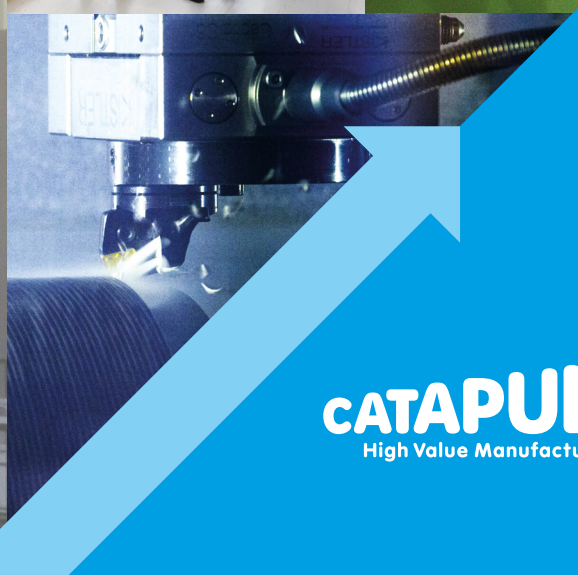
University of Sheffield

NUCLEAR AMRC
ADVANCED MANUFACTURING RESEARCH CENTRE

Helping manufacturers win work in nuclear

2023



CATAPULT
High Value Manufacturing

The Nuclear AMRC helps UK manufacturers win work.

We work with UK manufacturers to improve their capabilities and performance for nuclear and other high-value low-carbon sectors.

Our services are open to companies of all sizes to collaboratively tackle the manufacturing challenges of the energy transition, in markets where quality and long-term performance are critical.

You can use our engineering expertise and resources to develop and test new processes on production-scale machines, at minimum risk and without losing capacity in your own factories.

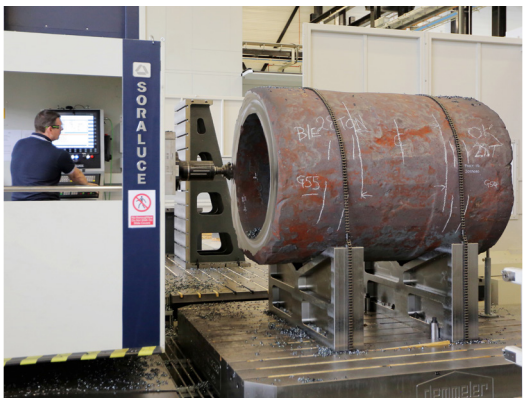
Our researchers focus on developing innovative techniques and optimised processes for large-scale high-precision manufacturing. We are improving productivity and capability for the current market, and developing innovative processes for future applications such as small modular reactors and fusion power.

As well as technical research and support, we provide a range of business development services to help manufacturers enter the nuclear supply chain and compete worldwide.

We work closely with nuclear industry leaders including new build groups, reactor developers and decommissioning site licence companies. We advise government on supply chain challenges for nuclear and other low-carbon growth sectors.

We are part of the High Value Manufacturing Catapult, a national alliance of seven leading manufacturing research centres backed by Innovate UK. We are owned by the University of Sheffield as part of its world-leading advanced manufacturing innovation cluster.

To meet evolving industry needs, we continue to expand the capabilities of our research factory in South Yorkshire and a growing network of regional facilities. The new Nuclear AMRC Midlands in Derby explores new technology areas and tackles cross-sector challenges, and our Birchwood Park facility develops advanced techniques for modular manufacturing.



NUCLEAR **AMRC**

We help companies through two interlinked work programmes:

Manufacturing innovation

We work with you to overcome your manufacturing problems, and help you develop the technical capability to compete on cost, quality and delivery.

We can take new manufacturing technologies and processes from proof of concept towards production readiness.

Supply chain development

We help you compete by raising quality, reducing costs, and developing new capabilities.

We work with you to identify gaps in performance and capability, support sustainable business improvements, and help you move into nuclear from other sectors.

Manufacturing **innovation**

The Nuclear AMRC works with companies to overcome their manufacturing problems, and help them develop the technical capability to compete on cost, quality and delivery.

Our engineers work alongside manufacturers of all sizes to overcome their challenges, expand their capabilities, and boost productivity and competitiveness. And we work with the developers of innovative low-carbon technologies to help bring their designs into commercial reality.

