NUCLEAR AMRC news

No.51 Q2 2024

- Digital twins
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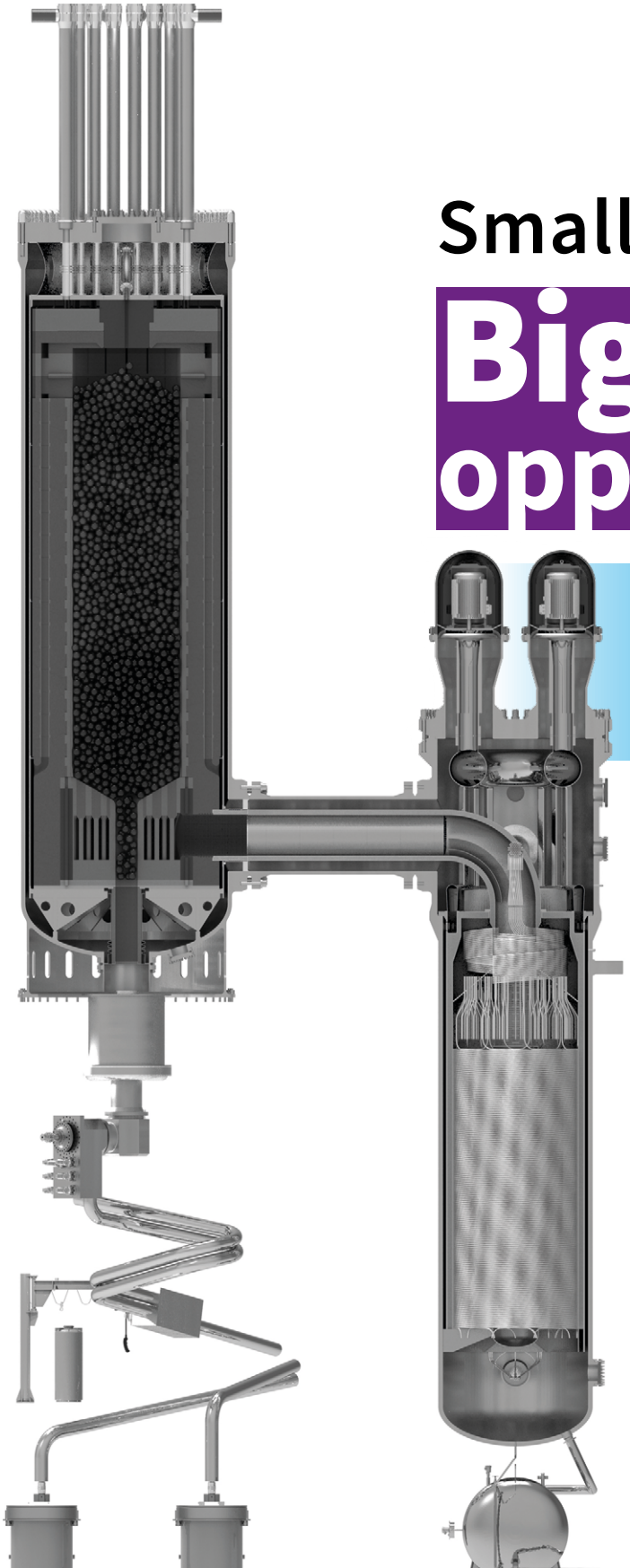


## Small reactors

# Big opportunities

## SMR developers connect with the UK supply chain

CATAPULT High Value Manufacturing

University of Sheffield


# UK suppliers meet SMR developers

New opportunities: GE Hitachi's Chris Southern welcomes delegates.

**The Nuclear AMRC brought together companies from across the UK with three small modular reactor developers, at a series of supply chain events in February and March.**

Each of the developers – Westinghouse, Holtec and GE Hitachi – is proposing to deploy its small modular reactor (SMR) in the UK.

The government's programme delivery body, Great British Nuclear, is currently considering proposals from six SMR developers, and is expected to confirm successful bids in the second half of this year (see p17).

**Westinghouse**

More than 130 UK companies attended Westinghouse's UK supplier symposium in early February. The two-day event in Preston allowed Westinghouse to engage with current and potential suppliers for its AP1000 and AP300 reactors, and was managed by the Nuclear AMRC.

"Westinghouse sees tremendous opportunity for our local supplier partners in the UK as we advance these vital projects," said Rita Baranwal, senior vice president for energy systems. "We have a long history working side-by-side with the British nuclear industry and that legacy will continue for decades to come. We felt that now was the perfect moment to help the supply chain understand the breadth and scale of opportunity and our requirements to ensure delivery with sustainable social value."

The AP300 SMR is based on technology from the established AP1000 gigawatt-scale pressurised water reactor, and began the UK's Generic Design Assessment (GDA) process in February. Shortly after the event, Westinghouse announced plans to deploy four AP300 reactors in North Teesside.

**Holtec**

In early March, around 100 UK companies came to the AMRC Knowledge Transfer Centre in Rotherham to discuss opportunities to support Holtec's SMR-300.

The SMR-300 is a pressurised water reactor developed in collaboration with Mitsubishi Electric and Hyundai Engineering and Construction. US-based Holtec proposes to deploy around 16 SMRs in the UK by 2050. In December 2023, it secured £30 million from the government's Future Nuclear Enabling Fund (FNEF) to start the GDA process.

Holtec has also signed agreements with Balfour Beatty and Mott MacDonald to support SMR-300 deployment in the UK, and invited regional agencies to submit bids to host a factory for SMR components.

"We assembled a world-class team that can deliver gigawatts to the grid with our SMR-300 technology, contributing meaningfully and reliably to the British energy security strategy," said Rick Springman, Holtec's president of global clean energy opportunities.

Holtec will launch a UK supplier portal in the spring.

**GE Hitachi**

Later in March, the Nuclear AMRC brought together around 150 suppliers to meet GE Hitachi Nuclear Energy, part of the recently rebranded GE Vernova.

GE Hitachi plans to deploy its BWRX-300 boiling water reactor in the UK and across Europe. In January, it secured £33.6 million from FNEF to start GDA.

"It is based on tried, tested and reliable technology, and partners in Canada, the US and Poland are already investing in our technology," said Sean Sexstone, executive vice president for advanced nuclear at GE Hitachi. "We have assembled a first-class team to deliver the BWRX-300 in the UK, and we look forward to working with the local companies who have attended today's conference as we continue to develop a robust UK supply chain."

Delegates also heard from Poland's Orlen Synthos Green Energy about potential cross-European collaboration, and from current suppliers Jacobs and Curtiss-Wright.

"An SMR programme in the UK will present huge opportunities for the domestic supply chain, and information-sharing and networking events like this are an essential first step to maximising UK content and making the most of the economic benefits of investment in low-carbon power," commented Andrew Storer, CEO of the Nuclear AMRC.

- For the latest information on SMR development in the UK and links to company portals: **namrc.co.uk/intelligence/smr**

# X-energy secures funding for UK development

**The Nuclear AMRC is part of an industrial partnership led by X-energy to develop its plans for deploying advanced modular reactors in the UK.**

X-energy and Cavendish Nuclear have been awarded £3.34 million from the Future Nuclear Enabling Fund (FNEF), which will be matched by X-energy. The companies will use the funds to develop UK-specific deployment plans including assessments of domestic manufacturing and supply chain opportunities, constructability, modularisation and fuel management.

"We are delighted to receive this FNEF award from the government," said Carol Tansley, vice-president of projects at X-energy. "It reflects the readiness of our advanced technology to contribute to the UK's energy needs in the next wave of new nuclear. Building on X-energy's initial deployment with Dow on the US Gulf Coast, we can create both jobs and long-term energy security in the UK with clean, reliable advanced nuclear power."

X-energy's Xe-100 is a compact high-temperature gas-cooled reactor (HTGR) generating 200MW thermal and 80MW electric power, designed for industrial decarbonisation as well as grid generation. The company is working with chemicals group Dow to install four Xe-100s to provide on-site power and steam by 2030.

In the UK, X-energy and Cavendish plan to build a fleet of up to 40 Xe-100s, including an initial 12-reactor plant at Hartlepool by the early 2030s.

"A fleet of Xe-100s can complement renewables by providing constant or flexible power, and produce steam to decarbonise industry and manufacture hydrogen and synthetic transport fuels," said Mick Gornall, managing director of Cavendish Nuclear. "Deployment in the UK will create thousands of high-quality, long-term jobs across the country."

X-energy and Cavendish will work with UK partners including the Nuclear AMRC, Sheffield Forgemasters and Kier Group on the FNEF project. The companies intend that 80 per cent of value of Xe-100 projects will flow to UK firms.

"This is an exciting project for the UK nuclear industry, looking in detail for the first time at the potential for the UK to support the manufacture, construction and operation of a commercial-scale HTGR," said Andrew Storer, CEO of the Nuclear AMRC. "We are delighted to be one of the key project partners."

The Nuclear AMRC's contribution will draw on its in-depth knowledge of UK supply chain capabilities and advanced manufacturing technologies, with additional specialist support from other parts of the University of Sheffield.

