Engineering and Physical Sciences Research Council

EPSRC funding landscape

(With a hint of Charles Dickens)

1 Dec 2021

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Regional Engagement Manager - Cymru

Engineering Net Zero: Decarbonising our economy and society, creating an alternative energy future and developing truly circular economies

Why is this important?

- The population and economic growth of the twentieth century has come at a price that cannot be sustained.
- We need solutions to mitigate further climate change, reduce our demand on the earth's finite resources and identify ways to reduce our impact on and improve our natural environment.
- Major focus from UK Government on this agenda – Net Zero 2050 legislation and Carbon Budget 6, COP26 Presidency, numerous strategies (hydrogen, industrial decarbonisation, transport etc), Dasgupta Review (biodiversity), 25 Year Environment Plan.
- Also seen as key to all the devolved administrations including Wales – “Net Zero Wales”
- EPS advances have created today's opportunity to address these issues and EPS research (and EPS skills) are critical to solving the problems that remain.

Research that secures the discovery, development and deployment of a sustainable, resilient and prosperous Net Zero future

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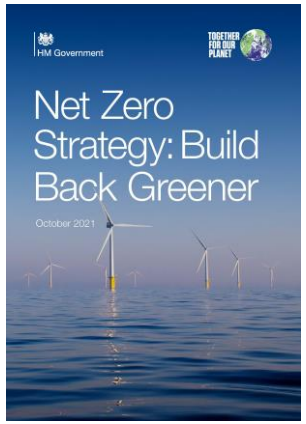
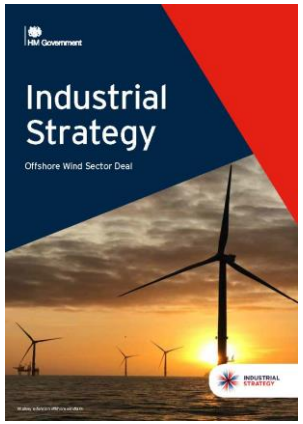
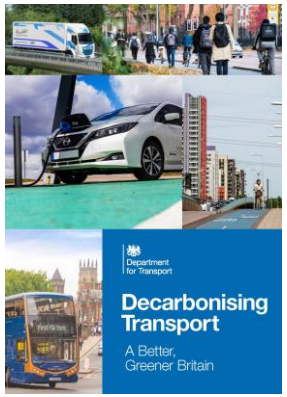
	2020s	2030s	2040s
ELECTRICITY	Largely decarbonise electricity: renewables, flexibility, coal phase-out	Expand electricity system, decarbonise mid-merit/peak generation (e.g using hydrogen), deploy bioenergy with CCS	
HYDROGEN	Start large-scale hydrogen production with CCS	Widespread deployment in industry, use in back-up electricity generation, heavier vehicles (e.g. HGVs, trains) and potentially heating on the coldest days	
BUILDINGS	Efficiency, heat networks, heat pumps (new-build, off-gas, hybrids)	Widespread electrification, expand heat networks, gas grids potentially switch to hydrogen	
ROAD TRANSPORT	Ramp up EV market, decisions on HGVs	Turn over fleets to zero-emission vehicles: cars & vans before HGVs	
INDUSTRY	Initial CCS clusters, energy & resource efficiency	Further CCS, widespread use of hydrogen, some electrification	
LAND USE	Afforestation, peatland restoration		
AGRICULTURE	Healthier diets, reduced food waste, tree growing and low-carbon farming practices		
AVIATION	Operational measures, new plane efficiency, constrained demand growth, limited sustainable biofuels		
SHIPPING	Operational measures, new ship fuel efficiency, use of ammonia		
WASTE	Reduce waste, increase recycling rates, landfill ban for biodegradable waste	Limit emissions from combustion of non-bio wastes (e.g Deploy measures to reduce emissions from waste water)	
F-GASES	Move almost completely away from F-gases		
GREENHOUSE GAS REMOVALS	Develop options & policy framework	Deployment of BECCS in various forms, demonstrate direct air capture of CO_2, other removals depending on progress	
INFRASTRUCTURE	Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids	Hydrogen supply for industry & potentially buildings, roll-out of infrastructure for hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion	
CO-BENEFITS	Health benefits due to improved air quality, healthier diets and more walking & cycling Clean growth and industrial opportunities		

