



UK Research
and Innovation

Developing the UK's Clean & Resilient PEMD Supply Chains

Driving the Electric Revolution

Will Drury | 19/07/2021

Agenda

1. Driving the Electric Revolution

A brief overview of the Driving the Electric Revolution Challenge being delivered by UKRI

2. Building and growing an ecosystem

An overview of the importance of collaboration and the advantages an ecosystem brings

3. Collaboration enables success

A view of international collaboration and the importance of the export market to the UK PEMD sector



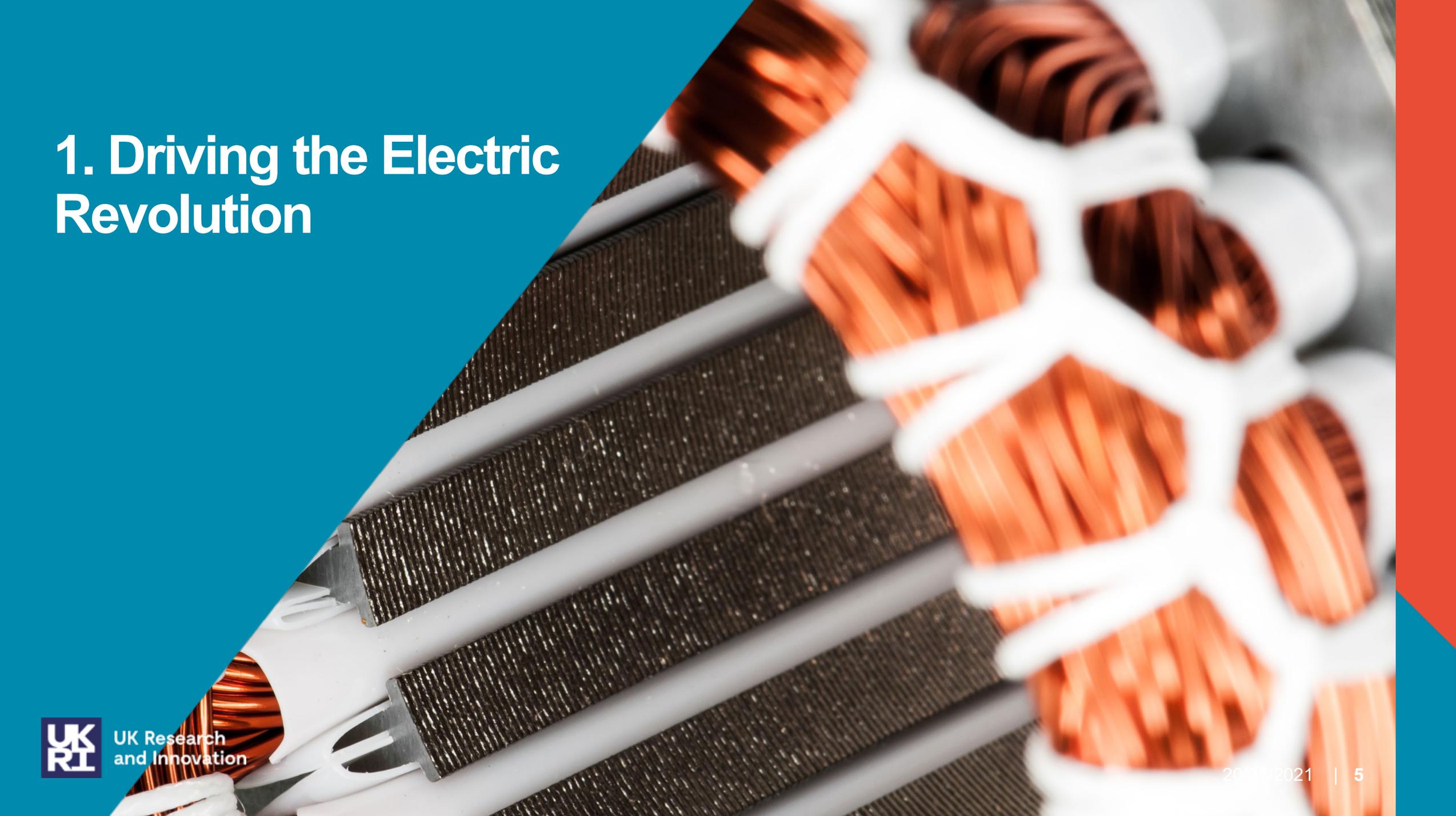
Benefiting everyone through knowledge, talent and ideas

UK Research and Innovation brings together the seven Research Councils, Innovate UK and Research England.

