



NUCLEAR AMRC news

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Nuclear Manufacturing Summit & Awards

Special edition

CATAPULT
High Value Manufacturing

 **University of
Sheffield**

Nuclear Manufacturing Summit 2023

The Nuclear Manufacturing Summit returned in October 2023 for its third year, bringing together hundreds of manufacturers with the leaders of the UK's major nuclear programmes.

Some 650 delegates, 40 exhibitors and two dozen speakers from across the industry met at the Magna Science Adventure Centre in Rotherham for two days of knowledge-sharing, discussion and networking – including the first UK Nuclear Manufacturing Awards, recognising the best of the best in the UK supply chain.

The conference came at a critical time for the UK nuclear sector. “We need to start thinking about how we deliver 24GW, small reactors, Aukus and space nuclear,” Andrew Storer, CEO of the Nuclear AMRC, said in his welcoming speech. “This is about working together across the sector to deliver what I think is a fantastic mission.”

Political support for new nuclear has grown in the year since the last Summit, noted Tom Greatrex, CEO of the Nuclear Industry Association. “What’s changed in the last year is not only has the government finally got it, but the opposition party has also got it,” he told delegates.

“We don’t need to convince people of the need for nuclear. We need to convince people that we can deliver it.”

The conference was again compèred by Rosa Wilkinson, head of policy for the High Value Manufacturing Catapult, and stage-managed by nuclear event specialists Marick.

This special edition of *Nuclear AMRC News* details the key messages for the supply chain from all the speakers, and presents the winners of the Nuclear Manufacturing Awards in the centre spread.



Great British Nuclear focusing on confidence and partnership



Confident delivery: Simon Bowen, Great British Nuclear.

Great British Nuclear is aiming to give the UK supply chain the confidence to invest in new capabilities and capacity, interim chair Simon Bowen told the Nuclear Manufacturing Summit.

To help the new government-backed body develop its understanding of national manufacturing capabilities, the Nuclear AMRC will host a supply chain event this winter and compile a report on how Great British Nuclear (GBN) can best work with suppliers.

“How do we interface with the supply chain? How do we work this out so we know how we can give the vendors the freedom to develop their supply chains, and deliver the projects as quickly as they can at the lowest possible cost?” Bowen asked as he announced the collaboration.

“We’ve got to deliver value for money across the programme. That will come from really operating it as a programme and integrating the supply chains, and making sure that all the individual projects are interfacing with the supply chains in a way that we understand so it’s not conflicting.”

The scale of the challenge in delivering 24GW of nuclear power by 2050 was underlined by Andrew Bowie MP, minister for nuclear and networks at the Department for Energy Security and Net Zero, in a recorded message to delegates.

“The demand for nuclear workforce and supply chain are going to grow exponentially in the coming years – this country’s going to need you more than ever,” Bowie said.

“We also want to build on our strengths in advanced manufacturing techniques and become the best nation in the world at constructing, operating and decommissioning nuclear facilities. This is of course where the Nuclear Advanced Manufacturing Research Centre – you guys – come in.”

Bowen hailed the rejuvenation of the UK nuclear industry, and stressed the need to build

on current developments at Hinkley Point C and Sizewell C with a continuing programme including gigawatt-scale plant, small modular reactors (SMRs), and new designs of advanced reactor.

The week before the Summit, the government announced its shortlist of six SMR developers – EDF, GE-Hitachi, Holtec, NuScale, Rolls-Royce SMR and Westinghouse – to enter the next round of the competition managed by GBN.

Each company is invited to bid for government contracts later this year, with successful bids announced in spring 2024 and contracts awarded in the summer. SMR procurement is budgeted at £20 billion, with support for up to four technologies.

“Our focus initially is to get the SMRs online so that we can prove the SMR story works – because it’s not proven yet – that you can genuinely build modular reactors in a smaller form, that you can build them faster,” Bowen explained. “In parallel with that, we’ve got to look at all the other technologies including gigawatt to make sure we deliver the targets that have been set.”

Bowen discussed GBN’s key principles of partnership, confidence, and opportunity, and emphasised its role as a programme delivery company committed to meeting the targets set in policy, as well as overseeing individual projects and advising government on support for the sector.

The manufacturing supply chain will play a vital role in delivering new build, and Bowen confessed that supply chain skills and capability is (alongside grid connections) one of the things that keep him awake at night.

If suppliers are to invest in expanding their capabilities for new build, confidence in a programme is vital. “You have to know there’s a programme to make the investments you need,” Bowen said. “You’re not all going to get contracts, but you’ll have to make some speculative investments in your capabilities. The only way for us to do that is to create a competitive environment where you can compete for work because you’ve got confidence in a long-term programme. That’s the job of GBN.”

Great British Nuclear Q&A

The Summit audience had too many questions for Simon Bowen to answer on the day, so he has generously agreed to respond in print.

Will GBN manage the whole nuclear programme including fusion?

GBN will deliver the new nuclear programme covering SMRs, AMRs and future fission technologies, including gigawatt-scale. We will not have a role in Hinkley Point C or Sizewell C (at least in the short term) and there is no planned role in fusion.

When GBN was set up, the target was first SMR on grid in 2030. The announcement last week stated mid-2030s. Is slippage inevitable?

Since the SMR plan was first communicated in July, we said that we were aiming for FID before the end of 2029 and for first power to grid in the mid 2030s. This plan remains. We are still in the early stages of the selection process, but will work with the successful vendors to do everything we can to meet and, wherever possible, beat these dates.

Where do AMRs fit in the GBN strategy?

AMRs form a very important part of the government's nuclear programme as we will need all technologies in order to deliver our ambitions of 24GW and net zero. The forthcoming consultation will be exploring routes to market for all technologies including AMRs for energy generation including electricity and heat.

Where do micro-reactors fit into GBN's technology selection?

Micro-reactors may well form part of the future nuclear programme – the government plans a consultation on alternative routes to market later this year. However, GBN's immediate priority is on bringing technologies forward that deliver energy security at scale, offering real value for money as soon as possible.

GBN does not seem to be fitted by Treasury to negotiate and match private funding. When will mechanisms and mandate be in place?

We are still in the early stages of the selection process, and thus we do not have any cost data to approach Treasury with and request funds. Our selection process will determine what the costs of each project are going to be, how much private sector funding is being sourced, and what government funding is required. The procurement that we have commenced has a total contract value of £20 billion, which will allow us to support the design and construction of SMR technologies to commercial operation.

Are you looking to the UK submarines programme to see what you can translate into the civil nuclear industry?

Yes, and much broader than that. We have studied many major nuclear projects and infrastructure programmes to see what we can learn in order to avoid repeating the problems of the past.

How can GBN work effectively and quickly with the NDA to release land to developers?

We are working with DESNZ on a fair and transparent process for securing access to sites to support the nuclear programme. This will be conducted in parallel with the SMR selection process for projects that sit within that, and also potentially for projects with alternative routes to market.

There are parallels to the nuclear renaissance of the early 2000s, which didn't happen. What's different this time?

GBN is itself one proof of what's different. It has been set up with the specific remit of delivering government's nuclear programme as a result of the changes in policy and the recognition that we have to secure greater energy security. This has cross-party support.

How will GBN, and the wider nuclear industry, address the conflict between short-term political priorities and long-term nuclear programme commitments?

I believe that we have cross-party support for a new nuclear programme. The commitment to an SMR selection process, which has overwhelming support in Parliament, is clear evidence of that. Nuclear is by its very nature long term – and all indications that we can see are that government will continue to fund this. Even when government finances are so stretched as they are currently, they have committed to the SMR selection process.

What is the potential effect of a change in government in 2024, and will the election affect timescales?

Hopefully minimal, as we have seen Labour expressing strong support for the new nuclear programme. We do not believe it will have any impact on timing.

Is there a deadline when the government will stop investing in nuclear technologies?

Not that we can see. Obviously the government is keen to attract private investors to work with them, but nuclear requires long-term public and private investment.

Who do companies talk to to get involved in GBN?

In the first instance, please email enquiries@gbnuclear.gov.uk

Tackling the challenges of delivery

The Summit's big conversation panel brought together a cross-section of nuclear leaders to discuss how the sector can rise to the challenges, and face questions from the audience. Here are the highlights.

