

ISSUE 21 2016

# INSIGHT

into nuclear decommissioning

NDA

Nuclear  
Decommissioning  
Authority

Delivering progress across the UK

**INSIDE:**  
Four-page  
focus on  
**Annual  
Report and  
Accounts  
2015/2016**



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*Front cover: the steel framework is lifted into place at Sellafield's Pile Fuel cladding Silo. See page 4.*

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## £15 million nuclear college announced

Cumbria and Somerset are set to be joint hosts of a new world-class nuclear training college for the UK, following a recent government announcement.

The £15 million investment by the Department for Business, Innovation and Skills (BIS) will create the National College for Nuclear (NCfN) based on sites in the two counties.

It will be developed alongside four other national colleges focused on high-speed rail, onshore oil and gas, digital skills and the creative industries. The overall package is worth up to £80 million.

Work can now progress on building a multi-million pound training facility at Lakes College, Lillyhall, which will form the college's northern hub in a partnership with the University of Cumbria. The southern base will be constructed at Bridgwater College, partnered with Bristol University.

The NCfN aims to train 7,000 people by 2020 and is set to open its doors in September 2017.

Current forecasts predict demand for skilled staff at all levels in nuclear will increase by 40% from 70,000 to 98,000 workers.

Employers will play a leading role in shaping the curriculum and qualifications of all the national colleges, ensuring industry needs are at the heart of decision-making.

The NCfN will focus on higher-level vocational skills development and education in core engineering

disciplines most relevant to the nuclear industry, such as qualifications supporting Advanced and Higher Apprenticeships in the sector through to Graduate Apprenticeships.

Sellafield Ltd and EDF will lead industry input, working alongside both colleges and universities. Other employers are already a key part of the planned wider governance for the NCfN and the opportunity for new members to be invited to join the board is in place. Future expansion to other hub sites in the UK will be considered by the NCfN and the government.

The Lakes College campus will also form a key part of the Centre of Nuclear Excellence initiative (CoNE) for Cumbria.

Dr Paul Howarth, CoNE chairman, said: "Skills and education are crucial to Cumbria becoming the UK's Centre of Nuclear Excellence.

"This will provide the pipeline of talent necessary to ensure Cumbria can grasp the opportunities offered by the huge predicted growth in the global nuclear industry."





*Visitors listen to presentations at last year's event.*

## Date for your diaries

Registration is now open for the 2016 NDA Estate Supply Chain Event which takes place on **Thursday, 3rd November** in Manchester.

Applications for exhibition space are already flooding in, so anyone considering taking a stand is urged to act quickly.

Those interested in exhibiting need to be signatories to the NDA Estate Supply Chain Charter (visit [www.gov.uk/nda](http://www.gov.uk/nda)), and space is allocated on a first-come first-served basis.

Last year's event, organised jointly by the NDA and its SLCs, attracted a record 1,500 visitors and scored an overwhelming 97% success rating, according to a follow-up survey. It is now believed to be one of the largest events of its kind in Europe.

One of the key speakers can now be confirmed as John Manzoni, Chief Executive of the Civil Service and Permanent Secretary of the Cabinet Office. Appointed in 2014, he was previously Head of the Major Projects Authority and has more than 30 years' experience in the private sector, including as President and Chief Executive of Canada's Talisman Energy Inc.

For 2016, the venue is again Manchester's EventCity, providing opportunities for businesses of all sizes to exhibit in the main hall and meet leading figures in nuclear decommissioning. The afternoon is allocated to informal 'meet the buyer' and networking opportunities.

The theme this year is **Delivering Success Together**.

Entry to the one-day event is free of charge for visitors and exhibitors (with optional extras subject to a small flat-rate charge).

Launched in 2011, The NDA Estate Supply Chain Event aims to continue improving the visibility of opportunities for suppliers, particularly those in the Small and Medium-sized Enterprise (SME) community.

A major highlight of the morning sessions will be the prestigious Supply Chain Awards, which acknowledge the vital role played by the estate's wide diversity of contractors. Entries are now being sought and can be submitted through the event website below.

Launched in 2012, the awards are jointly sponsored by the NDA and its Site Licence Companies, with the aim of acknowledging the supply chain's vital role in delivering progress across the estate. A new category has been added this year for suppliers or organisations who have brought extra focus on employee skills and capabilities in nuclear decommissioning. The deadline for submissions is 9th September 2016.