"The team are very much looking forward to supporting Cavendish Nuclear and X-energy on the development of a UK-focused manufacturing and sourcing strategy," said Jamie Gordon, head of manufacturing engineering and joining technologies.

Cavendish Nuclear has been a tier one member of the Nuclear AMRC since 2018, collaborating on a variety of manufacturing technology projects.

X-energy and Cavendish will also engage with the UK nuclear regulators to evaluate approaches to licensing the Xe-100 for UK deployment. The design is already progressing through initial regulatory assessments in Canada and the US.

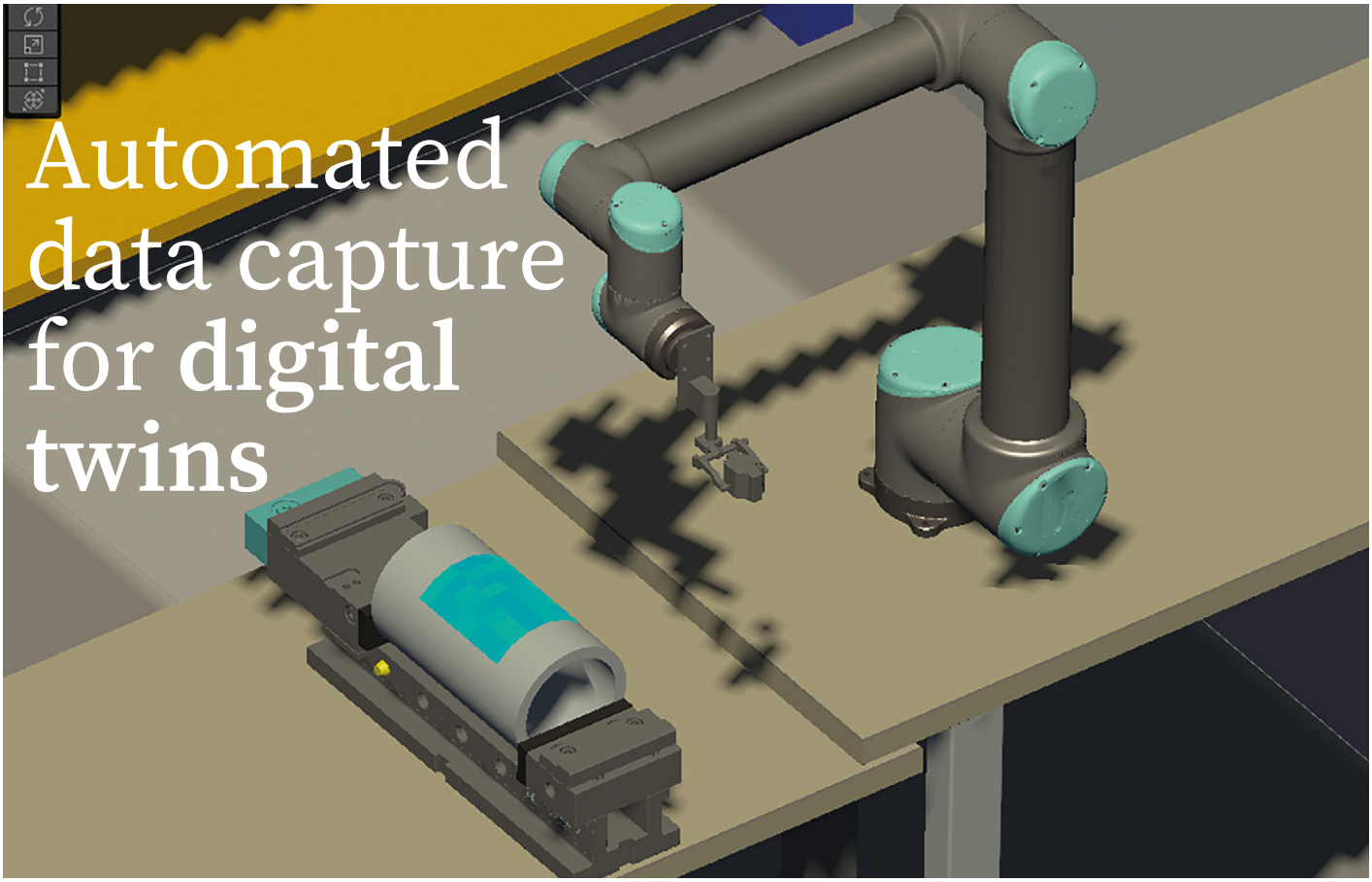
FNEF is intended to support nuclear projects with mature technologies that could take a final investment decision by the end of the 2020s. The award to X-energy and Cavendish is the first for an advanced modular reactor based on Generation IV technology.

"We are backing innovation in nuclear – from building large-scale plants better to encouraging new advanced technologies – to achieve our ambition for a quarter of our electricity to come from nuclear power by 2050," said Andrew Bowie, minister for nuclear and renewables. "This funding supports the next step in the development of advanced modular reactors, and shows our commitment to keeping the UK at the forefront of nuclear technology."

- **x-energy.com**

**Next wave: the Xe-100 reactor (left) and steam generator (right).**

# Automated data capture for digital twins



Twin benefits: digital model of the inspection robot and testpiece.

**Nuclear AMRC researchers have successfully demonstrated a new automated inspection system which feeds data into a digital twin to provide benefits throughout a component's life.**

The work is part of an internally-funded project to develop a digital twin platform that includes manufacturing data from each step of production. The project is a collaboration with the Sheffield Robotics research group, using their Twinality tool to integrate a range of data sources.

In the first phase of the project, Nuclear AMRC researchers created a tabletop robotic system for automated non-destructive inspection and testing.

The demonstrator uses an electromagnetic acoustic transducer (emat) sensor for thickness measurement, mounted on a robot arm. Emat is similar to common ultrasound testing tools, but uses magnetic fields to generate ultrasonic waves within the component. The waves' reflections can be measured and analysed to map the component's internal structure and identify any material flaws.

The arm and sensor were integrated with software for automated path planning and real-time data visualisation, to create a detailed 3D model of the fabricated component's internal structure with minimal work required from the operator.

"It's giving you the data while it's doing the scanning," says Dr Faris Nafiah, senior research engineer. "It gives a more intuitive way of visualising the inspection data."

The automated path generation reduces inspection time, by removing the need to program the robot's movements for different components. It also helps improve accuracy by optimising the scan parameters for data analysis.

The main challenge lay in integrating all the different pieces of hardware and software, Nafiah notes: "Communication between software and hardware is the difficult bit, because one isn't necessarily compatible with the other."

The team successfully demonstrated the system by inspecting a carbon steel pipe section. "We started on a generic sample with a bit of complexity in three dimensions, to give us that curvature which we wanted to verify the visualisation in real time and 3D," Nafiah explains. "A uniform shape is easy, but the benefits of the automated approach come with a more complex shape."

Nafiah is now preparing to test the system on more complex geometries and joints. Meanwhile, the Nuclear AMRC's welding engineers are carrying out trials in the ABB/Fronius robotic welding cell to collect weld data which can be integrated into the same digital model. The machining team will carry out similar work for automated weld grinding.

"It's all about having that continuity of data from one process to another," Nafiah says. "The idea is to have a data passport for an asset – the data goes where the asset goes, and what happens in the physical world happens in the digital world."

In the next phase, the Nuclear AMRC researchers will continue working with Sheffield Robotics to scale up the demonstrator in the centre's modular intelligent manufacturing and inspection cell, which features two large robot arms which can carry out a variety of welding and inspection tasks.

The technology could have wide applications for a range of safety-critical fabrications, including reactor components and waste containers. The team have already seen interest from technology providers who see the benefits of making their products compatible with a through-life data management system.

- To find out more about the project, contact: **f.nafiah@namrc.co.uk**

# First prototype delivered for Deep Isolation

**Deep Isolation and partners including the Nuclear AMRC have completed the manufacture of a full-size prototype canister for the safe geological disposal of spent nuclear fuel and high-level radioactive waste in deep boreholes.**

The corrosion-resistant canister, measuring nearly five metres in length and weighing over 2,000 kg, was manufactured by the Nuclear AMRC with support from Lancashire-based Graham Engineering (see last issue).

US-based Deep Isolation is developing a range of technologies to safely encapsulate and dispose of radioactive spent fuel within deep borehole repositories located up to three kilometres underground.

“This has been an exciting project for us, and a great example of US-UK partnership on nuclear waste disposal,” said Chris Parker, managing director of Deep Isolation EMEA. “We already had a detailed engineering design for our disposal canister that we knew would meet regulatory requirements for safe, permanent disposal of spent nuclear fuel. With the support of Nuclear AMRC’s world-class team, technologies, and UK partners, we now know how to refine the design to enable highly efficient manufacturing at scale.”

The project milestone was marked with a visit to the Nuclear AMRC by Parker and Matthew Ryan Tucker from the Department for Energy Security and Net Zero, which is sponsoring this work through the Energy Entrepreneurs Fund. The full project team met to see the completed prototype before it was shipped to the US for field testing at the Deep Borehole Demonstration Center.

