

CSA Catapult 2018-2022: the story so far

We work with Innovate UK



csa.catapult.org.uk

CATAPULT
Compound Semiconductor Applications



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01

Introduction

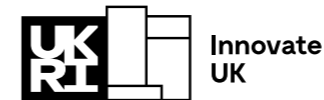
About us

Our vision

Our vision is for the UK to become a global leader in developing and commercialising new applications for compound semiconductors.

Our mission

As a Catapult established with investment from Innovate UK, we are here to work with a range of industries to grow the contribution of compound semiconductor technologies to the UK economy.



How we support industry in the UK

We help a wide range of industry sectors bring their next generation compound semiconductor-based innovations to market. We also help companies to start using compound semiconductors to make their products and, therefore, the UK more competitive. Our support removes barriers to innovation and commercialisation by creating interventions, minimising risk, and accelerating the route to market through:

- **the world-leading technical knowledge and expertise of our team**
- **our extensive, cohesive research and capability network**
- **the world-class, state-of-the-art facilities at our Innovation Centre**
- **our team's specialist market intelligence and commercial expertise**

The industries we support:

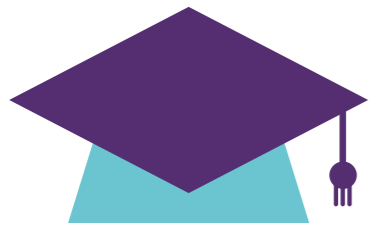
- **Transportation**
- **Clean energy**
- **Smart industry**
- **Digital Communications**
- **Defence & Security**
- **Space**

Our areas of expertise:

- **Power electronics**
- **Radio Frequency (RF) & Microwave**
- **Photonics**
- **Advanced Packaging**

Our team

29



29 PhDs

93



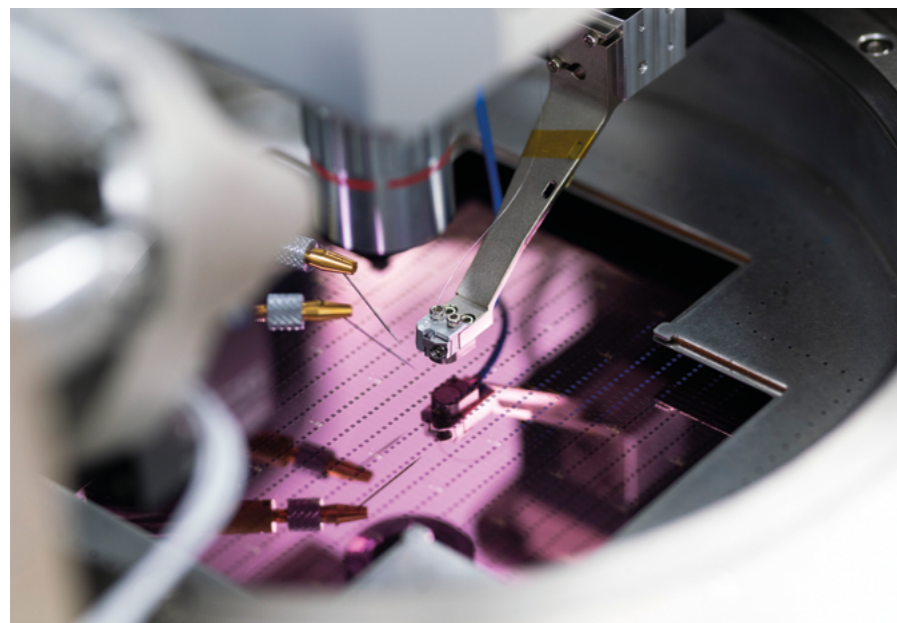
93 Employees

Our impact

We leverage research, eliminate barriers, minimise risk, accelerate routes to market and attract investment for our collaborators in industries where compound semiconductor technologies have transformative capabilities.

We help organisations develop new and improved products, identify new markets and stimulate demand for compound semiconductor technologies across the UK supply chain. We help people acquire new skills, and policy makers form future perspective.

We continually monitor and evaluate the impact we have, through research, project reviews and case study development. In Summer 2022, we surveyed our customers to understand our impact, with the following key findings:



93%

said they would work with the CSA Catapult again

56%

would not have been able to progress on new developments, or it would had taken longer or cost more, if they have not worked with the CSA Catapult (according to those who answered the question)

43%

secured private sector funding as a direct or indirect result of working with the CSA Catapult

100%

have been able to develop new partnerships

44%

secured public sector funding because of their direct or indirect engagement with the CSA Catapult

