

innovate

ISSUE 9 May 2016

New Science and Technology Strategy

By playing an increasingly important role as hub and integrator for national nuclear research and development programmes, NNL is pulling out the stops to deliver value to customers and the best authoritative advice to stakeholders including the UK Government.



NNL Chief Scientist, Andrew Sherry

NNL's new Science and Technology strategy sets out a five year programme that aims to establish a national laboratory operating commercially as well as being recognised as the UK's premier nuclear science and technology organisation.

The next decade will see tremendous change to the nuclear sector worldwide with an expansion in new build, growth in decommissioning and waste management and the prospect of Small Modular Reactor (SMR) development and also progress on accident tolerant fuels.

There is an opportunity for NNL to make a real and sustained contribution in the future positioned at the frontier of nuclear science and technology.

NNL's Science and Technology strategy outlines the core elements of the 2020 Vision to:

- Be the UK's premier nuclear fission science and technology organisation
- Be in the top 10% of similar organisations worldwide
- Lead the international community in at least five fields of nuclear science and technology

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New Science and Technology Strategy

NNL's focus will be on promoting excellence in innovative programmes, outstanding people and leading edge facilities. Links with a network of Universities and industry in the UK and overseas will ensure the quality and relevance of the solutions being provided.

Targets are defined with respect to each foundation area and the implementation plan has been integrated into NNL's 2016/17 business plan. The Science and Technology strategy was a strong theme of NNL's 2016 Technical Conference, which took place in Manchester in April (see page 16).

To be successful in the long-term requires NNL to build a capability to deliver the national laboratory role and remit. As NNL also operates on a commercial basis, this can only be achieved by also meeting short-term business targets.



NNL's On the Ball

At the end of 2015, NNL had a strong delegate representation and exhibition at the flagship conference for the UK nuclear industry - #Nuclear Powering the UK - in London.

Over the past 14 years, the conference, led by the Nuclear Industry Association (NIA), has showcased the contribution the nuclear industry makes to the UK and outlines its plans for the future. NNL has been a key supporter of the event over the years and again provided a strong group of delegates and hosted a popular exhibition.

Olivia Thompson, NNL Business Manager for Decontamination and Waste Assessment attended to support the Women in Nuclear (WiN) exhibition stand and encountered a star of television.

Johnny Ball was a regular fixture on TV in the late 1970s and throughout the 1980s, presenting popular science and technology programmes aimed at inspiring children. In 2004, he was named in a list of the top 40 most eccentric TV presenters of all time. He is also a passionate supporter of nuclear energy. This qualified him for an informed chat with Olivia (pictured right with Johnny Ball) about NNL, WiN, science and the nuclear industry.

Olivia has been representing NNL in WiN UK since it was launched in 2014. The aim of the WiN network is to strengthen the contribution of women working in the nuclear industry, achieve a better gender balance and engage with women in the wider public (read more about WiN on page 5).

The #Nuclear Powering the UK conference was declared a great success. The event programme covered the whole nuclear fuel cycle from new build and power generation

to decommissioning and safe storage. The conference examined how the nuclear sector provides innovative, safe and reliable services via a series of speakers, panellists and presentations from across the industry, Government and beyond.

In the evening following the conference, NNL hosted a table at the NIA/Nuclear Institute annual dinner. The NNL table attracted external guests from EDF Energy, Rolls Royce, the Department of Energy and Climate Change (DECC) and Westinghouse.



Q & A

with Anna Duckworth, Human Resources Business Partner, Chadwick House



What does your job involve?

I work alongside the leaders and managers in the NNL business to bring our HR agenda to life. I also oversee NNL's Corporate Social Responsibility (CSR) programme. With the help of our CSR co-ordinators I look to increase our activities, our presence in our local communities and help to share our knowledge and celebrate our success in the industry.

How long have you been with NNL?

Three years.

How did you come to be doing the job you have now?

After I left Liverpool Hope University, where I gained a degree in Education Studies and English Language, my original plan was to become a teacher. But, my first placement in a school soon made me realise that teaching probably wasn't the right career path for me. I took up some temporary work for six months in a HR department with the NHS, which I really enjoyed. Then I applied for a permanent job working in HR for Bolton Council and haven't looked back since. I moved on to work for a media company before joining NNL.

What do you hope to be doing in five years-time?

Still working at NNL and hopefully making a difference. In my current role, I'm the HR Business Partner supporting NNL's Waste Management and Decommissioning area. The business is

focused on developing and applying technologies and techniques that add value to the ongoing decommissioning of nuclear facilities. In five years I hope we've succeeded in growing the business and are celebrating our ongoing success.

With CSR, we've introduced a more structured approach and strategy. The renewed focus directs how we go about engaging our CSR activities. In five years, I hope we've established our CSR strategy and we're adding even greater value in the communities close to our sites and throughout the UK.

What does working at NNL mean to you?

Working with good people in an effective team delivering what the business needs. I look forward to coming in to work, which is always a good measure of how much enjoyment there is in a job.

What aspects of your job do you like the most (and the least)?

The variety of work on a daily basis is something I particularly enjoy. No two days are the same and it definitely keeps things interesting. The things I like the least...in all honesty I don't actually think there is anything I don't particularly like about my job. I must just be lucky!

Tell us something about yourself that people may not know...

I am a keen Liverpool FC supporter. We have a couple of season tickets in the family and there is always someone at

the games hoping for silverware. We're all confident our new manager Jurgen Klopp can turn our fortunes around!

Who or what has been a big influence on your career journey?

Without a doubt it's my dad. He worked incredibly hard while we were growing up and achieved an enormous amount of success while still ensuring he made time for the family. He has always encouraged us to follow our career aspirations and supported us in our decisions on which path we want to go down. His advice throughout my education and career so far is something I will always remember and value.

What advice would you give to someone thinking of joining the nuclear industry?

Do it! The level of experience and variety of work you can get involved in will excite you and make you want to come to work. Finding a genuine interest in your job can be difficult for some people but I think the nuclear industry opens more doors and allows individuals to develop and enhance their skills to another level.

What do you do to relax outside of work?

I've been into fitness for a while now but I recently purchased the 'Lean in 15' book which is keeping me busy learning new healthy recipes and providing me with a challenge when

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attempting the high intensity interval training! A good G&T always helps me to relax as well.

What is the first thing you pack to take with you when you travel away from home?

Passport and beach essentials! If it's a mini break in the UK then my waterproofs!

Which famous figure would you most like to meet?

This one took me a while but David Attenborough is definitely a favourite. His documentaries just fascinate me and I'd love to hear his stories of all his travels and discoveries, although anything featuring a shark is big no-no in my book and even David wouldn't be able to convince me to get in the water with them or even watch them in an aquarium!



American Nuclear Society Winter Meeting

Late last year, the Winter Meeting of the American Nuclear Society (ANS) featured 'silver' sponsorship and a high profile presence for NNL.

ANS is the international, scientific and educational organisation that promotes various sectors of nuclear science and technology.

Very influential on the international stage, ANS has a membership of around 11,000 engineers, scientists, administrators and educators. It



represents 1,600 plus corporations, educational institutions and Government agencies in the USA.

The Winter Meeting and accompanying Technology Expo took place in Washington DC. In addition to silver sponsorship, NNL also exhibited at an event attended by over 1,250 delegates from major US and international organisations, the US national laboratories, Universities and Governmental departments including the US Department of Energy (Office of Nuclear Energy) and Nuclear Regulatory Commission.

NNL delegates were fully involved in the event throughout the week long programme and presented three separate scientific papers:

- Americium Space Radioisotope Power Systems
- Opportunities to Reuse and Recycle Redundant Radioisotopes
- Plutonium Disposition R&D within the UK

NNL also participated in three panel sessions as either a panellist or session chair:

- International Perspective of Electrochemical Recycling
- Collaborative R&D for Future Nuclear Energy

- Proliferation Risk and Sustainability of Nuclear Energy Systems

While the Winter Meeting provided the main focus, NNL took part in a separate series of meetings to maximise value from the visit. A particular highlight was a reception co-hosted by NNL and UK Trade and Industry (UKTI). NNL maintains a close relationship with UKTI across a range of countries that hold the potential for nuclear sector exports.

The NNL/UKTI reception in Washington DC took place at the Deputy Ambassador's residence with around 85 attending, the vast majority representing US based companies. NNL Fuel Cycle Solutions (FCS) Business Director Fiona Rayment and UKTI's nuclear specialist Ron Cameron made the joint keynote address, which focused on international collaboration.