Our research factory on the Advanced Manufacturing Park in South Yorkshire is designed for production-scale technology development and demonstration across a variety of mechanical engineering areas – including machining, joining, metrology, near-net shape and additive manufacturing.

Many of our manufacturing cells feature unique capabilities, or are the largest or most powerful of their kind available for industrial research anywhere in the world.

We continue to expand our facilities and extend our capabilities to meet industry needs, based on consultation with our customers, members and Fit For Nuclear companies.

Our Birchwood Park facility focuses on modular manufacturing technologies, while Nuclear AMRC Midlands in Derby is developing new capabilities in controls & instrumentation, digital engineering and equipment qualification.

The capabilities of our workshops are matched by the expertise of our team. Our engineers have extensive experience of working with industry in long-term collaborations to significantly reduce costs and lead times. We have also completed hundreds of shorter projects with a host of companies to investigate new processes, resolve process problems, and tackle manufacturing challenges.

Core **technologies**

We focus on R&D with the maximum impact for the UK nuclear industry.

We continually consult with our industry and research partners to identify technology areas which will deliver the most value from targeted process development for the nuclear market.

Our core technology themes include:

Machining technologies – new and optimised processes for the machining of large and complex components.

Joining technologies – mechanised welding and solid-state bonding methods, including arc, power beam and diffusion bonding techniques.

Additive manufacturing & near-net shape forming – high-integrity production and customisation of large metal components.

Automation & digitalisation – robotics, artificial intelligence and data-driven manufacturing to improve productivity and develop new capabilities.

Controls & instrumentation – digital sensors, instruments and safety systems for nuclear power plants and other industries.

Materials, surface, corrosion & thermal engineering – enhanced material characteristics and performance in reactors and other extreme environments.

Analysis & simulation – high-fidelity data-driven models for materials processing and optimisation, plant construction and operations.

Product & process verification – developing high-quality structural integrity data for performance models and through-life maintenance forecasts.

Codes & standards – ensuring innovative manufacturing techniques meet relevant industry standards.

We have also identified critical development programmes which cut across our portfolio of technical capabilities, and underpin the adoption of new manufacturing technologies for the nuclear industry:

Automated platform manufacturing – game-changing productivity improvements by completing multiple manufacturing and inspection processes on a single centre.

Equipment qualification – providing assurance that power plant components and assemblies meet all design standards and specifications.

Modularisation – fabricating large plant systems in factories rather than on site, including design for modularisation.

Reconfigurable tooling & smart facilities – flexible data-driven tools to deliver a wider variety of manufacturing, assembly and inspection processes.

Standardisation – improving productivity by making sure different facilities and components work seamlessly together.

Supply chain development – identifying opportunities and closing potential gaps in the UK supply chain, working through our established Fit For Nuclear programme.

Through-life engineering services – creating new market opportunities and ensuring the long-term performance of complex safety-critical systems.

Projects

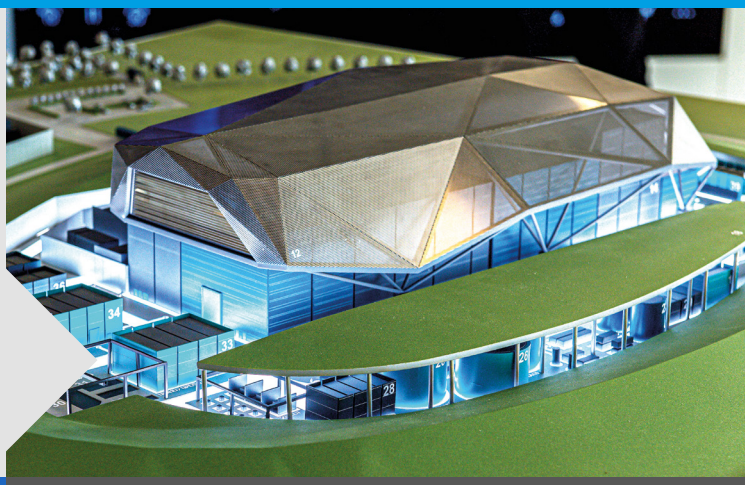
The Nuclear AMRC helps companies innovate through a host of commercial and collaborative R&D projects.

