

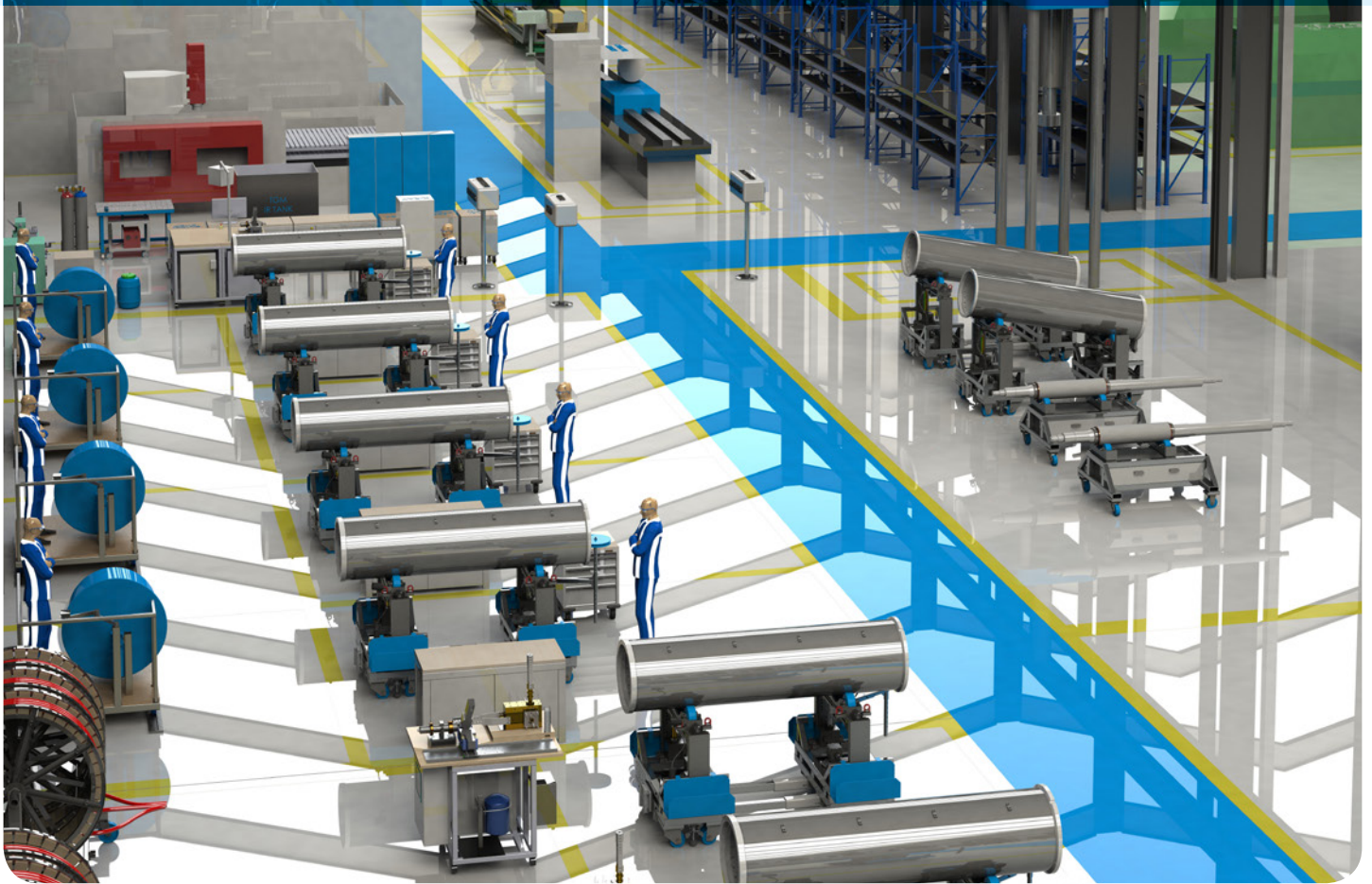


NUCLEAR AMRC
news

No.18 Q1 2015

Pumps primed

How a 200-year-old company is investing in a nuclear future

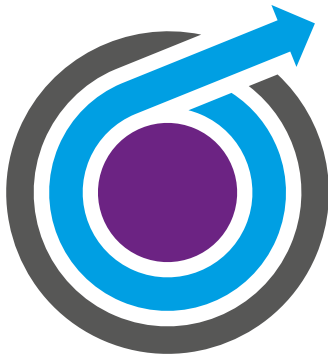


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From the editor

Welcome to the new-look Nuclear AMRC News.

Since 2010, this quarterly newsletter has grown and developed alongside the centre itself. The first four-page newsletter detailed the start of construction on our core facility, and discussions with key suppliers to identify our priorities. Less than five years later, our research factory is fully commissioned with over £25 million worth of production-scale equipment tailored to industry needs, and we're working with hundreds of manufacturers along the supply chain to help them win work.

This 18th issue includes just a few examples of how we're delivering real value to manufacturers through collaborative R&D, providing intensive support to key suppliers through our Civil Nuclear Sharing in Growth programme, and helping SMEs take their first steps into the sector through Fit For Nuclear. You'll also see how we're constantly expanding our capabilities, forging new partnerships, and engaging with ever more companies in complementary sectors like oil & gas.

As with everything we do, this newsletter aims to support UK manufacturers. 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



Flexible friend: setting up a portable machine tool in the Nuclear AMRC test cell.

Safety challenge for portable machine tools

The Nuclear AMRC has helped Rolls-Royce demonstrate that portable machining technologies can make nuclear manufacturing more flexible and cost-competitive while meeting industry health and safety standards.

Rolls-Royce is investigating a "process-to-part" approach, which uses portable machine tools to work on large and unwieldy components and assemblies. Using portable tools in place of conventional large machine tools can potentially reduce capital equipment costs by at least half, while improving flexibility during manufacture.

In research supported by the Civil Nuclear Sharing in Growth programme, Rolls-Royce is developing and testing a fleet of portable machines in the Nuclear AMRC workshop. These machines have been adapted from commercially available equipment, primarily used for repairs in the oil and gas sector, and capable of tasks such as weld preparation, drilling, flange facing and milling.

For nuclear applications, the machines have been modified to add higher levels of controllability, robustness, accuracy and safety. The trials have shown that the portable tools can reduce lead times, eliminate bottlenecks, remove the need to lift large and heavy components close to the end of the manufacturing process, and reduce capital investment in machine tools.

"All of that will allow us to be more responsive in meeting customer requirements," says Tom Robinson, civil

nuclear manufacturing engineer at Rolls-Royce. "This is not a new technology to Rolls-Royce, but what's novel here is that we are bringing them into a modern production environment with modern health and safety practices, to ensure we meet our customer requirements and ensure timely delivery of components."

The Nuclear AMRC machining team worked alongside Rolls-Royce and the machine suppliers to develop robust and novel fixturing and guarding solutions, ensuring that the machines can be used safely, and applied dynamic analysis to increase the machining speed.

"The main challenge when developing this kind of technique is to modify the equipment to meet the more demanding health and safety requirements of a continuous in-house manufacturing environment," says Mikael Thery, Nuclear AMRC programme manager. "Our engineers introduced innovative tooling solutions to deliver a simple process, giving large savings in process time and producing features right first time."

Rolls-Royce is continuing to develop the tools in collaboration with the Nuclear AMRC and suppliers.

The Civil Nuclear Sharing in Growth (CNSIG) programme is supported by the Regional Growth Fund, and aims to develop the UK manufacturing supply chain for the global civil nuclear market. As well as industry-led research and development, CNSIG includes intense business development for 10 key suppliers (see p8).

CMM room opens for business

The Nuclear AMRC's new CMM room is open for business, giving manufacturers access to one of the largest gantry-type coordinate measuring machines available on the market.

