NUCLEAR AMRC news

No.44 Q3 2022

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# Skills for the future

## Opening the door to a career in nuclear manufacturing


CATAPULT
High Value Manufacturing

# Rolls-Royce SMR announces factory shortlist

**New dawn:** concept design for the Rolls-Royce SMR.

## Rolls-Royce SMR has released a shortlist of potential locations for its first factory, which will produce heavy pressure vessels for its small modular reactor power stations.

**The factory will be the largest and most complex of the company's three proposed factories, and will create more than 200 jobs at the winning location. Construction will begin once Rolls-Royce SMR receives the go-ahead to build a fleet of SMRs in the UK.**

The sites – all in the north of England or north Wales – were selected from more than 100 submissions from Local Enterprise Partnerships (LEPs) and development agencies.

"I would like to thank everyone who sent in a submission suggesting locations in their region for the first Rolls-Royce SMR factory," said chief executive Tom Samson.

"The response was fantastic and shows the ambition and appetite of the UK to build and operate a fleet of SMRs which will provide affordable, low-carbon electricity for generations to come. The final location will come from the shortlist and will result in significant investment and long-term high-skilled jobs, and will support the UK government's aspirations for levelling up."

All submitted locations will also be considered as potential sites for Rolls-Royce SMR's other two factories – one will manufacture civils modules, while the other will focus on mechanical, electrical and plumbing modules. The SMR is designed to be produced as more than 800 modules, which will then be transported by road to the construction site for final assembly under factory-like conditions.

The heavy pressure vessel factory will be around 23,000 square metres in size and create more than 200 permanent jobs, with a projected value of £100–200 million to the host region.

The Nuclear AMRC is working with Rolls-Royce SMR on pre-production development of the manufacturing processes which will be deployed in the factory.

Following initial process development, the centre will work with partners to produce two advanced manufacturing prototypes – one will be a representative-scaled heavy pressure vessel, of around six metre length, 2.5 metre diameter, and 27 tonne mass. The other will be a full-scale vessel closure head, of around 4.5 metre diameter and 40 tonne mass. Both will be produced from forgings provided by Sheffield Forgemasters, and fully welded and clad to nuclear quality standards.

The Nuclear AMRC continues to engage with potential suppliers for this pre-production phase of development (see last issue).

Rolls-Royce SMR also recently established a head office in central Manchester, which will work alongside its locations in Warrington and Derby. The company is aiming to recruit 850 staff by the end of the year.

**www.rolls-royce-smr.com**

### The shortlisted sites for the Rolls-Royce SMR heavy vessel factory are:

- Kingmoor Park, Carlisle
- IAMP, Sunderland
- Forrest Park, Newton Aycliffe
- Catterick, North Yorkshire
- Ferrybridge, West Yorkshire
- Pioneer Park, Grimsby
- Gateway, Deeside

# **Fan Systems** draws on automated welding knowledge

## The Nuclear AMRC is helping Halifax-based Fan Systems Group to introduce new automated welding technologies which will ensure the quality of safety-critical fabrications for customers across the energy sector.

**Fan Systems, part of Witt UK, is a leader in the manufacture of high quality industrial fans for nuclear and defence, with units operating around the world.**

The company previously worked with the Nuclear AMRC through the Fit For Nuclear programme to develop its capabilities for the nuclear new build and decommissioning markets, and is now aiming to become the premier manufacturer of high-value, high-specification fans for a range of energy sectors.

Fan Systems recently won a significant contract from a civil nuclear client, with the potential for additional work if the company delivers a high standard of safety-critical welds.

"The automatic welding solution piloted with the Nuclear AMRC will give our customers great confidence in our ability to consistently deliver a high quality product," says executive director Tim Barnes. "This is particularly important for customers with rigorous welding requirements, such as in the nuclear sector, where getting it right first time is critical to encouraging future business."

The new technical collaboration is funded through the national Knowledge Transfer Partnership (KTP) programme, and will embed automated welding techniques which can consistently produce joins to a specified standard. The introduction of automated welding processes is believed to be a first for the UK fan manufacturing sector, and will help ensure that Fan Systems can meet the demands of long-term contracts for high-value fabrications.

The project will be overseen by Nuclear AMRC senior welding technician Billy Armstrong, who is responsible for the centre's own robotic arc welding facilities.

"I am uniquely positioned to guide Fan Systems in this transition," Armstrong says. "I started my career in manual manufacturing, and have spent many years transitioning to become proficient in automated manufacturing. I will use the knowledge and experience I have gained through my own journey to guide and mentor the stakeholders within this project, allowing them to gain the relevant skills and knowledge."

**Knowledge sharing:** Fan Systems operations manager Dan Brook and executive director Tim Barnes with Billy Armstrong in the Nuclear AMRC's automated welding cell.

There are three main challenges to the project, Armstrong notes: understanding what industrial robotic systems are available and how these will interact with Fan Systems' current facility; understanding how current production needs to change to facilitate the integration of robotic technology with minimal disruption; and ensuring the factory and workers can adapt to the increasing use of digital technologies.

The Nuclear AMRC is recruiting for a postgraduate KTP associate who, under Armstrong's guidance, will work closely with the Fan Systems team to tailor and embed the technology at the company's Halifax factory. Following the two-year project, the associate is expected to remain with Fan Systems to lead automation projects across other manufacturing processes.

The KTP programme is funded by Innovate UK, and is designed to help businesses improve their competitiveness and productivity through the better use of knowledge, technology and skills from the UK's research base.

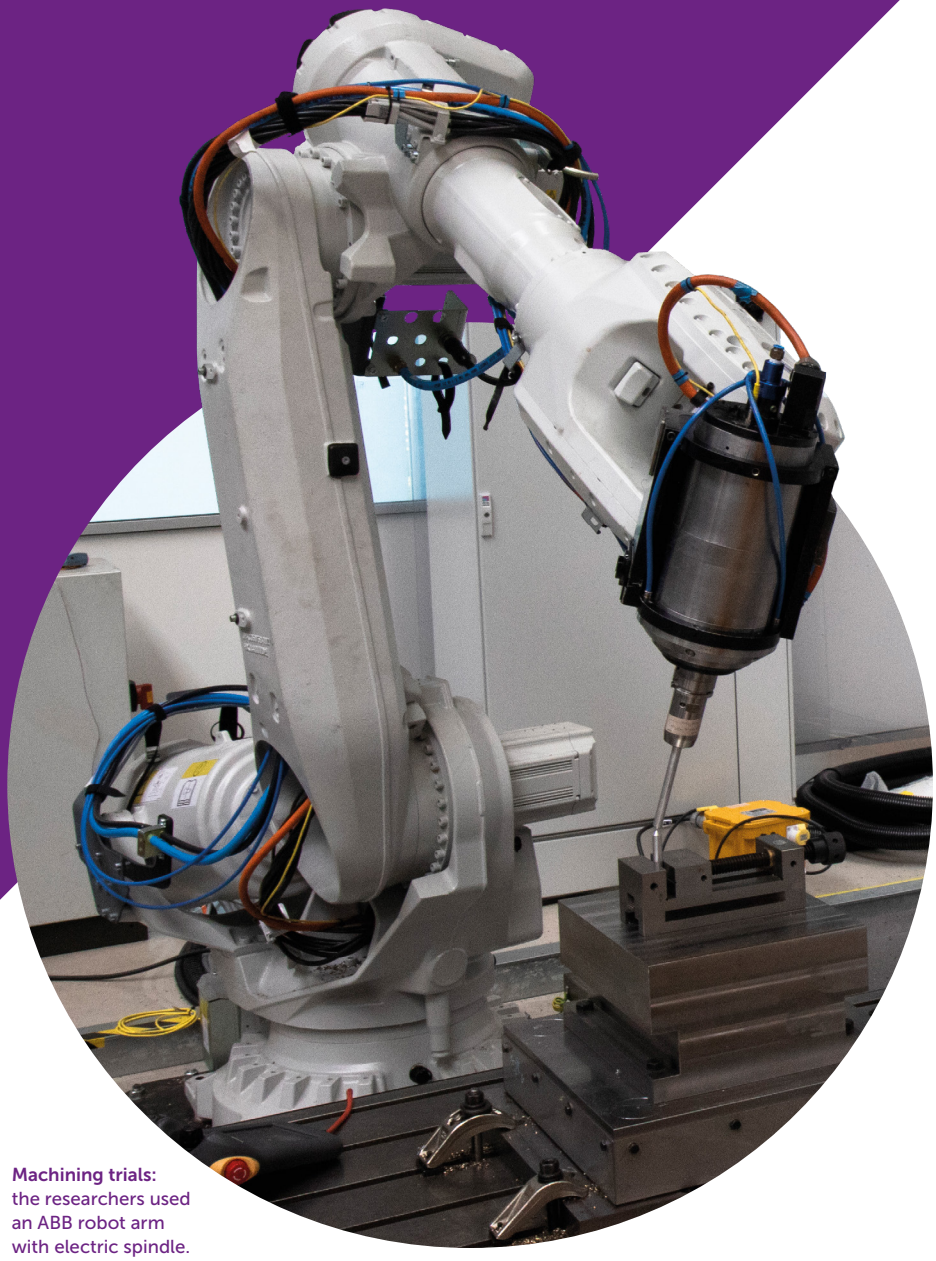
"KTPs are a great way for manufacturers to draw on the expertise and innovation available at the Nuclear AMRC and other specialist research centres," says Helen Arthur, collaborative R&D lead at the Nuclear AMRC. "It's very suitable for companies which have gone through Fit For Nuclear or our other supply chain programmes to develop their business capabilities, and are now looking for the technical edge to help them win work."