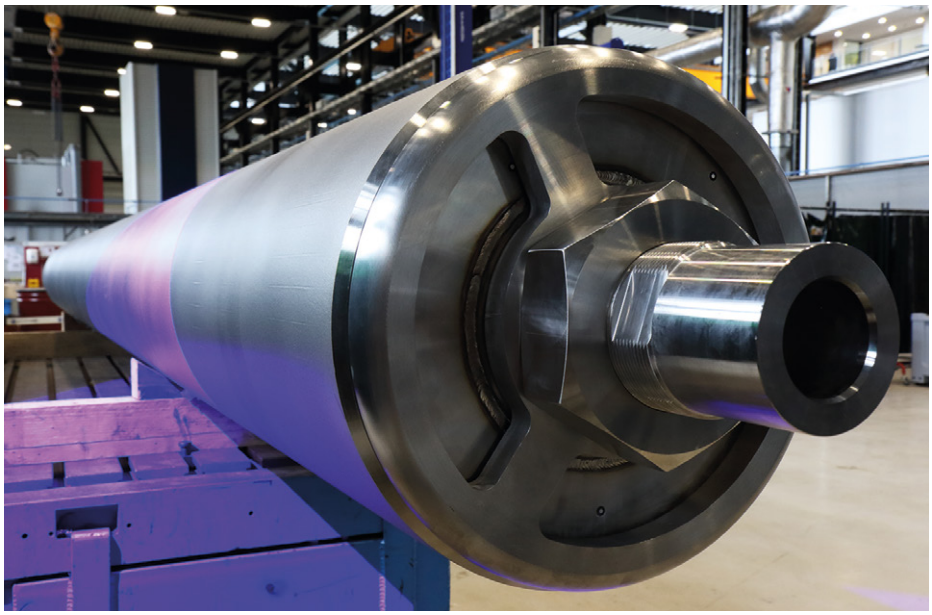
“It is exciting to have the world’s first fully-engineered deep borehole disposal canister coming for testing,” commented Ted Garrish, executive director of the Arizona-based facility.

In parallel, the University of Sheffield will validate the safety performance of the canister design through performance modelling in generic UK geological environments.

A second prototype is planned for manufacture by early 2025, which will incorporate any design modifications derived from this testing and modelling programme, as well as any changes identified by the Nuclear AMRC’s design-for-manufacture review which will make it more cost-effective to produce at scale.

Deep collaboration: the Nuclear AMRC project team with prototype canister and partners.

Top-down design: the prototype is almost five metres long.



If the borehole disposal method is adopted in the UK, more than 2,000 canisters could be needed to dispose of spent fuel from a single power plant over its lifetime. Global demand could total more than a million canisters for the disposal of legacy waste, and another 1.35 million to meet future demand.

- **www.deepisolation.com**


Deeper underground: the University of Sheffield team ventured 1.1km down during a visit to the Boulby site.

# Search for dark matter poses deep challenge to manufacturers

**UK physicists preparing to search for the universe's missing matter from the bottom of a mine have called on the Nuclear AMRC for advice on manufacturing the large metal structure at the heart of the experiment.**

An international consortium of particle physicists known as XLZD are proposing to build the world's largest and most sensitive detector for dark matter, the hypothetical particles which are thought to make up 85 per cent of the matter in the universe but which are invisible to conventional astronomical tools.

Experiments have shown that such weakly-interactive massive particles can be detected by their interactions with a large mass of liquid xenon. This liquid needs to be protected from cosmic rays and other sources of interference which would confuse the results. The best way to do that is to build the detector deep underground, so the detector is insulated by hundreds of metres of the right kind of rock.

One site being considered for the XLZD experiment is the Boulby mine, near the tourist village of Staithes on the North Yorkshire coast. Opened in 1968 to mine potash and polyhalite for fertiliser from the thick salt deposits left by an ancient sea, Boulby now includes a sprawling network of tunnels and caverns reaching depths of 1,400 metres.

The depth and the very low background radiation from the rock salt means that the mine is an ideal venue for dark matter experiments. It has hosted a laboratory, operated by UKRI through the Science and Technology Facilities Council, at a depth of 1,100 metres since the 1990s. But the scale of the proposed XLZD experiment creates a host of new engineering challenges.

**Deep down and dirty**

The core of the detector will be a large cryostat – a cooled chamber made of stainless steel or titanium, holding around 60 tonnes of liquid xenon at –110°C, and measuring four or five metres in diameter. This is an order of magnitude bigger than any previous detector. The UK-manufactured cryostat for the Lux-Zeplin experiment in the US, XLZD's largest precursor, holds just seven tonnes.

The cryostat will be surrounded by plastic tanks of organic liquid scintillator, which are used to filter out results from other kinds of particle. Around that will be an even larger steel tank filled with high purity water, alongside additional infrastructure to purify, cool and recycle the xenon. All this will sit at the heart of a cavern of around 25 metres diameter and height, surrounded by an array of experimental and operational subsystems.

"A key requirement is that all the infrastructure must be ultra-clean and highly radiopure, including all welds and machining tooling," says Dan Tovey, professor of particle physics at the University of Sheffield. "This is especially true of the cryostat, which must have impurity levels for uranium and thorium less than around 20 parts per trillion."

The cryostat is larger than the access shaft, so will need to be brought down in sections, then welded and machined under ultra-high standards of cleanliness.

"This is challenging as the environment underground is poorly accessible, dusty and hot," Tovey notes. "The work will need to be carried out in cleanroom conditions similar to those currently used in the semiconductor industry."

Building the XLZD experiment at Boulby isn't a done deal. Rival sites in Italy, US, Canada and Japan are also being considered as hosts, with a decision expected next year. Each site will present its own engineering challenges, so an authoritative proposal for dealing with the fabrication challenges at Boulby should strengthen the UK proposal.

**Ultraclean ship in a bottle**

If Boulby is selected for XLZD, the UK partners will be responsible for designing and fabricating the cryostat and surrounding infrastructure. Academic partners including the University of Sheffield have submitted initial proposals to UKRI to expand the infrastructure at Boulby to support XLZD, including the creation of new centres for clean manufacturing, engineering and skills development.

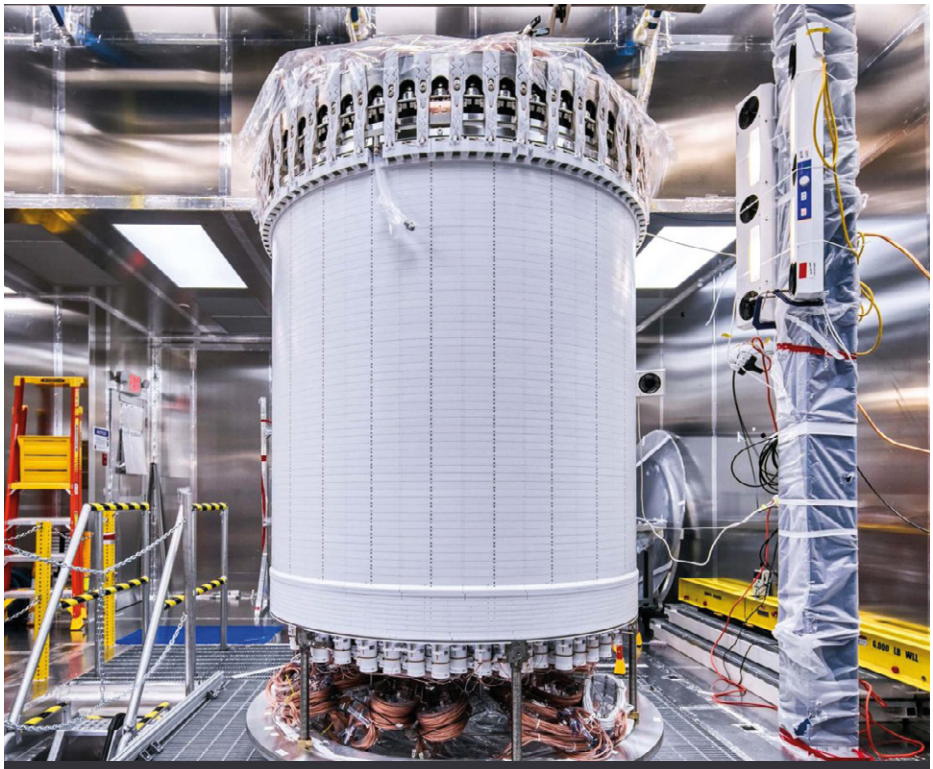
Under the proposals, the Nuclear AMRC will provide expert advice on advanced manufacturing in challenging environments, and draw on the wider expertise of the High Value Manufacturing Catapult and capabilities of the UK supply chain.

"Since we will be manufacturing large devices from materials with ultra-pure chemistries, mimicking those cleanliness atmospheres seen in the semiconductor and bioengineering sectors – which demand temperature and humidity control to extremely narrow tolerances – will be only one of the major challenges," says Steve Jones, professor of welding technologies and chair of the High Value Manufacturing Catapult's joining technologies group.