As part of UK Research and Innovation, Innovate UK drives productivity and economic growth by supporting businesses to develop and realise the potential of new ideas including those from the UK's world-class research base.



1. Driving the Electric Revolution

A close-up photograph of an electric motor's stator core. The image shows several grey, ribbed insulation rings stacked together. Between these rings, there are bundles of copper wire coils. The copper has a bright, metallic sheen. The background is a solid teal color on the left and a solid orange-red color on the right, with a diagonal split between them.

Driving the Electric Revolution



Power Electronics, Electric Machines and Drives (PEMD)

Identify key gaps in the UK PEMD supply chain and help industry fill them enabling delivery of Net Zero



Funding for industry

Investing £80m of ISCF funding for R&D projects



Networking and collaboration

Connecting industry, academia, RTOs & the government



Industrialisation and manufacturing

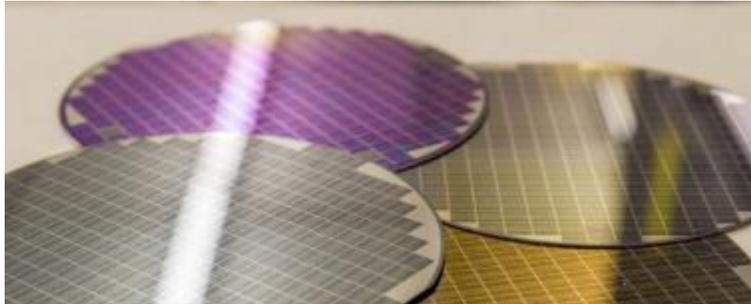
Leverage the UK's world leading research capability in PEMD



Talent growth

Define & fill the PEMD skills gap by training, upskilling & reskilling

Driving the Electric Revolution – Supply chain



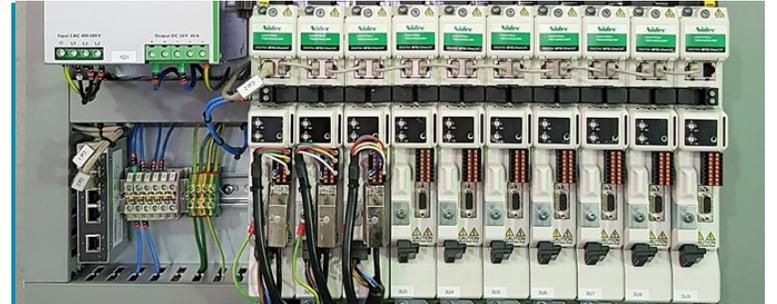
Power Electronics

Development of semiconductors (Si, SiC, GaN) and their packaging to enable switching of high power (voltage and/or current) whilst minimising loss



Electric Machines

Conversion between electrical energy and kinetic energy through electromagnetic, mechanical & thermal design optimised for each application



Drives

Intelligent digital control systems embracing power electronics, passive components, thermal management, mechanical design and the overall system