To find out more about KTPs with the Nuclear AMRC, email: **helen.arthur@namrc.co.uk**

**wittukgroup.co.uk/fan-systems**

# Future decommissioning challenge for robot machining

Nuclear AMRC researchers have shown how a robotic machining tool can be used to reduce the size of irradiated components from a fusion reactor for safe long-term storage.



**Machining trials:** the researchers used an ABB robot arm with electric spindle.

**International fusion project Iter is building the world's largest tokamak reactor to demonstrate the feasibility of hydrogen fusion as a large-scale source of carbon-free energy. Controlling the extreme temperatures and conditions within the experimental reactor chamber presents a host of engineering and material challenges – including the fact that many components will become irradiated and need to be regularly replaced.**

These include the 54 divertor cassette assemblies within the vacuum vessel, each measuring several metres across and comprising eight tonnes of various metals including tungsten, stainless steels, and copper and bronze alloys.

After removal, these will need to be treated as medium-level long-lived waste, which must be safely stored in a suitable nuclear repository. Reducing the size of the waste will significantly reduce the cost of this long-term storage, and also optimise recovery of tritium, the hydrogen isotope used as fuel for Iter.

"The scale of everything at Iter is extra-large, from the main reactor itself to the many sub-component assemblies and modules that make up the sum of its parts," says Vincent Micheneau, hot cell engineer at Iter. "Eventually, these sub-components will succumb to wear and tear as is inevitable, so it is important that they can be handled and disposed of at the end of their viable life in a safe and cost-effective manner."

The Iter team asked the Nuclear AMRC to investigate a robotic machining method for reducing the volume of used components and preparing them for storage.

The proposed method uses a cutting tool mounted on a remotely-programmed industrial robot arm to break these complex assemblies into small fragments within a secure waste management complex, the Hot Cell Facility, which is designed to operate safely with no risk to the operators and the environment.

Technical challenges include managing the lack of rigidity in the robot arm, and controlling the risk of harmful vibrations caused by the cyclical cutting forces. To meet regulations, the machining process has to be dry, with no liquid or gas coolant used.

"The main challenge is that robots aren't built to do this," says Benjamin Rae, technical lead at the Nuclear AMRC. "There are a lot of advantages to working with robots, and they're a known quantity in the nuclear sector, but they really struggle to deal with the forces and damaging vibrations caused by machining. We know that they can cut metal, but the challenge is how can we achieve the required level of productivity."

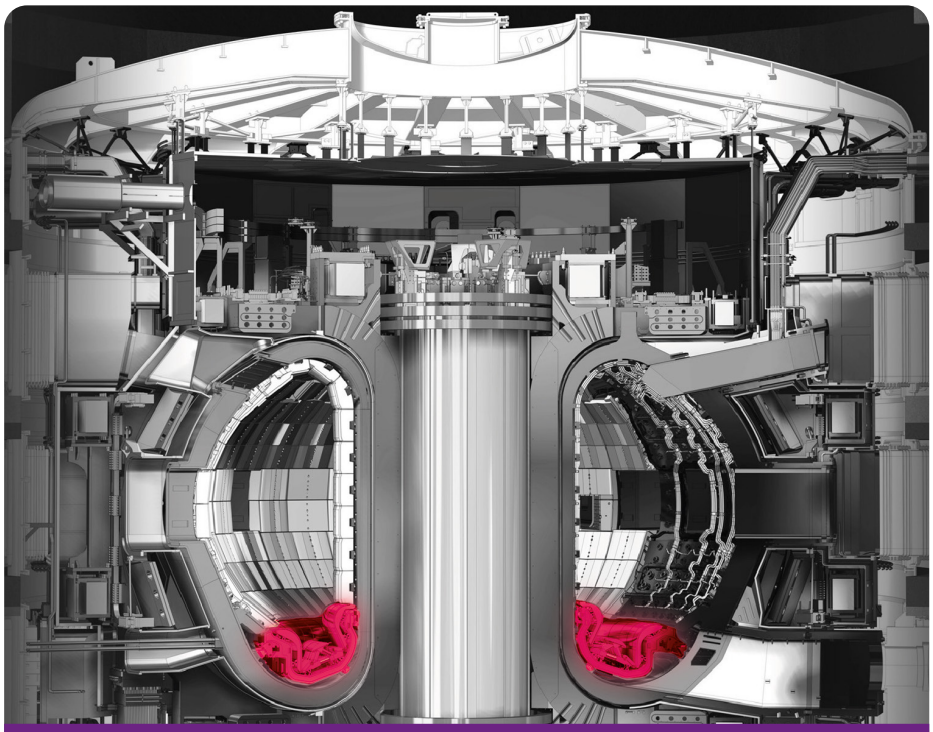
To resolve these challenges, Rae worked with senior technology officer Ozan Gurdal and other colleagues to complete extensive cutting trials on a variety of metals, testing a range of cutting tools and machining strategies.

The trials used the centre's ABB 6700 robot arm with an electric spindle. The combination provides an accuracy of around 1mm, Rae notes, which is too large for many machining operations but not a limiting factor for this kind of destructive cutting.

The team collected data from a cutting force dynamometer, with a thermal camera to help predict tool wear. The robot was also equipped with a piezoelectric accelerometer and microphone to monitor vibrations, linked to a custom algorithm to alert the operator and suggest a new spindle speed in case of chatter or high dynamic forces.

The researchers then used the data to identify safe and stable cutting conditions, allowing the spindle speed and feed speed of the robot arm to be optimised for each specific geometry and material.