NNL Chief Scientist Andrew Sherry also attended and led a series of high level discussions relating to investments in science, technology, cation and training.



NNL and WiN Addressing Gender Balance

NNL played a prominent role as a 'gold' sponsor and exhibitor at the second annual Women in Nuclear (WiN) UK Conference held in London in early February. The event theme was 'Addressing Gender Balance in the Nuclear Industry'.

The programme for the conference placed emphasis on sharing best practice for developing a gender balanced nuclear industry. It highlighted the tools, techniques and standards available for leaders to implement change. A series of workshops proved very popular with delegates and examined key topics.

A small army of speakers was led by Andrea Leadsom MP, Minister of State at the Department of Energy and Climate Change (DECC). NNL Fuel Cycle Solutions Director Fiona Rayment took part in a panel session that discussed the implementation of WiN UK's Industry Charter.

Other speakers included WiN UK President Miranda Kirschel MBE, John Warden, CEO of the Nuclear Institute, Arun Batra, Director at Ernst & Young and Adrienne Kelbie, CEO at the Office for Nuclear Regulation. A pre-conference reception in House of Commons featured Workington MP Sue Hayman and Donna Connor from Sellafield Ltd.

The NNL delegation also included Colette Grundy, Jilly Atherton, Allyson Dixon, Rachel Roberts, Lucy Platts, Thomas Bennett and Sehri Kayani. Peter O'Brien looked after the NNL exhibition.



A Personal Perspective

Sehri Kayani, NNL Strategic Business Development Team (pictured above)

I was privileged to attend the Women in Nuclear UK conference in London earlier in the year.

The themes were diversity, inclusion and addressing gender balance in the nuclear industry. For someone fairly new to the industry I was expecting to be inundated with detail. I'm pleased to report that the conference was not like that.

It was good to be among women who wanted to get to know me on a more human level rather than inquiring about job title or technical knowledge. The conference sessions were of great interest and I scribbled as many 'pearls of wisdom' as I possibly could.

I was particularly impressed by the male speakers and their clear and unwavering support for WiN and the fact that diversity makes good business sense.

The interactive 'pledge wall' worked really well with delegates writing pledges which will contribute to both personal and organisational change. During breaks in the conference

sessions I attended the NNL exhibition and helped deal with a surge of inquisitive questions from empowered and interested delegates.

During the latter part of the day, a series of workshop sessions looked to develop thinking and discussion in a number of key areas. I attended a pair of workshops – 'Authentic Leadership' and 'Unconscious Bias'.

The first encouraged participants to explore their own leadership style while the second discussed how blind spots can be addressed to make sure we improve gender inclusion.

I found the presenters engaging and particularly enjoyed 'Unconscious Bias' as I felt it highlighted real life examples with key themes including negative association, judgements, preconceptions and assumptions. The workshop provided insight into thought processes that can lead to negative behaviours in the workplace.

A personal favourite of the day was a speech made by Adrienne Kelbie. She really captivated the audience with a very engaging and people orientated demeanour and style. She ended with a powerful closing which I think may turn into a personal mantra for me, 'if we aspire to inspire, we'll probably get the job done'.

I think everyone gained value from the conference, whether it was a new business relationship, fresh insight, inspiration or new skills. For me personally I took away inspiration, motivation, confidence and a reinforced value for women.

The 2016 conference was aimed at addressing the gender imbalance in the nuclear industry and the support of so many delegates displayed a compelling desire to create a more balanced and diverse workforce for the future.

Changing Places - NNL & CEA

NNL and French research organisation CEA have developed a new collaboration through the European Union (EU) TALISMAN project. This has led to NNL and CEA people working and studying at each other's sites.

TALISMAN is an EU 7th framework funded project that aims to link major nuclear laboratories across Europe to enable researchers to gain access to facilities for actinide studies.

CEA is the long established French Alternative Energies and Atomic Energy Commission. The organisation is active in low-carbon energies, defence, security and health technologies. In each of these areas, CEA maintains a cross-disciplinary culture of engineers and researchers undertaking technological research. Nearly 16,000 people are employed including over 1,500 PhD and nearly 300 post-doctorate students.

As a sign of increasing co-operation, NNL and CEA recently signed a 'Letter of Intent' that points to even

closer collaboration in nuclear energy research. The agreement takes into account the shared nuclear heritage in both the UK and France. Both nations have embraced the nuclear fuel cycle and are looking to build on joint experience via an agreement that seeks to identify opportunities for mutually-beneficial collaboration.

With TALISMAN, NNL's Central Laboratory and CEA's Atalante facility are part of the core network supporting the project. NNL and CEA developed a plan to collaborate on a project looking at the chemistry of neptunium in nitric acid and solvent phases.

NNL made a proposal to TALISMAN that led to Central Laboratory based Research Associate Tamara Griffiths travelling to the CEA Atalante facility to work and study. Tamara joined NNL last year after a post-doctoral research project at the University of Manchester where she also studied neptunium chemistry.

Atalante is located at Marcoule in the South of France and Tamara enjoyed her time at the facility, which specialises in actinide molecular chemistry. She immersed herself in the French culture and toured the beautiful Provence region with its

vineyards, olive trees and lavender fields allied to the Roman and Gothic architectures that dominate the area.

Tamara said: "I would like to thank the TALISMAN project and the NNL Aqueous, Recycle Strategic Project for allowing me to participate in such a fascinating joint research project."

CEA made a reciprocal application for funding for sponsored PhD student Arnaud Deroche to undertake a placement in the Central Laboratory. Following an accelerated training programme he has worked in NNL's Radiochemistry team.



Tamara Griffiths (front row right)

Keeping Standards High

NNL has received excellent news from the International Organisation for Standardisation (ISO) with the confirmation of first time certification to the new ISO 50001 - Energy Management standard.

ISO sets the standards as an independent, non-governmental international organisation with a membership of 162 national standards bodies. NNL also maintained existing accreditations to other international standards:

- ISO 9001 Quality Management
- ISO 14001 Environmental Management
- ISO 27001 Information Security Management

These new and continued accreditations to the highest standards are extremely important to NNL. They are proof to customers and other stakeholders that responsibilities are taken very seriously across a range of key areas.

ISO international standards ensure that products and services are safe, reliable and of good quality. For any business, accreditation is essential in increasing productivity, minimising waste and errors leading eventually to reduced costs.



Delivering a Rolls-Royce Solution

Since July 2014, NNL has been working with Rolls-Royce to develop an examination capability to study Nuclear Steam Raising Plant (NSRP) components. The work takes place in NNL's Windscale and Central Laboratories at the Sellafield site.

NNL's relationship with Rolls Royce is developing and both organisations are looking forward to building on the success achieved so far. Rolls Royce is the sole Ministry of Defence (MoD) Technical Authority for submarine NSRP and has manufactured reactors and propulsion plants for the whole of the UK's Royal Navy submarine fleet over its 50 years of operation.

The NSRP is the equipment that translates energy from the submarine's reactor into high pressure steam. This drives the turbines that provide electrical power and drive the submarine's propulsion system.

In 2013, MoD agreed a ten year contract worth around £800 million with Rolls-Royce Submarines to deliver and maintain nuclear propulsion plants for the Royal Navy's nuclear powered vessels.

As the UK Technical Authority for NSRP, Rolls Royce manages all aspects of the plant design, safety, manufacture, performance and through life support in relation to the



Rolls-Royce

nuclear propulsion of the submarine flotilla. At the end of December last year, NNL signed a long-term contractual arrangement with Rolls Royce covering continued technique and infrastructure development to mid-2017.

The total investment in NNL people and facilities is around £50 million over approximately three years. Once fully commissioned, the capability will constitute a unique UK asset to service MoD's immediate operational requirements. This will pave the way to develop a long-term Post Irradiation Examination (PIE) contract to meet MoD campaign requirements for the next ten years or more.

This is a major milestone in the work NNL carries out in this key area and the Defence PIE team has responded rapidly to Rolls Royce and MoD's challenging timescales and priorities over recent months.

The ability to respond quickly has been helped by on-site representation from Rolls Royce based in the Central Laboratory working closely with the NNL team. This arrangement has also served to strengthen the relationship between both organisations.

Adrian in Fukushima Events

NNL External Relations Director Adrian Bull participated in a week-long series of meetings and presentations in Japan in March, coinciding with the fifth anniversary of the events that took place at Fukushima Daiichi as a result of the devastating earthquake and tsunami. He also visited the exclusion zone which remains in place around the power plant.