Materials processing



Component manufacture

Manufacturing supply chain



System integration



Re-use and recycling



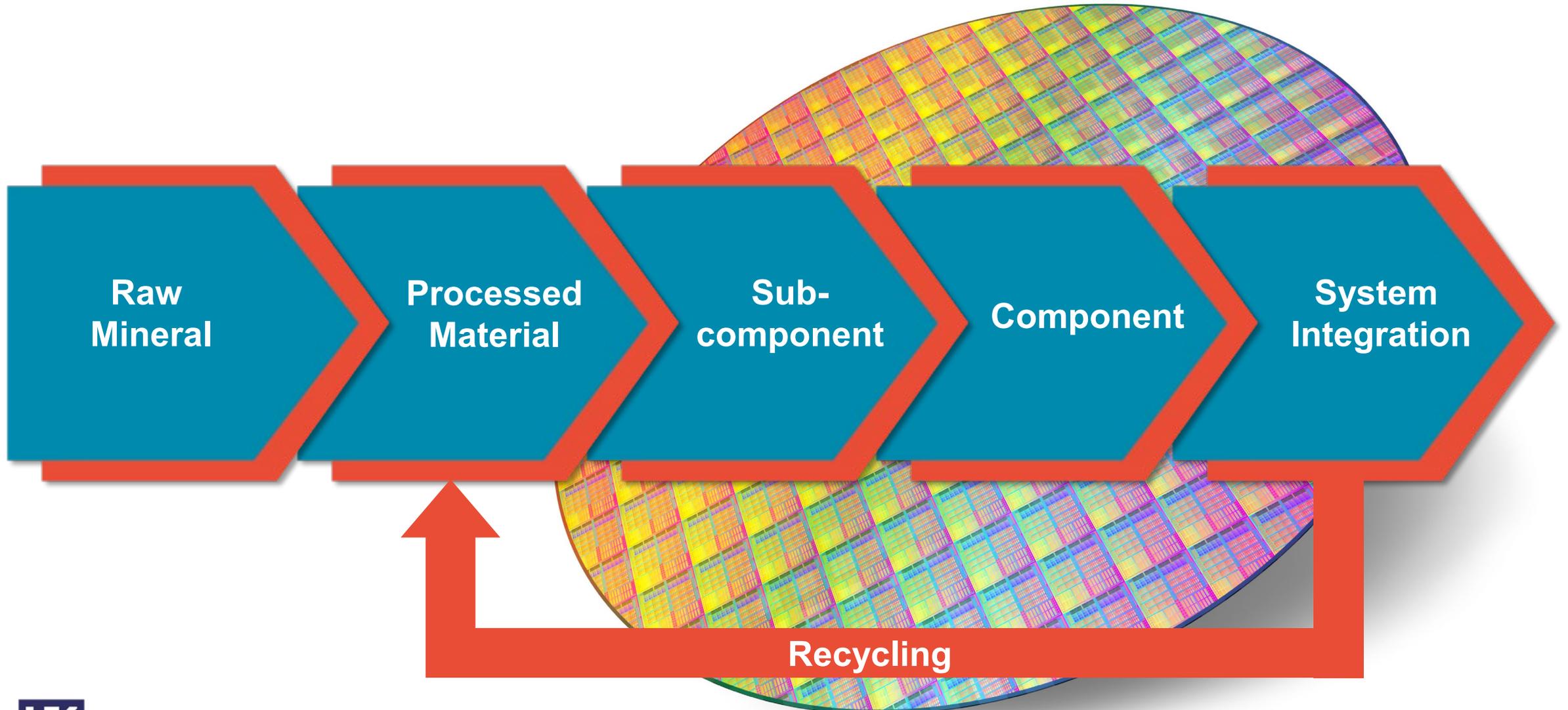
10-point plan

- Driving the Electric Revolution is focused on **building back better, supporting green jobs, and accelerating our path to net zero.**
- Power Electronics, Machines and Drives (PEMD) growth will deliver **high-skilled high-paid jobs that offer the extra satisfaction of helping to make our nation cleaner, greener and more beautiful.**
- We must look to manufacture the core technology to enable the Green Industrial Revolution. Importing technology will result in erosion of the sovereign supply chain and all the skills being delivered must encompass the manufacturing.



“If we apply the same zeal and ingenuity to stopping climate change as we have to tackling coronavirus, we can do so while transforming our economy, delivering jobs and growth across the country.”

Supporting whole process, materials to product



Driving the Electric Revolution Investment

Driving the Electric Revolution challenge funding distributed to industry through tailored programmes addressing key opportunities in the UK PEMD supply chain: R&D, collaboration, talent, equipment & expertise.

