UK Research and Innovation

Driving the Electric Revolution

2021 Annual Report

Published: April 2022

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Welcome

As we look back on 2021, there are many similarities to 2020. The "return to normal" and even a vision of a "new normal" had not materialised as the year drew to a close with the impact of the Omicron Covid-19 variant. The resilience of the sector throughout the year, the continued push to make a difference and developing understanding of the importance of Power Electronics, Machines & Drives (PEMD) to deliver on our net zero ambitions has been tremendous. The importance and immediacy of the changes needed to stabilise our climate have been brought into sharp relief with international focus on the UK with COP26 being hosted in Glasgow. This community, as we continue to grow, needs to be at the forefront of implementing the actions needed to make a difference and enabling this industry to prosper from the transition to net zero.

During 2021 the Driving the Electric Revolution team have continued to work with industry and the research community to expand our reach, enabling new companies to engage with our activities. A good number of the projects that we funded in the early stages of the Challenge have concluded, the majority of which have delivered very promising results and a route to further exploitation and commercialisation. I want to thank all the projects, monitoring officers and the team for ensuring the success of these projects and we all look forward to seeing the achievements they will bring.

We launched 'Supply Chains for Net Zero', the Driving the Electric Revolution flagship competition, and have committed more than £16 million to projects that were announced and kicked-off in early 2022. I am excited to see the opportunities these projects will bring for the UK to grow in the manufacture of PEMD components and looking forward to seeing how these projects further enable the growth of UK businesses.

The sector is ever growing. The breadth of skills needed is ever expanding and to support this we have delivered around £350,000 in fully funded (Minimal Financial Assistance) projects. This was quickly followed by the launch of the Skills Hub that will be announced and made live in 2022 (a highlight I am looking forward to). As I write, the second Building Talent for the Future competition to deliver high quality, industrially relevant, training courses is underway, and the winners will be in full swing by this time next year. Hopefully enticing more skilled people to join this exciting industry that has never been so relevant to global megatrends.

I must remind you of the work being delivered by the Driving the Electric Revolution Industrialisation Centres to enable access to equipment across the length and breadth of the country. The team, across all engaged institutions, is there to help and as the equipment is installed and commissioned over the coming 12 months and beyond, I implore you to get in touch with them and see if they can support your ongoing developments and see how their equipment can support the growth of your business and PEMD supply chains.

As we move forward into 2022, I am excited about what the future holds for the Challenge and the industry as a whole. As we hope the world starts to carefully open up again, reaffirming, rebuilding, or establishing international relationships is important. We must play our role in the international community.

As we move to the new future where net zero is a non-negotiable achievement, Driving the Electric Revolution will continue to work with you all to:

- grow PEMD manufacturing activity
- up-skill the workforce
- support the cross-sectorial delivery from infrastructure to mobility and electricity generation to recycling.

I hope to see as many of you as possible over the coming 12 months as we continue to make an impact in delivering the underpinning technology for net zero.

Will

Professor Will Drury
Challenge Director

Challenge overview

Mission

'Driving the Electric Revolution will be 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 with academia to establish a PEMD supply chain.'**

Objectives

The objectives of Driving the Electric Revolution Challenge are to:

- leverage the UK's world leading research capability in PEMD to help industry create the supply chains necessary to manufacture the PEMD products developed here.
- identify gaps in the supply chains and help industry fill them.
- ensure cooperation and collaboration so we don't duplicate effort, waste time and can reuse solutions across all sectors.
- help fill the skills gap by retraining, upskilling and repurposing engineers from traditional internal combustion businesses into PEMD supply chains.

Delivery

The challenge has four main areas of activity:

1. Industrialisation Centres

£33 million investment for four national centres of excellence in PEMD, based at existing areas of expertise in:

– Strathclyde, Scotland

– Sunderland, North East England

– Nottingham, Midlands

–Newport, South West and Wales

These centres support research and development allowing businesses and researchers to develop and scale new PEMD technologies and manufacturing processes.

2. Collaborative research funding

£20 million programme of collaborative research funding to help businesses create future supply chains in both the high volume and low volume PEMD supply chains. These projects will develop innovative new processes for the next generation of PEMD technologies.

3. Filling gaps in the supply chain

£19 million for projects to fill gaps in the PEMD supply chain and deliver quick benefits to the UK's economy.

4. Training and skills development

£6 million to support skills and training provision which will be focused on activity from school leavers and undergraduates, to experienced engineers and technicians looking to retrain to address the acute shortage of skills in PEMD.

Funding

Funding from the Driving the Electric Revolution project portfolio currently supports 42 small and micro enterprises (SMEs) across the UK with 45% of the Driving the Electric Revolution funding being provided to these companies. Table 1 shows the breakdown of grant funding by company size.

Table 1:

Organisation Type	Grant Award	% of Total Grant Award
Large	£2,005,283.91	25.35%
Medium	£2,307,951.93	29.18%
Micro/Small	£3,596,707.84	45.47%

So far:

- 76% of the Challenge's funding has been allocated to industrial partners
- 13% to Research Technology Organisation (RTOs) and
- 11% to Academic institutions

A breakdown of the funding allocated to each of these is shown in Figure 1.

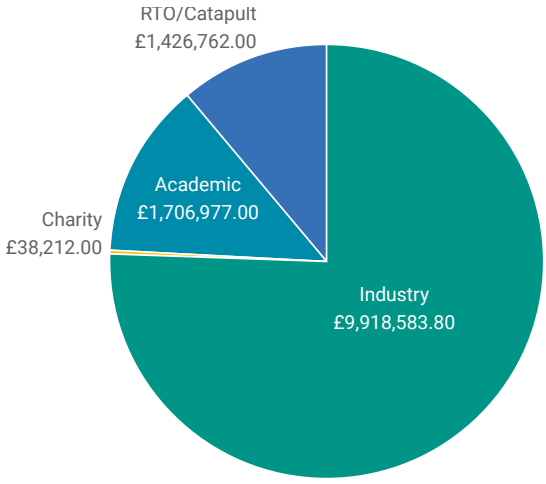


Figure 1: Breakdown of organisation type receiving funding from Driving the Electric Revolution

The Driving the Electric Revolution Challenge is working across sectors and the UK to ensure electrification supply chains are strengthened and developed to help us reach net zero by 2050. Figure 2 shows the location of the lead partners in projects funded by the Challenge.

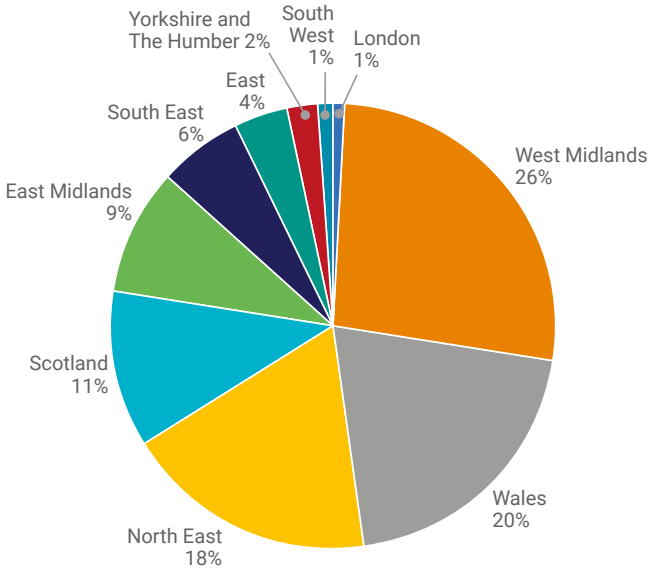


Figure 2: Location of lead partners in projects funded by Driving the Electric Revolution Challenge

Full details of the projects funded by Driving the Electric Revolution can be found at https://gtr.ukri.org/.

2021 overview

Collaborative Research & Innovation

- Driving the Electric Revolution ran its flagship funding competition the £22 million 'Supply Chains for Net Zero' from March to June 2021.
- The winning projects were announced in early 2022 and will feature in the 2022 annual report.

Skills

This year saw the start of skills work package with two funding competitions being launched along with the Undergraduate Award in association with the UK Electronic Skills Foundation.

Building Talent for the Future

The Building Talent for the Future competition saw almost £350,000 being invested by the Challenge across 14 projects to help address the skills shortage in the UK PEMD sector.

Applicant proposals to the Building Talent for the Future competition had to deliver a clear game-changing intervention, which would realistically and significantly meet a UK PEMD talent requirement.

Delivered over a three-month period these projects are designed to fill immediate gaps in skills, talent, and training for the PEMD industry.

The projects range from the creation of online training platforms, to developing continuing professional development courses and running dedicated networking events for young people.

The funding is the first step of the Challenge's aim to invest £6 million to support skills and training provision in the UK for PEMD technologies. Focusing on activity from school leavers and undergraduates, to experienced engineers and technicians looking to retrain, the Challenge aims to address the acute shortage of skills in PEMD.

Skills Hub

The end of the year also saw the launch of the Skills Hub competition. Designed to create a lasting 'platform' it will connect training and education course providers with employers and learners. The Skills Hub will be available to people for at least the next 10 years.

When operational it will be accessible to new learners and professionals already working in PEMD, as well as those wanting to develop expertise in specialist areas. The hub will impartially curate, organise and host a range of innovative and traditional courses that meets industry needs and encourages the community to share PEMD skills.

The £1 million funding will support:

- the development of the platform for the hub
- the development of a cohesive UK PEMD skills community
- operational costs for up to 36 months to enable the hub to become established.

Undergraduate Award

Launched in collaboration with the UK Electronic Skills Foundation (UKESF). The Undergraduate Award allows companies working on PEMD technology to connect with the most capable students from the UK's leading universities in a low-cost, low-risk way. The Undergraduate Award is designed to promote interest in PEMD technologies among engineering students and allow employers to connect with these students through a one-off summer work placement.

Find out more about the Undergraduate Award online.

Agriculture and Food Report

To achieve the UK's net zero ambitions there is an urgency for the agriculture and food sector (AgriFood) to move to cleaner technologies. To help the AgriFood sector identify potential opportunities and challenges related to the adoption of PEMD technologies, the Challenge asked Innovate UK KTN to consult various AgriFood stakeholders and produce a report. You can read the Driving the Electric Revolution in AgriFood report online.

"The funding that **Driving the Electric Revolution** made available between 2020 and 2021 enabled CSA Catapult to focus on supporting multiple UK SMEs across eleven separate proposals, with a running total project value of £12.18 million in **Driving the Electric Revolution Innovation** Competitions. If all of the projects we support are successful, this would leverage around £8.77 million of public sector funding for SME R&D projects.

Driving the Electric Revolution and CSA Catapult being the host of the **Driving Electric Revolution Industrialisation Centre** for components and materials, has been vital in allowing us to help a variety of SMEs throughout various sectors access collaborative research funding programmes and linking with supply chain partners."

Martin McHugh
CEO, CSA Catapult

People

The UKRI Challenge team is at the heart of the delivery of the Challenge.

Delivery Team

Will Drury
Challenge Director

Will joined UKRI in January 2020 from engineering and environmental consultancy Ricardo where he was Global Technical Expert – Power Electronics and Head of Electronics & Electric Machine Products. At Ricardo Will led the strategy in PEMD component development and approaches to engineering solutions for clients. Will also worked extensively in business development, engaging customers from strategy through to product design with globally outreach. Will holds a PhD from the University of Bristol in Electrical Engineering, is a Chartered Engineer, Fellow of the IET and Senior Member of the IEEE. Will is a Visiting Professor in the Electronics & Electrical Engineering Department at the University of Strathclyde since January 2021. He sits on the IET Transport Sector Executive, previously holding the position of deputy-chair. Will also sat on the EPSRC Centre for Power Electronics (CPE) advisory group and was a visiting fellow to the University of Warwick until 2019.

Venn Chesterton
Deputy Challenge Director

Venn has been Deputy Challenge Director since September 2019 and was instrumental in shaping the Challenge before this.

Before Innovate UK, Venn was the Ultra Low Emissions Vehicle and energy lead at the Transport Research Laboratory where he led on numerous UK and EU research projects designed to accelerate the transition to low emissions vehicles. Before that Venn worked on sustainable transport projects at Transport for London.

Martyn Cherrington
Interim Deputy Challenge Director

Martyn joined Innovate UK in 2017 and the Driving the Electric Revolution team as Innovation Lead in 2019. In 2021 he took up the role of Interim Deputy Challenge Director.He has a broad technical background, including chemistry and materials engineering, and has EngD in large-area electronics from Swansea University. Prior to Innovate UK he worked at the Knowledge Transfer Network, Tata Steel and L'Oreal.

