



NUCLEAR AMRC news

No.27 Q2 2017

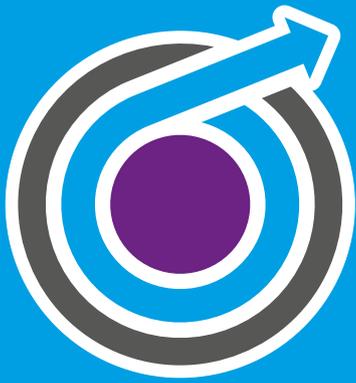
- ▶ Cammell Laird
- ▶ Barron
- ▶ NOV Gateshead
- ▶ Hinkley Point C
- ▶ Heatric



Ready for growth

Why nine out of ten manufacturers recommend F4N

CATAPULT
High Value Manufacturing



From the editor

Welcome to the Q2 edition of Nuclear AMRC News, with all the latest on our manufacturing innovation and supplier development work, and news and case studies from the UK's nuclear supply chain.

This issue focuses on our Fit For Nuclear programme, with detailed case studies on two very different companies – Heatric, part of the global Meggitt group; and Barrnon, a tiny Cumbrian firm moving from fishing into nuclear decommissioning – plus results from this year's F4N participant survey.

We also feature Mike Tynan's final column. After four years as CEO of the Nuclear AMRC, and 42 years in the industry, Mike is taking well-earned retirement in July. We wish him all the best.

Regular readers may have noticed that we've slightly redesigned and expanded the newsletter, following last quarter's reader survey. Thanks to everyone who responded, and congratulations to Andrew Hughes of GFSA Ltd in Stourbridge who won the prize draw. If there are other features you'd like to see, or if you have stories to share, please do get in touch.

Tim Chapman, Nuclear AMRC communications manager:
t.chapman@namrc.co.uk

Cammell Laird and Nuclear AMRC to focus on modular manufacturing for nuclear

Cammell Laird, one of the most famous names in British industry, is working with the Nuclear AMRC to position itself as a world-leading nuclear industry hub.

The partnership was announced at a Nuclear Industry Association meeting at Cammell Laird's Birkenhead site, with over 100 nuclear industry executives attending.

Cammell Laird is taking tier one membership of the Nuclear AMRC, and hosting a new facility to develop modular manufacturing techniques for the nuclear industry.

Modular manufacturing involves the off-site assembly of large-scale systems, which are then transported to site for final installation. Modular techniques are already widely used in shipbuilding, aerospace and other safety-critical industries. In the nuclear sector, they can significantly reduce construction risk and help deliver new power stations to schedule and cost.

As well as developing technology and knowhow through collaborative R&D projects, the facility will also provide a regional base for the Nuclear AMRC to support North West companies of all sizes.

"The development centre will thrust Cammell Laird forward as the leading UK industrial manufacturer developing expertise in off-site module build in partnership with the High Value Manufacturing Catapult," said Jonathan Brown, managing director of Cammell Laird's energy division.

"We are looking to research a wide range of areas supporting the assembly, commissioning and transportation of modules of up to 5,000 tonnes, where Cammell Laird benefits from its coastal location," Brown added. "Working with the Nuclear AMRC, we will invest in our facilities and our skilled workforce and supply chain to meet the demands of modular new build. Looking forward, we will also target the export market through a strategy built on working with partners and countries around the world, focused on the exploitation of the benefits of modular construction."

Future signs: the new Nuclear AMRC facility.



Targeting nuclear:
Jonathan Brown,
head of Cammell Laird's
energy division.

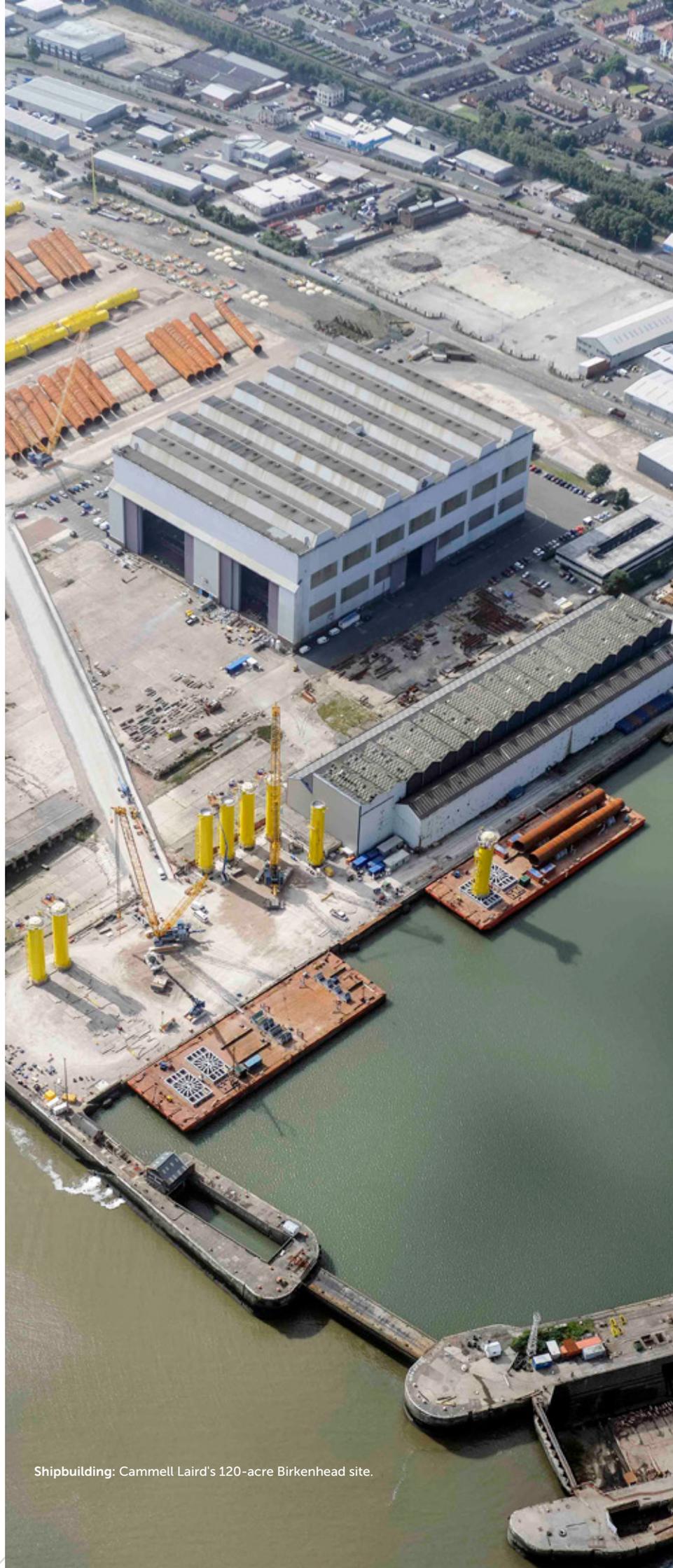


Cammell Laird is one of the most famous names in British industry, with roots tracing back to the early 19th century. Its 120-acre site on the Mersey features four dry docks, a non-tidal wet basin, a large modular construction hall and extensive covered workshops. Cammell Laird has been increasing its involvement in the UK's nuclear sector for several years, and has collaborated with Nuclear AMRC members Nuvia and Ansaldo NES on modular manufacture for the civil nuclear sector.