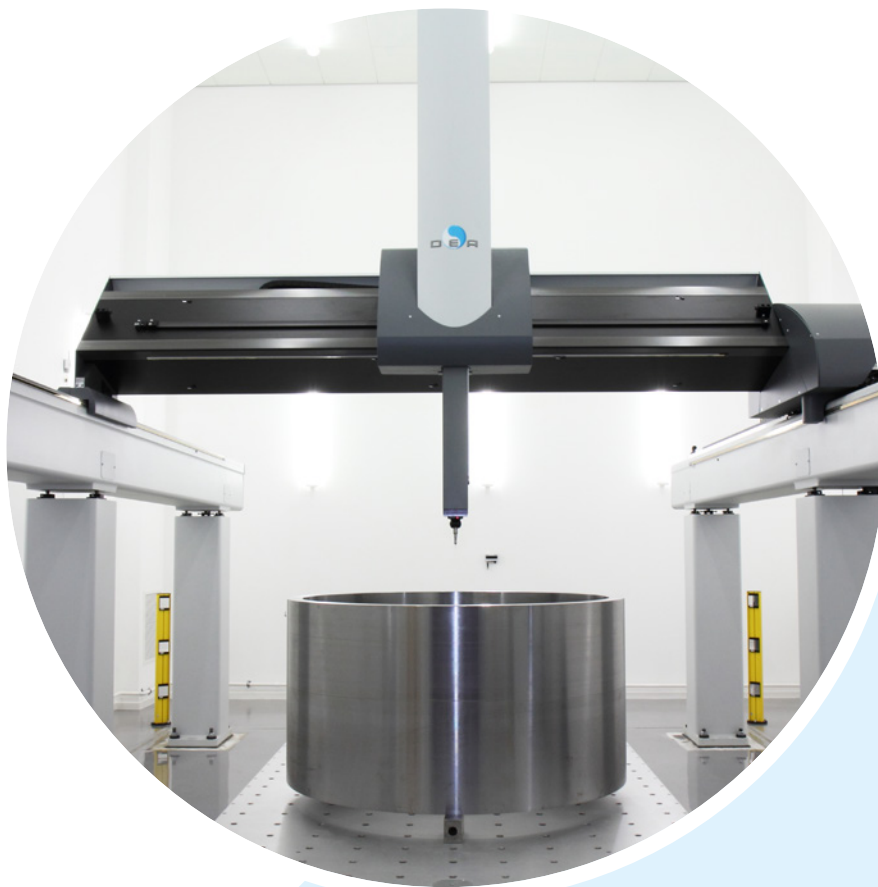
The Hexagon DEA Delta can measure parts of six metres length and three metres width, and weighing up to 15 tonnes, to a precision of 5-25 microns depending on measurement range.

The machine is housed in a new vibration-isolated and temperature-controlled CMM extension to the main Nuclear AMRC workshop, allowing it to work to its optimum performance and deliver the highest standards of dimensional measurement. Large parts can be carried from the main workshop on a four-metre air table.

The DEA Delta was selected for its rapid traverse speed and accuracy over the largest distance measurements, and provided by Hexagon Metrology, a Tier One member of the Nuclear AMRC. It features an 800mm long bore stylus produced by measurement specialists Renishaw.

The CMM's first task (pictured) was to measure a cylinder prepared on the Nuclear AMRC's new Dörries Contumat vertical turning/milling lathe to make sure it met requirements for in-house welding trials. As well as validating components produced in the centre's collaborative R&D projects, the metrology team will also investigate new ways to combine CMM technology with optical non-contact measurement techniques to achieve even greater precision over very large parts.

To find out more about the Nuclear AMRC's metrology capabilities, contact Carl Hitchens, Nuclear AMRC metrology lead: carl.hitchens@namrc.co.uk



New guide to workshop capabilities

Manufacturers and research partners can explore the Nuclear AMRC's world-leading workshop resources with a new edition of the centre's capability directory.

The updated and expanded directory includes full details and specifications of the centre's resources in machining, welding and cladding, metrology and inspection, and visualisation – all of which are available to help manufacturers develop innovative and optimised manufacturing techniques.

The second edition includes full details of recently commissioned equipment including the very large Dörries vertical turning/milling lathe, Soraluze FX12000 floor-type horizontal boring machine, and 15kW diode laser cell, plus an expanded section on arc welding, and a first look at new capabilities for 2015 including a new bulk additive manufacturing cell.



To download the directory and explore the Nuclear AMRC's R&D capabilities, go to: namrc.co.uk/capabilities/innovation

Nnuman explores thick-section welding

Dalton Nuclear Institute researchers are deploying a new weld restraint rig to develop thick-section welding techniques for nuclear applications.

The team at the Manufacturing Technology Research Laboratory in Manchester are investigating narrow-gap welding techniques as part of the Nnuman (New Nuclear Manufacturing) programme. Nnuman is funded by EPSRC and led by the Dalton Nuclear Institute at The University of Manchester and the Nuclear AMRC, and is addressing the fundamentals of advanced manufacturing for new reactors and the next generation of nuclear power stations.

One of Nnuman's four core R&D themes focuses on innovative joining technologies for thick-section reactor components. Narrow-groove welding technologies, especially those using beam-welding techniques, can potentially improve productivity, but have no established track record for nuclear applications, particularly with regards to long-term structural performance.

The Manufacturing Technology Research Laboratory at the Dalton Nuclear Institute is now producing representative narrow groove welds in SA508 Gr3 pressure vessel steel using four processes – gas tungsten arc, submerged arc, electron beam and laser welding.

For each process, the team is characterising the residual stress state and distortions before and after post-weld heat treatment, and performing detailed material property

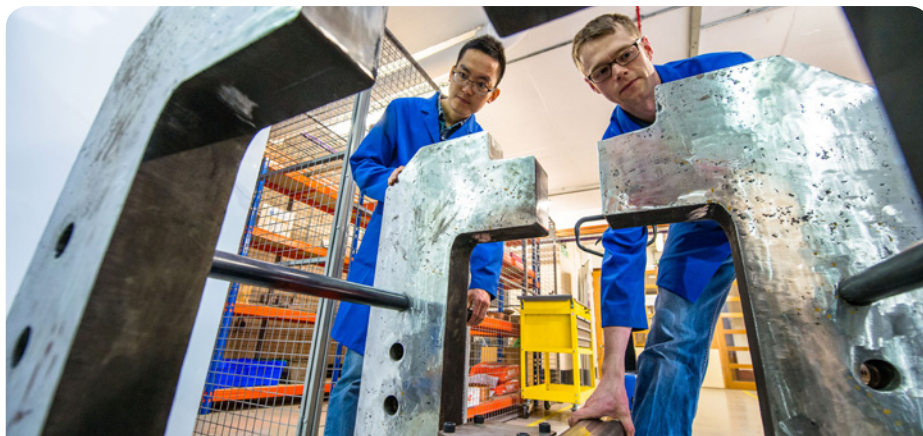
characterisation studies on the weld and materials in the heat-affected zone. The project also covers advanced simulation techniques to predict the transient temperatures during welding and the microstructures, residual stresses and distortions that develop as a result of welding.

Local distortion is captured using the Nuclear AMRC's Creaform handheld 3D laser scanner, while material condition is measured using a Struer automatic hardness scanner. The University of Manchester's Materials Performance Centre is carrying out detailed materials characterisation.

Early results include a comparison of residual stresses developed in 30mm weld mock-ups using the different processes, and simulations to predict the distribution of microstructural phases, residual stresses and distortions in electron beam welded plates.

The team is now working to produce larger specimens up to 130mm thickness, using the hydraulically-powered restraint rig to hold these thick sections parallel during welding and simulate the structural restraint in real components.

To find out more about Nnuman research:
www.dalton.manchester.ac.uk/research/researchprogrammes/research-nnuman



Parallel processing: the new restraint will be used to produce test welds up to 130mm thickness.



Bright future: Hermann Hauser experiences the Nuclear AMRC's virtual reality capabilities during his fact-finding visit.

Funding boost for HVM Catapult

The government has confirmed £61 million additional core funding for the High Value Manufacturing Catapult, the national network of seven industry-led R&D centres including the Nuclear AMRC.

According to the Catapult funding model, the new investment should leverage at least as much private sector investment into the HVM Catapult network, and at least as much additional research funding.