£5_m

Short, high impact,
high resilience
supply chain
CR&D projects

£6_m

Initiatives in
addressing the
skills gap through
training, upskilling
and reskilling

£7_m

Fast start
accelerated
supply chain
CR&D activities

£22_m

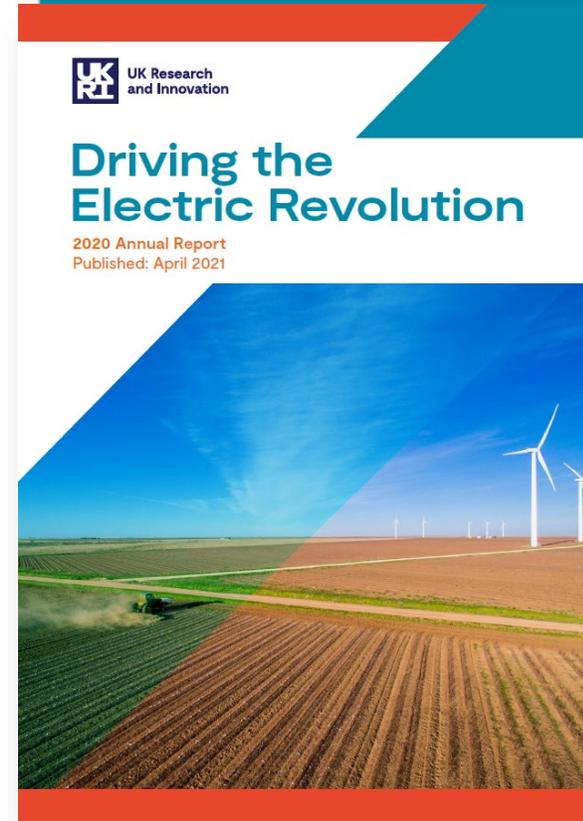
Flagship programme
for high value/low volume
& high volume/high
efficiency manufacturing
supply chain
CR&D projects

£33_m

Industrialisation centres
supporting industrial
engagement with new
equipment & expertise
in PEMD scale up &
manufacturing