The focus of the programme was nuclear industry communications and stakeholder engagement, linked to the work done in this area by the UK's Nuclear Industry Council. Also on the trip was Professor Gerry Thomas from London's Imperial College. Together, Adrian and Gerry held a press conference for Japanese media and met with various groups from across Government, industry and academia.

Adrian commented: "The trip was fascinating and informative, in particular the opportunity to visit the area around the power plant and see first-hand the work being done to enable people to move back at some point.

"We had very useful meetings with the Japanese and I know that there is interest on both sides to share our experiences and insights in many areas of communication and engagement."



Adrian presenting at the British Embassy in Tokyo

NNL Hosts Delegation from China

Following on from a series of technical proposals issued by NNL, a high level delegation from China visited the UK in December. The three day visit led by the NNL Strategic Business Development (SBD) team reflected developing links with China.

The delegation included representatives from the China Institute of Atomic Energy (CIAE), the China Experimental Fast Reactor (CEFR), the China National Nuclear Corporation (CNNC) and China Nuclear Power Engineering (CNPE). CNPE is a CNNC subsidiary company. Last year, NNL signed a groundbreaking agreement with CNNC to establish a Joint Research and Innovation Centre (JRIC).

During the visit, technical discussions took place around a further two potentially significant programmes of work this time in NNL's Fuel Cycle Solutions (FCS) business area. The first will focus on the development of a groundbreaking R&D roadmap for nuclear modelling and simulation. This combines the UK's Integrated Nuclear Digital Environment (INDE) with the Chinese Virtual Reactor System. The second area focuses on CNNC's existing reactor core modelling system and adapting it to UK regulatory requirements.

The broad aim of the visit was to enable the Chinese team to meet NNL technical personnel who will collaborate on current and potential work programmes. The visitors were able to observe NNL operations and participate in technical discussions to identify potential areas for collaborative research and development in modelling and simulation. This ranged across the whole fuel cycle including remote and virtual engineering, data generation and integrated modelling.

NNL also took the opportunity to showcase a number of facilities. A tour of the rig hall at the Workington Laboratory included remote segregation robots supporting the development of new plant at Sellafield. While at Workington, the party also viewed test rigs supporting Highly Active Evaporation and Storage (HALES) corrosion and jet ballast along with solids transport.

The party moved on to visit already operational facilities in the Central Laboratory and new Phase 2 (Plutonium Laboratories) and Phase 3 (Highly Active Cells) currently undergoing commissioning. Each area has the potential to play a significant part in the UK/China JRIC's work.

The delegation also received a series of high level modelling demonstrations and presentations at NNL's Warrington offices and participated in a technical workshop hosted by the Science and Technology Facilities Council (STFC) Daresbury Laboratory in Cheshire. STFC Daresbury is involved in scientific research in accelerator science, bio-medicine, physics, chemistry, materials, engineering and computational science. The visit to the UK further illustrated the close links being developed between NNL and China.

NNL currently has two live contracts with CNNC that are progressing very successfully.

Environmental Characterisation

The first covers a research programme being carried out by the NNL Environmental Characterisation Team in the Waste Management and Decommissioning (WM&D) business area. The work is being undertaken on behalf of CNPE. The agreement, signed in June 2015, covers reactor design and environmental impact.

CNPE is seeking to improve understanding of the requirements for undertaking radiological impact assessments relating to gaseous and liquid waste disposal from nuclear reactors in the UK.

A two day technical meeting to discuss the assessment of radiological environmental impact took place in Beijing in January. NNL WM&D Business Leader Matt Randall led a team that also featured Linda Fowler and Simon Kwong from Environmental Characterisation.

Subsequent feedback from the customer has been very positive including:

"Thank you very much for your great presentations covering the technology report and the discussions that answered many questions we put forward.

"I and my colleagues have learned much about the parameters applied to the UK radiological environmental



Delegation from China at NNL Warrington

impact assessment through your introduction and exchange.”

The customer has been delighted so far with the quality of NNL’s work and has requested that further offers covering five packages of work be made.

Reactor Chemistry and Materials

The NNL Reactor Chemistry and Materials (RCM) team, part of the Reactor Operations Support (ROS) business area, is involved in the second contract with CNPE. The CNNC subsidiary is seeking to promote its nuclear technology in the UK market. The contract is aimed at providing technical information relevant to the UK.

It consists of work packages relating to reactor design including consideration of environmental impact, materials

selection and the corrosion properties of materials during their deployment in reactor systems. The work followed on from discussions with CNPE and the subsequent development of proposals by the NNL RCM team working with colleagues from the Strategic Business Development team.

A significant part of scope relates to guidance on the reliable operation of nuclear power plant seawater cooling systems. Cooling water is an essential part of any power plant. Nuclear stations use cooling water to extract heat from condenser equipment and other auxiliary heat exchanger systems.

The aim of the project was to detail current industry best practice, based on UK experience, for anti-corrosion and anti-fouling in seawater systems. Due to the significant requirement for cooling water, all currently operational

UK nuclear power plants are situated on the coast or in estuaries. Members of the RCM team have extensive experience and knowledge in this area. Over the past few months, the RCM team has reviewed current industry best practice and compiled a detailed report to meet the scope of CNPE’s requirements.

A final customer meeting with CNPE in Beijing saw members of the RCM team - Steve Walters, Fiona McLachlan and Sarah Harris - travel to China and present an overview of the report to CNPE.

The meeting was the culmination of a successful project in which NNL has formed a good working relationship with CNPE. Further follow-on discussions are underway and NNL is looking to build on a successful package of work for CNPE and CNNC.

UKTI Greater China Bites Seminar

Businesses and organisations from across the north-west of England ranging from oil companies to machinery manufacturers have been honoured for their commitment to supporting business links with Greater China.

The 11th Annual Greater China Awards took place at The Lowry in Salford and allowed guests the perfect opportunity to celebrate the Chinese New Year in the year of the Monkey. Prior to the awards ceremony, the China Bites seminar took place with delegates hearing an opening address from Nick Whittingham, British Consul General in China.

Nick discussed export opportunities for UK businesses in Middle China and the relationship between Manchester and its twin city of Wuhan. The event also featured talks from industry leaders regarding best practice on selling, buying and partnering in Greater China.

In the Annual Greater China Awards, NNL finished in a very creditable third place and was recognised for its co-ordinated and co-operative approach to nuclear R&D collaboration. NNL Strategy and Commercial Director Chris Moore and Business Development Manager Ozma Taylor were there on the night to collect the award on behalf of NNL.

The Awards form part of the UK Government’s ‘Exporting is GREAT’ campaign, which aims to inspire and support 100,000 additional UK exporters to sell their goods and services overseas by 2020.

Launched in November 2015, ‘Exporting is GREAT’ is designed to empower UK Small and Medium sized Enterprises (SMEs) to take advantage of the global appetite for British products, skills and expertise in markets.

In partnership with major British businesses, the programme will support companies at every stage of their exporting journey – from identifying opportunities to winning contracts overseas.



NNL at Civil Nuclear Showcase

A strong delegation and exhibition illustrated NNL's commitment to demonstrating the breadth of the UK's nuclear capability at the latest Civil Nuclear Showcase in London.

The sold out event was led by UK Trade and Investment (UKTI), the Government agency that works with UK based businesses to ensure their success in international markets through exports). UKTI also encourages and supports overseas companies to look at the UK as the best place to set up or expand their business. NNL has worked closely with UKTI on international programmes in recent years.

NNL Managing Director Paul Howarth hosted on Day One of the three day programme and Fuel Cycle Solutions Director Fiona Rayment presented a talk on defining how R&D supports the success of the industry. The NNL exhibition attracted a great deal of interest and the delegates were in demand throughout the many networking opportunities. During the Showcase, NNL attended a meeting and dinner with the Emirates Nuclear Energy Corporation (ENEC).

Discussions focused on nuclear security, safeguards and non-proliferation and the UK perspective that NNL can provide. ENEC are looking for input from NNL to help define their decommissioning and waste management policy.

The NNL China Team was also heavily engaged during the event as Paul Howarth and Strategy and Commercial Director Chris Moore met counterparts from the Chinese National Nuclear Corporation (CNNC) to continue discussions on the next steps for establishing the UK-China Joint Research and Innovation Centre (see page 8).



Savannah River Joint Study

Constructed during the early 1950s, the Savannah River site in South Carolina USA produced the basic materials used in the fabrication of nuclear weapons.

Five reactors were built with a suite of support facilities including chemical separation plants, a heavy water extraction plant, nuclear fuel and target fabrication facility, tritium extraction facility and other waste management equipment.