The trials established a set of optimised material removal rates for different materials – for example, almost 25cm$^3$ per minute for 316L stainless steel – which met or exceeded the client's target rates. Tool life was measured at between 10 and 30 minutes, depending on the material and cutting parameters.



**Extreme conditions:** cutaway of the Iter reactor, with divertors highlighted in red.

"The Nuclear AMRC brought real-world proof of concept to the project and allowed the demonstration of a feasible, effective solution to the volume reduction of large, very heavy reactor vessel internal components," says Micheneau. "The team at Nuclear AMRC are highly skilled, highly knowledgeable and highly efficient. They were intuitive to our needs and became real partners in this project, working alongside us and providing true value to the tasks, with suggestions and ideas for improvements all along the scope of the trials."

To better understand the effects of the divertor assembly's complex geometry on machining performance, the team constructed a small replica of part of the component. Cutting trials successfully demonstrated milling of different representative features, although at a lower rate of material removal than with a solid block.

Safe removal of the potentially radioactive swarf is also a challenge. The team designed a prototype housing to vacuum up the chips, and achieved capture rates of 99 per cent in initial trials on flat samples.

Once the swarf was captured, the team looked at how it could be efficiently compacted into standardised bricks which can then be packed for long-term storage. Initial trials with a hydraulic ram achieved densities of 4g/cm$^3$, about half the density of solid stainless steel, and identified the force required to reach the target density of 5g/cm$^3$.

Rae presented results from the project at the Nuclear Industry Association's fusion group meeting in May, hosted by the Nuclear AMRC. The team are now working with industrial suppliers to develop tool-changing techniques for use in hot cells, and are looking to engage with other fusion technology developers on robotic techniques for size reduction and decommissioning.

## Join the Fusion Cluster

The Nuclear AMRC is part of a new industry group to promote and support the UK's world-leading fusion energy sector. Led by UKAEA, the Fusion Cluster is free to join for interested organisations in business, academia, investment and government.

To find out more: **thefusioncluster.com**

# Manufacturers need to get to grips with **cybersecurity**

Cybersecurity is a growing challenge across many industries, including the nuclear supply chain. Dr Dimitrios Anagnostakis, Nuclear AMRC research engineer and co-author of a new report on cybersecurity for advanced manufacturers, explains how companies can deal with the risks.

**With increasing use of advanced digital systems and information technology (IT) across all sectors, the potential for accidental or malicious harm is also rising. Everyone working in industry needs to be aware of cybersecurity risks and how to manage them.**

From an IT perspective, cybersecurity sits within three main principles: confidentiality, to keep sensitive data safe and protected; integrity, to maintain accuracy and completeness of data; and availability, to ensure the proper functioning of a system so data can be accessed when needed. All these aspects need to be maintained for the secure operation of an IT system.

In a manufacturing environment, the same principles apply to operational technology (OT) systems which include all the computer-controlled manufacturing equipment used on the shopfloor along with associated hardware and software. Availability is usually the priority, as any downtime will cost money, followed by integrity and confidentiality.

In advanced manufacturing, OT systems make up a large percentage of an organisation's assets. To improve operational efficiency and offer higher quality products and services, IT and OT need to converge. There are plenty of overlapping areas between IT and OT in a connected data-driven manufacturing environment, but effective strategies might not be in place to protect data, infrastructure and people.

Large organisations are likely to have invested in cybersecurity, but smaller companies may lack the time or resources or underestimate the risks. Even if your organisation has invested time and effort in securing an IT certification such as Cyber Essentials, it won't necessarily cover your OT.

OT-related decisions are often made on the shopfloor by operations staff, with less engagement with IT and security teams. This may result in a variety of technologies and capabilities which will require significant effort to integrate and manage with existing IT infrastructure.

## Nuclear challenges

Cybersecurity threats exploit the increased complexity and connectivity of critical infrastructure systems, with risks to security, economy, and public safety and health. It's a particular challenge for the nuclear sector, including manufacturers in the supply chain.

As in most industries, digitalisation of nuclear is well underway with growing use of digital systems to replace legacy infrastructure. This has led to an increased deployment of modern hardware for connecting existing systems, collecting data, enabling automated data processing and eventually creating valuable insights to inform decision-making. However, this also brings a series of cybersecurity challenges.

Each digital system and end-user device may constitute a point of access for cyber-attackers, potentially leading to critical incidents such as shutdowns, data breaches, and physical damage to operating systems. Nuclear facility operators need to carry out a proper cybersecurity risk assessment so vulnerabilities and associated threats can be identified, and the appropriate measures and precautions are taken.

From a nuclear manufacturer's point of view, the challenges remain the same as in other industries such as aerospace, oil & gas, and defence. Components have extremely high value, as do the data generated throughout their manufacture, so it is critical for manufacturers to maintain the highest possible level of cybersecurity.

## Understanding the threats

With the rapid adoption of connected manufacturing equipment, companies need to map the state of their infrastructure and identify any potential cyber-threats. These maps will then facilitate an effective cybersecurity risk assessment so countermeasures can be applied. An effective assessment will ensure that business assets and production machines will be protected and kept available, while sensitive data will remain secure and accurate.

As systems are increasingly connected across manufacturers, supply chains and industries, cybersecurity readiness is currently not as mature as it needs to be to provide a sufficient level of protection from current and emerging threats. Manufacturers need to seriously consider the implementation of a cybersecurity strategy.

This is why I recently worked with colleagues from the AMRC and other High Value Manufacturing Catapult centres to write a detailed introduction to cybersecurity risk assessment for advanced manufacturers.

The report aims to help manufacturers with limited knowledge to identify potential threats and prioritise actions for reducing the risks. We also explain how to frame a strategy and policy for cybersecurity, and take the necessary measures to protect your data and assets.

To download the report, go to:
**hvm.catapult.org.uk/resource-hub**

# Exploring the benefits of nuclear hydrogen cogeneration

## Frazer-Nash Consultancy and the Nuclear AMRC are leading a new project to understand and demonstrate the benefits of advanced nuclear reactors for more efficient low-carbon hydrogen production.

**The project explores the feasibility of a hydrogen production demonstrator and test facility that simulates the heat and electricity outputs of a new generation of nuclear plant.**

The facility would support the development and commercialisation of a range of small modular reactor (SMR) and advanced modular reactor (AMR) designs.

It would also help companies which are developing new technologies for low-carbon hydrogen production to test and refine their technologies' performance, and accelerate commercial deployment.

The collaborative research project is funded by BEIS through the Net Zero Innovation Portfolio.

"We are thrilled to have won funding for this exciting study combining new and emerging technologies from within the nuclear and hydrogen sectors, gaining valuable insights from industry on future trends and understanding their requirements," says Steve McCluskey, technology management consultant at Frazer-Nash and overall project delivery manager.

The proposed test facility will cover hydrogen production by high-temperature electrolysis and thermochemical splitting of water. Both techniques are more energy efficient than conventional electrolysis, while avoiding the high greenhouse gas emissions of steam methane reforming.

As well as replacing fossil fuels for transport and heating, hydrogen can help decarbonise industrial processes such as steelmaking, chemical synthesis, and the production of ethanol and synthetic fuels.

"Nuclear power will play an important part in meeting 2050 net-zero targets as a provider of baseload electricity to meet ever-increasing demands, but nuclear's cogenerative potential is absolutely massive and largely untapped," says Neil Murray, business development manager for advanced technologies at the Nuclear AMRC.