Watch out for further information.

**[www.decommsupplyevent.co.uk](http://www.decommsupplyevent.co.uk)**

# spotlight on Sellafield

*Aerial view of the Pile Fuel Cladding Silo in the 1970s.*



## You've been framed

One of Sellafield's most hazardous buildings is a step closer to being cleaned up after a huge engineering task was completed.

A steel door frame weighing 40 tonnes and measuring nine metres wide has been installed next to the Pile Fuel Cladding Silo (PFCS), as the crucial first move to hanging highly engineered doors on the side of the legacy facility. Behind the doors, holes will then be cut enabling remote grabs to reach in, drop down and pull out the waste.

The PFCS dates back to the 1940s and is the oldest of Sellafield's four historic plants which pose the most challenging clean-up tasks in the NDA estate.

In 2001, the air inside was replaced by argon gas to reduce the fire risk from its radioactive contents. Although non-toxic, argon cannot be breathed, so all work must be carried out remotely and the atmosphere must be maintained during the retrievals.

The door frames were installed onto a reinforced concrete superstructure built alongside the PFCS, which will house all the equipment needed for waste retrieval.

Gary Snow, Head of the PFCS Programme for Sellafield Ltd, said: "Hanging a door might sound like a

simple DIY job. But when that door is being hung on a nuclear storage facility, you need more than your average toolbox.

"It has taken years of planning, testing and specialist engineering to design, build and position this crucial part of the retrievals mission. It's the most visible sign yet of the retrievals equipment starting to take shape on the new superstructure."

Pete Lutwyche, the NDA's Sellafield Programme Director, said: "This marks a massive step in one of the highest priority nuclear clean-up jobs in the UK.

"The difficulty of lifting such an enormous piece of steel on one of the most congested nuclear sites in the world cannot be underestimated.

"This milestone is yet another sign that we are making real, tangible process towards clearing away the hazards from the UK's early nuclear industry and making the UK a safer place as a result."

**Contractor:** Bechtel  
Cavendish Nuclear  
Solutions (BCNS)

## FACT FILE

During the Cold War, both the Pile Fuel Storage Pond and the Pile Fuel Cladding Silo played important roles in the development of the UK's nuclear deterrent.

Spent fuel rods were consigned to the pond for cooling after being burned in the Windscale Pile reactors to create weapons material.

The pond also played a support role during the UK's worst nuclear accident, the 1957 Windscale fire. Rods pushed through the the Windscale Pile reactor core by workers battling the blaze were later transferred to the pond for storage.

Before irradiated fuel was dropped into the pond, its metallic cladding was shaved off and transferred to the silo. In later years, cladding from the Magnox fleet was also tipped into the silo and by 1964, it was full.



# Historic moment as entire bulk fuel stocks are lifted out

Workers have now removed the entire bulk stocks of nuclear fuel from Sellafield's ageing Pile Fuel Storage Pond, an achievement hailed as a "truly landmark moment" in the site's decommissioning mission.

The milestone means a 70% cut in radioactivity content at the 68-year-old pond, vastly increasing safety for people and the environment.

Operators worked behind radiation shields from 40 feet away, using cameras to control the lift-out of the final skip containing metal fuel.

The removed fuel has been transferred to a modern storage building at Sellafield where it can be held in a safer environment.

Pete Lutwyche, the NDA's Sellafield Programme Director, said: "This is a huge achievement in the decommissioning of Sellafield's most hazardous facilities, and I congratulate the team on their

commitment, dedication and hard work.

Paul Foster, Chief Executive Officer of Sellafield Ltd, added: "This is a truly landmark moment in the decommissioning of Sellafield.

"Removing decades-old corroded fuel from an aging facility and placing it into modern containment makes Sellafield, and the whole of the UK, a far safer place.

"The enormity of the challenge cannot be underestimated – the pond was built with no design for how its contents would be removed. We have had to retro-fit an export process and then safely execute it in one of the most challenging environments imaginable."



The approach required a step-change in thinking at Sellafield as it necessitated bringing fuel skips up and out of the water and therefore being 'unshielded' for a time.

Mr Foster added: "In order to achieve this we had to embrace new ways of working, focusing on collaboration, removing barriers, fit-for-purpose solutions and embracing innovation.