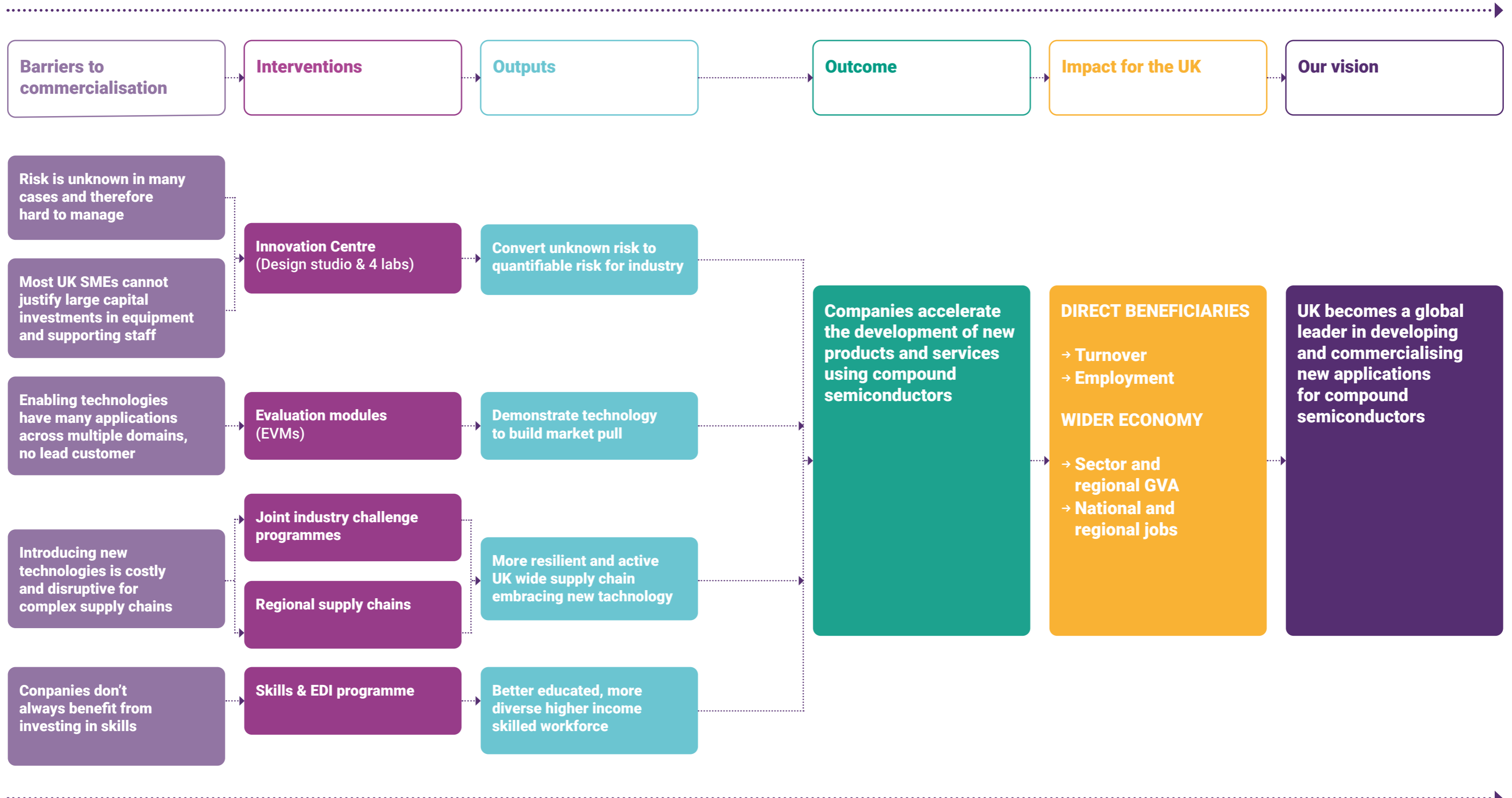
20%

agreed they have stronger international links

30%

agreed they have been able to target new markets because of working with the CSA Catapult

How we work



Outputs and outcomes

£14m



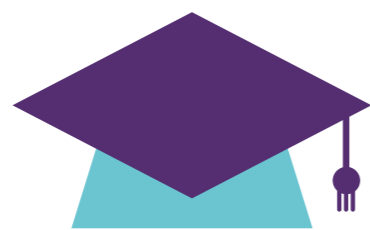
Collaborative Research and Development (CR&D) projects won

5093



5093 UK jobs forecast to be created/safeguarded

68%



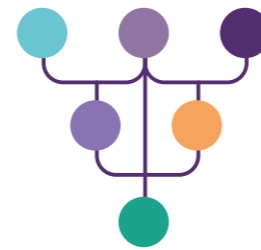
of our project partners are academic

10



international partners secured

84



collaborations with universities and research institutes

£177m



direct investment leveraged

£224m



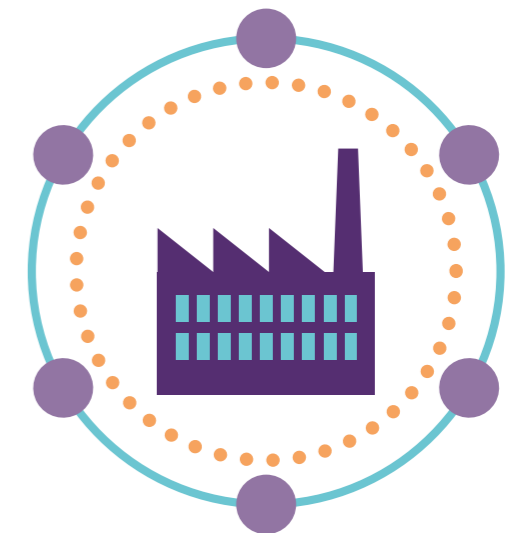
collaborative project pipeline established

51



research & development (R&D) projects delivered/underway/completed

180



collaborations with industrial partners

Chair's statement

Since setting up this Catapult four years ago, despite two of those years being affected by the Covid pandemic, the impact of our work is now beginning to be significant in ensuring the outcome-focused projects will support sustained UK compound semiconductor industry growth.

At the time of writing, the Catapult has more than 180 collaboration partners. The compound semiconductor industry is expected to grow from a current market value of \$67 billion to over \$350 billion in ten years. Thus, our ambition of growing the UK proportion of the global market by at least 1% will create a sizeable economic return, benefitting companies across the UK in what is going to be an increasingly competitive global market.

This will require sustained coordination, maintaining the UK's academic lead, and aligning the industry with the greatest global opportunities; the Catapult is playing a central coordination role.

To deliver that vision, we must continue to grow our collaborative activities, find new opportunities to work with industry, accelerate commercial scale-up, upskill a new generation, safeguard intellectual property and reach out to new international partners to address new and emerging markets. I am thus excited by our current endeavours, not least the launch of our Skills Academy.

I would like to take this opportunity to thank our first Chair, Kevin Crofton, for his inspirational leadership during the Catapult's first years, taking us from a start-up to being the leading neutral convener as well as a major commercial partner in the UK's compound semiconductor research and development ecosystem.

I am very proud of the contribution which the Board, executive and employees together have made to deliver the Catapult's multiple successes. I would also like to thank Angela Noon, who stepped down from the Board in July 2022, for her contribution during her three years on the Board.

As the Catapult continues to move forward, we will focus on connecting the capabilities of the UK through a regional network of offices and facilities that focusses on key clusters around the UK. I look forward to you being able to read about their progress in the next annual report. This annual report, the first that we have formally produced, covers the period 2018-2022.



Rob Bryan
Interim Chair
December 2022

Chief Executive Officer statement

Today, the Catapult is at the heart of the flourishing UK compound semiconductor ecosystem, with clusters providing strength-in-depth and a powerful international proposition.

We are working to grow the UK compound semiconductor sector with academia and industry through increasing product development, testing and evaluation, the identification of significant new domestic and international markets, and through the creation of effective end-to-end supply chains.

While the past three years have seen significant progress, the pace of developments at the Catapult has certainly accelerated over the past year since the impact of the pandemic began to recede. We have around one hundred employees, forged some significant international partnerships and entered a strategic innovation partnership with Siemens to accelerate the development of leading-edge power electronics capability. This partnership model, a first for both companies in the UK, will focus on the development of disruptive power electronics and building advanced skills.

We have also been delighted to be able to welcome more of the most talented next-generation students, interns and stakeholders to our state-of-the-art Innovation Centre.

And so, the Catapult is underpinning a growing UK success story and a promising future, with support and collaboration from government, industry, and academia.

Compound semiconductor applications have unrivalled power to help us thrive, connect, and explore. Next-generation technologies, from electric vehicles to satellite communications and remote health monitoring, require them; our journey to Net Zero cannot be achieved without them. And, most excitingly, the UK is equipped to lead the world in their design, development, and commercialisation.



Martin McHugh
Chief Executive Officer
December 2022

02

Growing the UK Compound Semiconductor Industry

Since our standing start in 2018, the CSA Catapult has built a team of around 100 talented colleagues and 29 PhDs, as well as a state-of-the-art Innovation Centre with unique facilities.