"Studies have shown that nuclear energy's unique combination of heat and electricity can be used to produce clean hydrogen at a price similar to current renewable and fossil fuel methods, at any time of day, in all weathers, and without the need for fossil fuels or carbon capture. This demonstrator will seek to unlock the potential for nuclear as part of the wider energy mix, by answering the questions that would otherwise go unanswered until SMR and AMR reactors are operating in the 2030s."

In the first phase of the collaborative project, Frazer-Nash and the Nuclear AMRC are working with hydrogen and nuclear industry partners to investigate the feasibility of a small-scale hydrogen production demonstrator to simulate the output of a range of AMR and SMR designs. This feasibility study will take nine months, supported by funding of around £237,000 from BEIS.

If the study demonstrates value for money and a viable solution, a second phase would then cover detailed design, construction and operation of the facility by 2025.

The project builds on an initial study of the potential for nuclear cogeneration and hydrogen production, led by the Nuclear AMRC on behalf of the Catapult network with support from Frazer-Nash.

The unique combination of uninterrupted low-carbon electricity and heat from conventional reactors can be used to electrolyse water steam into hydrogen at an energy efficiency of up to 85 per cent, significantly higher than current green hydrogen technologies which use renewable electricity to electrolyse water at ambient temperatures.

New designs of high-temperature reactor, which can provide temperatures of 800°C or higher, open the door to even more efficient thermochemical water-splitting processes. BEIS's AMR research, development and demonstration programme is now focusing on high-temperature gas reactors.

Frazer-Nash, a leading systems and engineering technology company, joined the Nuclear AMRC as a member in early 2021 to collaborate on innovative technologies for the nuclear sector and other low-carbon applications.

**On 20 September,** the Nuclear AMRC and Frazer-Nash are hosting an interactive event about the future of nuclear in hydrogen cogeneration.

For details: **namrc.co.uk/events/hydrogen-cogeneration-fnc**

# £120 million fund to support nuclear new build

## The UK government has launched a £120 million Future Nuclear Enabling Fund to support the development of new nuclear energy projects.

**Originally announced in last year's Net Zero Strategy, the fund is intended to lower barriers to entry for new reactor designs, and will support the target of 24GWe of nuclear power by 2050 announced in April's British Energy Security Strategy.**

The fund will provide targeted, competitively-allocated government grants which will help nuclear construction projects, including small modular reactors, to attract private investment. It is also intended to boost the resilience and capability of the UK nuclear supply chain.

In May, the government invited interested parties to register their interest in bidding for funding, and to provide information on potential future projects. It also invited nuclear stakeholders who are not planning on bidding for the fund to advise on fund design before bids formally open.

The fund aims to reduce barriers to entry to the UK market, accelerate the commercialisation of different technologies, and help technology providers and developers demonstrate their readiness for the UK market.

Given the scale of investment required to mature a new nuclear project, the government expects to concentrate the funding on a small number of projects. All awards will be subject to robust eligibility and evaluation criteria and value-for-money assessments.

### Introducing RAB

Building a new gigawatt-scale nuclear plant can cost tens of billions of pounds over a decade or more before generating any electricity. This is not an attractive investment profile for developers and their financial backers.

To lower the financial barriers which have scuppered a number of proposed projects over the past decade, the government is introducing the Regulated Asset Base (RAB) financing model for nuclear projects.

**Infrastructure finance:** Sizewell C is likely to be the first nuclear project to use the RAB model and support from the Future Nuclear Enabling Fund.

RAB is designed to provide a more attractive investment profile for major infrastructure projects by reducing project risk for the investor and providing an income stream during construction. The Nuclear Energy (Financing) Act, which allows the use of RAB for nuclear new build, received royal assent in March 2022.

In June, the government unveiled further details of how RAB can be used in nuclear, and opened a consultation on exactly how nuclear projects would receive their funding under the new model.

Under RAB, projects will receive a regulated payment from electricity suppliers during construction, allowing the developers to generate predictable returns at an early stage and reducing the costs of financing.

The government says that by reducing financing costs, electricity consumers are expected to save more than £30 billion over the project's lifetime on each new large-scale nuclear power station.

Under the previous mechanism to support new nuclear projects – the contracts for difference scheme – developers had to finance the entire construction cost of a nuclear project in advance of operation, and only begin receiving revenue when the station starts generating electricity. The high costs of upfront financing under this model contributed to the cancellation of projects such as Hitachi's proposed new build at Wylfa Newydd and Toshiba's at Moorside.

EDF's Sizewell C project in Suffolk is expected be the first nuclear project to use the RAB model, subject to the outcome of current negotiations. The current consultation will inform new revenue regulations which will shape how Sizewell C and other large nuclear projects will receive funding.

The task of helping new build projects through the development process will fall to a new government-backed vehicle, Great British Nuclear, which was also announced in the Energy Security Strategy. It will be supported by substantial funding to help get projects investment-ready and through the construction phase, with the project selection process expected to start in 2023.

Simon Bowen, former chief executive of Babcock International's nuclear business, is leading the development of Great British Nuclear with support from experienced industry specialists. The Nuclear AMRC's Andrew Storer is leading activity on supply chain and skills issues.

Executive **view**

# The heat is on

**I write this shortly after the hottest days ever recorded in the UK. If there was any upside amid the fires, infrastructure damage and personal discomfort, it was the reminder of the extreme conditions that face us all if we don't get to grips with reducing our greenhouse gas emissions.**

The same week, Conservative MPs closed a series of increasingly heated votes to select the UK's next prime minister. We won't know the final winner until September, but we do know that she or he will face some massive challenges.

I've written here before about the scale and urgency of what we need to do to reach net zero, and the strides made over the past few years.

We are now legally committed to reducing our emissions to net zero by 2050, and aiming to decarbonise electricity generation by 2035. The only realistic way we can do that is by deploying nuclear power alongside renewables. We also need investment in a host of other low-carbon technologies, and the government has taken steps to support that.

The risk in any period of political or economic upheaval is that we lose focus. My simple message for the new PM is that we mustn't slacken our pace or lose our sense of purpose as a nation.

Targeted investment in low-carbon tech will help drive all those other political goals – economic growth across the UK, productivity improvements, energy security, and cost reduction. It's not an obstacle or an alternative to anything that any leader should want to achieve.

Over the past months, I have been spending a lot of time at BEIS, helping establish the framework for Great British Nuclear. This will be the vehicle for bringing nuclear new build through the regulatory and financial hurdles that have stymied projects over the past decade.

Work so far has focused on defining how that will operate, its scope, and the needs of the market. It's a wide-ranging challenge, considering a host of questions around the technology mix, access to finance, site identification and development, construction management, the operational model for plant owners, and streamlined regulation.

I'm privileged to be leading the work on understanding how Great British Nuclear can best support the UK supply chain, by supporting efforts to plug the gaps in technical capabilities, skills and production capacity. It's a complex topic that's at the heart of what we do at the Nuclear AMRC, and essential for the delivery of our national ambitions.

When I met the PM in March, it was clear that Great British Nuclear was inspired by the approach taken to vaccines and ventilators, with the ambition to move at the pace that we did in the pandemic. My aspiration is that we focus the requisite sector resources, including research funding, to the problem at hand.

I intend to work with Innovate UK, UKRI, NIRAB and BEIS to ensure that the appropriate focus is bought to bear on the gaps that exist in capability and capacity. Part of closing the gap is to implement innovation to reduce the people burden and speed up delivery.

The Great British Nuclear proposals include items which are directly relevant to our centre's activity. On the innovation side, our researchers are working with companies of all sizes to improve productivity and solve technical challenges.

On supply chain development, we've already helped UK manufacturers win over £2.5 billion of new business. That's just the tip of the iceberg if you look at the investment we need to reach net zero.