Net Zero Policy Landscape

It is **essential** the Research UKRI funds influences and is influenced by Policy and Business to ensure impact as contribute to meeting our Net Zero Targets







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UK Net Zero 2050 target – what is the role of research and innovation?

What is our role working closely with our partners?

Discover

Discovering solutions to problems that we cannot yet solve.

And deliver the **disruptive science** that contributes to achieving global carbon neutrality in the long-term.

Develop

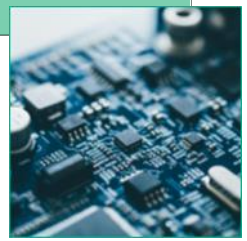
Developing those technologies and solutions that are not yet ready

Create new **scientific insights, innovative technologies, and unlock deployment**

Deploy

Deploying at scale those technologies and solutions that are ready

*Address the **research questions that arise during deployment*** and understand the **policy, regulatory, financial, institutional decisions and incentives/disincentives** that will be most effective.



Where do UK GHG emissions come from?

Agriculture 10%	Business 18%	Energy 23%	Industrial Processes 2%	Public 2%	Residential 15%	Transport 28%	Waste Management 5%	LULUCF -2%

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The Ghost of Funding Past… Where have we been?

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We already have a lot of work underway…

deploy, develop, discover

Some examples,

- UK Energy Research Centre (UKERC)
- Energy Systems Catapult
- Prospering from the Energy Revolution Challenge
- SUPERGEN Energy Networks Hub (HubNet)
- MISTRAL: Multi-scale Infrastructure Systems Analytics
- Centre for Climate Change Economics and Policy (CCCEP)
- Centre for Evaluation Complexity across the Nexus (CECAN)
- Centre for Energy System Integration (CESI)
- UK Geoenergy Observatories (UKGEOS)
- Centre for Doctoral Training in Power Networks
- ADdressing Valuation of Energy and Nature Together (ADVENT)
- Centre for Doctoral Training in Wind and Marine Energy Systems
- UK Collaboratorium for Research in Infrastructure & Cities (UKCRIC)
- Centre for Doctoral Training in Future Power Networks and Smart Grids

A whole-systems approach

Reduce

Reduce demand *for GHG-intensive products, processes and services*

- UK Centre for Research in Energy Demand Solutions (UKCREDS)
- Centre for Doctoral Training in Energy Demand (LoLo)
- National Interdisciplinary Circular Economy Research NICER) Programme
- Plastics Research and Innovation Fund
- Smart Sustainable Plastic Packaging
- Transforming Construction
- Transforming the Foundation Industries
- Transforming Food Production
- Centre for Power Electronics
- Driving the Electric Revolution Challenge

Remove

The ***ability to capture, store and utilise*** *GHGs from essential processes that cannot be decarbonised.*

- UK Carbon Capture and Storage Research Centre
- Pilot-scale Advanced CO2 Capture Technology (PACT)
- Greenhouse Gas Reduction Technologies Programme
- British Geological Survey
- Industrial Decarbonisation Challenge

Replace

Replace GHG emitting products, processes and services *with low and zero carbon solutions.*

- SUPERGEN Hydrogen and Fuel Cell Research Hub
- Green Ammonia Demonstrator
- Centre for Doctoral Training in Fuel Cells and their Fuels
- SUPERGEN Bioenergy Hub
- Centre for Doctoral Training in Bioenergy
- Transport Network + and Networks
- Wind Supergen
- Energy Storage Supergen
- Faraday battery Challenge
- Low Cost Nuclear Challenge
- National Nuclear Users Facility
- Offshore Renewable Energy Catapult
- Energy Catalyst