Big conversation: (L-R) Carwyn Chamberlain, YGN; Carol Tansley, X-energy; Andrew Storer, Nuclear AMRC; Kirsty Gogan, Terra Praxis; Stuart Broadley, EIC; Rachael Glaving, EDF.

How can we create the certainty that the supply chain needs?

Rachael Glaving, commercial director, EDF: "We're teetering on the edge of enough certainty for a lot of businesses, academic institutions and industrials to actually do something and commit to nuclear. We could learn something from our colleagues across the water. In France, they've just announced the EPR2 programme. They've said we're going to have eight new nuclear power stations, at these sites, in this order, starting from this date."

Carol Tansley, vice-president, X-energy: "There is a need for government to support the market. One of the things we've lost is, because there's been such a big gap between builds in the UK, we have a more fragmented and fragile supply chain. We need to be working together – industry, vendors and government – to rebuild that supply chain."

Why are nuclear projects so slow to progress compared with other technologies?

Stuart Broadley, CEO, Energy Industries Council: "There's 144 new nuclear projects around the world, and 47 per cent are fully funded. I don't understand where this lack of confidence comes from. Your industry is the most funded globally of any energy sector."

Kirsty Gogan, co-CEO, Terra Praxis: "Poland is using nuclear to repower coal plants. The government is setting the strategic leadership by demonstrating that these have to be repowered, which provides direction to investors and the supply chain that this is a political priority. We don't see that kind of strategic leadership in the UK."

What messages can we give to attract young people into this sector?

Carwyn Chamberlain, chair, Young Generation Network: "I spoke to lots of people last week at New Scientist Live. We talk a lot about the clean energy argument, but the questions we got asked were not about carbon neutrality. The questions were what about the waste, what about sustainability? What's your industry doing to become a sustainable industry as a whole?"

"We also talk about a job for life. I don't know that the next workforce sees jobs for life as a positive. There's a lot more flexibility in the modern workforce coming through. What we've got to do is just be fun, we've got to be an attractive industry that isn't just about science."

Why do manufacturers often struggle to sell to overseas nuclear?

Andrew Storer, CEO, Nuclear AMRC: "I think it's commercial. It's not about the knowhow, but for some reason we've been wrapped up in Britain in some fat juicy contracts. We've got used to working in a certain way. There's been some innovation, but we need to sharpen the way we work."

With a major bottleneck in getting new capacity on grid, can we use nuclear off the grid?

Glaving: "If you apply for a grid connection now, you'll get it in 2037. It's a massive problem. The worse the queue gets, the more you see developers putting in speculative applications just to get in the queue. One way of addressing that is to prioritise those projects that are real and credible."

Gogan: "There is incredible demand for behind-the-meter energy services, because there is so little confidence that the grid will be expanded to meet the demand from industrial energy users who generate on-site using fossil fuels. Therefore there's an incredible demand for small and modular reactors to deliver those energy services."

How can we support innovation and entrepreneurship?

Storer: "I don't think innovation is supported that well in this sector. As part of the Catapult network, I see the amount of money that goes into aerospace or automotive compared to nuclear, and we get peanuts by comparison. In France, there's billions going into nuclear innovation."

Gogan: "There are incredibly large amounts of money going into nuclear innovation, and probably the UK is underperforming, but it's all R&D. What we really need is commercialisation."

Is there a middle way for the UK between private and government investment?

Glaving: "There's a huge amount of discretionary effort available to be unlocked in the supply chain and research facilities. That's what the French are very good at doing. They set the objective, and give enough clarity and confidence to mobilise everyone around it. Just doing that brings investment and actions."

Delivering new nuclear from Sizewell to Step

Leaders from the UK's new build and reactor development programmes affirmed their commitment to the UK supply chain as their projects move towards delivery.



Normalising investment: Julia Pyke, Sizewell C.

Following the ongoing £26 billion project at Hinkley Point C, where two EPRs are being built for first generation in 2027, the UK's next new build site is expected to be Sizewell C in Suffolk.

Sizewell C will build on EDF's investment in Hinkley Point, including key elements of the supply chain, managing director Julia Pyke told the Summit.

"A lot of contracts which are in place for Hinkley, we would expect to use again where performance has worked out very well," she said. "Sizewell C will have probably more than 70 per cent UK content during construction, through life it will be more like 90 per cent."

The Sizewell C reactor plant will be a copy of Hinkley Point C, but with additional technologies and facilities to support the wider programme of decarbonisation. EDF proposes to extract around 400MW of heat from the plant to power a prototype direct air capture facility to remove carbon dioxide from the atmosphere, and is looking at green hydrogen production.

The Sizewell C project is now jointly owned by EDF and government, with each taking a 50 per

cent stake during the development phase. The government has invested an initial £700 million in the project plus £511 million to support project development and site preparation. In September, private investors were invited to express their interest in the project, with EDF aiming to dilute its own stake to 19.9 per cent.

"This will normalise nuclear investment in the UK, for incoming investors both from overseas or from the UK," Pyke said.

EDF is aiming to make a final investment decision in 2024. First, it needs to secure the site and satisfy 387 conditions around environmental impact and management before triggering the development consent order.

Building Sizewell C will save households money, Pyke emphasised – if it had been online before the recent electricity price rises, it could have saved consumers around £4.5 billion.

"It will be cheaper to build Sizewell than not to build it. That is increasingly being understood," she concluded. "In a world of increasingly unstable politics and potential rise in gas prices, what looks expensive might look very different."

Small reactors, big opportunities

The Summit also heard from two of the small modular reactor (SMR) developers shortlisted by the government for potential support and investment.

David White, chief operating officer at Rolls-Royce SMR, outlined plans to deploy a fleet of power plant for electricity generation and industrial applications.

"We're not making one, we're making a fleet of many," he told delegates. "That gives us the scalability to go to our supply chain and say now you need to scale up. That gives the supply chain the assurance and the investment and the skills they need long-term."

During the conference, Rolls-Royce SMR announced a contract with Westinghouse to develop a UK-based fuel design for its 440MWe reactor, which is currently in the second stage of the UK's generic design assessment (GDA) process.



Small talk: (L-R) Rosa Wilkinson, HVM Catapult; David White, Rolls-Royce SMR; Gareth Thomas, Holtec; Carol Tansley, X-energy.

the timescales that have been set for SMRs," she told delegates.

Another US-based developer, Ultra Safe Nuclear, is also focusing on industrial applications and targeting UK opportunities.

"We're looking to develop a distributed energy source that can address a lot of the hard-to-decarbonise industries throughout the UK and throughout the world," said Mark Davies, vice-president for UK business development. "We are developing reactor factories to assemble and test these, and standard fuel production facilities. Should the market demand it in the UK, we will transfer both to the UK."



Distributed power: Mark Davies, Ultra Safe Nuclear.



Engineering marketplace: Nick Walkden, Fusion Industry Association.

Ultra Safe is working with Jacobs in the UK to develop new capabilities in areas such as robotic fuel handling, with £21 million match funding from the second phase of the government's AMR research, development and demonstration programme. The project involves other UK contractors including Howden and Ultra Energy, and Ultra Safe is now engaging with the wider supply chain ahead of the third phase of development.

"Our target is to use 78 per cent of UK supply chain, creating around 18,000 jobs," White said. "What we want to do is build up this supply chain."

Rolls-Royce SMR opened its online supply chain portal (suppliers.rolls-royce-smr.com) in September to help identify the best UK companies to help deliver the SMR fleet, and share essential information including quality management requirements. Companies can register interest now, but White cautioned that they wouldn't necessarily hear back straight away.

Holtec is meanwhile building its team to begin the GDA process, after submitting its SMR-160+ design at the start of the year.

The US-based group is aiming for a first commercial unit in the US by 2032, and has established a factory in New Jersey. Holtec proposes to deploy 32 of its 160MWe reactors (over 5GWe total) in serial production in the UK, and has also secured agreements in other countries including a potential 20 units in Ukraine.

"We are building a team in the UK because we have so many other projects going on," said Gareth Thomas, director of operations for Holtec Britain. "The focus is on the safety case to take the US design and get it through the UK regulators."