Organisations in other low-carbon sectors have recognised the impact of our Fit For Nuclear programme, and we're working with partners to adapt it to their needs. As you'll read elsewhere in this newsletter, we recently opened the first national Fit For Offshore Renewables programme, and are launching Fit For Hydrogen and Fit For CCUS.

We're also working to close the skills gap, as part of the consortium delivering the new Nuclear Skills Academy for Rolls-Royce's submarine business. That's a fantastic model that I want to see replicated across the broader nuclear sector.

Whatever happens in Westminster, we need to maintain and accelerate this work. We need the new PM to commit to Great British Nuclear and the wider net-zero mission, and to continue to support industry through Catapult and other proven programmes. The heat is on for us all.

**Andrew Storer, CEO**

# Nuclear Skills Academy

## to train 200 apprentices a year

**The Nuclear AMRC is working with Rolls-Royce to create a new Nuclear Skills Academy to develop manufacturing expertise for the UK submarines programme and train 200 apprentices a year.**

**The new Nuclear Skills Academy at Infinity Park Derby is supported by industry and education experts, including the Nuclear AMRC, the National College for Nuclear, the University of Derby and Derby City Council. The collaboration, brought together by the Nuclear AMRC, will ensure that new apprentices have access to the best courses and mentors throughout their learning journey.**

"We are proud of our unique nuclear capability, and we are fortunate enough to have some of the smartest minds on the planet working for us," said Steve Carlier, president for submarines at Rolls-Royce. "But we must maintain this capability if we want to continue to innovate and evolve.

"Being born and bred in Derby, I am immensely proud that we are playing our part in further boosting the area's reputation for engineering excellence. The UK is embarking on a nuclear renaissance and we are determined to make the East Midlands the home of nuclear expertise for decades to come."

Rolls-Royce has provided power systems for all of the Royal Navy's nuclear submarines from its base in Raynesway, Derby, for the past 60 years. The training announcement came as the Ministry of Defence announced more than £2 billion of contracts for Rolls-Royce and BAE Systems to begin the third major phase of the Dreadnought submarine programme.

### Filling the skills gap

The Nuclear Skills Academy will initially focus on satisfying the needs of Roll-Royce's submarine propulsion business for 200 apprenticeships a year over the next 20 years, to meet the demands of Dreadnought and other long-term defence contracts. This number is likely to increase with the needs of Rolls-Royce's supply chain companies, which will also require similarly skilled personnel.

The Academy will cater for young apprentices, mid-career conversions, and experienced career conversions. Rolls-Royce already delivers its own apprenticeship training in Derby through its Learning & Development Centre, principally for aerospace apprentices. The new

**New home for skills:** iHub at Infinity Park Derby.

Academy will build on this with training tailored to the specific requirements of the nuclear industry.

The apprenticeships will be spread across four courses: Nuclear Engineering Degree Apprenticeship, Business Degree Apprenticeship, Nuclear Engineering Technician Apprenticeship, and Advanced Engineering Apprenticeship.

Training will be provided by the University of Derby, using material developed by the National College for Nuclear.

"All four courses offer debt-free, higher education qualifications while earning a wage within an exciting and growing business that supports the UK's net carbon ambitions," said Lee Warren, submarines engineering and technology director at Rolls-Royce. "Our new Academy will not only maintain and develop our nuclear capability for years to come, but it will also provide invaluable STEM qualifications for hundreds of individuals at the very start of their careers."

Comparable nuclear skills courses are currently available only in the South West and North West of England. The Academy will help grow nuclear sector capabilities and capacities within the Midlands, and ensure the continued success and growth of manufacturing and engineering companies across the region.

## Delivering for Derby

The Nuclear Skills Academy is taking over the iHub building at Infinity Park Derby, and will open its doors to the first apprentices in September. Infinity Park is a major industrial development located close to Rolls-Royce's Sinfin campus, and home to the new Nuclear AMRC Midlands facility.

iHub opened in 2016 as a flexible workspace for start-ups, early stage businesses and high growth SMEs. The Nuclear AMRC Midlands team moved into iHub in 2019, and will now work remotely or from the centre's other facilities until the new full-scale research facility opens early next year (see box). Other occupiers are being supported to move to alternative accommodation.

"The creation of this Skills Academy is a really exciting opportunity for Derby," said Councillor Chris Poulter, leader of Derby City Council. "It's so important that we grow and nurture talent in Derby, and with 2,000 apprenticeships set to be created over the next 10 years, we're delighted to be facilitating such a significant project through the use of our iHub."

The Nuclear AMRC played an instrumental role in bringing the stakeholders together. The collaboration is closely aligned to the Nuclear AMRC's core mission of helping UK manufacturers win work in nuclear, and to the High Value Manufacturing Catapult's work to address future skills gaps in key sectors.

The Nuclear AMRC will use its expertise in established and emerging manufacturing technologies for nuclear applications to support the design and delivery of bespoke training equipment for the engineering apprentices. The centre's staff will also provide guest lectures on advanced manufacturing and mentoring for students.

"We're very excited to support this new resource for Rolls-Royce's submarines business, which shows the value of our growing presence in Derby," said Andrew Storer, CEO of the Nuclear AMRC. "With the next phase of the UK's Dreadnought nuclear submarine programme now starting, it's recognised that there are significant skills shortages across the sector. We're pleased to be partnering with Rolls-Royce, the National College for Nuclear and the University of Derby to ensure that young apprentices can be trained, and mid-career professionals can develop new skills, for rewarding new jobs in the defence sector.

"After launching the submarines programme later this year, we hope we can make a similar intervention for the broader nuclear sector and in other low-carbon energy industries, where there's also a shortage of skilled people along the supply chain."

## The new permanent home for Nuclear AMRC Midlands is now under construction on Infinity Park, with the first steelwork erected in June.

**When it opens its doors in spring 2023, the new 4,300m² building will expand the Nuclear AMRC's capabilities in areas including digital engineering, controls and instrumentation, and equipment qualification, and help more companies in the Midlands and beyond to win work in nuclear and other high-value low-carbon sectors.**

The building will also be home to the University of Derby's Institute of Innovation in Sustainable Engineering, which specialises in design, manufacturing, product lifecycle management and application of new and smart materials.

The Nuclear AMRC Midlands facility is part-funded by £9 million of funding from the D2N2 Local Enterprise Partnership.

# Doors open for National Manufacturing Day

## The doors of the Nuclear AMRC's research factory in Rotherham were opened to the public in July for National Manufacturing Day.

**Led by manufacturers' organisation Make UK, National Manufacturing Day is designed to be a national celebration of the sector, with manufacturers across the UK invited to show their local communities what they do.**

The day is also intended to help attract young people into the industry. Manufacturing accounts for £183 billion of outputs, 64 per cent of UK R&D and over half of the UK's exported goods, but many manufacturers are facing a labour shortage and lack of the skills they need to grow their business.

Salaries are around 12 per cent higher than the national average, but there is often still a misconception that manufacturing jobs are low-skilled and low-paid.

Make UK says that National Manufacturing Day presents a real opportunity for businesses to work with schools, colleges, Jobcentres and local residents to inspire local talent and showcase modern manufacturing to dispel the myths.

The Nuclear AMRC welcomed visitors to discover its world-leading capabilities in advanced machining, welding, additive manufacturing and metrology, with senior technical fellow Andrew Wright and principal engineer David Anson leading the tours.

Most visitors were school students and apprentices, with many posing some challenging and insightful questions to the guides about manufacturing technologies and low-carbon power.

