



The
University
Of
Sheffield.



Advanced
Resource
Efficiency Centre
(AREC)
Creating the Supply Chain of the Future.

The Advanced Resource Efficiency Centre (AREC)

Professor Lenny Koh , FRSA

Director, Centre for Energy, Environment and Sustainability (CEES) and Logistics and Supply Chain Management (LSCM) Research Centre



The future is not about a supply chain competing against another supply chain. The future is about a resource sustainable supply chain competing against another resource sustainable future.

The Advanced Resource Efficiency Centre (AREC) is the result of more than ten years of development in supply chain and resource sustainability research capabilities to benefit industry, policy makers and society.

The Advanced Resource Efficiency Centre (AREC) is a facility to promote the collaboration between industry and academia. It provides a platform for access to policy makers, in order to meet the challenges of promoting resource efficiency and sustainability across supply chains.

AREC in brief

AREC supports the development of resource sustainable supply chains, facilitating collaboration with industrial partners and benefit from cutting edge academic research and skills.

Mission

To create a world leading supply chain resource efficiency and sustainability infrastructure addressing critical resource existentiality and challenges using a combination of methods, tools, models, technologies, processes and systems.

Vision

To reengineer future supply chains by integrating supply chain resource efficiency and sustainability into strategic decision making in government, industry and education for improved competitiveness internationally.



Strategic objectives

- To build partnerships and collaborative approaches addressing the world's biggest challenges of resource existentiality.
- To focus research and innovation on the supply chain of the world's essential resources, particularly in advanced materials/manufacturing, energy and nuclear, water, agritech/food.
- To connect lower and higher TRL activities , accelerating the maximum impact of supply chain resource efficiency and sustainability to users and society.
- To sustain a pipeline of relevant skills, ensuring future supply chain resource efficiency and sustainability.

Partnering with the AREC



Benefits for partners

Partners of AREC, including industry and policy makers, will collaborate directly with the University of Sheffield to design bespoke, innovative research programmes to meet their needs and solve their supply chain challenges. Through an annual subscription our partners will benefit from the following:

- **Enhanced supply chain performance**
- **Cost reduction**
- **Efficiency improvement**
- **Increased sustainable competitiveness**
- **Lab access – access to our world leading research labs and facilities**
- **Affordable, low risk high reward innovation**
- **Supply Chain Life Cycle Analysis**
- **Staff and skills development**
- **Access to computer modelling power**
- **IP – new saleable IP will bolster patent portfolios and future research to create the best products on the market and create distinctive competitive advantage**
- **Collaborative working with one of the best research universities in the world to develop joint capability**
- **Expertise – Sheffield is home to some of the leading thinkers in these fields who are working to create the most innovative solutions across a broad range of disciplines**
- **Branding and CSR**

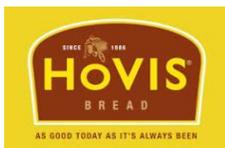
AREC Partners



Rolls-Royce



SHEFFIELD FORGEMASTERS INTERNATIONAL



Advanced Manufacturing Research Centre



SKANSKA

South East Electricity Substation Alliance (SEESA)
South East England, UK



ITM POWER
Energy Storage | Clean Fuel

Henry Boot
CONSTRUCTION

BROCKLESBY
a blend for success



Supply Chain
Resource
Sustainability

AREC
Creating the Supply Chain of the Future.



QinetiQ

PH
Premier Hytemp
QUALITY ENGINEERED ALLOYS



The University
Of
Sheffield.



Microsoft

YorkshireWater

Innovate UK
Technology Strategy Board

Advanced Resource
Efficiency Centre



Shaping Cloud™



mmta
minor metals trade association

Iom³
The Institute of Materials,
Minerals and Mining

mas
manufacturing advisory service

namtec
national metals technology centre

Sheffield
City Region
Local Enterprise
Partnership



UKERC
UK Energy Research Centre

CIPS
Chartered Institute of
Purchasing & Supply

The Chartered Institute of
Logistics and Transport (UK)

