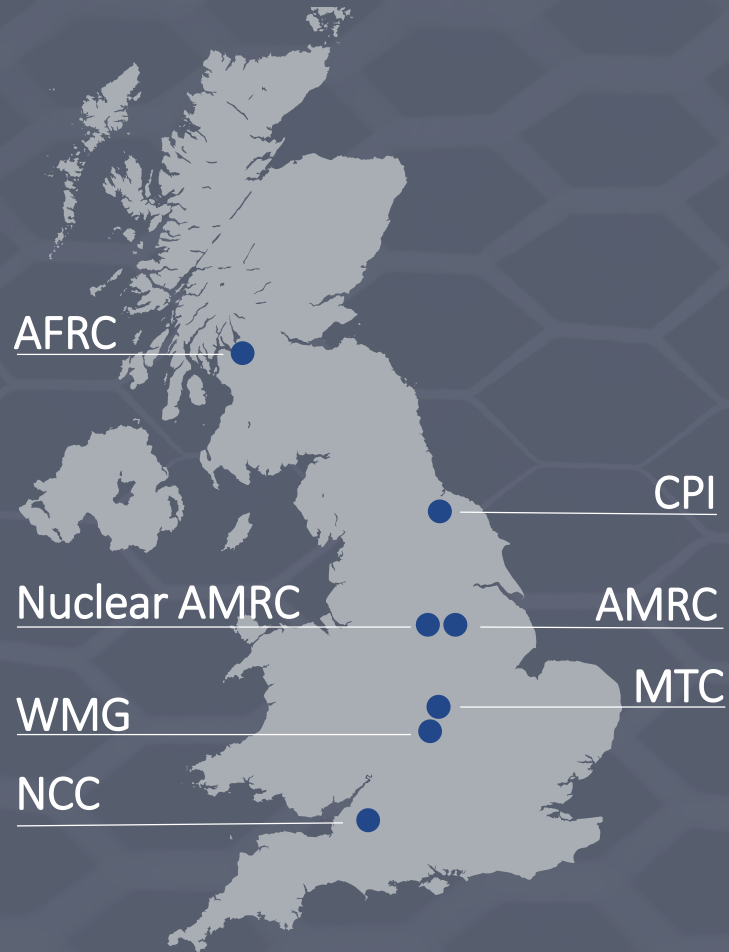
Satellite Applications Catapult

Semiconductors Applications Catapult

Market failure: Bridging the Valley of Death



HVMC Where we are – What we do



Driving growth in HV manufacturing:

- Help companies of all sizes and all sectors
- Reduce the risks of innovating
- Have expert engineers, scientists, technicians
- Provide leading edge **OPEN ACCESS** equipment
- Link to UK's best relevant research knowledge
- Foster an environment of collaboration and open innovation - even among competitors
- Work across sectors / technologies / supply chains
- Support implementation and technology insertion
- Create and disseminate knowledge
- Provide Strategic Leadership – 'the go to place'