According to a survey published by Make UK for National Manufacturing Day, three quarters of manufacturers expect to see significant growth in employment over the next five years – with more than one in five companies say they expect more than 20 per cent growth.

More than a quarter said that greater investment in apprenticeships would make a big difference to their ability to grow. Make UK is calling on the government to reform the current Apprenticeship Levy scheme to make it work better for businesses.

"To further tap into the growth, agility and resilience Britain's manufacturers have shown over the last two years, imaginative solutions are needed to make sure the full potential is reached," said Stephen Phipson, Make UK CEO. "It is not an overly ambitious target to say that manufacturing can grow to deliver a 15 per cent share of UK GDP, but government does need to help companies be confident enough to make big investment decisions by helping with some key incentives."

www.makeuk.org


**Engineering futures:** David Anson explains how advanced manufacturing can help deliver decarbonisation.


**Open doors:** Andrew Wright shows the centre's work to young visitors.

# **3D Scanners** to help drive digital transformation

## Metrology specialist 3D Scanners UK has joined the Nuclear AMRC to help manufacturers improve their performance through digital transformation.

**Established in 1998, 3D Scanners UK is a market leader in scanning systems, providing metrology and 3D scanning software to a range of industries. The Warwick-based company is UK master distributor for PolyWorks software and associated metrology services such as training, support and consultancy.**

"As the leading metrology software, PolyWorks is the first single-vendor enterprise solution that supports all manufacturing 3D measurement processes, from measurement planning by design and manufacturing, through to facilitating the company-wide sharing of 3D measurement data and results," says Nik Alimaras, managing director.

"We believe the digital transformation of manufacturing is essential for reducing organisations' operational costs, thus increasing profits. Digital technologies can drastically transform 3D measurement processes through managing such information digitally and enabling access to all that require it.

"We are thrilled to join the Nuclear AMRC in helping manufacturing SMEs take steps towards such innovation through deploying PolyWorks as their smart 3D metrology digital ecosystem."

As part of its tier two membership, 3D Scanners will provide software and support to the Nuclear AMRC's metrology researchers.

"We're delighted to welcome 3D Scanners UK to the Nuclear AMRC," says Simon Cavill, technical lead for metrology. "The PolyWorks software will support our goal of digitally transforming 3D measurement processes for our clients, and enhance our capabilities for inspection, data analysis and visualisation."

Because PolyWorks software is not linked to any one hardware manufacturer, it can combine and analyse data from across the Nuclear AMRC's stock of advanced metrology equipment to meet the particular needs of different R&D projects.

"The first job for the new software will be in measurement planning and validation projects for modular reactor vessel manufacturing, where the ability to capture, analyse and report inspection data from a diverse range of instruments will bring real value to our customer," Cavill says.

**3dscanners.co.uk**

# **Advanced machining coolants** can reduce cracking risk

## Safety-critical reactor components produced using advanced machining coolants have less risk of cracking in service, research has shown.

**As part of the international Meactos (Mitigating Environmentally-Assisted Cracking Through Optimisation of Surface Condition) project, Nuclear AMRC researchers investigated ways of mitigating stress corrosion cracking in nuclear steels, and how advanced machining and surface treatments can improve the long-term performance of primary circuit components in light water reactors.**

Research focused on the use of supercritical carbon dioxide coolant, a sustainable alternative to oil-based emulsion coolants, for machining 316L stainless steel and Alloy 182.

"We've previously shown that the use of supercritical $CO_2$ improves tool life, and comes with added cleanliness benefits and better surface integrity," says Dr Krystian Wika, senior technical fellow in the Nuclear AMRC's machining technologies group. "We have now proven that supercritical $CO_2$ reduces the susceptibility of these steels to environmentally-assisted cracking, and might extend the operative life of primary circuit components in light water reactors. This is a significant discovery, and we are very excited to investigate further."

The work involved rigorous trials to compare standard and advanced techniques. Technical fellow Dr Agostino Maurotto led the analysis of surface integrity and microstructural changes, and their effects on corrosion resistance.

"The comparison with the standard production process showed that the samples machined using supercritical $CO_2$ as coolant had less incidence of environmentally-assisted cracking, and appeared to perform better than shot peened surfaces," Maurotto says. "No detrimental effects on microstructure were noted."

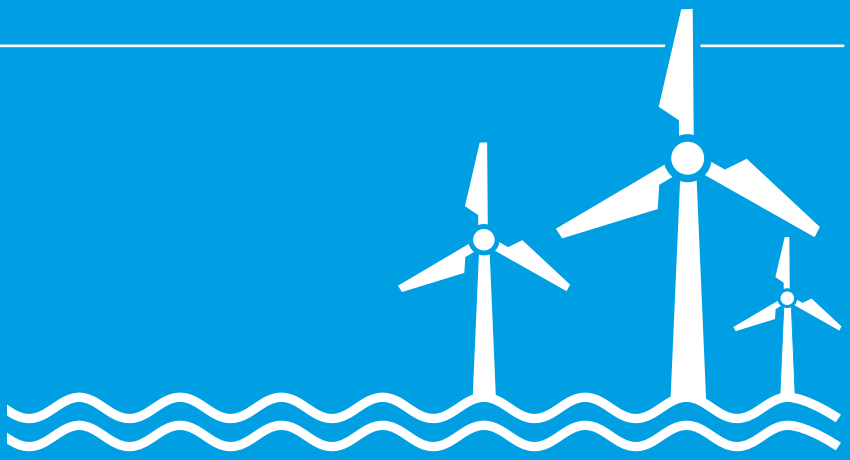
Meactos was a four-year, €2.5 million project funded by the European Horizon 2020 programme, involving 16 partners from 11 countries led by Ciemat of Spain.

The researchers will discuss their study at the Nuclear AMRC's next advanced cooling seminar on 15 September.

**namrc.co.uk/events/advanced-cooling-2022**

**meactos.eu**

# F4OR
## Fit For Offshore Renewables



# First 14 enter **national F4OR**

Fourteen businesses from across the UK are now developing their capabilities through the first national Fit For Offshore Renewables (F4OR) programme.

**Based on the Nuclear AMRC's proven Fit For Nuclear (F4N) programme, F4OR has previously been offered in key regions for the industry including North-East Scotland and East Anglia.**

The Nuclear AMRC has worked with the Offshore Renewable Energy Catapult and regional partners to help more than 70 companies through the programme – more than 40 have now been granted F4OR (see below for the latest). Participating companies have reported an average 23 per cent increase in turnover, and 13 per cent increase in job creation.

The first national F4OR programme launched in January with funding from the Offshore Wind Growth Partnership (OWGP). More than 50 companies registered their interest, with 14 successful entrants named in June. Several, including HV Wooding and Wozair, are already granted F4N.

Each company will go through the rigorous 12-18 month programme, focusing on improving business operations and sector competence to prepare them to compete for and secure contracts at UK offshore wind farms.

The recent ScotWind leasing round requires that developers commit to 25 per cent local content in their projects, making it more important than ever to develop the skills, capability and experience of the regional supply chain.

"Increased targets for offshore wind deployment to meet net zero and energy security commitments requires a rapid growth in the UK supply chain," commented Andrew Macdonald, OWGP programme director. "The F4OR programme gives companies the knowledge and skills to succeed, and companies that have been granted F4OR status are recognised as ready to deliver in the offshore wind sector."