"This additional investment will enable us to build on the advantage we have already created," said Dick Elsy, chief executive of the HVM Catapult. "In particular, it will allow us to work with more small and medium sized businesses, helping them to enter or grow in the supply chains and helping them thrive and produce in this country."

The money will be shared between the seven centres to fund additional world-class resources to support UK manufacturers. The Nuclear AMRC has previously used Catapult funding to pay for production-scale facilities including the Dörries vertical turning/milling lathe, the largest tool of its kind available for collaborative R&D anywhere in the world.

The announcement followed Hermann Hauser's review of the Catapult programme, published in early November. Hauser visited the Nuclear AMRC in June to see how the centre was closing the gap between academia and innovation for the energy sector.

Hauser called for a long-term expansion of the Catapult network, with one or two new centres created each year. As well as the HVM Catapult, there are currently another six Catapults focusing on areas from offshore renewables to cell therapy, with another two due to launch this year.

The Catapult programme was launched in 2011 following recommendations from Hauser and James Dyson.

High Value Manufacturing Catapult:
hvm.catapult.org.uk



The Tynan view



Planning for the future

After a very busy and successful 2014, part of our job now at the Nuclear AMRC is to plan for the future.

Having the full capacity of installed equipment in our research factory – over £26 million worth of state-of-the-art manufacturing resources – is a major step for us. We now need to push forward in our drive to be an internationally recognised centre of excellence for the manufacture of large and ultra-large components.

A big challenge for us through 2015 and beyond is to develop our workforce skills and competence to a level that is world class. We plan to combine world-class capacity and capability, to deliver projects that will enhance our standing and keep us on the right path to achieve our aspirations.

We are in a key delivery stage with our supplier development programmes. Civil Nuclear Sharing in Growth (CNSIG) is now very active with our ten client companies. This work is in delivery phase from now through to the end of 2017, and work with these companies will continue at pace over the next two years.

We have enhanced and expanded our Fit For Nuclear programme to include support and delivery from the Manufacturing

Advisory Service (MAS), and I'm pleased that we are now in a position to offer firms more substantial support to help them develop as competitors in the civil nuclear supply chain. We have a lot of work to get through over the next two years, as funding for this work runs to 2016 only. Beyond that time, we are planning to work with government on a new programme of support to further bolster the strengths of UK manufacturing.

An important development for us has been the creation of a new concept, Nuclear AMRC Local. This initiative establishes a presence for us in each of the areas where new nuclear build programmes are being developed and where decommissioning is a major opportunity: Somerset, Anglesey and West Cumbria. Not only does this give us a regional presence, it also helps us target SMEs in these areas and helps them to understand how they might participate in the UK nuclear programme. This usually means helping them understand more fully the stringent specifications around nuclear safety and quality. We are planning to consolidate our footholds in these regions over the year.

In terms of progress nationally with nuclear new build, progress has been slow.

In order for projects to progress into actual construction, the scheme owners

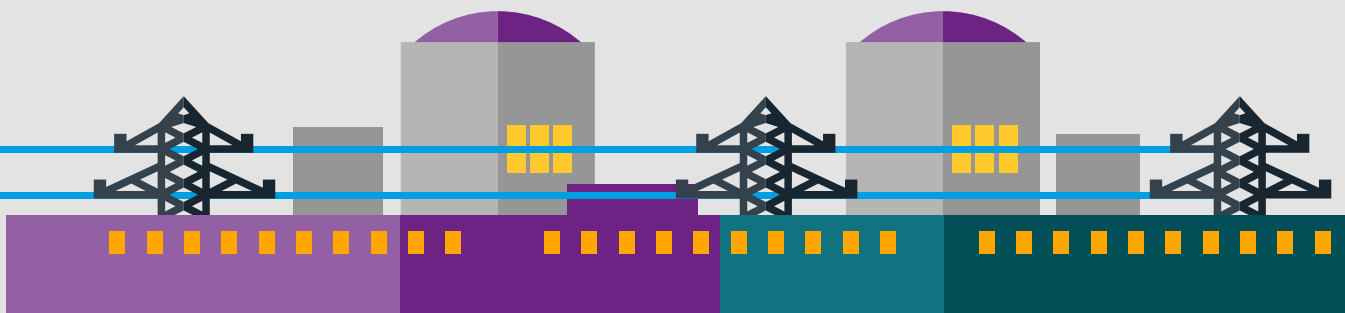
must reach a final investment decision (FID). To do this, they need a design acceptance certificate and statement of design acceptance from the nuclear regulators (Office of Nuclear Regulation and Environment Agency respectively), a site licence from the regulator, planning permission and an agreement with government on the price they will charge for the electricity.

EDF Energy is the only developer that has acquired these licenses, permissions and agreements, and is yet to make a final investment decision. The principal reason for this delay in reaching a final decision is the lack of investors, and this barrier to progress will not be overcome quickly.

Nevertheless, we are planning our work programmes around FIDs of 2015 for EDF Energy's Hinkley Point C, and 2018-2020 for Horizon Nuclear Power's proposed new build at Wylfa Newydd and NuGen's at Moorside.

These dates are important for potential suppliers as they give some indication as to when contracts might be available. Our job is to ensure that these suppliers are ready to compete for contracts on these projects when the time comes.

Mike Tynan,
chief executive, Nuclear AMRC



Open doors for oil and gas suppliers

The Nuclear AMRC opened its doors to the oil and gas industry in November, to show how advanced manufacturing techniques can help suppliers compete on cost, quality and delivery.

While its core focus is on helping UK manufacturers win work in nuclear, the centre's resources and expertise are eminently applicable in other sectors that require large high-integrity components.

"Even though we're set up to manufacture representative sized parts for gigawatt-scale nuclear reactors, the technology we have in place is equally applicable to the large high-value manufacturing processes you guys are involved with," Stuart Dawson, Nuclear AMRC operations director, told the invited audience of over 90 delegates.

The Nuclear AMRC offers access to some of the world's largest and most advanced machines, but its smaller machining centres also offer unique capabilities. The Mazak Orbitec was designed specifically for the oil and gas sector and features a unique turning and facing headstock that allows turning operations on large irregularly-shaped parts.

"The Orbitec is quite a mindblowing machine in how it works," Dawson noted. "It's quite a niche machine but in the right application it's unbeatable."

Delegates also had the opportunity to explore the Nuclear AMRC's work in advanced welding and cladding processes using electron beam and diode laser technology, and powder metallurgy

techniques such as hot isostatic pressing (HIP).

"Oil & gas is quite an early adopter of HIP parts for high-integrity applications, because of its very homogeneous material properties," Dawson noted.



Big opportunities for oil and gas: Stuart Dawson shows guests the Nuclear AMRC's largest machining centres.

Manufacturing rethink pushes the limits

Two oil and gas engineering companies have created a new manufacturing method for a demanding component with help from Nuclear AMRC machining specialists.

The project focused on a riser slick joint produced by FMC Technologies, a leading supplier of technologically advanced products and systems for the international oil and gas industry. A slick joint is a safety-critical part of the surface equipment for the riser system connecting a subsea well with a platform or ship. FMC's design includes a complex hole and other features which presented some challenging production problems.



"This is a very complex high-risk machined part that had a history of scrap and defects," says Stuart McGuire, procurement manager for well access systems at FMC. "We had to change how we approached the manufacture of this product."

FMC approached a number of its established UK suppliers, but found few were willing to take the job on. Glasgow-based Howco stepped up to the challenge, and McGuire brought in the Nuclear AMRC to provide independent support.

"We brought in the Nuclear AMRC because of the technology and experience they've got working with other companies and industries," McGuire says. "Challenging the design and investing time to get the engineering right upfront adds value because you're reducing the quality risk, and making the manufacturing efficient which then reduces your cost."

The project kicked off with a pre-manufacture meeting involving technical, quality, procurement and project managers from all three sides, to identify risks and agree strategy and responsibilities throughout the engineering and manufacturing phases.

The Nuclear AMRC machining group worked closely with Howco to redesign the machining strategy.