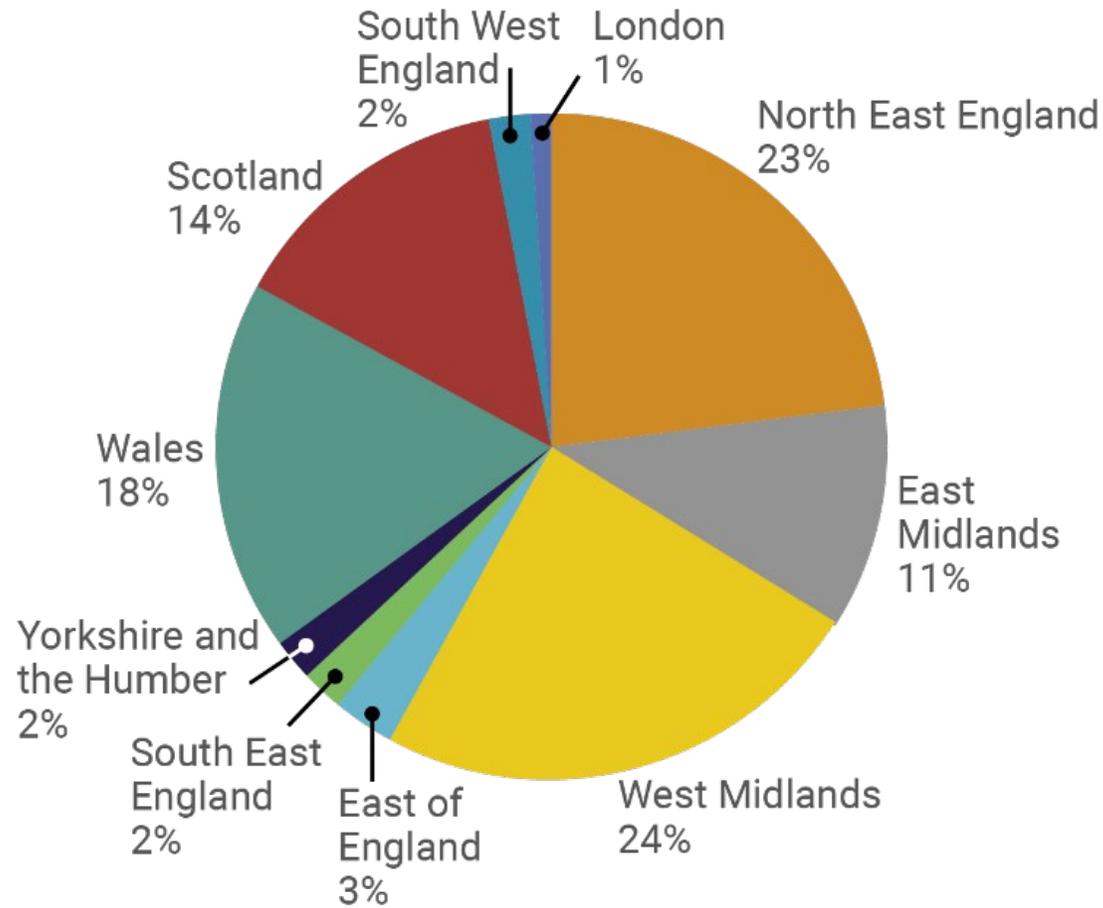
Annual Report 2020

- Overview of the purpose, objectives and approach Driving the Electric Revolution has taken in 2020
- Successes of 2020 showcased including funding by region and company size
- Annex showing all the projects Driving the Electric Revolution has funded over the last 12 months
- Engagement with KTN and DER-IC and benefits of these



“Driving the Electric Revolution has been vital in allowing [...] SMEs access short-notice research funding programmes providing immediate support to help them through the Covid-19 pandemic.”

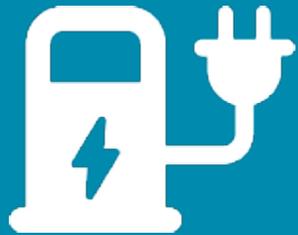
Delivering on Scaling up and Levelling Up



2. Building and growing an ecosystem

Skills & Talent

Use Driving the Electric Revolution Challenge funding and access to industry expertise to efficiently and effectively add value, inclusivity and diversity in key areas of the UK's PEMD workforce, building on and complimenting existing skills initiatives in electrification sectors



Joining up & needs analysis

Electrification skills needs analysis for PEMD in all electrified sectors and reviewing current workforce & training capability across all levels and educators.



Outreach & engagement

Raising awareness of PEMD to all people including STEM in schools, existing workforce looking to upskill or reskill, and businesses needing to address their skills gap.



Education & training

Collation of high quality PEMD training material & educators, leading to accredited qualifications for all skill levels including vocational training, CPD, further & higher education.



Delivery mechanism

Central administrative hub providing signposting & access to training courses for learners & businesses, material for educators, and engaging information for outreach.

Diversity and inclusion

We are committed to encouraging diversity and inclusion in business innovation.

- We want to find the best and most talented innovators from a diverse range of backgrounds, and provide them with the resources, advice and self-belief to succeed.
- Our approach shines a spotlight where there is currently under representation in business innovation. We support and empower people to innovate, grow businesses, and in turn the UK economy, through:
 - Our Women in Innovation competition and campaign
 - Ideas Mean Business – supporting the UK's brightest young innovators



The UK PEMD community is growing

- Building relationships
- Collaborating
- Thought leadership
- Business development
- Signposting
- Networking & events

Industrialisation Centres leveraging UK capability



Investment & Growth

- UK SME growth
- Export expansion
- Inward investment
- Sovereign supply chain expansion



Industrial Engagement

- Identify & help industry fill gaps
- Cross-sectoral collaboration
 - Build competitiveness
 - Scale-up acceleration



Equipment & Expertise

- Open access facilities
- Adding to existing UK capability
 - Develop scalable manufacturing processes
- Small batch manufacturing for demonstration

Industrialisation Equipment

- **The University of Strathclyde**

Propulsion and powertrain systems validation capability at MW scale with hardware in the loop.