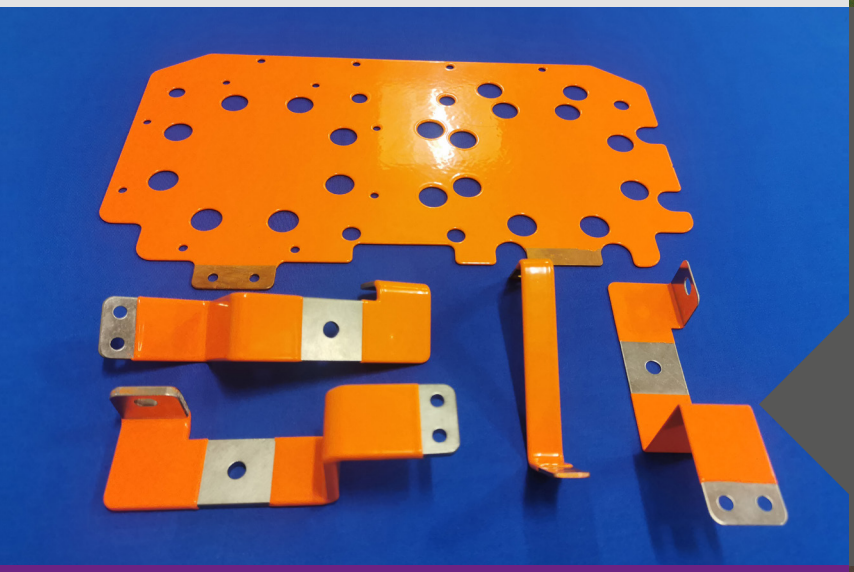
The projects below are a selection of our recent and ongoing work with partners of all sizes.

Advanced manufacturing for SMRs

We are working with Rolls-Royce SMR to develop the manufacturing processes to build a new kind of power station. Around 90 per cent of the 470MWe power plant will be built or assembled as large modules in factory conditions.

We have demonstrated how a range of advanced manufacturing techniques can reduce capital costs and production time, and are now working on pre-production process development for the new Rolls-Royce SMR heavy vessel factory.





Process improvement for the electric vehicle market

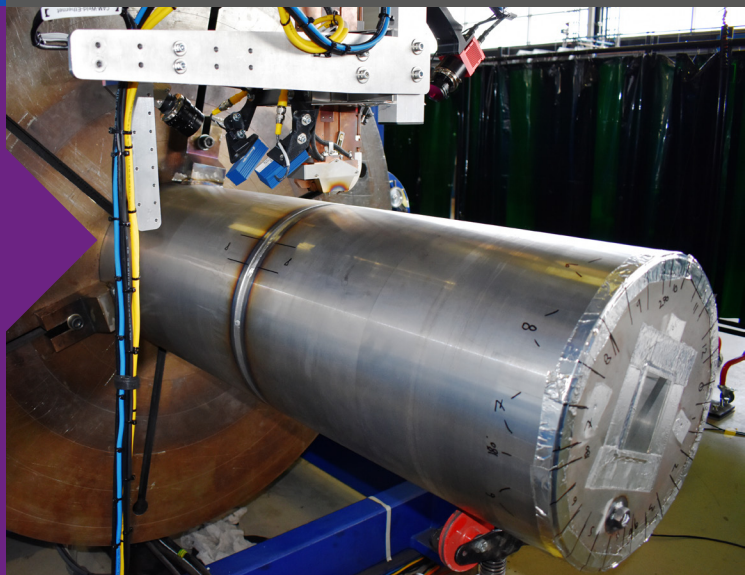
We worked with specialist manufacturer H V Wooding to develop a new powder coating process to improve the quality and performance of its busbars for the fast-growing electric vehicle market.

The Kent-based SME won new business and invested in new production capabilities as a direct result of our R&D collaboration. The project was supported by Innovate UK through the Faraday Battery Challenge.

Live weld inspection to boost productivity

We helped develop a new technology to identify weld defects in minutes, saving time and cost in high-integrity fabrication.

The Awesim project was led by our member Cavendish Nuclear, and drew on our expertise in real-time weld monitoring. By enabling rapid detection of defects, the Awesim technology will take hours out of the welding process and reduce waste.