Advanced generation

While SMRs are Generation III+ reactors based on established technology, other developers are pushing ahead with Generation IV advanced modular reactors (AMRs).

US-based X-energy is developing an 80MWe high-temperature gas reactor for industrial applications, and aiming to have its first reactor online with chemicals manufacturer Dow in Texas in 2029.

X-energy is working with Cavendish Nuclear on UK development, and vice-president Carol Tansley outlined plans to deploy its technology in Hartlepool to support industrial decarbonisation on Teesside. "If we began today, we would be able to deliver faster than

Fusion growth

Nick Walkden, UK director for the international Fusion Industry Association, highlighted the growth of what could be the ultimate form of clean energy. More than \$6 billion of private capital is now invested in the fusion sector, with a number of international developers moving to the UK to tap into the cluster of expertise around Culham.

The government-owned UKAEA is now preparing to launch the first major contracts for the Step demonstration plant at West Burton, Nottinghamshire. "These will be the world's first contracts to engineer and build a fusion power plant," Walkden noted. "That is long-term commitment."

Suppliers should see fusion as a marketplace for engineering materials and manufacture, he emphasised: "You do need science and engineering knowhow. You need manufacturing capacity to produce large complex components, some doing things that have never been done before. We need new and tailored materials, not just in a lab but at the scale needed for a pilot plant."

Decommissioning moves to volume production

Decommissioning leaders are seeking early engagement with suppliers as part of a move to volume production and to introduce innovative ways of working.



Changing culture: (L-R) Joanne Lane, NTS; Duncan Steel, Jacobs; Gareth Frazer, Sellafield; James Leatherland, Nuclear AMRC.

Gareth Frazer, head of manufactured products at Sellafield, called on suppliers to get in touch to discuss ideas (see box). “I’d like them to knock on our door now, and talk through how we can work together and what we’re looking for,” he said. “We have £100 million of manufacturing to do and be done every year for the next 20 years in the supply chain. We can’t manufacture packages without the support we need.”

Sellafield’s new Manufacturing Products Partnership (MPP) is designed to manage procurement of all future products. These will include the standard 3m3 boxes for intermediate-level waste, other waste containers and supporting components such as can racks, with a total value of around £2 billion over the next 20 years.

“We’ve set that up recognising things are changing at Sellafield, we’re moving to an era when there’s lots more manufacturing as we clean up the site,” Frazer said. “We recognise that we need to change as an organisation, change the way we behave, change the way we work in the supply chain, and we can’t do it on our own.”

Decommissioning remains a relatively unpredictable market, which requires a more agile supply chain. But uncertainty about throughput rates, and the handling and storage of waste material, can make it hard for site owners to give security and confidence to their supply chain.

Duncan Steel, group director for engineering development at top-tier supplier Jacobs and a former CTO at Sellafield, stressed the need for innovation in all areas of decommissioning.

“It isn’t just about how we produce boxes, it’s innovation in our thinking,” he said. “Risk aversion in the nuclear sector seems to be everywhere. It needs to be in maybe 20 per cent of it.”

Waste has to be safely transported between decommissioning sites and long-term storage, and Joanne Lane, head of business management at Nuclear Transport Solutions (NTS), discussed the long timescales for developing and procuring transport containers.

“The industry will need 200 transport packages to transport intermediate level waste as part of the decommissioning programme, and we need to engage with regulators early,” she said. “We’re developing a new category of transport package - that means early engagement with regulators so we can translate innovation through into a deliverable product.”

NTS recently worked with the Nuclear AMRC on the design and manufacturability of a new fleet of transport container, and programme manager James Leatherland highlighted the supply chain challenges of decommissioning.

“We’re moving from low-volume batch components to high-volume serial production. That means a big change for the supply chain,

and how customers and end-users behave,” he said.

The move to volume manufacture will create opportunities for suppliers with experience in other sectors, and will also require the current decommissioning supply chain to adopt new ways of working. “The demands of contracts are transitioning, and we need to support organisations in the tools of new product introduction and high-volume techniques,” Leatherland concluded.

Sellafield’s Manufacturing Products Partnership (MPP) is looking to engage with manufacturers about the future procurement of waste containers and other high-volume products.

MPP aims to start releasing contracts from 2028, but first wants to understand the current state of the market and the appetite from manufacturers, and share information about upcoming opportunities with interested suppliers.

Companies are now being asked to register interest, and share information about their capabilities.

For full details and links: namrc.co.uk/industry/sellafield-mpp-consult

Submarine drumbeat puts suppliers under pressure

The international submarine programme demands investment in supply chain capabilities, but also offers new opportunities for collaboration.

As part of the Aukus pact between Australia, the UK and US, Rolls-Royce will manufacture the reactors for Australia's first nuclear-powered submarines while also supplying a new UK fleet (known as SSN). That means a rapid scale-up of production, with the UK Ministry of Defence investing to double the footprint of Rolls-Royce's Raynesway site in Derby.

"The key thing is the drumbeat," John Sulley, chief of engineering capability for Rolls-Royce Submarines, told the Summit. "We were always planning for the UK SSN to go down to an 18-month drumbeat – with Aukus, we need to get down to 12 months."

Rolls-Royce is also investing to expand its skilled workforce, with the new Nuclear Skills Academy in Derby welcoming 200 apprentices a year for the next decade, and in new manufacturing process capabilities including laser powder bed additive, hot isostatic pressing, and electron beam welding.

Suppliers will also need to expand their capabilities and capacity to deliver the ambitious programme.

"We've got an established supply chain – 92 per cent of what we procure is from the UK," Sulley said. "We're going to those companies

that have been supplying us for all those years, and saying we want twice as much as what you have been giving us to meet that drumbeat."

Australia and the UK will both build submarines to a new design known as SSN-Aukus, with UK construction based at BAE Systems in Barrow-in-Furness. Australia will work over the next decade to build up its industrial base, and will build its submarines in South Australia with some components manufactured in the UK.

Stephen Camporeale from the Government of South Australia highlighted the opportunities for UK suppliers to support capability development, starting with infrastructure, skills and training.

"There's opportunities for partnering in manufacturing under licence," Camporeale said. "We need to know that we have redundancy and resilience within the supply chain. That creates opportunities for second or additional production lines."

The Australian partners are now working with supply chain organisations including the Nuclear AMRC and ADS Group to identify potential partnerships.

Key UK suppliers are also investing in new technical capabilities to meet growing demand.



Doubling demands: John Sulley, Rolls-Royce Submarines.

William Rowles, chief of staff at Babcock International, described how the group has embraced digital technology to enhance manufacturing operations and Rosyth and other sites.

Babcock created an integrated digital facility to support its work on the current frigate programme, which can be transferred to new programmes. The process starts with design and manufacturing, including shopfloor digitalisation, and includes process automation and asset management. "We're operating more like a car production line than a bespoke ship builder," Rowles noted.



Moonshot projects: Professor Gary Jones.

Professor Gary Jones, head of manufacturing innovation, gave an update on the power giant's work to develop small reactors for space applications.

The current project, funded by the UK Space Agency, aims to demonstrate the feasibility of a

Space is the place

Rolls-Royce is pushing forward with new technologies to take nuclear power to the moon.

micro-reactor which will provide up to 1MW of power for a future lunar base. Rolls-Royce aims to have a reactor ready to send to the Moon by 2029.

Part of the challenge is developing the reactor core, where Rolls-Royce is collaborating with research centres including the Nuclear AMRC, University of Sheffield AMRC and TWI

on techniques to create complex but well-controlled holes through a large graphite block.

"This is proper manufacturing work," Jones told the Summit. "The first step in manufacturing is how we collaborate with research centres, but immediately after that is the supply chain and SMEs. They're already involved providing raw materials. We are making those connections."

New approaches to skills and innovation

While the nuclear supply chain can tap into a range of support services and organisations, there are still major challenges to be faced in delivering skills and innovation.

Rachael Glaving, commercial director at EDF and a member of the new government-backed Nuclear Skills Task Force, outlined the skills challenges across the company's operations.

Even though the current AGR fleet is entering or approaching the end of its life, EDF recruits some 200 people a year into the AGR workforce, and invests £30 million in training and development.

That current workforce can play an important role in new projects, Glaving noted: "The place to start if we need more nuclear is how we do more with what we have."

