

# Annual Report

2012



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# Delivering the best nuclear science and technology solutions in the world

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## Integrity, Innovation and Impact

### Key Highlights:

- All environmental, health and safety targets met and reached 11 million hours worked without a Lost Time Accident
- Strong financial performance with increased profit
- Significant progress in commissioning the world-class facilities in our Central Laboratory
- Winner of R&D Industry Sector Award from Royal Society for the Prevention of Accidents
- Continuing to build a thriving Corporate Responsibility programme
- Playing a key role in safeguarding UK nuclear skills and capability

# Chairman's Introduction

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Welcome to the 2011/12 Annual Report from the UK's National Nuclear Laboratory. The year was a critical one for the world's nuclear industry, as the various ramifications from the March 2011 Fukushima incident permeated around the globe.

For NNL, as well as being able to play a vital role in supporting the UK Government's response to Fukushima in a variety of ways, it was the year when the UK Government undertook a major inquiry into the role, scope and governance of nuclear R&D.

Both the House of Lords Select Committee's report and the Government's response indicated the need for a much stronger programme of UK civil nuclear research, with a central role for NNL. We are more than ready to take up that challenge. NNL's Managing Director, Paul Howarth, and a team led by our Chief Science and Technology Officer, Graham Fairhall, are actively engaged in programmes to ensure the nation's nuclear R&D programmes are put onto a stronger footing. Our work links fully with that being led by the Government Chief Scientific Advisor, Sir John Beddington.

Our strong technical and financial performance through the year gives us an excellent basis upon which to build as we embrace these new opportunities. I hope you enjoy reading about our successes in this report.



Richard H Maudslay  
CBE FEng  
Chairman



# Managing Director's Report

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Against the backdrop of an uncertain year for the nuclear industry at home and overseas, I was delighted with NNL's performance throughout the year. Most importantly - we achieved our target on safety and I was delighted that we once again secured a prestigious award from the Royal Society for Prevention of Accidents. In 2011 we were announced as the Winner in their Research and Development Sector - a fantastic achievement - more so that it was our 7<sup>th</sup> win in 8 years.

We also delivered some significant milestones - both in terms of work for customers and relating to our own facilities, including:

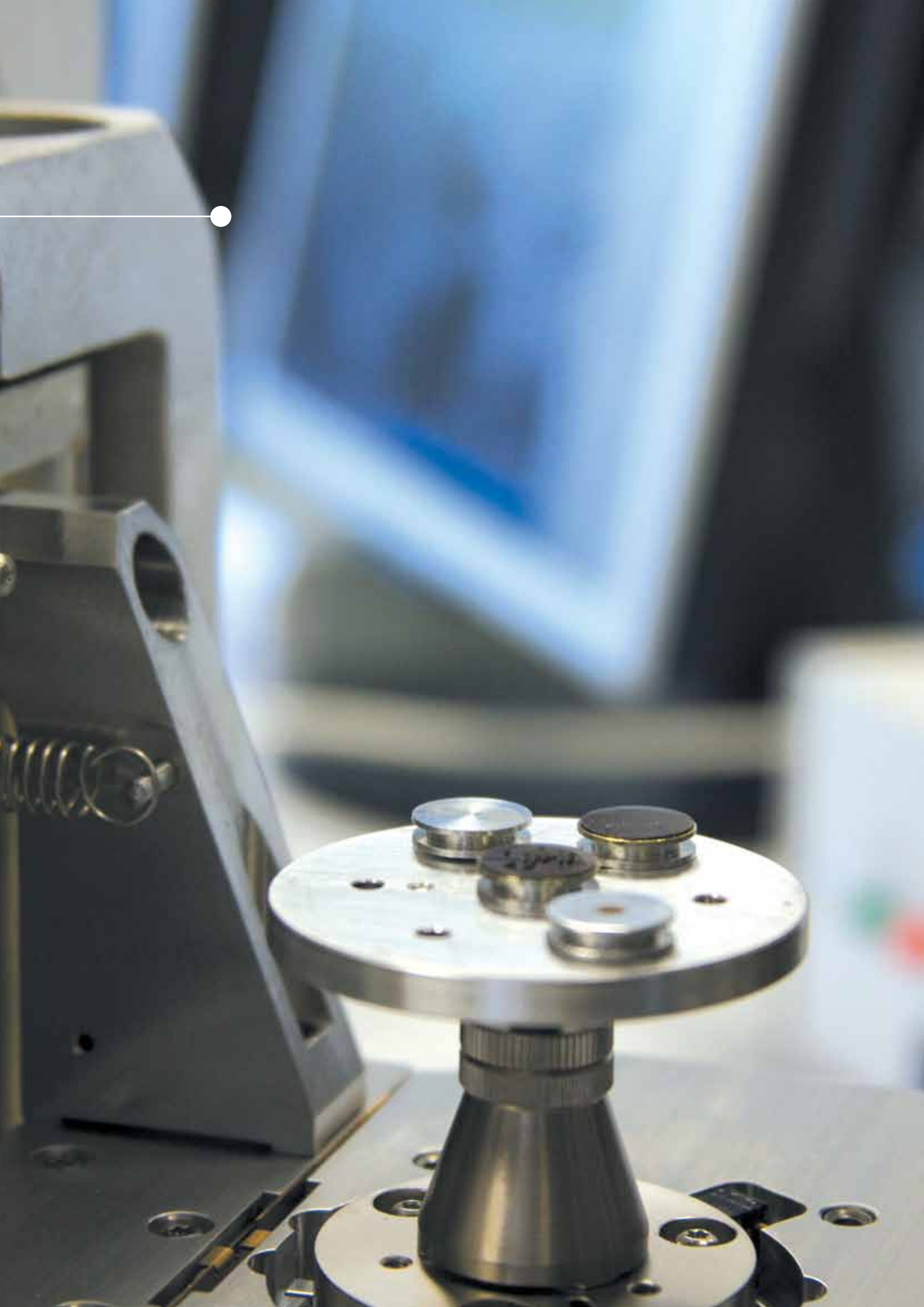
- Strengthening relationships with key customers including Sellafield Limited and EDF Energy
- Reorganising our business into three key areas so we are more focused on customer delivery to time, cost and quality (described further on page 6)
- Refurbishment work on the Windscale Laboratory and commissioning work on Phase 2 of the Central Laboratory
- Collaboration agreements with several academic organisations
- Our Signature Research programmes continue to develop and provide benefits for our customers and the wider UK nuclear industry

You can read more about these, and some of our other work, later in this report. Importantly, we did all of this while also remaining profitable and while continuing to invest some of that profit back into our own internally funded work and signature R&D programmes, which form a key component of our plans for the future.



Paul Howarth  
Managing Director





# Who We Are and What We Do

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NNL's principal activity is the provision of technology services across the nuclear fuel cycle. We provide an extensive and integrated range of technology services and solutions across the nuclear fuel cycle, based on a powerful combination of highly experienced workforce with unique skills and internationally recognised expertise and specialist nuclear facilities.

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The Company provides technical support and services to customers in three key areas of the nuclear fuel cycle:

## Waste Management and Decommissioning

Products and services are focused on supporting customers via the development and application of technologies and techniques that assist with the ongoing and eventual decommissioning of nuclear facilities. The business comprises the skills and facilities required to cover the full dimension of waste management and decommissioning projects. Key areas include environmental and effluent management, measurement and analysis and waste immobilisation technology. Programme integration and project management also form a key part of the service portfolio.

## Fuel Cycle Solutions

The business is focused on providing fundamental technical solutions to customers in the nuclear industry. It covers fuel cycle performance and technology development, spent fuel disposition and plant integrity. Other areas covered include nuclear security, safety management and engineering services. An advanced modelling and simulation capability is also a key part of the directorate.

## Reactor Operations Support

As the profile of nuclear generated energy continues its resurgence in the UK and internationally, NNL provides key services to reactor operations. These include post irradiated examination and performance of fuel, components and graphite. The business also offers services covering power station chemistry, endoscopy and metallography.

Our largest customers are the Nuclear Decommissioning Authority (NDA), Sellafield Limited, Magnox Electric Limited, Springfields Fuels Limited, EDF Energy and the Ministry of Defence (MOD).