Agriculture 10%	Business 18%	Energy 23%	Industrial Processes 2%	Public 2%	Residential 15%	Transport 28%	Waste Management 5%	LULUCF -2%

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Recently closed funding opportunities

deploy, develop, discover

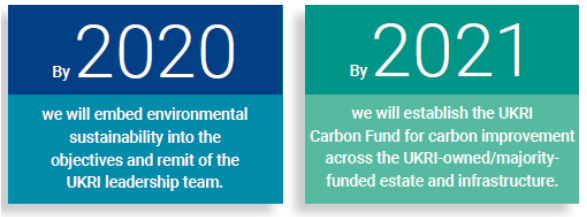
- Develop and integrate **energy storage technologies at grid scale** - £12m available and closing date 5 October 2021. https://www.ukri.org/opportunity/develop-and-integrate-energy-storage-technologies-at-grid-scale/

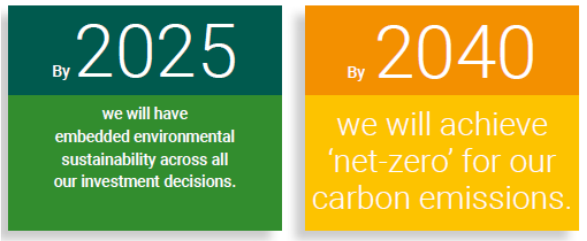
- Research the **production and integration of zero carbon hydrogen -** £2m available and closing date 2 November https://www.ukri.org/opportunity/research-the-production-and-integration-of-zero-carbon-hydrogen/

- Become a **hydrogen research coordinator** - £700k available and closing date 20 November 2021 https://www.ukri.org/opportunity/become-a-hydrogen-research-coordinator/

- Research **nuclear energy** with a US partner: 2022 - £2.5m available and closing date 22 September 2021 https://www.ukri.org/opportunity/research-nuclear-energy-with-a-us-partner-2022/

- **Equality, diversity and inclusion in the energy research community** - £1m available and closing date 4 November 2021 https://www.ukri.org/opportunity/equality-diversity-and-inclusion-in-the-energy-research-community/
- EPSRC-Siemens Feasibility Studies: **Digital Solutions for Energy Demand Reduction and Carbon Production -** £400k available and closing date 7th October https://www.ukri.org/opportunity/digital-solutions-to-reduce-energy-demand-and-carbon-production/
- **Sustainable urban systems and infrastructure** Network Plus (EP/AH/NERC) - £3.6M available and closing date 9th November https://www.ukri.org/opportunity/improve-the-sustainability-of-urban-systems-and-infrastructure/
- **Sustainable agri-food** for net zero: Network Plus (EP/BB/ES/NERC) -£5M available and closing date 20th October https://www.ukri.org/opportunity/build-a-network-to-research-sustainable-agri-food-for-net-zero/





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Agriculture 10%	Business 18%	Energy 23%	Industrial Processes 2%	Public 2%	Residential 15%	Transport 28%	Waste Management 5%	LULUCF -2%

The ghost of Funding Present…

Where are we now?

Engineering
Physical Sci
Research Co

UKRI councils preparing new delivery plans

External Strategies: Spending Review, Plan for Growth, Innovation Strategy, People and Culture Strategy, Place Strategy, R&D Roadmap

Risk Management and Performance Management Framework – cascade and feed back into cycle

Strategy/ Guiding Principles
- Longer term priorities
- High level principles & areas of focus
- Acts as a "north star"

c. 5 years

Delivery Plans
- Medium-long term focus
- Responds to internal and external strategies, and how we collectively deliver our vision and mission
- Content council / discipline specific, including x-councils

SR period (c. 3 years)