- **The Innovation Centre, Sunderland**

Reconfigurable Power Electronics assembly line and a flexible electric machine assembly line.

- **University of Nottingham PEMC Centre**

A high frequency coil manufacturing and magnetic test characterisation.

- **University of Warwick**

A power electronics reliability and failure analysis facility and a Winding Centre of Excellence facility.

- **The University of Birmingham**

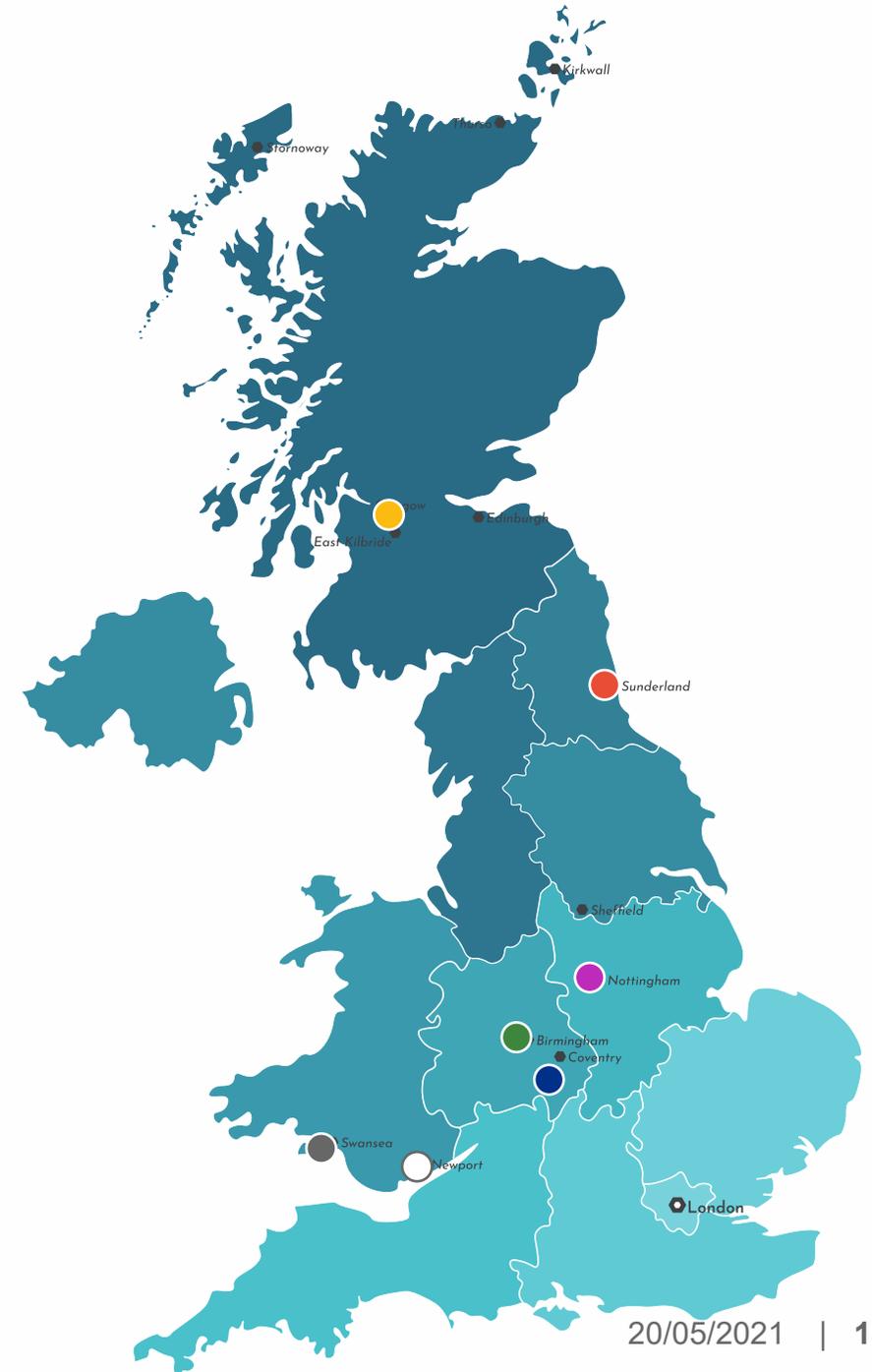
A production line to for recycled sintered magnets with 'end to end' supply chain to enable UK supply of recycled rare earth magnets.