During the development of Hinkley Point C, EDF has trained more than 2,000 apprentices and invested £300 million in skills. There is a lot of interest in joining the sector in some areas – EDF had more than 850 applications for six supply chain graduate vacancies – but the group has had to change the way it operates to access the skills it needs. "We had to structurally change our business, so each one of our business units all have access to a pooled capability of resources," Glaving said.

Sarah Champion, MP for Rotherham and a vocal supporter of nuclear within the Labour party, identified a fundamental problem in attracting new workers: teachers and parents don't see apprenticeships as the way forward for talented young people.

"The establishment of the Nuclear Skills Academy in Derby is a great example of how industry, local and national government can come together to help solve this specific crisis," Champion said. "But we need to be motivating the parents and teachers to enable the young people to take advantage of these opportunities. We need you to go out and tell young people and their parents that nuclear is a viable career."



Tackling the skills gap: Saralyn Thomas, Destination Nuclear; Rachael Glaving, EDF; Sarah Champion MP.



Jobs of tomorrow: Steve Bagshaw, HVM Catapult.



Destination Nuclear: concept design for the careers campaign.

A new industry-led campaign aims to change the way that the public thinks about working in nuclear.

Destination Nuclear, devised by the Next Gen Nuclear Industry Council, Nuclear Institute's Young Generation Network, Women in Nuclear UK and Nuclear Skills Strategy Group, aims to grow the sector's talent pool to meet an expected 120,000 new job opportunities by 2040. The first phase of the campaign will focus

on attracting career-switchers with transferable skills.

"We need so much more if we want to deliver energy security, net zero and national security, while managing our legacy waste," said Saralyn Thomas, one of the architects of the campaign. "This is the first ever national cross-sector recruitment campaign for nuclear."



Integrated innovation: Rosa Wilkinson of HVM Catapult in conversation with the Nuclear AMRC's Jay Shaw & Liz Gregory.

Innovative approaches

The High Value Manufacturing Catapult is also targeting the skills gap across UK industry, as Steve Bagshaw explained in his first public appearance as chair of the national network of innovation centres.

“One of the things that Catapult is very passionate about is creating sticky jobs, jobs that last,” Bagshaw said. “We’re taking the technologies of today and tomorrow, working with the companies of today and tomorrow, and creating the jobs of tomorrow.”

An experienced chemical engineer, Bagshaw also considered the opportunities for nuclear to support other industrial sectors in decarbonising their energy-intensive operations. “Green hydrogen is one of the areas that we’re committed to – the nuclear industry has a real part to play in that, so does the chemical industry, so does the supply chain,” he said. “There are real opportunities in how you do that processing, and how you get the safety of the installations that will be next to nuclear capabilities. The supply chain has a real role to play, and HVM Catapult can be your partner in that.”

As part of the HVM Catapult, the Nuclear AMRC has a key role to play across supply chain support, skills development and manufacturing innovation, and is taking an increasingly integrated approach across its operations.

“A lot of issues that we see in the supply chain can’t be tackled by supply chain interventions on their own,” noted Liz Gregory, supply chain and skills director. “We need to look at the supply chain we’ve got, and strengthen them in capability and capacity.”

“We need to innovate on the shopfloor and off the shopfloor,” added Jay Shaw, manufacturing innovation director. “We’re bringing together that capability and capacity and competitiveness work which means the UK will be more rounded in its supply chain offering and able to meet the demands of the future programme.”

The nuclear industry needs to “pinch with pride” techniques and good practice from other sectors, Shaw said, and collaborate to tackle shared challenges. “A lot of companies approach things in isolation, but the problem often isn’t just theirs,” he noted.

Recent years have seen significant government support for shared approaches to supply chain challenges. The Nuclear Innovation Programme was a £180 million investment with a focus on advanced manufacturing and materials research involving collaboration between technology developers, research institutions and end users from along the supply chain. The Nuclear AMRC led or supported numerous projects in areas including automated weld monitoring, large-scale machining and metrology, additive manufacturing and advanced coolants.

Dan Mathers, executive director of the Nuclear Innovation and Research Office (NIRO), discussed the programme’s successes and emphasised the need for continuing innovation to reduce costs and derisk nuclear programmes.

NIRO is now working to define five key themes for further development, to be set out in the spring with recommendations for future R&D. “The challenge now is to maximise the potential of this innovation through deployment,” he concluded.



Olympic insight

In the Summit’s closing keynote speech, five-times Olympic gold medallist Sir Steve Redgrave gave his personal insight on the importance of defining a goal and making constant improvements to reach it.

“Having that goal is what you need to do. Placing the structure is so important to getting to your destination, in whatever sport or industry you’re involved,” he told delegates.

Redgrave echoed many of the industry speakers in emphasising the value of collaboration and teamwork in whatever you do: “It comes down to the team, the individuals who make it work on a day-to-day basis. It’s not about the best individual – a boat will only go as fast as the weakest person in the boat.”

Dinner of champions

The Summit concluded with a gala dinner centred on the first UK Nuclear Manufacturing Awards.

The awards were designed to recognise the best of the best in the supply chain under six categories. Entries were judged by experienced Nuclear AMRC staff including supply chain specialists, industrial advisors and manufacturing innovation experts.

The awards ceremony was hosted by celebrity guest Rob Rinder, barrister, author and broadcaster.

The evening also featured fundraising for Macmillan Cancer Support, with delegates committing more than £9,250 on the night, and musical diversions including a surprise appearance from Derby's Hot House Music School big band.



Customer focus: Bendalls Engineering

The judges were impressed with customer feedback from nuclear projects at Bendalls, part of Carr's Group. Bendalls recently achieved ISO 19443 certification, which the judges considered a clear sign to customers that the firm has a serious commitment to health, safety and quality. The Carlisle-based firm has also launched a new skills academy to tackle local skills shortages, with benefits for other regional employers.

Runners-up: Hydrobolt; Nuclear Energy Components.



Innovation: Sellafield Ltd

Sellafield worked with partners to introduce unmanned aerial vehicles (UAVs) for site monitoring. As well as halving costs, the UAVs remove the need for humans to go into hazardous environments or work at height, and are now the standard method for remote inspection. The project has had a lasting impact on Sellafield's culture by fostering acceptance of working with robots to improve performance and safety.

Runners-up: Sheffield Forgemasters; Tokamak Energy & Qdot.



People development: Proeon Systems

Specialist control and safety solutions group Proeon has more than doubled its investment in staff training, with regular lunch-and-learn sessions led by the MD and QHSE advisor. The business has become more competitive as a result, driving sales growth across various markets. The judges were also impressed by the Norwich-based firm's graduate placement programme with local universities and colleges.

Runner-up: Hydrobolt.



SME: Witt Group – Fan Systems

Judges were impressed by the diverse and multi-skilled workforce at the Halifax-based company, which has worked with local schools to increase its apprentice and graduate intake. They also commended the way Fan Systems works with its local supply chain to instil the importance of quality management and traceability. Fan Systems started the Fit For Nuclear programme in 2014 as part of a strategic move up the supply chain.

Runners-up: GR Carr; Hydrobolt.



Large employer: Sheffield Forgemasters

The stalwart of UK nuclear forgings has generated interest from customers across the sector by successfully industrialising local-vacuum electron beam welding techniques for thick-section vessels. The judges were also impressed by the way the firm has expanded its manufacturing capabilities and capacity while transitioning to new ownership under the Ministry of Defence.

Runner-up: Cementation Skanska.



Young manufacturing engineer: Grace McCrickard

Now working as an electrical project engineer at Jacobs, McCrickard was previously employed by James Fisher Nuclear, and trained through Cumbria's Gen2 apprenticeship centre. She has mentored other apprentices, hosted work experience students, and been active in a string of outreach activities. She is a trained UAV pilot, and winner of NSAN Apprentice of the Year 2023.

Runners-up: William Coles, Westinghouse; Tom Hughes, Westinghouse.

Let nuclear play its full part

Executive view

During the Nuclear Manufacturing Summit, we heard a lot of discussion about the particular needs of the sector and the challenges facing our supply chain. It's easy to think that there is something uniquely special about our industry – but the truth is that it has a lot more similarities than differences with other sectors.