Corporate Plan
- Snapshot of annual priorities and deliverables across whole organisation
- How we'll deliver strategy/ vision/ mission in the next year

1 year

Annual report & accounts
- Reflects what we have delivered in the last year (reflection of Corporate Plan)
- Includes reporting on risk

1 year

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Spending review – the reality is a protracted timeline…

Spending review

- On 27 October, the Chancellor delivered a speech to the House of Commons in which he announced the outcome of the Spending Review 2021

UKRI negotiates with BEIS & HMT

- UKRI support BEIS in their discussions with HMT.
- Work with BEIS to provide initial high level allocations advice on the overall BEIS R&D portfolio to Ministers, including the Secretary of State (before the end of the 2021).

UKRI settlement

- Over the next few months, we will be negotiating with BEIS to determine UKRI's settlement within the BEIS envelope.
- Budget agreed Jan / Feb 2022 (Best guess)

EPSRC negotiates with UKRI for settlement

- Budget agreed March / April 2022 (Best guess)

The ghost of funding yet to come….

Still high levels of uncertainty around our budgets

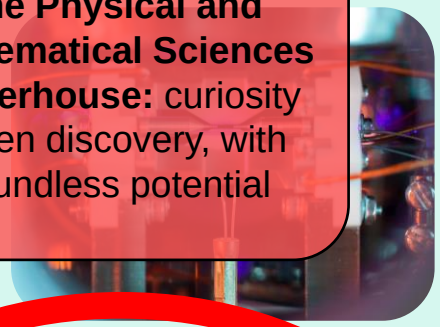
But where do we think we are going?

Engineer
Physical
Research

EPSRC's Strategic Priorities

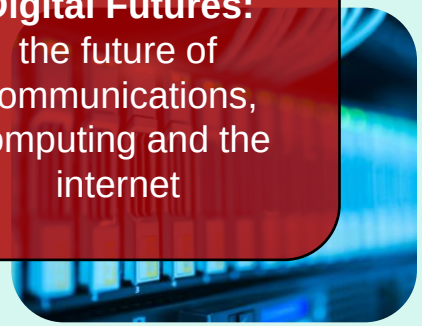
Core Disciplines

The Physical and Mathematical Sciences Powerhouse: curiosity driven discovery, with boundless potential



Frontiers in Manufacturing, Engineering and Technology: unleashing our productivity potential

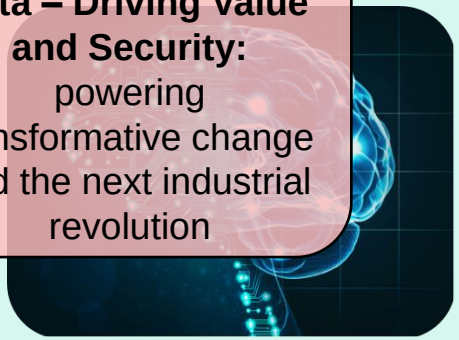
Digital Futures: the future of communications, computing and the internet



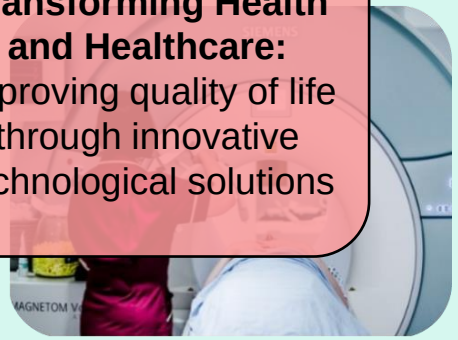
Mission Inspired and Translational Research

Engineering Net Zero: decarbonising our economy and society, creating an alternative energy future and developing truly circular economies

AI, Digitalisation and Data – Driving Value and Security: powering transformative change and the next industrial revolution



Transforming Health and Healthcare: improving quality of life through innovative technological solutions



International | Talent and Skills | Place | World Class Infrastructure | Economy

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An Effective Ecosystem for Engineering and Physical Sciences

Engineering Net Zero:

Deliver solutions to **reduce demand and increase efficiency** across all greenhouse gas emitting, resource consuming and polluting systems and sectors taking a whole systems approach.