- **Swansea University**

A Wide Bandgap Power Electronics Component Industrial Pilot Line.

- **Compound Semiconductor Applications Catapult**

A facility to prototype ceramic and copper elements and sub-assemblies within highly integrated PE modules.



Catapult Network

Fostering innovation to drive economic growth.

- Bridge the gap between businesses, academia, research and government
- Transforming the UK's ability to create new products and services
- Ensure global opportunities for the UK and sustained economic growth for the future



Engage with... webinars



The First Practical Zero Emission Aviation Powertrain
KTN ENGAGE
Julian Renz - Head of Programmes - julian.r@zeroavia.com
12 November 2020
www.zeroavia.com

30
webinars in one year...

with over
2,200
attendees...

asking
472
questions...

over
100
introductions



European Framework Programmes

- Are funding programmes created by the European Union/European Commission to support and foster research
- Began in 1984 and each last for 7 years (aligned to the rhythm of the EU's Multiannual Financial Framework – MFF)
- Horizon 2020 is the most recent Framework Programme. It began in 2014 and had its last call for proposals in 2020. Total budget for Horizon 2020 was ~ €80Bn
- Horizon Europe is the successor to Horizon 2020 and the Work Programme is due to be published in spring 2021
- Horizon Europe has an agreed budget of €95.5Bn plus Associate Country contribution
- The UK has agreed to Associate to Horizon Europe



Useful EU networking groups

- The European Automotive Research Partners Association (EARPA) is a very active network holding frequent workshops and seminars
- European Technology Platform on Smart Systems Integration (EPoSS) is an industry-driven policy initiative, defining R&D and innovation needs as well as policy requirements related to Smart Systems Integration and integrated Micro- and Nanosystems.
- If you join any networking organisation, ensure that you get your money's worth:
 - Be an active member – say 'hi' when you join the virtual room. Ask questions, support others' opinions, act as if you are already well known to all in the virtual room because you soon will be
 - Volunteer to draft working papers, take notes, send in useful information – be helpful
 - Speak up at workshops – demonstrate Thought Leadership
 - Show that you would be a valuable partner for collaborative projects and that without you they won't win – you have the secret sauce that is necessary for their success

3. Collaboration enables success

The global PEMD market

- Delivery of Net Zero is not a local issue and global solutions are needed
- PEMD is the underpinning technology to enable this to happen
- Driving the Electric Revolution has focused on scaling UK supply chains, the export market is critical
- International collaboration can enable faster adoption and more diverse opportunities



Building resilient supply chains

- As the world enters a new normal over the coming months and years a new dawn will be upon us
- The resilience of supply chains, our relationships with those we supply, as well as those that supply us will never have been more important
- The responsibility we have now to make a difference for the world will lead to different sourcing decisions and the corporate social responsibility rests with this generation to create ethical, fair and responsible supply chains
- Working across borders, delivering world class solutions from the UK in aspects we lead in is a critical part of this
- Looking inwards at the UK alone will not solve global warming or enable the global community to achieve Net Zero

Our key role...

Build on the world class research being undertaken in our Universities and Research Organisations

Maintain the delivery of excellence in our engineering

Grow the talent pool with increased diversity of skills, people and ideas to make the world a better place

Collaborate and work together growing the ecosystem and building global networks that will last

Continue to develop the innovative and collaborative landscape in which we work



**UK Research
and Innovation**

Thank you.



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