Jonny Bunt
Programme Manager

Jonny joined the Challenge in January 2020. Previously he delivered business-wide change programmes and projects in commercial and public sector organisations, encompassing a broad range of fields including digital transformation and target operating model implementation, new product and capability development and integration, GDPR transition, Organisation-wide Terms and Conditions harmonisation, and cancer protocol and pathway re-design.

Lorna Thomas
Project Manager

Lorna joined UKRI in September 2019 as Project Manager from a large public sector organisation based in Thames Valley. At Driving the Electric Revolution, Lorna is also the Relationship Manager with the external evaluation partners. She is an Associate Member of the Association of Project Management. Her special interest areas are Risk Management and Equality, Diversity, and Inclusion (EDI).

Lorna champions and advocates EDI on behalf of the Challenge team, this year leading on the delivery of a series of externally facing EDI webinars.

Sennaya O'Connor
Project Support Analyst

Sennaya joined UKRI in March 2020 from for The Department for International Trade (DIT) in London. During her time at DIT, she worked within the Digital, Data and Technology area where she began her career in Project Management.

Katy Sutherland
Impact & Performance Manager

Katy Sutherland is Impact & Performance Manager for the Driving the Electric Revolution Challenge and is an active ED&I Advocate member within the UKRI working group.

Born and raised in Inverness, Scotland, she started a career in finance obtaining a first-class hons degree at Edinburgh Napier University. Katy recently qualified as a Chartered Certified Accountant with the Association of Chartered Certified Accountants (ACCA). Previously undertaking finance roles, Katy most recently worked at global investment bank Morgan Stanley before joining the world of engineering with the Driving the Electric Revolution Challenge in May 2020.

Katy has always been a champion for equality, diversity, and inclusion – receiving double prize recognition at her 2014 graduation for her dissertation discussing the 'glass ceiling' in the finance sector.

Mark Urbanowski
Innovation Lead

Mark joined the challenge in early 2020 with several years of consultancy and original equipment manufacturing experience in the automotive industry. Most recently he worked on the Dyson electric vehicle project, leading the Performance and Driveability attribute team. Before this he spent several years at the consultancy Ricardo as a driveline and transmission development and attributes engineer, consulting with automotive companies all over the world. He has a master's degree in mechanical engineering from the University of Southampton.

Hristo Yordanov
Finance Business Partner

Hristo joined Innovate UK in July 2016 from operational consulting firm KLB Group where he was a junior consultant working on finance optimisation projects.

Hristo holds a master's degree in international Banking & Finance, as well as an Advanced Diploma in Accounting and Business from the Association of Chartered Certified Accountants (ACCA) and is currently sitting final exams to become a member of the association.

Dawn MacGregor
Communications Business Partner

Dawn joined UKRI in June 2020 as a Senior Communications Manager for the ISCF where she provides communications support to multiple challenges, including Driving the Electric Revolution.

Before joining UKRI she worked at the Groceries Code Adjudicator and at the Financial Ombudsman Service.

Programme Board

The Programme Board provides a key component of the ISCF Programme governance and assurance structure. The Board supports and makes recommendations to the Challenge Director, the ISCF Steering Board, and UKRI, on matters of delivery, strategy, and assurance. The Board helps to identify and support approaches that will lead to the successful realisation of desired outcomes and benefits, as defined in the Challenge business case.

Guy Woolley
ISCF Governance Director / Challenge SRO

Guy has worked at Innovate UK since 2014, joining as Head of Process Improvement and Business Change. He then took on the role of Deputy Director Programme Management Office, supporting the creation of UKRI to bring the seven research councils, Innovate UK and Research England into a single organisation, and then Director for Major Programmes Governance at Innovate UK.

Nigel Pargiter
BEIS Representative

Nigel is Acting Deputy Director for the automotive sector at the Department for Business Energy and Industrial Strategy. With the Department for over 10 years, he previously held roles in Trade and EU Exit, Aerospace, and developing a scheme for energy cost compensation. Before this Nigel had an extensive career in the NHS and Local Government, where he held roles in economic development and sub regional strategies for regeneration.

Ian Constance
External Board Member

Ian is CEO of the UK Advanced Propulsion Centre where he oversees delivery of high value, high impact research. Ian has held positions globally in the automotive industry with over 25 years' experience.

Mark Scully
External Board Member

Mark is responsible for leading on the Aerospace Technology Institute technology strategy for advanced systems and propulsion. Mark has held several positions in aerospace but also in automotive and energy sectors.

Andrew Hodgson OBE
External Board Member

Andrew is a Chairman in automotive and circular economy sectors, and previously held senior roles in the energy, aerospace and subsea sectors. He has been awarded three Queen's Awards for industry.

Dr Samantha Francis
EPSRC Representative

Samantha is a Deputy Director for the Research Base for Engineering and Physical Sciences Research Council (EPSRC). Responsibilities include leadership in Engineering, ICT, Managing the Portfolio and Research Infrastructure portfolios.

"Over the last 12 months the Driving the Electric Revolution Challenge has continued to deliver growth and impact in this technology sector which is vital for our overall net zero ambitions and we have seen that growth and impact across the UK with the Challenge starting to look internationally. A major part of this success is down to the way the community has responded and worked cohesively together. The Driving the Electric Revolution Programme Board has met with the Challenge team to provide governance, guidance, and support to enable the delivery of the overall Challenge objectives. The commitment and engagement of the external members of the programme board has been fantastic, especially in these challenging times." **Guy Woolley**

Advisory Group

External Advisory Group members at March 2022

- Philippa Oldham – Co-chair
- Dr Graham Bruce – Co-chair
- Professor Derrick Holliday
- Dr Felix Langley
- Dr Steve Lambert
- Dr Thomas Wildsmith
- Guy Blundell
- Phil McGoldrick
- Professor Bill Drury
- Professor Geraint Jewell
- Professor James Widmer
- Professor Matt Boyle OBE
- Sarah Mlundira
- Vicki Edmonds
- Alex Barnett
- Kiran Harish
- Jillian Hughes
- Jeff Townsend

Innovate UK Knowledge Transfer Network (KTN) Partners

Dr Paul Huggett
Knowledge Transfer Manager (KTM) – Electronics

Paul is responsible for technical communities in power electronics, and cross-sector liaison relating to electronics. Paul is the electronics technical and strategy liaison with Government agencies and leads on the Driving the Electric Revolution as well as the Power Electronics, Machines and Drives (PEMD) work at Innovate UK KTN.

Dr Sven Knowles
KTM – Electronics Systems

Sven's background is in leading technology innovation, business strategy and product development. He has managed a portfolio of technology companies and investments across the globe. At Innovate UK KTN, he manages the Driving the Electric Revolution Challenge.

Natasha Sim
Events Manager

Natasha organises all KTN events within the Built Environment, Energy and Transport communities. Natasha holds a Professional Diploma from the Chartered Institute of Marketing.

Claire Doughty
Marketing Manager

Claire has over 10 years' experience in developing integrated marketing strategies and delivering engaging campaigns to a broad range of industry audiences.

The role of Innovate UK KTN

Innovate UK KTN sits at the interface of the public and private sector, working in close partnership with Innovate UK and UKRI to support businesses in their innovation journey, including identifying strategic goals and innovation pathways, and delivering a rich annual portfolio of activities at regional, national, and global level.

Other clients include the Department for Digital, Culture, Media and Sport, Department for International Trade, Ministry of Defence, Department for Business Energy and Industrial Strategy (BEIS), and the Foreign, Commonwealth and Development Office.

Innovate UK KTN exists to connect **innovators** with new **partners** and new **opportunities** beyond their existing thinking – accelerating ambitious ideas into real-world solutions.

Innovate UK KTN connects ideas, people and communities to **drive innovation that changes lives**.

With 200 staff across the UK, deep technical sector expertise, and over 43,000 organisations in its network, Innovate UK KTN are specialists in creating critical mass by convening innovation communities and traversing traditional sector boundaries to bring together innovation communities.

Innovate UK KTN has a wide geographical reach across the UK and extensive connections within the UKs industrial and research bases. This enables it to bring different communities together to generate cross-sector collaborations.

Industrialisation Centres

Driving the Electric Revolution Industrialisation Centres

The Driving the Electric Revolution Industrialisation Centres (DER-IC)[1] are playing a vital role in bringing together a UK-wide network of over 30 academic, research and technology organisations. The network gives businesses the opportunity to develop manufacturing process technologies and industrialise the processes needed for PEMD scale up, whilst reducing risk by sharing expertise, technical advice and facilities.

Led by Newcastle University, four regional Centres in Scotland, the South West & Wales, the North East, and the Midlands will coordinate and build on the UK's national capability to deliver long term sustainable growth on the road to net zero. Together they will help businesses scale up the use of electric-powered vehicles and machines across a range of industries and transport systems to grow the UK supply chain.

The £28.5 million investment in new equipment will help develop existing centres and fill gaps in the UK's current capability. The investment will enable a competitive electrification supply chain to be built across sectors, including industrial, transport and energy. Procurement of the equipment started in early 2021.

The new equipment consists of:

- a high power integrated electrical propulsion and powertrain accelerator at the Power Networks Demonstration Centre, University of Strathclyde.
- assembly lines for power electronics and electrical machines at the North East Innovation Centre, Sunderland.
- a high frequency coil manufacturing and magnetic test facility at the University of Nottingham.
- a power electronics reliability and failure analysis facility and an electrical machines winding centre of excellence at the University of Warwick.
- a wide band gap power electronics component industrial pilot line at Swansea University.
- a production line for recycled sintered magnets at the University of Birmingham.

In 2021, DER-IC worked towards their goal of accelerating PEMD supply chain capability and growth. DER-IC's main milestones in 2021 were:

1. https://www.der-ic.org.uk/

Communications and Engagement

The past year has seen the Driving the Electric Revolution community grow from 1,700 members in December 2020 to over 3,500 and interest in the community remains strong. The Innovate UK KTN has continued to be vital in attracting new entrants to the community and connecting businesses.

Innovate UK KTN's support for Driving the Electric Revolution

Innovate UK KTN has a long history of working in support of PEMD technologies to drive economic growth and address societal challenges. It has achieved this by working with others including a wide range of partners, from academia to industry, government and public sector.

This year Innovate UK KTN has promoted and provided information about the Driving the Electric Revolution Challenge to a targeted network of more than 3,000 unique PEMD focused individuals. This has included provision of:

- PEMD focused, cross sector weekly emails including funding opportunities.
- Direct community support for consortium building, collaborations, and assistance in project development.
- Live online events online, including the weekly 'Engage with…' webinar series and Equality, Diversity and Inclusion events.
- Repository of recordings and presentations from historic 'Engage With…' webinars.
- Information about the Driving the Electric Revolution Challenge to a targeted network of PEMD focused unique individuals.
- Driving the Electric Revolution Challenge newsletters.
- Driving the Electric Revolution landing pages.

The 'Engage with…' webinar series

The Engage with… webinars began in April 2020 at the very start of the Covid-19 pandemic. They were designed to enable everyone to continue meeting, engaging and communicating with leading companies and organisations involved in PEMD across the UK.

Since 2020 this Thursday afternoon session has held 45 events, presenting to around 2,500 people, who together asked more than 500 questions.

As a result of the series KTN know of 125 new introductions made between companies, all exploring future opportunities for partnerships, collaborations and projects. Engage with… has directly led to several new business opportunities taking advantage of the economic opportunities from the global transition to clean technologies.

We thank the presenters and attendees for making Engage with… such a fabulous success. You can watch all previous Engage with… webinars here.

Out and about

With Covid-19 restrictions briefly easing in 2021 the Challenge team took the opportunity to get out and about. The team thoroughly enjoyed meeting members of the Driving the Electric Revolution community at the Automotive Electronic Systems Innovation Network (AESIN) conference and Cenex-LCV.

DER-IC events

The Industrialisation Centres had a busy 2021 attending six major events including:

- Centre for Power Electronics (CPE) conference 2021
- CPE Conference DER-IC extra time session
- AESIN Conference
- Cenex-LCV
- Society of Motor Manufacturers and Traders (SMMT) Meet the Buyer
- COP26 where the DER-IC team attended the electrification sessions in Glasgow.

  - The Business Development Manager for DER-IC Scotland also exhibited at The National Manufacturing Institute Scotland Manufacturing a Net Zero Future as part of the COP26 programme.

Driving media outreach

In October we enlisted the help of the COW PR agency to bolster our media engagement. Brought on board initially for a 10-week campaign, this was extended by two weeks to ensure we could cover as many sectors as possible.

Overall, we secured 30 pieces of coverage in publications ranging from Rail Business Daily to Farm Business and Aerospace Manufacturing. Coverage was secured in every sector we specified and the publications we were featured in had the combined potential to reach over six million unique readers a month.