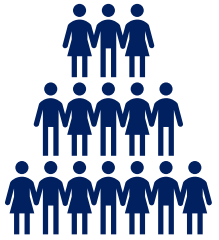
Produce **low and zero carbon and zero waste solutions** to meet our needs through extensive electrification, alternative sustainable fuels and the goods and services that we consume.

Discover and develop **negative emission technologies** including greenhouse gas reduction technologies (GGRs) and carbon capture utilisation and storage (CCUS) solutions.

Deliver **high risk, high reward** research to stimulate entirely new and transformative low and zero carbon and zero pollution technologies and systems

Attract, retain and develop talented **Net Zero researchers and innovators** in the UK

WHOLE-SYSTEMS APPROACH



Research that secures the discovery, development and deployment of a sustainable, resilient and prosperous Net Zero future

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UK Net Zero 2050 target – what needs to happen?

Commitment: bring all UK greenhouse gas emissions to Net Zero by 2050 (does not include imported emissions)

Engineering, Energy, Maths, AI, ICT, Digital Twins

A whole-systems approach

Reduce

Reduce demand *for GHG-intensive products, processes and services*

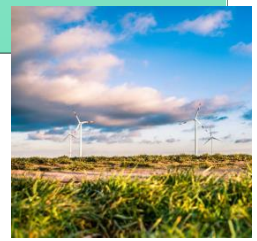
Improve efficiency *to reduce demand through both technical solutions and behaviour change*

Circular Economy, ICT, AI, Manufacturing, Digital Economy, Healthcare Technologies, Physical Sciences, Maths, Quantum Technologies

Remove

Improve our ability to capture, store and utilise GHGs *from essential processes that cannot be decarbonised.*

Energy, Engineering, Physical Sciences, Advanced Materials



Replace

Replace GHG emitting products, processes and services *with low and zero carbon solutions. This includes extensive electrification and solutions for needs that cannot be met through electrification.*

Energy, Circular Economy, Manufacturing, Physical Sciences, Advanced Materials, Quantum Technologies

EPSRC Energy & Decarbonisation Team – [correct at time of writing (Dec 2021) but expecting some team changes soon]

	**Dr Jim Fleming** *Head of Energy, PFER ISCF, LCN ISCF*		**Ruqaiyah Patel** *Head of Decarbonising Industry and the Environment, Industrial Decarbonisation ISCF*		**Claire Spooner** *Head of Decarbonising Transport, Faraday ISCF, COP26*
	**Gerard Davies** *Senior Portfolio Manager, Decarbonising Heat, PFER ISCF, Environmental Change*		**Dr James Tarver** *Senior Portfolio Manager, Hydrogen and Alternative Energy Vectors, Fuel Cell Technology,*		**Dr Jennifer Channel** *Senior Portfolio Manager Faraday Challenge, Decarbonising Transport*
	**Dr Neil Bateman** *Senior Portfolio Manager, Nuclear Fusion, International, Decarbonising Electricity*		**Dr Judith McCann** *Senior Portfolio Manager, Energy Storage*		**Dr Heather Macklyne** *Senior Portfolio Manager, IDC ISCF, Transforming Construction ISCF*
	**Dr Andrew Eustace** *Nuclear Fission, ECRs*		**Dr Nicola McDougal** *End Use Energy Demand (EUED)*		**Vacancy** *Carbon Capture & Utilisation (CCUS), Solar, Public Engagement*
			**Dr Zaffie Cox** *Bioenergy, Offshore Renewables, Fellowships, EDI*		**Dr Strachan McCormick** *Power Networks, Whole Energy Systems*

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Thank you

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