Working in partnership, the Savannah River National Laboratory (SRNL) and NNL have won a contract from the US Department of Energy to undertake an assessment of groundwater clean-up of carbon and technetium at the site.

NNL will provide a state of the art environmental modelling capability to help underpin the understanding of experimental and field data. SRNL will undertake laboratory and field studies to support design and implementation of clean-up.

The study builds upon work already carried by NNL to examine the behaviour of key contaminants and a long standing collaboration between SRNL and NNL to compare methods of contaminant migration modelling.

The work will test NNL's approach to contaminant clean-up with the potential for knowledge transfer to improve support to other clean-up programmes.



NNL's New PhLAME

An exciting new collaborative research group 'PhLAME', established by NNL and The University of Manchester, has been launched at a special event. The prestigious launch took place at The University of Manchester's Photon Science Institute.

PhLAME is the Photonics and Laser Analysis of Materials and Environments Research Group. It has been created around researchers from the NNL Environmental Services and Reactor Operations Support teams.

The NNL teams will work alongside a number of schools from the University including Earth and Environmental Sciences, Mechanical, Aerospace and Civil Engineering, Chemical Engineering and Analytical Sciences and also Physics and Astronomy. The PhLAME Group will undertake research in all aspects of photonics and laser-based characterisation and analysis, with a particular focus on nuclear industry applications. The research is divided into separate themes, led by people from both organisations.

Much of the PhLAME research is based in the state of the art laboratories at the University's Photon Science

Institute. These include the PHoton Analysis by Remote Observation Suite (PHAROS) Laboratory, which was officially launched in 2014.

The work is specifically aimed at materials identification, characterisation and monitoring in nuclear and other industry environments, such as during the decommissioning of nuclear plants and monitoring of deep geological disposal facilities.

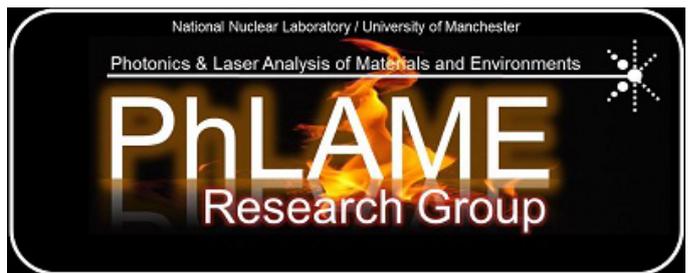
The PhLAME Group launch was attended by VIPs from the University and NNL and by others from wider industry. A high level group of keynote speakers introduced PhLAME and outlined the research work being undertaken. The launch ceremony was led by Professor Bruce Hamilton, Director of the Photon Science Institute who highlighted the importance of collaboration to create multi-school/organisation research hubs.



PhLAME Launch

Commenting on PhLAME, NNL Chief Scientist Andrew Sherry said: "The launch of the NNL/University of Manchester PhLAME Group provides an excellent example of high-profile collaboration between NNL and academia.

"The fundamental and applied research that the Group undertake and, importantly, the translation of that research to real application within the industry, will enhance nuclear operations, clean-up and waste management."



Reporting Great Science

Working with EDF Energy, NNL co-sponsored a Science Media Centre 'Introduction to the Media' event. The Science Media Centre is an independent press office helping to ensure the public have access to the best scientific evidence and expertise through the news media when science hits the headlines.

This event took place in April and ran in collaboration with Manchester University's Dalton Institute. Content was modelled on a format devised by the Science Media Centre over a decade ago and has been running regularly ever since, although this particular event was specific to the nuclear industry. All of the case studies used focused on nuclear stories.

Technology Supply Chain in Action

NNL's support for technological solutions to some of the industry's biggest decommissioning and waste management challenges was underlined recently when NNL and The University of Manchester organised an event on behalf of the Nuclear Institute Cumbria Branch.

The Nuclear Institute's 'Technology Supply Chain in Action' event was held earlier this year ahead of the NI Cumbria branch dinner.



Paul Collings

Co-sponsored by NNL and Sellafield Ltd, the day began with a conference at the Energen facility in Workington, West Cumbria. Research organisations, Tier 2 contractors, Small-Medium sized Enterprises (SMEs) and Universities responded to the request to participate and were able to showcase their technologies and research.

Poster presentations and table-top devices were displayed alongside enthusiastic promoters! During the conference, poster sessions were interspersed with talks on Innovation from industry and the supply chain.

The first session, chaired by NNL's Head of Technology Commercialisation Paul Collings, featured distinguished keynote speakers. NNL's Chief Scientist Andrew Sherry spoke about innovation challenges in nuclear decommissioning and the barriers that need to be overcome for innovation to make a difference.

Sellafield Ltd's newly appointed Technical Director, Rebecca Weston, gave a keynote speech about the innovation opportunities at Sellafield. Rebecca was keen to point out that as Sellafield moves to deal with its unprecedented decommissioning challenge, there will be a need for innovation to help reduce costs and Sellafield will embrace external development of technologies by the supply chain.

James Rudd, Business Development Manager at NSG Environmental gave an informative talk on the technology that won the SME Innovation Award at the Nuclear Decommissioning Authority's Supply Chain Event in November. The technology solved the problem of dealing with legacy contaminated water in tube stores at the Harwell site in Southern England.

The second session was chaired by NNL's Innovus Programme

Director Adrian Davis-Johnston. Adrian introduced Mike Angus, NNL's Corporate Chief Technologist and Tom Scott, Director of the Southwest Nuclear Hub at the University of Bristol. Mike and Tom spoke about the collaboration between Universities, NDA, Sellafield Ltd and NNL on the 'DISTINCTIVE' programme. DISTINCTIVE incorporates 32 research projects within the broad area of nuclear waste management, decommissioning and disposal.

Barry Lennox, Research Director at the Dalton Nuclear Institute spoke about the devices his research group at the University of Manchester are working on in conjunction with a West Cumbria-based SME, Forth Engineering. Finally, Mike Guy, Sellafield Ltd's Remediation and Decommissioning Projects Technical and Strategy Manager spoke about Sellafield's Active Demonstrator Facility and its role in bringing added innovation to decommissioning.

Around 50 of the delegates visited NNL's Workington Laboratory to view a number of technologies being showcased. Studsvik, in conjunction with Antech, demonstrated their Embassy technology which is used to measure contaminants in soil and rubble prior to disposal. Representatives from Nuvia demonstrated their HIRAM and GEM technologies for contaminated land survey.

James Fisher Nuclear Ltd also attended to demonstrate their simple solution for moving metal objects around decommissioning storage ponds. A combination of buoyancy bags from the oil and gas industry and pneumatically-controlled industrial magnets have been tested to overcome difficulties in using traditional crane hooks and slings in difficult environments.

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Size Matters for Construction News

NNL External Relations Director Adrian Bull contributed an opinion piece 'Size now Matters in Nuclear Market' for Construction News. Adrian asked the question is bigger always better when it comes to nuclear reactors? His conclusion was that it depends.

Large reactors such as those planned for Hinkley Point or Wylfa on Anglesey are based on established technology and have the opportunity to learn from experience elsewhere in the world. If large quantities of electricity are needed, 1,000 MW or more and a suitable site is available to build a substantially sized station then a large reactor is the best bet.

These reactors take a long time to build and have high capital costs. They also require a coastal site for cooling water, which limits where they can be built. A range of newer Small Modular Reactors offer potential advantages such as reduced upfront costs and construction times.

SMRs can potentially be built on inland sites closer to where the electricity is needed such as a city or a big energy-intensive industrial facility. Some SMR designs also open up

routes to deploy novel technologies such as fast reactors, different fuels or the use of molten salts as the coolant or even the fuel. If a utility is looking to select a reactor to buy, there is a choice to make depending on circumstances.

In 2014, NNL made an influential contribution to the debate about the potential use of SMR technology in the UK. The long awaited feasibility study was produced with Government by a consortium project managed by NNL and led by an independent project director. The study is available on the website at nnl.co.uk. Adrian's article in Construction News is available in full at constructionnews.co.uk.



Technology Supply Chain in Action continued

... continued from page 12

Students and academics from The University of Manchester presented research on remotely-controlled underwater vehicles and progress on robotics, including collaborative work with Forth Engineering.

Two NNL projects, running in collaboration with Sellafield Ltd and NDA, were also demonstrated. The first covers research being carried out on Hot Isostatic Pressing, a technology for immobilising nuclear material. The second showcased NNL's impressive project, being developed with Kuka Systems UK Ltd, to use robots for segregating and sorting waste nuclear material.