**ore.catapult.org.uk/f4or**

## **Congratulations** to the latest companies to be granted F4OR

**Aubin designs,** develops and supplies chemistry-based enabling technology to the global energy industry.
**www.aubingroup.com**

**eTest and eBlast,** both part of Aberdeenshire-based eGroup, provide specialist non-destructive testing and surface preparation services for the energy sector.
**www.theegroup.co.uk**

**First Marine Solutions** specialises in temporary and permanent mooring solutions for floating offshore units.
**www.firstmarinesolutions.com**

**ITC Hydraulic Services** provides an on-site hydraulic service to the offshore, subsea, agricultural, mobile and industrial sectors.
**www.itc-hydraulics.co.uk**

**Osprey Shipping** transports heavy and abnormal loads, delivering critical infrastructure for on- and offshore projects.
**osprey.group**

**PanGeo Subsea Scotland** specialises in high-resolution 3D volumetric acoustic imaging solutions to mitigate risk in offshore installations.
**www.pangeosubsea.com**

**PD&MS** is an international engineering solutions provider operating across the energy industry.
**www.pdms-group.com**

**Safinah** provides coating and engineering solutions which reduce cost, extend asset lifespan and minimise environmental impact.
**www.safinah-group.com**

**THREE60 Energy** is a leading independent energy service company offering complete asset lifecycle expertise.
**three60energy.com**

**Tyne Gangway (Structures)** is a world leader in the design and manufacture of marine access systems.
**www.tynegangway.com**

# UK companies ready to supply **decarbonisation market**

## UK manufacturers could make more than 80 per cent of the components needed for decarbonising industrial clusters through hydrogen production and carbon capture, according to a new study by the Nuclear AMRC.

**The centre's researchers analysed supply chain readiness levels for more than 750 components needed for a major programme to help decarbonise the Humber cluster. The study considered three different hydrogen generation technologies, and the complete carbon capture, usage and storage (CCUS) cycle from emissions capture to deep sea storage.**

The team identified more than 450 UK companies with the potential capability to supply components, and found that 82 per cent of products could be made using current capabilities or with minor enhancements.

The work was carried out on behalf of the Zero Carbon Humber Partnership, a major collaboration to clean up the UK's most carbon-intensive industrial cluster and help UK manufacturers win work in emerging low-carbon sectors.

The partnership includes Associated British Ports, British Steel, Centrica Storage, Drax Group, Equinor, Mitsubishi Power, National Grid Ventures, px Group, SSE Thermal, Saltend Cogeneration Company, Uniper, and the University of Sheffield AMRC, with funding from the government's Industrial Strategy Challenge Fund.

The Nuclear AMRC's supply chain development team are now working on an additional report on the codes and standards which will apply to CCUS and hydrogen projects.

To help companies prepare to win work in decarbonisation projects, the Nuclear AMRC is also developing a new Fit For Hydrogen ($F4H_2$) and Fit For CCUS (F4CCUS) service based on the proven Fit For Nuclear model.

The team are now collecting expressions of interest for a pilot programme for Zero Carbon Humber, in which 20 UK manufacturers will be helped to prepare for opportunities at what promises to be the world's largest hydrogen production project at px Group's Saltend Chemicals Park. Applications are open until the end of August, with selected companies set to formally start the programme in the autumn.

To register your interest in $F4H_2$ and F4CCUS, go to: **namrc.co.uk/services/zch-supply-chain**

# **Congratulations** to the latest companies to be granted Fit For Nuclear

## These companies have benchmarked their performance against the standards demanded by the nuclear industry's top tiers, and driven business improvements.

**PPI Engineering** offers world-class expertise in the design, supply, support and monitoring of large motors and generators.
**www.ppi-engineering.com**

**RTR Group** is a supplier of steel to the global energy industry, with routes to tube/pipe mills, forge, fabrication, machining, bending and stock materials.
**www.rtr-group.com**

**Vector X-Cel** specialises in the manufacture of precision machined and fabricated engineering components and assemblies for all industrial sectors.
**www.x-cel.com/x-cel-vector**

### Congratulations also to

**Hayward Tyler, Joseph Ash Galvanizing, Penny Hydraulics** and **Proeon Systems** on being regranted F4N.

For details of all F4N-granted companies: **namrc.co.uk/services/f4n/companies**

# Making things possible with engineering

## Engineering can tackle grand challenges such as the climate crisis and energy security, but it can also make a big difference to people's everyday lives. Adam Blenkiron, sustainability technical lead at the Nuclear AMRC, explains how he's using his skills to help people living with disabilities.

**Engineering independence:** in his first Remap project, Adam Blenkiron (right) adapted a veteran's wheelchair.

**One of the most rewarding opportunities I have had to use my engineering skills has been to help disabled people in the local area to live more independent lives.**

Working towards becoming a chartered engineer through the Institution of Mechanical Engineers' monitored professional development scheme, I thought the best thing to do was to get involved in the local community and perhaps use my engineering skills at the same time.

This would allow me to work towards some professional engineering competencies that I would normally not get a chance to do at work, such as recognising obligations to society. Although my work is focused on making manufacturing more sustainable which can save costs, make processes more environmentally friendly and help create jobs, it can sometimes be difficult to show the immediate social benefits of our research.

I have always been interested in volunteering, and spent many years as an active IMechE volunteer promoting engineering for young members. About a year ago, I decided to try something different and got involved with Remap, a charity that custom-makes equipment to help disabled people live more independent lives. Pretty soon after, my drive for engineering competencies changed to the drive to help others and try to make a difference in disabled people's lives.

I joined the Sheffield and Rotherham branch of Remap, who help with adapting existing equipment or making new equipment. They have a monthly meeting to discuss this work, and the main idea is to visit clients and use engineering and practical skills alongside an inventive ability to solve problems.

I have met many disabled people, often with an occupational therapist who provides the clinical input. My job is to solve whatever practical challenge they throw at you, designing and then making a special piece of equipment that will help them become more independent. Of course, I have to do a risk assessment and provide basic documentation depending on the job at hand.

My first case was one of the most rewarding and it really hit home. Before I joined the Nuclear AMRC, I had a relatively short career in the RAF as an aircraft technician. So I am now a veteran, albeit a young one, and still feel part of the military community.

At the start of the year, I was contacted by the local Remap case officer about an army veteran who required help with his wheelchair. This was initially referred to by Help for Heroes, with whom I am very familiar as I have many friends who have received support and raised money for this charity. The veteran is an amputee who needed some help with decreasing the length of his leg rest. That is exactly what we did, along with a long chat about his current situation and his time in the army.

After we started talking, it felt like I was back in the military, and the comradeship was evident. This was a very rewarding experience and, though not the most arduous of jobs, still a problem that we had to find a solution for.

This is just one of many examples of helping those in need which I have been involved in. Some have been more challenging than others, and some of the situations that clients are in have been quite distressing, but the professionalism inside me drives me to push on with the solution and help them in any way possible.

I believe this is a huge opportunity for literally anyone involved in engineering who wants to help others. And it's not just engineers – administration and media skills are very useful and can help just as much in organising the group and getting the word out about what we do.

If you are interested in making a difference, please visit the Remap site for more information about volunteering.

**www.remap.org.uk**

# **Inspiring women** to step up in engineering

Each June, International Women in Engineering Day highlights the achievements of female engineers and encourages more young women and girls to take up engineering careers. For 2022, the High Value Manufacturing Catapult showcased the work of women working at its seven centres.

The Nuclear AMRC was represented by Dr Iwona Zwierzak, who has worked at the centre for six years as sustainability technical lead on a range of metrology and machining projects.

**Which female inventors or innovators have inspired you?**

I have a list of scientists and engineers who have inspired me. From the scientific world, it is Marie Skłodowska-Curie, a very determined woman, an amazing scientist who has made a huge contribution to treatments for cancer – the first woman to receive a Nobel Prize, and the only woman to receive two Nobels.