"We're delighted to welcome Cammell Laird to the Nuclear AMRC network," said Andrew Storer, managing director of the Nuclear AMRC. "Our new facility in Birkenhead will focus on developing modular manufacturing methods for new reactors of all sizes, drawing on Cammell Laird's expertise in modular shipbuilding and a host of innovative technologies to significantly reduce costs and lead times for nuclear new build. It also gives us a base in the North West, the core region for the UK's nuclear industry, allowing us to work more closely with the regional supply chain and the development sites in Cumbria and North Wales."

Working with the Nuclear AMRC will strengthen Cammell Laird's unique and highly competitive package of engineering services, Brown added. "Cammell Laird offers reliable, cost-effective and flexible solutions to multi-billion pound industries crying out for experienced support," he said. "Working with the Nuclear AMRC, we will further develop our modular expertise, drawing on its formidable nuclear and wider academic expertise through its links with the University of Sheffield and The University of Manchester to make Cammell Laird's offering even more compelling."

www.clbh.co.uk



Shipbuilding: Cammell Laird's 120-acre Birkenhead site.

Innovative projects tackle challenges of large components

The Nuclear AMRC is leading two new collaborative R&D projects to address fundamental challenges in nuclear manufacturing.

The centre has secured funding from Innovate UK to address key manufacturing challenges associated with the production of large-scale nuclear components, and to develop an integrated manufacturing platform which could significantly increase productivity.

The Nuclear AMRC is now leading an initial three-month feasibility study for each project. If the study shows that the proposed innovation can deliver real value, the centre will then lead a four-year development programme with academic and industry partners from across the UK.

The **Simple** project (single manufacturing platform environment) aims to integrate a range of technologies and operations into a single machine, reducing the time lost in moving large parts between tools.

The Nuclear AMRC will work with two of its sister centres within the High Value Manufacturing Catapult, the Advanced Forming Research Centre and AMRC with Boeing, as well as the University of Sheffield, Coventry University, TWI and Peak NDT.

The proposed first phase will develop an integrated welding and monitoring system which combines a range of sensors and testing tools with an automated welding

head. This could reduce the cost and time for fabrication tasks by half.

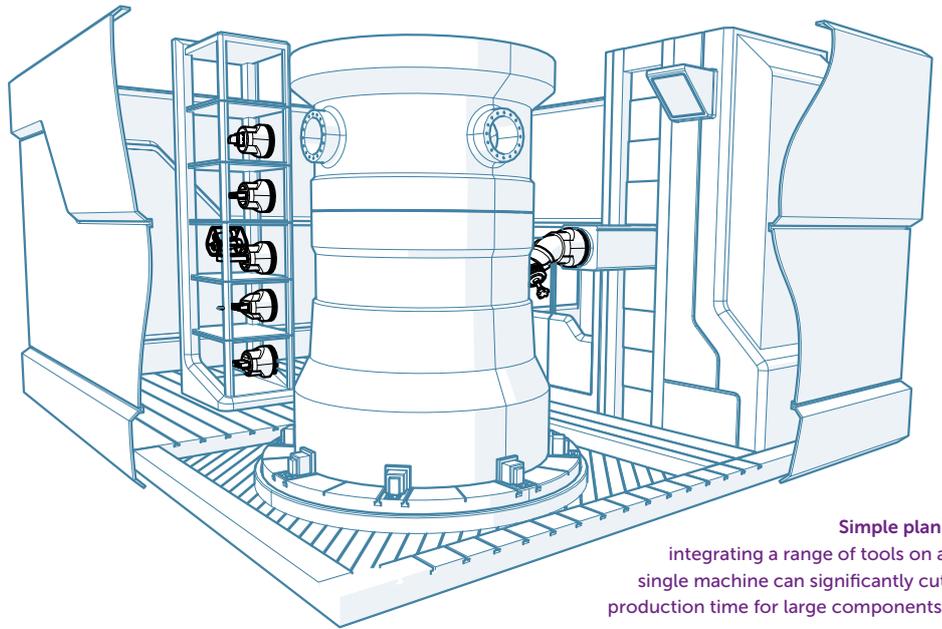
The second phase would then integrate this tool with a comprehensive selection of machining, cladding and inspection heads on a single manufacturing platform.

The **Inform** project (intelligent fixtures for optimised and radical manufacture) will tackle a range of challenges in producing high-precision fabrications. Proposed partners include Sheffield Forgemasters,

Cambridge Vacuum Engineering, TWI, The University of Manchester, University of Nottingham, and the AMRC with Boeing.

If the feasibility study is positive, the project will develop an adaptive fixturing system to ensure precision throughout forging, machining, welding and inspection, and to cut time during assembly and alignment.

Simple and Inform are funded under Innovate UK's recent call for advanced R&D into nuclear manufacturing and materials.



Simple plan: integrating a range of tools on a single machine can significantly cut production time for large components.

New European collaborations

Two new international research projects will see the Nuclear AMRC working with partners across Europe to improve the safety of nuclear plant and develop a new reactor concept.

The **Meactos** project (mitigating environmentally-assisted cracking through optimisation of surface condition) aims to reduce the risk of stress corrosion cracking in the primary circuit of light water reactors.

The €2.5 million project involves 16 academic and industrial partners, led by Spain's Ciemat, and including Areva, EDF and Amec Foster Wheeler. The Nuclear AMRC will build on the recently completed McScamp research into the root causes of stress corrosion cracking in nuclear steels (*Nuclear AMRC News 26*).

The **Gemini+** project will develop a small modular high-temperature gas reactor for industrial cogeneration applications. The

€2.5 million project involves 27 partners from Europe, South Korea, Japan and the US.

The Nuclear AMRC will lead a study into modular manufacturing and construction techniques for the proposed reactor.

Both projects are funded by the European Commission's Horizon 2020 programme.

New cell to tackle laser welding challenges

Nuclear AMRC engineers are preparing to develop new welding and cladding processes using a powerful new laser cell

The cell will be installed over the summer, and will give the centre new capabilities in laser welding and hot-wire laser cladding. The facility is designed to produce high-quality deep penetration joins, from around 15mm in stainless steel.

The 16kW disk laser is believed to be the most powerful of its kind in the UK. It will also be capable of delivering a simultaneous MIG weld for hybrid welding with hot or cold wire.

The laser will be mounted on a six-axis gantry over a two-axis manipulator table which can carry components up to 15 tonnes. The system will be contained in a safety enclosure measuring 10 by seven metres.

The cell will enhance the Nuclear AMRC's welding capabilities to support manufacturing process development

for key nuclear components, says laser engineer Björn Krämer.

"One example would be the duplex steel boxes used to store hazardous waste from Sellafield and other decommissioning sites," he notes. "Laser welding can significantly reduce manufacturing times and costs while maintaining a high quality of weld seams."