"Other challenges we will face include the manufacturing of parts and partly-formed structures both above and below ground, where the dismantling and reassembling of them will necessitate an array of joining techniques to create an effective vacuum flask levelled on a scale over a thousand times finer than a human hair."

This will require major collaborations with industrial and scientific experts from across the UK, incorporating novel manufacturing and assembly practices in areas including near-net shape forming, power beam welding, portable machining, metrology and modularisation, all performed to strict quality demands.

All manufacturing processes will need to avoid any contamination. For joining, that means electron beam or laser techniques to create autogenous welds with no filler material. For machining, there must be no foreign material introduced from coolants or tooling, which will require real-time monitoring and control of secondary particulates – a task that will challenge the current state of the art.



State of the art: the xenon tank at the Lux-Zeplin experiment is a fraction of the size of the proposed facility. (Sanford Underground Research Facility)

Depending on the final design of the experiment, the large metal chamber may require electroplating with a radiopure overlay such as copper which is pure to 99.99998 per cent by weight. Capabilities to do that don't currently exist, Jones notes.

"These technologies and procedures will provide the basis of addressing the industrialisation challenge – one that is akin to producing a ship in a bottle," he says. "Because there is no standard that would achieve our needs, we will be using a variety of the most demanding quality procedures adopted by industry – what we in the nuclear sector call best available techniques."

Delivering the project will need to draw on practices and quality codes used in the semiconductor and bioengineering sectors, as well as those from aerospace and nuclear.

**Cosmic challenge, local impact**

It's a massively complex engineering challenge motivated by questions about the fundamental nature of the universe – but there will be earthly rewards for UK manufacturers.

Building the XLZD experiment and its supporting facilities at Boulby will create significant opportunities for UK manufacturers to produce specialist equipment, particularly those in the Yorkshire and north-east regions with experience in challenging sectors like nuclear. Meeting the manufacturing challenges will require investment in new technical capabilities and skills, which will in turn create new opportunities in high-value markets.

As plans progress, the Nuclear AMRC's supply chain specialists will engage with the network of Fit For Nuclear manufacturers to discuss the opportunities and identify companies with the necessary capabilities to supply the project. A supply chain engagement event is planned for the summer.

The team will also work with the AMRC Training Centre to understand the skills requirements and develop new training programmes, potentially including new advanced and higher apprenticeships with local colleges, as well as degree apprentices.

"There will be a need for the UK to develop appropriate skills, and a change in manufacturing culture to one that continually challenges the status quo," Jones says. "We will be working with industrial partners and local education providers to develop specific science and engineering skills and knowledge to deliver, operate and maintain the Boulby facilities, and thereby generate growth for the region and position the UK as a world leader in understanding the cosmos."

- To find out more about potential opportunities at Boulby, contact: **steven.jones@sheffield.ac.uk**

## Executive view

# A little more action please

I have spoken at some fantastic events since I last wrote this column. One was with the Bessemer Society, where I gave a talk at the Worshipful Company of Cutlers in London in late March.

I was keen to explain the work of the Nuclear AMRC, and the situation we find ourselves in as a sector with the government plan of 24GW of civil nuclear power by 2050 and more defence work in the UK and Australia.

I started by asking the audience the plural for renaissance and how long a renaissance lasts. During my time working in civil nuclear I have experienced four or five renaissances, so reckon each lasts around three years. Of course, this may seem flippant but we have to work within the system we have. For the last 12 to 15 years, we have announced or worked on various renaissances, industrial strategies, roadmaps and sector deals.

Throughout, the supply chain has remained keen, engaged and ready to invest when there is a clear line of sight to long-term contracts. It was great to hear the enthusiasm from entrepreneurs at the event, and it really struck me that the UK can go when it needs to – we just need to decide what, where and when, and then set the industry into action.

By action, I mean in the supply chain and also the interventions that have been created in the last two decades, including the Nuclear AMRC. We have a lot of support organisations in the nuclear sector, and we also have the cross-sector Catapults, of which we are part. My focus over the next period will be to bring these organisations together to discuss the challenges we face in the sector, and how together we can start to enable more efficient and effective delivery of new build across both civil and military programmes.

Not long after the Bessemer event, I had a great visit to Boccard's new UK plant in Broughton, near Chester, to see the work it is delivering for Hinkley Point C.

Opened in late 2022 in a former Airbus wing factory, the plant now produces high-integrity piping supports and systems, including tens of thousands of pipework supports for UK EPR projects. There are also big plans to expand into other products such as the pipework itself, tanks and vessels for the nuclear industry.

Meeting the team here really did reassure me that we can step up our manufacturing capability and capacity to meet our national ambitions. In one welding bay, I met three 24-year-olds who all served their apprenticeships together and are now fully qualified and taking on some of the most challenging products. We are short of nuclear welders across the sector, but this proves we can get them.

The industry is facing a daunting challenge in skills and recruitment to deliver our ambitions, particularly when other sectors such as renewables, construction and transport will also need huge numbers of skilled workers to deliver their share of decarbonisation.

Part of our work at the Nuclear AMRC is about using advanced manufacturing technologies to reduce these demands on the workforce, through automation and innovative processes which allow skilled people to be more productive. We believe that using advanced processes along the supply chain could cut the required number of new recruits by half.

If we can apply innovation to products and processes to make production more efficient, then I'm sure we can recruit and develop enough skilled people to operate them. Nuclear will still be a growing industry, but we can do more with a limited workforce by working smarter.

Companies in the supply chain require confidence to invest in skills and new technical capabilities, of course. As many of the companies at our recent SMR supply chain events pointed out, they are waiting on decisions from government, Great British Nuclear (GBN) and the top-tier developers on which projects might be going ahead and on what timescale.

The sooner that decisions are made and transferred to the supply chain, the sooner capability and capacity can be developed. To bridge the time gap, we have proposed a new supply chain intervention programme to GBN and DESNZ which would allow the UK industry to develop the required capabilities before contracts are released, placing domestic manufacturers in a prime position to win and retain work in the UK.

As I've been arguing at least since the 2018 Nuclear Sector Deal, we need to act as one sector to deliver our ambitions. We need to work much more efficiently across the sector than we have in the past, sharing resources, facilities and expertise across the industry. That could include alignment of standards, a single demand-planning tool, a shared database of material requirements and capabilities, and a single approved vendor list.

And we need active political support. Later in April, I joined GBN and Trade Unionists for Safe Nuclear Energy (TUSNE) in Parliament for a discussion about how nuclear can deliver thousands of good jobs, huge opportunities for domestic manufacturers, and clean sustainable power for generations to come – surely a wishlist for anyone in Westminster.

The discussion did attract dozens of MPs and peers from across the political spectrum. With the general election looming, it's very encouraging that both main parties are supporting the nuclear industry's central role in delivering energy security and decarbonisation, as well as continuing investment in the nuclear submarine programme.

There has been some really good positive action from GBN already on securing sites, completing the first stage of the SMR selection process, and standing up a team of people. If only the whole political system would get behind the GBN team, instead of what seems like making life harder.

At the launch of GBN I was asked what I'd like from the minister. I said, like BA Baracus from the A-Team, to "quit your jibber-jabber" and get on with it. Things are happening, and the chat has reduced but we still need to see a "little less conversation and a little more action", to quote the King of Rock and Roll. Fingers crossed for more on this next time.

**Andrew Storer, CEO**

# BMD Infrastructure Services joins to foster collaboration

International partnership: Tom Purnell and Emily Milsom.

**BMD Infrastructure Services has joined the Nuclear AMRC to collaborate on technology development and expand its presence in the nuclear sector.**

BMD Infrastructure Services is part of BMD Group, the largest privately-owned civil contractor in Australia. By joining the Nuclear AMRC as a tier two member, BMD intends to foster collaborative technology development and expand its presence within the nuclear sector.

"This partnership signifies BMD's commitment to keep ahead of technological advancements in the nuclear manufacturing industry and complementary infrastructure," said operations director Graeme Fenemore. "By sharing our capability and 45 years of experience in delivering critical infrastructure projects in highly regulated industries, coupled with our deep understanding of the importance of supply chains and their capacity to support and drive technological advancement, we will be able to support the Nuclear AMRC in helping to shape the future of nuclear manufacturing."

As part of its membership, BMD will develop its technical capabilities in advanced manufacturing technologies and methodologies tailored to the specific needs of the nuclear industry.

BMD is also seconding senior consultant Emily Milsom to work at the Nuclear AMRC on strategic campaigns as part of the business development team.

"I am incredibly grateful to undertake this secondment opportunity at the Nuclear AMRC," Milsom said. "I am excited by the prospect of immersing myself in the world of nuclear manufacturing, and I am eager to leverage my diverse experience to drive success in this role. I look forward to embracing new challenges, collaborating with industry experts, and contributing to the advancement of strategic initiatives at the Nuclear AMRC."

Strategic programmes include support for the international AUKUS submarine programme, in which the UK and Australia will both build new nuclear-powered submarines to a UK design.