From the engineering world, it is Margaret Hamilton, the woman who sent the Apollo missions to the moon and back.

Both were always confident in their skills and extremely enthusiastic. Those ladies have inspired many women to step up and be recognised for the work they do.

I totally agree with Margaret that to achieve success, we should be never afraid to ask questions, to continue even when things appear to be impossible, to not be afraid to be different and admit mistakes. And with Marie that nothing in life is to be feared; it is only to be understood.

**What inspired you to get into engineering?**

Ever since I was a child, I have enjoyed maths, problem solving and challenges, and I have been very creative. My second love was theatre and a dream of becoming an actress.

However, maths was logical, and it did not require learning by heart. After the battle between my head and my heart, I decided to study Biomedical Engineering at the Wroclaw University of Technology.

My curiosity and passion for science had won. Theatre became my hobby.

**What are you currently working on?**

My main research is on sustainable manufacturing. It is crucial to improve the efficiency of equipment and processes, to lower energy consumption, decrease manufacturing time, and reduce waste.

**What projects are you most proud of working on and why?**

Working on the development of the technologies for nuclear applications makes me happy. Anything that can make a significant change and stop us from crossing environmental boundaries matters to me.

**What innovation in your sector do you think has had the biggest impact on people's lives?**

Working on the manufacturing problems which are crucial for the development of the UK nuclear sector is exciting. We believe in carbon-free electricity and reliable energy sources which will impact people's lives due to a significant reduction of air pollution and more affordable energy.

In the nuclear sector, it is key to bring together lots of different technologies and innovations to create a safe and reliable source of low-carbon power.

**What advice would you give to other women looking to get into engineering?**

The engineer of today must have interdisciplinary knowledge and be versatile to increase employability. It is important to believe in your skills and have the courage to introduce yourself, no matter if you are male or female.

Whenever you feel like you are interested in any industry or research institute, do contact them, explain who you are and what you can bring to the organisation. Skill transferability should be welcomed.

You may not know everything, but you can always learn something if you really want it. Never let anyone discourage you from applying for engineering studies.

Remember that flexibility can open multiple doors for you. The saying which I really like is *carpe diem* – seize the day.

Find out more about International Women in Engineering Day: **www.inwed.org.uk**

# **Graduates** head into industry

Jack Walker-Appleton and Jake Kilcoyne, two young professionals sponsored by the Nuclear AMRC through the nucleargraduates programme, recently completed their initial placements at the centre and are now on secondment in different parts of the industry. *Nuclear AMRC News* asked them what they've learned so far.

**I applied for the nucleargraduates scheme in my final year of studying Business Management at the University of Brighton, with a placement year at Baker Hughes. The importance and growing need for energy has always interested me, and I applied for the scheme because of the opportunity it offered to work in a centre that is on the cutting edge for manufacturing.**

It also offered the opportunity of working across multiple organisations in different positions, which will allow me to learn and grow as a professional.

I worked at the Nuclear AMRC in project management, working on multiple different projects, and learning about the project lifecycle and the processes used for managing projects. I have gained valuable experience in working with a project team, on a large project facing multiple different challenges which I had not worked with before.

Everyone I have worked with at the Nuclear AMRC has been very friendly and goes out of their way to help answer the questions I have about all different varieties of topics, whether about the company, project management or career advice.

I have learnt a lot about working in a team, how to develop my communication skills, and also the important skill of how to chair a meeting successfully.

I am now moving on to my next secondment, at BEIS in Westminster where I will work as an International Atomic Energy Agency advisor. I will be supporting international conferences, working with diplomats to prepare briefings and statements on nuclear security and non-proliferation.

I have really enjoyed my time at the Nuclear AMRC, and would like to give a big thank you to everyone here for supporting me, taking time to answer my questions and being so friendly. I have learned a lot.

**– Jack Walker-Appleton**

**I graduated from a masters degree in Mechanical Engineering at the University of Strathclyde last summer. I had a keen desire to enter the nuclear industry, which prompted me to apply for the nucleargraduates scheme. I was excited by the prospect of working across different businesses, trialling different roles, and gaining unique experiences across the two years.**

Since starting on the scheme, my enthusiasm for nuclear has grown. This is a great time to be starting a career in the industry. The opportunities within the British nuclear landscape are endless and, with SMRs and fusion still in their infancy, I believe there is an opportunity for this generation to help pave the way to a carbon-free, sustainable future.

Working within the manufacturing engineering group at the Nuclear AMRC gave me the opportunity to work on cutting-edge developments which help bridge the gap between academia and industry. One of my favourite aspects was the opportunity to support a wide range of projects. I have supported commercial and collaborative R&D, as well as in-house projects, in areas ranging from lean manufacturing to fusion technology.

I have extended my knowledge in different aspects of manufacturing, including non-destructive testing, hot isostatic pressing, and welding systems. I also attended Fit For Nuclear site visits which helped to enhance my understanding of nuclear supply chain requirements.

Everyone I worked with was friendly, and I felt welcomed at the centre. I was able to seek advice and guidance from more experienced colleagues for project work and general career advice, with everyone happy to offer their support.

For my next secondment, I will be working as a project engineer for Magnox, based at Hunterston A. I am looking forward to gaining on-site experience and enhancing my understanding of the regulatory aspects of a nuclear licenced site, while continuing my professional development.

**– Jake Kilcoyne**

To find out more about the nucleargraduates programme: **www.nucleargraduates.com**

# International Nuclear Manufacturing Summit 2022

## UK capabilities + Global opportunities

16–17 November 2022, Magna, Rotherham

**The Nuclear Manufacturing Summit returns this autumn with expanded coverage of opportunities for the UK supply chain in the global nuclear market, a new venue, and enhanced networking opportunities.**

**The UK is targeting 24GW of new nuclear power by 2050, and other countries are setting their own ambitious targets to support decarbonisation and energy security. With potential investment totalling hundreds of billions of pounds, there will be huge opportunities for nuclear-ready manufacturers.**

From current gigawatt-scale projects to new designs of small and advanced modular reactors, along with continuing opportunities in the decommissioning and defence sectors, the scale of the potential nuclear market will challenge the capabilities and capacity of the supply chain.

Hosted by the Nuclear AMRC, the International Nuclear Manufacturing Summit 2022 will showcase opportunities in the major programmes and explore how suppliers can win work now and over the next 30 years.

This event is designed for UK manufacturers looking for opportunities in the nuclear market at home and worldwide, and wanting to play a part in the international mission to reach net zero emissions and reform the global energy market.

With the first day focusing on the latest UK developments and the second day expanding to cover international opportunities, this event is not to be missed.

For the latest information and registration: **nuclearmanufacturingsummit.co.uk**

# Work **with us**

**The Nuclear AMRC is here to support manufacturing companies, from SMEs to global giants, which are seriously interested in winning business in the nuclear sector.**
**If we can help your company, we want to hear from you.**

We help manufacturers through **supply chain development** and **innovation**.

We can work with you to raise your quality, capability and cost competitiveness to meet the needs of the global nuclear industry.

And we can develop world-leading manufacturing processes and technologies. We have the production-scale facilities and the manufacturing expertise to help you improve cycle time, reduce lead time, improve quality and reduce costs.

Our capabilities and services are open to all UK manufacturers. We provide a responsive service to help you solve your manufacturing challenges and win new work.

We also offer full membership, giving you access to our generic projects and the opportunity to determine our core research.

**To find out more about how we can help you win work,** contact the Nuclear AMRC business development team:
business@namrc.co.uk

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