The cell is designed and built by Loughborough-based Cyan Tec Systems, a specialist in integrating robotic and laser systems for industrial applications.

To find out more about the Nuclear AMRC's laser manufacturing capabilities, contact: bjorn.kraemer@namrc.co.uk



Enclosed power: concept design of the new laser welding cell.

Winning formula for welding team

Student racers called on the Nuclear AMRC's welding engineers to help build a car for a competition at Silverstone in the summer.

Sheffield Formula Racing (SFR) has represented the University of Sheffield in the international Formula Student competition since 2010. The team is designing and building a single-seat race car, which will be put through its paces at the Formula Student UK event run by the Institution of Mechanical Engineers.

Two of the team, aerospace engineering student Robert Newman and mechanical engineering student Matt Brown, called on the Nuclear AMRC after working with another company on the Advanced Manufacturing Park to cut steel for the car's chassis.

"We found out about the welding capabilities at the Nuclear AMRC, and wanted to take advantage to get some really nice welds," says Newman.

Nuclear AMRC senior welding technician Jonathan Bramall worked with the students to fabricate the chassis using TIG pulse welding. "It's a technique we widely use for stainless steel and duplex welding, giving a neater joint than standard methods," Bramall notes.

The chassis will return to the Nuclear AMRC for inspection on the large CMM. The SFR team are also working with the AMRC with Boeing to create a carbon fibre composite body for the car.

In July, the car will be put through its paces in a series of events at Silverstone including a drag race, skid pan trial, sprint and 22km endurance race.

www.sheffieldformularacing.co.uk



Racing start: SFR's Robert Newman and Matt Brown with Jonathan Bramall (centre) and the welded chassis.



Kori-1: South Korea's first nuclear power station enters decommissioning this year.

Nuclear AMRC fosters supply chain links with South Korea

A delegation from the Nuclear AMRC visited South Korea in April to help foster collaboration between the South Korean decommissioning sector and the UK's established supply chain.



Programme director Colin Walters and project manager James Leatherland presented to over 150 delegates at the 32nd Korea Atomic Power Annual Conference in Gyeongju.

The visit followed a study, sponsored by the British Embassy in Korea, of the nuclear decommissioning market in the two countries. The Nuclear AMRC worked with the University of Sheffield's Energy 2050 programme and the Nuclear Decommissioning Authority (NDA) to compile the report, which highlights the strengths and role of the UK's decommissioning supply chain to potential partners in Korea.

This summer, South Korea is shutting down its first nuclear power station, the 576MWe Kori-1 reactor located near Busan. With nuclear power and waste management

high on the agenda for the country's upcoming presidential elections, the conference focused on topics including seismic risk management in nuclear power plants, public acceptance for high-level radioactive waste management, and the role of nuclear energy in a new climate change regime.

The UK delegates also visited the headquarters of Korea Hydro and Nuclear Power (KHNP), a subsidiary of Korea Electric Power Corporation (Kepeco) responsible for nuclear decommissioning, to discuss decommissioning plans for Kori-1 and how the UK could support the programme. KHNP, the Nuclear AMRC and NDA will continue discussions through 2017.

"With 10 reactor plants currently scheduled to shut down and enter decommissioning in the 2030s, this is the dawn of the Korean

decommissioning story," notes Leatherland. "The UK supply chain has the potential to support these projects with the experience built up over the past 30 years on the UK's decommissioning programme."

The UK and South Korea are also exploring potential collaboration in the UK nuclear new build programme. The Gyeongju conference coincided with UK business secretary Greg Clark visiting Seoul to discuss the Moorside new build project in Cumbria. Kepeco confirmed in March that it would be interested in joining the Moorside project, which has been thrown into doubt by financial troubles at current owner Toshiba.

To download the full Nuclear AMRC report on decommissioning in the UK and South Korea: namrc.co.uk/intelligence/decommissioning/south-korea



The Tynan view



Hail and farewell

I started work in the nuclear industry in 1975. My employer was British Nuclear Fuels Ltd (BNFL), then a four-year-old company formed from the production group of the United Kingdom Atomic Energy Authority.

My first job was in the general office at Calder Hall power station as a clerical assistant. Calder Hall was a station comprised of four Magnox nuclear power reactors, their turbine halls, transformers, and cooling towers. In 1975, it was a station in its prime, generating 200MWe. It continued on load until 2003.

I look back with great pride on my early days at the station. My father, Tommy Tynan, was a construction worker on the build of Calder Hall and went on to become part of its original operating crew. We were both part of the growth of the nuclear industry, an industry that I have now served for 42 years, and from which I will retire in July 2017.

I have seen the nuclear industry in the UK grow and decline, and struggle to grow again. I do not think the UK is yet in the much hoped-for nuclear renaissance, though I suspect we are not far away.

We have witnessed the closure of the first generation Magnox reactors, and we are close to the beginning of the end of the second generation advanced gas-cooled reactors. Hopefully we will shortly see the first nuclear concrete for the UK's third generation pressurised water reactors.

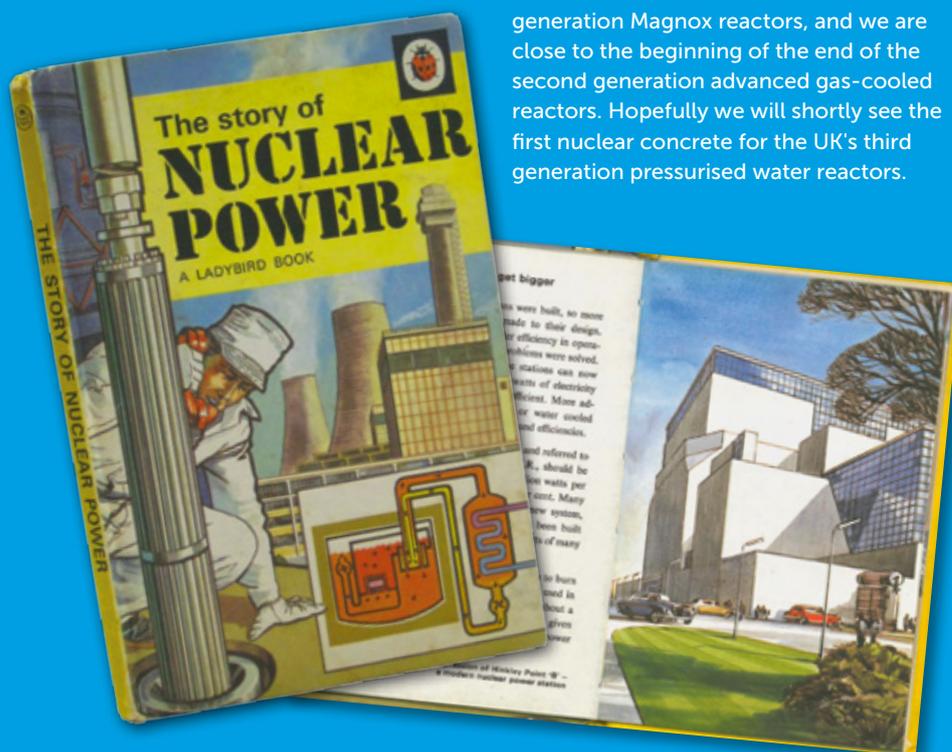
I hope to see new nuclear power stations at Hinkley Point, Wylfa, Moorside, Sizewell and Bradwell, and I hope these stations will be the foundation for a new fleet of nuclear power reactors that will see the UK through the next 100 years of electricity demand.