"It is essential we embed this change of approach across Sellafield Ltd to ensure we build on the achievements at the pond and drive forward with decommissioning across the site."



Top, a skip is lifted out by staff operating remotely from behind radiation shields.





## £39 million training centre for armed police

Construction work is now under way on a new £39 million training facility for the armed police who guard the Sellafield site.

The four-storey facility for the Civil Nuclear Constabulary (CNC) is part of enhanced security arrangements that have already seen an increase in the number of firearms officers at the site.

Located on 14 acres of land near Sellafield, the base will have classrooms, stores and offices, as well as live firing ranges. Further facilities can be added if required in the future.

The facility will be owned by the NDA, developed by NDA Properties Ltd and leased to the CNC. Morgan Sindall has been appointed to construct the facility with Deloitte Real Estate providing project management and cost consultancy support.





*At the ground-breaking event are, from the left, Deloitte Real Estate Project Manager Michelle Richardson, and from NDA Properties Ltd (NDAPL), Project Manager Stewart Swift, NDAPL Managing Director David Atkinson and Contract Manager Andrew Edwards.*

Construction and fit-out is due to be completed December 2017, with the facility operational by January 2018.

Phil Bishop, CNC Chief Inspector, said: "The new training facilities represent an important and necessary step forward for the CNC, ensuring we continue to effectively deliver our mission of maintaining public safety and protecting civil nuclear sites. It will allow us to continue to meet the most stringent armed

policing standards set by the College of Policing and UK Government regulatory standards for the protection of nuclear sites such as Sellafield."

NDA Assurance Director Kenna Kintrea said: "This is a crucial facility for the constabulary in its support to the nuclear clean-up and decommissioning mission. I look forward to seeing the finished facility completed safely, on time and within

budget, which will add to the network of important local infrastructure that supports the nuclear industry."

CNC is in charge of protecting civil nuclear sites and nuclear materials in England, Scotland and Wales. The force employs more than 1,500 police officers and works with the civil nuclear industry, national security agencies and regulatory bodies.





*Mark Garland, Construction Director of Morrison Construction and Rob Higgins, NDA's Business Services Director on the site near Wick airport.*



# Archive taking shape

On a windswept site close to Wick John O'Groats Airport, the sleek triangular lines of the NDA's new archive building are now clearly visible from the air.

Morrison Construction is building the facility on behalf of NDA Properties Ltd on a site donated by the Highland Council.

The £20 million archive, named Nucleus (The Nuclear and Caithness Archives), is due to be complete this autumn, opening to the public in 2017.

Vast numbers of plans, photographs, drawings, records plus other data and information, some dating back to the beginning of the UK nuclear industry, are currently stored in various locations around the country. Some are held at NDA sites and others with a variety of commercial organisations.

All those requiring long-term preservation will be transferred over several years to the facility, which is designed to hold more than 20 kilometres of records. They will be processed, digitised, stored and, where possible, made available to the industry and the public.

A successful recruitment event, meanwhile, attracted 250 people who were interested in the positions that will be available later in the year.

Around 20 full-time jobs will be created, while the construction phase has generated contracts for almost 30 businesses, the majority of which are based in Scotland.

NDA's Business Services Director Rob Higgins recently visited Wick to see the progress.

"It was apparent from the plane as we landed in Wick airport that the archive construction has made great progress since I visited last August for the turf-cutting ceremony," he said.

"It is now possible to envisage how impressive this structure will look when it is complete and what a valuable resource it will be both to the NDA and to Caithness."

In a partnering arrangement between the NDA and Highland Council, part of the facility will also house the Caithness Archives.

The collection of historic documents dating back to the 16th century has outgrown its current home and the new arrangement will allow space to expand.

A large public area will include a reading room and community space for recreation, study or training.

One of the prominent features at the archive will be a stone table made of Scottish granite, which is due to be moved from its current home outside Dounreay's Prototype Fast Reactor.

Standing more than one metre tall, the table is carved with Pictish symbols and inscribed with the words "E Cathenesia Ad Mundum" (Out of Caithness to the World).

Mark Garland, Construction Director at Morrison Construction, said: "The project has benefited greatly from the skills and expertise of the local supply chain. Our main mechanical and electrical subcontractor, G&A Barnie of Wick, has performed particularly well.