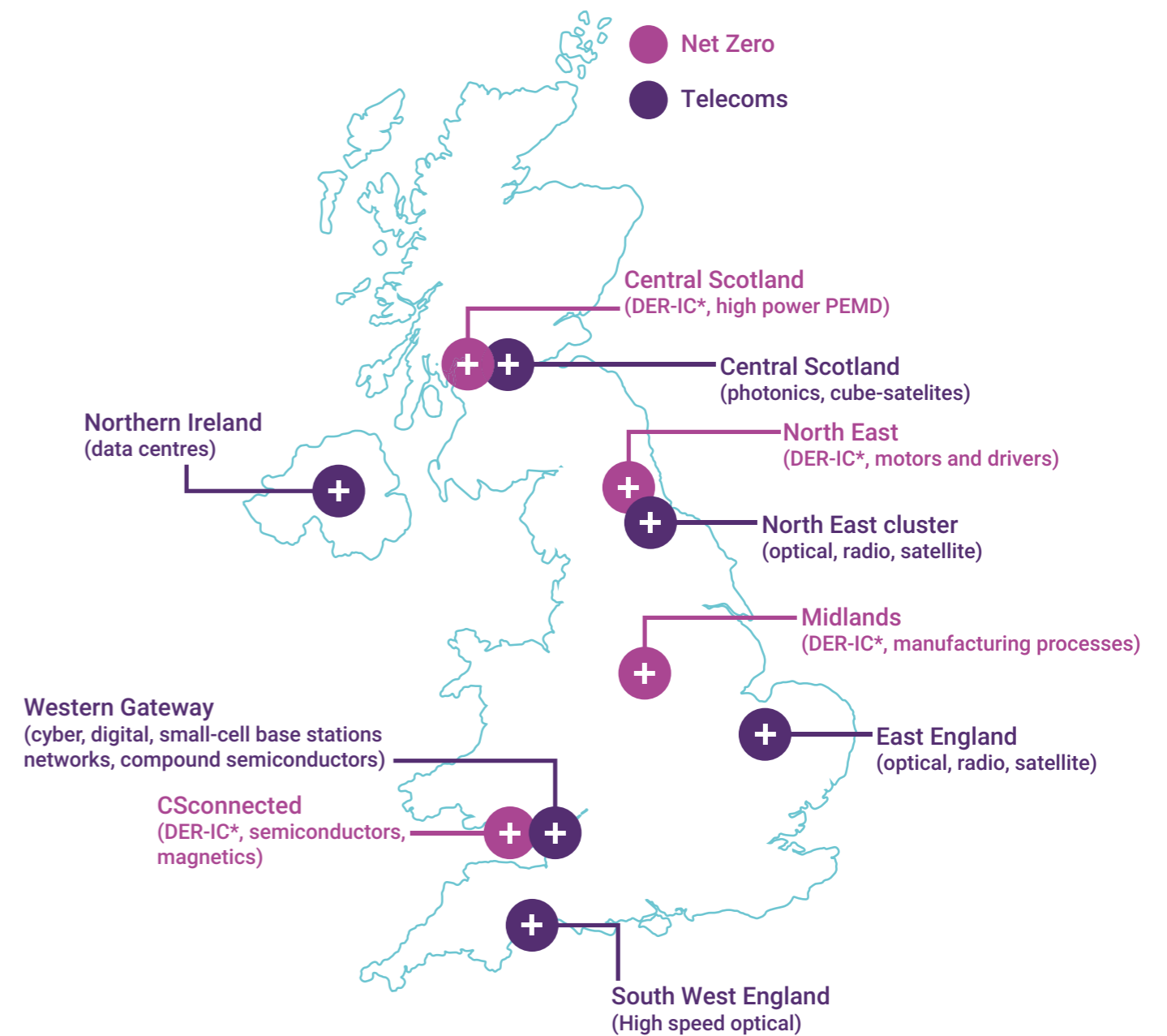
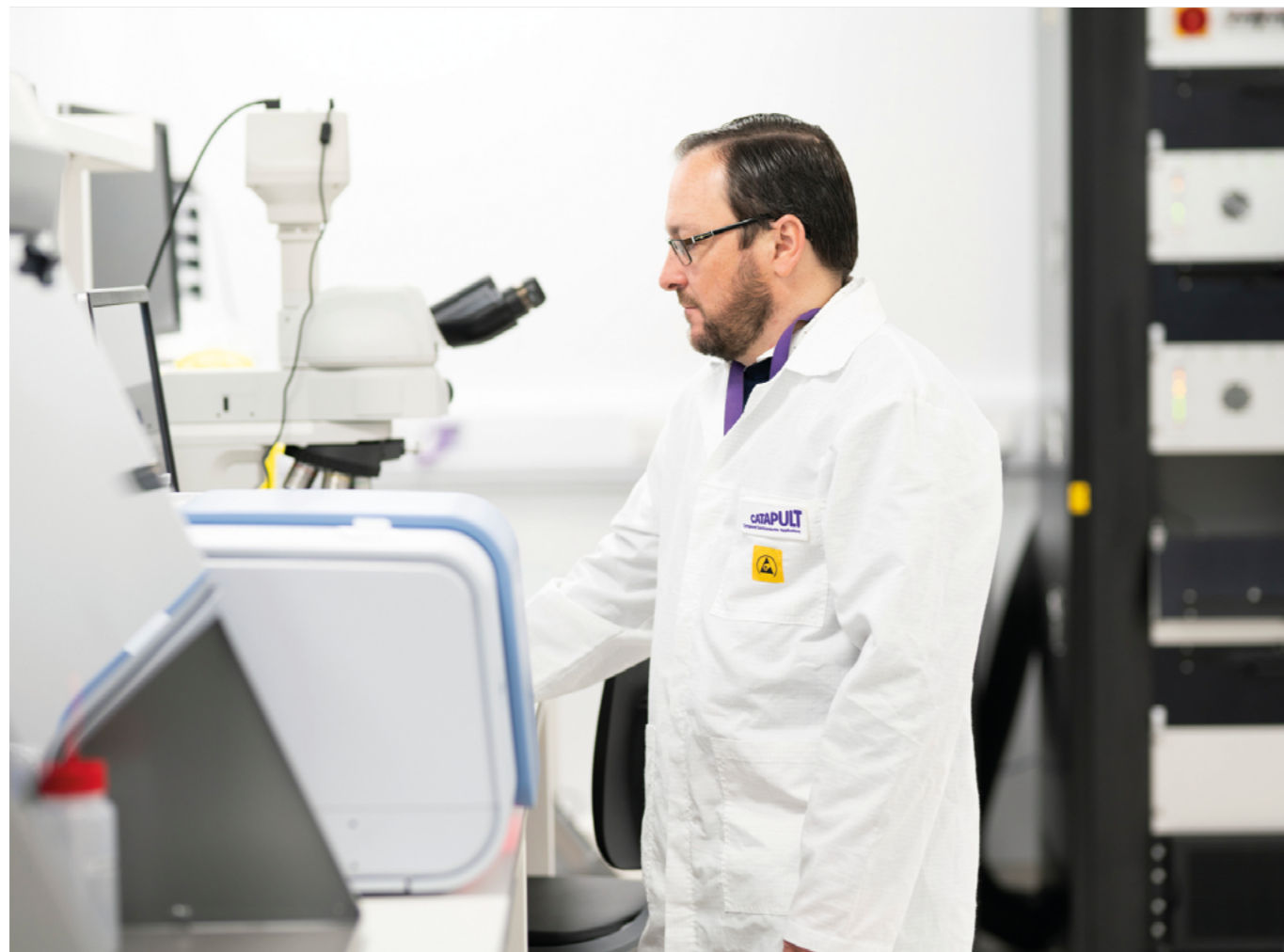
Since 2018, we have started work on over 50 projects which involve more than 100 partners and are currently valued at £177m. These projects are transforming the UK's electronics sectors, from advanced electric vehicles to remote monitoring of rail infrastructure.