It's true that the nuclear industry has to manage safety-critical processes and technologies. It has to deal with hazardous waste and the decommissioning of old plant. And it has to raise billions of capital investment for new infrastructure, with no return for many years. But the same is true of many other sectors like aerospace, rail, chemicals, oil and gas, even offshore wind.

While there's much the nuclear sector can learn from others, perhaps it's time to stop treating the industry as the unloved child of UK industry, and take a close look at the support it needs to liberate both its growth potential and the vital impact it can have in delivering our national goals of decarbonisation and energy security.

The change has to start at the top. Government is inextricably involved in major infrastructure decisions, and investors and industry alike want to see a clear pipeline of projects – from gigawatt reactors at Hinkley and Sizewell through to small modular reactors (SMRs) across the country.

Just before the Summit, government named the six developers of small modular reactors which could win through to deliver the next generation of nuclear power in the UK. That is welcome, but we cannot wait until final investment decisions are made at the end of the decade if we are to deliver a new build programme by the mid-2030s. We need to invest now to build strong industrial foundations that will deliver long-term economic growth, jobs and energy security.

Understanding the pinch points in key supply chains, including interactions with other manufacturing sectors will be a vital first step, helping to identify where we need to put our shoulders to the wheel to boost investment and build both capability and capacity.

The Nuclear AMRC was set up to do just this – to help UK manufacturers win work, and to maximise domestic content in high-value engineered products for nuclear projects.

For the past 12 years, we have been supporting the supply chain through our Fit For Nuclear (F4N) programme, working with hundreds of manufacturers across the UK to help them improve their capabilities for nuclear customers and their business competitiveness. In the new year, we will launch an expanded version of the programme to increase its impact still further, giving smaller manufacturers access to additional support and signposting to commercial opportunities (see p18).

And as Simon Bowen announced during the Summit, we will be working with Great British Nuclear to investigate the detailed opportunities and challenges for the supply chain to help deliver 24GW of nuclear by 2050. This winter, we'll be bringing together all six developers in the SMR competition with hundreds of potential suppliers to discuss the specific requirements of the projects, and the capabilities of the supply chain to meet their needs – and identify the interventions needed to close any gaps in capability or capacity.

Understanding our domestic capability is essential if the UK is to minimise its exposure to international supply chains and global markets. Lead times for critical reactor components are measured in years, not months, and procurement processes and supply chain plans will be determined long before final investment decisions.

We understand the challenges and have the solutions. We now need government to support a supply chain development programme which tackles weaknesses in the current sector,



provides R&D, test and demonstration facilities to close the technical gaps, and drives development of the capabilities we need to build a secure and resilient supply chain.

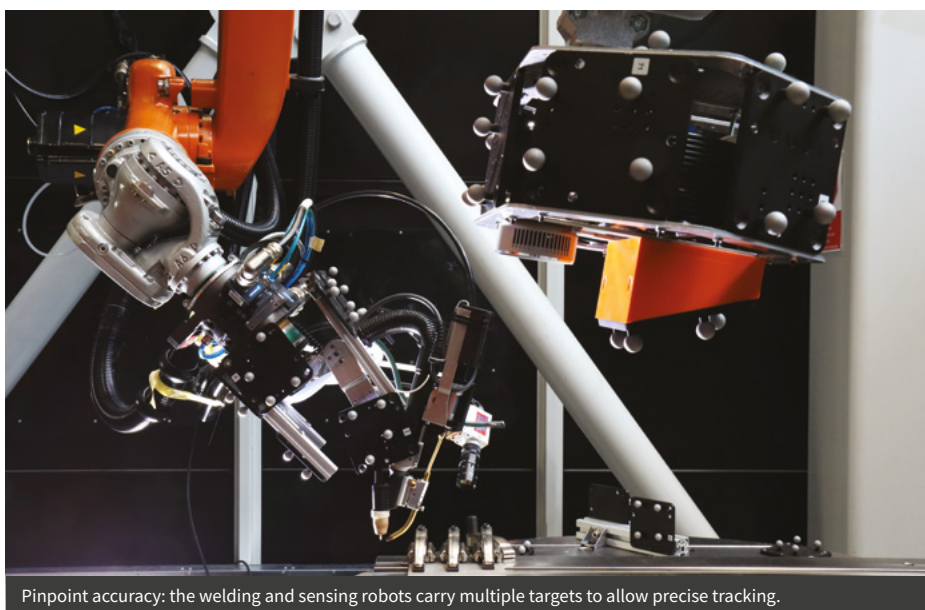
Only then can we reap the full benefit of the energy transition, and create a genuinely world-leading manufacturing sector in the UK.

Finally, I'd like to offer my heartfelt thanks to all the delegates at the Nuclear Manufacturing Summit who dug deep to give more than £9,250 to Macmillan Cancer Support, keeping us on track to reach our fundraising goal for the year. This really shows what we can achieve when we work together as an industry.

And for next year, I've entered the London Marathon.

Andrew Storer, CEO

Affirming the promise of automated weld inspection



Pinpoint accuracy: the welding and sensing robots carry multiple targets to allow precise tracking.

Researchers working to automate the fabrication of nuclear waste containers have successfully demonstrated a new advanced tracking system.

The technology forms part of a research collaboration called Affirm (advanced photogrammetry for flexible intelligent robotic manufacturing), which aims to develop a new platform for robotic manufacturing and autonomous inspection of safety-critical fabrications for the nuclear sector.

The two-year Affirm project is backed by £1 million funding from Innovate UK's Smart Grant programme. It is led by Insphere, a tier two member of the Nuclear AMRC, with support from Cumbrian technology specialist Createc.

The team have now integrated technologies from the two companies into the Nuclear AMRC's modular intelligent manufacturing and inspection cell, which features two Kuka robot arms working in tandem.

One robot is suspended from a multi-axis gantry over a rotary welding table. The other floor-mounted arm carries a weld inspection sensor produced by 3D imaging specialist Photoneo.

The robots and table are continuously tracked by Insphere's Iona camera system, which has been developed specifically for high-accuracy

tracking and guidance of industrial robots.

"Iona is integrated with the robot controllers, so that its measurement data can be used directly for control and correction of robot position and orientation," explains Craig Davey, chief operating officer at Insphere.

Once the plates to be welded are clamped onto the table, the floor-mounted arm tracks the Photoneo sensor along the gap between them. The measurements it collects are used to plan the path for the welding robot.

The Iona system then tracks the robot's precise movements as it welds, to validate weld accuracy and correct its path where necessary. Finally, the sensor arm is again tracked along the weld to collect assessment data and detect any deformation of the steel plates.

The complexity of the cell made it a good test of the Iona technology, notes Dr Faris Nafiah, senior research engineer at the Nuclear AMRC. The Insphere engineers typically install four nodes to track the targets attached to each part of the robot cell, but used six in the Affirm cell to ensure full coverage.

"The cell involves a lot of components, including the robots, welding torch, table and gantry, and tracking the position of all the complex components made it a bit more complicated than normal," Nafiah says. "We've also got different control systems and interfaces, and the challenges for us were mostly to do with understanding how the interfaces of each system worked together."

After installing the system and successfully demonstrating the workflow, the team are now carrying out trials to assess robot accuracy, the influence of environmental variables, and material performance when parameters are varied.

"High temperatures, high-intensity radiation, smoke and sparks all have the potential to hinder tracking and even damage system components," Davey says. "These influences are being rigorously tested, and the Nuclear AMRC cell is proving very valuable to maximise the learning from the project."

The data gathered during the trials will also be used to feed machine-learning algorithms, which will be used to automatically optimise robot paths, drive down errors and further enhance performance.

Following the trials at the Nuclear AMRC, the researchers aim to install demonstrator cells with companies working on waste container fabrication. Several major companies are already engaged as part of the Affirm project's industrial committee. "They're very interested in this, because being able to track the welding robot is key to these companies," says Nafiah.

The Affirm technology could significantly increase the UK's capacity to produce waste containers for the decommissioning programme, tens of thousands of which are needed over the coming decades.

One current constraint on the UK supply chain is a shortage of skilled welders. Fully automated robotic welding could reduce the demand on welders' time, while reducing production costs and ensuring consistent quality, allowing UK manufacturers to meet the huge demand from the decommissioning sector.