Case studies

Four written case studies were produced for:

- **project STREAMLINED**
- **project WINDER**
- **Performance Projects**
- **Electronic Minds**

Challenge Benefits & Evaluation

The Challenge will directly deliver a wide range of benefits here in the UK in the years to come. Although many of the benefits will be fully realised over the long term, early benefit recognition is clearly visible from successful Driving the Electric Revolution Challenge intervention. An overview of the expected Challenge benefits is below.

Building a community

One benefit has been the growth of the UK PEMD community because of the Driving the Electric Revolution 'Engage with' series. With almost 3,000 people taking part over the last 12 months, the Challenge has enabled the Innovate UK KTN to connect 125 firms that may not have previously considered working together. Despite a difficult year Driving the Electric Revolution has successfully built and virtually connected the PEMD community to start linking up the UK supply chain.

Producing highly skilled jobs

Targeted at onshoring, training, retraining and upskilling existing and new businesses, exploiting collaboration between UK academia and UK businesses. There are currently around 30,000 highly skilled workers associated with internal combustion engine supply chains in the UK today. With the shift to the electrification of vehicles, the Challenge seeks to retrain and repurpose a substantial proportion of these workers. This will enable them to work in PEMD supply chains in areas like mechanical, electrical, software, manufacturing systems and management.

These will be cross sector jobs based in PEMD supply chains serving all Challenge focus sectors. These jobs will range from machine operators earning £35,000 to doctorate research and development engineers earning £150,000 plus annually.

Filling key gaps in the supply chain

Developing a unique national coordination of activity across the UK PEMD sector, the Challenge has facilitated successful collaborative working relationships where previously this networking opportunity would not have taken place.

In doing this, we have funded projects which create collaborative working partnerships and develop value chains that we previously unfeasible. The network outreach has provided visibility for many SMEs and promoted partnership working.

Increasing export revenues and market share

Latest estimates suggest that by around 2050 PEMD will be worth over £2,000 billion globally, of which Europe would consume £700 billion. In 2025 the PEMD demand is expected to exceed £450 billion globally and will be heavily automotive, energy and maritime driven, because of earlier and less regulated adoption. With support from Driving the Electric Revolution, the UK can increase its global market share from £7 billion (2.33%) to over £80 billion (4.5%) by 2050.

Wider/social impacts

Supporting the delivery of government policy to meet climate change targets and industrial growth, the Driving the Electric Revolution Challenge directly addresses the need to be able to manufacture the new products required to meet enacted legislation. Increased rate of modern technology introduction, simultaneous development of technology and manufacturing process increasing likelihood of anchoring long-term production in the UK.

The Driving the Electric Revolution Challenge has been involved in various working groups across UKRI to ensure PEMD is recognised as a vehicle to enable government goals. PEMD exposure has become more readily recognised and is earning its well-deserved place in many reports. Including in the 'Net Zero Strategy: Build Back Greener' where it provided vital context for delivering climate change targets.

Funding projects

Work is now underway to gather data from established Driving the Electric Revolution funded projects to capture their success and impact directly derived from the Driving the Electric Revolution funding investment. This will cover both financial and non-financial benefits including co-investment secured and job creation.

The Driving the Electric Revolution Challenge success relies highly on the investment made into funded projects through competitions, and with this the Challenge does not have a fund and forget attitude. Driving the Electric Revolution recognises the importance of the accountability of public spending and with that wants to celebrate project success and provide ongoing support during the funding period.

UKRI support

Claire Spooner

Head of Decarbonising Transport at Engineering and Physical Sciences Research Council (EPSRC).

Research and innovation into PEMD are crucial to accelerate the UK's path to net zero, enabling us to build back greener and support high value jobs. The Driving the Electric Revolution Challenge is a key strategic intervention which will deliver a step change in the development of clean technology and supply chains through linking fundamental research, industry support and government activities. The Challenge can unite sectors across electrification technologies, developing efficiencies in a set of industries including construction, agriculture, energy production and different transport modalities.

EPSRC has provided long term support of fundamental research in this space encompassing design and manufacture of electromechanical systems and their accompanying power electronic drives and controls, with this research providing the foundation to Driving the Electric Revolutions activities. But there is more to be done.

Fundamental challenges include improving electric machine performance, reducing weight and cost, increasing reliability and eliminating critical materials. The Challenge is undertaking this work through Newcastle University, which leads a network of 21 universities across the UK, who are working across Driving the Electric Revolution's Industrialisation Centres to enable and facilitate collaboration with industry. This collaboration is vital to the development of future PEMD solutions and will drive the research knowledge to assist with securing materials and developing resilient supply chains.

Training and skills development is another area where Driving the Electric Revolution is pushing the agenda forward by partnering to produce "The Opportunity for a National Electrification Skills Framework and Forum". This is a welcome intervention, focusing on the need to up-skill, re-skill and add new skills to deliver key learning and specialist skills for industry. This development builds on years of EPSRC support for centres for doctoral training in PEMD skills, with current funding of more than £10 million. Importantly, Driving the Electric Revolution has further highlighted a need for skills development at all levels of learning.

As the UK holds the presidency of the United Nations Framework Convention on Climate Change until November 2022, there is an opportunity to show how growth of the UK's PEMD sector is developing in a green and sustainable way to a global audience. Driving the Electric Revolution is perfectly placed to develop our existing strengths within the PEMD market and showcase how the UK will achieve the goal of zero emissions by 2050, through vital collaborative research and innovation.

Equality, Diversity & Inclusion (EDI)

The Driving the Electric Revolution Challenge is committed to raising awareness of EDI issues within the PEMD community. Building on the success of the 2020 "Engaging a Diverse Workforce for the Future" webinar, we ran four webinars in 2021/22 dedicated to championing EDI in engineering and PEMD technology.

These sessions explored how we can bring about an increase in EDI in these sectors, discussed the barriers we need to overcome, and explored the collective benefits that diversity and inclusivity brings. Watch the EDI webinar session recordings here.

Jo O'Leary
UKRI Head of Equality, Diversity and Inclusion

"UKRI launched its draft EDI strategy in January 2021, which set out our ambition for a more diverse, sustainable and productive Research & Innovation system underpinned by an effective and inclusive culture.

The Driving the Electric Revolution Challenge is contributing to achieving this ambition through its investments in skills and training. Including the Skills Hub, a webinar series to champion EDI in engineering and PEMD, and learning and development programmes to support inclusion. Creating and driving change is a shared endeavour and the EDI Advocates Programme is an important way of inspiring people and sharing learning to improve inclusion.

As UKRI continues its EDI journey, I look forward to working with the Driving the Electric Revolution team and seeing its further progress on increasing diversity and inclusion".

Dr Kirsty Hewitson
Director – Capability, Innovate UK KTN (IUK KTN)

"The business case for supporting diversity can no longer be disputed. Increased diversity can lead to improved performance, innovation, decision making and employee satisfaction. However, despite this acknowledgement, further work needs to be done in creating a diverse and inclusive workplace where everyone is valued. This includes gender representation with, as an example, only 24% (2019) of the STEM workforce being women. IUK KTN has identified diversity and inclusion as one of its key strategic priorities with an explicit link to driving innovation.

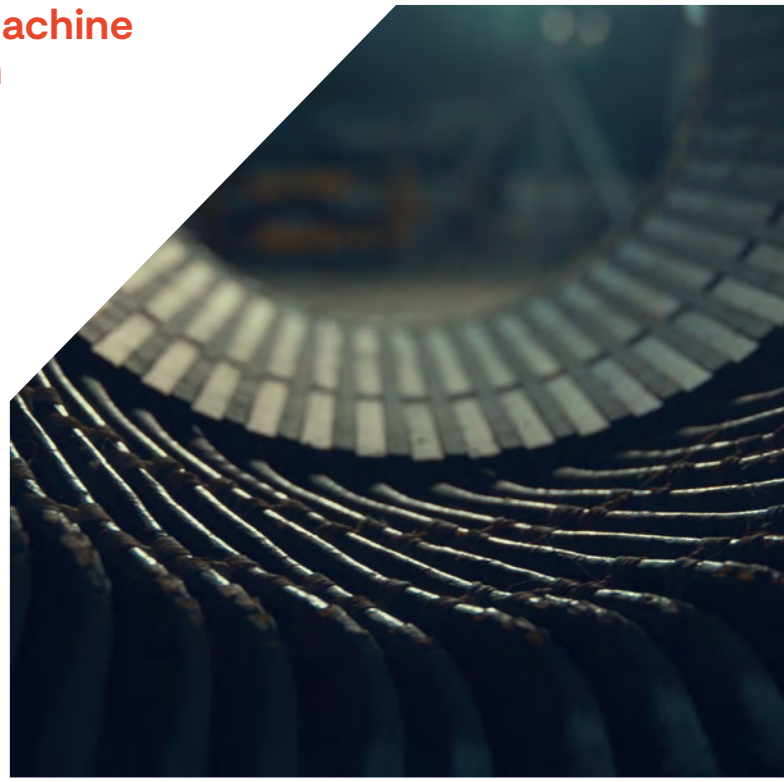
IUK KTN is proud to support Driving the Electric Revolution as they continue to show commitment to EDI. This has been highlighted this year through a plethora of events and activities including a series of four external webinars, featuring a range of diverse panellists and allies, that have focused on EDI within the PEMD community. Furthermore, the Skills Hub competition, outreach and engagement projects should enable connection with a diverse representation. There has also been an array of EDI training and support packages delivered. The work undertaken by Driving the Electric Revolution is an excellent example of how EDI can be addressed collectively and collaboratively by a sector and should be adopted by others".

2. https://www.stemwomen.com/blog/2021/01/women-in-stem-percentages-of-women-in-stem-statistics

Annex 1

Accelerated Supply Chain

105895: Accelerating the UK E-Machine Preformed Winding Supply Chain



Description

Development of a flexible, scalable automated manufacturing processes and supply chain for the next-generation motor and generator windings. This technology will increase motor and generator power density and efficiency. This technology is applicable across most motor and generator types and powers.

The project extends existing motor and generator design simulation software to capture requirements and integrate automated manufacturing processes in design-for-manufacture assessments.

An automated winding pilot station will be commissioned, followed by virtual and experimental validation.

Funding & project size

Total project cost: £1,753,936
Driving the Electric Revolution Funding: £831,876

Consortia members

- Belcan Engineering Services UK Limited
- Cummins Ltd
- Motor Design Limited
- GKN Hybrid Power Limited
- University of Nottingham

105894: High-T Hall

Description

Demonstration of an advanced Hall sensor, based on 2D graphene technology, for PEMD providing a bespoke packaging solution for an initial focus on the aerospace sector.

The focus is on Hall sensors, operating in high temperature environments, to accurately measure current to enable precise control of electric motors and generators. Therefore, increasing their operating efficiency.

Funding & project size

Total project costs: £1,273,559

Driving the Electric Revolution funding: £629,159

Consortia members

- Paragraf Ltd
- Compound Semiconductor Applications Catapult Limited
- Rolls-Royce plc
- Aero Stanrew Limited

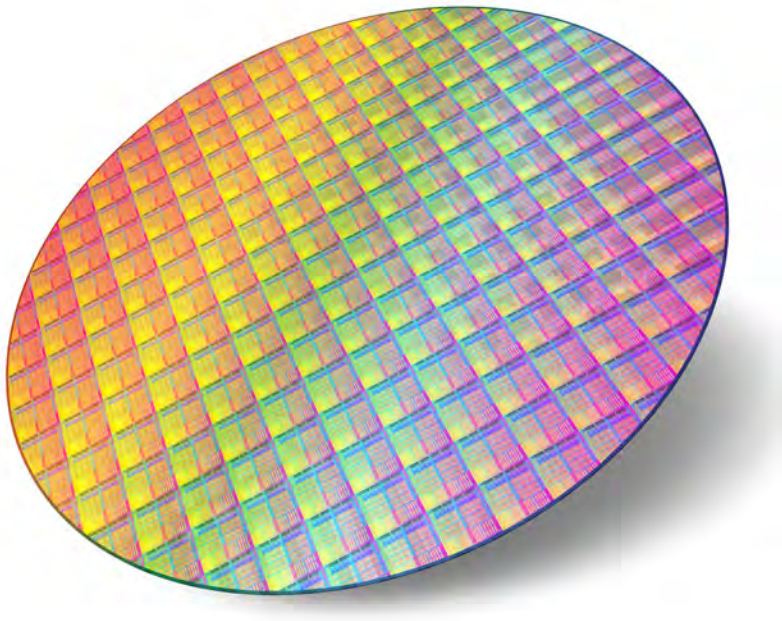
105891: SLOGaN M4 – Short Loop Optimisation of Gallium Nitride Materials and Major Manufacturing Modules

Description

This ambitious project aims to develop the 200mm GaN on silicon epitaxial materials and key manufacturing process modules to de-risk and accelerate a 200mm, 650V GaN High Electron Mobility Transistor capability for cross sectoral power electronic applications.