I'm convinced that we will see the electrification of energy usage over the next 50 years, with a decreasing reliance on fossil fuels. Electrically-powered transport systems will develop and become widespread, and carbon-efficient power stations will be needed to fuel this transition. Our electricity generation mix will become more and more reliant on renewable energy, nuclear power, and demand-side efficiency – I am hoping that my new role as a retired nuclear industry veteran will be in this latter category.

It would take too many pages to reflect upon my entire career, and while I would find such an essay nostalgic, I suspect you would find it somewhat tedious and self-indulgent. I will simply say thank you to the thousands of people I have met along the way, who have taught me everything I know, and with whom I am profoundly honoured to have shared a career.

It has been a privilege to work in the nuclear industry and I believe that the pioneering work of the Nuclear AMRC will continue to drive a new era of nuclear power in the UK. I wish you all every success in that mission.

Mike Tynan, CEO (2013–17),
Nuclear AMRC



In its prime: the UK nuclear industry as seen by Ladybird Books in 1972.

Industry alliance to map equipment qualification challenges

A new alliance of nuclear engineering companies is starting a year-long study of the equipment qualification challenges facing the UK's nuclear new build programme.

Equipment qualification (EQ) is a systematic approach to ensuring that safety-critical components and systems being manufactured for new nuclear power stations meet the relevant quality standards (see below).

"UK suppliers aiming to win work in nuclear new build need to understand the requirements for qualifying safety-classified equipment," says Andrew Storer, Nuclear AMRC managing director. "This can be a barrier to winning work in the nuclear sector, but is often overlooked."

The new EQ Alliance comprises Rolls-Royce, Lloyd's Register, Assystem and Arexis Group, and has been commissioned by the Nuclear AMRC.

"By developing the UK's capabilities for equipment qualification, the EQ Alliance can help UK manufacturers win work," Storer says. "We can also help the UK become a recognised global centre for equipment qualification for the nuclear

sector, providing new export potential. With four different reactor technologies being developed in the UK, helping UK suppliers understand the differences and identify common areas could provide significant efficiencies for new build projects worldwide."

The four companies will work closely with the Nuclear AMRC and industry stakeholders to produce a detailed report on EQ requirements for the UK new build programme, and examine the UK's current capabilities to meet those requirements.

The report, to be completed in spring 2018, will provide vital strategic guidance to help ensure that UK manufacturers are ready to meet nuclear customer requirements, reducing the risks of new build while maximising the opportunities for the UK supply chain.

"We are delighted to be working with our partners to ensure successful delivery of this EQ project for the Nuclear AMRC and,



by extension, the UK's ambitious nuclear build programme," says Mark Tipping, offshore technology manager at Lloyd's Register. "EQ is an essential element in demonstrating that the nuclear power plant can be operated safely. It is a regulatory requirement which must be satisfied in order to obtain a licence to operate."

"Ensuring a robust and agile EQ framework is in place will deliver significant technical and commercial benefits to the UK's new build programme," adds Chris Tierney, executive vice president at Rolls-Royce. "We have partnered with some of the foremost companies in the industry to ensure the strongest combination of EQ expertise and the highest standards of delivery for the Nuclear AMRC."

For the latest on the EQ Alliance study:
namrc.co.uk/services/eq

The EQ challenge

Equipment qualification (EQ) is a fundamental requirement of the UK's approach to safety assessment for nuclear facilities. Nuclear reactor technology vendors and energy utility developers must demonstrate to regulators that any safety-related and safety-critical equipment used in their reactor designs will function correctly and reliably on demand, within the parameters of the site-specific nuclear safety case.

The UK's Office for Nuclear Regulation (ONR) requires that qualification procedures should be in place to confirm

that structures, systems and components which are important to safety will perform their required safety functions throughout their operational lives.

The UK's new build programme is based on overseas reactor designs, with the majority of safety-critical components likely to be manufactured overseas. These will be made to the technical standards prescribed by the International Atomic Energy Agency (IAEA).

The ONR, however, takes a goal-based approach to EQ. Nuclear operators will

need to demonstrate that their reactor components and systems will operate safely as intended, not just that they meet the prescribed IAEA standards. This approach is intended to drive continual improvements in reactor safety performance, but does make it difficult for operators to definitively demonstrate compliance. This could lead to time and cost over-runs in new build projects.

The EQ Alliance report is intended to help shape UK policy on EQ requirements for nuclear new build projects, and reduce the risk of EQ-related delays.

Fit For Nuclear delivering real impact

Nine out of 10 companies which have joined the Fit For Nuclear programme would recommend it to other manufacturers, according to a new survey.

Fit For Nuclear (F4N) is a unique service which lets manufacturers measure their operations against the standards required to supply the nuclear industry – in new build, operations and decommissioning – and helps them take the necessary steps to close any gaps. F4N is delivered exclusively by the Nuclear AMRC, and supported by top-tier partners in nuclear new build and decommissioning.

Around 600 UK manufacturers have now taken the initial F4N online assessment, with most receiving ongoing support from the Nuclear AMRC's industrial advisors and nuclear specialists. Completing the programme requires commitment and drive from senior managers, and typically takes 12–18 months.

Almost 100 companies at all stages of their F4N journey responded to the survey request in February. Nearly all are small and medium-sized enterprises (SMEs).

Almost half of respondents said that they have already experienced meaningful business benefits, from demonstrable improvements in HSEQ measures to greater awareness of nuclear opportunities. A significant proportion say they have won new orders or enquiries as a result of their F4N journey – many more say it's simply made their business better.

Around a quarter of companies said they would not have tried to develop their capabilities for nuclear sector if F4N support had not been available.

The survey results will help the Nuclear AMRC develop the F4N service to provide additional value to manufacturers.

"We welcome the frank comments in the survey about how we can refine the F4N service, and where manufacturers want to see additional support," says Nuclear AMRC chief executive Mike Tynan. "One consistent message is the need for ongoing



support after F4N granting, to make sure that companies can identify relevant opportunities and successfully bid for work. We are currently developing a number of new services to meet this demand."

The survey also shows the appetite from SMEs for innovative R&D – 80 per cent of respondents said they would consider working with the Nuclear AMRC to solve their manufacturing problems and develop their capabilities, or are already doing so.

"Advanced technical capabilities and high-impact innovation are increasingly vital factors to winning nuclear work," notes Tynan. "With the UK's new build programme finally progressing, and the decommissioning programme reaching out to new suppliers, it's a great time to start your F4N journey if you haven't already."

To download the complete survey report:
namrc.co.uk/industry/f4n-survey-17

What manufacturers say about F4N

"F4N is essential for companies who need to improve their status."

David Toone, W Maass

"We are early on our improvement programme, however we are seeing significant improvements in the way our business operates."