HVMC - growing manufacturing's contribution to the UK's economy

27 technologies

CATAPULT
High Value Manufacturing



Advanced Assembly

Automation

Biologics

Biotechnology

Casting

Composites

Design

Digital Manufacturing

Electronics



Flexible Manufacturing

Formulation

High Temperature Processing

Joining

Machining

Polymers

Materials Characterisation

Metal Forming and Forging

Metrology



Modeling and Simulation

Netshape and Additive

Powder Technology

Power and Energy Storage

Resource Efficient and Sustainable Manufacturing

Printable Electronics

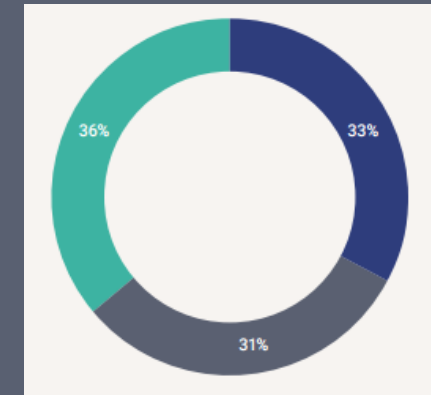
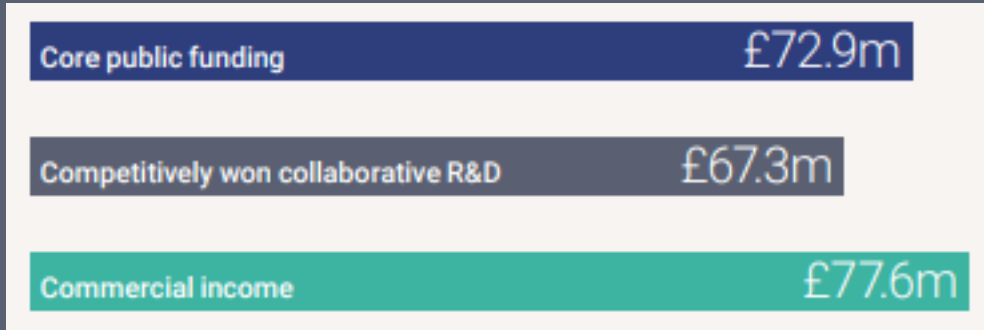
Surface Engineering

Tooling and Fixtures

VR and Virtualisation

HVMC's Vital Statistics 2016 -17

Funding
£217.8m



Total value of our assets:

£617m

↑ Up 10%
from 2015-16

Investment in large capital projects:

£52m

Number of employees:

2,114

Number of private sector projects:

1,730

Size of order book:

£205m

→ Of which £137m is collaborative R&D

Private sector clients:

3,387

→ Over 40% of whom (1,383) are SMEs

2017 – 18 HVMC Annual Review will be published shortly

Our vision for UK high value manufacturing



Our vision is for the UK to have an **innovation-led manufacturing sector**, with **world class capability** to bring the best technology research to market, making a **growing contribution** to the UK economy and supported by **access to innovation** insight, facilities and expertise provided by the HVM Catapult as the '**go to**' place for advanced manufacturing technology.

IMPACT = Innovation + Workforce + Supply Chains

Listening to Industry

Day to day exposure
to the future of
manufacturing



Collaborating with Academia



7 Founding Universities



57 UK universities & 24 international universities

Priority Themes and Technology Investment Plans

Digital Manufacturing >

Robotics & Automation >

Materials Processing & New Materials

Process Eng'g, Biotechnology & Biologics

Product Design & Verification

- Data capture, management and sensors
- Digital twins; embedded intelligence and human interface

- Advanced robotics
- Advanced assembly and fixturing
- Bespoke automation and machine build

Technology Forums aligned to Investment Plans

Priority Themes and Technology Investment Plans

Digital Manufacturing

Robotics & Automation

Materials Processing & New Materials >

Process Eng'g, Biotechnology & Biologics

Product Design & Verification

- Near net shape (excluding ALM)
- Subtractive machining
- Joining
- New materials and coatings
- Circular economy
- Composites materials processing
- Additive manufacturing
- Metal forming and associated tooling

Technology Forums aligned to Investment Plans

Priority Themes and Technology Investment Plans

Digital Manufacturing

Robotics & Automation

Materials Processing & New Materials

Process Eng'g, Biotechnology & Biologics >

Product Design & Verification >

- Formulated products and formulation
- Biologics
- Industrial Biotech and Biorefineries

- Modelling design and simulation
- Complex systems architecture
- Measurement and evaluation
- Certification testing and standards

Technology Forums aligned to Investment Plans

HVMC Growing in the regions

AFRC – National Manufacturing Institute for Scotland - Glasgow

A broad HVM technology offering sited in Scotland but open to all. Based around the current AFRC facility this centre will provide regional access to technologies available around the rest of the HVM Catapult, such as digital manufacturing, additive manufacturing and composites technology. Building will start late 2018.

AMRC – North West

A new facility adjacent to BAE Systems in Salmesbury near Preston. This open access facility will provide a collaborative space for SMEs seeking support to develop advanced manufacturing technologies and processes. Opens in 2019.

AMRC – Cymru

This open-access collaborative facility is to be built on the Airbus Broughton site and is intended to develop the assembly processes and supply chain capability for the next generation aircraft wings, known as “Wing of Tomorrow”. Opens in 2019.