The complementary capabilities of the two industrial partners provide a route for a cost competitive, 200mm (8") Wide Band Gap (WBG) power electronics capability that can scale to meet the growing demands of the UK PEMD supply chain for WBG materials.

The process optimisation will be undertaken at Bristol University, with implementation and wafer mapping at NWF so that real time, non-destructive assessments can be made as part of the process control methodology adopted for a future full flow GaN on Si power process.



Funding & project size

Total project costs: £988,283

Driving the Electric Revolution funding: £476,852

Consortia members

- Compound Semiconductor Centre Limited
- University of Bristol
- Newport Wafer Fab Ltd

105896: Automated Dynamic Testing of Magtec Power Controllers

Description

The research project is developing a radical innovation to improve the test process capability for electrical power controllers (drives). Delivery of robust solutions to adapt drives through data acquisition and feedback approaches into product design, developing predictive modelling and enabling scale up of production activity.

The partners are developing independent test capabilities to allow for component, sub-assemblies and final unit dynamic testing on an automated basis. Adapting best in class technologies from electrical test innovative markets (mainly aerospace and automotive) to significantly improve drive lifespan and efficiency for robust applications into primary and new market opportunities.

Funding & project size

Total project costs: £1,431,213

Driving the Electric Revolution funding: £715,607

Consortia members

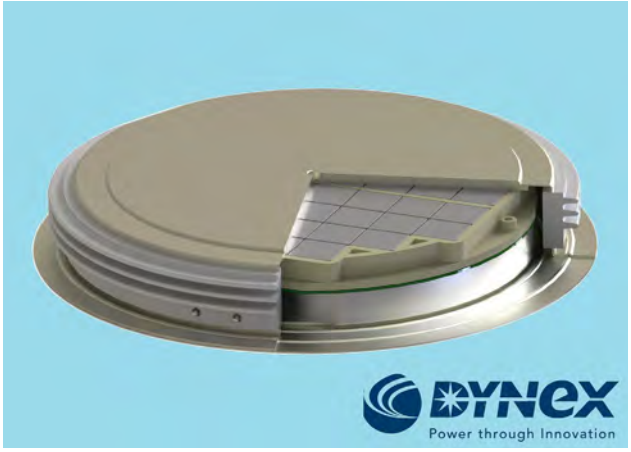
- Magnetic Systems Technology Limited
- Tioga Limited

105900: Integrated Optical Sensor IGBT Module

Description

This project is creating a new supply chain integrating optical sensing technology into the manufacturing processes for high voltage high power IGBT modules.

This project will realise a novel manufacturing method and a new supply chain to allow the integration of optical temperature sensors into high power high voltage IGBT modules to enable direct measurement of the individual component temperatures. Being based on actual temperature measurements, this will enable higher power energy efficiency in the system and longer operating life from the power modules.



Funding & project size

Total project costs: £388,234

Driving the Electric Revolution funding: £194,067

Consortia members

- Dynex Semiconductor Limited
- City University of London

105899: Die on Heatsink

Description

Electronic controllers for motors use transistors which must be cooled to remove the semiconductor losses that arise. YASA have a novel, patented, method for mounting several, small standard transistors onto heatsink plates that are immersed in a flow of liquid coolant. This project aims to improve power density and reduce controller weight further by improving the thermal and transient electrical performance of this technology. The target for this project is to devise a transistor mounting method that will permit a complete 250kW motor controller with a power density of 100kW/l.

Funding & project size

Total project costs: £199,877

Driving the Electric Revolution funding: £98,862

Consortia members

- YASA Limited
- Compound Semiconductor Applications Catapult Limited

105902: QUIET - Quietness Understanding in E-drive Technology

Description

This project seeks to test and develop simulation software that enables a "digital twin" approach with increased use of simulation as part of a design process is needed to identify potential e-NVH problems earlier this ambition to be realised.

There exists, in many market sectors, an increasing demand for lower audible noise and vibration (low noise, vibration and harshness - NVH) from electric drives.

A successful project outcome will close a gap in the current UK motor supply chain - that of design-stage e-NVH analysis simulation software, for which the current players are all non-UK based.

Funding & project size

Total project costs: £997,352

Driving the Electric Revolution funding: £498,676

Consortia members

- ZF
- Romax Technology Ltd

105903: STREAMLINED

Description

The UK wants to be a global leader in high power density motor design and development. A key advantage of high-power density machines – achieved through increased speed – is that they reduce system weight, leading to more compact designs. Using magnetic rotors in these machines decreases energy loss, which in turn increases their power and efficiency.

Innovations in motor technologies are making these machines a reality, but there are UK supply chain issues. Existing local supply chains can either only deliver low volumes of the new technologies or high volumes of the older, lower specification technologies. To meet demand and enable electrification to happen more quickly, the UK needs to build up a supply chain of newer, greener technologies. This is where STREAMLINED comes in.

Nick Henry, Group Technical Director at Polar Technology Management Group, the parent company of Lentus Composites, explained: "The objective of the project was to develop a product line of high-speed magnetic rotors for energy recovery systems. There is increasing demand from the marketplace to scale up and we have been developing the processes to take us from low volume prototyping to a higher volume."

The 18-month project involved mapping manufacturing processes to identify which elements to bring in-house and which to leave in the supply chain. Lentus assembled rotors in prototype batch volumes and then developed and trialled innovative new manufacturing processes, working in collaboration with the National Composites Centre. The project ended in autumn 2021 and Lentus now has more structured processes in place, making it easier for the company to expand as demand grows.

Nick said: "At the beginning of the project we were low volume prototyping, with quite a fragmented process. By the end of the project, we had a production facility that is capable of doing repeat volume."

The funding from Driving the Electric Revolution enabled Lentus to invest in new, more advanced facilities and equipment. It has built a 100,000 sq. foot manufacturing facility in Oxfordshire, allowing it to scale up production and meet the growing demand. Eight new jobs have been created as a result.

During the project, a British luxury car manufacturer came on board as a customer and Lentus is also in talks with an Italian sports car brand. The company can now produce about 3,000 parts a year and by the end of 2022, that will have risen to 6,000 parts a year.

Funding & project size

Total project costs: £714,693

Driving the Electric Revolution funding: £355,277

Consortia members

- Lentus Composites
- National Composites Centre
- High Value Manufacturing Catapult

105904: LAW (Lightweight Aluminium Windings)

Description

The partners are developing a winding machine for aluminium wires. The winding machine will be developed and provide the first UK supply chain solution for manufacturing aluminium coils. Coil winding is a critical component of motor and generator manufacture and is not provided by any UK manufacturer.

The advantages of aluminium coils are lower cost and lower weight compared with copper. The major disadvantage is the higher resistance, which decreases the efficiency of the e-Machine at low speeds. With the drive to higher speed motors, this disadvantage is becoming lower. The project will develop the reduction in weight of e-Machines by 15% without compromising performance by developing manufacturing processes for winding coils from alternative material.

Funding & project size

Total project costs: £659,734

Driving the Electric Revolution funding: £326,857

Consortia members

- Aspire Engineering Limited
- Dana TM4 UK Ltd
- Hydro Aluminium Rolled Products Limited
- University of Warwick

105901: HiCap

Description

Development of a UK manufacturing capability for readily scalable, in terms of capacitance and shape, thin film capacitors capable of operating at sustained temperatures of approximately 125°C.

These devices are aimed at EV and other demanding industrial applications, and thus, must be viable to economically manufacture in short lead times for low to medium volumes.

Funding & project size

Total project costs: £354,993

Driving the Electric Revolution funding: £176,068

Consortia members

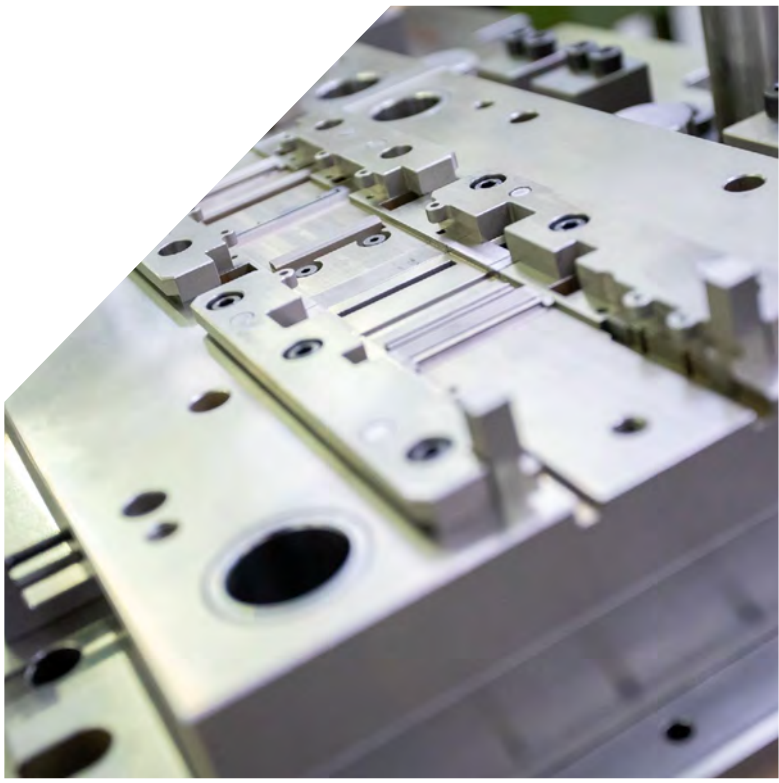
- API Capacitors Limited
- Integral Powertrain Limited
- Compound Semiconductor Applications Catapult

43016: High Volume E-Machine Stack Manufacture

Description

This project is closing the gap in UK-based supply of rotor and stator lamination stacks based on the demands of the automotive industry pushing for volume production of thinner laminations with finer details to meet higher performance requirements.

The project is improving the production methods, tooling design, processes and material selection used in the creation of rotor and stator components to pave the way to a high-volume production of thinner laminations in the UK.



Funding & project size

Total project costs: £897,796

Driving the Electric Revolution funding: £445,517

Consortia members

- C. Brandauer & Co. Limited
- University of Warwick

43784: MABEL – Optimising through Life Cost of Industrial Gas Processing

Description

MABEL is identifying and demonstrating innovations in electrical machine system design that can advance both the efficiency and cost of high-speed electrical motors and generators. Opportunities are being exploited to improve the performance, and ultimately the value proposition, of high value systems used today in direct drive, oil free applications where 24/7 running of gas processing equipment is undertaken. Considering all aspects of the system including magnetic, mechanical, control system and power electronic design will enable an approach that optimises through life cost, opening further market sectors for targeted exploitation.

Funding & project size

Total project costs: £966,567

Driving the Electric Revolution funding: £679,518

Consortia members

- Turbo Power Systems Limited
- Newcastle University

Business-led innovation in response to global disruption

55544: Enhancing UK Engineering Skills to Drive the Low Carbon Economy

Description

This project provided free and highly focused online technical training to employees of UK companies who wish to up-skill in power electronics. It aimed to maximising the use of time for employees to up-skill whilst they had to remain at home for management of the Covid-19 pandemic.

This project catalysed a longer-term initiative in technical training to provide companies a forum to ensure their engineering teams are always up to date with the very latest in advanced engineering.

Electronic Minds produced 20 webinars providing free online technical training for engineers wishing to up-skill in power electronics. Because the training was free, Electronic Minds was able to reach a wide range of participants and to establish itself as a provider of expert training.

The company is now moving into commercial training and has secured several overseas contracts on the back of the webinars, leading to the recruitment of a new team member.

The hour-long webinars were released over a four-month period in 2020, enabling people to upskill while working and learning from home during the Covid-19 pandemic.

Electronic Minds partnered with the University of Warwick to produce the webinars, which are still freely available and are viewed daily. Roughly 3,000 people attended the live webinars.