Automated welding and inspection can also be deployed in other markets such as modular reactors, offshore wind, automotive and aerospace, Davey adds.

insphereltd.com/iona

New help for SMEs to cut energy use

Smaller manufacturers have a new toolkit to help them cut their energy consumption and costs.

The Manufacturing Energy Toolkit is a new service from the High Value Manufacturing Catapult, designed to allow SMEs to better understand the energy they use in production, and identify practical ways to improve efficiency and reduce waste.

It is based on a guided assessment led by experts from the seven HVM Catapult centres, including the Nuclear AMRC, starting with a free site visit

and analysis of current production operations.

“SMEs are the backbone of the UK economy, but they often have to shoulder the greatest burden under external pressures like seasonal energy price rises,” says Katherine Bennett, CEO of the HVM Catapult.

“That’s why the HVM Catapult is offering free support to help manufacturers become more efficient – both environmentally and financially.

The Manufacturing Energy Toolkit will give SMEs the expert insights they need to make smarter, more sustainable choices in their factories and on their production lines.”

In trials led by WMG, the toolkit helped SMEs save an average 21 per cent of their energy costs. Individual companies reduced their energy use by between 12 and 46 per cent across their operations, and by up to 90 per cent on a single machine.

To find out more about the Manufacturing Energy Toolkit and other SME services: namrc.co.uk/services/sme

£650 million investment in fusion futures

The government has announced new support for the UK’s growing fusion power industry, including a new fuels development facility, skills programme and industrial research funding.

The Fusion Futures Programme, worth up to £650 billion by 2027, was announced by nuclear minister Andrew Bowie at the IAEA Fusion Energy Conference in London in October.

It includes up to £200 million R&D funding to ensure that UK industry can develop and design components for future fusion power plants, with an additional £35 million for the ongoing Fusion Industry Programme challenge fund.

Government will also invest up to £200 million for a fuel cycle testing facility, to develop technology to breed fuel for fusion power plants and support the UK in becoming a leader in tritium-related intellectual property.

A new Fusion Skills Programme aims to train at least 2,200 people over the next five years, by investing up to £55 million in businesses and universities to expand fusion training programmes.

“Delivering fusion power will require ideas to solve science and engineering challenges, involvement of industry partners, development of thousands of skilled people and strong international partnerships,” commented Professor Sir Ian Chapman, CEO of the UK Atomic Energy Authority (UKAEA).

“Fusion Futures will invest in all of these aspects – a truly concerted programme that will support economic growth and high-quality jobs as well as advancing fusion as part of a future sustainable energy mix.”

Funding will also help develop UKAEA’s Culham campus in Oxfordshire, and provide additional support for the delivery of the Step demonstration plant in Nottinghamshire.

Step will be delivered by a new UKAEA subsidiary called UK Industrial Fusion Solutions.

Paul Methven, previously director of submarine acquisition at the Ministry of Defence, was appointed CEO in October.

Fusion Futures will also support international collaboration, and strengthen links between UK research organisations and overseas programmes.

The investment was announced as part of the UK’s updated Fusion Strategy, which highlighted the importance of international collaboration in delivering commercial fusion power.

www.gov.uk/government/publications/towards-fusion-energy-the-uk-fusion-strategy

Hot topics in advanced coolants

Advanced cooling techniques using carbon dioxide can bring significant benefits for industries including fusion power, aerospace and biomedical devices.

Cool job: supercritical carbon dioxide deployed through a milling head.

International researchers and industrial engineers met at the Nuclear AMRC's seventh annual cooling seminar in September to discuss the latest developments.

Over the past eight years, the Nuclear AMRC has led research into supercritical CO₂ cooling, with a focus on combining CO₂ with minimum quantity lubricant (MQL) techniques to improve efficiency while reducing costs and environmental impacts in a variety of challenging machining tasks.

"The focus is on improving productivity," said Andrew Wright, senior technical fellow, as he opened the day-long event. "Traditional coolant systems use a large amount of resources and material, and are expensive to run."

Recent projects at the Nuclear AMRC include work with difficult-to-machine refractory metals such as tungsten for applications in the fusion power sector.

"We're seeing more and more interest from the fusion industry," Ed Reeves, technical lead for process methods, told delegates. "A lot of plasma-facing components in fusion reactors will be made of tungsten, and how these components will be machined is the elephant in the room at the moment."

In milling trials, Reeves and colleagues confirmed that conventional soluble oil coolants are not suitable for tungsten even with optimised cutting parameters, and demonstrated that supercritical CO₂ and MQL can provide significantly better performance than dry cutting.

"Tungsten is a difficult material to machine, but it's not impossible," Reeves concluded.

"With the correct understanding of feeds and speeds and cutting conditions, it's not an insurmountable problem."

Supercritical CO₂ cooling is also proving its worth with hard-to-machine metals in other industries. Roy Berning of Spirit AeroSystems discussed how he's used the technique for challenging applications such as drilling hundreds of holes in aerospace pylon components.

Dr Chris Taylor of the University of Sheffield AMRC presented research showing productivity increases of 35 per cent in milling titanium alloys, while Leon Proud of the AMRC Industrial Doctorate Centre demonstrated tool life increases of up to 245 per cent with the commercially pure titanium used for biomedical implants.

Researchers also discussed work to improve the performance of MQL delivery systems and lower barriers to entry for users. Stuart Vere of Kugel Rotary Services and Frank McQuade of Bloc Digital presented the latest from the UltraMQL project to develop an innovative ultrasonic technology for precisely delivering a small quantity of oil to the cutting zone.

The collaborative project, funded by an Innovate UK Smart Grant, aims to develop a bolt-on system which will allow smaller manufacturers to reduce their costs and environmental impact without having to invest in new machines.

A prototype system, based on an ultrasonic oil atomiser developed by the University of Brighton, is beginning trials and analysis at the Nuclear AMRC in the autumn. Quaker Houghton is also developing a new lubricant as part of the project.

Counter-intuitively, using CO₂ as a coolant can help reduce the emissions from manufacturing, thanks to increased productivity and the removal of power-hungry pumping systems for flood coolant.

David Anson, principal engineer at the Nuclear AMRC, shared analysis of data gathered during cutting trials with 304L steel on the centre's large Starrag HEC1800 machine. Using advanced coolants was 2.4 times quicker than with conventional coolant, and used just 18.5 per cent of the total energy.

Based on current average emissions from the UK grid, that means that CO₂ coolant can reduce the total emissions of machining by 80 per cent.

Using advanced coolants can also bring other benefits to manufacturers. Dr Vijayarvarman Chakkravarthy of Cranfield University discussed his work in recycling titanium swarf as a feedstock for additive manufacturing, with trials using swarf generated by the Nuclear AMRC.

Swarf produced during machining with CO₂ and MQL minimises contamination which would cause problems in remelting and processing. That means it could fetch a premium price in the secondary market. "You will be able to sell your swarf for a very much higher price in future," Chakkravarthy said.

To find out more about advanced coolants, contact senior technical fellow **Dr Krystian Wika**: krystian.wika@namrc.co.uk

The next phase of Fit For Nuclear

The next evolutionary phase of Fit For Nuclear begins in the new year, with added services for participating companies and a new subscription-based operating model.

Since its launch in 2011, Fit For Nuclear (F4N) has helped hundreds of manufacturers and suppliers across the UK to test and develop their capabilities to serve the nuclear market.

As of October 2023, participating companies have reported that the F4N programme has helped them win £2.1 billion worth of new contracts in nuclear and other sectors, creating or safeguarding 2,952 jobs, and leveraging £42 million additional private investment.

But just as companies can't stand still in a constantly changing marketplace, the F4N programme is evolving to ensure that it is fit for the future.

Over the past year, the Nuclear AMRC's supply chain specialists have reviewed the programme, consulting with companies at all tiers to understand what they need to create a resilient and competitive UK supply chain. Alongside that consultation, the team have analysed the future requirements of nuclear programmes across new build, reactor development, decommissioning and submarines.