CARBON MANAGEMENT ASSOCIATION



Centre for
Low Carbon Futures
2050



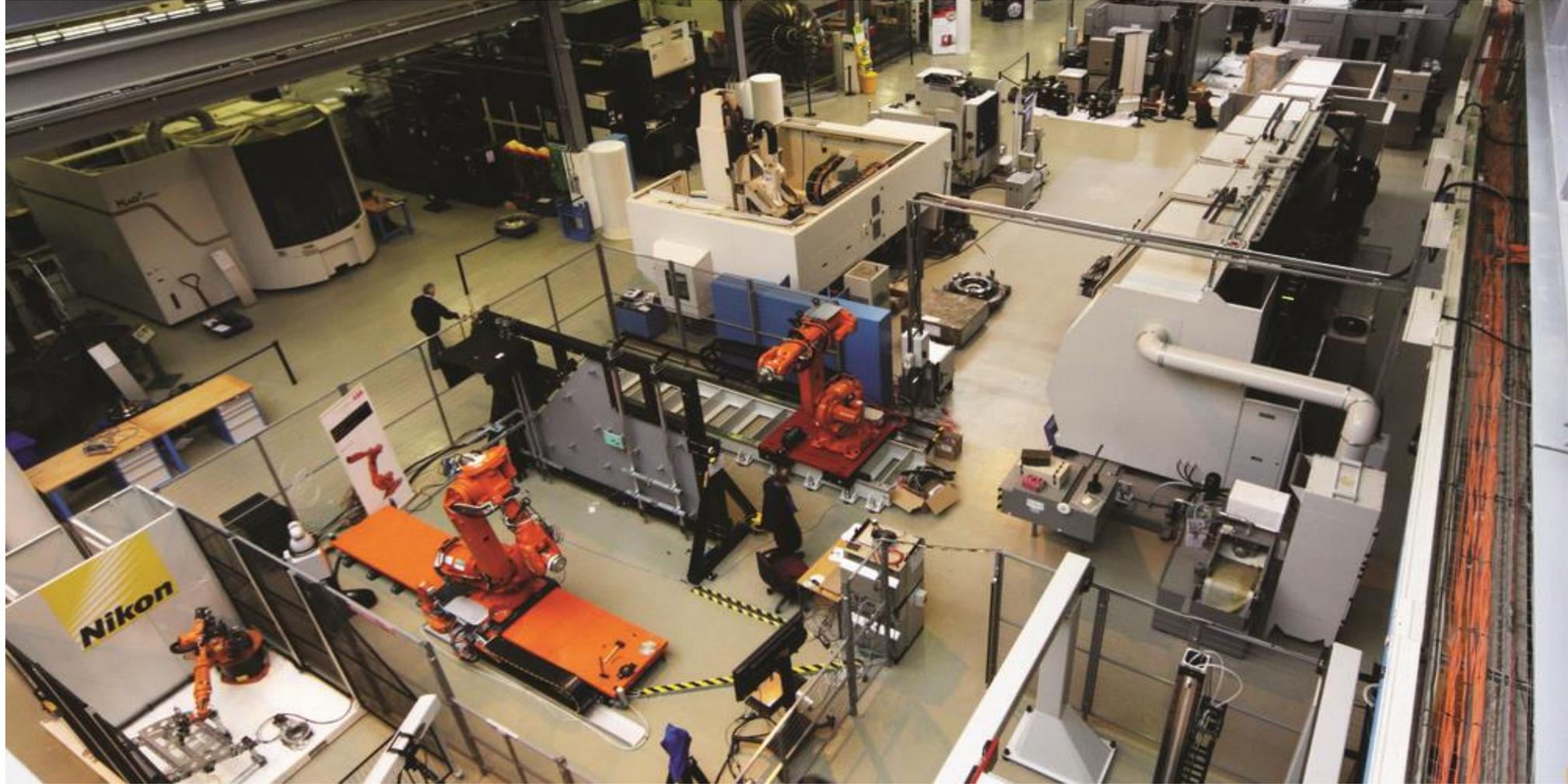
SEERC
SOUTH-EAST
EUROPEAN
RESEARCH
CENTRE

Briga tecnalia
Inspiring
Business

PA Consulting
Group

NUCLEAR AMRC

Advanced Manufacturing Research Centre (AMRC) with Boeing – A world renowned University of Sheffield and Industry Collaboration.