Funding & project size

Driving the Electric Revolution funding: £49,722

Company involved

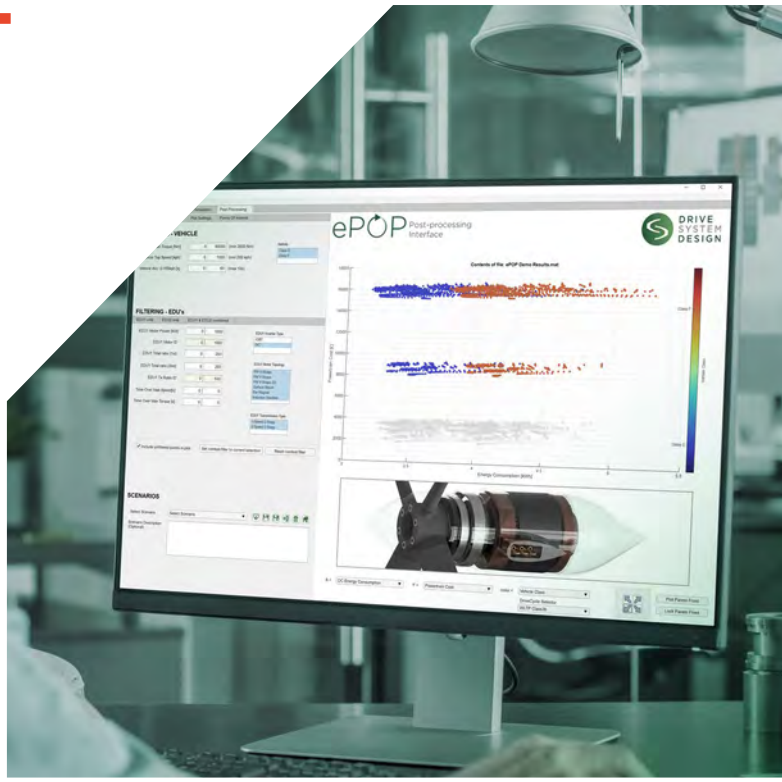
- Electronic Minds

57574: Propulsion system to expedite the development of eVTOL technology

Description

The new generation of small electrified vertical take-off and landing (eVTOL) air vehicles promises exciting new opportunities for travel, business and commerce. The propulsion technology for these vehicles is a critical contributor to their success as a technology.

The project removes barriers and expedites the route to market by creating a modular, scalable propulsion system to suit the majority of fan driven eVTOL vehicles. From the data generated across many topologies, based on simulation, a comparison of the benefits will be clear and, where necessary a scoring matrix will be created to account for additional criteria. The most competitive solution will be selected and specified in detail.



Funding & project size

Driving the Electric Revolution funding: £49,267

Company involved

- Drive System Design

57890: Assessment of technical and commercial feasibility of a novel low-cost and ultra-efficient electric drive technology for Drone Delivery Systems

Description

Electric drones are considered as enabling technologies for the current and future of the Drone Package Delivery market with huge market growth anticipated by 2030. Camvertec has developed a novel drive technology with brushless operation and a fractionally rated converter, providing a robust, low-cost and low-maintenance drive solution, cutting the overall capital cost by 35-35%.

This project studied, assessed and proved the commercial feasibility of the drive technology and set the foundation for commercialisation operation to move to the next phase. This project will scale up the laboratory-proven prototype design to a real size, fully optimised and characterised prototype design with its performance and economics quantified with respect to cost, size, reliability and efficiency.

Funding & project size

Driving the Electric Revolution funding: £48,796

Company involved

- Camvertec Limited

59007: Modular electric vehicle powertrain for small delivery vehicles - "e-power-arm"

Description

This project is to perform design feasibility on simplifying the powertrain for lightweight electric vehicles. The aim is to create a power pack housed within the suspension arm of the vehicle, which is titled "e-power-arm". The objective is to take cost and weight out of the vehicle by sharing structures to their best advantage.

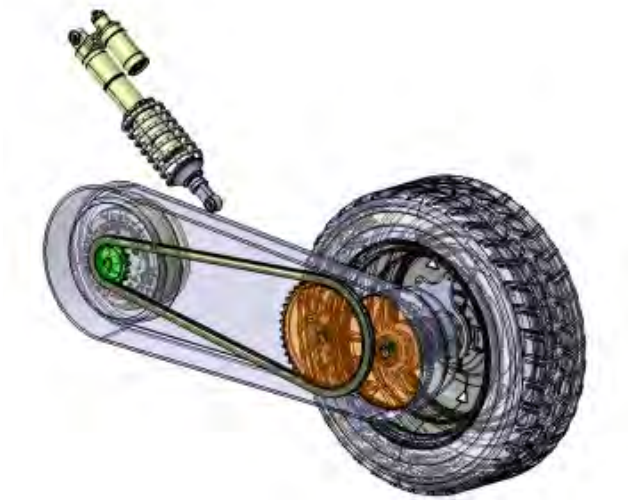
By creating such a component system, smaller electric vehicles are easier to engineer and this supports the development of smaller and more efficient delivery vehicles. The growth of home deliveries is already a trend, and the recent change in shopping habits will further enhance this sector, however it needs to clean its act up and stop using large delivery vehicles, by being offered a range of alternatives.

Funding & project size

Driving the Electric Revolution funding: £41,490

Company involved

- Nedra Limited



61334: Immersion-cooled power components and modelling

Description

This project is focused on advancing next-generation immersion liquid-cooled power electronics for mainstream computing applications. This use of immersion-cooled power components aims to improve computing performance, reduce emissions and help accelerate immersion-cooled, high-performance-computing systems into the mainstream.

Funding & project size

Driving the Electric Revolution funding: £50,000

Company involved

- Supply Design Limited

63530: Design Development of an integration solution to utilise spare capacity in transport systems to provide local energy supplies in dense urban centres

Description

The project is to develop product that safely connects electrically powered rail transport systems (DC traction), electric road vehicles (EV) and solar panels.

The application of the product would allow transport authorities, rail operators, Network Rail and light rail operators the opportunity to reducing operational costs and provide infrastructure in support of the rise in demand for EVs.

Additional opportunities are available with the electrical supply industry for low voltage supplies in dense urban areas for permanent back up supplies or temporary usage required by their clients.

Funding & project size

Driving the Electric Revolution funding: £48,069

Company involved

- Power Supply Projects Ltd

66091: Additive Manufacturing for Electric Motors

Description

From the start the design of motors must consider the manufacturing methods available, limiting the design choices. Using Additive Manufacturing (AM) to produce these windings creates opportunities to rapidly prototype these motors in the UK.

Moreover, such technology could present an opportunity for new high-performance motor designs that were previously infeasible with present manufacturing methods.

This project concentrates on manufacturing individual conductors which will then be connected to printed circuit board end windings. High frequency motors require "litz" wire to produce low resistance windings at these high alternating current frequencies.

This project will attempt to build "litz" wire with AM methods allowing for high copper densities within the motor whilst maintaining the benefits of using multiple small conductors to make up a larger conductor.

Funding & project size

Driving the Electric Revolution funding: £47,314

Company involved

- Technelec Limited

Catalysing Green Innovation

77130: UK-Alumotor

Description

UK-Alumotor is developing a dedicated supply chain to manufacture a patented electric motor/generator which will exploit UK-based high-value manufacturing technology. The e-machine is leveraging specialist material, transferring technology developed within the aerospace & motorsports sectors, together with commodity materials. The design makes use of aluminium & iron, rather than copper and rare earth metals. This provides the UK supply chain with competitive advantage to fulfil the growing market demand for traction e-machines during the next decade and beyond.

The lifecycle impact of the product will be considered throughout the supply chain. Using widely available, and recycled, metals within the e-machine will reduce the lifecycle impact of the e-machine compared with permanent magnet-based motors.

Funding & project size

Total project costs: £497,790

Driving the Electric Revolution funding: £331,743

Consortia members

- Ricardo UK Limited
- C. Brandauer & Co. Limited
- Phoenix Scientific Industries Limited
- University of Warwick
- Aspire Engineering Limited
- Global Technologies Racing Limited

75543: Industrialisation investigation for WaveDrives' radical magnetically geared electric actuator

Description

WaveDrives has developed electric actuation technology, motivated by two decades' experience developing commercial robots and powered prosthetics. Inspired by the structure and performance of human muscle, their Sarcomere Inspired Linear Actuator (SILA), is more controllable and efficient than comparable technologies because its contactless transmission has no energy wasted due to friction.

In this project, WaveDrives and an interdisciplinary team from the University of Bristol have combined to industrialise SILA manufacture. The project will accelerate SILA industrialisation, seeding new avenues of scientific research and informing research-based education at the University of Bristol and provide knowhow on automation methods for potential UK exploitation in other high-tech magnetics applications. The project lies at the heart of establishing the UK as "a global leader in the manufacture of core technologies which underpin electrification".

Funding & project size

Total project cost: £224,751

Driving the Electric Revolution funding: £176,205

Consortia members

- WaveDrives Ltd
- University of Bristol

75678: RIFT 10-30 kW EV motor - Manufacturing Readiness and Supply Chain development (RIFT-MaRSC)

Description

The RIFT 10-30 kW integrated machine and power electronics is an innovative approach to an ultra-efficient electric vehicle (EV) motor, bringing forward a unique range of advantages including:

– significant weight reduction (circa 50%)

– lower cost

– plus, other features that results in a range increase of up to 75%.

Today, in the industry, most EV motor components are imported from Asia. For UK manufacturers to compete, it is necessary to decrease the production labour required in manufacture. This will be achieved by making Design for Manufacture advancements, reshoring the supply chain, and advancing the UK production capacity to be able to produce 300 units p.a. at a low production unit cost.

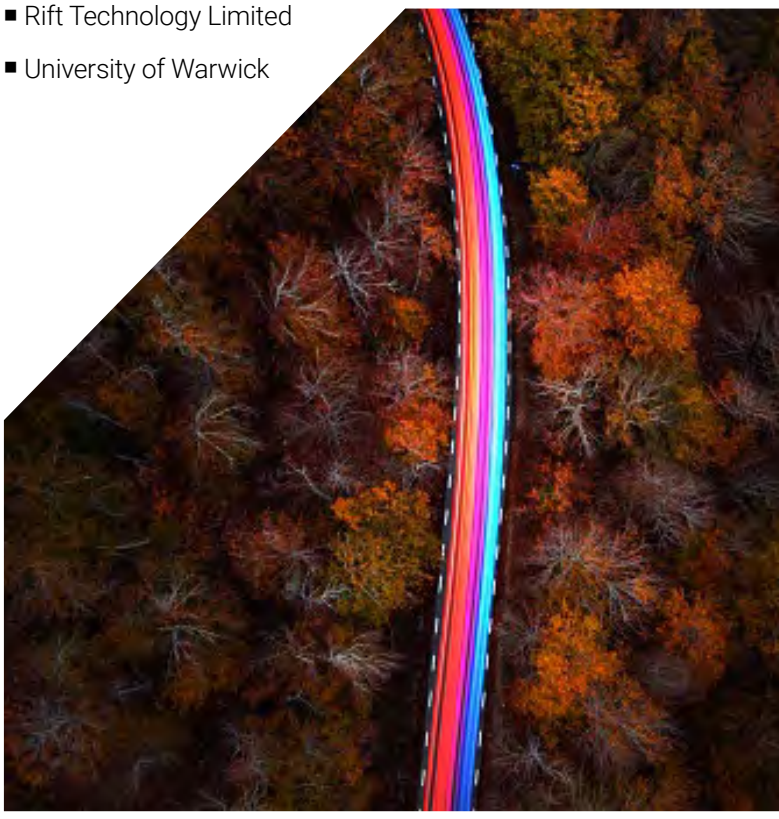
Funding & project size

Total project costs: £361,763

Driving the Electric Revolution funding: £278,188

Consortia members

- Rift Technology Limited
- University of Warwick



75835: REAP - Rare-Earth Extraction from Audio Products (REAP)

Description

Rare earth magnets based upon neodymium iron boron (NdFeB) are a key material in electric vehicles where they are used in drive motors, generators, power steering and in loudspeakers. Recycling of rare earth magnets presents a significant opportunity and REAP aims to develop a recycling supply chain for the loudspeaker market. REAP will investigate ways of liberating rare earth magnets from automotive and consumer audio modules.

The quality, quantity, availability and value of the scrap will be determined for speakers from various sources and a calculation of value added to the scrap will be made. The short loop recycling processes which are being developed by Hypromag Ltd will have a significant environmental benefit compared to primary production of magnets.

Funding & project size

Total project costs: £256,144

Driving the Electric Revolution funding: £174,745

Consortia members

- Hypromag Ltd
- European Metal Recycling Limited
- University of Birmingham

76003: M-PowerD - Manufacturing PSJ GaN Power Devices in the UK

Description

This project builds capability in the UK to manufacture the world's first, low cost, high voltage GaN power transistors. The project aims to develop a polarisation super-junction high electron mobility transistor (PSJ HEMT) and process wholly in the UK. This project will allow a low cost bi-directional 3kV GaN PSJ HEMT to be built.

PSJ technology is a patented break-through concept for GaN developed in the University of Sheffield with Powdec of Japan. This concept enables ultra-high-performance power devices that have been proven to achieve more than 3x higher voltage than existing GaN technologies. The initial target application will be for a smart power grid to replace the UK's ageing infrastructure.