"We are pleased to have BMD as a member, and having Emily on board with us provides a great chance for her to support some of our most important and developing programmes, such as the AUKUS strategic partnership, as they develop," said Tom Purnell, Nuclear AMRC business development director. "I look forward to working with her and the wider organisation over the coming years, strengthening our links with Australian industry at a pivotal time for the sector."

- **bmdinfrastructureservices.co.uk**

# Suppliers celebrate fitness for hydrogen and carbon capture

**Manufacturers from across the UK are targeting and winning new work in fast-growing low-carbon sectors after being granted Fit For Hydrogen and CCUS.**

At the end of the pilot programme, 28 companies have been granted F4H2+CCUS status following a rigorous assessment of business excellence and sector-specific development and training.

The Nuclear AMRC led the programme on behalf of the Zero Carbon Humber (ZCH) Partnership, a major collaboration led by energy group Equinor to clean up the UK's most carbon-intensive industrial cluster, with support from the Industrial Strategy Challenge Fund.

The partnership's plans involve investment in hydrogen production and processing facilities, with carbon capture, usage and storage (CCUS) infrastructure to store greenhouse gases in former oil and gas reservoirs under the North Sea.

"Having a supply chain that understands the industry and market they are selling into is very important to Equinor and the Zero Carbon Humber partners," commented Ian Livingston, chair of ZCH's steering company. "Given the nascent nature of the CCS and hydrogen industry globally now, it is important that suppliers do what they can to upskill and prepare to supply the market.

"Schemes like Fit For Hydrogen and CCUS are useful tools for suppliers to demonstrate that they are qualified and have made a commitment to develop themselves in readiness to support the energy transition. We congratulate the companies who have been granted Fit For Hydrogen and CCUS status, and thank the Nuclear AMRC for developing and implementing the scheme."

More than 90 companies applied to join the programme, with selected companies meeting for the first time in May 2023 to start the sector-specific training led by Ian Williamson of consultancy HyEnergy.

"It is a genuine pleasure to be engaged with so many UK-based manufacturers who are interested in the opportunity that hydrogen offers their businesses," Williamson said. "We hope that our input to the overall scheme will have helped provide a foundation for them, and the UK as a whole, to forge market-leading positions in the hydrogen sector."

**Sector insight**

The companies had varying levels of background experience in the hydrogen and carbon capture sectors, with all reporting benefits from the programme.

"Although we are already supplying products for hydrogen-based applications, our attendance at the cohort meetings has given us valuable insight and useful networking opportunities," said Dave Sibson, general manager at Billingham-based Paralloy. "We found the assessment to be very stringent and a useful tool in evaluating business excellence."

For Clean Power Hydrogen Group (CPH2), a manufacturer of hydrogen electrolysers, the programme resulted in significant positive changes and opened up new opportunities for collaboration.

"The lessons learned and changes implemented because of the programme will serve as a foundation for our continued growth and success in the hydrogen industry," said Arash Selahi, chief operating officer. "The Fit For Hydrogen programme has been and will be a catalyst for positive transformation within our company."

Teesside-based mechanical engineer Francis Brown is adopting the business excellence portion of the programme across its operations, and using the sector-specific training to build on existing work.

"The sector-specific training has allowed us to enhance our knowledge where we already have business in the hydrogen sector, identify risks to us and our clients, as well as identifying new areas of opportunity and potential development," said CEO Jamie Brown. "We have been providing pressure vessels for storage of hydrogen in the heavy goods refuelling sphere, and are now pursuing similar vessels for hydrogen powering of industrial plants."

Another established supplier to benefit from the programme is Trillium Flow Technologies, which was also granted Fit For Nuclear (F4N) status last year. "As an existing supplier to the hydrogen and CCUS industry throughout the world, we are looking to grow our offering within this market with new customers and new products," said managing director Steven Brayley. "We recognise the benefits of the F4H2+CCUS programme, both in terms of networking and visibility of our brands, and in qualifying as an approved supplier for prospective customers."

> **£46 billion**
>
> **Annual value of UK hydrogen technology market by 2050 (HII)**

**Building on fitness**

Many of the participating companies had previously secured F4N status, and knew the value of such market-focused development programmes.

F4H2+CCUS was based on the proven F4N model, with a shared base of business excellence complemented by sector-specific training and development.

Specialist fastener manufacturer Hydrobolt, which was first granted F4N in 2013, is targeting further opportunities to diversify from traditional energy markets.

F4H2 + CCUS

Fit For Hydrogen

Carbon Capture Usage & Storage

"We believe involvement in the F4H2 programme has allowed us to penetrate a market not yet occupied by other companies in our sector," commented Will Duxfield, business development manager. "The modules and support gave Hydrobolt a deep understanding of the full value chain, technology and political factors in order to see all possible routes to market."

Graham Hart (Process Engineering) also built on its experience in F4N to understand where its heat transfer and high-pressure products could be used in the hydrogen and CCUS sectors.

"Apart from what we had read in journals and the press, we had very little understanding of either of these two sectors," said Chris Hart, managing director. "The programme provided us with a detailed understanding of the processes, vocabulary and economics, to allow us to interact knowledgeably with potential clients."

Control and safety systems specialist Proeon Systems became the first company to be granted Fit For status in three sector programmes – after being granted F4N in 2017, the company was granted Fit For Offshore Renewables (F4OR) in 2021 through the Nuclear AMRC's collaboration with the Offshore Renewable Energy Catapult.

"Proeon Systems has a strong track record of working within a number of highly regulated industries and has been looking at ways to improve its positioning within the developing hydrogen and CCUS supply chain," commented managing director Richard Miller. "The Fit For programmes have helped us to consolidate improvements within our business processes and company culture."

Valve and fuel systems specialist Score Group used the programme to support a strategic move into hydrogen and CCUS from its Brighouse production facility, and is now looking at F4OR to support further diversification. "While this was initially seen as a specialist part of process of moving into this industry, it has evolved into a far wider reaching process of improvement throughout the facility and beyond," said principal engineer Kenneth Delaney.

**New connections, new work**

Participating companies have already reported that their experience in the programme has helped them win new contracts worth more than £220 million.

Fluid handling specialist KGD Industrial Services has completed two projects for hydrogen refuelling stations, and is starting electrolyser modularisation for a UK manufacturer. "Our ambition is to become a go-to company to manufacture equipment for hydrogen and carbon capture technologies over the next decade," said Edward Pitt, managing director.

Newcastle-based BEL Valves is meanwhile engaging with prospective customers in two regional clusters. "The programme has enabled BEL Valves to gain a greater understanding of the hydrogen and carbon capture markets and the overall supply chain," said general manager Paul Humphreys.

The Nuclear AMRC is now developing proposals for a national Fit For Hydrogen programme as part of the Hydrogen Innovation Initiative (HII), a collaboration between 11 organisations including the High Value Manufacturing Catapult.

HII estimates that hydrogen technologies including production, storage, distribution and conditioning could be worth £46 billion a year to the UK by 2050.

- To find out more about HII: **hydrogeninnovation.co.uk**

## F4H2+CCUS granted companies are:

**Amarinth** – www.amarinth.com

**Amazon Filters** – www.amazonfilters.com

**BEL Valves** – www.belvalves.com

**Clean Power Hydrogen** – www.cph2.com

**CMP Products** – www.cmp-products.com

**Francis Brown** – www.francisbrown.co.uk

**Graham Hart (Process Technology** – www.graham-hart.com

**Halifax Fan** – halifax-fan.co.uk

**Hydrobolt** – www.hydroboltgroup.com

**KGD Enterprises** – kgd.co.uk

**Laker Vent Engineering** – lakervent.co.uk

**Langfields** – www.langfields.com

**LBBC Beechwood** – lbbcbeechwood.com

**Ledwood Mechanical Engineering** – www.ledwood.co.uk

**LTi Metaltech** – lti-metaltech.com

**Paralloy** – www.paralloy.co.uk

**Parker Hannifin Manufacturing** – www.parker.com

**Powertherm Contract Services** – www.powertherm.co.uk

**Proeon Systems** – www.proeon.co.uk

**Rockford Components** – www.rockford.co.uk

**Score Europe** – score-group.com

**SL Engineering** – www.sl-engineering.co.uk

**Solartron ISA** – www.solartronisa.com

**Swagelok Central UK** – www.manchester.swagelok.solutions

**TEi Ltd** – tei.co.uk

**Trillium Flow Technologies** – www.trilliumflow.com

**Witt UK Group Fan Systems** – wittukgroup.co.uk/fan-systems

**Woodcock & Wilson** – www.fanmanufacturers.com

(as of April 2024)

F4N
Fit For Nuclear

# Dynamic Aerospace Fabrications moves to diversify in nuclear

**Dynamic Aerospace Fabrications is diversifying outside its core market with support from Fit For Nuclear.**

Based in Castle Donington near Derby, Dynamic specialises in complex, high-precision parts and assemblies, in a variety of metals including titanium, stainless steel and aerospace superalloys. Core capabilities include CNC machining, laser cutting, forming and welding, to produce sheet metal fabrications and components that meet aerospace, nuclear and commercial standards. Work often combines fabricated elements and machined forgings to extremely fine tolerances, with products validated through in-house CMM inspection.