Partnership model of the AREC: A feeding facility into AMRC, NAMRC, AMPI and AMPPII



Professor Sir Keith Burnett, FRS
Vice Chancellor, The University of Sheffield



Professor Keith Ridgway, CBE, FEng
Executive Dean, AMRC



Professor Mike Tynan
CEO, Nuclear AMRC



Professor Richard Jones, FRS
Pro Vice Chancellor Research & Innovation



The AREC delivers key policies

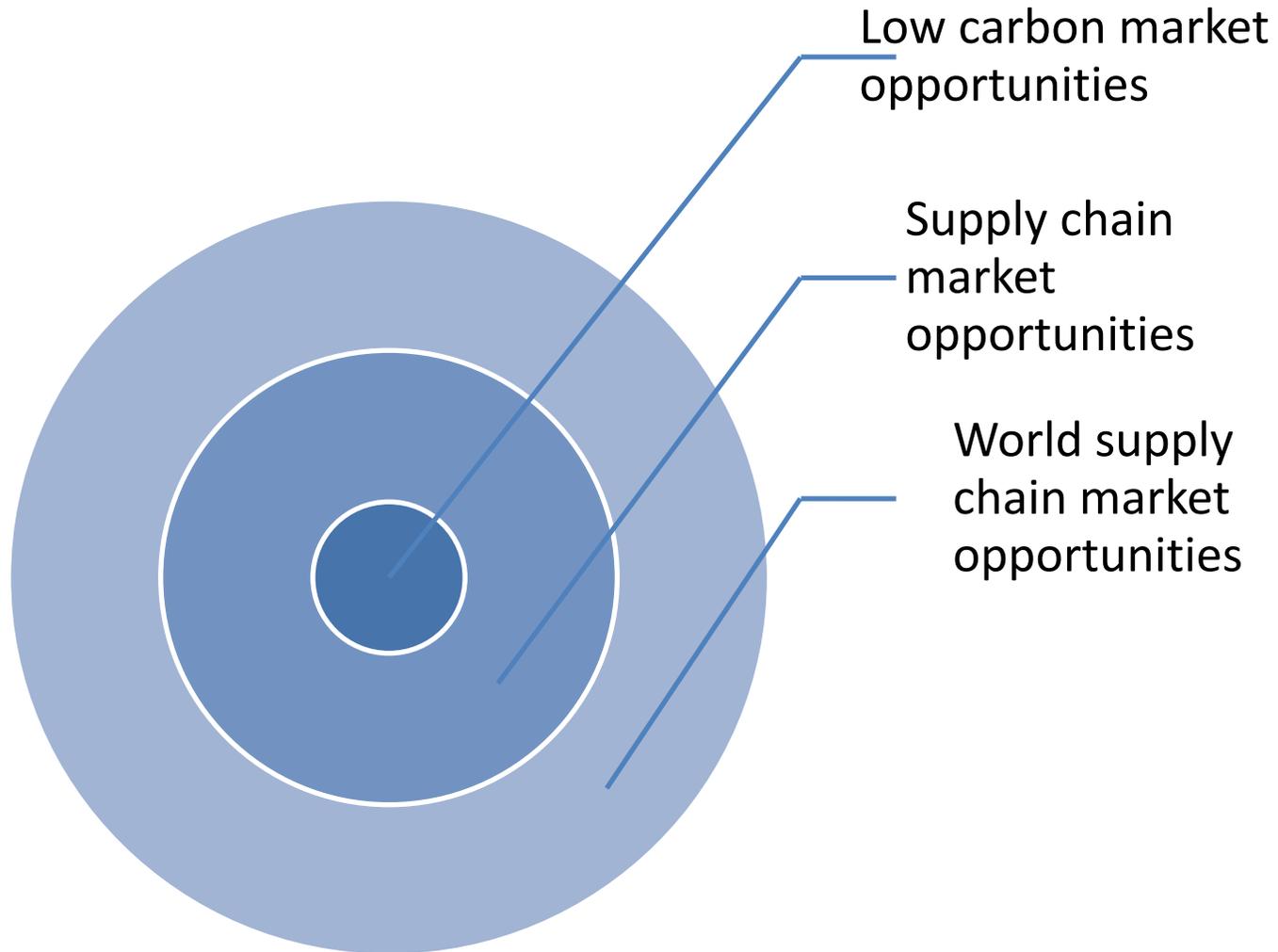
Resource Security Action Plan (BIS, 2012)	<p>“Resource Security Action Plan” from the Department for Business, Innovation and Skills (BIS) states: “Government’s objective is to bring better resource use criteria into the mainstream, so they routinely included in the range of minimum and best practice product standards”</p> <p>The long term vision to achieve this objective is set out, stating: “The Government is putting innovation and research at the heart of its growth agenda through greater investment and increased collaboration”</p>
Infrastructure Carbon Review (HM Treasury, 2013)	<p>The UK is committed to driving forward the delivery of strategic new infrastructure alongside the renewal and maintenance of existing infrastructures. These initiatives aim to embed low carbon practices into business activities, leading to reduced energy demand and pressure on resources</p>
Climate Change Act 2008 (HM Government, 2008)	<p>The UK set out legally binding requirements for the UK to reduce CO₂ emissions by 80% against 1990 levels by 2050. The European Union (EU) issued similar directives in 2011, proposing cuts in Greenhouse Gas Emissions of “80 to 95%” by 2050 (Commission of the European Union, 2011).</p>
A Resource Efficient Europe – Flagship Initiative under the Europe 2020 Strategy (Commission of the European Union, 2011)	<p>EU outlined the need for promoting a “resource efficient” Europe, one that is less reliant on scarce fuels and materials, with greater levels of food and energy security, and therefore increase EU member state’s resilience against global commodity and energy prices</p>
Eight Great Technologies (Willet, 2013)	<p>The UK Government’s vision of future scientific research into the “8 Great Technologies”, developing great research with practical industrial application influence the focus of sectors and their supply chains in Supply Chain Resource Sustainability.</p>