"Our mission as a centre remains to maximise UK content in high-value engineered products



Taking the supply chain message to Parliament: Yvan Lavaux of Wozair; Andrew Storer and Liz Gregory of the Nuclear AMRC; Robert Crocker of Rolls-Royce SMR.

for UK nuclear projects," says Liz Gregory, Nuclear AMRC director for supply chain and skills. "To do this, we need a value-adding supply chain programme, supported by the government, developers and prime contractors. We want to increase the scope and scale of the F4N programme, broadening out the offering with new services, courses, and events, and bringing more companies into the sector."

In September, Gregory outlined the proposals to government and industry stakeholders at a reception in the House of Lords, as part of Nuclear Week in Parliament. Yvan Lavaux, sales and marketing director of F4N-granted HVAC specialist Wozair, spoke about his experience of the programme, while Robert Crocker, head of operational quality at Rolls-Royce SMR, gave the reactor vendor's perspective.

As the Nuclear AMRC's flagship supplier development programme, F4N will continue to play a key role in the centre's work to improve capabilities along the UK supply chain.

"By supporting development of an integrated supply chain strategy, we will be able to identify gaps and bottlenecks across the industry, identifying opportunities to invest in building

the capability, capacity and competitiveness needed to deliver an ambitious programme of new nuclear build," says Gregory.

"A clear understanding of our domestic capability is essential if the UK is to avoid being unnecessarily exposed to international supply chains and global markets. This is why we have taken steps to evolve the Fit For Nuclear programme now."

Extra value

The new phase of F4N will continue to deliver the core areas of business excellence and sector-specific assessment and improvement, with new upgraded nuclear elements. To provide additional value and support, it will also provide a range of new events, services and training.

Events will be exclusively for companies on the F4N programme, and offer the opportunity to engage with customers and decision-makers. Topics will include supply chain and manufacturing challenges, skills requirements and gaps, competitiveness and opportunities for improvement – covering common issues across the sector as well as specific components and systems.

Participating companies will also be invited to join round-table discussions with nuclear primes and other key players, and regional networking and knowledge-sharing events with industry peers.

“The round tables will promote working across the supply chain tiers, focusing on key challenges and promoting collaboration to ensure the supply chain works more efficiently,” Gregory notes. “This is particularly important when considering the multiple needs of civil, defence, decommissioning and fusion sectors.”

Companies can access a suite of targeted services to help them secure work with nuclear customers, including signposting to opportunities and tenders, and access to UK supply chain benchmarking data.

“The sector can be confusing to navigate, but our intention will be to provide a direct line of sight to business opportunities,” Gregory says.

Companies can also benefit from help in understanding relevant codes and standards, including support for companies preparing to qualify for the nuclear-specific ISO 19443 quality management standard.

The Nuclear AMRC’s team of industrial advisors will lead deep dives into various areas of business excellence, and share sector information and news.

The third leg of the expanded F4N programme involves a range of courses to increase knowledge and understanding of nuclear sector topics, delivered with industry-leading training partners.

New ways of working

One big change to the way that F4N operates is that the programme will now be run on a cohort basis – a number of companies will start their F4N journey at the same time, and encouraged to share good practice and lessons as they progress together.

This cohort model has already proven its worth in the Fit For Offshore Renewables programme, an ongoing collaboration between the Nuclear AMRC and the Offshore Renewable Energy Catapult, as well as the Fit For Hydrogen & CCUS pilot managed on behalf of the Zero Carbon Humber Partnership.

“We’ve designed this new approach to F4N to increase company-to-company engagement and foster supply chain co-operation,” says Gregory. “The cohort model has been successful on Fit For programmes in other energy sectors, as it gets companies talking and working together across the supply chain.”

Companies are now being invited to register interest in joining the first cohort of 25, to start their F4N journey in April.

To ensure the expanded programme is self-sustaining, F4N is moving to a subscription model. Participating companies will pay a flat fee to cover assessment and support from their industrial advisor on the road to granting, which typically takes 12 to 18 months. The subscription will include access to all events and other services, with additional training courses offered on a pay-as-you-learn basis.

After granting, companies can maintain granted status with regular visits from their industrial advisor and access to all the additional services, for an annual subscription. There will be no additional fee for re-granting after the usual three years.

Companies which are already on their F4N journey will continue to granting under the established programme, at no cost to themselves. Granted companies approaching re-assessment will be contacted by their industrial advisor about their next steps.

To find out more, and register interest in joining the new cohort: namrc.co.uk/services/f4n

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.

Advanced Manufacturing (Sheffield) Limited is a leading supplier of complex machined metallic components, with special capability in gear manufacture.
www.amlsheffield.co.uk

Armultra specialises in design and high-quality fabrication of pipework and steelwork, plus installation for the oil & gas and nuclear sectors.
www.armultra.co.uk

Hawke International, part of the Hubbell Group, specialises in globally-certified cable glands, enclosures, connectors and connection solutions.
www.hubbell.com/hawke

Lion Engineering offers comprehensive precision machining, complemented by specialist welding and hardfacing facilities.
lioneng.com

RAM Universal has 40 years of experience in supplying valve and process solutions to the energy, food, mining, pharmaceutical and chemical industries.
www.ramuniversal.co.uk

Vecom Sillavan Metal Treatment offers advanced chemical technical cleaning solutions, extending the lifespan of metal components in the nuclear industry.
www.vecom-group.com

Congratulations also to **Horstman Defence Systems**, **IT4Automation**, **NIS Ltd** and **SCX Special Projects** on being regranted F4N.

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



Evident joins for inspection innovation



Safety-critical: NDT ensures the integrity of nuclear fabrications.

Scientific and industrial equipment specialist Evident has joined the Nuclear AMRC to support the development of new inspection techniques for the nuclear industry.

Evident manufactures world-class nondestructive testing (NDT), precision measurement and analysis, quality control and assessment, and other research, environmental, and life science solutions. Formerly a wholly-owned subsidiary of Olympus, Evident employs more than 4,300 people in 24 countries.

NDT covers a variety of technologies that are used to evaluate the structure and integrity of a component without damaging it. In the nuclear sector, it is essential to ensure the safe operation of reactor components, waste containers, and other safety-critical fabrications.

“The nuclear industry takes plant safety very seriously,” says John Crossley, Nuclear AMRC technology lead for nondestructive testing. “NDT plays an important role in the

manufacture and continued maintenance of plants to ensure the quality and safety of the most critical parts of nuclear power plants at a cost-effective rate.

“Evident has many state-of-the-art solutions to conduct these inspections, and working closely together under the new membership will give us the ability to deliver these solutions to our customers and their projects.”

Evident has previously worked with the Nuclear AMRC on NDT technology development, including phased array ultrasonic testing of novel components and improved testing methodologies to meet nuclear industry requirements.

As part of its membership, Evident will provide equipment and additional support to the Nuclear AMRC. The collaboration will focus on

qualifying new NDT methods to meet the quality management requirements of nuclear customers and developing examination methods for advanced joining and production technologies.

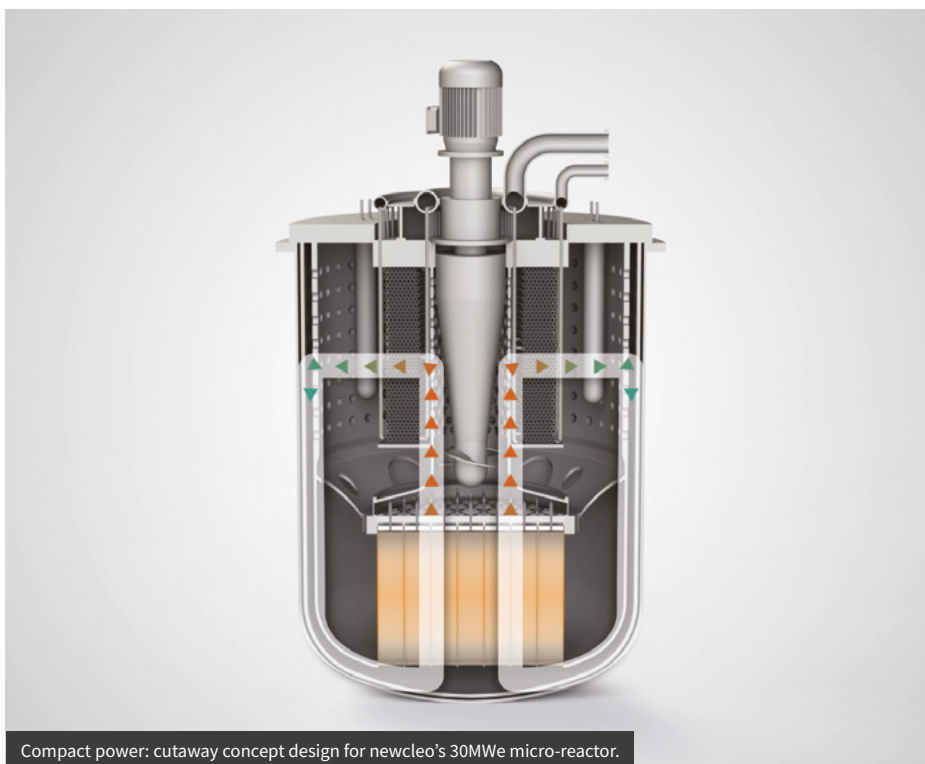
“As a company we look forward to contributing to the cutting-edge work going on at the Nuclear AMRC,” says Jim Worland, director industry direct sales UK at Evident.