Peter Bruch, AE Aerospace

"F4N has forced us to think through every aspect of our business systems and ensure that they meet best practice."

Jeremy Kemsley-Pein,
Heatsense Cables

"We have over 20 years' experience in the nuclear industry and we see F4N being very important for us to be considered for future new build projects."

Paul Bunn, S&H Systems Design and Installation

"Great programme. More help with the next steps would enhance it further."

Matthew Heaton, DAE Systems

"It will definitely change the company for the better, and well worth all the hard work."

Chris Steele, WKW Precision Engineering



Compact technology: one of Heatric's printed circuit heat exchangers.

HEATRIC

targets nuclear opportunities

Heatric, a specialist manufacturer of advanced heat exchangers, is targeting new nuclear business after completing the Fit For Nuclear programme.

Part of the global Meggitt group, Poole-based Heatric specialises in printed circuit heat exchangers (PCHEs) for demanding applications. These assemblies feature stacks of chemically etched steel plates, joined using a proprietary diffusion bonding technology, with headers and nozzles welded on to form the complete exchanger.

A Heatric PCHE of 15 tonnes can offer the same cooling capacity as a conventional shell-and-tube assembly of 100 tonnes, while coping with higher pressures over a wide range of temperatures. The

technology was embraced by the oil and gas sector for offshore platforms, and Heatric grew rapidly on orders for bespoke PCHEs since their introduction in 1990. Other industries including solar thermal, chemicals and industrial gas processing also adopted PCHE technology, and Heatric worked on nuclear applications for the proposed pebble bed modular reactor in the late 2000s. At least three quarters of production is exported.

The firm expanded its main production site just outside Poole, Dorset, and acquired its Birmingham-based supplier of etched steel

plates to reduce supply chain risk.

"We had a very good run up to two years ago with our oil and gas applications, but recognised that we needed to broaden Heatric," says Adrian Tattersall, general manager. "We had been working on other things, but with the seismic changes in our core market in the past two years we took the decision – supported by Meggitt head office – to put effort into developing a number of new strands that aren't related to oil and gas."

Natural fit

Manufacturing development manager Paul Morris was already working with the Nuclear AMRC to investigate the K-TIG keyhole welding system, an innovative technology provided by Nuclear AMRC member WB Alloys, for applications in Heatric's core oil and gas work.

"As I was going up to review the K-TIG, I began to better understand the nuclear industry and its importance," Morris recalls. "There are clearly great opportunities out there for us. At the time we weren't really looking at it, but knew it was a potential."

After carrying out some research on nuclear opportunities and the support available through the Fit For Nuclear

programme, Morris completed the initial online assessment in April 2016. "The questions were very much aligned to what we were already doing in levels of compliance for oil and gas, and a lot of things we were asked for were things we'd introduced over the past five years," he says.

Heatric had already spent several years working through the Meggitt Production System (MPS), a group-wide programme of continuous improvement based on lean manufacturing principles.

"The Meggitt Production System synchronises nicely with the requirements of the nuclear industry," notes Tim Bycroft, director of operations. "F4N seemed to fit very well with our general direction of travel – it was a natural fit."

The firm's focus on quality-led manufacturing was rewarded with a record score on the initial F4N assessment of 95 per cent.



Taking steps: (L-R) Giles Corbett, Tim Bycroft, Adrian Tattersall, Andrew James and Paul Morris.

F4N

Fit For Nuclear

Closing nuclear gaps

Heatric's self-assessment was confirmed by F4N industrial advisor Huw Jenkins during his initial site visit. The team didn't want to rest on their laurels, and Morris brought in Andrew James, leader of Heatric's innovation and new business team, to focus on developing the business for nuclear.

"Our remit is to look at alternative business streams that fit with our core capabilities and competencies," says James. "We believe nuclear is one of the largest business opportunity that fits our profile. The demands the nuclear industry puts on its suppliers are very stringent, but we are used to that from working in oil and gas."

The main area for development was around health and safety. Heatric had an exemplary record, but wasn't emphasising safety culture in the way that nuclear customers like to see.

"One of the things from Huw's visit was that our health and safety was good, but it wasn't sufficiently in your face – there wasn't a formal induction when you came into reception," James says. "That's now implemented. One of the things we took from that was if you do something well, make sure you're seen to be doing it."

The team worked with Jenkins and F4N nuclear specialist Martin Ride to close the

nuclear gaps in Heatric's HSE approach, and identify additional nuclear quality standards that would be required for specific product types – for example, the ASME N-Stamp for welding if Heatric pursues opportunities to fabricate pressure vessels.

"When Martin and Huw give us advice on something, we respond to that advice," Morris says. "We understand why it's important to do so, and their advice on the industry is always very useful and very supportive. Our MPS journey has driven a passionate continuous improvement culture, and we are always searching for ways to improve our business."



Knowledge Poole: inside Heatric's workshop.

Flexibility through technology

Heatric is also driving its technical capabilities to meet customer demands. The Poole factory boasts a range of advanced capabilities, including one of the few five-axis plasma cutting machines in the country and the UK's largest independently-owned radiographic cells, capable of non-destructive testing of fabrications up to 50 tonnes.

The firm fully appreciates the value of collaborative R&D – its patented diffusion bonding process was invented at the University of Sydney in the early 1980s – and continues to develop its core etching and bonding processes. The team are also working with the Nuclear AMRC and partners to investigate advanced fabrication techniques including a range of automated welding technologies.

"Our manufacturing developments are based around increasing our flexibility in terms of product, reducing lead times and reducing costs, and at the same time reducing our dependence on manual skills," says Giles Corbett, operations manager. "What we want to do is retain our world-class manual skills, and use the technology that we're exploiting with the Nuclear AMRC."

The manufacturing team see automation of welding and other processes as an opportunity to do more with their skills.

"Our welding qualifications put our guys in the top three per cent of welders in the UK – all our apprentices become coded welders in their first year," Morris says. "When we talk about nuclear on the shopfloor, the welders consider that nuclear standards are a step up, and they see there's an opportunity to broaden their skills. They're very keen to attain codings that are N-Stamp approved."

Heatric's welding and fabrication capabilities are among the most advanced in the country, adds James, giving it a unique advantage for the nuclear market. "The whole business is taking it very seriously as an opportunity," he says. "People are very keen to win nuclear orders, and it's very important that nuclear is in our mindset going forward."

Nuclear ambitions

In the short-term, the firm sees the biggest nuclear opportunities in the decommissioning market, including waste treatment systems and waste containers. Heatric recently secured funding from the Game Changers programme, managed by Innovus for Sellafeld Ltd, to develop its diffusion bonding technology to fabricate

lids for the standard 3m³ intermediate level waste container

The team are also looking at pressure vessels and HVAC systems for new build and, in the longer term, heat exchangers and other systems for the proposed new generation of small modular reactors.

"After the nuclear decommissioning opportunities, there's a chance that a number of opportunities could come sooner," Tattersall notes. "It's great that we've had this success and been recognised by F4N. We recognise it's only the first step in a very long journey, but we're on our way."