AFRC – Glasgow

MTC – Liverpool

NAMRC – Birkenhead

NCC – Bristol

HVM Catapult – Aberdeen

CPI – National Formulation Centre / National Printable Electronics Centre - Sedgefield

CPI – Printable Electronics Centre – Newton Aycliffe

CPI - Wilton

AMRC – Factory of the Future / Factory 2050 - Sheffield

NAMRC – Sheffield

AMRC – Casting Technology International - Sheffield

MTC – Coventry

WMG – Coventry

HVMC - growing manufacturing's contribution to the UK's economy

National Manufacturing Institute for Scotland



Background: Manufacturing Future for Scotland 2016

Ambition:

- Reduce Scotland's productivity gap
- Manufacturing to have a strong role in boosting Scotland's performance & inclusive growth
- Action plan developed to boost innovation, investment & develop skills
- Proposition based on embracing new digital technologies, products, services and circular economy



More businesses making innovative products, providing world class services and expertise



National Manufacturing Institute for Scotland



- Provide nationwide support to manufacturing sector to embrace Industry 4.0
- Utilise Scotland's research strengths & established links to the HVM Catapult.
- Centre of excellence in technology areas: Automation and Robotics, Advanced Machining, Visualisation
- 3 core elements:
 - Digital Factory 2050
 - The Manufacturing Skills Academy
 - The Innovation Collaboratory (Innovation space)

NMIS will make it easier for Scottish businesses to use new technology to grow and compete.

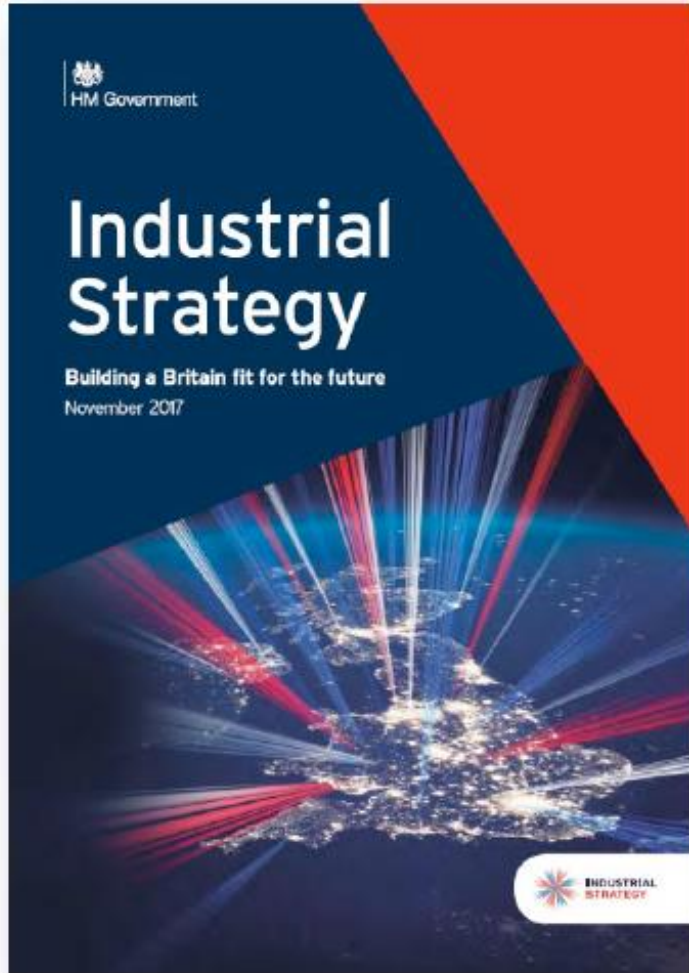


Informing and Influencing

140+ Strategic forums



Creating an economy that boosts productivity and earning power throughout the UK



Our five foundations



Ideas

the world's most innovative economy



People

good jobs and greater earning power for all



Infrastructure

a major upgrade to the UK's infrastructure



Business Environment

the best place to start and grow a business



Places

prosperous communities across the UK



AI & Data Economy

We will put the UK at the forefront of the artificial intelligence and data revolution



Future of Mobility

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



Clean Growth

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



Ageing Society

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

ISCF Objectives



- Increased UK business investment in R&D and improved R&D capability and capacity
- Increased multi- and interdisciplinary research around the challenge areas
- Increased business-academic engagement on innovation activities relating to the challenge areas
- Increased collaboration between younger, smaller companies and larger more established companies, connecting up value chains (or networks)
- Increased overseas investment in R&D in the UK

Wave 1 Challenges (c. £1b)