“We see closer cooperation with the nuclear industry as paramount to tackling the ongoing challenges of energy production in line with net-zero targets, and Nuclear AMRC membership allows us to take part directly in research and development projects where we can directly impact relevant areas in close cooperation with a wide network of industry and academic partners.”

The Nuclear AMRC will also work with Evident on innovative developments in some of its other technology areas, including remote visual inspection technologies, where Evident products are used in nuclear and other energy sectors to monitor the condition of operational plants in challenging environments and difficult-to-access areas.

www.evidentscientific.com

newcleo signs MOU with Nuclear AMRC



Compact power: cutaway concept design for newcleo's 30MWe micro-reactor.

Clean nuclear technology company newcleo has signed a memorandum of understanding (MOU) with the Nuclear AMRC, establishing an outline for a collaborative partnership to drive forward manufacturability, supply chain, and development studies for pioneering nuclear technologies.

newcleo is working to deliver innovative reactors which will significantly reduce existing volumes of radioactive waste and plutonium, as well as end the need for further uranium mining for the long-term benefit of communities and the environment.

The first step of newcleo's delivery roadmap will be the design and construction of the first-of-its-kind Mini 30MWe lead-cooled fast reactor to be deployed in France by 2030, rapidly followed by a 200MWe commercial unit two years later.

This MOU between newcleo and the Nuclear AMRC establishes the foundation of a partnership for exploring a range of technical and business operations. These could include supply chain readiness assessments, investigation into potential supply chain partners, identification of entities for potential acquisition, modularisation studies, manufacturability and fabrication assessments, material and metallurgy studies.

"As an organisation that has consolidated their position at the heart of the UK's civil nuclear manufacturing industry, we are enthusiastic about this opportunity to work collaboratively alongside the Nuclear AMRC to push forward innovation in nuclear, participating in activities that will play a role in meeting our ambitious plan-to-market," said Stefano Buono, newcleo chairman and CEO.

"This partnership provides support to the development of our end-to-end industrialisation strategy, as well as our business activities in the UK. This will play a helpful role in our mission of building a new competitive industrial standard in nuclear energy and providing safe solutions to energy and environmental challenges."

Privately funded and headquartered in London, newcleo was launched in 2021 to be an innovator in the field of nuclear energy. Its mission is to generate safe, clean, economic and practically inexhaustible energy for the world, through a radically innovative combination of existing, accessible technologies. newcleo capitalises on thirty years of R&D activity in metal-cooled fast reactors and liquid-lead cooling systems, and has around 430 employees across Europe.

"We look forward to working with newcleo to help bring their advanced modular reactor to market, and help them tap into the capabilities of the UK's nuclear supply chain," said Andrew Storer, Nuclear AMRC CEO.

"Advanced reactors like newcleo's have a vital role to play in decarbonising electricity generation and energy-intensive industrial processes, and potential development in the UK will offer significant opportunities for nuclear-ready manufacturers to win work. Our experience in manufacturing innovation and supply chain development will help them achieve their ambitions in the UK and worldwide."

www.newcleo.com

Baking, running and skydiving for Macmillan



Down for a challenge: Izzy Storer conquers her fear of heights.

Nuclear AMRC staff continue to push their limits to raise funds for Macmillan Cancer Support, with a major boost from delegates at the Nuclear Manufacturing Summit.

The centre has committed to raising at least £25,000 to help people with cancer live as fully as they can.

In late September, research associate Dr Rahul Mandal completed a marathon baking challenge for a staff coffee morning in Rotherham – raising more than £2,200 from sponsorship and sales. A coffee morning the following week for colleagues in Derby then added more than £300 to the pot.



Dr Rahul Mandal shares the results of his baking marathon.



Streets ahead: Dr Robin Hildyard and Dami Shofoluwe relax after the Sheffield 10K.

In more energetic challenges, research engineer Dr Robin Hildyard and mechanical engineer Dami Shofoluwe ran the Sheffield 10K in late September, raising close to £1,000 between them.

Project manager Loretta Sarpong committed to walking 100 miles during August, raising over £100. And chief technology officer Charles Carpenter is leading an ongoing series of sponsored walks and bike rides for colleagues.

Business support analyst Isobel Storer meanwhile defied her fear of heights to complete a tandem skydive, raising almost £600.

The team also offer huge thanks to the generosity of friends and contacts along the supply chain. Delegates at the Nuclear Manufacturing Summit contributed more than £9,250 through donations, a charity auction and raffle during the gala dinner.

For the latest information and links to donate: namrc.co.uk/about/charity

New bridge to business support



Supporting the supply chain: Quder Hussain.

Quder Hussain has joined the Nuclear AMRC business development team, to help manufacturers access the centre's support for innovation and business improvements. *Nuclear AMRC News* asked him to introduce himself.

I have a manufacturing career in cast metals spanning 30 years, beginning in technical cast materials, leading to quality roles and the past 20 years in a commercial capacity. Roles ranging from technician to senior management have given me the opportunity to work and travel within the UK, EU and internationally.

More recently, my focus has been on the aerospace, defence and gas turbine sectors, predominantly working within the titanium and super alloy component manufacture. Building on the solid foundation of industry experience, I look forward to supporting our members and potential members to realise the advantages of how the Nuclear AMRC can assist in developing their business within the nuclear sector.

In my new role, I'm initially focusing on decommissioning, waste management and the supply chain. My aim is to develop and support our existing projects, coupled with a strong emphasis on engaging new clients and projects

in the medium to long term. I will be engaging with industry across the UK, and being the bridge to enable easier access to the vast range of technologies and services available at the Nuclear AMRC.

I believe one of the biggest challenges for manufacturers is the sometimes complex nature of the nuclear sector. It can be difficult to navigate the various routes for businesses, especially for our SMEs where resources can become a limitation.

Nuclear quality standards are naturally stringent due to the nature of the business, but our Fit For Nuclear programme is in place specifically for this reason. F4N allows SMEs to explore opportunities in the nuclear market with our team advising if a business is ready, or if they require changes in specific areas to meet the required standards.

q.hussain@namrc.co.uk

Diary

namrc.co.uk/news/events

World Nuclear Exhibition

28–30 November, Paris

The international showcase returns with more than 600 exhibitors from the civil nuclear sector around the world. The Nuclear AMRC is exhibiting as part of the UK Pavilion, hosted by the Department for Business and Trade to showcase the national supply chain.

www.world-nuclear-exhibition.com

Nuclear 2023

7 December, London

The Nuclear Industry Association's annual conference features speakers from across the sector, plus extensive networking opportunities. The Nuclear AMRC is exhibiting.

nuclear2023.co.uk

Nuclear Manufacturing Summit 2024

20–21 November 2024,
South Yorkshire

Save the date for our fourth annual supply chain conference, with the latest information and insight across the sector, plus the second UK Nuclear Manufacturing Awards.

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.

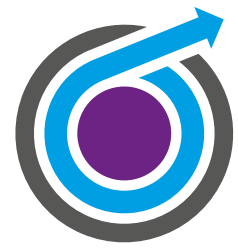
We can work with you to raise your capabilities and competitiveness to meet the needs of the global nuclear supply chain.

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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Tier 1 members:



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