



Innovate
UK

Where should the next
PEMD/Semiconductor
funding be focused?

Driving the Electric Revolution

Innovation & Growth Roundtable event,
Silverstone Technology Cluster.
16 July 2024

Dr Sven Knowles
Innovate UK Business Connect

Biography

- Dr Sven Knowles is the Knowledge Transfer Manager for Electronic Systems at Innovate UK Business Connect. He helps industrial partners develop UK supply chains and capitalize on innovations to support net zero by sourcing technologies, securing funding, and building consortia.
- Sven collaborates with startups, SMEs, and multinationals in the electronics sector, and supports government bodies such as Innovate UK, UKRI, and LEPs.
- He is actively involved in the ISCF Driving the Electric Revolution Challenge, an £80 million initiative over four years to help UK businesses transition to a low-carbon economy.
- sven.knowles@iuk.ktn-uk.org
- Dr Sven Knowles will present an overview of the "Driving the Electric Revolution" challenge, a five-year program initiated in 2019.
- This initiative aims to catalyse the creation of £5 billion worth of power electronics, machines, and drives (PEMD) products in the UK by 2025 by fostering industry-wide investment and collaboration to establish a robust PEMD supply chain.
- Sven will discuss the critical role of PEMD products in various industries, including aerospace, automotive, energy, industrial, marine, off-highway, and rail. He will highlight the significant future opportunities for PEMD, driven by technological advancements, increased investment, and the growing demand for recycling, remanufacturing, and performance improvements.
- We will ask: Where should the next PEMD/Semiconductor funding be focused?