Our collaborative projects and other activities are forecast to create or safeguard more than 5000 jobs. Over the next ten years, the activities of the Catapult are forecast to generate over £500m gross value added to the UK economy, as the companies we are working with grow their businesses.

We focus on two key areas, Future Telecoms and Net Zero, where the transformational potential of compound semiconductor applications is both understood and prioritised internationally. It is also where they can make the most significant economic impact.

Our collaborations focus on developing new markets and UK semiconductor supply chains to enable next-generation technologies in both Future Telecoms and the drive to Net Zero.

Since 2018, we have worked with 400 companies who design and manufacture electronic systems, as well as leading universities all over the UK.



* Driving the Electric Revolution Industrialisation Centre

03

Future Telecoms

The opportunity:

Compound semiconductors enable the technologies required for high-speed internet services, such as 5G and next-generation satellite communications.

The imperative:

In the context of the National Security and Investment Act 2021 and the restriction of the transfer of technologies of strategic national importance, the Catapult is developing supply chain consortia. These will prepare the ground for UK companies to deploy a larger proportion of future telecoms infrastructure both domestically and for export.

CASE STUDY:

Building resilient supply chains

Supported by the Welsh Government, the £5m GaNforCS (gallium nitride for connectivity and security) project involves 12 partners.

The opportunity:

To create a UK supply chain for RF gallium nitride (GaN), the essential compound semiconductor for 5G, wireless networks and satellite communications, to provide UK sovereign capability and export potential.

Our role:

- **Creating an end-to-end supply chain**
- **Bringing together academia and industry**
- **Translating research into commercial production**

Outcomes:

- **This will create the ability to scale to mass production providing sovereign UK capability to support UK defence and high-volume customers focussed on future communications, as well as significant export potential.**

Trialling future technologies

Our open-access base station system puts the Catapult at the heart of Open RAN (Radio Access Networks) developments, ready to exploit a rapidly emerging global market. Using the GaN process developed in SMART Expertise, we will explore GaN transceiver designs and evaluate their performance when integrated within the base station.

This forms part of a £36m investment from the Department of Digital, Culture, Media & Sport (DCMS) to support secure 5G telecoms supply chain diversification.

“The support of the CSA Catapult is critical to enabling the translation of our cutting-edge research outputs into tangible commercial offerings.

“The Catapult’s ability to work across the entire supply chain and bring in end-users has been critical to the successful formation of the consortium and progress of the project to date.”

Professor Paul Tasker
Cardiff University

CASE STUDY:

Identifying new international telecoms markets

In 2017, the Catapult identified significant international market opportunities for the UK compound semiconductor industry in future telecoms. There are now five areas of UK-India collaboration, with further opportunities in electrification on the horizon.

The opportunity

In July 2021, the Catapult was awarded a £180,000 grant by UK Research and Innovation (UKRI) to explore opportunities for UK and Indian companies and universities to collaborate on joint research and innovation projects to meet the requirements for future telecom networks.

Five technology streams were explored with the aim of addressing the challenges of cost-effective, secure digital access while reducing energy usage across the network.

Our role

Between October 2021 and March 2022, we ran a series of online consultations with around 180 companies and universities from India and the UK. In Spring 2022, CSA Catapult led a UK delegation to India’s technology hubs to discuss the programme with government officials, industry, and academia.

In Summer 2022, we welcomed a delegation of senior Indian telecoms executives to meet with UK Ministers and the UK telecoms industry.

Outcomes

- **We identified key technologies required for future telecom networks that could be developed by UK and Indian companies and academics; they include 5G technologies in the short term to longer-term developments in quantum and satellite communications.**
- **Our consultations played a key role in informing the telecom chapter of the India-UK Free Trade Agreement.**
- **The consultations provide a sound baseline for future bilateral funding agreements with India.**
- **The CSA Catapult was asked to run a similar programme with India exploring opportunities relating to vehicle electrification.**

04

Accelerating the UK towards Net Zero

The opportunity: Silicon carbide (SiC) semiconductors provide breakthrough performance in vehicle electrification.

Power electronics are at the heart of automotive electrification, managing and optimising the power transfer between the battery (or fuel cell) and the electric motor.

Underpinning them with compound semiconductors (SiC) delivers unprecedented and significant performance and cost advantages to create lighter, more powerful vehicles with greater range.

“The Catapult has made tremendous progress since its founding in 2018, initiating dozens of innovative projects worth over £177 million. These projects include the development of advanced electronics for electric vehicles, energy efficient systems, quantum, and telecommunications systems of the future as part of our commitment to driving positive change and making impactful collaborations in these exciting applications and beyond.”

Amar Abid-Ali
Chief Commercial Officer

Our role:
UK companies already innovating in this area require expertise and innovative facilities to develop and commercialise their prototypes. This is where we come in.

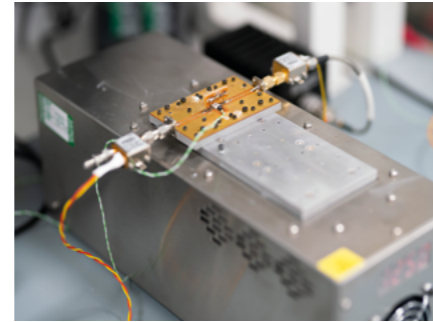
Our Innovation Centre includes a design studio and world-leading test and verification laboratories – facilities of strategic importance to the sector which do not exist together elsewhere.

These facilities, our technical expertise and that of our academic network, plus our ability to create new supply chains, are helping UK companies to build these advanced technologies.

Outcomes:

Creating a complete end-to-end supply chain for this key component to be used in all electrified vehicles whether automotive, railway, marine or aviation will:

- be a first for the UK
- position the UK at the centre of the Net Zero economy and a power electronics market predicted to be worth £5 billion by 2026
- safeguard over 200 jobs
- attract a further £66m of industrial investment in SiC research and development and capital expenditure



CASE STUDIES:

Vehicle Electrification

We are involved in three projects that are accelerating electrification and the drive to Net Zero. The projects are helping create UK competitive advantage by building end-to-end UK supply chain capability and confidence, as well as enabling mass production and driving future innovation right across the UK.

ESCAPE

The opportunity:

This is a £20m project, part-funded by a £9.7m grant from the Advanced Propulsion Centre (APC), to develop an end-to-end SiC supply chain to underpin power electronics components and systems for McLaren Applied electric vehicles.