"There were two or three features which caused us problems," recalls Hugh Rankin, engineering manager for Howco. "The

main one was a deep, highly finished, high tolerance bore of 23 inches or thereabouts. There was a bit of concern with machining this bore and achieving the finish, and there was a tolerance issue."

The Nuclear AMRC was able to call on specialist tooling and drilling expertise from member companies TBT and Sandvik Coromant. Together, the team developed an approach using new tooling including special Brunswick reamer holders, and a small boring tool to eliminate any deviation in concentricity before the reamer went in.

"There were a lot of new tools, and stretching the techniques and the way we do things to the extreme," Rankin says. "We'd never dreamt of pushing these things that far before."

"I probably wouldn't have taken the job on without the Nuclear AMRC's support," he adds. "It was a real breath of fresh air, knowing there was someone I could talk things through with."

Howco produced two slick joints using the new approach, with both manufactured right first time. Both have now been fully assembled and have passed FMC's factory acceptance test.

"It's been a great success, and a great example of collaboration, innovation and quality," McGuire concludes.

www.fmctechnologies.com

www.howcogroup.com

NuScale agreement opens road to SMR development

US-based reactor developer NuScale will work with the Nuclear AMRC to develop a groundbreaking small modular reactor for the UK.

NuScale chief technology officer Dr Jose Reyes and executive vice president Tom Mundy visited the Nuclear AMRC in November to see how the centre's manufacturing R&D capabilities could help develop the company's innovative reactor and reduce costs in production.

NuScale's Power Module is a 50MWe pressurised water reactor and generator, designed to be deployed in clusters of up to 12 per site. The combined containment vessel and reactor system measures around 25 metres in length by five metres diameter, and features state-of-the-art passive safety systems which significantly reduce risks associated with current reactor designs.

Like other proposed small modular reactors (SMRs), the Power Module is designed to be largely produced in factories, reducing the risks of on-site construction. SMRs promise to be a cost-effective alternative to other generation technologies, so long as advanced manufacturing techniques can be used to drive down production costs and deliver economies of multiple production. According to recent studies (see box), they also offer the UK the opportunity to regain a global lead in reactor technology.

Many of the manufacturing technologies under development at the Nuclear AMRC, including electron beam welding, diode laser cladding, hot isostatic pressing and large-scale high-precision machining, can potentially deliver significant productivity savings for SMRs. Many of the centre's tools are large enough to produce full-scale prototypes of SMR components.

During the visit, Reyes and Nuclear AMRC chief executive Mike Tynan signed a memorandum of understanding which



R&D focus: NuScale's Tom Mundy and Jose Reyes with Nuclear AMRC's Stuart Dawson.

opens the way for potential collaboration on the development and manufacture of the NuScale technology.

"Our discussions with NuScale Power are part of our continuing support to the diverse technology base for civil nuclear power in the UK and we look forward to the potential development of SMR technology for the UK," Tynan commented.

NuScale's visit to the Nuclear AMRC was part of a week-long programme of engagements with key UK nuclear engineering facilities.

"Given the UK's engineering and skills base, working with British organisations is vitally important for NuScale as we move towards our first commercial power station," Reyes said.

During his visit, Reyes led a seminar on the NuScale design for an audience of local manufacturers and engineers at the AMRC Knowledge Transfer Centre, and announced details of a new internship programme with the University of Sheffield.

www.nuscalepower.com



Growing support for UK SMRs

A new industry-led feasibility study has concluded that small modular reactors (SMRs) offer the UK the opportunity to regain leadership in low-carbon generation technology and to secure a sustainable energy source.

The government-commissioned report was produced by a consortium of key industry bodies and companies, including the Nuclear AMRC, and managed by NNL.

"Small modular reactor technology has the potential to play a substantial part in the UK's clean energy future, and also to help boost UK wealth creation by virtue of the significant scope for UK companies to be part of the supply chain for SMR systems," noted Paul Howarth, NNL managing director.

The report emphasised the role of advanced manufacturing techniques to reduce costs of production. The Nuclear AMRC's R&D work with companies large and small is expected to deliver further cost reductions, the report notes.

The industry report's conclusions were echoed by a separate report from the House of Commons Energy and Climate Change Committee, also published in December. The report was based on a series of evidence sessions, written evidence from interested bodies, and a visit to the Nuclear AMRC to see first-hand the collaborative approach taken by academic and industrial partners from across the civil nuclear manufacturing supply chain.

The committee concluded that SMRs are a viable proposition for future deployment in the UK in the next decade, and that the government should help drive their development and deployment. The government should also work with industry to better understand the economics of SMRs and the conditions under which they are likely to be cost-competitive in the UK.

Pumps primed

Hayward Tyler is investing for the future with support from the Civil Nuclear Sharing in Growth programme.

Hayward Tyler, a specialist manufacturer of high-integrity pumps which this year celebrates its 200th anniversary, is growing its global footprint with the support of the Nuclear AMRC.

Based in Luton, with facilities in Scotland, China, India and the US, Hayward Tyler is a leading supplier of electric motors and pumps for the most demanding applications.

"Nuclear is absolutely a sweet spot for Hayward Tyler," says Ewan Lloyd-Baker, chief executive officer. "We provided the first pumps to Calder Hall in 1956, and recently won civil nuclear contracts in South Korea and Sweden, so we have a long pedigree of installed equipment. However, we should be developing our presence more in the sector."

The company has undergone a major turnaround over the past three years under Lloyd-Baker's leadership, and is now targeting global opportunities in new nuclear with the support of the Nuclear AMRC's Civil Nuclear Sharing in Growth (CNSIG) programme. The group currently generates around 15 per cent of revenues from nuclear, but sees significant scope for growth.

"The opportunity is to leverage the improvements we've made here to our processes and people, and say we are fit for nuclear. We're looking at investment now, supported by CNSIG and Fit For Nuclear, not just for the UK supply chain but for us globally," Lloyd-Baker says. "We're the market leader in boiler circulating pumps in China, but doing very little in terms of

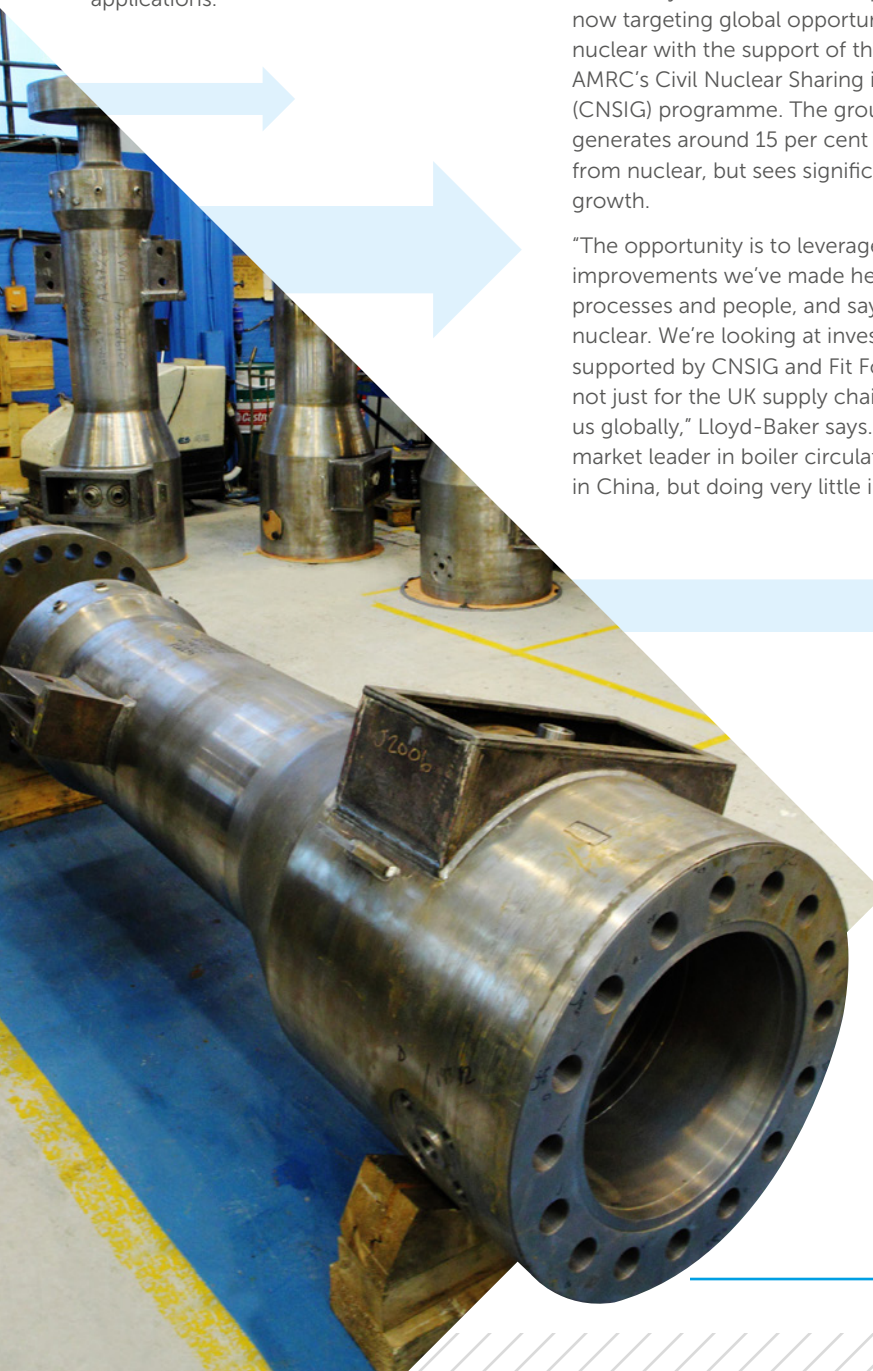
nuclear opportunities there. I'd like to think our business will eventually be at least a quarter derived from the nuclear sector, and will predominantly be exports."