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About us

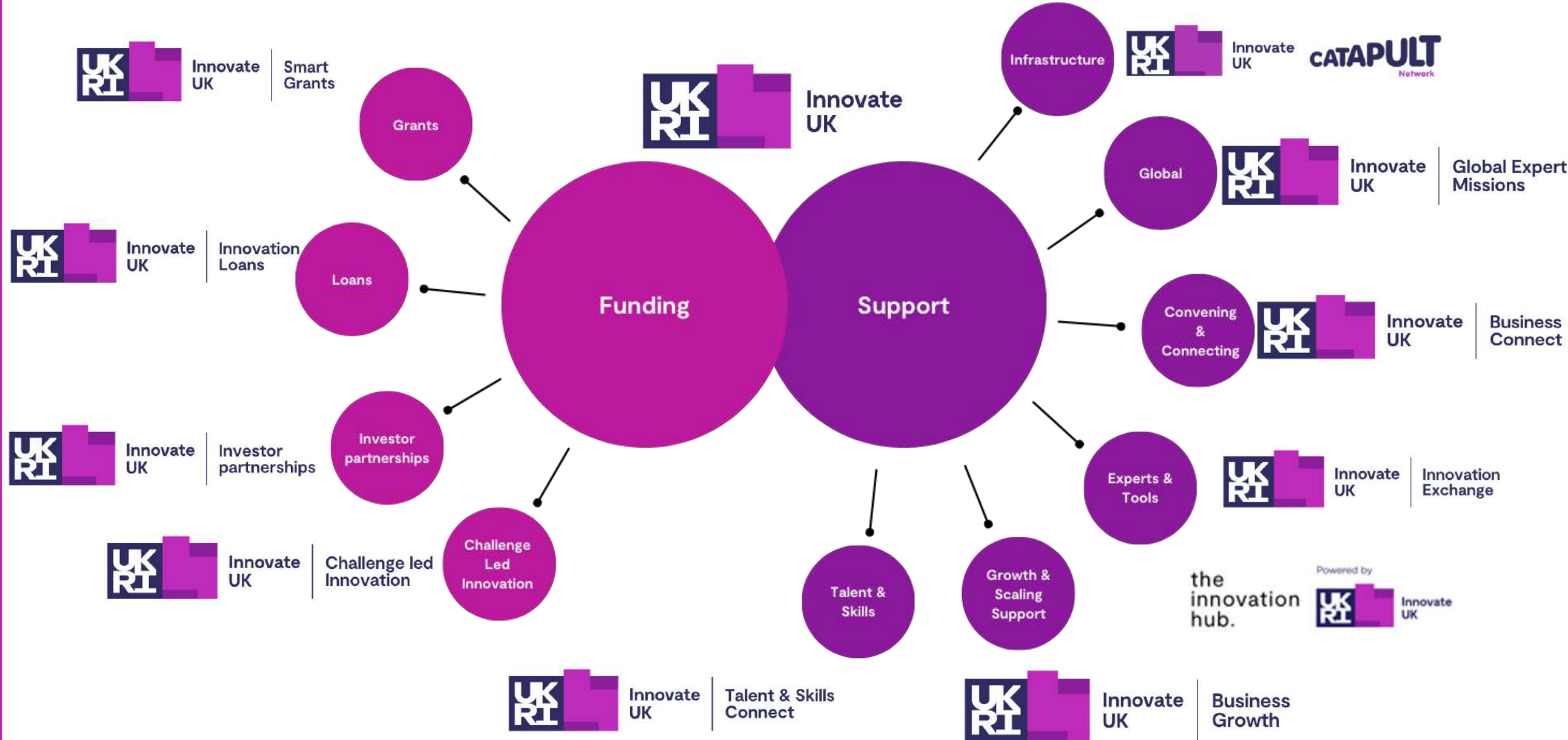
Innovate UK: supporting UK business

Innovate UK Business Connect is the new name for Innovate UK KTN.

We exist to connect innovators with new partners and new opportunities beyond their existing thinking – accelerating ambitious ideas into real-world solutions.



Products and Services – Portfolio of Examples



Innovate UK Business Connect

We support innovators to deliver their next idea and connect for positive change.

It is PPP:

People
Products
Pounds

FAQ around our support - <https://iuk.ktn-uk.org/support/>



Cross-Sector Expertise

Agrifood	Infrastructure
Biotechnology	Manufacturing
Chemistry	Materials
Creative Industries	Photonics
Computing	Quantum
Design	Robotics & AI
Digital	Security & Defence
Electronics	Sensors
Energy	Space
Geospatial	Transport
Health	Water
Industrial Maths	Net Zero

Driving the Electric Revolution

... the catalyst to building £5 billion more Power Electronics, Motors and Drives (PEMD) products in the UK by 2025. Encouraging industry across all sectors to invest and collaborate to establish a PEMD supply chain



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

Invested £80 million of ISCF funding for R&D projects, accelerating and de-risking business innovation



Networking and collaboration

Connecting industry, academia, RTOs & the government to ensure cooperation & collaboration to efficiently use solutions across the UK



Industrialisation and manufacturing

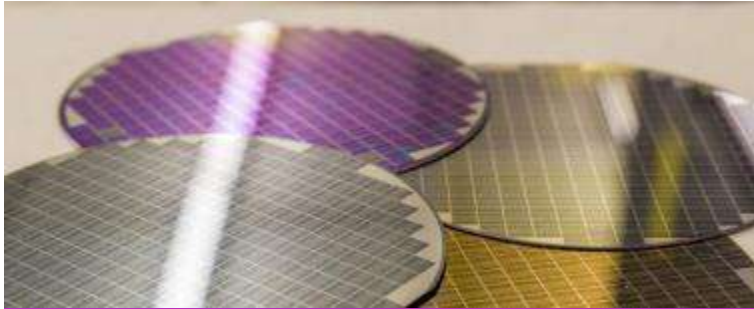
Leverage the UK's world leading research capability in PEMD to create the supply chains necessary to manufacture PEMD products



Talent growth

Define & fill the PEMD skills gap by training, upskilling & reskilling to grow an evolving diverse & inclusive PEMD workforce across all levels

Why the focus on PEMD ?



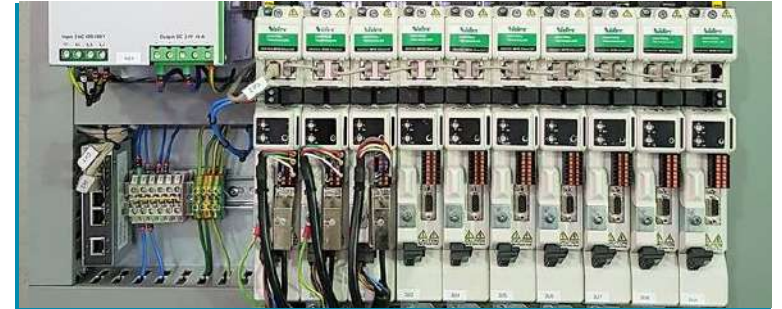
Power Electronics

Development of semiconductors (wide bandgap) 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