F4N came at the perfect time for the company, James adds. "We were reassessing our strategy and looking to develop automation for different welding processes with Nuclear AMRC support," he says. "F4N just fitted for us perfectly. We knew it was going to take significant resource and effort to break into nuclear and establish ourselves, but F4N gives us credence when we're presenting our capabilities. It shows the industry that we've gone through this journey and are absolutely serious about it."

www.heatric.com

F4N company delivers first nuclear work

Precision engineering firm NOV Gateshead has completed its first nuclear order after being granted Fit For Nuclear status.

Part of the US-based National Oilwell Varco corporation since 2010, NOV Gateshead supplies high pressure valves, flowlines and precision machined components to the oil and gas sector. The company entered the F4N programme in early 2016 as part of a programme of diversification into new markets.

"Because we've always been in oil and gas, getting the F4N badge shows that we are committed to diversification and can support the nuclear sector," says business development manager Richard Bathan. "It's given us prestige and credibility."

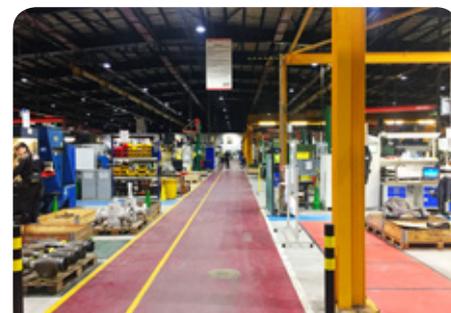
Bathan received his first nuclear enquiry soon after NOV Gateshead completed the F4N programme in just four months. Scottish engineering group JGC needed a complex machined component for a decommissioning contract and had not

been able to identify a suitable qualified subcontractor.

NOV Gateshead was able to quote for the piece within three hours of the initial enquiry, and worked closely with JGC to complete the job within four weeks.

"From the outset of this contract, NOV Gateshead worked closely with us and not only provided a competitive quote but carried out the work to a very high degree of accuracy and finish," says JGC project engineer Murdo Coghill. "Without NOV's help in this project, JGC would have struggled to deliver a satisfactory job on time."

NOV Gateshead has already secured a second contract, and is targeting other nuclear opportunities. The firm aims to increase its nuclear orders to £3–5 million a year, and is also looking at opportunities



Path to growth: inside NOV Gateshead.

in offshore wind. As well as producing precision machined components, NOV Gateshead offers expertise in fabrication, weld overlay, assembly and pressure testing.

For more information, contact:
richard.bathan@nov.com

EIC agreement to help energy sector suppliers enter nuclear

The Nuclear AMRC has signed a new agreement with the Energy Industries Council (EIC) to help UK companies enter the civil nuclear sector.

EIC chief executive Stuart Broadley and Nuclear AMRC chief executive Mike Tynan signed the memorandum of understanding (MOU) at an EIC conference hosted by the Nuclear AMRC in March.

The two organisations will collaborate on events which showcase opportunities in the nuclear industry in the UK and around the world, and share their facilities.

They will also share their knowledge and expertise to further develop the EIC's project tracking database, produce nuclear sector reports to help EIC members identify

opportunities, and support EIC members through the Fit For Nuclear programme. EIC is a trade association for UK supply chain companies providing goods and services across the energy industries.

"Mike Tynan and I both recognise the enormous potential that exists for our two organisations to work closely together to expand UK expertise into the global nuclear sector," said Broadley. "I'm delighted to sign this MOU, which will help to formalise that recognition into a series of specific areas where our complementary skills, experience and knowledge can be brought together to work more effectively."



Understanding for energy: Stuart Broadley and Mike Tynan seal the new agreement.

Tynan added: "We're very excited to work with the EIC to help their members win work in the civil nuclear sector. Companies with established experience in the wider energy sector are ideally placed to succeed in the nuclear supply chain."

www.the-eic.com

Barrnon steps up to nuclear challenges

Innovative engineer Barrnon scooped awards and attention after adapting its scallop dredging technology for radioactive sludge. The tiny Cumbrian company is now aiming to move from fishing to nuclear, and has used the Fit For Nuclear programme to make sure it's ready for the opportunities.

Barrnon was founded in 2007 by experienced engineer Andy Barr to provide high-quality scallop dredging equipment to the UK fishing fleet. The firm expanded its services from its base in Appleby, but hadn't considered nuclear until one day in 2014 when Barr received a call from the Magnox decommissioning site at Hunterston. Could Barrnon's dredging kit be used to clear radioactive sludge from a nuclear waste pond?

"Rather than just put the phone down, Andy had the vision to think about it for a while," recalls Steve Thompson, business development manager at Barrnon. "He found a potential solution, and the Hunterston team liked the look of it."

Barrnon had limited resources to devote to the project, but was able to secure funding from Innovate UK and Innovus, the innovation agency backed by The University of Manchester and NNL.

The firm has also used Innovate UK's Knowledge Transfer Partnership (KTP) scheme to recruit a graduate engineer to develop control systems for its nuclear tools.

Barrnon built a prototype dredger, and the Magnox team brought a selection of simulated sludges down to Appleby for tests. "They had a wide array of sludges, everything from very fluid material to very coarse gravel, with nuts, bolts and cable ties in it," Thompson says. "Andy's creation managed to pull the lot. We sent three units up to Hunterston, and they completed the job. The nuclear industry then pricked their ears up and thought this works – there's huge sludge problems all over the world, and this could well be the answer we were looking for."

Up from the depths

The unusual move from fishing into

nuclear grabbed people's attention, and Barrnon won the London Business School's first Alexander Fleming Serendipity Award in 2016. The team were asked to apply their creativity to other decommissioning challenges, and came up with a series of innovative products which are now being trialled by potential customers worldwide (see box).

If any one of its products enters full service, Barrnon will need to rapidly expand operations to meet demand. As a five-man operation producing fishing kit from a rough-and-ready workshop, the team realised that they would need to change the way they operate.

"Our engineering standards were based on fishing industry needs, which were pretty basic," Thompson says. "When we moved into nuclear, we realised that if we were going to be taken seriously, we had to raise our standards quite dramatically."



Platform for growth: Andy Barr tests the Hydrospyder platform on Ullswater.



Getting things right: Barrnon's Steve Thompson.

Thomson led work to achieve the ISO 9001 quality management and 14001 environmental management standards, and was pointed towards F4N by a contact at NNL. "They said if the nuclear industry is going to take you seriously, you have to speak to people like F4N and get your site in order," he says. "We tried very hard to take that advice on."

The long haul

After laying the ISO groundwork, Barrnon began its F4N journey in early 2016. Thompson worked closely with industrial advisor John Olver to overhaul operations to meet nuclear expectations.

The F4N journey involved addressing areas such as staff training, including welder certification; record-keeping and project management; ordering and storekeeping; and transforming the workshop to introduce new comprehensive toolkits with shadowboards, whiteboards to detail work in progress, and separate areas for fishing and nuclear jobs.

"John was great – he did a gap analysis which was about as big as the Encyclopedia Britannica," Thompson says. "It took a long time and wasn't easy because you have to change your attitudes as well. Changing attitudes was difficult, but everybody could see the future in it."