Following the event, Paul Collings said: "It was a pleasure, as the UK's National Nuclear Laboratory, to lead this event and have the chance to showcase technologies from the breadth of the supply chain. "I would like to thank all companies and researchers that attended. Without their support, this event would not have been possible.

"I would also like to thank the speakers, who gave up their time to talk authoritatively at the event, Rebecca Weston and Neil Smart from Sellafield Ltd and the Nuclear Institute Cumbria Branch Committee for their enthusiastic support, to Adrian Davis-Johnston and the team at Innovus who did an excellent job in arrangements at Energus and to all involved with the NNL Workington Tour."

NNL People:

Des Wright - Business Leader, Civil Post Irradiation Examination

Having been born in close proximity to nuclear, the industry remains a passion and a huge part of Des Wright's life.

Des is originally from Hartlepool, the home of a nuclear power station with advanced gas cooled reactors.

With the nuclear industry a close neighbour as he grew up, Des has maintained a strong connection and now works for NNL at Sellafield where he is the Business Leader for Civil Post Irradiation Examination (PIE).

"Hartlepool power station is situated just a couple of miles south of my home town," he said. "I was aware of the industry from quite a young age and its positive influence in the local community."

Des has been with NNL since 1992. His current role sees him leading a team that supports the operational requirements of the current UK reactor fleet including Hartlepool. "In NNL we have tremendous experience in the PIE of commercial reactor fuels and irradiated reactor components," he said.

"Effective PIE enables us to better understand the behaviour of materials in a reactor. Our facilities and expertise means we can handle a full range of fuel and irradiated materials, including steels and graphite.

"We offer non-destructive and destructive PIE for the seven AGR stations and can also handle novel fuels and very small and often fragile specimens. We're always looking to improve our services by developing new evaluation techniques."

New Challenge

Having been involved in NNL facility management for over a decade, the Business Leader role is a new challenge. "It's good to be back in the Windscale Laboratory where I was Facility Manager for eight years," he said. "But this time it's a completely different role.

"We're moving towards the final stages of new contract negotiations with EDF Energy, our major customer for PIE services. The contract is a long term agreement covering five years and I'm delighted that our relationship with EDF Energy has strengthened.

"We've worked hard to improve our services, build trust and operate in an environment based on openness and transparency. We look to make our business decisions around satisfying the needs of the customer."

NNL's work is essential in supporting safety cases for EDF Energy's suite of AGRs. It has been announced that closure dates for stations at Heysham (reactor 1) and Hartlepool have been extended by five years to 2024 and Heysham (reactor 2) and Torness by seven years to 2030. The news followed extensions previously announced covering other AGRs at Dungeness, Hinkley Point and Hunterston.

"We're very aware of how important our services are to the customer," said Des. "Providing ongoing excellence is a priority and we're working with EDF Energy as one of their strategic partners to develop a lifetime agreement."



"We're also looking to develop our services beyond PIE and fuel and graphite performance. There are different reactor types already online or starting up across the globe. We're looking at how we might be able to support in new markets.

"The Windscale Laboratory is a tremendous facility and the recent comprehensive refurbishment means it will be available to us until at least 2035. There's a dedicated and talented team of people in the plant and they're committed to providing the best possible services for customers."

PhD, Biosensors and Sellafield

A chemistry enthusiast, Des studied the subject at Newcastle University before gaining a PhD in electrochemistry. On graduating in 1992, he moved to Cambridge to join a company involved in biosensor research. He spent five years there before looking to move on and increase his development and progression opportunities.

He spotted an advertisement in New Scientist magazine for nuclear fuel cycle services company British Nuclear Fuels plc (BNFL). BNFL was looking for new researchers to be based at the Sellafield site.

"I had and still have a strong belief that nuclear is part of the long term global energy solution," he said. "I was excited at the possibility of becoming involved in applying science and technology to the industry's challenges.

"I was successful with my application and joined BNFL Research and Technology (R&T) at Sellafield and was part of an influx of young people. BNFL was looking to build its R&D skill base to address some depletion caused by people moving from research into operating major projects.

"This presented exciting opportunities for younger people arriving into the industry. R&T has developed and evolved into the independent NNL we see today."

From R&T to NNL

Des spent his first years in the industry as a Research Associate working on advanced reprocessing concepts and ideas. He progressed to become a Team Leader in Process Chemistry before developing his career by moving into team management working on intermediate level waste cementation then on to high level waste research.

"I was very lucky to come into contact with good people," said Des. "I learned a lot from great mentors like the late Ivan Owens working on high level waste. I became involved with setting up NNL's Vitrification Test Rig (VTR)."

The VTR is a full scale replica of the Sellafield Waste Vitrification Plant (WVP) process. The WVP treats high level waste on the Sellafield site and is a key plant. NNL's VTR supports WVP and has delivered solutions to challenges over the years in a non-radiological environment. In 2014, the VTR celebrated a decade of successful operations.

"I look back on my involvement in VTR with great pride," said Des. "We were quite painstaking in recruiting the right people and that investment has paid dividends. In NNL we're proud of the calibre of the people we have working across the business and our sites."

Business Processes and Laboratory Management

Des enjoyed a year implementing new business processes during the mid-2000s. "It represented a change of direction," he said. "With NNL I've been fortunate to participate in a

broad range of roles and opportunities.

"The business is the right size to generate varied personal opportunities while not being so big that people feel they have to specialise immediately. If you want to specialise then you can but I've found that there are always new challenges available."

Des was looking around at what to do next when he was presented with an offer he couldn't refuse. "Facilities and Safety Director Keith Johnson offered me the opportunity to be involved in facilities management at the Windscale Laboratory," he recalled. That was the start of his eight-year stint as Windscale Laboratory Manager.

Big Changes and Improvements

"The Windscale Laboratory is a great facility with an excellent team of people," said Des. "Being a mature facility, by the early 2000s it was requiring regular maintenance and needed refurbishment to bring it up to modern standards."

Des took over as Laboratory Manager in 2005. "The plant had certainly earned a facelift having operated for more than four decades," he said. "While the investment activity was being carried out, the facilities team worked extremely hard to balance plant operations with the needs of the refurbishment programme."

The renovation work included removal of legacy waste items as well as major access improvements, material handling and import/export capability, the fuel element transfer system, ventilation systems and electrical cabling.

"Thanks to everyone involved we made tremendous progress," said Des. "Sometimes we have a tendency to be modest and undervalue what's been achieved. There's a very impressive 'can do' attitude around the Windscale Laboratory and I'm immensely proud of my time in the facility."

Central Laboratory

In 2013, Des took over as Facility Manager in the Central Laboratory.

"There's quite a contrast between the two facilities," said Des. "The Central Laboratory is still relatively new and more about research while Windscale is a production plant.

"Working at the Central Laboratory took me back to my early days delivering research projects. We worked hard to align the Facilities team with the needs of users and to embed a greater customer focus into the culture.

"We also looked to proactively improve and integrate safety and quality into our daily operations. Again, I had the support of a very committed team.

Aligning with Family

Married to Alison, Des is a father of two boys and a girl aged 16, 14 and 12 and lives in Cocker mouth. His spare time is largely taken up with family activities. "I have hobbies around sports like swimming, running and football," he said. "It's mostly connected with what the kids are up to."

He's involved with football via Cocker mouth Junior FC. "It's an ambitious club," he said. "We have 300 kids in the club and cater for boys and girls. I spend up to 10-15 hours a week coaching or in my capacity as Chair of the club.

"We were recently voted the FA Cumbria Community Charter Standard Club of the Year, which was really good recognition for everyone associated with the club who give up their free time to help."

Looking Ahead with Confidence

There's still plenty of challenge to come for Des as a Business Leader. "It's early days," he said. "I'm keen to make my contribution and bring some new ideas with me.

"It's quite a change from what I've been doing over the past decade. Building a mutually beneficial relationship with the customer and the development of new business are key priorities. I'm looking forward to the challenge."

Technical Conference Declared a Hit

Themed 'Innovation into Action', the third NNL Technical Conference took place recently in Manchester. The event was well received and has subsequently gained very positive reviews and feedback.

The conference and programme attracted a wide range of internal and external delegates and featured technical presentations, an international panel session, poster competition and time put aside for networking opportunities. The NNL science and technology community were prominent with each commercial business strongly represented across each of the sites.

Record Numbers

The conference drew record numbers of external delegates from home and overseas. The academic sector was also present in significant numbers and featured a group of NNL sponsored PhD students from various Universities. Each student enthusiastically participated in the poster competition.