“Supply Chain Resource Sustainability research and application is a top priority, and the AREC will play a key role to translate this research to industry use and deliver government impact.”

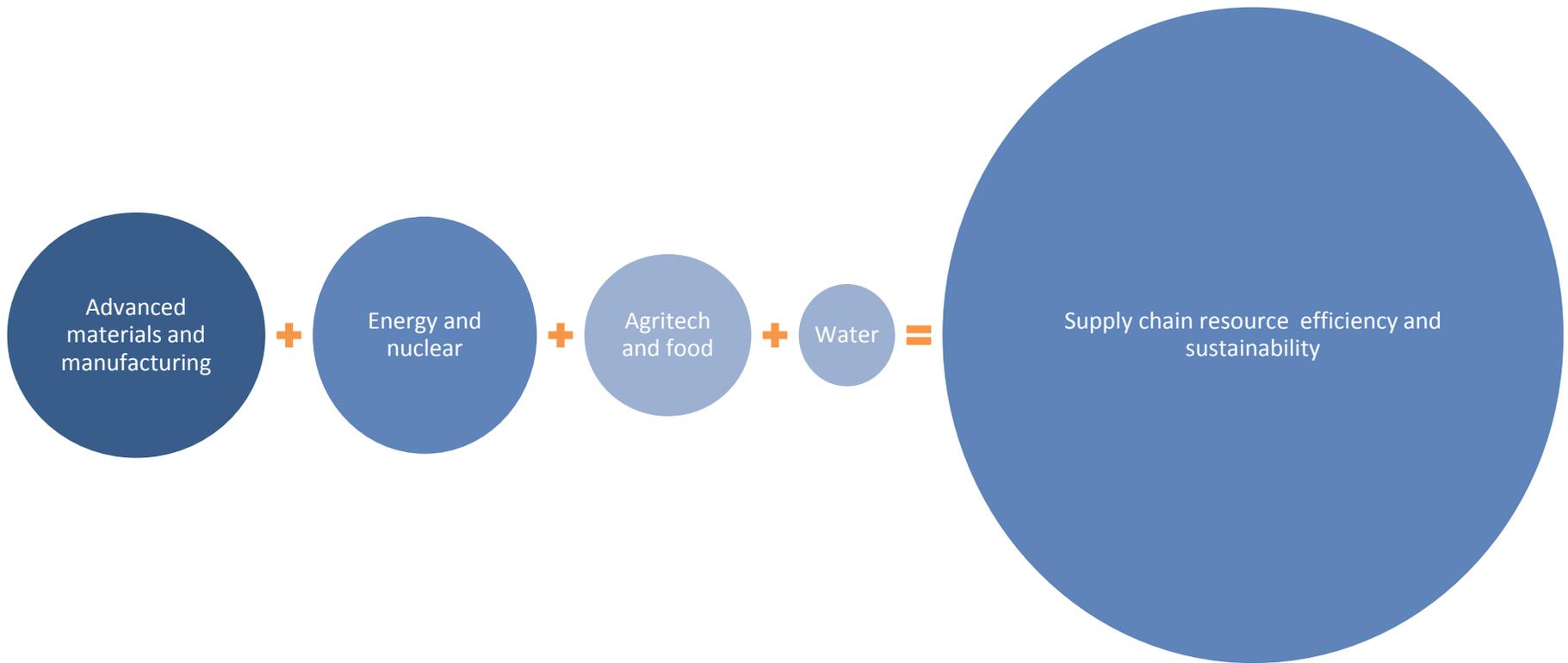
“Each new generation nuclear infrastructure scheme is worth up to £20bn and the developers wish to place 60% of the work and technology in the UK.”