Funding & project size

Total project costs: £488,798

Driving the Electric Revolution funding: £379,849

Consortia members

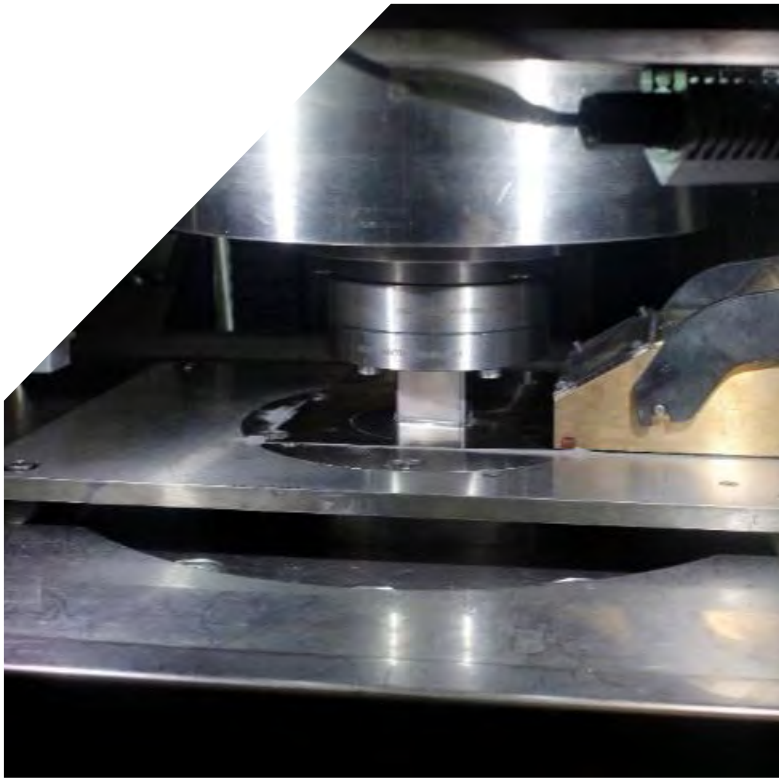
- INEX Microtechnology Limited
- Compound Semiconductor Applications Catapult Limited
- University of Sheffield

76019: Improved Loss Modelling of SMC Components

Description

Soft Magnetic Composite (SMC) is an iron powder that can be compressed into component parts. Each individual iron particle is magnetically isolated from its neighbours reducing losses. The use of SMCs thus has the potential to offer cheap high performance electric motors compared to laminations.

In this project, academic loss modelling capability is combined with component pressing expertise to provide a flexible loss prediction method. This will allow motor designers to confidently design low loss high efficiency electrical machines and promote a dynamic UK supply chain with an improved time to market.



Funding & project size

Total project costs: £238,367

Driving the Electric Revolution funding: £170,586

Consortia members

- SG Technologies Limited
- Newcastle University

76169: GaNSiC

Description

Project GaNSiC (Gallium Nitride Silicon Carbide) will develop a unique manufacturing process for electronic devices based on compound semiconductors. Next-generation electronic devices will be based on technologies such as GaN and SiC which enable processing speeds up to 100x faster than silicon transistors.

GaNSiC will develop an ink jet/direct dispense manufacturing process that deposits a silver sinter paste onto pre-populated circuit boards to provide a suitable die-attachment method meeting Custom Interconnect Limited's mechanical and thermal efficiency requirements.

GaNSiC brings together experts in electronics manufacturing, material jetting and SiC/GaN device design. GaNSiC will quickly develop a required manufacturing process that will readily be commercialised as it would meet customers' requirements.

It will enable both SiC and GaN arrays to be incorporated into mixed technology products enabling the development of next-generation SiC and GaN products. This innovation will result in an entirely unique SiC and GaN die attach capability in the UK, if not globally.

Funding & project size

Total project costs: £287,644

Driving the Electric Revolution funding: £206,934

Consortia members

- Custom Interconnect Limited
- Compound Semiconductor Applications Catapult Limited

76341: Development of Coil Winding and Magnet Assembly Manufacturing Processes for a Ferrite Based Permanent Magnet Generator

Description

The UK has set an ambitious target to increase its offshore wind capacity to 30GW by 2030. However, to achieve this target, it is reliant on imported wind turbines. The Covid-19 pandemic has highlighted this dependency and vulnerability to disruption, particularly in terms of the supply of critical raw materials, such as rare-earth magnets. For these reasons, it is of strategic importance that the UK develops its own wind turbine supply chain to meet its renewable energy targets.

All wind turbine Permanent Magnet Generators (PMGs) use conventional designs that rely on one key material, rare-earth magnets. GreenSpur, a Time To Act subsidiary, has invented and patented a new and highly innovative approach, with a PMG that substitutes scarce and expensive rare earth magnets for cheap and abundant ferrite magnets.

The long-term vision of GreenSpur's project is to stimulate the development of a UK supply chain and manufacturing network that can build multi-MW generators for the UK wind market.

Funding & project size

Total project costs: £499,999

Driving the Electric Revolution funding: £365,865

Consortia members

- Time to Act Limited
- University of Warwick

76399: SOCRATES - SilicOn Carbide tRAnsistor Trench process

Description

SOCRATES will introduce silicon carbide (SiC) and gallium nitride (GaN) trench processing technologies to the UK, establishing a critical capability into the PEMD supply chain for power transistors. This nine-month project will define the critical semiconductor manufacturing processing steps required for introducing a disruptive SiC power metal-oxide-semiconductor field-effect transistor (MOSFET) supply chain for automotive power electronics to the UK.

Current SiC diodes and transistors are still based on planar devices commercialised in 2001 and 2011 respectively, which are limited in terms of efficiency and reliability.

The proposed trench technology will revolutionise the performance of SiC transistors, with lower on-state resistances, and enhanced energy efficiencies. VGaN-on-SiC devices will further drive performance and costs advantages.

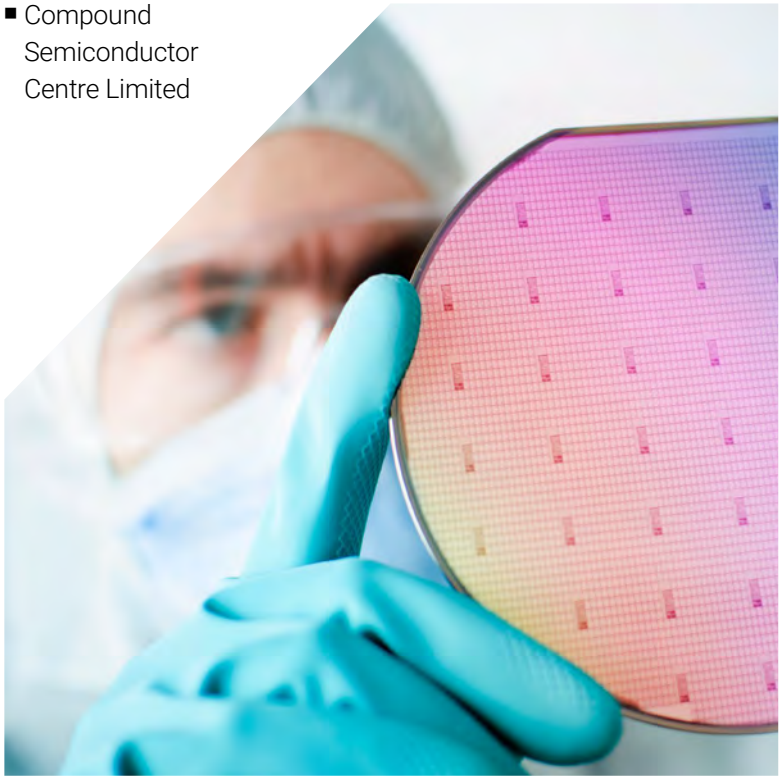
Funding & project size

Total project costs: £216,859

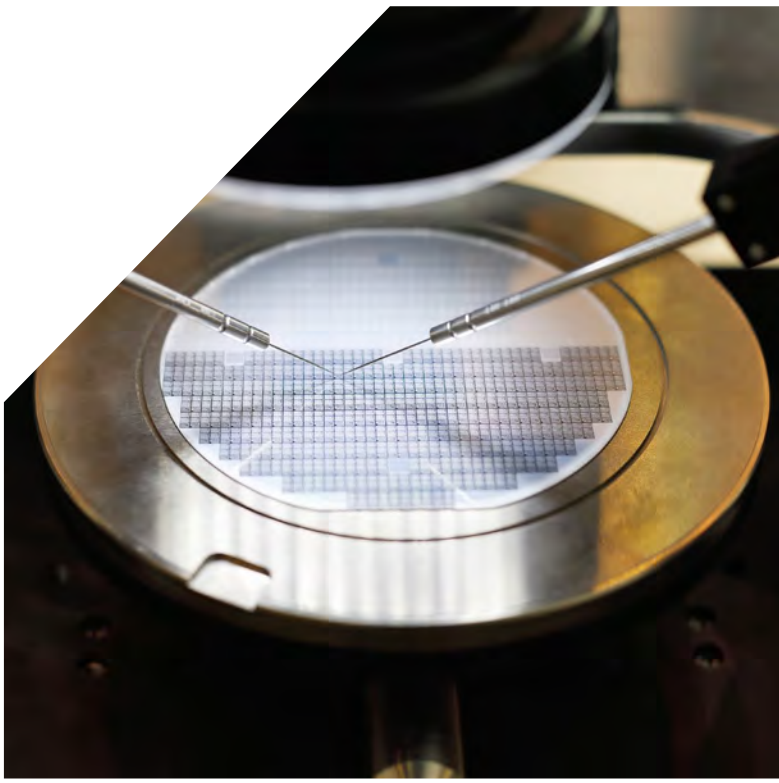
Driving the Electric Revolution funding: £137,423

Consortia members

- SPTS Technologies Limited
- Swansea University
- CS Connected Limited
- Newport Wafer Fab Ltd
- Compound Semiconductor Centre Limited



77743: SiC-MAP



Description

Silicon Carbide MOSFET Applications unlocked by PDK (SiC-MAP), takes a 1,200V planar SiC MOSFET process and develops it further to include 1,700V and 3,300V capability. Once the 1,700V and 3,300V capabilities have been demonstrated, SiC-MAP will then go on to extract relevant electrical parameters from the fabricated SiC MOSFET's (including reliability) along with design and layout parameters, into a Process Design Kit (PDK).

Innovation lies in Clas-SiC's PDK which will initially enable customers to have 1,200V SiC MOSFET devices tailored to their specific requirements using established design elements, modules and processes which have had basic reliability proven. For the customer, this will de-risk and shorten the time to market for New Product Introduction.

Funding & project size

Total project costs: £492,731

Driving the Electric Revolution funding: £371,448

Consortia members

- Clas-Sic Wafer Fab Limited
- Compound Semiconductor Applications Catapult Limited

77777: Development of PEMD for Nuclear Coolant Systems

Description

In support of broader UK Government objectives toward electrification and net zero carbon, nuclear is seen as a critical part of the government's plans for future clean electricity generation. This project includes the design and supply of electric pumping machinery, forming part of the primary nuclear safety systems of upcoming Small Modular Reactors, with specific consideration for UK capability in low and zero cobalt metals.

This project will support initial conceptual design through to a theoretically proven drive system design specifically to target Small Modular Reactor Cooling Pumps. The knowledge and experience acquired during this project will provide a framework to engage with UK suppliers on specific product designs facing the same issue, with the overall goal of establishing a motivated UK-based supply chain that is suited for future nuclear applications.

Funding & project size

Total project costs: £333,301

Driving the Electric Revolution funding: £234,544

Consortia members

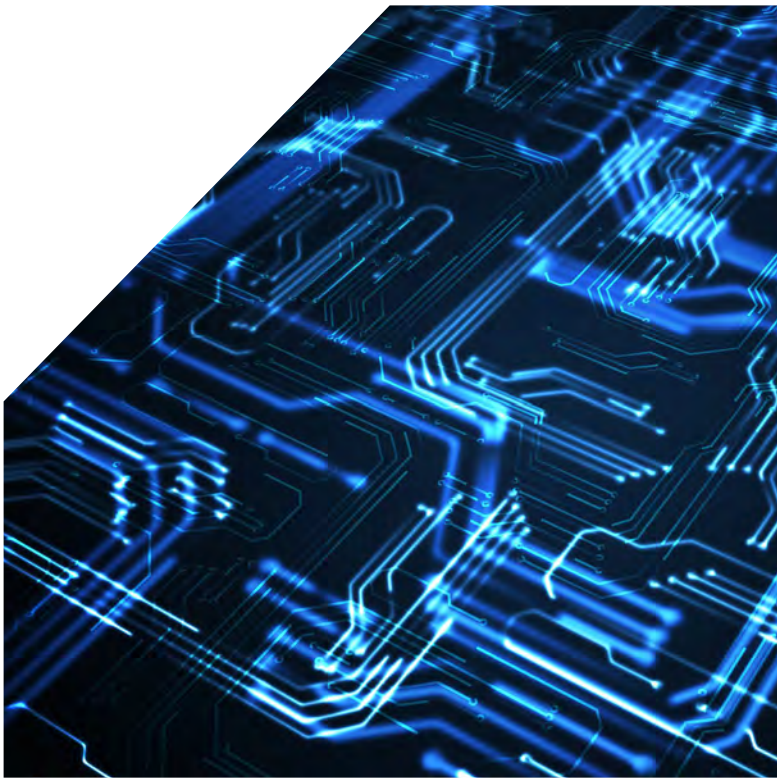
- Hayward Tyler Limited
- University of Sheffield

78366: CoolSync

Description

This project is to develop an innovative GaN based rectifier cooling unit. For the data centre market, CoolSync offers energy and space savings on the datacentre floor (reduced costs) and an increase in power quality.