Our role:

- Testing and validation
- Creating an end-to-end supply chain

Outcomes to date:

- The principle of using an 800v SiC converter is proven
- McLaren Applied delivered the motor powertrain, enabling faster vehicle charging using 800v-rated SiC semiconductors provided by Clas-SiC Wafer Fab Ltd in Fife
- Two markets were created, enabling Clas-SiC to achieve economies of scale
- Turbo Power Systems in Gateshead developed rapid charging technology for the UK market, currently estimated at demanding more than 120,000 rapid and 60,000 ultra-rapid vehicle chargers by 2030. We provided design expertise and modelling software



13 partners



**203 jobs created/
safeguarded**

“As the first of its kind, the ESCAPE project gives McLaren Applied a competitive advantage in the race to create a full UK supply chain for automotive power electronics. The Catapult’s testing and validation capability is vital to this project, perfectly complementing the activities of the other 12 partners.”

Stephen Lambert
Head of Electrification
McLaren Applied

@FutureBEV

(Accelerated Technologies for Future Battery Electric Vehicles)

The opportunity:

Accelerated Technologies for Future Electric Vehicles (@FutureBEV) aims to develop a UK supply chain for future generations of Battery Electric Vehicles (BEVs).

Premium automotive global company BMW is bringing together a development team including Custom Interconnect Ltd (CIL) and Lyra Electronics from industry, the CSA Catapult and the University of Warwick (UoW).

The team will develop a new UK supply chain for sub-components and system capability for future electromobility addressing UK Government targets for industrial growth, generation and safeguarding of jobs, and the transformation to zero emission mobility. The technology will drive BEV from niche to mainstream.

The project will be delivered through two strongly interlinked workstreams addressing volume and performance.

Part-funded by a £15m grant from the APC, this project is creating a UK supply chain that can support the transition of BMW SiC-based power electronics in their future generations of BEVs.

@FutureBEV lays the foundation for 800v inverters, significantly exceeding the APC (Advanced Propulsion Centre) 2035 and further industry targets. As charging times come down and efficiency improves, industry anticipates increased consumer demand and sales, heralding potential new business with a major automotive manufacturer for the UK supply chain.

Our role:

- **Concept design through to prototyping for high value electric inverter component**
- **Project management of the consortium**
- **Testing and validation**



6 partners



**100 jobs created/
safeguarded**

“The @FutureBEV project is accelerating the uptake of battery electric vehicles, placing BMW firmly at the forefront of this exciting technology.”

David Bock
Project & Technical lead, BMW

**Driving the Electric Revolution
Industrialisation Centres (DER-IC)**

The opportunity:

These centres of excellence will enable industrial and academic partners to develop and scale new power electronics technologies and manufacturing processes. Applying these electrification technologies more broadly to sectors including automotive, rail, marine and aerospace will unlock £10 billion in power electronics and £2 billion in electric machines, as well as contributing to Net Zero.

Our role:

CSA Catapult is one of the four regional centres for DER-IC, funded by a UK-wide £80M investment from the Industrial Strategy Challenge Fund.

We also secured industry support of around £150m.

Outcomes:

- **Several ‘fast-start’ projects are already underway. One of these is with YASA, developer of the world’s highest performance electric motors in terms of power density, which is creating new thermal management solutions to take their patented technology to new, world-leading levels.**

“Advancing technologies for power electronics, machines and drives is at the heart of this challenge, and I am excited that we are working closely with the Catapult on these fundamental Net Zero technologies.”

Prof Will Drury
UKRI Challenge Director
Driving the Electric Revolution

**Creating intelligent, energy-efficient
infrastructure for Network Rail**

The opportunity:

This project developed Spectrail, an Internet of Things (IoT) sensing platform which enables intelligent infrastructure.

Our role:

Sensor integration and data transmission.



5 partners



**TRL 7 Tech
readiness**

05

Translating Research

The opportunity:
In the field of compound semiconductors, UK academics author 15% of the world's most highly cited publications; the UK ranks second only to the USA for start-ups; and UK investments in research and related applications have exceeded £1 billion over the past decade.



Our role

The Catapult's technical capabilities in power electronics, packaging, radio frequency, photonics and quantum align naturally with corresponding university specialisms, creating a direct pathway from early-stage academic research to later stage commercialisation.

This relationship facilitates the two-way transfer of ideas, with industry describing new challenges for future academic research.

Outcomes:

- **We have become a trusted partner of both academia and industry, involved in over 50 collaborative R&D projects with more than 100 partners, including 12 leading UK universities.**
- **68% of all our collaborative projects involve an academic partner.**



A thriving collaborative community

Today, the Catapult is involved in over 50 collaborative R&D projects involving more than 100 partners of whom 12 are leading UK universities – in fact 68% of all our collaborative projects involve an academic partner. As a trusted partner of both academia and industry, the Catapult is at the centre of a thriving innovation ecosystem which continues to expand.

[View online](#)

06

Innovation

CSA Catapult is at the heart of CSconnected, the world's first compound semiconductor cluster, based in south Wales.

We are also at the centre of the UK's innovation ecosystem, actively working with clusters of world-leading expertise in Northern Ireland, Scotland, and from the north east to the south west of England. Working closely with our cluster partners gives us the 360-degree perspective and critical mass required to address global market opportunities.