Introducing new robotic welding capabilities

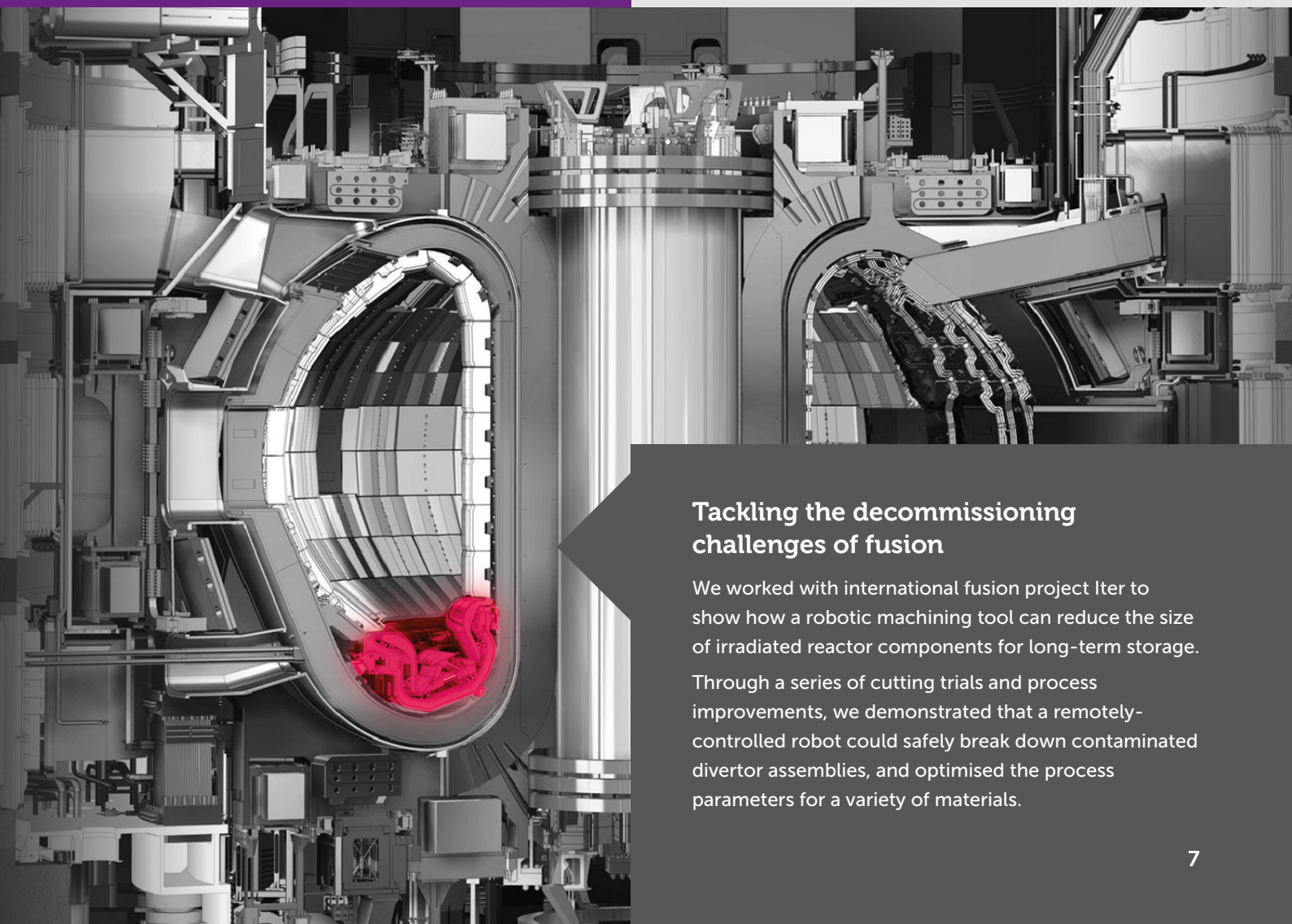
We are working with Fan Systems Group to introduce new automated welding technologies which will ensure the quality of safety-critical fabrications for customers across the energy sector.

The Knowledge Transfer Partnership will allow the Halifax-based SME to develop new capabilities for high-value production, and win work in nuclear and other energy markets.

Exploring the potential for nuclear hydrogen cogeneration

We worked with our member Frazer-Nash Consultancy to investigate the potential use of advanced nuclear reactors for more efficient low-carbon hydrogen production.

Funded by BEIS through the Net Zero Innovation Portfolio, the project was the first step towards a proposed demonstrator and test facility to simulate the heat and electricity outputs of new designs of nuclear plant.



Tackling the decommissioning challenges of fusion

We worked with international fusion project Iter to show how a robotic machining tool can reduce the size of irradiated reactor components for long-term storage.