Dynamic Aerospace Fabrications is a relatively new name to the market, but the firm has a long history in aerospace and other sectors. Its previous incarnation as Paul Fabrications supplied Rolls-Royce's aviation business since the second world war, and worked with nuclear customers since winning work for Windscale in 1957.

By the 2010s, Paul Fabs included a nuclear fabrication workshop specialising in fuel assembly components for the UK's AGR fleet, operating alongside the larger aerospace business. The firm was first granted Fit For Nuclear in 2016, but three years later split into two under new owners – the main aerospace-focused business was bought by US industrial group Dynamic Aerospace and Defense, while the nuclear operation was acquired by its core customer to become Westinghouse Precision Fabrications.

Under new ownership, Dynamic's management team aimed to increase sales through diversification.

"Part of our diversification strategy is to widen our customer base and introduce new sectors to complement our existing portfolio," says David Greatorex, managing director. "We have an engineering skills base that can serve a number of different sectors, including nuclear, defence and medical. As part of our diversification strategy, we felt that it would be beneficial for us and make us more attractive to customers if we were Fit For Nuclear certified as well."

When the team took the initial F4N assessment in early 2023, the firm's experience meant there were only minor improvements identified in areas including strategy and internal communications.

Dynamic duo: Andy Clift and Eamon Lyons with the new laser machining centre.

"There were no significant gaps, though we did identify a number of opportunities to improve things," says Andy Clift, head of quality and engineering. "With the help of our dedicated nuclear advisor we set ourselves a target of what we wanted to achieve, and worked through the associated activities. One of the biggest impacts it had was that it really brought the management team together and made us more collaborative."

The team found that the F4N journey, as shepherded by Nuclear AMRC industrial advisor Kevin Ross, gave them a new outlook on managing and reporting progress on their shared goals and targets, and proved instrumental in implementing a more structured process for monitoring KPIs.

Using lean six sigma practices, the team developed an x-matrix identifying top-level objectives and core business processes, with each strategic objective linked to a measurable target. Progress could then be tracked on a visual management board, giving an at-a-glance dashboard of performance which is now used to prioritise action at multi-disciplinary team meetings.

"It helps us further embrace the full suite of KPIs we've got," Clift explains. "It's challenged the mindset of the senior leadership team, which means the business has become a more collaborative team aiming at a common goal."

Alongside the strategic development, the team focused on improving communication about business performance with its staff of around 90 people. The workshop now features prominent SQCDP boards to track and share information on safety, quality, cost, delivery and people performance.

"Our business has undergone a cultural transformation," Clift says. "The culture was fragmented. Having gone through the journey, we now have a unified no-blame culture that encourages open discussions on all topics without retribution."

The firm has also upgraded its workshop capabilities, investing around £3 million in the past three years in new equipment including a Trumpf fibre optic laser machining centre, four-axis high precision milling machines, five-axis pressbrakes, a new chemical processing plant and NDT facility. And it continues to invest in skills, with a well-established apprentice programme.

The team are prepared to make further investment to support their strategic ambitions in nuclear, says business development manager Eamon Lyons. “We’re looking for long-term contracts for fabricated assemblies of machined parts,” he says. “If we don’t have a particular process on site, the investment will be made to support the customer.”

As part of its diversification strategy, Dynamic also recently secured Joscar registration to support growth in the defence market. “Our strategy is to gain as many new customer and regulatory approved accreditations as we can to support our growth into the sectors we have identified as target markets,” Clift says.

As with the core aerospace work, the focus is on complex machined products and fabricated assemblies, especially where special processes or exotic materials are required. For nuclear, the team are in discussions with existing customers about new projects, and have engaged with potential new clients across the sector – including small modular reactor developers at the recent supply chain events hosted by the Nuclear AMRC, and decommissioning organisations.

“We know the sector’s got some fantastic growth opportunities and, for us, I believe there’s the opportunity for 100 per cent growth,” Lyons says. “But what we have realised is it’s a very slow drawn-out process in nuclear. Things don’t happen quickly.”


**Cultural transformation: F4N helped management share strategic information with staff.**

Rather than relying on patience alone, Dynamic’s action to secure Fit for Nuclear recognition gives them a valuable calling card for new nuclear customers. “For anybody thinking about embarking on the F4N journey, the way the programme is set up is very structured, very self-explanatory and easy to use,” Lyons concludes. “If you’re serious about getting into nuclear, it’s a very worthwhile journey.”

- **dynamicaerofabs.com**

## **Congratulations** to the latest company to be granted Fit For Nuclear.

**XL Engineering** provides complex and rapid short batch small to medium sheet metal fabrications to industry, with significant experience in civil nuclear assurance that drives product quality and governance.
**www.xl-eng.co.uk**

Congratulations also to **Bendalls Engineering, BEP Surface Technology, Brown & Holmes, Hi-Tech Fabrication, Hutchinson Engineering** and **WKW Precision Engineering** on being regranted F4N.

More than 100 companies are currently granted F4N status. To date, granted companies have reported that the F4N programme has helped them win more than £2.1 billion worth of new contracts in nuclear and other sectors.

### Could you be Fit For Nuclear?

**Register now to join the first cohort of the expanded F4N programme.**

The latest phase of F4N offers an updated assessment, upgraded nuclear elements, and additional support including training, networking and signposting to opportunities. Under the new cohort model, up to 25 companies will start their F4N journey at the same time, and share good practice and lessons as they progress together.

To find out more: **namrc.co.uk/services/f4n**

**The Nuclear AMRC is also hosting regular webinars to introduce companies to the F4N programme, with exclusive presentations from granted companies sharing their experiences. See the website for the latest dates.**

# William Cook Cast Products invests to cut lead times

MEMBER NEWS

**William Cook Cast Products has opened its new state-of-the-art radiography centre, helping the Sheffield-based firm cut lead times for large nuclear castings.**

The facility is believed to be the most powerful in the UK, with two x-ray linear accelerators rated at 3 and 9MeV. The electron volt (eV) rating refers to the energy imparted to each photon fired by the accelerator – the 9MeV accelerator is hundreds of times more powerful than hospital x-ray machines, and can penetrate around 400mm of steel to identify potential flaws.

The company's previous non-destructive testing (NDT) facility was based at a separate site in Sheffield. The new two-cell centre is encased within a purpose-built blockhouse inside its heavy finishing facility, allowing William Cook to test all the parts it casts – from a few grammes up to 12 tonnes – without having to take them off site or rely on subcontractors.

"It doubles our capacity, and makes things significantly faster so our customers have shorter lead times," says technical manager Dr Nora Fuchs. "It's focused on all the high-integrity markets we work in which are heavily regulated and demand the highest quality, including civil and naval nuclear. Doing everything in-house means we can guarantee we have produced the highest quality at every single manufacturing step."

The radiography facility is part of a £5 million investment to expand William Cook's heavy foundry capabilities. It has opened an expanded metallurgical laboratory, and is working towards ISO 17025 accreditation which will allow it to test all materials in-house.

New capabilities also include an upgraded steel refining unit, and a heavy factory manipulator to carry hot castings into heat treatment furnaces. "The manipulator reduces both transfer times and the need for operators to get close to hot castings," says Fuchs. "It's an important investment in quality and safety."

As part of its strategy to develop new capabilities for nuclear and other energy markets, William Cook Cast Products joined the Nuclear AMRC as a tier two member in 2022. After being granted Fit For Nuclear (F4N), the company also secured the ISO 19443 nuclear-specific quality management certification.

State-of-the-art inspection: William Cook's new radiography centre.

"Getting F4N was beneficial because it set the foundation for ISO 19443, which has helped us get more work at the international level," Fuchs says. "F4N gave us a brilliant base for that. We had no problem understanding the requirements of the code because it is very similar to F4N."

F4N also helped the senior management communicate with all levels of staff about the importance of safety culture and quality management for nuclear customers, Fuchs notes. "It's created a good understanding in the entire workforce about the quality requirements and their significance for the end market. That kind of communication has really been facilitated by the F4N process," she says.

The energy sector accounts for the majority of the company's turnover, with nuclear currently making up around 10 per cent. After delivering castings for the cooling water intake system for Hinkley Point C, the team have been asked to quote for more opportunities for the second EPR unit. "I'm pretty sure the reason we're suddenly seeing an increase in enquiries for nuclear parts is Fit For Nuclear and ISO 19443," Fuchs says.

The company is also targeting opportunities in decommissioning, including large cast components for waste containers. "Some of these boxes are rather difficult to produce, and we think that casting can help reduce lead times," Fuchs notes. The team recently cast a prototype flange for a new type of container, based on designs developed in collaboration with the Nuclear AMRC and Sellafield Ltd.

Fuchs also joined the Nuclear AMRC's recent small modular reactor events (see p2) to meet the developers' supply chain managers. "They were happy to see that we're investing in new energy capabilities," she says. "They told us that, in their supply chains, they find NDT to be a bottleneck – long lead times come from companies not having enough NDT facilities. They're pleased that we've invested in our own radiography."