Driving this overseas growth is the responsibility of James McNamara, the recently-appointed key account manager for nuclear. "In addition to the big-name players with large-scale reactors, we're also keeping a close eye on new reactor technologies like SMRs and molten salt reactors, things that won't come into fruition for ten years or more," McNamara says. "If we can cooperate in equipment development via test rigs or pilot plant, that feeds our future."

Identifying gaps

The CNSIG programme, led by the Nuclear AMRC with funding support from the Regional Growth Fund (RGF), is an intensive business development programme for key members of the UK's manufacturing supply chain. Hayward Tyler joined in early 2014 in the programme's second phase.

To help prepare its bid, HT first entered the Fit For Nuclear (F4N) programme to identify gaps in the business's performance.



Driving growth: James McNamara, Sue Henshaw and Larry Redmond.



Factory transformation: the Luton workshop in January.

"We did F4N so we could benchmark ourselves," says special projects director Larry Redmond. "It made us ask the questions that we had tended to avoid, and gave us a checklist for everything we need to do – we keep coming back to it and saying what is the gold standard?"

"It helped highlight areas we hadn't been facing up to. We would have been compliant with regulations, but that's an awful long way from meeting assumptions in the nuclear industry for health and safety or in process control. It's not so much about making you aware of gaps, but it makes them black and white."

The first six months of CNSIG involved a further detailed diagnostic of the company's performance, focusing on skills and training issues. "F4N fits well with the CNSIG diagnostic, because we could see how much more we had to do," Redmond notes. "CNSIG will help develop the people, and we are working to ensure we have the right processes and we know where the gaps are."

Building a world-class factory

Visit Hayward Tyler's Luton factory today, and you can see a company in transition. Older buildings have been demolished to allow a major expansion of the main workshop, which dates from the 1920s, as part of an ambitious investment programme supported by a separate £3.5 million RGF grant.

The redevelopment, which will complete in July 2016, will extend the workshop by over 40 per cent and create five focused zones based on lean manufacturing methods.

"That will allow us to reorganise and have flowline production for stators and rotors, and a new clean assembly and testing area to comply with nuclear standards," says Redmond. "We've done a lot with methods like 5S to make things good, but it hasn't yet taken it world-class. What we're doing now is combining the support we're getting from RGF with what we're learning through CNSIG – that's started to give us world-class facilities, world-class processes, world-class people and world-class products."

To model and plan the new production lines, Hayward Tyler is working with software group Lanner, after learning about its Witness process simulation tools during a visit to the Nuclear AMRC.

The factory development is led by manufacturing systems director Martin Clocherty. "The biggest value I'm getting from CNSIG is how to design and implement a nuclear-compliant facility," Clocherty says. "There was a knowledge gap there, but the guys have absolutely filled that for me. If I have any doubt about anything, I can go to them and get an answer."

For example, the simple way of creating the new clean assembly and test area would be to enclose it in a clean room – but that might not be able to handle new products as the nuclear business develops. The alternative is an open clean area which requires complex infrastructure to provide a positive airflow, something with which the team had no previous experience.

Sharing in Growth

The Civil Nuclear Sharing in Growth programme (CNSIG) aims to develop the UK manufacturing supply chain for civil nuclear – in new build, operations and decommissioning – and help key suppliers win work in the nuclear industry at home and overseas. CNSIG is part-funded by government through the Regional Growth Fund, and supported by industry leaders including Rolls-Royce.

The 10 participating companies are:

Ansaldo NES – www.ansaldo-nes.com

Goodwin International – www.goodwininternational.co.uk

Graham Engineering – www.graham-eng.co.uk

Hayward Tyler – www.haywardtyler.com

James Fisher Nuclear – www.jfnl.co.uk

Metalcraft – www.metalcraft.co.uk

NIS Ltd – www.nisltd.com

Tata Steel Projects – www.tatasteelprojects.com

Therco – www.thercoheatexchangers.com

Truflo Marine – www.truflo.co.uk

"We have a lot of expertise on site, but we can't do everything," Clocherty notes. "Where the Nuclear AMRC comes in is plugging these knowledge gaps. They can find someone who has done it before – we're now looking at JCB and others to see how they've made clean areas."

"Some of our products don't need that level of spec, but what we're doing with our factory is taking it to the top spec as a default. A lot of the design of the new facility is to give us increased scope."

Embedding skills

To fulfil its potential, a world-class factory needs world-class people. Training the workforce to nuclear standards is the core of Hayward Tyler's work with CNSIG.

Sue Henshaw was recruited as learning and development manager in August 2014. "Historically, there had been legislative and compliance training, with limited opportunities for additional people

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development activities. Funding was part of that problem, which is where CNSIG has massively supported us," she says.

The training supported by CNSIG includes online learning in areas such as metrology and measurement, NVQs, and specialist industry courses including Triple Bar Nuclear Manufacturing. "So far, it's been about getting everyone to a consistent standard," Henshaw notes. "We've worked with the manufacturing team and spent a lot of time on the shopfloor to see how our people are getting the training and applying it to the work environment. It's not just about attending the training, it's about embedding it into the workplace. The CNSIG team is also supporting with specific development interventions where their expertise is invaluable in preparing ourselves for nuclear bids."

Communication is key to engaging the workforce. "Initially, people can find it quite hard, as with any change. However, once we've explained the training, there is the understanding of what we're aiming for as a business and what we need to do to be ready for nuclear bids," Henshaw says.

"Myself and Martin were on the shop floor and said this is your workplace, how do you see your working area being most effective for you? The penny drops, they see how the development and training interventions can be applied. I believe it's gone from apprehension to embracing the necessary changes very quickly."

Fit for the future

Hayward Tyler aims to use the support from CNSIG and the RGF investment to double revenues across the business and expand its Luton workforce from 170 to 250.