External companies and organisations sending representatives included Sellafield Ltd, the Nuclear Decommissioning Authority (NDA), EDF Energy, Rolls Royce, Westinghouse, Cavendish Nuclear, AMEC Foster Wheeler, Nuvia, Atkins, International Nuclear Services, AWE, the US Department of Energy and the China National Nuclear Corporation. UK Government departments were also present especially the Department of Energy and Climate Change (DECC).

Science and Technology Strategy

NNL Chief Scientist Andrew Sherry hosted the conference and made the Keynote Address, which focused on NNL's newly-published Science and Technology Strategy (see cover story).

Sessions were led by Chief Technologists from each of the NNL businesses - Anthony Banford (Waste Management and Decommissioning), Richard Stainsby (Fuel Cycle Solutions), Jonathan Hyde (Reactor Operations Support) and Mike Angus (Science and Technology). Paul Collings, Technology Transfer and Commercialisation Consultant in the NNL Strategic Business Development (SBD) team also led a session.

Research: The Cradle of Innovation

Fiona McLachlan, Materials, Chemistry and Modelling Business Manager in the NNL Reactor Operations Support



(ROS) business made the first technical presentation. Fiona focused on 'Radiation Science - Building a Capability to Support the Fuel Cycle'. She discussed why radiation science is important across the nuclear fuel cycle and where capability is required for the future.

David Mountford from the Nuclear and Reactor Physics team in the NNL Fuel Cycle Solutions (FCS) business then spoke about the 'Antineutrino Safeguards Detector for Reactor Monitoring'. David presented with collaborator Jonathan Coleman from the University of Liverpool. NNL and the University are involved in anti-neutrinos detector simulations with the aim being to develop a commercial prototype.

Nassia Tzelepi covered 'Mechanisms of Formation in and Release of Carbon-14 from Reactor Graphite'. Nassia is part of the NNL Fuel and Graphite Performance team in the ROS business. The management of Carbon-14 contained in graphite waste is a major challenge and Nassia outlined progress in a strategic project to deal with the issue.

Development: Driving towards Innovation

With future anticipated reactor build in the UK based on water reactor technology, Tony Brooks examined the 'Post Irradiation Examination (PIE) of Water Reactor Fuel' in the first presentation in the 'Driving towards Innovation' Session. Tony, a Business Manager in NNL ROS, outlined current progress in re-energising the UK's Light Water Reactor (LWR) PIE capability.

Based in the Thermo-Fluids team in the FCS business, Brendan Perry presented on 'Highly Active Storage Tanks (HAST) - NNL's Experimental and Modelling Programme'. The continued efficient operation of the HAST tanks on

the Sellafield site is fundamental to the site's highly active waste treatment programme. Brendan discussed NNL's contribution in supporting continued safe operations.

Dan Whittaker from the FCS Radiochemistry team spoke about 'Neptunium/Plutonium Flowsheet Development' and a new collaboration with the Oak Ridge National Laboratory (ORNL) in the USA. While Europe plans to use Americium as a power source for space exploration, the USA has historically used Plutonium. There is a programme of work to produce Plutonium by irradiating Neptunium and NNL is working with ORNL on the project.

The Innovation Imperative - Guest Speaker and Panel Session

The conference featured an excellent External Keynote presentation from Rebecca Weston, Technical Director for Sellafield Ltd. Rebecca's presentation was entitled 'The Innovation Imperative - A Sellafield Perspective' and introduced background to the challenges on the site and how Sellafield is thinking differently about clean up.

Rebecca also featured on a high level Panel discussion themed 'Overcoming of Innovation Barriers'. Panel members focused on innovation based on their own personal, company and national perspectives. Participating alongside Rebecca were NNL's Andrew Sherry and Jonathan Hyde, Professor Eann Patterson from the University of Liverpool (also a NNL Research Fellow), Robert Page from Cavendish Nuclear and Alice Caponiti from the US Department of Energy.

Demonstration - Innovation in Action

Gavin Cann from NNL's Immobilisation Science and Technology team in the Waste Management and Decommissioning (WM&D) business was the first speaker in the 'Innovation in Action' session. His presentation 'Applying Cement Science to Support Development and Operation of Waste Immobilisation Processes' provided an introduction to cement science, the materials used, support to operating plants and the continued development of cement-based immobilisation.

In 2014, NNL published a feasibility study into the potential use of Small Modular Reactor (SMR) technology in the UK examining four separate designs. Aiden Peakman from the FCS Nuclear and Reactor Physics team presented the latest SMR Technology Evaluations to conference. He described each of the technologies and examined the challenges to be overcome with all SMR reactor systems in relation to time and cost to deploy.

Charlie Scales from the Waste Residues and Progress team also in the WM&D business made a presentation on 'Progress in Developing Geomelt - Applying the Underpinning Science'. Charlie covered technology capability and the development partnership between NNL and Kurion. He described the role that Geomelt can play



Rebecca Weston

in addressing decommissioning challenges by producing a vitrification based waste form. A Geomelt System has been installed in the Rig Hall at NNL's Central Laboratory with initial trials planned on materials with low activity.

BEST Award Presentation and Paper

The Technical Conference was the perfect setting for the presentation of the Lawrence Medal to the NNL author of the Best External Scientific or Technical (BEST) article published externally. The 2016 winner was Paul Styman. Please see page 19 for more.

Cheryl's Triumph in Poster Competition

An impressive collection of more than 40 posters entered the 2016 competition at the conference. Entrants included NNL people and teams alongside University students. Each delegate was given three votes to choose their favourite posters. The richly deserved winner was Cheryl Carrigan from the FCS Radiochemistry team. Cheryl's poster 'Solid Characterisation Studies' looked at advanced separation processes for future closed fuel cycles. Cheryl received her prize from NNL MD Paul Howarth.

Productive Day

Paul Howarth wrapped up the proceedings following a very productive day. The event was bigger and better than ever and declared a great success. This has been underlined by subsequent feedback. The organising team is considering what went well, what could be improved and any other learning points to make next year's event even better.

Making a Positive IMPACT

Celebrating their fifth year, NNL's IMPACT Awards are a fixture on the social calendar. The latest dinner and ceremony took place in April at the Museum of Science and Industry in Manchester.

After a year which has included a number of challenges and successes for NNL, the IMPACT Awards are an opportunity to step back and give richly deserved recognition to some of the many NNL people who have gone the extra mile to help the business in all sorts of ways.

Nominated by NNL People

IMPACT Awards nominations are mostly made by NNL people for NNL people with Pioneering Science and Technology Awards chosen by specialist panel. In 2016, over 400 nominations were received representing a very healthy return and a real testament to how much the Awards are recognised and valued across the business by people at all levels.

The winners were spread across the NNL sites with each pulling the stops out to help take the business forward. The dinner featured the winners, successful nominators and other distinguished guests with a record number of external VIPs including a party from overseas. Introduced and hosted by MD Paul Howarth, the ceremony featured the full suite of IMPACT Awards.

Proud winners were:

Business Team of the Year
Preston Laboratory Pilot Plant

Project Team of the Year
Graphite Performance Team

Consistent Can-Do (Internal Customers)
Emma Macdermott

Consistent Can-Do (External Customers)
Robin Orr

Good Citizen
Mike Edmondson

Environment, Health, Safety and Quality Excellence
Charlotte Stone

Security Excellence
Karen Verrall

Inspiring Leader
Colette Grundy

Fantastic Manager
Dave Brown

Newcomer
Clive Smith

Personal Development
Luisa McGregor

Ground-breaking R&D
Colloids team

Breakthrough Innovation
Owen Horsfall

Winning Nominators

In addition to the winners, nominators providing the best nomination for a winner were also invited to the Awards Dinner.

High Flying Speaker

Guest speaker at the IMPACT Awards was Andy Wyatt. Having been a member of the crack Royal Air Force Aerobatic Team, The Red Arrows, Andy now flies commercial long haul routes.



Host: Paul Howarth

He presented an interesting talk illustrated with footage of the Red Arrows in action.

Make Note of Special Contributions

Paul Howarth rounded off another successful IMPACT Awards evening, the biggest so far, with a reminder to NNL colleagues to keep an eye out for examples of people making a special contribution to the business and deserving recognition in 2017.



Winners: Graphite Performance Team

Paul's the BEST!

This year's winner of the coveted BEST Award received his prize at the NNL Technical Conference. For the past three years NNL has presented the BEST Award and associated Lawrence Medal to the author of the Best External Scientific or Technical article published externally.