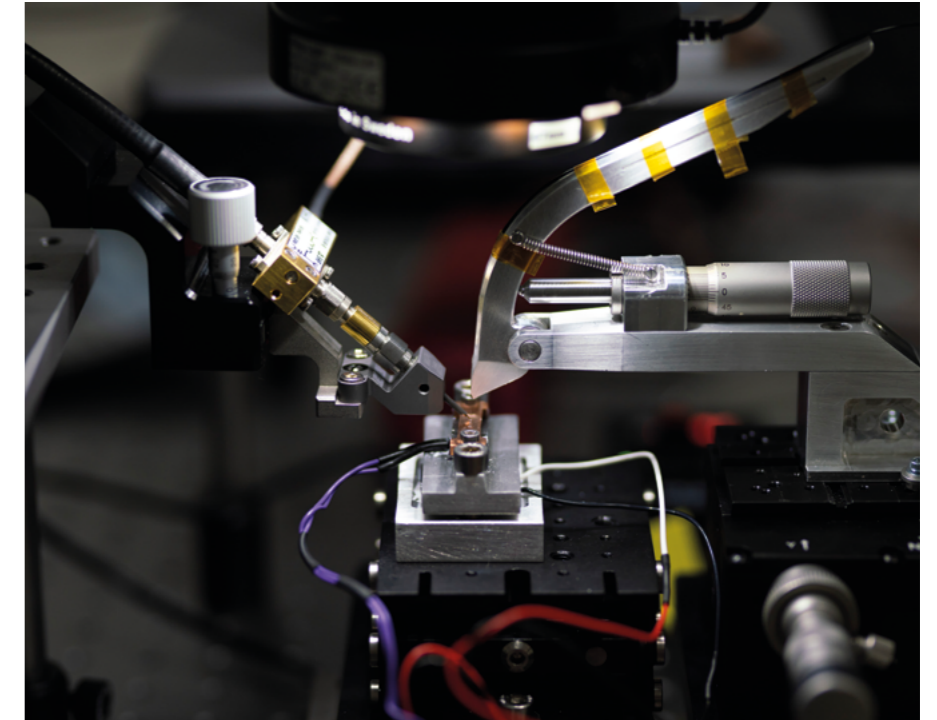
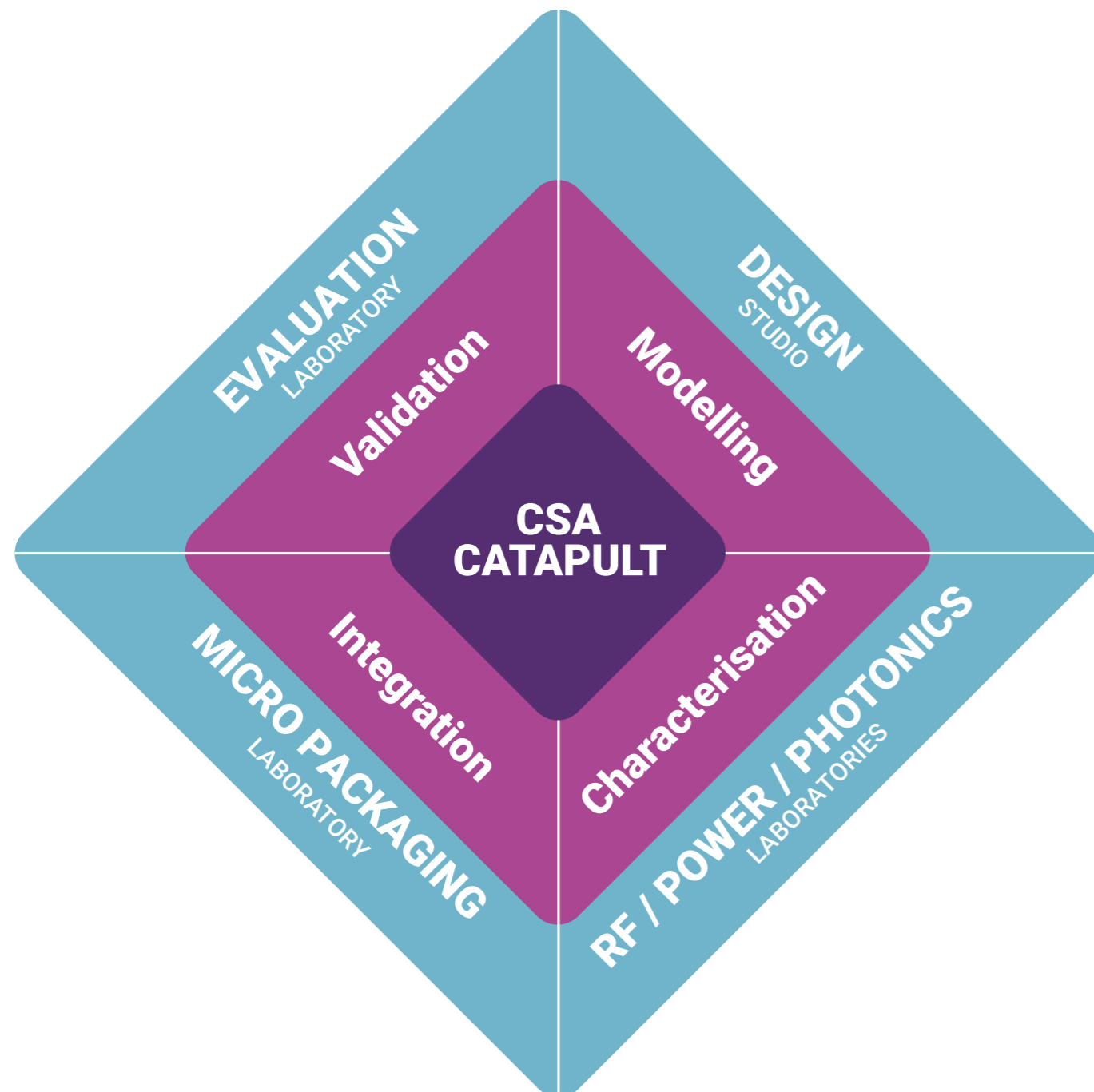
Our 3,000m², state-of-the-art Innovation Centre is key to unlocking compound semiconductor innovations in the UK, with four unique laboratories specialising in Power Electronics, Radio Frequency (RF) and Microwave, Photonics and Advanced Packaging technologies.



Our role

Companies work with us to simulate their products, develop prototypes, and carry out validation using state-of-the-art instruments – all supported by the Catapult's team of expert engineers.

The Catapult has developed a unique combination of modelling, characterisation, integration, and validation facilities, collectively known as the MCIV framework. Using the framework, we can transform a raw concept into a market-ready product in a process known as Virtual Product Development (VPD). The VPD capabilities of CSA Catapult are configured to support the flow of commercial, market- or customer-oriented development projects.



The CSA Catapult EVM approach

The Catapult has adapted the evaluation module (EVM) approach traditionally taken with new chip design to de-risk the adoption of new compound semiconductor chips.

Our EVMs focus on the riskier aspects of product development, reducing uncertainty at the outset, where the market is risky and reluctant to invest.

Our double-pulse EVM, originally developed to characterise the performance of new SiC power devices, uses high-precision metrology operating at elevated voltages and currents. This innovative approach to device characterisation was recognised by the UK's trade association TechWorks, winning their R&D Excellence award in 2019.

The double pulse tester is the cornerstone of several projects, include ESCAPE and @FutureBEV. It is also the basis of our future developments around Artificial Intelligence (AI).

Outcomes:

Following the early success of the double pulse EVM, we have applied EVMs to 11 projects involving over 80 organisations and crowding in over £41m of investment.



***“This partnership is a significant milestone for CSA Catapult, it will help us accelerate power electronics projects across UK industry, to solve complex innovation problems.*”**

“Developing power electronics skills across the UK is a priority and working alongside Siemens will provide opportunities to attract more talent and skills to the region. Working across our industry, we will continue to build on our track record in bringing power electronic supply chains together, to support UK growth.”

Martin McHugh
Chief Executive Officer, CSA Catapult

CASE STUDY:

Siemens Power Electronics Innovation Hub

A strategic innovation partnership with Siemens UK plc creating a dedicated hub at the CSA Catapult’s Innovation Centre.

The opportunity:

A first for both companies in the UK, announced in July 2022. It will deliver a series of joint projects, potential future collaborative supply chain programmes with other UK companies, and engagement with universities, other Catapults, RTOs (Research and Technology Organisations), industrial partners, start-ups, and grant-funding organisations.

Our role:

Siemens employees will be based on site at the Catapult, and we will work with them on initiatives to develop power electronics in the UK to be deployed in worldwide markets.

Outcomes:

The hub will accelerate the development of leading-edge power electronics, machines and drives technology, capability, skills, and jobs here in the UK.

“A high value UK collaboration ecosystem with CSA Catapult, enabling us to accelerate commercialisation of next generation disruptive technologies underpinned by advanced PEMD skills. This will help with building more sustainable, cleaner supply chains, and create more jobs for the future.”