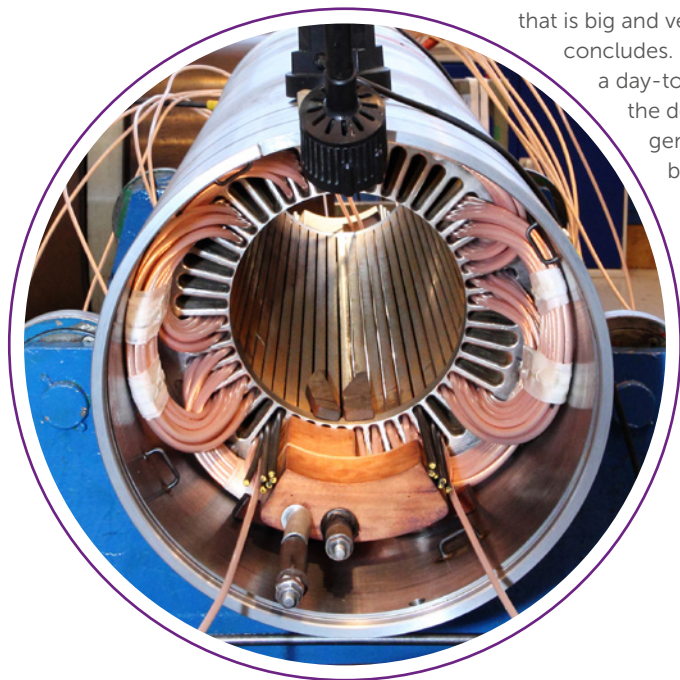
The investment is also allowing Hayward Tyler to push its technical capabilities. The company is investing heavily in tools and resources to develop its core competencies for the nuclear market, focusing on energy-dense and high-efficiency motors, and enhancing its capabilities in finite element analysis (FEA) and computational fluid dynamics (CFD) to support product development.

The firm has also built and commissioned a new R&D facility to investigate advanced engineering materials for the nuclear market. "This area of research will continue as we develop high temperature motor applications for the new nuclear market," notes McNamara.

Working with the Nuclear AMRC has also brought the team other benefits, such as the opportunity to meet the top-tier suppliers for Hinkley Point C (see box). "One thing that we couldn't get from outside is the access to the market," says Redmond. "The networking is a bit of an intangible, but being able to get into a room with Areva and EDF is not something you can do easily."

"The great thing about CNSIG is it's enabled us to look at what's happening in the wider world and feel we're part of something that is big and very exciting," Lloyd-Baker concludes. "When you work hard on a day-to-day basis to be part of the development of the next generation of civil nuclear new build, there's a real sense of pride in being able to do that."

www.haywardtyler.com



○ Long and winding road: Hayward Tyler pushes for continuous improvement.

CNSIG10 meet FID4

The Nuclear AMRC and EDF Energy brought together the 10 UK manufacturers taking part in the Civil Nuclear Sharing in Growth programme with the first four top-tier suppliers for Hinkley Point C.

EDF Energy has appointed four top-tier suppliers to the project in advance of its final investment decision (FID). Representatives from each of the so-called FID4 discussed the scope of their work packages, and met with the CNSIG companies for one-to-one discussions about potential supply opportunities.

Alstom is the lead supplier for the turbine hall, and will be responsible for mechanical systems including the turbine-generator shaft line, main pumps and heat exchangers, 2-3000 tonnes of pipework, and 4-500 valves. Around 70 per cent will be sub-contracted, and the group wants to identify as many suppliers as possible.

Areva will supply the nuclear steam supply system for the EPR, as well as instrumentation and control systems. Areva is encouraging UK manufacturers to partner with established French supplier. RFQs for equipment including pumps, valves, pipings and fittings will be issued from 2015.

Baylor, a partnership between Bouygues TP and Laing O'Rourke, will lead civil works on the project, and will have extensive requirements for reinforcement and structural steel, steel plate containment liner, and specialist coatings.

Costain is lead contractor for marine work, and will require tunnelling and offshore equipment for three marine tunnels of around 11km total length.

EDF Energy is expected to name its final three top-tier suppliers, covering mechanical installation, electrical installation and HVAC, in early 2015.

F4N

Fit For Nuclear

mas
manufacturing advisory service



£1.5 million funding call for Fit For Nuclear projects

English manufacturers can now access £1.5 million funding to help them enter or expand their presence in the civil nuclear sector.

The funding is available to companies taking part in the Fit For Nuclear (F4N) programme, which helps manufacturing companies get ready to bid for work in the civil nuclear supply chain.

F4N was developed by the Nuclear AMRC with leading industry partners, and is delivered in partnership with the Manufacturing Advisory Service (MAS), part of the government-backed Business Growth Service.

For the first time, thanks to support from the Regional Growth Fund, participating companies based in England can claim grants of around £10,000 to help them meet industry standards and compete for work in civil nuclear.

An estimated 5000 SMEs are needed to supply the UK's £60 billion civil nuclear new build programme. "Smaller manufacturers have a vital role to play in civil nuclear, if they can meet the standards demanded by the industry's top tier," notes Mike Tynan, Nuclear AMRC chief executive.

The new F4N funding will allow management teams to drive business improvements or R&D projects to optimise production or develop new processes and products.

All projects must be completed by 31 March 2016, with firms urged to apply as soon as possible to secure their share of funding.

namrc.co.uk/services/f4n/funding

Backed by top tier partners including Areva and EDF Energy



F4N diary



SS Tube Technology is an award-winning motorsport supplier with no previous experience in nuclear. In a new diary column, managing director Daniel Chilcott describes the first steps on his Fit For Nuclear journey.

SS Tube Technology was established in 2000 to meet the growing demand for precision TIG-welded exhaust systems for elite racing cars such as Formula One and IndyCar, made from exotic materials such as Inconel and titanium. We've grown organically year-on-year through securing new customers in the racing industry, while also starting to deal with markets such as energy and automotive where our pipework assemblies and insulation systems for very hot and aggressive environments are clearly transferrable.

Our progress was recently recognised with the 2014 Motorsport Industry Association Export Achievement award – we exported over 70 per cent of our products to the US, Europe and Asia this past year, while delivering a 40 per cent turnover increase.

In 2012, SSTT was acquired by Polar Technology Management Ltd, opening up new investment and allowing a transition to a new management team led by myself as managing director, Nick Henry as engineering director and Rob Allen as operations director. We've transformed the strategic vision of the business, and developed a 10-year plan to increase content supplied to other advanced engineering sectors while still maintaining agility and an engineering-led approach.

Core to this plan is developing a capability and product base to serve the nuclear

industry. With the UK in the process of implementing several new builds plus ongoing decommissioning work, we saw a great opportunity to grow a sustainable nuclear supply chain market share.

Our board has substantial experience of working in the nuclear sector, but we knew we could not do this on our own. We turned to Martin Ride and his team at the Nuclear AMRC for support through the Fit For Nuclear programme, starting in April 2014 with the online assessment.

Since then, we've made huge progress on our F4N journey. We are refurbishing a new 60,000 sq ft facility, investing in capital equipment such as six-axis laser cutting and electronically controlled CNC tube bending, and also putting a real focus on our systems and procedures.

Perhaps one of the largest undertakings is the change to our culture. There is a natural can-do attitude at SSTT, but health and safety has really come to the forefront and is now considered in every decision we make.

We undertook the follow-up F4N business excellence diagnostic with the Nuclear AMRC team in November, which really reinforced the progress we'd made – a 10 per cent increase in our score in only seven months.

The next challenges for us are in raising the awareness of SSTT within the nuclear industry supply chain, managing a phased transfer to our new facility, and implementing a new ERP system towards the back end of 2015.

We will be working with the Nuclear AMRC every step of the way, and are currently reviewing the training on offer which will help to build the knowledge and skill base expectations serving this industry.

www.sstubetechnology.com

Start your F4N journey:
namrc.co.uk/services/f4n

Suppliers explore Anglo-French collaboration

The Nuclear AMRC is bringing together UK nuclear manufacturers with established suppliers from France to explore potential collaborations.

In October, the centre held its first networking event with members of PNB, France's national nuclear industry cluster, and around 18 UK manufacturers which have worked with the Nuclear AMRC through Fit For Nuclear and other programmes. Delegates learned from the experiences of top-tier Anglo-French partnerships established to supply EDF Energy's new build programmes, and had the opportunity to build new cross-Channel relationships.

EDF Energy is encouraging UK suppliers to consider partnerships with its French parent's established suppliers (see *Nuclear AMRC News 16*). Chris Squires, head of supply chain engagement for EDF Energy, told delegates that such partnerships can benefit all sides.