The main technology objective is developing a solution demonstrating application understanding in UK PEMD supply chain to enable short term commercial exploitation within approximately five years and to establish a robust foundation for longer term industrial engagement for a future generation of cooling techniques.



Funding & project size

Total project costs: £346,377

Driving the Electric Revolution funding: £269,774

Consortia members

- Supply Design Limited
- Compound Semiconductor Applications Catapult Limited

78550: Recovery of Gallium from Ionic Liquids (ReGaIL)

Description

Recovery of Gallium from Ionic Liquids (ReGail) aims to develop a recovery process of Gallium from bulk sourced end-of-life (EoL) LEDs to supply the uptake of Gallium Nitride (GaN) semiconductors in PEMD.

The innovation is to create a circular sourced supply chain of Gallium in the UK. Building on established recycling methods and expanding it to encompass bulk sourced EoL LEDs. The recovered Gallium will then be used in new GaN transistors for PEMD, creating a sustainable supply chain, avoiding virgin mining, increasing the UK's supply chain resilience, and laying the foundation for establishing the EoL recycling process for PEMD.

Funding & project size

Total project costs: £335,735

Driving the Electric Revolution funding: £265,111

Consortia members

- S2S Electronics Ltd
- HSSMI Limited
- Envaqua Research Ltd
- E.C.Williams Limited
- Recolight Limited
- Institute of Materials Finishing

78600: Design for manufacture of integrated e-hubs for agricultural vehicles

Description

Rapid advances are being made in the world of AgriTech, which is itself driving demand for integrated electric hubs (e-hubs) to provide the speed, torque, efficiency and durability required. The project aims to drive the electric revolution by undertaking design for manufacture, integrating the motor, gearbox, brake and controller modules into a single unit designed specifically for AgriTech requirements. The product design will be available in a range of power outputs and will facilitate scaling up and easy adoption by a multitude of vehicle and robot manufacturers.

The project will result in two power variants (at opposite ends of the power range) of the e-hub being manufactured. They will be dyno tested for efficiency and durability, then fitted to appropriate vehicles for preliminary confirmation of dyno results by means of agricultural field trials.

Funding & project size

Total project costs: £499,003

Driving the Electric Revolution funding: £355,282

Consortia members

- Performance Projects Limited
- University of Lincoln
- Printed Motor Works Limited
- Saga Robotics Limited
- ARWAC Limited

79321: Development of a PEMD supply chain for Off-Road vehicles

Description

A project working to improve capability in virtual process development and virtual product validation of PEMD. Significant advancements in processes for assessment of lifecycle and embedded carbon, remanufacturing, refurbishment and recyclability analysis of PEMD will be realised, supporting the development of the circular economy.

Funding & project size

Total project costs: £499,613

Driving the Electric Revolution funding: £324,496

Consortia members

- Perkins Engines Company Limited
- University of Nottingham

79839: WIND Electric Revolution (WINDER)

Description

Magnomatics has developed a pseudo direct drive (PDD) that improves the efficiency and reliability of offshore wind technology. It has a longer lifespan and generates energy at a lower cost than conventional methods. As wind turbine generator unit volumes increase and turbines have a longer shelf life, it's vital that technology can cope with higher loads. This product will help the UK deliver on its goal to manufacture large generators for offshore wind locally.

According to David Latimer, Chief Executive Officer at Magnomatics, PDD is much more efficient and reliable than conventional direct drive and mechanically geared systems. It doesn't have meshing gear teeth, a feature that greatly improves the lifespan of the technology because it eliminates friction.

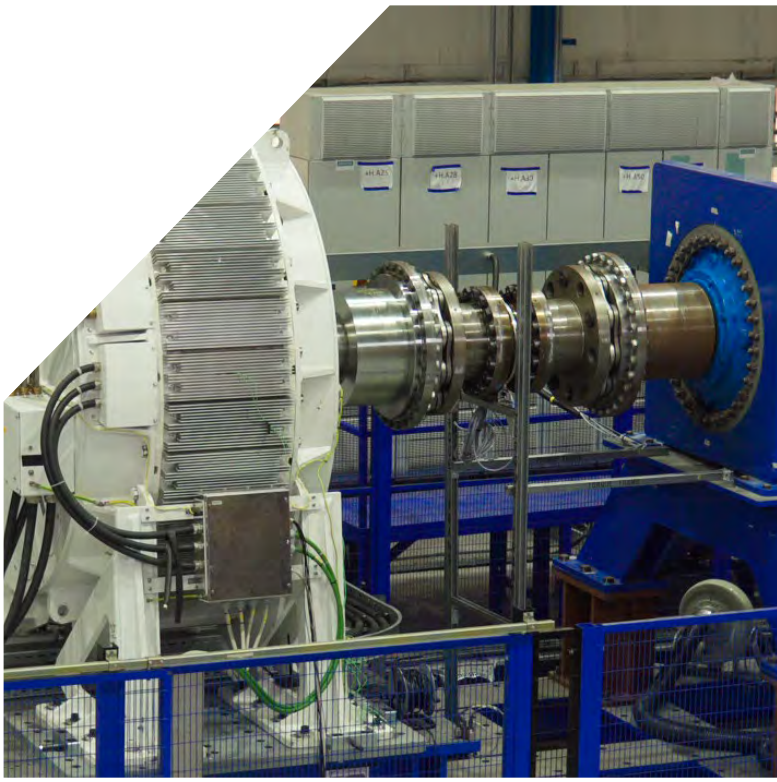
This enhanced efficiency should also lead to price efficiencies in the market. Gearboxes commonly cause component failure in offshore wind technology, leading to high maintenance costs.

David said: "The cost of electricity will be cheaper, which should help drive down the cost of renewable energy. This also makes it more likely to be adopted."

Part of this innovative new technology is a pole piece rotor (PPR), a cylindrical structure made up of multiple axial steel pole pieces within a non-magnetic composite structure. During the project, Magnomatics developed computer-based modelling software that was used to design robust PPRs. This work included dynamic modelling of pole piece loads to better understand the behaviour of the PPR under wind turbine loads and cycles.

David says the current average capacity (potential energy output) of each UK offshore turbine is 4.4 megawatts (mw), but new installations are now 9mw, with 20mw turbines on the horizon. Independent analysis shows that applying Magnomatics' technology to all wind turbines currently installed in the UK would create an additional 3% of energy.

David said: "That may not sound like much, but you would save around 900,000 tons of CO2 per annum when compared to that energy being generated by the non-renewable UK grid."



Plus, because the technology does not suffer the same wear and tear issues as gearboxes, it will not need replacing. Currently, gearboxes need replacing at least once during a turbine's 20-to-25-year lifetime. As the industry is working towards wind turbines lasting 30 or 40 years, it is increasingly imperative that the technology and all the component parts are robust and long lasting.

As well as the R&D findings of the project, Magnomatics has commercialised the product and recently secured an order from an engineering partner worth £1.6 million. The technology can also be applied to rail, marine propulsion and industrial drives, improving efficiency and reducing CO2 emissions in those sectors as well.

Funding & project size

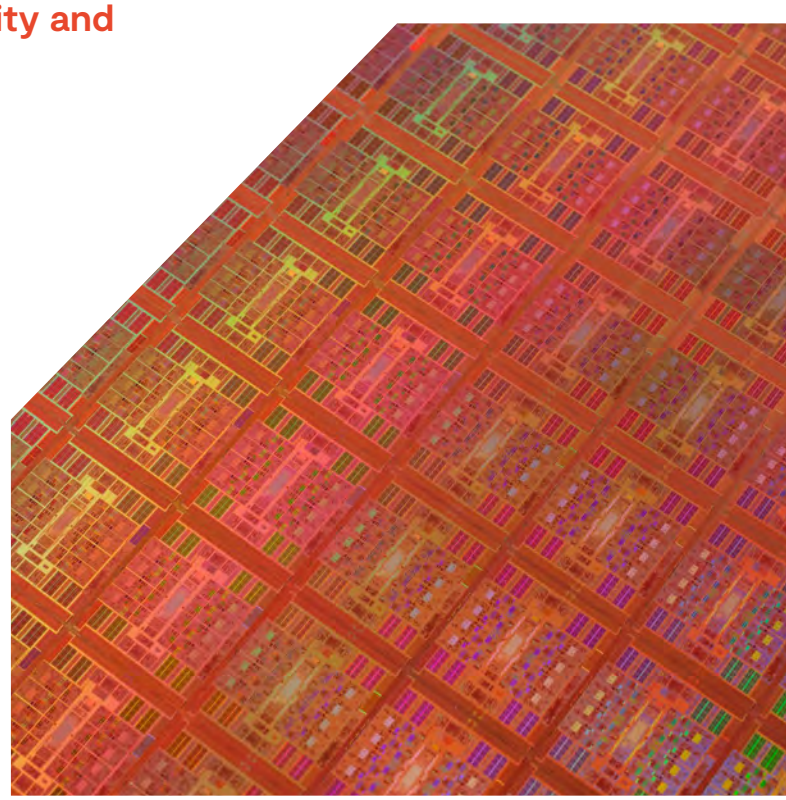
Total project costs: £468,882

Driving the Electric Revolution funding: £363,460

Consortia members

- Magnomatics Limited
- Offshore Renewable Energy Catapult

80731: Trench Clustered Insulated Gate Bipolar Transistor (IGBT) Manufacturing Process Capacity and Productivity Improvement



Description

The IGBT component is mainstream in PEMD switching semiconductor device applications. Semefab's application is based around establishing patented 1,700V Trench clustered IGBT (TCIGBT) manufacturing capability at Semefab in Fab 3 on 6-inch wafers.

This will create a high current density, high performance component applicable to mainstream industrial drive, solar, wind farm and electric vehicle applications and create a platform for higher and lower voltage applications.

Funding & project size

Total project costs: £498,183

Driving the Electric Revolution funding: £338,424

Consortia members

- Semefab Limited
- University of Sheffield
- Eco Semiconductors Limited

81035: Conmotator: Advanced, Integrated Machines for Efficient Manufacture & Operation

Description

The 'Conmotator' project (combined convertor-motor to electronic commutator) project investigates and addresses the key technological, integration and manufacturing challenges to allow the commercial exploitation of an integrated electrical machine where the power electronics and motor are contained within a single physical unit at the multi-MW level.

The project develops and tests the interfaces that bridge between existing motor and drive elements and investigates manufacturing/supply chain aspects related to megawatt scale integrated electrical machines to pave the way for full commercial exploitation, targeting the benefits at a worldwide market, placing UK industry as world class leader in this field.

Funding & project size

Total project costs: £300,213

Driving the Electric Revolution funding: £195,107

Consortia members

- GE Energy Power Conversion UK Limited
- University of Nottingham

81136: EV-Join

Description

The EV-Join project will provide a user-friendly software tool that addresses major issues faced by companies developing electric vehicle (EV) systems such as calculation of production rates and costs to aid a user in selecting a production process, production line planning processes and manufacturing process understanding to achieve in service requirements.

With this, EV-Join will enable reduced time-to-market, more efficient selection of joining process, increased productivity and reduction in repairs and scrap and reduced and potentially eliminated need for expensive and time-consuming post-weld Non-Destructive-Testing.

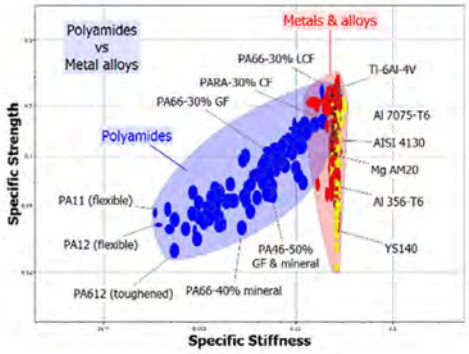
Funding & project size

Total project costs: £235,288

Driving the Electric Revolution funding: £152,911

Consortia members

- Granta Design Limited
- The Welding Institute



Building Talent for the Future

10018142: Skills and Talent Insight Platform for PEMD

Description

This project will further develop the labour market analytics platform (Stratigens™) to identify existing locations for PEMD skills and to identify adjacent skills pools that could be accessed by companies needing to find talent to drive the electric revolution. By creating a specific PEMD skills module that will define the PEMD skills gap, identify pools of talent and pools of talent that could be upskilled or reskilled most easily, we can specifically address the skills and talent needs of the PEMD sector.