Imran Agha
Innovation Manager, Siemens plc

07

Developing Skills to Support Industry

Our Skills Academy brings together all our own initiatives and those we support to help create the workforce for the compound semiconductor technologies of the future.

We have a wide-ranging skills programme to develop the future skills pipeline, starting in schools and right through to post-graduate level and the workplace.

Skills are vital to consolidate the UK's leading position in the compound semiconductor sector, and we are working to create the pool of talent that can underpin the compound semiconductor applications and technologies of the future.



Developing skills early

Our work starts in primary schools with activities to introduce pupils to simple electronic engineering. We understand the importance of engaging with parents, so we also deliver a range of interactive sessions at Science Festivals throughout the school holidays for both primary and secondary schoolchildren.

Making it relatable; encouraging girls into the industry

We have begun consulting with secondary school teachers on how we can best support the introduction of compound semiconductor technologies into the STEM curriculum across the UK. For example, we are developing an ‘unboxed’ heart rate monitor (ETHOS) to introduce photonics to pupils in a familiar and recognisable format.

This way we can introduce electronic engineering concepts into students’ biological sciences and hope to attract and inspire a larger female cohort to think about a career in engineering.

This diversity and inclusion approach was developed with the UK Electronics Skills Foundation (UKESF) and our sponsorship of their Girls into Electronics Summer School in 2022. The event ran at ten universities across the UK and attracted 230 girls between the ages of 15 and 18.

Each girl was able to:

- attend a sample undergraduate lecture from a senior academic
- hear from current female students about their experiences
- tour the university department and see research facilities
- learn about working in the sector by hearing from UKESF Scholars
- take part in a ‘hands on’ introduction session to learn about microcontrollers

97%
of respondents
rated the Girls into
Electronics day as
‘Good’ or ‘Excellent’

84%
of respondents
who were not
considering a career
in electronics prior
to attending now are

89%
of respondents
felt more enthused
about electronics
after attending

Centres for Doctoral Training (CDT) with universities across the UK

The Catapult is currently supporting five PhD students from across the UK.

Three are part of the Centre for Doctoral Training (CDT) in compound semiconductors, which is a consortium of four universities – Cardiff University, the University of Manchester, the University of Sheffield and UCL.

We are also working with students from the Sustainable Electric Propulsion CDT at the University of Nottingham and Newcastle University. Focusing on the transfer of research into production, the PhD students spend time at university before completing their PhD studies at the Catapult, creating a highly sought-after qualification that combines academic rigour with industrial experience.

STEM ambassadors

30% of the Catapult’s employees are volunteer STEM ambassadors, encouraging career pathways in science, technology, engineering, and maths.

Knowledge Transfer Partnership

As the first Catapult to be awarded ‘knowledge base’ status by Innovate UK, the Catapult has already identified several knowledge transfer partnership (KTP) candidates to transfer technology in areas that include the internet of things, human-machine interaction and solar energy harvesting.

“Through our skills programme we want to encourage as many young people in the UK to consider the opportunities in compound semiconductors.

“Through our outreach programme in schools, colleges, and higher education we want to increase the numbers of young people considering a career in electronics.”

Clare Gunning
People and Resources Director

Skills Statement

Our skills team is working closely with the Driving the Electric Revolution Industrialisation Centres (DER-IC) to bring together the University of Bristol, Bath University and UWE in the south west of England to provide sessions on upskilling and reskilling, among others.

The collaboration is exploring micro-credentials to develop a 'pick-n-mix'-style qualification.

We are also working with Careers Transition Programme (CTP) to identify skills that ex-service personnel can bring to the compound semiconductor industry and whether there is something that we can offer as a 'top-up' to enable a much swifter transition into the industry.

With Cardiff University we are also looking to develop an online delivery platform in high-level skills such as thermal characterisation and 3D modelling.

"At CSA Catapult we have a lot of cutting-edge equipment and being able to work on that has been an amazing experience."

Andrew, Packaging Scholar 2021/22
MEng Electric and Electronic
Engineering, Lancaster University



CASE STUDY:

Scholarships

As members of the UKESF Scholarships Scheme, we support electronics undergraduates in several ways, including an annual bursary, paid work placements and mentoring and networking opportunities. During summer 2021, five scholars joined the team, each specialising in a specific technology area.

"The engineers working here are specialists in their fields and the technical knowledge and learning you can get from them is fantastic! It has been an exciting and eye-opening opportunity working here."

Sharon, Photonics Scholar 2021/22
MEng Electric and Electronic
Engineering, University of Bristol

"The idea of taking research and developing it into technology is why I entered engineering, and the Catapult's aims and structure really matched well with that. Being surrounded by really experienced people from a broad range of technical backgrounds, every conversation I've had has been a great learning opportunity."

Alice, Electronics Scholar 2021
BSc Engineering, University of Cambridge

"Honestly, the Catapult is an amazing organisation. They are working here with cutting-edge technology to tackle real-world problems."

Angel, Power Electronics Scholar 2021
MSc Electronics and Electrical
Engineering, University of Leeds

"A blend between research and industry, I've been involved in many projects [...] really relevant to the modern-day needs of the industry."

Simon, RF Scholar 2021
MEng Electrical and Electronics
Engineering, Cardiff University

"A progressive organisation working on interesting projects and cutting-edge technologies, they provide fantastic opportunities for undergraduates. For the Catapult, our Scholarship Scheme is a great way of, not only, connecting with students but raising awareness and generating interest in compound semiconductors at universities."

Stew Edmondson
CEO of UK Electronics Skills Foundation

08

Equality, Diversity and Inclusion

Our commitment to diversity and inclusive workplaces in innovation

CSA Catapult strives to have an inclusive culture where all employees can flourish. This means we work hard to create a supportive, fulfilling working environment, where everybody feels able to bring their whole selves to work and for this to be encouraged and celebrated.



We are proud of the diversity in our workforce, with our staff representing a wide range of ages, ethnicities, abilities, faiths, sexual orientations, and parental and caring duties.

CSA Catapult has 93 employees, with 21 different nationalities and a third of our people are female. Our Diversity Dashboard below illustrates that our “women in STEM” stand at 25% of our workforce, and 24.5% of our colleagues have identified as BAME.

In 2022, we have joined the other Catapults in signing up to the “Inclusivity in Innovation Charter”. It sets out a vision for diverse and inclusive workplaces in innovation, and signing it means we have committed to the following:

- **We will ensure that ED&I is embedded in our culture and throughout our policies and procedures**
- **We aim to recruit the most talented individuals to our workplace and empower them to realise their goals**
- **We will celebrate the individual as part of a strong and diverse team**
- **We will promote an expectation for our collaborators to uphold ED&I practices**
- **We will share best practices within the network and continually strive to improve**

CSA Catapult is a committed member of Inclusive Employers.

In 2022, CSA Catapult was certified as a ‘Great Place to Work’.