Through a series of cutting trials and process improvements, we demonstrated that a remotely-controlled robot could safely break down contaminated divertor assemblies, and optimised the process parameters for a variety of materials.

Supply chain **development**

The Nuclear AMRC works with companies along the UK's nuclear supply chain to help them compete by raising quality, reducing costs, and developing new capabilities.

We demystify the nuclear sector and reduce barriers to entry.

Most of the companies we work with are small and medium-sized enterprises (SMEs). We help smaller manufacturers understand what the market expects from them, what they may be capable of supplying, and where they sit in the supply chain.

Our flagship Fit For Nuclear programme helps UK manufacturers get ready to bid for work in civil nuclear, allowing companies to measure their operations against industry standards and take the necessary steps to close any gaps.

We are now working with partners to roll out the Fit For model in other low-carbon sectors. Current programmes include Fit For Offshore Renewables (F4OR) in partnership with the Offshore Renewable Energy Catapult, and Fit For Carbon Capture, Usage and Storage (F4CCUS) and Fit For Hydrogen ($F4H_2$) for the Zero Carbon Humber Partnership.

Tyne Pressure Testing, granted F4N in 2022.

Companies participating in our supply chain development programmes have reported that our support has helped them win more than £2.5 billion of new contracts, create or safeguard more than 10,000 jobs, and secure £114 million additional investment.

We also offer tailored supply chain consultancy services to build links and share knowledge between suppliers and top-tier customers, and to help new-build and decommissioning groups develop their UK supply chains.

To support skills development to meet the current and future needs of manufacturers, we work with the National Skills Academy for Nuclear to provide a one-stop shop for companies along the nuclear supply chain. Our sister centre, the University of Sheffield AMRC Training Centre, provides practical skills from apprenticeships through to MBAs.

In 2022, we worked with Rolls-Royce and partners including the National College for Nuclear, University of Derby and Derby City Council to launch the Nuclear Skills Academy, which is now training 200 apprentices a year for Rolls-Royce's submarine propulsion business. We are now working to replicate this model across the wider nuclear sector.

F4N
Fit For Nuclear

Fit For Nuclear (F4N) is an industry-recognised hallmark of business excellence.

Delivered exclusively by the Nuclear AMRC, F4N allows you to measure your operations against industry standards and take the necessary steps to close any gaps.

F4N is a journey of business improvement, typically taking 12–18 months to granting.

There is no charge for the F4N assessment or the support of our industrial advisors, though you may need to invest to close any gaps. F4N will demand commitment and drive from your senior management team, but we will support you through every step.

More than 1,000 companies – mostly SMEs – have taken the F4N assessment, with around 100 currently granted F4N status after driving improvements through a tailored action plan and maintaining continuous improvement.

Participants have reported a wide range of benefits, from new contracts to demonstrable improvements in quality.

F4N connect

Find a nuclear-ready supplier to meet your specific needs with F4N Connect, a fully-searchable online database of UK manufacturers who have demonstrated their ability to meet the expectations of the nuclear industry.

connect.f4n.namrc.co.uk

Recently granted companies include:

CMP Products – a designer and manufacturer of cable glands, cleats and associated products for harsh industrial environments. CMP completed both the F4N and F4OR programmes to expand its business in key low-carbon sectors.

"As a result of the F4N and F4OR programmes, we have developed a nuclear safety culture, increased our knowledge as a company of both nuclear and offshore renewables industries, and increased connections."
Francisco Dominguez, QHSE director

GadCap Technical Solutions – a manufacturer of cable for nuclear applications, and monitoring systems for power generation and aerospace. GadCap entered F4N as part of a strategic expansion into new markets.

"We recognise the F4N status as being one that can help us continue with our company improvement programme."
Paul Seccombe, technical director

Mech-Tool Engineering – a global supplier of systems to protect people and equipment from fire, blast and heat hazards across the energy sector. Mech-Tool says F4N demonstrates its commitment to the highest industry standards.

"It's important for us to build long-term trusting relationships with our customers, and the F4N status allows us to provide that assurance."
George Hodgson, head of governance compliance

Tyne Pressure Testing – a specialist pressure testing and assembly facility for nuclear and other safety-critical industries. TPT entered F4N to improve performance and secure new work in the sector.

"The F4N programme has been a great help to improving our overall business performance, as well as making TPT a better place to work."
Paul Smith, CEO

Our centres

The Nuclear AMRC's production-scale facilities are designed to tackle your manufacturing challenges with no risk to your own operations.