The Winner and recipient of the Lawrence Medal in 2016 is Paul Styman.

Congratulations to Paul, who works in the Materials, Chemistry & Modelling team at NNL Culham. He was lead author on a paper published by the Journal of Nuclear Materials 'Post-irradiation annealing of Ni-Mn-Si-enriched clusters in a neutron-

irradiated RPV steel weld using Atom Probe Tomography'.

Paul's winning paper was chosen following a thorough shortlisting and judging process. A total of five papers were shortlisted, which in turn were chosen from nine papers entered into the competition.

Papers were judged on technical and scientific content, coherency of argument, innovation and impact of the science. Each of the five shortlisted papers were of a very high standard. However, the BEST Judging Panel felt that Paul's paper had the edge.

The runners-up were Robin Boothby, Mike Carrott (winner of the Lawrence Medal in 2015), Ewan Maddrell and Martin Metcalfe.

Paul was presented with his award and the Lawrence Medal by Chief Scientist



Paul Styman with the Lawrence Medal

Andrew Sherry at the NNL Technical Conference in Manchester at the end of April. He presented his paper to the conference with the runners-up also invited to attend.

New NNL Chairman

At the end of last year, the Department of Energy and Climate Change (DECC) announced the appointment of Sir Andrew Mathews as the new NNL Chairman.

Sir Andrew, who has been a Non-Executive Director with NNL since June 2014, succeeds Richard Maudslay.

His appointment became effective on 1st January. He previously enjoyed a distinguished career spanning over 35 years in the Royal Navy, during which he rose to the rank of Vice Admiral. He held a series of senior roles including latterly Chief of Materiel Fleet, where he had charge of over 4,500 people and an annual budget in excess of £5 billion.

Speaking about his appointment as NNL Chairman, he said: "I'm delighted to be selected for this important appointment and at such exciting times. There is a genuine opportunity for NNL to sit at the heart of the UK's revitalised civil nuclear programme, but it will not be without its challenges.

"I am looking forward to working with my Board colleagues as we navigate our way to achieve our vision of being a world-leading national nuclear laboratory. As I take over from Richard Maudslay, I would like to acknowledge the huge contribution his leadership and guidance have made over the six years of his chairmanship, since NNL was formally established in 2009."

Married to Beverley, Sir Andrew has two grown up children. He spends



his spare time restoring a house in Cornwall and rediscovering gardening. He also tries to find the opportunity to sail and cycle.

Innovus Game Changers

As Cumbria's successful technology commercialisation programme, Innovus, has created a very impressive 64 new jobs so far linked to projects it has supported.

Operated by NNL and The University of Manchester's Dalton Nuclear Institute, the Innovus programme is transforming the culture of research and development in Cumbria and inspiring clients to continually seek out the next innovation that will become the future of their business.

Launched in 2013, Innovus reaches out to individuals, researchers and small and large businesses, wherever they're based, to seek out solutions to technology problems including decommissioning challenges on the Sellafield site.

The key driver in everything Innovus does is to create jobs and wealth for the Cumbrian economy, whether through increased turnover, licensing or the creation of new enterprises. The scheme has invested £1.8M in innovative research projects, unlocking £3.2M of research and development

activity in private sector Cumbria based firms.

With support from the Regional Growth Fund, operating across England from 2011 to 2017, Innovus works with innovative Cumbrian businesses by helping them develop and sell the solutions that will overcome industry challenges.

Innovus is forecasting more jobs and growth in 2016 as a result of continued success and benefits from new initiatives like Game Changers, a partnership with Sellafield Ltd.

What is Game Changers?

Game Changers aims to work with Small and Medium sized Enterprises (SMEs), Universities and larger companies nationwide to unlock potential innovative ideas which can make a significant impact on the Sellafield decommissioning challenge.

A series of challenges will be issued to encourage fresh thinking, the first two being 'Characterisation' and 'Dismantling'. A social media campaign has been launched which will aim to create interest and awareness, opening the way for discussions of ideas.

Seed-corn grants will be available for each successful applicant to develop and discuss their idea with end users and industry innovation leaders with additional support and funding potentially available to develop the idea.

The overall objective of game changers is to save millions of pounds and speed up the vital decommissioning work as a result of innovative ideas and technologies. The Innovus website will display the challenges to attract innovative ideas, technology and opportunities from individuals and companies.

The decommissioning of the Sellafield site is predicted to take over 100 years at a cost of over £50 billion. To meet these decommissioning challenges there is a need to invest in the novel technologies, ideas and methods which are either new in concept or new to the industry.

From technologies and methods already used in other industries to non-standard technologies and approaches that address specific needs, Game Changers is looking to harness innovation wherever and whatever it is.

NNL's Adrian Davis-Johnston, the Innovus Programme Director said: "Innovus is the perfect vehicle for Sellafield Ltd to reach its target audience with great routes into the SME and supply chain communities as well as academia and the national laboratory. Innovus has quickly built a reputation for promoting great new technologies.

"We want to reach out for innovation from all sectors, perhaps especially those that don't have knowledge of the nuclear industry, to have a fresh perspective and to challenge us with new ways to address our most pressing challenges."

For more information about Innovus and Game Changers, please visit the Innovus website at innovus.org.uk.



Prestigious Prize Winner

Kevin

NNL Senior Fellow Kevin Hesketh has been awarded the prestigious Institute of Physics Nuclear Industry Group Career Contribution Prize for 2016.

The Institute of Physics Nuclear Industry Group is a collection of physicists involved with or interested in the nuclear sector. The group is concerned with all aspects of the industry, including both the civil and defence-related areas and reflects the diverse roles that physicists have within it.

The Career Contribution Prize recognises those who have demonstrated outstanding levels of innovation and contributed to the progress of the industry over a sustained period.

NNL's Senior Fellows are world recognised technical experts. They act as a technical leads on a wide range of research

and development projects and are involved with collaborative research opportunities to promote NNL's technical reputation.

Kevin is NNL's expert on Nuclear Systems Analysis. He is primarily involved in providing technical consultancy to external customers on a diverse range of reactor and fuel cycle projects. He is also developing teaching and research links with the Universities of Birmingham and Manchester.



New Laboratory and Senior Fellows

Working collectively with the cohort of Senior Fellows, Laboratory Fellows look to develop and promote technical capability within their own areas, across NNL and also externally.

NNL has recently appointed a further five Laboratory Fellows. The new Laboratory Fellows and their specialist technical areas are:

Glyn Rossiter	Fuel Performance
Dave Goddard	Nuclear Fuel Manufacturing
Bruno Merk	Physics of Nuclear Reactors
Mark Sarsfield	Actinide Chemistry
Nassia Tzelepi	Graphite Technology

Laboratory Fellowship awards are made to candidates with a strong technical track record, a commitment to high quality science and engineering and the potential to reach the highest technical positions in NNL.

The Fellows undertake leading technical roles in specialist research fields and lead on science and technology based initiatives and external activities across industry and academia.

The latest set of appointments have been achieved through individual merit and a robust application process that requires a detailed written submission to be scrutinised by a committee appointed by NNL Chief Scientist Andrew Sherry prior to an interview taking place.

Laboratory Fellows may be elevated to Senior Fellow status if they continuously maintain and enhance their track record. The latest Laboratory Fellow to join the Senior Fellow cohort is Jonathan Hyde.

Jonathan is the new Senior Fellow in the Nuclear Materials technical area. He is also Chief Technologist for the Reactor Operations Support business directorate and is based at NNL Culham.

Beginner to Winner - NNL Apprentice Scheme

Apprenticeships are a key part of NNL's skills pipeline. Although we've employed apprentices for years, our brand new 'Beginner to Winner' scheme brings together both technical and behavioural development for the first time, with the added benefit of a co-ordinated support network.

Natalie White, NNL's Apprentice Co-ordinator explains more.

"With Government support, more and more companies are taking on apprentices.

"Given this increased competition, we've reviewed our existing scheme to make sure we can attract and nurture great young talent into our business and into the nuclear industry as a whole.

"In fact, as a National Laboratory, we feel it's our duty to support and

encourage opportunities for those taking Science, Technology, Engineering and Maths (STEM) subjects.

"We want to give people the best possible start to their careers, working alongside industry-leading experts. And we believe that it's just as important for our apprentices to develop behavioural skills - such as teamwork, leadership, communication and making an impact - as well as technical skills.

"We also want to connect people, to create a support network where our apprentices can share their experiences and learning. That's how



Getting To Grips: Apprentices tackle an outward bound challenge

my role came about - to help create, co-ordinate and support this network and to manage the scheme as a whole."