The Company also serves other customers in the UK, USA, Japan, Europe and Middle East.





## Our Facilities

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In NNL, we have a number of unique nuclear facilities. The flagship facility is the Central Laboratory located on the Sellafield site in Cumbria. It is unique in the UK with a capability that includes active and non-active laboratories and an active rig hall. Other facilities include the Windscale Laboratory which is also on the Sellafield site (active handling and inspection), Preston Laboratory in Lancashire (low activity uranium research) and the Workington Laboratory in Cumbria (non-radioactive test rig services).

We have office-based facilities located at Risley in Cheshire (modelling and simulation/environmental management), Stonehouse in Gloucestershire (reactor operations support) and Harwell in Oxfordshire (materials science and chemistry).







Workington

Sellafield/Windscale

Preston

Rislely

Stonehouse

Harwell

# Financial Information

2011-2012 was a financially successful and profitable year for NNL. We have achieved our aim of being on a sound commercial footing and we are now in the process of finalising long term investments in key facilities which will complete the central plank of our commercial strategy. Funding for these investments will be provided by NNL's parent Company (NNL Holdings Ltd) and by re-investment of our profits. NNL is committed to ensuring that we generate sufficient profits to support these investments. The reorganisation we undertook during 2011 is already showing signs of delivering new revenues and we expect to retain focus on key markets and customers.

## Financial Highlights

	2012 £'000	2011 £'000
<b>Revenue</b>	83,996	78,272
Cost of sales	(61,408)	(58,829)
<b>Gross Profit</b>	<b>22,588</b>	<b>19,443</b>
Administrative expenses	(14,718)	(11,688)
<b>Profit from operations</b>	<b>7,870</b>	<b>7,755</b>
Finance income	222	59
Finance expense	(390)	(914)
<b>Profit before tax</b>	<b>7,702</b>	<b>6,900</b>
Tax expense	-	-
<b>Profit for the year</b>	<b>7,702</b>	<b>6,900</b>



# Environment, Health and Safety

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NNL won the prestigious RoSPA Research and Development (R&D) Sector Award in 2011 (and we were highly commended in 2012). This recognises us as one of the leading organisations for health and safety in the R&D industry in the UK. This external recognition confirms NNL's excellent health and safety performance and our ongoing commitment to EHS&Q improvements to ensure the safety of our employees, our customers and our stakeholders.

The Days Away Case (DAC) rate (rolling 12 months) is zero. We have achieved three million hours worked since the last DAC occurrence, and 11 million hours worked since our last RIDDOR reportable Lost Time Accident (LTA). There were no INES, significant environmental or RIDDOR Dangerous Occurrence events during the year.

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## Assurance

NNL continues to maintain its certification to the ISO 9001:2008 (Quality Management), ISO 14001: 2004 (Environmental Management and ISO 27001:2005 (Information Security) standards and to maintain the confidence of the certifying body, LRQA, in our commitment to high standards and continual improvement.

There were eight external customer audits in the second half of 2011/2012, including audits by EDF Energy, Sellafield Ltd and Rolls Royce. In all cases, NNL arrangements were deemed positive with only a few minor issues noted.