“Resource efficiency capability is the pathway to create a sustainable future supply chain.”

Sustainable supply chain growth



Size of the supply chain resource efficiency and sustainability: Challenges and Opportunities



The AREC programme focuses on supply chain resource efficiency and sustainability in 4 key themes

Advanced Materials and Manufacturing

- Fragility of global supply chains and resource availability
- Cyclic second life of materials
- Tools to design future supply chains

Energy & Nuclear

- Help with defining the supply chain
- Developing coherent energy policy
- Understanding the future energy mix

Water

- Risk and resilience management
- Knowledge and transfer of best practice
- Understanding the difference between water and manufacturing

Agritech & Food

- Engage with retailers
- Provide evidence base and ability to evaluate tradeoffs
- Innovation in energy and crop production



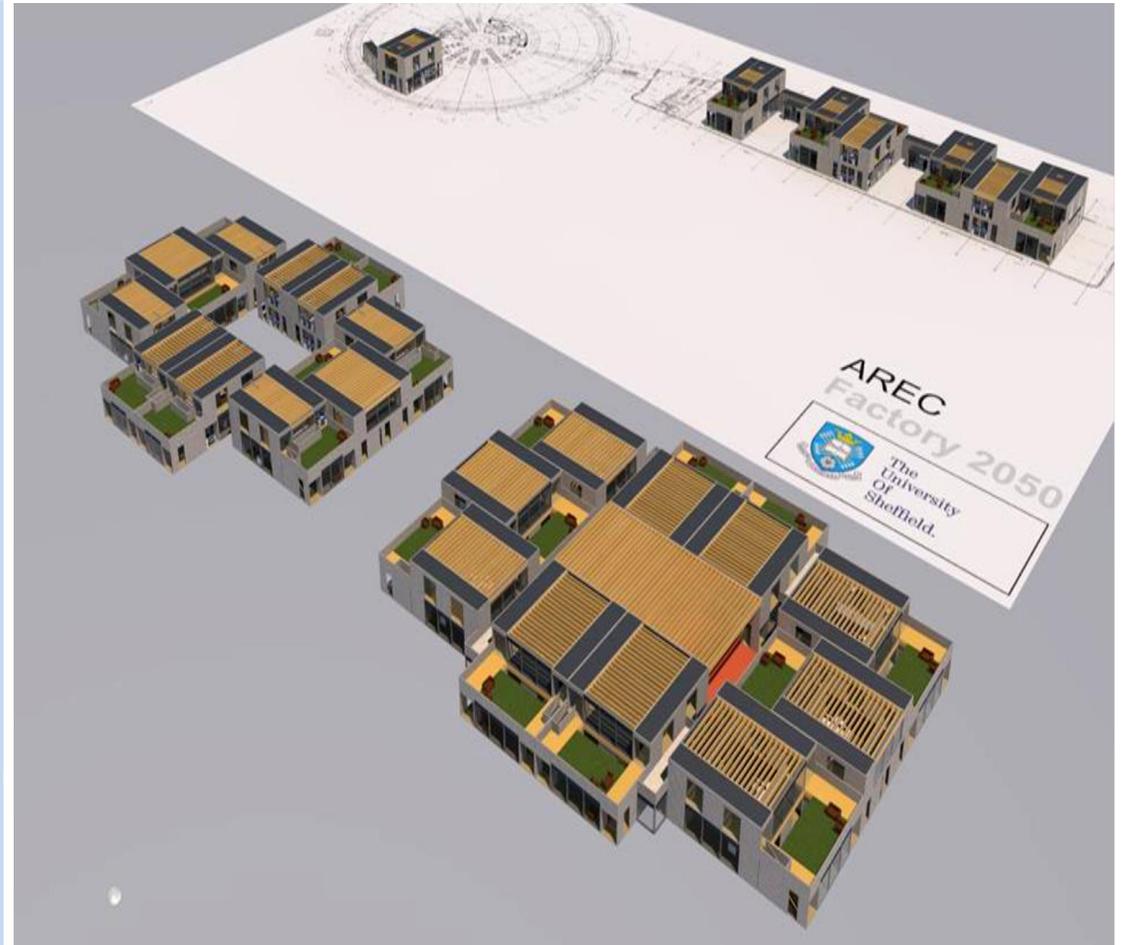
Mark Tomlinson
Sheffield
Forgemasters

“We have been involved in collaborative research work with The University of Sheffield for many years. AREC is a way to start engaging with the research expertise at the University, and to access support and IP which would not be available in house.”

Our facilities

Current laboratories

- AMRC Composite Centre
- AMRC Design Prototyping and Testing Centre
- Mercury Centre's Quarrel Lab
- Plasma Electrolysis Research Laboratory
- The Leonardo Tribology Centre
- Immobilisation Science Laboratory
- Sheffield Centre for Advanced Magnetic Materials and Devices
- Centre for Cement and Concrete
- Sheffield NanoLAB
- X-Ray Diffraction Laboratory (XRD)
- Characterisation Small Research Facility (SRF)
- Nuclear AMRC