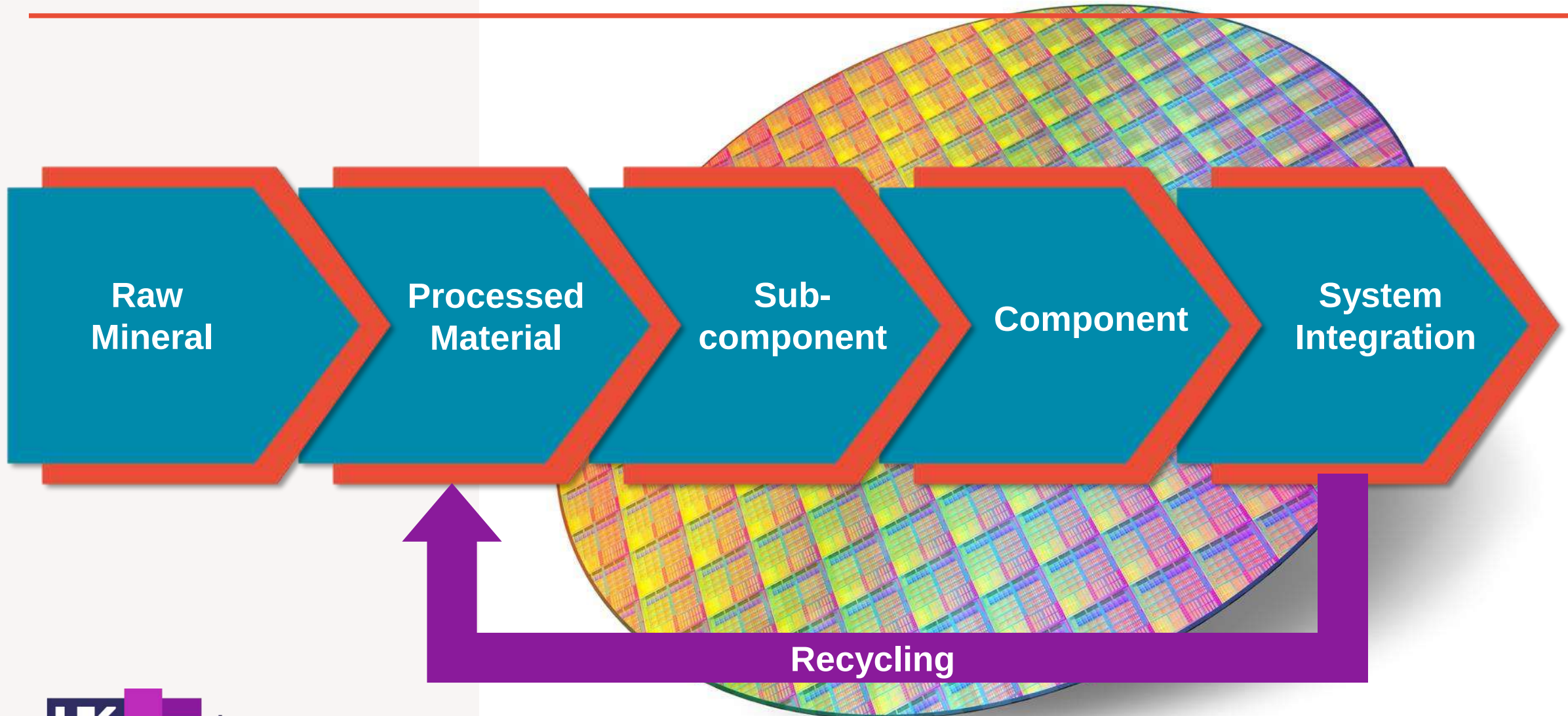


Re-use and recycling

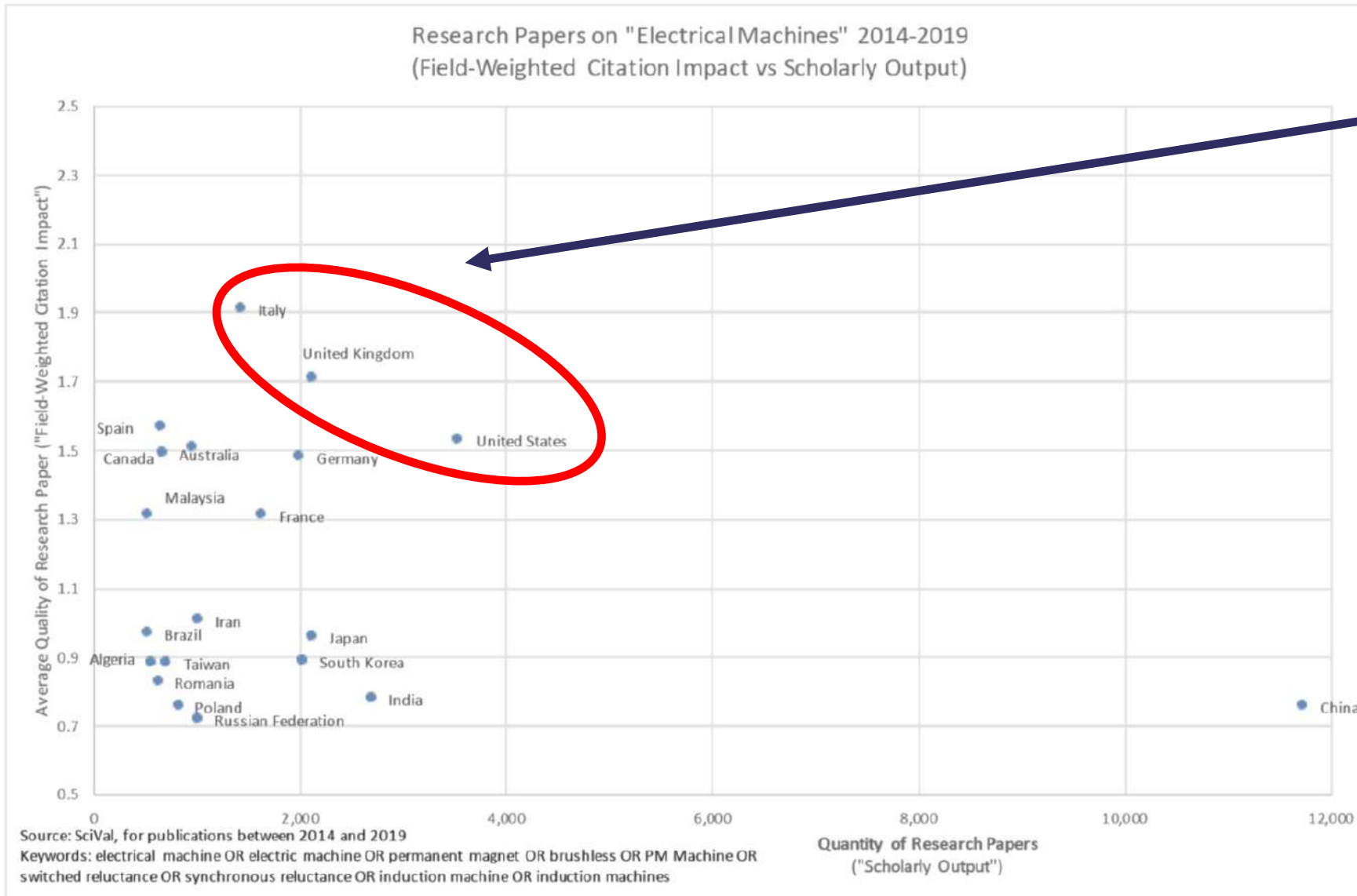


Power Electronics, Machines and Drives (PEMD) enable all of this

Supporting whole process, materials to product



UK is a PEMD World Leader



Three recognised locations to do integrated electrification:

- Northern Italy
- UK
- NE USA

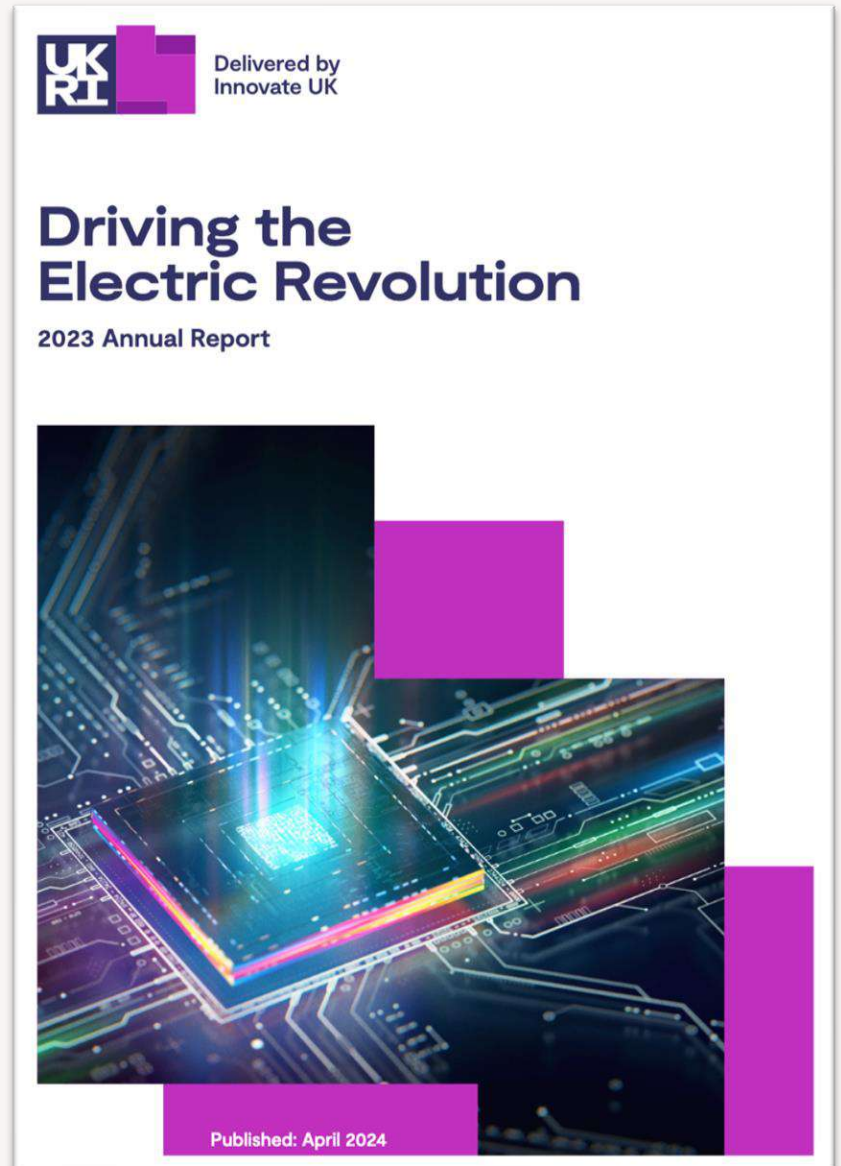
Professor Geraint Jewell
Department of Electronic and Electrical Engineering
University of Sheffield

Driving the Electric Revolution: what it has achieved

- Focused on both CR&D and Skills initiatives
- Over 91 funded projects
- Over c236 funded project partners (some in multiple projects)
- Lasting Legacy with DER-IC and ERSH
 - <https://www.der-ic.org.uk/>
 - <https://www.electricrevolutionskillshub.co.uk/>

For details of funded projects please see our annual report:

<https://www.ukri.org/publications/annual-report-driving-the-electric-revolution-challenge/>



UK Semiconductor Strategy

- Semiconductors are 1 of the 5 technologies of tomorrow
- They are critical to the UK's economic and national security and to the strategic advantage that the UK will secure on the global stage
- The UK semiconductor strategy (19th May 2023) has the stated vision and themes:

Our vision

Over the next 20 years, the UK will secure areas of world leading strength in the semiconductor technologies of the future by focusing on our strengths in R&D, design and IP, and compound semiconductors. This will facilitate technological innovation, boost growth and job creation, bolster our international position in order to improve supply chain resilience, and protect our security.

Key Themes

- Technological innovation in UK strengths
- Growth & job creation in domestic landscape
- International collaborations with aligned territories

<https://www.gov.uk/government/publications/national-semiconductor-strategy/national-semiconductor-strategy>