Diversity Information



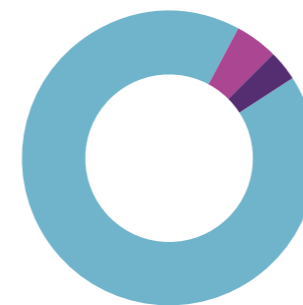
Male 68% (67%)
Female 32% (33%)



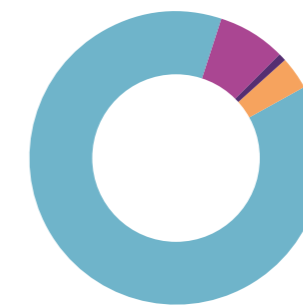
Women in STEM 25% (26%)



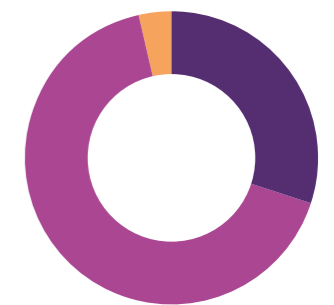
Married/Civil Partnership
Yes 39% (39%)
No 46% (48%)
Prefer not to say 15% (13%)



Disability
Yes 3.5% (3.5%)
No 92% (93%)
Prefer not to say 4.5% (3.5%)



Sexual Orientation
Bisexual 1% (2.5%)
Gay Man/Woman 3.5% (3.5%)
Heterosexual 88% (88.5%)
Prefer not to say 7.5% (5.5%)



Caring Responsibilities
Yes 30%
No 66.5%
Prefer not to say 3.5%

2021 figures in brackets

09

Regional Clusters

Building a compound semiconductor powerhouse in Wales

Formed together with our partners in south Wales, the Compound Semiconductor Cluster, **CScnnected**, represents a globally significant investment, generating annual sales of £500m, and supporting 2390 highly skilled engineers, researchers, and manufacturing specialists.

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Partners

3000



Jobs created

£43M



Project worth

Over 95% of manufacturing output is classed as export, representing 2.5% of total Welsh exports. The cluster directly contributes £194m pa to Welsh GVA (Gross Value-Add), but this grows to £277m pa once supply chain and household effects are considered.

Uniquely, the Cluster includes world-leading university research working alongside large volume manufacturing facilities. The region can supply a massively growing global demand for compound semiconductor materials and devices, from applied research to scalable volume manufacturing, utilising open-access foundry models across the semiconductor product supply chain.

CASE STUDY

The opportunity:

By formally combining compound semiconductor capabilities within a cluster, the UK is in pole position to address the global compound semiconductor market forecast to be worth \$124 billion by 2024.

In 2020, the cluster attracted a £25m investment from UKRI's flagship Strength in Places Fund (SIPF) to build on a £700m+ investment commitment for industrial and academic capacity expansion in the region.

Our role within the Cluster:

To provide advanced testing and evaluation services, design and process feedback to the partners and connect the regional capability to UK-wide centres of excellence in manufacturing.

Outcomes:

The Strength In Places (SIPF) investment has enabled CSconnected to establish itself as a compound semiconductor powerhouse and a rapidly growing, world-leading cluster of excellence, bringing economic investment and high-quality jobs to the region.

It is already enabling CSconnected to continue to develop groundbreaking compound semiconductor technologies and to nurture a critical talent pipeline.



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International Partnerships and Projects

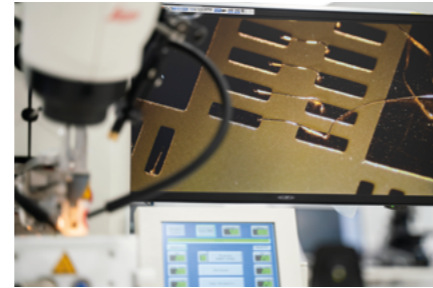
We have been able to evaluate international market and supplier opportunities and highlight the UK's capabilities by building key strategic partnerships with complementary overseas academic, commercial and government organisations.

Our first strategic partnership, between the Catapult and the Industrial Research Technology Institute (IRTI) of Taiwan, began in October 2020. The UK-Taiwan International Showcase for Compound Semiconductor Technology was established to build long-term and supplier relationships between the UK's and Taiwan's companies and researchers.

In 2021, we identified a substantial opportunity to develop bilateral collaborations with companies and academics in India through a Future Telecoms Programme.

The Catapult discussed the Future Telecoms Programme with government, industry, and academia during delegations to New Delhi and Bangalore in 2022. It was an opportunity to demonstrate the value of the UK's innovation ecosystem and our ability to work collectively to translate disruptive technologies and innovation into commercial products and services. Specifically, there was a desire to collaborate on aspects of cyber security, electric vehicles, semiconductor supply chains, optical communications, security, and satellite technologies.

A reciprocal week-long delegation welcomed officials and executives from India to meet UK Government, industry, and academia in June 2022. Funded by UKRI, our partners visited key companies and UK innovation centres in London, Southampton, Oxford, and Cardiff. Initial discussions centred on 5G rollout, with further future telecommunications and electrification opportunities identified.



“The CSA Catapult sees significant opportunities to work with Indian organisations to develop technologies for future telecoms networks, starting with the rollout of 5G to longer-term opportunities in optical, quantum and satellite communications.”

Dr Andy G Sellars, Strategic Development Director



International projects

Our first international project involved Rolls Royce in the UK working with Ascatron, a supplier of SiC die in Sweden, Durham University and UK-based TT Electronics (Semelab), developing lightning protection for electric aircraft.

COMPASS (Compact Phased Array Sensors and Systems) is our two-year international collaboration to develop a compact, lightweight, RADAR system. The end-customer is Sweden-based Saab AB, and our third partner in the project is UK-based Microchip.

Our third current international project involves Vector Photonics, a spin-out from the University of Glasgow, and QD (Quantum Dot) Laser Inc, a Japanese epitaxy manufacturer. This project is developing high power solid-state lasers for 3D printing, replacing bulky CO2 lasers for a market that is forecast to be worth \$10 billion by 2025.

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Looking Forward

Demand for electronics products will grow rapidly in the coming years as consumers want more devices, data, better energy management, 5G and 6G.

Industry will need electronic systems that are energy efficient and operate in harsh environments.

New markets will develop in space, healthcare and quantum.

Compound semiconductor technologies are central to meeting all these needs.

Our role as a dedicated Catapult is to support the UK's industries as they look to capitalise on these markets, by driving the development of compound semiconductor technologies and growing their contribution to the UK economy.



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Financial Summary

The financial information in this review represents the year-end position for CSA Catapult Limited Group for the year ending 31st March 2022.

Income

For the year ended 31st March:	2022 £'000s	2021 £'000s	2020 £'000s
Innovate UK core grant funding	9,459	8,543	8,402
Third party grant funding	3,076	1,516	482
Industrial income	546	462	241
Total	13,081	10,522	9,125

Balance Sheet

For the year ended 31st March:	2022 £'000s	2021 £'000s	2020 £'000s
Fixed assets	11,371	12,525	11,406
Net current assets	1,186	1,060	1,105
Creditors	(5,944)	(5,105)	(3,857)
Provision for liabilities	(12,433)	(13,553)	(12,504)
Net assets	124	31	8
Capital and reserves	124	31	8

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Applications (CSA) Catapult**