- Immobilisation Science Laboratory
- Sheffield Solar Farm
- Catchment Science Centre
- Arthur Willis Environment Centre
- Sir David Read Controlled Environment Facility
- Biological Mass Spectrometry Facility (BioMicS)
- NERC Biomolecular Analysis Facility - Sheffield



AREC will provide futuristic shared facilities to empower advanced supply chain efficiency and sustainability monitoring.

Advanced Materials and Manufacturing Leads



Professor W Mark Rainforth

BMet PhD FIMMM CEng
FInstP CPhys FRMS
Head of Department and
Professor of Materials
Science and Engineering



Professor Neil Hopkinson

Department of Mechanical
Engineering



Professor Derek C Sinclair

PhD, BSc, MRSRC
Professor in Materials
Chemistry



Dr Sam Turner

Head of Process
Technology Group and CTO
AMRC with Boeing

List of AMM research centres:

1. Advanced Manufacturing Research Centre (AMRC) with Boeing
2. Mercury Centre
3. Composite Systems Innovation Centre
4. Research Centre for Surface Engineering
5. Functional Materials Group
6. Centre for Advanced Additive Manufacturing
7. Leonardo Centre for Tribology and Surface Science
8. Centre for Glass Research
9. Centre for Biomaterials and Tissue Engineering
10. Immobilisation Science Laboratory
11. Polymer Centre
12. Sheffield Centre for Advanced Magnetic Materials and Devices
13. Centre for Cement and Concrete
14. Sheffield NanoLAB
15. Sorby Centre for Electron Microscopy and Microanalysis
16. X-Ray Diffraction Laboratory (XRD)
17. EPSRC Centre for Doctoral Training in Advanced Metallic Systems
18. Characterisation Small Research Facility (SRF)
19. Logistics and Supply Chain Management (LSCM) Research Centre
20. Centre for Energy, Environment and Sustainability (CEES)