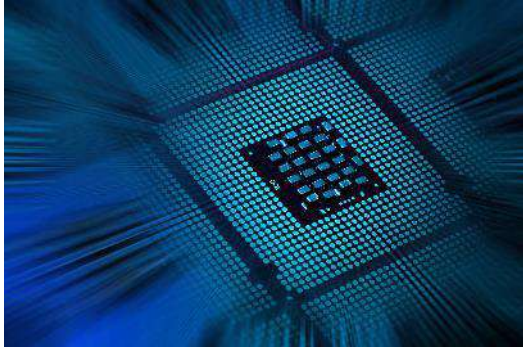
UK Semiconductor Strategy – In progress

- [UKSII Feasibility Study](#) – With results due in Early 2024, this DSIT commissioned study is to understand the technical and economic feasibility of developing specific capabilities to support commercial R&D, grow the UK semiconductor sector and contribute to supply chain resilience.
- The [Semiconductor Advisory Panel](#) was established by the DSIT to enable the government to work closely with industry to deliver the goals of the [National Semiconductor Strategy](#) on growing the UK sector, ensuring a stable supply of chips and protecting the UK from national security risks associated with semiconductor technology.
- [ChipStart](#) is a two-year pilot programme backed by the government that will provide early-stage companies involved in the design of semiconductors with the technical and commercial help they need to help bring new products to market – and ultimately improve lives and livelihoods in the long-term.
- [UK Semiconductor Institute](#) - A brand new independent UK Semiconductor Institute will for the first time bring together government, universities and the private sector to support key components of the government's Semiconductor Strategy to grow the sector, which is backed by £1 billion.
 - with independence from government, the Institute will promote the voice of industry
 - new body will be a single point of contact to promote the sector to investors and attract foreign investment in British research expertise

Semiconductors - Related interventions by Innovate UK

- **ISCF - Digital Security by Design (DSbD) £70m**
 - Investing to help the UK digital computing infrastructure to become more secure
- **ISCF - Driving the Electric Revolution (DER) £80m**
 - Electrification technologies, including power electronics, machines and drives (PEMD) developing clean technology supply chains
- **ISCF - Commercialising quantum technologies £174m**
 - Advancing commercialisation of new products and technologies based on advances in quantum science
- **ISCF - Robots for a Safer World £112m**
 - Advancing robotics and autonomous systems in extreme and challenging environments
- **FER – SEMIconductors (Manufacturing & Skills) £18m**
 - Supporting skills development and manufacturing scale up across the semiconductor supply chain
- **Compound Semiconductor Applications Catapult £80m +**
 - Helping UK companies exploit advances in compound semiconductor technologies

UK Semiconductor - Strengths

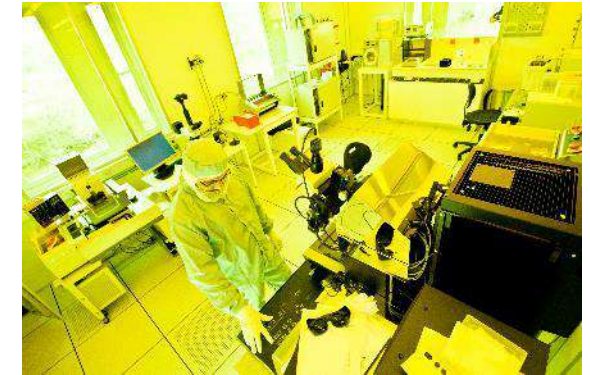
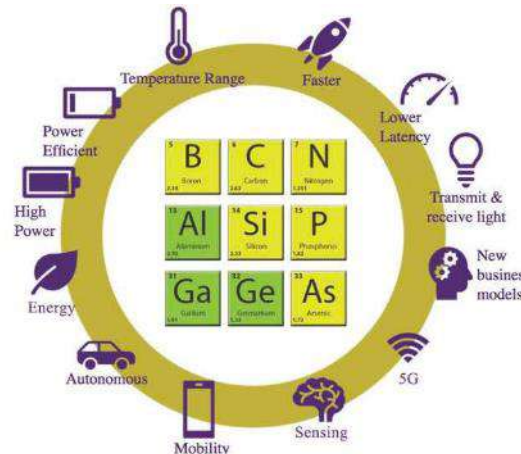


Semiconductor Design/IP

- **Over 100** semiconductor design/IP companies,
- **Global companies** in IP, AI, SoCs, IoT, graphics
- **World leading chip-design sector with clusters** including Cambridge, Bristol and Edinburgh

Compound & Novel Material Semiconductors

- 8% global market share
- **Compound semiconductor** strengths across the UK, including South Wales, Scotland, NE England, Cambridge
- World leading **advanced materials** companies

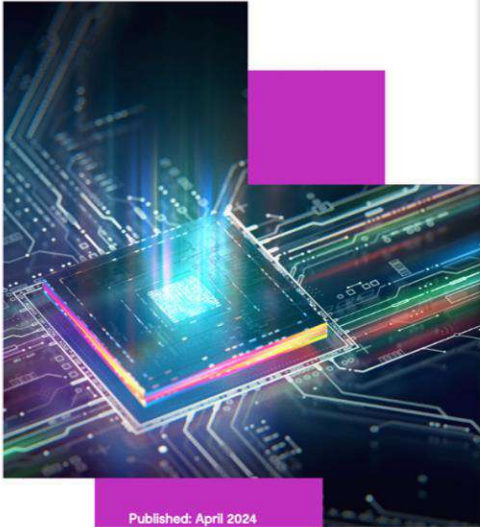


Research Strength

- Photonics / photonic systems integration
- Integrated circuit design
- Compound semiconductors
- Embedded security, on chip
- Polymer electronic materials
- New and advanced materials for devices (spintronics, magnonics, etc.)