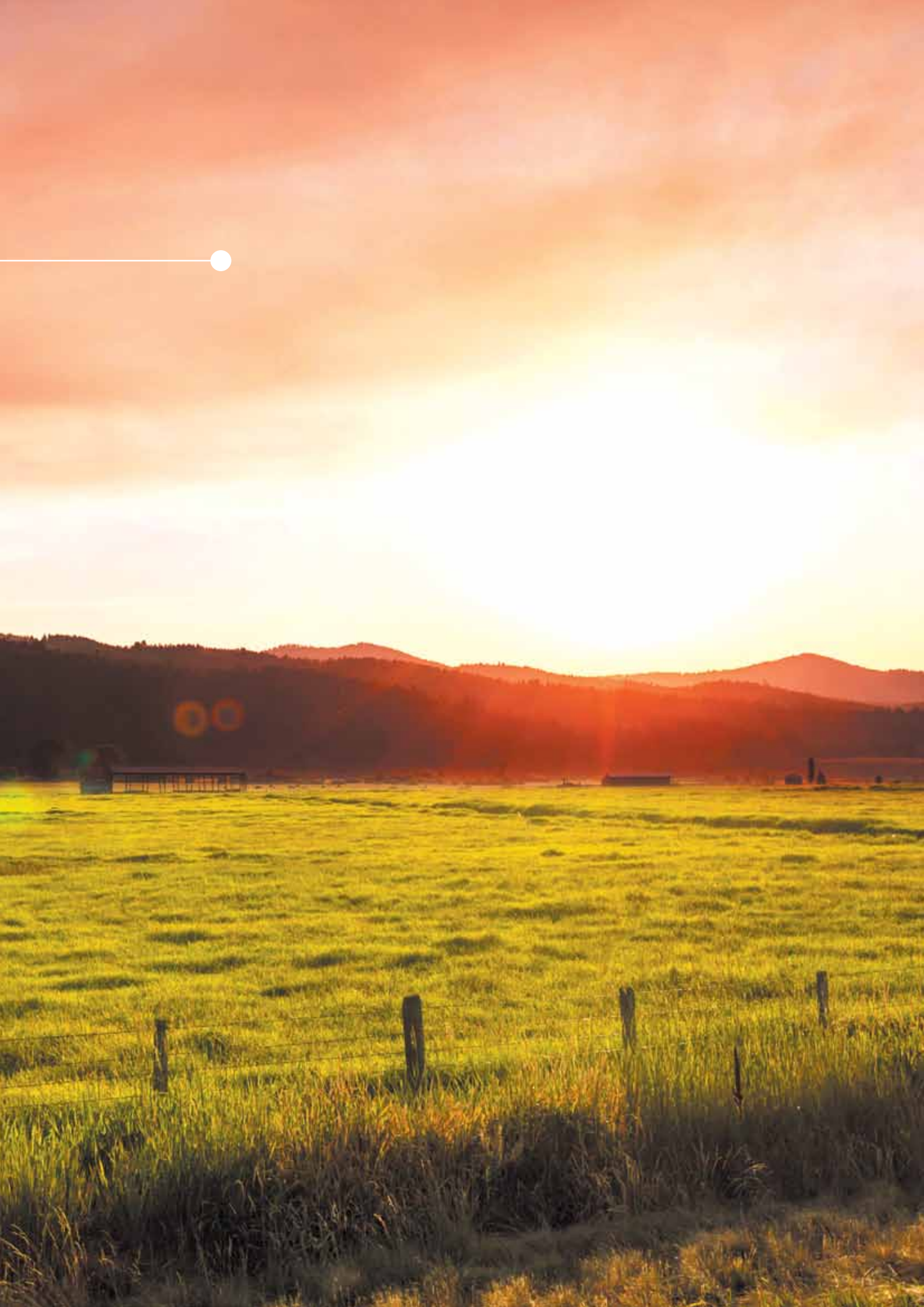
## Quality

Quality improvements have remained very high priority over the course of the year. The Quality Forum acts as the main focus. The Human Performance programme is supporting both quality and safety aspects of culture and is expected to continue to provide a supportive influence on quality management over the coming years.

The Quality Forum takes the lead in promoting a quality culture and monitoring the response to quality issues. Our quality strategy has led to a number of activities which have resulted in significant improvements such as:

- Introduction of the Quality Improvement Leader role to lead improvements on specific quality-related topics
- Improvements in company wide quality related communications
- New arrangements for learning from quality events, with Non-Conformance Report (NCR) Champions identified for different business areas.





# Technical Highlights

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An important part of a fully functioning National Laboratory is its interactions with other key stakeholders and organisations. A 'Hub and Node' model sees NNL helping to bring a range of stakeholders together for the benefit of the industry and ultimately for UK plc. Our research and development programme generates Intellectual Property (IP), develops capabilities and supports collaborations across the entire nuclear fuel cycle.

We work with over 20 universities and a number of national and international research and development organisations, including US National Laboratories.