Both F4N and the ISO standards are designed for larger organisations, but the Barrnon team realised that they had to create a framework for rapid growth. The two processes proved complementary, with F4N providing industry focus to the

general business improvements of ISO.

"ISO helped a lot, but F4N gave us more business direction," Thompson notes. "If you want ISO to work, you've got to have people with industry experience who can make it work. F4N gave us that hands-on experience from people who spend all their time going out to factories and seeing what's needed for nuclear. We wouldn't be in this position without F4N."

The best Barrnon

Barrnon is now aiming to achieve a £10 million turnover and tier two status in the nuclear supply chain within five years. The firm is planning to invest in a bespoke facility near Penrith and preparing for a recruitment drive – but is waiting for the first major order from the current trials, which Thompson expects this year or next.

Meanwhile, the firm continues to develop its capabilities and address other decommissioning challenges. After attending the recent waste container event at the Nuclear AMRC (*Nuclear AMRC News 26*), Barrnon is working on a new project with support from Innovus's Game Changers programme.

"As well as the advice from F4N, there's all the technology development going on at the Nuclear AMRC," Thompson notes. "We haven't used that much yet, but we have every intention to avail ourselves."

www.barrnon.com

Tools for tough jobs

Barrnon has developed a range of specialised tools to solve common decommissioning challenges.

Bladecutter, Barrnon's breakthrough product, uses a mechanical dredging tool adapted from the fishing industry, with waterjets to break up the sludge and suck it up for recovery. The tool is mounted on a remotely operated vehicle which crawls along the bottom of waste ponds.

The horizontal system has now been adapted for vertical dredging of skips, with the tool manipulated by a Kuka robot arm and controlled through VR. Both systems are being considered for wider adoption in the UK and overseas.

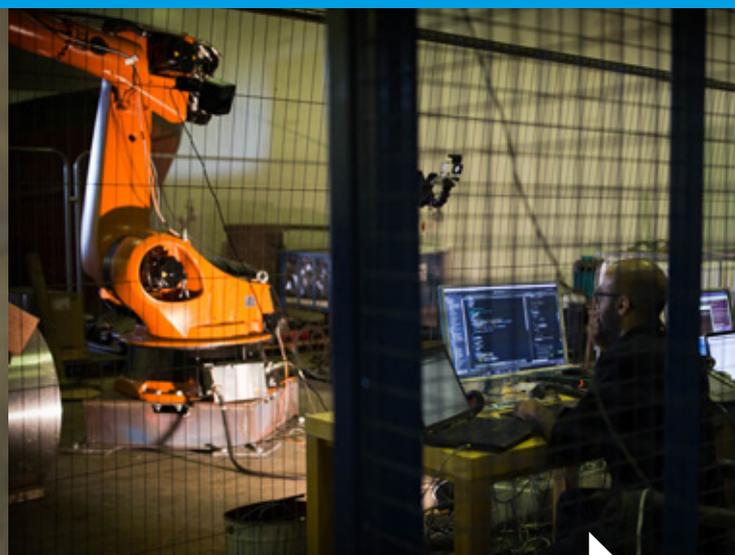
Hydrospyder is a mobile floating platform designed to carry Bladecutter and other tools across a large waste pond. The prototype was successfully trialed on Ullswater, and Barrnon is now working on a smaller version to access restricted areas at Fukushima.

Rotocutter is designed to break up hard radioactive waste where water can't be used. It is being trialed for use at Hanford in the US, to remove waste which has been encapsulated in bitumen to avoid leaks.

Barrnon is also working on range of other nuclear decommissioning challenges, as well as a new approach to permanently sealing disused oil and gas wellheads.



Deep cuts: the Bladecutter dredging tool.



Remote operation: Barrnon is developing VR control of its tools.

New machines boost capabilities at TPG Engineering

Heat exchanger specialist TPG Engineering has invested in two new machine tools worth almost £1 million to enhance its capabilities for the energy sector.

TPG made the investment after working with Nuclear AMRC machining specialists to identify the best technology to meet the firm's requirements in terms of capacity, spindle speeds, torque ratings and longevity.

"We presented the Nuclear AMRC with specifications for a series of parts which, by their nature, require consistently reliable and high-accuracy machining routines centred on vertical turning, and milling and boring," says Phil Curtis, commercial enterprise director at TPG Engineering. "For maximum flexibility and agility, and to avoid potential production bottlenecks, two separate machines were suggested – a VTL and a mill-bore centre."

The selected machines – a Soraluze TA-A35 travelling table mill-bore centre, and a Hankook VTC 200 E vertical turning lathe – were provided by TW Ward CNC, a tier two member of the Nuclear AMRC.

The investment is part of a strategic move to increase TPG's machining capabilities to secure new customers in nuclear engineering, and to produce larger and more complex products for existing clients at its site in Dukinfield, Greater Manchester.

TPG Engineering completed the Fit For Nuclear programme in 2015, under its former identity of Hunt Thermal Technologies, and is continuing to develop its manufacturing processes and systems.

Tony Clowrey, TPG Engineering site director, says the new machines will enable the company to work in partnership with clients by offering agile and manufacturing solutions.

"The enhanced machining capabilities that our new Hankook and Soraluze machines provide are at the heart of the group's strategy to future-proof our overall manufacturing service and complement



Flexibility and agility: Tony Clowrey of TPG Engineering with Stuart Lawson of Ward CNC.

our established specialist engineering capabilities and technical and managed services," Clowrey says.

www.tpgroup.uk.com/bu/engineering
www.wardcnc.com

Inspection innovation for James Fisher Nuclear

James Fisher Nuclear has secured a substantial contract with EDF Energy to produce specialist tools for the inspection of graphite cores in the UK's current nuclear fleet.

The tools use innovative eddy current technology to assess the condition of the graphite within vacated fuel channels in EDF's fleet of advanced gas-cooler reactors (AGRs).

The tool applies an electromagnetic field to induce eddy currents, and assesses graphite density by measuring variations in conductivity. The data will allow the EDF Energy inspection team to rapidly assess core condition without taking physical samples.

The technology was developed by Lancashire-based James Fisher Nuclear

(JFN) in collaboration with EDF Energy and partners. The contract follows extensive trials of a prototype tool.

"The prototype was only intended for a limited number of deployments but has exceeded expectation and now, several years later, is still providing EDF with valuable inspection information from within the graphite channels of their reactors," says Sarah Town, project lead for JFN.

The new tools are now in production at JFN's plant at Malton, North Yorkshire, with full deployment scheduled for 2018. The contract includes control consoles,

specialist transportation and storage, calibration units and test rigs to ensure that each tool performs as expected.

An established supplier of specialist engineering, manufacturing and technical services for high-integrity applications, JFN is working with the Nuclear AMRC to develop its capabilities through the Civil Nuclear Sharing in Growth programme.

www.jfnl.co.uk



Access all areas: NIS will supply doors to Sellafield Ltd

Doors open at Sellafield for NIS

Integrated engineering specialist NIS Ltd has secured a 10-year contract with Sellafield Ltd to provide personal access doors across the decommissioning site.

The contract is worth up to £25 million for Chorley-based NIS.