Leading-Edge Healthcare Challenge (including Medicines Mfg) up to £188m



Faraday Battery Challenge up to £246m



Robotics and AI in extreme environments Challenge up to £93m



Next Gen. Affordable Lightweight Materials Mfg (ATI projects) up to £26m



Autonomous Vehicles (CCAV projects) up to £38m



National Satellite Test Facility up to £99m

Underpinning UKRI investments (Wave 1a) up to £283m

Wave 2 Challenges (up to £729.5m)



**Audience of the future
(up to £33m)**



**Data to early diagnosis
and precision medicine
(up to £196m)**



**Prospering from the
energy revolution
(up to £102.5m)**



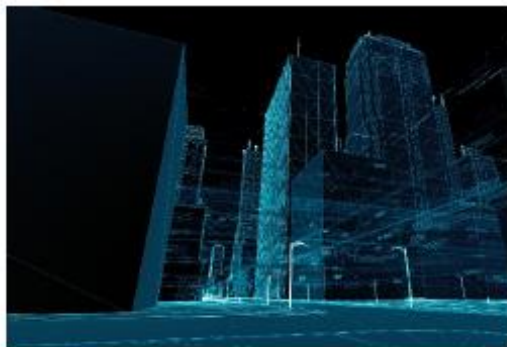
**Healthy ageing
(up to £98m)**



**Next generation
services (up to £20m)**



**Quantum technology
(up to £20m)**



**Transforming construction
(up to £170m)**



**Transforming food
production (up to £90m)**



Wave 3 Challenges (up to £m ???)

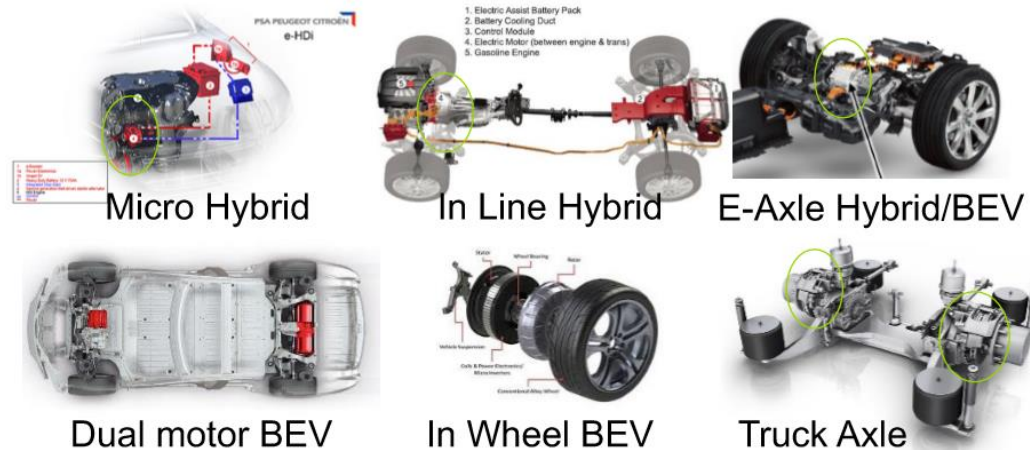
The First Two :-
Oct 29th 2018 Budget
Announcement

Digital Manufacturing
£121m

The Stephenson Challenge: driving the electrification revolution
£78m



ACCELERATED GROWTH – PEMD COVERS ALL ELECTRIFIED PROPULSION SYSTEMS



- Hybrid powertrains integrate with existing ICE technologies to minimise packaging issues
- BEV offer more flexible powertrain configurations
- Hybrid HGV applications are in line with ICE powertrain but alternative configurations are being considered
- Growth in PEMD covers all HEV as well as BEV