Although we are fully funded through our own commercial work, NNL's breadth goes beyond this to include independent and authoritative advice to the UK Government. In 2011-12, we have played an integral role in offering technical advice to the government and the nuclear regulator in support of determining the UK position on nuclear following the unfortunate events in Japan last year. Some 40 of our people have been involved one way or another ranging from the Managing Director advising Mike Weightman to a secondee in the British Embassy in Tokyo. We have also published a number of position papers in the past year, providing a clear, high level view on specific technical and policy issues. Our position papers on Thorium and UK Nuclear Horizons can be downloaded from [www.nnl.co.uk/positionpapers](http://www.nnl.co.uk/positionpapers).

Below is a selection of some of the key technical projects on which we have worked for customers during 2011-12.

## Hot Isostatic Pressing

NNL provides support to customers in the development of waste immobilisation process and products. There are a number of waste streams which are not suitable for processing

using currently established methods, for example cement encapsulation and vitrification.

NNL has been working for a number of years with the Australian Nuclear Science and Technology Organisation (ANSTO) to develop a new immobilisation technology using Hot Isostatic Pressing (HIP) – using high temperature and pressure to create a stable ceramic matrix. A programme funded by Sellafield Limited has successfully demonstrated the immobilisation of plutonium containing wastes and residues in ceramic based wasteforms using this HIP technology.

With the development and demonstration phases largely complete, NNL is now supporting Sellafield Limited in a studies phase as a precursor to the design and build of a pilot plant. The design of this plant will start later this year and the plan is to carry out active demonstration of the technology using actual residues in NNL's Central Laboratory at Sellafield.

## Wider application

The experience gained in the development and demonstration stages has shown there are wider applications for the technology. NNL, with Sellafield Limited's support, is exploring the use of encapsulation using metals such as copper for the immobilisation of other waste streams. Experiments have also shown that other materials such as aluminium, glass and





polymers may be suitable candidates for the HIP'ing process and in some cases, acceptable wastefoms can be produced at relatively low temperatures. NNL has utilised its non-active pilot plant, Workington Laboratory, to support this work.

### Helping Iraq to Clean Up Nuclear Sites

NNL has signed an agreement with the European Union (EU) and Iraq to help scientists dismantle, decommission and decontaminate nuclear facilities built during the Saddam Hussein regime. Iraq has tried to clean up ten old nuclear sites around the country but progress has been slow since work began two years ago. This new EU programme will see NNL

involved in training Iraqi scientists and providing equipment to speed up the clean-up operation which had been previously estimated to take up to ten years.

NNL, along with BelgoProcess, will support the programme requirements in areas such as dismantling, decommissioning and decontamination activities, radioactive waste management and disposal. Up to 80 Iraqi nuclear scientists will be involved in the programme with the aim of exchanging scientists and gaining mutual experience for the benefit of the overall programme.

## Vitrification of Uranium-Bearing Liquors

High Active Storage Tanks (HASTs) 1 and 2 were filled between 1955 and 1975 and contain highly active liquors from the earliest production scale reprocessing operations to take place on the Sellafield site.

The composition of the liquors is different to current wastes because of technical advances. NNL was asked to carry out a number of experiments to determine how the materials behaved and how best to treat and vitrify them.

NNL established facilities at the Central Laboratory to manufacture and test glasses containing uranium. Much of the equipment required to carry out the experiments were located in our Non-Active Laboratory. NNL determined that the safest and most cost efficient way to carry out the experiments was to set up a special nuclear material accountancy area with additional security and safety measures.

NNL provides a safe, secure and cost effective capability to perform research utilising existing equipment. The results of the work have allowed Sellafield Limited to develop a strategy for the vitrification of the contents for HASTs 1 and 2 and to reduce highly active liquor stocks with the knowledge that the resulting glass product will be of an appropriate quality.

## Signature Research Programmes

NNL has five Signature Research Programmes:

- Spent Fuel and Nuclear Materials
- Legacy Waste and Decommissioning
- Waste Immobilisation, Storage and Disposal
- Fuel and Reactors
- Nuclear Security

Each of these programmes plays an integral part in helping to deliver NNL's key mission of providing a coherent and integrated research and development programme. These programmes are customer funded with additional support from NNL.