"The whole team at NIS are absolutely delighted to have been awarded this valuable long-term contract," said Gill Marsden, acting managing director. "We have been providing plant and equipment to the Sellafield site for over 30 years but it hasn't always been easy to forecast our capability and capacity requirements.

The value and duration of this contract will allow us to further strengthen our relationship with the Sellafield community, and to invest in developing and growing our skill base and socio-economic contribution, both in Lancashire and in West Cumbria."

The contract forms part of Sellafield's strategic category management procurement programme. Introduced

in 2016, the approach aims to reduce decommissioning costs by standardising design and manufacture for broad categories of equipment.

"By working with excellent engineering companies such as NIS Ltd, we can accelerate hazard and risk reduction and build our collective capability for the challenge ahead," says John Sidney, head of category management for Sellafield Ltd.

NIS is working with the Nuclear AMRC through the Civil Nuclear Sharing in Growth high-intensity support programme. For a detailed case study, see *Nuclear AMRC News 26*.

www.nisltd.com

Switch success for Delta Controls

Nuclear sensor specialist Delta Controls has secured orders for over 250 units of a new safety-critical temperature switch for operating reactors.

The new sensor is designed to monitor air temperature in and around the nuclear containment area, and quickly raise an alert in response to changes which may be caused by incidents such as a line break leading to loss of steam or coolant water. The initial order will be used inside the containment and the nuclear island of an operational boiling water reactor.

The fast reaction air temperature switch has been tested to the IEEE standard Class 1E. Delta says that it offers significantly

improved reaction times, accuracy and repeatability over conventional bulb and capillary systems.

Based in Farnham, Surrey, Delta Controls has over 40 years' experience as a manufacturer of reliable, high-performance process control instrumentation for the nuclear industry. The firm was among the first to complete Fit For Nuclear in 2012, and is now working to renew its action plan.

www.delta-controls.com

F4N

Fit For Nuclear

Are you ready to join the nuclear supply chain?

Start your Fit For Nuclear journey today to assess your capabilities and operations, and take the necessary steps to close any gaps.

namrc.co.uk/services/f4n





Bottom up: first concrete is poured in the galleries.

(below) Pier review: concrete aggregate will be delivered from sea.

Hinkley Point C becomes a concrete reality



EDF Energy has poured the first concrete at Hinkley Point C – the first for a new nuclear power station in the UK in 30 years.

The concrete forms part of the power station galleries, a network of tunnels which will carry cabling and pipes under the power station. Construction for the first reactor building will start in 2019, with the pouring of concrete to form the reactor platform.

"Pouring the concrete for the first permanent structure of HPC is a significant milestone," said Hinkley Point C project director Philippe Bordarier. "It is the outcome of many years of preparation and hard work from all our teams and supply chain across the UK and France. It

demonstrates our ability to undertake the serious responsibility of nuclear power plant construction."

EDF says that three million cubic metres of earth have already been moved on the site, and 1,600 workers from 32 companies are on site each day. Three million tonnes of concrete and 230,000 tonnes of steel reinforcement will be used in construction, with 64 per cent of contract value being spent in the UK.

Work has also started on a 500 metre temporary jetty to bring in concrete aggregate by sea; the first of more than 50

tower cranes; and on-site accommodation from Nottinghamshire-based Caledonian Modular.

EDF says it has already placed more than £435 million of contracts with companies in the South West region. Building the UK's first Areva EPR reactor and surrounding infrastructure will provide some 25,000 jobs and 1,000 apprenticeships, and represents an estimated construction cost of £18 billion.

www.edfenergy.com/energy/nuclear-new-build-projects/suppliers

Wylfa licence on the Horizon

Horizon Nuclear Power has taken a major step towards building the Wylfa Newydd power station by submitting its nuclear site licence application.

The application triggers a detailed assessment by the Office for Nuclear Regulation (ONR) of the suitability of Horizon as a developer, the Hitachi-GE ABWR as a reactor, and the proposed site on Anglesey, Wales.

If Horizon meets the 36 licence conditions, it will be regulated by ONR for the full

life of the site from construction to decommissioning.

The site licence assessment should conclude in late 2018, with Horizon making a final investment decision shortly after. The generic design assessment (GDA) for the ABWR is on track to complete by the end of 2017, after the ONR announced in April that an outstanding regulatory issue has been closed.

www.horizonnuclearpower.com/suppliers/supplier-registration



Submission success: Andy Bevan, nuclear site licence manager, and Anthony Webb, safety and licensing director.

AP1000 wins regulatory OK

Westinghouse Electric Company has announced that its AP1000 nuclear power plant design has successfully completed review by UK regulators.

The AP1000 has concluded the Generic Design Assessment (GDA) process, with the Office for Nuclear Regulation issuing a Design Acceptance Confirmation (DAC) and the Environment Agency issuing a Statement of Design Acceptability (SODA).

"The successful completion of this rigorous review by the ONR and the EA has been many years in the making, and it represents

a major milestone toward bringing a new generation of safe, clean energy to the United Kingdom through the Moorside project," said José Emeterio Gutiérrez, Westinghouse interim president and CEO.

New build developer NuGen plans to build three AP1000 units at the Moorside site in West Cumbria, providing up to 3.6GWe of new generation capacity. Westinghouse



says Moorside will benefit from its experience on the world's first eight AP1000 units, which are currently being delivered at four sites in the US and China.

However, fresh doubts have been thrown on the Moorside development following Toshiba's high-profile financial problems.

www.supplytomoorside.co.uk

For the latest on the UK new build programme and site developers, see the Nuclear AMRC website: namrc.co.uk/intelligence/uk-new-build-plans



namrc.co.uk/news/events

Diary

Some of the events that the Nuclear AMRC will be attending or supporting in the coming months – see us to find out more about how we can help your business.

Nuclear Industry Forum

15–16 May, London

Industry conference covering new build and decommissioning. The Nuclear AMRC will present on SMRs.

www.marketforce.eu.com/events/nuclear/nuclear-industry-forum

Nuclear New Build 2017

27–28 June, London

NIA event focusing on the UK new build programme, with Mike Tynan presenting on innovation in the supply chain.

nuclearnewbuild2017.co.uk

European Nuclear Young Generation Forum 2017

11–16 June, Manchester

Leading gathering of young nuclear professionals from across Europe, co-sponsored by the Nuclear AMRC.

www.enygf.org

Nu-Tech Engineering & Technology Solutions

11 July, Birchwood

A supplier showcase for buyers in the North West nuclear cluster, featuring the Nuclear AMRC's Mantra lorry and a host of F4N companies.

Contact: sales@nu-techassoc.co.uk

Work with us

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

We help manufacturers through **supplier development** and **innovation**.

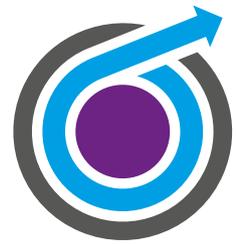
We can work with you to raise your quality, capability and cost competitiveness to meet the needs of the global nuclear industry.

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

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

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

To find out more about how we can help your business, contact Jay Shaw, Nuclear AMRC business development director: jay.shaw@namrc.co.uk



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