Energy & Nuclear Leads



Professor Mike Tynan
CEO, Nuclear AMRC



Professor Neil C Hyatt
Professor of Nuclear Materials
Chemistry
Royal Academy of Engineering and
Nuclear Decommissioning Authority
Research Chair in Radioactive Waste
Management
Director, Immobilisation Science
Laboratory
Co-Director, Nuclear First & Next
Generation Nuclear Doctoral Training
Centres



Professor Peter Styring
Professor of Chemical
Engineering & Chemistry
Director of UK Centre for
Carbon Dioxide Utilisation
(UKCDU)

List of E&N research centres:

1. Nuclear Advanced Manufacturing Research Centre (NAMRC)
2. Nuclear Fission DTC
3. Immobilisation Science Laboratory
4. Logistics and Supply Chain Management (LSCM) Research Centre
5. Centre for Energy, Environment and Sustainability (CEES)
6. Centre for Low Carbon Futures (CLCF)
7. UK Centre for Carbon Dioxide Utilisation (UKCDU)
8. EPSRC Energy Storage CDT
9. EPSRC e future CDT
10. ESRC Whiterose CDT
11. Sheffield Solar Farm
12. Siemens Wind Research Centre
13. Sheffield Urban Institute
14. Grantham Centre for Sustainable Futures / Project Sunshine

Water Lead



Prof. Simon Tait
Professor of Water
Engineering

List of Water research centres:

1. Pennine Water Group
2. Catchment Science Centre (Ursula)
3. Green Roof Centre
4. Advanced Water Research Centre
5. Logistics and Supply Chain Management (LSCM) Research Centre
6. Centre for Energy, Environment and Sustainability (CEES)

Agritech & Food Leads



Professor Peter Jackson

List of Agritech and Food research centres:

1. Grantham Centre for Sustainable Futures
2. Project Sunshine
3. Logistics and Supply Chain Management (LSCM) Research Centre
4. Centre for Energy, Environment and Sustainability (CEES)
5. Sheffield Sustainable Food Futures (SheFF)
6. Robert Hill Institute
7. Plant Production and Protection (P3)



Dr Jurriaan Ton
Co-Director of Plant
Production and Protection
(P3)

Resource Sponsorship Opportunities

- Business Development Director / Manager
- Finance and Funding Director / Manager
- Undergraduate summer projects (basic mapping of supply chain)
- Postgraduate dissertations / projects (mapping and evaluating supply chain)
- Software interface to make tool useable for companies (rather than too technical to access)
- Marketing/Impact Officer
- Administrator
- Research Assistants / Post Doctoral Research Associates
- Laboratory and building resources for The AREC
- Kits for the infrastructure including support for computing and modelling

Engage with the AREC

Partnership of the AREC is open to any company which works in a complementary area or which wishes to participate in the support of our programmes.

We have two tiers of partnership

- **Tier 1** partners have an individual seat on the board of the AREC and the opportunity to influence the direction of future research and training. Tier 1 partners participate in, and obtain the results of, all generic projects, and can also propose specific projects which are presented to the board for approval.
- **Tier 2** partners participate in, and obtain the results of, all generic projects. Tier 2 partners are represented by a single board member.

TATA Steel

“We have been working with the AREC to develop advanced new indicators in SCENAT which considers recyclability of materials in the supply chain.” said Louis Brimacombe, Head of LCA team.

Rolls-Royce

“Partnering with AREC provides early access to valuable R&D ideas which helps improve sustainability and efficiency in our supply chain.” said Prof Ian Shellard, Former Director of Global Physical Logistics.



For more details and/or to join the AREC, Please contact:

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arec@sheffield.ac.uk



Creating the Supply Chain of the Future.

To
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Discover
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And
.....
Understand.
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