## Spent Fuel and Nuclear Materials

Encompasses all aspects of the management of spent fuel, uranium and plutonium.

## Legacy Waste and Decommissioning

Includes management of the post operational legacy of nuclear operations including the retrieval and clean-up of legacy wastes and contaminated land.

## Waste Immobilisation, Storage and Disposal

This programme includes all of the research carried out by NNL in support of activities at the back end of the fuel cycle from waste management to disposal.

## Fuel and Reactors

NNL is home to some of the key specialist nuclear skills required to support the design and operation of both current and future reactors.

## Nuclear Security and CBRN (Chemical, Biological, Radiological, Nuclear)

Covers research associated with the nuclear security of facilities and nuclear materials, with a key focus on non-proliferation of nuclear technology and materials and the enhancement of UK resilience to CBRN threat.







# NNL Scientific and Technical Performance

In addition to operating safely, delivering to customers and achieving a strong financial performance, it is important to us, to UK Government and to many of our other stakeholders that we maintain and, where possible, improve our scientific and technical excellence.

We continue to benchmark ourselves against past performance and against other comparable organisations and we are pleased to report that our 2011 overall performance was the best we have ever achieved.

The table below shows some of the key metrics we use to assess our performance both within the business and with regard to our connectivity with the broader scientific, technical and research community - in the UK and beyond. It also illustrates the performance relative to a base year of 2009 - the first full year that NNL existed in its current form.

NNL's Scientific and Technical Performance in 2011			
External technical peer reviews of NNL work, to ensure high quality science & engineering	104		Increased significantly more than twice over
Peer reviewed NNL publications in journals or conferences	61		Increased more than twice over
Established NNL visiting roles at universities	49		Increased significantly more than twice over
NNL involvement in national or international fora, committees, etc	50		Increased
Technical peer reviews by NNL for external customers	39		Increased around twice over

# Corporate Responsibility

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## Education Focus

NNL is tasked by Government to protect nuclear skills and the national nuclear technology capability. In support of this, our primary corporate responsibility (CR) focus continues to be on education. This involves activities centred on investment in science learning, training and general support for young people.

Our strategy also leads to key development and networking opportunities for our own people in supporting various initiatives and schemes.

CR is also recognised as an important component in many of our commercial bids, for example it forms one of our key deliverables in the Sellafield Limited Framework Agreement.

### Headlines:

- NNL operates a professional and committed CR strategy
- We take CR very seriously and it underpins our culture and values
- Community investment is focused on education and young people
- Employee contributions to the CR programme are recognised and rewarded
- CR is an important component in winning new business

### The three streams of focus are:

1. Core science, technology, engineering and mathematics (STEM) activities – year on year support to charities such as the Smallpeice Trust, Engineering Education Schemes etc. Delivering bespoke educational course to (Yr 7 to Yr11, A Level) students.
2. General STEM activities – mainly focused within the Sellafield community e.g. donation of Scanning Electron Microscope to Cockermouth School, World of Work Day St Benedicts, Whitehaven - Careers Speed Dating, Whitehaven Science Festival etc.
3. General fundraising – NNL employees support to charities, with individual sponsorships being match funded by the NNL e.g. Race for Life.



### Smallpeice Trust

NNL continues to work with the Smallpeice Trust, an independent charity providing programmes to promote engineering careers to young people. In 2011/12 students from around the country, with a high proportion from the communities around NNL sites, took part in a 4 day residential course at Bangor, Lancaster and Lancaster Universities and Reeds School, Surrey. Students participated in engineering and scientific challenges applicable to the nuclear and radiological environment including associated safety issues.

### Engineering Education Scheme

The Engineering Education Scheme, organised by the Royal Academy of Engineering, provides young people with an insight into the real world of engineering. 16-18 year old students link with local companies to work on real scientific, engineering and technical problems. NNL supported two schemes in 2011-12 at St Benedicts School, Cumbria and Manchester Grammar School. NNL employees can use the experience towards obtaining their professional accreditation in addition to supporting a real world problem given to the students.



**Winner**  
**RESEARCH & DEVELOPMENT**  
**Sector Award**

Winner 2004-2008, 2010-2011  
Highly Commended 2009



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