We are based on the Advanced Manufacturing Park (AMP) in Rotherham, as part of the University of Sheffield's world-leading cluster of engineering research and training centres.

Our 8,000m^2 research factory is home to a wealth of state-of-the-art manufacturing equipment, dedicated to developing innovative and optimised processes in machining, joining, inspection and other large-scale precision manufacturing techniques.

Our regional network of specialist facilities extends our capabilities and let us work more closely with companies in key regions.

Our Birchwood Park facility in north west England focuses on research into modular manufacturing for new reactors of all sizes, as well as for the challenges of decommissioning and waste management. Hosted by our member Jacobs, Nuclear AMRC Birchwood gives us a growing presence at the heart of the UK's largest nuclear region.

In 2023, Nuclear AMRC Midlands moves into its new 4,300m^2 facility at Infinity Park Derby after four years in the iHub facility. The new centre focuses on technology areas which will deliver the maximum impact for the UK's nuclear supply chain, including equipment qualification, digital engineering, and controls & instrumentation.

High Value Manufacturing Catapult

We can help you tap into a national network of advanced manufacturing innovation.

The Nuclear AMRC is part of the High Value Manufacturing Catapult, a national alliance of seven leading manufacturing research centres backed by Innovate UK. Being part of the Catapult ensures that we are at the heart of the UK's industrial strategy, and working with leaders and innovators from all sectors.

We are the gateway for the nuclear supply chain to access a national network of manufacturing research excellence. If your project needs additional knowledge or capabilities, we can call on the specialist resources of the other Catapult centres while managing the project to your specific needs.

Work with us

The Nuclear AMRC is open to all UK manufacturers.

You can commission commercial research to address your specific needs, meet your R&D objectives with a government-funded collaborative project, or tackle a shared challenge through a joint industry project.

Commercial research:

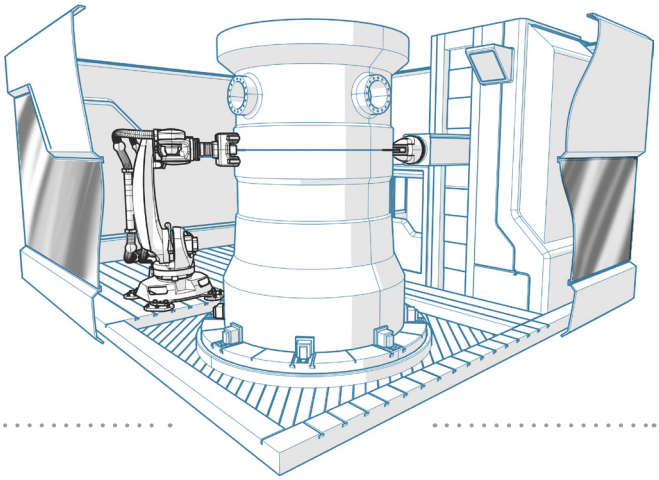
- Commission research to resolve your manufacturing challenge, optimise production, or explore new technologies.
- We operate in full commercial confidentiality – you own any resulting intellectual property.
- Costs are based on staff and equipment time plus material and consumables.

Joint industry project:

- Work alongside industry peers to tackle a common technology challenge.
- We carry out targeted research to meet your shared requirements.
- Projects are funded by a small consortium of companies, with results shared exclusively between participants.

Collaborative R&D:

- Work with industry and research partners, supported by external funding.
- We track new funding opportunities and can tailor a bid to meet your business needs.
- We can build a research consortium, write bids and manage projects – or bring our capabilities to your project.



Membership

Becoming a member of the Nuclear AMRC gives you the highest level of engagement and support, and a place at the heart of the UK nuclear manufacturing industry.

We are led by our member companies, ensuring that everything we do delivers value to industry. Our membership brings together manufacturers and technology providers with OEMs and reactor developers.

Membership is a strategic alliance, and a mutually advantageous relationship.

We offer our members significant business development benefits, networking opportunities, and priority access to market intelligence and targeted support.

As a member, you can help determine our research priorities and capabilities, and leverage your R&D investment through our board-directed research.

Our two-tier membership structure and flexible terms allow us to tailor your membership to the specific needs of your business. The annual fee includes a contribution towards our shared resources, including the board-directed programme of core research projects.

Meet our members: **namrc.co.uk/members**

NUCLEAR AMRC

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UKRI Innovate UK

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