Pressure Containing Parts Study

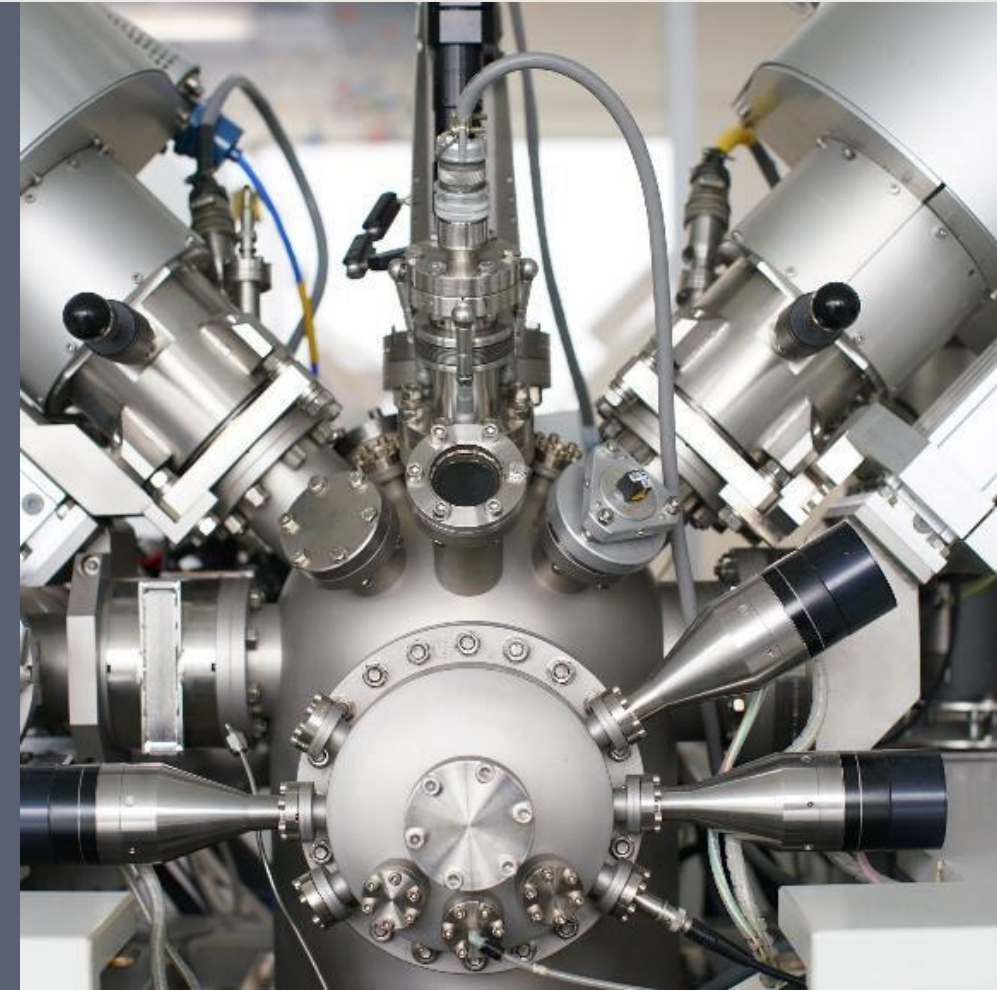
- Kicked off Jan 2017 and **concluded June 2017**
- Targeting value stream associated with **pressure containing parts**
- Established **consortium of 11 parties** (Operator, Tier 1 & Tier 2)
- Identified a XT Master Valve Block as an example
- Investigated 22 bulk material processing methods
- Investigated 10 overlay material processing methods
- Identified **7 potential themes** to pursue at next phase
- **Direct cost saving opportunities of 28-55% identified**
- **Lead time reduction opportunities of 11 weeks (34%) identified**



Agility

Five years ago our original Delivery Plan pre-empted:

- The rush to electrification and autonomous vehicles
- The grip of Industry 4.0
- The challenges of cyber security
- The shift towards servitisation
- Oil and gas needing low cost solutions
- Construction wanting manufacturing technology



HVMC – Staying ahead of the curve

McLaren Composites Technology Centre

- 1st UK McLaren facility outside campus
- In-sourcing the development and manufacture of carbon fibre chassis
- Using advanced know-how and technology developed with HVMC 's AMRC centre
 - £50m combined investment
 - 200 high level jobs
 - Projected cost saving of £10m
 - £100m GVA to UK economy by 2028
- Value of UK sourcing of a McLaren car to grow by **8%** (from current average of 50%)



Boeing Sheffield

- Boeing announces first European Manufacturing facility to be built in Sheffield
- Over £20m investment, commencing with at least 30 people
- Key actuation systems for next generation Boeing aircraft
- Built adjacent to HVMC's AMRC centre
- Result of many years of technology innovation work between Boeing and the HVMC centre





More resources at:
hvm.catapult.org.uk