"What the British bring is experience of the UK context such as construction design and management (CDM) requirements. What our French colleagues bring is their huge experience of delivering nuclear power plants – the codes and standards are well known to French organisations," Squires noted. "What we get when we bring them together is complementary knowledge, skills and experience."

One such partnership has been formed between Lloyd's Register and Apave, to bid for third party inspection work and other services at EDF Energy's new build project at Hinkley Point C.

"Apave have detailed knowledge of the EPR from their work at Olkiluoto and Flamanville, while we started in civil nuclear in the UK with Calder Hall," Simon Emery of Lloyd's Register told the meeting. "Between us we have a lot of coverage and expertise across the globe."

Key issues when establishing a partnership include defining the scope of the collaboration, and establishing clear lines of communication to overcome any cultural differences. "Culture is not just about the differences in French and British culture – it's about nuclear culture," Emery noted.

Such partnerships can require additional investment. For example, the two partners might individually have all the accreditations needed for a job, but these don't necessarily transfer into the joint body. "Joint ventures are not the cheapest thing in the world to operate, because you usually end up running a separate level of control, which you have to have," Emery said.

Leonel Sousa of French pipework specialist Boccard discussed his firm's partnership with Cavendish Nuclear, which was established to bid for steam supply and cooling system work at Hinkley Point. Although Boccard has provided pipework to 42 French reactors, it has no nuclear experience in the UK. After EDF encouraged it to explore UK collaborations, Boccard started discussions with Cavendish's parent group Babcock in 2009.

"It's been a long journey but we believe we've signed the right partner," Sousa said. "Between our two companies, we believe we were able to get the best of what we have in French nuclear expertise and the best in UK nuclear capabilities."

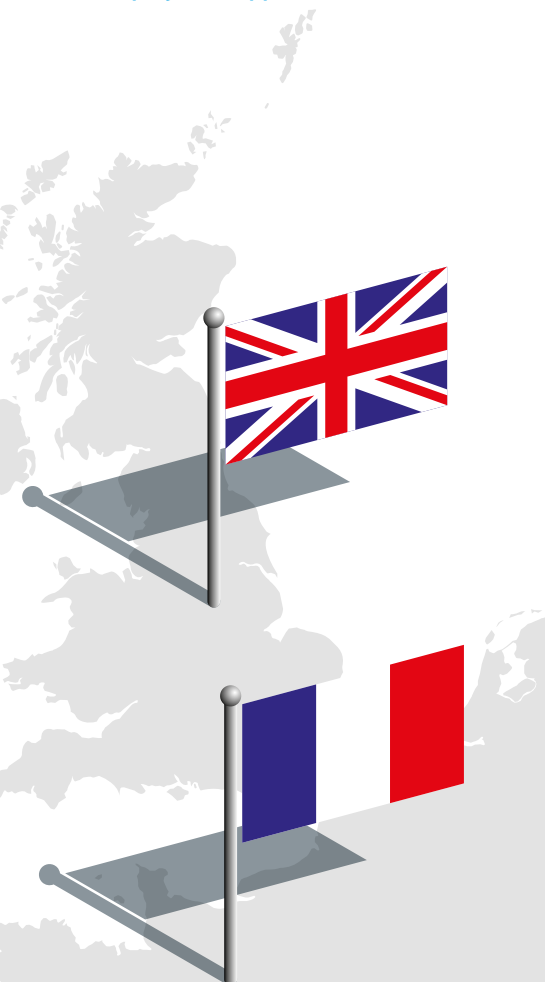
Again, communication between the two companies was key. "One of the things we started right from the beginning was to get resources from Cavendish into Boccard, and from Boccard into the Cavendish organisation," Sousa noted. "We didn't have an order, but decided to mobilise resources. We now believe the team we've built up for the bidding process for Hinkley Point C is very well integrated."

EDF is seeing a lot of partnering at these higher levels, Squires told the delegates, but would like to see more further down the supply chain.

"What we've got to do is find ways of cementing these relationships," he said. "A lot of businesses here in the room and out in the marketplace fit in at Tier Two and Three levels – you're sub-suppliers to the likes of Cavendish. Just because our procurement is well advanced, don't think there's nothing left for you."

PNB: www.polenucleairebourgogne.fr/en

EDF Energy supplier information:
www.edfenergy.com/energy/nuclear-new-build-projects/suppliers



Promoting our manufacturing strengths: Peter Handley Q&A

Peter Handley joined the Nuclear AMRC as senior business development and government relations manager in November 2014. We asked him to introduce himself.

I was absolutely delighted to be offered a role here at the Nuclear AMRC. I've had a very privileged career in the nuclear industry, and couldn't have asked for a better opportunity than this, helping UK manufacturers win work.

My career started in 1985 as a mechanical fitter apprentice for UKAEA at Springfields in Preston. I am a big believer in apprenticeships, learning new skills and gaining hands-on experience from an early age. I moved over to BNFL in 1990, undertaking many different roles supporting Magnox fuel manufacturing. We brought in new and innovative manufacturing techniques like total productive manufacturing and lean, which allowed us to take 50-year-old processes into the next century.

I joined the BNFL project office, and later took a senior management role for BNFL Research and Technology, now the National Nuclear Laboratory (NNL). I was business manager for the labs waste management and decommissioning directorate, when a unique opportunity came my way to join UK Trade and Investment (UKTI) as nuclear ambassador, helping UK companies win work overseas. This exposed me to many overseas markets, and really opened my eyes to the global marketplace and the great strengths of the UK supply chain.

What is your role at the Nuclear AMRC?

My role is simply to identify and create opportunities that will give UK manufacturers the best possible chance of winning work and creating high-value skilled jobs. I also have a role linking in with government, and building on the relationships already in place. I am confident that my background in nuclear will be very useful, and being passionate about the industry is a bonus.

What are the opportunities for UK manufacturers?

We need to look at both short and longer-term opportunities. In the shorter term,

while we wait for the nuclear new build tenders to flow through, there are some great opportunities to support the existing fleet of reactors, including the huge decommissioning programme at Sellafield which runs into billions of pounds per year.

For the longer term, we are engaging now with the new build developers, technology vendors and tier one suppliers, highlighting the strengths of the UK supply chain, and ensuring that UK manufacturers make the most out of the developers' promises on local content.

The important thing is that manufacturers are ready when opportunities do arise, and that's where our supplier development programmes come in.

And what are the challenges?

There are two real challenges, for the supply chain and for the developers.

The supply chain wants a realistic view of the opportunities; how they can access them; and what their chances are of winning work. The developers, on the other hand, are asking if they can have confidence in the UK supply chain; are UK manufacturers ready, cost-competitive and capable of supplying the right quality; and how can they de-risk their supply chain?

We strive to work with both parties, to unlock market intelligence and develop the supply chain, and then join the two together. It's not until you get to this level of detail that you see the UK's strengths and weaknesses. It is our mission at Nuclear AMRC to resolve any weaknesses we find, and to develop and promote our strengths.

How can the Nuclear AMRC make an impact in UK industry?

We are already making a big impact through our established supplier development programmes like Fit For Nuclear (F4N) and Civil Nuclear Sharing in Growth. We have helped hundreds of supplier to date, most of whom have already won new work as a result, and we



strongly recommend others to take the same journey. We are targeting a further 300 companies over the next two years.

We also have our world-leading research factory. We have commissioned some of the world's largest and most advanced machining technologies, and now have over £26 million worth of advanced manufacturing R&D capability. We are working with companies along the supply chain, for nuclear and other energy sectors, to reduce production cost and risk, and drive up quality and capabilities.

Finally, what's your message for manufacturers interested in the nuclear sector?

If you're not already doing so, you do need to seriously invest in nuclear. Opportunities will grow here in the UK for many years, and a skilled and experienced workforce needs to grow with it.

Work with us at Nuclear AMRC and join one of our programmes. The government has invested a lot of money in to UK support mechanisms like Nuclear AMRC, and all UK taxpayers deserve their share of the tremendous support on offer.