- **www.william-cook.co.uk/gb/product/nuclear**

# Lessons in the future of fusion

**As part of an international project to resolve the challenges of using tritium for fusion power, research engineer Amy Thornton visited the Iter experimental fusion reactor. She shares what she learned.**

Having always been interested in nuclear fusion for energy production, I had one clear motivation when given the opportunity to take part in the third Tritium School run by the international Titans project: to immerse myself in the world of fusion energy, and gain a better understanding of the groundbreaking research shaping our energy future.

Over five days in the south of France, I delved into the challenging aspects of bringing fusion energy production to fruition. Tritium, a radioactive isotope of hydrogen with a half-life of 12.3 years, poses several challenges in fusion energy. Many of these challenges are now being investigated by the Titans (Tritium Impact and Transfer in Advanced Nuclear Reactors) collaborative research project, funded by the Euratom programme.

The school provided a comprehensive understanding of these highly multi-disciplinary topics. These range from tritium's migration – due to its high mobility and ability to permeate through materials, tritium requires specialised coatings and material selection to keep it in the parts of the reactor it needs to be in – to its management, control and waste, as well as its radiotoxicity and dosimetry in organisms.

Lectures on tritium permeation and migration, and their effects on plasma-facing components such as the divertor and first wall, were of particular interest to me. Understanding how tritium interacts with materials such as steels, beryllium and refractory metals is crucial for ensuring the safety and efficiency of fusion reactors.

On the last day of the school, we visited the Iter and West experimental reactors at Cadarache. This was more than just a tour – it was an opportunity to witness history in the making.

Standing in the presence of Iter, with its colossal size and ambitious goals, underscored the magnitude of the scientific endeavour aimed at achieving sustainable fusion energy. From the intricate engineering designs to the collaborative efforts of an international team, every aspect of Iter spoke volumes about the importance of fusion research on a global scale.

**History in the making: Amy Thornton visits the Iter site.**

Similarly, stepping into the control room of the smaller West reactor provided a glimpse into the practical application of fusion technology. Watching the team prepare and execute plasma discharges with precision and expertise highlighted the progress being made in fusion research and the potential for commercialisation in the near future.

But why does this matter to UK industry? The answer lies in the immense opportunities that fusion energy presents for innovation, economic growth and sustainability. As the UK seeks to transition towards a low-carbon future, fusion energy is emerging as a promising solution with the potential to meet our energy needs while reducing carbon emissions.

While fusion holds promise for clean and abundant energy in the future, commercialisation remains a complex and uncertain journey due to the significant technical challenges. In contrast, fission technologies offer proven solutions for near-term energy needs.

I believe by investing in both fusion research and deployable fission technologies, the UK industry can position itself at the forefront of this transformative technology. Leveraging the UK's strong nuclear expertise, supply chain capabilities and collaborations with international partners can further strengthen the country's position in the global clean energy market.

My own passion for fusion energy has been nurtured through the Nuclear Graduates scheme, where I have had the privilege of connecting with industry experts and fellow enthusiasts who are passionate about advancing fusion technologies. As I continue to develop my skills and expertise in this field, I am inspired by the immense potential of fusion energy to address some of the most pressing challenges facing our planet.

- Find out more about the Titans project: **titans-project.eu**

The Nuclear AMRC is starting work on a new collaboration to investigate the machining of tungsten for fusion power projects.

In a joint industry project with UKAEA, Tokamak Energy and NE Components, the centre is trialling advanced cooling techniques including supercritical carbon dioxide to improve machining efficiency. The results will increase the capabilities of the UK supply chain to meet growing demand from fusion projects.

The centre is also part of UKAEA's Manufacturing Support Services Framework.

- **namrc.co.uk/services/jip**

# Major investment in nuclear skills

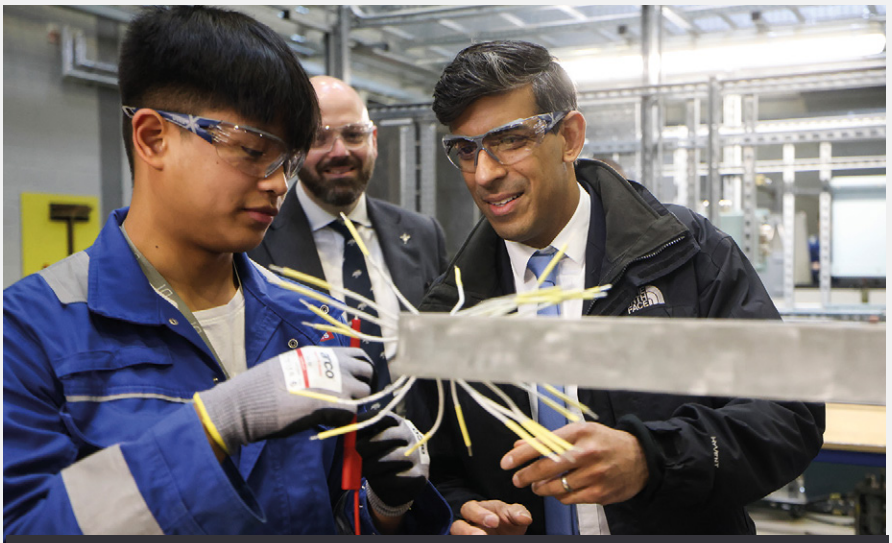
**The UK government and top-tier nuclear companies have committed to invest £763 million in skills development to meet the needs of the civil and defence sectors.**

The investment includes £350 million from the government's existing defence budget and £413 million from industry, and will create some 5,000 apprenticeships at top-tier companies in the next four years. It also aims to drive additional private investment and create job opportunities across the nuclear sector.

Prime minister Rishi Sunak declared a "national endeavour" to secure the future of the UK's nuclear energy industry and submarine fleet during a visit to BAE Systems in Barrow-in-Furness. Delivering new nuclear power stations and a new submarine fleet will require an estimated 123,000 workers by 2030.

"This is a welcome intervention that builds on a lot of what's been happening in the sector recently, through the Nuclear Skills Taskforce and work with Great British Nuclear, to join up civil and defence to address shared challenges in skills and capabilities," commented Liz Gregory, supply chain and skills director at the Nuclear AMRC. "Investment in apprenticeships is always welcome, but to deliver new nuclear power and new submarines, we need to help people enter the industry at all levels including through career conversions from other sectors.

"There's also a need to help companies further down the nuclear supply chain to train the people and develop the technical capabilities they need to meet demand from the industry primes. Manufacturing innovation in the supply chain can actually help mitigate the demands on the workforce, by helping skilled people such as nuclear-qualified welders be more productive."



Developing skills: Rishi Sunak met apprentice engineers at BAE Systems in Barrow.

The industrial investment will come from companies including EDF, Rolls-Royce, BAE Systems and Babcock. The government says the investment will create more than 8,000 career opportunities to help the sector fill 40,000 new jobs by the end of the decade, and support plans to double the number of nuclear apprentices and graduates, and quadruple the number of specialist science and nuclear fission PhDs.

EDF is hiring 1,000 people into its UK operations this year, noted CEO Simone Rossi, mostly apprentices and graduates. "EDF welcomes the joint commitments announced today, and looks forward to working with government and industry to help deliver the great opportunities for people who choose to work in the nuclear sector," he said.

The announcement followed the launch of Destination Nuclear, a national campaign to attract workers into the nuclear sector, supported by major employers and industry organisations including the Nuclear AMRC.

- **www.destinationnuclear.com**

# Doctoral centres to power research

**The Nuclear AMRC is supporting two new doctoral training centres covering nuclear fission and fusion technologies.**

In March, the Engineering and Physical Sciences Research Council (EPSRC) announced funding worth over £1 billion to support 65 specialist centres for doctoral training (CDTs) at universities across the country.

The new CDT for Skills and Training Underpinning a Renaissance in Nuclear (Saturn) is led by The University of Manchester, and will provide research training in science and engineering for nuclear fission.

The CDT in Fusion Power at the University of York also received new funding to train researchers for commercial partners and national laboratories.

The Nuclear AMRC is part of the advisory board for both centres, providing technical guidance and other support.

"These centres are directly aligned with our strategic objectives of supporting skills development across the nuclear sector, and developing manufacturing innovation that can be deployed across the supply chain," said chief technology officer Charles Carpenter.

The University of Sheffield is also leading a new CDT in Machining, Assembly, and Digital Engineering for Manufacturing.

# Great British Nuclear buys development sites

**Great British Nuclear is buying the Wylfa and Oldbury development sites previously owned by Horizon Nuclear Power.**

Wylfa on Ynys Mon (Anglesey) and Oldbury-on-Severn in Gloucestershire are both government-designated development sites for new nuclear power plant. Horizon proposed to build two Hitachi-GE ABWRs at each site, but the Hitachi-owned company suspended development in 2019.

The Budget statement in March confirmed that the government has agreed a £160 million deal with Hitachi to purchase the two sites. No decisions have yet been made on projects.