Driving the Electric Revolution

2023 Annual Report



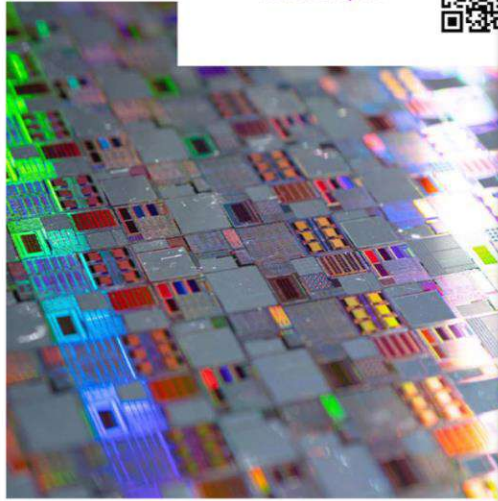
Published: April 2024

Innovate UK Global Expert Mission Report

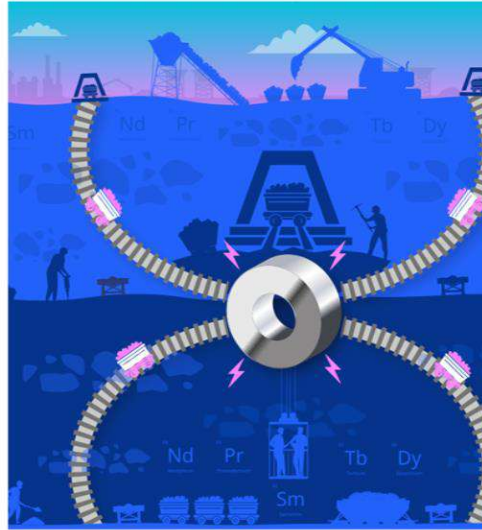
Semiconductors in Republic of Korea

February 2024

Scan the QR code to
view the report



UK supply chain opportunity in materials for permanent magnets



Delivered by
Innovate UK

Driving the Electric Revolution Metals Technology Deep Dive Report

Dr Sven Knowles
Raluca Popovici



Future?

Magnet recycling

Remanufacturing

Rare earth free motors

Metals

- Metals Technology is critical for the future due to their importance in the sustainable materials sector landscape, as well as advancing technologies such as semiconductors.
- Determine potential for future collaboration in semiconductor innovation between the UK and the RoK.

Semiconductors

- scaling up semiconductor manufacturing within the UK
- improving supply-chain resilience within the UK
- establishing innovations and new manufacturing techniques
- expanding capability or performance of existing manufacturing techniques
- encouraging relationships between product designers and manufacturers to develop new manufacturing techniques or expanding capability
- encouraging new collaborations across industry and academia

Where should the next PEMD/Semiconductor funding be focused?

Examples

- Improve supply chain opportunity in materials for permanent magnets
- Magnet recycling
- Remanufacturing
- Rare earth free motors (EU critical material act)
- Future power electronics
- System controls
- Incremental performance improvements
- Use of more aluminium over Copper
- Invest to scale up semiconductor manufacturing
- improve supply-chain resilience within the UK
- establish innovations and new manufacturing techniques
- expand capability or performance of existing manufacturing techniques
- encouraging relationships to develop new manufacturing techniques or expanding capability
- encouraging new collaborations across industry and academia
- Scaleup - enable UK businesses to adopt manufacturing best-practice
- Scale-up manufacturing process development
- Talent - creation of content and materials to support skills and training across PEMD manufacturing and supply chains
- Talent - Creation and delivery of industry-focused training, course content, materials and information
- Supply Chains for Net Zero - invest in innovation projects to facilitate the UK's supply chain and manufacturing capability growth in PEMD
- Catalysing Green Innovation - catalyse green economic recovery by investing in transport, energy and industrial sectors



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Thank you

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