We can help promote you, but only if we are aware of you!

To find out more about how the Nuclear AMRC can help your business, contact Peter Handley at peter.handley@namrc.co.uk or call 07776 198717.



A question of balance

The UK branch of the international Women in Nuclear network (WiN UK) held its first annual conference in Westminster in January, on the theme of addressing gender balance in the nuclear industry. WiN UK has rapidly established itself since its launch in 2014, with membership approaching 500 and over 200 delegates at this event.

So why is this issue attracting so much attention? Gender balance is currently receiving a revived interest across industry in general, and there is a clear economic motivation for employing more women: companies with more women on their boards outperform their rivals with a 42 per cent higher return on sales, 66 per cent higher return on invested capital, and 53 per cent higher return on equity.

Gender imbalance is particularly strong in engineering, where only seven per cent of the workforce is female. It was surprising and disappointing to learn that the UK currently lags all other European nations, with females making up less than 10 per cent of engineering professionals. Latvia, Bulgaria and Cyprus lead with nearly 30 per cent.

The variation between nations and variation over time indicates that the imbalance can be overcome. The reasons for the imbalance are many and complex, and are not necessarily the result of permanent features of human nature.

The nuclear industry currently lags other energy sectors in terms of the proportion of women in the workforce, so there is arguably an even stronger motivation for addressing the gender balance.

As explained by Katrina Williams, director general for the international, science and resilience group at DECC, the UK's nuclear new build programme will need a rapid expansion in the workforce from 70,000 to 98,000. Around 8,000 people per year will need training to achieve this expansion while countering the reduction caused by an ageing workforce. Attracting more women, and retaining women already in the industry, will be vital.

So what are the reasons for the gender imbalance in the engineering work force? A variety of causes were discussed, including the effects of unconscious bias (the tendency for men and women to judge the same behaviours more positively when exhibited by men); the impact of maternity leave; the challenges of usually being the primary carer for children; the tendency for women to not select physics as an A-level subject (only two per cent of women do so); the pay gap (currently female professionals in the UK earn £8,000 less than their male counterparts); parents' differing expectations on the career choices of their sons and daughters; and the tendency of women to undersell their abilities.

How can this be overcome? We heard testimonies from a number of companies that have implemented effective measures for addressing the gender imbalance in their organisations. These included introducing flexible working policies, targets for female hires, female-friendly advertising, training to address unconscious bias, professional networks for women, publicising female role models, mentoring programmes for women, and encouraging girls to take an interest in science from a young age.

While progress is being made, it is clear that the issue of gender balance needs to remain at the top of the agenda for industry and government, to support the ongoing development of a large, diverse and effective workforce to sustain nuclear growth in the UK, and to help us to remain competitive in an international market.

Dr Kathryn Jackson,
technology researcher, Nuclear AMRC



Overcoming imbalance: networking at the Women in Nuclear conference.



The Nuclear AMRC has launched a new programme to provide on-the-ground support at the UK's key nuclear regions, with the first events in Somerset and West Cumbria.

Nuclear AMRC Local aims to provide a direct point of contact for small and medium-sized manufacturers based in the UK's key regions for nuclear new build and decommissioning. The programme was launched in the south west to engage local manufacturers with the potential to supply EDF Energy's proposed new reactor at Hinkley Point.

The first event, held in Taunton in partnership with Somerset Chamber of Commerce, involved 16 companies, while a follow-up in Weston-Super-Mare attracted over 20 engineering businesses.

"Feedback from these early meetings has been very positive," says Dave Prescott, programme manager for Nuclear AMRC Local. "Manufacturers who are based close to the new build and decommissioning sites are in an excellent position to join the supply chains for these multi-billion pound projects, and we want to make sure they have the knowledge and capabilities they'll need to win work."

The Nuclear AMRC Local team also launched into the north west at December's meeting of Britain's Energy Coast Business Cluster, held at the Energus venue in West Cumbria with over 70 companies in attendance. As well as the opportunities in NuGen's proposed new build at Moorside, manufacturers in the region are ideally placed to target the requirements of the decommissioning programme at Sellafield.

The programme will continue with regular events in Somerset and West Cumbria, and will launch in Anglesey in early 2015.

To find out about upcoming Nuclear AMRC Local events, go to: namrc.co.uk/services/local

Atkins agreement marks shared spirit

The Nuclear AMRC will work with leading engineering consultancy Atkins on nuclear industry R&D as well as support and training for the UK's civil nuclear supply chain.

Chris Ball, managing director for nuclear at Atkins, signed a memorandum of understanding (MOU) with Nuclear AMRC chief executive Mike Tynan in November.

The MOU confirms that the two organisations will work together for mutual benefit in areas relating to nuclear research & development, UK civil nuclear supply chain development, and the provision of effective support to the UK civil nuclear industry. Both groups will contribute expertise, experience and knowhow to their shared aims.

Atkins commits to being an active supporter of the Nuclear AMRC, including joint reviews of opportunities for UK suppliers in nuclear new build, decommissioning and operations, and will seek to identify opportunities for the Nuclear AMRC to add value to Atkins' delivery of commercial work.

The Nuclear AMRC will involve Atkins in key areas of its manufacturing R&D including small modular and micro reactors, fuel cycle and waste treatment and management.

"Atkins and the Nuclear AMRC share the spirit of innovation, collaboration and excellence, and we are looking forward to working together," Ball said. "This is a very exciting time for the nuclear industry in the UK and internationally, and by working closely on pioneering projects with partners like Nuclear AMRC, we're making a real difference to civil nuclear power in the UK."

Atkins is one of the world's leading design, engineering and project management consultancies, employing some 17,400 people across the UK, North America, Middle East, Asia Pacific and Europe. It is working with EDF Energy on life extension of the existing AGR fleet, with Horizon Nuclear Power on proposed new build at Wylfa and Oldbury, and with the NDA on decommissioning projects.

"I am delighted to sign a collaboration agreement with Atkins, a successful, experienced and innovative company in the global civil nuclear marketplace," commented Tynan. "Both of our organisations are committed to excellence in the nuclear industry and are determined to drive a new era of civil nuclear power for the UK."



Committed to excellence:
Mike Tynan and Chris Ball.

www.atkinsglobal.com

ATKINS

Pro-beam signs up for membership

pro beam

Electron beam welding specialist Pro-beam is the latest company to sign up for membership of the Nuclear AMRC.

Based in Germany, Pro-beam is the company behind the Nuclear AMRC's giant K2000 electron beam welding chamber. With a vacuum chamber volume of over 208m³, the K2000 is believed to be the largest electron beam facility available for research anywhere in the world.

Electron beam welding can join very thick metal sections with a single weld, potentially cutting the time required to join nuclear pressure vessels from weeks to hours.

The Pro-beam K2000 can complete very intricate joins on components of up to three metres in diameter, and boasts advanced capabilities found in only a handful of machines worldwide.

The company also provided the Nuclear AMRC's smaller K25 chamber, used for pilot research into innovative joining techniques.

Pro-beam is taking Tier Two membership of the Nuclear AMRC, and will provide continuing support and resources for electron beam welding R&D.

www.pro-beam.com

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**.

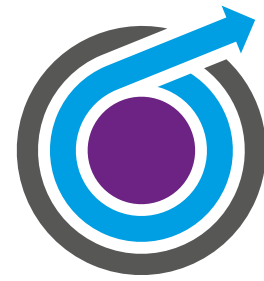
We can work with you to raise your quality, capability and cost competitiveness to meet the needs of the global nuclear industry.

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 Stuart Harrison, Nuclear AMRC business development director: stuart.harrison@namrc.co.uk



NUCLEAR AMRC
ADVANCED MANUFACTURING RESEARCH CENTRE



Contact us:

Nuclear AMRC

The University of Sheffield,
Advanced Manufacturing Park,
Brunel Way, Rotherham, S60 5WG

tel: +44 (0)114 222 9900
email: enquiries@namrc.co.uk
online: namrc.co.uk
twitter: @NuclearAMRC

Manufacturing Technology Research Laboratory

The University of Manchester,
Sackville Street, Manchester, M13 9PL

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