"These two sites at Wylfa and Oldbury have tremendous potential and present a significant opportunity for Britain and for local communities," said Gwen Parry-Jones, chief executive of Great British Nuclear (GBN).

"Each location has a long history of hosting the UK nuclear industry and has experienced the enormous benefits that nuclear power can bring to their local and regional economies. We deeply appreciate Hitachi's development of these sites and their work to date was one of the reasons why they were so attractive to us."

GBN will work closely with Hitachi's local representatives to ensure a streamlined approach to continuing site management and maintain a local contact point. GBN will also launch a project website, hold public meetings, and form community forums in Wylfa and Oldbury.

GBN also gave an update in March on its ongoing process to select small modular reactor (SMR) technologies for UK development. All six shortlisted companies – EDF, GE Hitachi, Holtec Britain, NuScale Power, Rolls-Royce SMR and Westinghouse – can now bid for multi-billion-pound technology development contracts.

Successful bidders will be announced later this year. The chosen technologies will be allocated sites – potentially including Wylfa and Oldbury – and incorporated into projects, with companies receiving further funding to develop their technology.

"We welcome the steady progress being made in building new nuclear capability in the UK and continued commitment to the SMR process," commented Chris Pook, government policy director at the Nuclear AMRC. "The agreement to purchase sites at Wylfa and Oldbury is great news for the industry, unlocking future development at these sites."

- **www.gov.uk/government/organisations/great-british-nuclear**

# Westinghouse unveils Teesside SMR plans


**Teesside vision: concept design of the AP300.**

**Westinghouse has announced plans to deploy the UK's first privately-financed fleet of small modular reactors, with proposals for four AP300 reactors in North Teesside.**

Westinghouse Electric Company has signed an agreement with Community Nuclear Power (CNP) to develop the project, with the aim of commercial operation in the early 2030s.

"This project brings together Westinghouse's proven technology and mature supply chain with our depth of expertise in nuclear programme delivery, in a region that is transforming its industrial landscape," said Paul Foster, Community Nuclear Power's CEO.

Westinghouse says the project complements its participation in Great British Nuclear's SMR technology selection process, and is in line with the government's consultation on alternative routes to market for new nuclear projects.

"We want to thank Community Nuclear Power for this tremendous opportunity to deliver our advanced, proven AP300 SMR technology to the UK market," said David Durham, Westinghouse president for energy systems. "Our AP300 SMR is ideally suited not just to support grid generation, but also for industrial sites for generating clean and secure energy and the ability to produce hydrogen, e-fuels, desalination and district heating."

The Teesside plan is supported by strategic partners including Jacobs and Interpath Advisory, and aims to develop a fully licensed site by 2027.

- **www.communitynuclearpower.com**

# The trump card for clean energy

Winning hand: Sam Needham with Power Clash cards.

**Sam Needham worked as a research engineer at the Nuclear AMRC on a secondment through the Nuclear Graduates programme. As part of the programme, he helped set up a company to encourage school students to consider a career in sustainable engineering and science. *Nuclear AMRC News* asked him about his experiences.**

I finished university with a degree in aeronautical engineering and started looking at opportunities in the engineering industry. I have always had a passion for the environment and working sustainably, so I began looking at roles within the nuclear industry as nuclear is a key player in the green energy mix. That's when I stumbled upon the Nuclear Graduates programme.

The programme gives amazing opportunities to young engineers like me to find their feet and explore what roles are out there, develop skills, and network with incredible professionals from across the industry. I have had the opportunity to be involved with a wide range of technical projects and make real contributions to their success.

I am sponsored by Rolls-Royce, with a secondment to the Nuclear AMRC as a research engineer. The Nuclear AMRC is a state-of-the-art research centre, employing the very best in manufacturing technologies and supply chain support. They collaborate with a wide range of companies, so they have been very valuable to me in terms of networking. The shopfloor at the Nuclear AMRC is a sight to behold, with technologies such as electron beam welding, virtual reality and robotic manufacturing.

One aspect of the Nuclear Graduates scheme involves starting an actual business and creating a product that will influence more young people to study the STEM subjects – science, technology, engineering and maths – and consider a career in related jobs. This really aligned with my values and I think it is a great opportunity to change the perception of the nuclear industry for the better.

Our company Energy Trumps has developed the product Power Clash which is a top trumps style game. It is aimed at Key Stage 3 students aged 11–14, but can be played by anyone! It includes competitive life-saver questions and dozens of fun facts.

The game promotes low-carbon and sustainable energy sources like nuclear. All proceeds go to our incredible charity partner Stemettes, which strives to inspire and support girls, young women and non-binary young people in STEM.

STEM subjects offer numerous benefits in terms of a career, by allowing you to develop your creativity, problem-solving and leadership skills while carrying out truly fulfilling work. STEM careers can also provide better job security and salaries than other industries.

STEM subjects tend to attract a negative stigma, especially towards girls, women and non-binary people. We want everyone regardless of gender to understand that STEM is a place for all and that there are endless opportunities for everyone willing to take that first step.

We are working with schools and the nuclear industry to bring these valuable educational resources into the classroom and inspire the next generation of leaders through camouflage learning. By supporting our mission and buying our packs, you are helping to address the labour and skills gap in the nuclear industry, promote the nuclear industry itself and gender diversity within STEM subjects.

The Nuclear AMRC has been incredibly supportive of our product, and will share packs with local schools which will make a massive difference to our mission. We hope that more nuclear companies will follow suit and support us too.

- To buy Power Clash cards: **linktr.ee/energytrumps**
- For more information about Nuclear Graduates: **nucleargraduates.com**

# Charity fundraisers hit the road



Marathon effort: Izzy Storer, Andrew Storer and Liz Gregory.

**Fundraising continues for Macmillan Cancer Support, with the Nuclear AMRC team aiming to top last year's total.**

In 2023, Nuclear AMRC staff raised over £25,000 for Macmillan through a string of individual and team challenges, and fundraising activities at the Nuclear Manufacturing Summit.

The supply chain development team kicked off activities for 2024 by setting out to collectively run, walk, swim and cycle the equivalent of the 2023 Tour de France route (2,116 miles) over March.

With help from the team at ATL, the Buckinghamshire-based coating specialist which is currently progressing through the Fit For Nuclear programme, they exceeded their target by 170 miles.

In April, CEO Andrew Storer, business support analyst Isobel Storer and supply chain and skills director Liz Gregory completed the London Marathon, raising more than £1,500.

The centre is again entering a team into the 40-mile Keswick to Barrow walk in early May. And colleagues including Liz Gregory, programme manager James Leatherland, marketing manager Amy Pritchett, programme director Jay Shaw and head of health & safety Laura Staton are preparing for the gruelling Tough Mudder Midlands in July.

- For the latest challenges and links to donate: **namrc.co.uk/about/charity**

March on: industrial advisor John Hilton and Belle rack up the miles.

## Diary

**namrc.co.uk/news/events**

### NDA Supply Chain Event & Decom 2024

26–27 June, Telford

Europe's biggest networking event for nuclear decommissioning returns, as the Nuclear Decommissioning Authority hosts its supply chain conference and exhibition. The one-day event aims to attract new businesses into the nuclear decommissioning sector, with a focus on SMEs.

The Nuclear Industry Association holds its decommissioning conference at the same venue on the previous day.

**decommsupplyevent.co.uk**

### Affirm technology demonstration

21 August, South Yorkshire

The Nuclear AMRC hosts an industry showcase for a new state-of-the-art robotic welding platform developed through the Affirm project.
A collaboration with Insphere and Createc funded by Innovate UK, Affirm has developed a multi-robot multi-sensor platform that interprets 3D scans of workpieces for precision welding with minimal human input. The event includes a demonstration of the technology and workshop sessions.

**inspherelt.com/project-affirm**

### Nuclear Manufacturing Summit 2024

20–21 November, South Yorkshire

Save the date for our fourth annual supply chain conference, sharing the latest information and insight from across the sector, plus the second UK Nuclear Manufacturing Awards.
With the need for action on decarbonisation more urgent than ever, the 2024 Summit will focus on innovative approaches to unblocking progress and delivery, and feature new networking opportunities with top-tier buyers. Registration opens in late May.

# Work with us

## The Nuclear AMRC helps UK companies win work in the nuclear sector.

We are here to support manufacturers and technology developers, from SMEs to global giants, which want to enhance and expand their capabilities for nuclear customers. If we can help your company, we want to hear from you.

We help companies through manufacturing innovation, supply chain development and skills support.

We can help you develop world-leading manufacturing processes and technologies. We have the facilities and expertise to help you improve quality, reduce time and costs, and bring new products to market.

We can work with you to raise your capabilities and competitiveness to meet the needs of the global nuclear supply chain.

And we are developing new services to help fill the skills and training gaps across the sector.

As part of the High Value Manufacturing Catapult, our capabilities and services are open to all UK companies.

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

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

NUCLEAR AMRC
ADVANCED MANUFACTURING RESEARCH CENTRE

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CATAPULT High Value Manufacturing

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