The traditional approach for companies to get this talent and skills insight is to spend considerable time on research projects with external consultancies. The PEMD version of Stratigens™ will provide insight within seconds, at a fraction of the cost of traditional research approaches. This innovative approach focuses on the skills gap, accessibility and potential to upskill and reskill for very specific skills using large, aggregated external datasets we have already developed. The retraining of our machine learning module to identify adjacent skills for retraining will help companies in the PEMD space understand their skills supply chain, enabling them to make data led workforce decisions with confidence.

Project costs

Driving the Electric Revolution funding £24,649

Company involved

- Talent Intuition Limited

10018277: E3x2

Description

The E3 Academy has operated with great success for 14 years, delivering high quality graduates to a group of Tier 1 and SME companies operating in the PEMD space. It provides students with a scholarship through their undergraduate degree programmes as well as focused vacation training and an annual summer school where students build valuable networks from diverse industrial and academic backgrounds.

This project will bring together the necessary collateral and present it in a truly compelling manner to companies in the PEMD space across multiple industrial sectors.

Funding and project costs

Driving the Electric Revolution funding £19,925

Company involved

- E3 Academy

10018575: Promoting Opportunities for UNder-represented Communities in power Electronics, machines and drives (POUNCE)

Description

Historically, the PEMD sector has been viewed as very traditional with relatively limited opportunities for wider participation and engagement. The age demographic has meant that there are relatively few accessible role models for current students. This is especially true for those that come from underrepresented communities, such as Black and Minority Ethnic (BAME), those from areas with low participation in the higher education sector and female students. Furthermore, as an underpinning and often hidden technology, it is not an obvious first choice of career for students.

POUNCE aims to develop two activities to support the call goals.

The first is the production of on-line material hosted by UK Electronic Skills Foundation (UKESF) and Aston University, via the Greater Birmingham and Solihull Institute of Technology and promoted widely within the UK education sector.

The second is an intervention focused directly on underrepresented engineers and will involve an in-person event for 30 engineering students. This event will serve as a proof-of-concept that, going forward, can be used to help SMEs and larger companies engage in a group recruitment process that encourages diversity.

POUNCE will build on Aston's reputation for inclusive engineering education, UKESF's wide industry connections and FluxSys's technical expertise in this area. Together this will enable the partners to reach out to diverse student communities and deliver an impactful event that has ongoing sustainability through the online material and a trial recruitment model for reaching underrepresented communities.

Funding and project costs

Driving the Electric Revolution funding £24,984

Consortia members

- Aston University
- UK Electronic Skills Foundation

10018587: Power Electronics Packaging – Training and Upskilling

Description

Power Electronics Packaging determines the performance, reliability and costs of power modules and is often overlooked at the design process stage. Knowledge of the materials and assembly processes resides within a limited cohort of electronics packaging engineers and there is little visibility of the multi-disciplinary nature of the work at schools/colleges and Universities.

IMAPS-UK (International Microelectronics Assembly and Packaging Society - UK Chapter) aims to prepare and introduce a Power Electronics Packaging Training Course based on basic, intermediate and advanced levels. Designed to introduce power electronics packaging to schools/colleges and Universities through to detailed training to assist in upskilling and reskilling personnel for the manufacture and testing of power modules.

Funding and project costs

Driving the Electric Revolution funding £24,962

Company involved

- IMAPS-UK

10019981: Beyond Ubiquitous: The role of Wide Band-gap Semiconductors in Electric Aircraft

Description

Power electronics are a key enabling technology in a wide range of fields that are critical to the achievement of the net zero carbon agenda. One of the main challenges facing engineers is the realisation of carbon neutral aerospace. With the requirements for ultra-high efficiency, highly reliable power electronic systems that occupy a limited volume, being the critical challenge. These aerospace requirements provide a different challenge to those posed by electric vehicles and renewable energy integration.

For aerospace applications, the need for higher operating temperatures, the increased risk of lightning strikes and the enhanced cosmic ray flux mean that aerospace faces unique challenges that require different skills to other fields. These differences mean that concepts that are taught in conventional power electronics courses, both within academia and industry do not equip engineers with the unique skills required.

This project addresses that need, by providing training for people working in the aerospace industry and has been designed specifically to ensure that the UK maintains its leading position in the electrification of aircraft.

Funding and project costs

Driving the Electric Revolution funding £24,952

Company involved

- Nascent Semiconductor Limited

10020386: Continual Professional Development – refocusing talent into the PEMD sector

Description

The transition to zero-emission transport technologies will have a significant impact on both the oil and gas and automotive sectors, with many people finding that they do not have the understanding or awareness of what is involved in low-carbon transport to be able to easily make the transition into new roles as their existing roles become redundant. At the same time, the low-carbon transport industry is dangerously short of experienced workers especially those in the PEMD sector, which if left un-tackled will impact upon the UK's competitiveness.

This project, through the provision of accredited Continual Professional Development training on low carbon transport technologies, combined with the publication of an associated handbook, is the first step in meeting this need.

The course will be developed and delivered by Centre of Excellence for Low Carbon and Fuel Cell Technologies (Cenex), a leading research technology organisation and has been working on low carbon transport innovation since 2005.

Funding and project costs

Driving the Electric Revolution funding £24,966

Company involved

- Cenex (Centre of Excellence for Low Carbon and Fuel Cell Technologies)

10020638: POWERED-PEMD: POWering Engagement, Re-skilling, Education and Diversity for PEMD

Description

The power electronics and related semiconductor industry is booming, with over 100,000 high skilled jobs in the sector in the UK. The project will engage and train a new generation of apprentices and students to feed into the UK Power Electronics industry. This is essential to meet the immediate and future industry demand for new employees in PEMD technology and applications.

The project will develop a unique range of innovative outreach, Continuous Professional Development and training materials for a range of participants of all ages.

Content will include:

- taster courses
- online web content
- podcasts
- interactive Apps to market the PEMD sector
- hands-on workshops
- site visits for pupils and teachers to manufacturing facilities and semiconductor fabrication plants

The "open access" programme will expose people of all ages to the total PEMD chip-to-module supply chain. Expanding the equality, diversity and inclusion of the sector is a key goal.

The courses will be advertised to an audience of 1.1 million Dragons' fans and deliver taster sessions to over 60,000 school children.

Funding and project costs

Driving the Electric Revolution funding £24,990

Consortia members

- Swansea University
- CS Connected Limited
- Newport Wafer Fab Limited
- SPTS Technologies Limited
- WRU Gwent Stadium Limited

10020861: TransPLANT: Transferring Power electronics Learning Across differeNt Technologies

Description

TransPLANT is an initiative to train experienced mechanical engineers so that they can apply their engineering knowledge and experience to power electronics engineering.

Our vision for the project is to establish the foundations of a retraining approach to directly address the:

- shortage of power electronics engineers
- risk of job losses to mechanical engineers

The objectives of the project are to:

- introduce the fact that fundamental engineering concepts are common across all engineering disciplines
- encourage senior managers in engineering firms that retraining of mechanical engineers directly addresses the shortage of power electronics engineers while reducing the risk of job losses to mechanical engineers as the industry migrates to zero-carbon technologies
- develop the foundation of a training course by identifying the principal engineer concepts that must be 'mapped' from mechanical to electrical

Funding and project costs

Driving the Electric Revolution funding £25,000

Company involved

- Lyra Electronics Limited

10020870: PEMD Sector Skills DNA

Description

The skills gap within the PEMD sector is easy to see and comment on, but difficult to articulate in detail. The sector will struggle to grow and be internationally competitive unless the UK actively works on solving the challenge for staff with the latest skills in this crucial sector.

To provide insights, the project team will analyse millions of documents from job specifications, adverts, CVs and education curriculum documents to define the skills gap from supply and demand data. The team will achieve this by using natural language processing and unsupervised learning techniques such as Clustering and Topic Analysis on the body of text to analyse the insights which exist.

The output from this project will also allow the overall Challenge to learn from the most important skills gaps which exist today, whilst focusing future phases on the most impactful interventions.

The project will produce a dataset which can be shared to highlight the skills gap in the north east and will showcase the skills gap using a new visualisation web portal.

Funding and project costs

Driving the Electric Revolution funding £24,263

Consortia members

- The North East Automotive Alliance Limited
- Geek Talent Limited

10021161: DriveLAB teaching and training products - Developing and delivering a pilot stage to meet the needs of academic, SME and industry for the training of electrification topics

Description

The electric motors and power electronics sector is experiencing rapid growth and requires a step-change in workforce skills and knowledge to exploit the opportunities created by cross-industry electrification. Educational establishments do not currently offer coherent courses for electrification. Often split between electrical engineering, mechanical engineering and materials engineering.

Consequently, we have a massive shortfall in electrification-competent trainees and engineers in the UK market. DriveLAB based training is a key tool to support the re-training and re-skilling of new and existing workforces to become productive in electrification industries.

DriveLAB, is a hands-on safe-voltage modular electric motor that helps accelerate the skills and learning of electric machines design and manufacturing

The unique DriveLAB modular motor product is specifically designed to expose and highlight core topics necessary to equip students and industry with abilities to design, specify, assemble and operate a wide variety of motor technologies.

Most importantly, by being a hands-on safe-voltage system, DriveLAB accelerates learning and development through an experiential teaching method. This aims to delivers skills growth at a faster pace than classroom training alone.

Our proposed project will accelerate the roll out and validation of the DriveLAB system across three core areas of industry.

Funding and project costs

Driving the Electric Revolution funding £24,946

Company involved

- FluxSys Limited

10021552: Boosting the Readiness of University Graduates for Power Electronics Market

Description

The project aims to establish a curriculum framework for Power Electronics which is supported by industrial inputs and more recent knowledge.

The project will help to accelerate the response time to market, increase the availability of suitably skilled engineers and bring recognition to the power electronics discipline.

Funding and project costs

Driving the Electric Revolution funding £24,898

Company involved

- Sheffield Hallam University

10021553: Advanced Winding training System for Electrical Machines (AWSEM)

Description

Advanced Winding training System for Electrical Machines (AWSEM) will build on results from the recently conducted project on Advanced Hairpin Windings and develop an online training platform to drive the adoption of this technology within the UK PEMD supply chain.

The tool will include easy to follow methods for design of hairpin windings, including online presentation of design guidelines that will be easy to update in future as new knowledge is created and the field of knowledge evolves.

Funding and project costs

Driving the Electric Revolution funding £24,928

Consortia members

- University of Nottingham
- Agile Manufacturing Power Systems Ltd

10021713: PEMD Skills Programme Bootcamp

Description

This project aims to continue the successful design and implementation of skills bootcamps focusing on the skills required for the design and manufacture of PEMD electronic systems. This project will lay the groundwork for a larger bootcamp planned for 2022 and will provide PEMD specific engagement and outreach to enthuse a potential workforce at all levels and ages to help drive the race to net zero. Initially focused in the north west, the project hopes to support further initiatives across the UK.

Funding and project costs

Driving the Electric Revolution funding £24,639

Company involved

- Tech Lancaster Limited

10021753: Web-Based Platform for Training in Thermal Design of Electric Motors

Description

Designing effective cooling systems for electric motors is essential to ensure reliable operation. As the electrification revolution continues, more powerful motors are required to replace the fossil-fuel burning status quo. As power density increases, so does the amount of heat that requires dissipating. Detailed thermal design is crucial for electric motors to meet these ambitious performance goals.

The need for specialist thermal engineering skills in this sector is increasing, and currently, the demand for this still outstrips supply. As a result, many motor developers rely on engineers without formal thermal engineering training to undertake this aspect of the design.

This project addresses the talent shortage in two ways:

1. Provide engaging, hands-on training to engineers in the workforce, equipping them with knowledge and tools for performing thermal analysis
2. Improve the quality of thermal engineering education at teaching institutions for the next generation of engineers entering the workforce

This will be achieved by delivering transformational teaching and training of thermal engineering practices and simulation procedures, delivered through an online simulation platform.

The project will take the first steps towards the development of a comprehensive thermal engineering education tool, targeted at electric motor developers and teaching institutions.

Funding and project costs

Driving the Electric Revolution funding £24,919

Consortia members

- Electric Cooling Solutions Ltd
- University of Nottingham

Notes

UK Research and Innovation

For more information contact:
DER@iuk.ukri.org

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