The apprentice support network is critical," added Natalie, "Some of our apprentices join at the age of 16, others at 18, depending on the skills and qualifications we're looking for.

For most people of that age, it's their first job. And while that can be exciting, it can also be quite daunting.

"That's why we allocate a mentor to each apprentice, drawn from our pool of graduates. We believe it's an ideal pairing and will prove to be really beneficial for all concerned.

"We're also investing time into creating a virtual team environment for the apprentices, recognising that they're spread across different sites and teams. This began last autumn when we invited our most recent cohort of 20 apprentices to an off-site 'introduction' event.

At a Glance - NNL Apprentices

NNL has employed around 60 apprentices since 2011

Schemes vary from generalist to technical and range from 24 to 39 months.

Although historically male-dominated, there has been an increased interest from female students and expectation that more will join the scheme in the future.

Over 95% of apprentices have gone into permanent roles.

There are currently 26 apprentices working in the NNL business

Around ten more are likely to be recruited starting in September

With planned changes to Government funding and incentives, this is likely to increase in future years.



“And what’s great is that our apprentices are also gaining internal and external recognition. Their achievements are formally recognised via our annual Apprentice of the Year Awards. And recently, at the eighth annual UK Nuclear Skills Awards, two of our apprentices were recognised.”

Kerry Burns received the top honour, winning Scientific Apprentice of the Year and Charlotte Fee took a coveted runners-up award in the Business Support category. For more details please see page 25.

What did the apprentices think?

“The most important lesson I’ve taken away is that the only limit is the one you set yourself.”

“Having to understand the real life impacts if something was to go wrong, gave me a good idea personally of how it is at work. The teamwork and social networking also contributed to my learning.”

“The event helped communication skills, promoted fresh ideas by working with new people, and helped break the trust barrier, as you had to let someone else be in charge of your safety at many different points in the week.”

“I learned the value of considering other people’s limits as well as my own, and I will use this when considering others’ capabilities and limits when planning and doing future work.”

“This was a great way to get people talking to each other and sharing their experiences and aspirations. We followed it up with a week-long outward bound event in the Lake District, centred around team-building and behavioural learning.

“The team shared a house in the Lake District and took part in a range of tasks. These ranged from ghyll scrambling and mountain climbing, to venturing out on Lake Windermere in the dark.

“The tasks were designed to take the participants out of their comfort zone, whilst developing skills such as teamwork, resilience, tenacity, planning, organising, and even cooking – yes, they even had to cook their own meals!

“Everyone enjoyed it and feedback has been really positive,” said Natalie.

“And it was a great way of applying new skills to unfamiliar situations, while really getting to know each other. We’ll definitely repeat it for our next cohort, but perhaps in the summer when it’s a bit warmer!

“If our apprentices choose to leave NNL and move elsewhere in the nuclear industry, we’ll see that as a positive thing, knowing that we helped to steer them to an exciting and rewarding career.”

So what’s next for the NNL ‘Beginner to Winner’ scheme? “We’ll keep evolving and improving it,” said Natalie.

“We’ll act on the feedback of our current cohorts and look to make it even better for the next group coming through. We want our apprentices to grow from ‘beginners’ to ‘winners’, potentially becoming leaders of the future.



How can people find out more and apply?

It’s simple, NNL has a dedicated website - nnlfuturedrive.co.uk

The site provides more information about the various schemes, together with details about how to apply.

Cheryl's a Space Ace

Graduate Scientist Cheryl Carrigan enjoyed an early career highlight when she attended a high level workshop to discuss Radioisotope Thermoelectric Generator Space Power at the Royal Astronomical Society in London.

NNL is contributing to the European initiative to produce a new generation of space battery. On behalf of the European Space Agency (ESA), NNL is examining the technical feasibility of using americium in a Radioactive Thermoelectric Generator (RTG) (space battery) to power future generations of European led space missions.

Cheryl, who works in NNL's Radiochemistry team in the Fuel Cycle Solutions (FCS) business, said: "Since joining the NNL graduate programme, I have had the opportunity to attend events aimed at extending my level of business acumen and developing my professional network.

"I was delighted to be invited along to the workshop at the Royal Astronomical Society. The event hosted some of the most influential and aspiring people from organisations such as NASA, the US Department of Energy and ESA. Although a relative newcomer this is an area which will be a focus in my career."

NNL Spent Fuel Management Technology Business Leader Tim Tinsley officially opened the event, which provided an overview of space radioisotope power systems both in the US and Europe.

This was followed by technical presentations from delegates covering progress in the various development programmes.



NNL Graduate Cheryl Carrigan

Cheryl soon settled at the event and enjoyed the experience. "Although I expanded my knowledge as a result of the workshop, the experience gained from my industrial placement year with NNL when I worked on the ESA space batteries programme was very helpful," she said.

"However, the meeting enabled me to gain a better insight and understanding into the ESA programme as a whole and how the smaller sections of the project work together towards a greater goal."

She also had the opportunity to attend a networking dinner at the House of Commons. "Before dinner we were given the opportunity to walk through the Palace of Westminster and learn about the history of UK politics as well as gain a glimpse inside the historic building," she said.

"The evening was an opportunity to network in an informal environment and for us all to discuss our thoughts about the day's presentations and share experiences even though I'm still at the start of my own career.

"It was great to be part of such an important event that presented me with a unique combination of opportunities to meet new people and hear about some of the cutting edge research being undertaken globally."



Success at Skills Awards

NNL emerged triumphant at the eighth annual UK Nuclear Skills Awards in Manchester. Two very special highlights saw Kerry Burns receive a top honour when she was named Scientific Apprentice of the Year while Charlotte Fee took a coveted runners-up award in the Business Support category.

Kerry works in NNL's Waste Management and Decommissioning business and is based in the Central Laboratory at Sellafield while Charlotte is part of the Procurement team and is based at the Workington Laboratory. It was a proud night for both Kerry and Charlotte and their families and friends.

NNL was delighted to be one of the sponsors at the event, which is organised by the National Skills Academy for Nuclear (NSAN).

The UK Nuclear Skills Awards has become an established event on the nuclear calendar. NSAN reported a 50-50 male/female split across the Apprentice, Graduate and FD/HND category finalists demonstrating greater diversity across the industry.

Kerry Burns

Kerry will complete her three-year apprenticeship with NNL in September this year. Her work is primarily carried out in laboratory conditions and she has been trained in all analytical techniques used within the team including use of Scanning Electron Microscope (SEM) equipment.

In a recent project she worked alongside the Savannah River National Laboratory (SRNL) in the USA to compare analytical techniques for the durability qualification of vitrified glass products. Her work with SRNL led to her travelling to the USA. Kerry was able to learn about ways of working at SRNL, which she found had great benefits and she was heavily involved in a successful reciprocal visit by SRNL to the UK.

Kerry has also been involved with induction for students, industrial placements and new starters within the company using her own very recent experience. She has been passing on her knowledge of the work being undertaken in NNL's non-active and active laboratories.

She completed her HNC in Applied Chemistry in the first 18 months of her apprenticeship. She is studying for her HND and NVQ level 3 in Laboratory and Associated Activities.



Winners Unite: Kerry Burns pictured left

Once completed she has ambition to undertake a Bachelor Degree in Chemistry.

Charlotte Fee

Charlotte is due to complete her apprenticeship with NNL in October this year and is part of the NNL Procurement team. She has carried responsibility for supporting the NNL company hire car contract across each UK site. She has collated safety related feedback and has become familiar with all aspects of occupational road risk. She is the first point of contact for questions and queries from hire car users and participates in quarterly contract review meetings with the supplier.

She has also been involved with major project work providing procurement updates to senior project management. Her role has included the expediting of critical path items and goods and services to meet tight deadlines. Charlotte has also taken responsibility for conducting annual competitive tender exercises for all of the service contracts at the Workington Laboratory.

She has completed studies for her NVQ Level 2 in Business and Administration and has progressed onto the Level 3 course. In addition, she is studying for a Level 4 Diploma in Purchasing and Supply Operations.

Congratulations from NNL to both Kerry and Charlotte for their tremendous achievements.



Innovation Delivered

At the UK's National Nuclear Laboratory, we deliver the right amount of innovation to meet our customers' needs.

On one level, we might simply drill a hole to analyse underground waste with our integrated microdrilling technology.

At the other extreme, we are developing state-of-the-art power systems to support deep space exploration.

Find out more about what we can do for you at www.nnl.co.uk or email customers@nnl.co.uk

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