"We and our client the NDA are keen to promote local economic development and engaging the local supply chain is a key way of achieving this. The work of Highland sub-contractors will account for at least a third of the total contract value."

He added that the highly specialist nature of the work had brought some particular challenges.

"The environmental conditions within the archives need to be very highly controlled to ensure safe storage of the archived materials. The archives must operate at a stable temperature with low humidity and have a high fire resistance," he said.





## Berkeley vaults success

A uniquely complex range of mixed waste has accumulated at Berkeley site since the 1960s, produced by the power station and the neighbouring laboratory complex which carried out research for the UK's entire nuclear industry.



Now, some 50 years later and after a number of failed attempts, waste is finally being retrieved from the underground chambers where it was kept, and is being sorted ready for safe storage in the purpose-built Interim Storage Facility (ISF).

Around 620 tonnes of metallic fuel element debris (FED) and 6,665 containers, some of which are sludge cans, were housed in three vaults. A single silo, meanwhile, houses charge rods and the chutes used to discharge fuel from the reactors.

The first major milestone was achieved in March when the chute silo was declared empty. Although it was originally anticipated that all the material would be Intermediate Level Waste, innovative retrieval techniques and segregation enabled some of it to

be disposed of as Low Level Waste or Very Low Level Waste, diverting over 50 tonnes away from the site's ISF and saving millions of pounds.

Following this success, active commissioning has started of the retrieval and process equipment at the vault containing FED. Ten shielded Ductile Cast Iron Containers (DCICs) have so far been filled. These are then dried in the conditioning facility before transfer to the ISF.

Paul Oswald, Site Delivery Manager, explained: "It hasn't been an overnight success. We started designing the retrieval equipment with Cavendish Nuclear back in 2010 and since 2013 we have been working tirelessly on site to build, install and test the equipment.

"Finally, all the hard work has paid off and to say that we have retrieved waste from the Berkeley Vaults for the first time offers a huge sense of achievement for everyone here at Berkeley, Magnox and the entire supply chain."

In 1992, Berkeley was the first Magnox site to complete defueling, and several years later became the first to decommission its storage ponds, while in 2010, its reactors were the UK's first to enter the passive Safestore phase.

Clearance of the waste vaults is critical for Berkeley's entry into care and maintenance (C&M).





*The view from Bunker 5.*

## Solid work shifts bunker waste

The second of Hunterston's five concrete waste bunkers has now been successfully emptied of its hazardous contents – six weeks ahead of schedule.

Using remotely operated vehicles, more than 650 tonnes of radioactive graphite and metallic waste were lifted before being packed into specially engineered stainless steel boxes.

Hunterston holds the largest inventory of solid Intermediate Level Waste (ILW) in the Magnox fleet, accounting for more than 35% of the 7,500 cubic metre total.

The Solid Active Waste Bunker Retrieval (SAWBR) Project, established to enable retrieval of material generated during the station's operating phase, involves emptying the bunkers in sequence by breaking through the walls.

Retrievals are carried out remotely, using Brokk vehicles to recover and load the contents into the boxes which are located inside a purpose-built facility next to the bunkers. The filled boxes, each three cubic metres in size, are then transported to the site's ILW store for future encapsulation.

Unusually, Hunterston's two reactors were constructed in an elevated position at a height of more than 10 metres, which enabled access from underneath. Gravity assisted the removal of used fuel, while refuelling could be carried out without lifting machinery above the active core.

The fuel elements were also unique, incorporating a graphite sleeve which was stripped from the irradiated uranium during discharge from the reactors, along with associated metallic components.

This ILW was transported via underground tunnels into one of the five above-ground bunkers built between the 1960s and 1980s.

The first breakthrough came in 2014 at bunker 5 which contained less waste than the others and was used as the active commissioning phase of the project. Overcoming the technical difficulties during this phase led to a consistent operating regime and improvements in throughput.

Bunker 5 was cleared by February 2015, which was followed by another breakthrough to access the waste in bunker 4. Benefitting from the earlier experience, improvements in the packing efficiency allowed Bunker 4 to be cleared ahead of programme, using 274 boxes – 23 fewer than the original projection.

To date, 336 packages of solid ILW have been retrieved from the two bunkers, packaged and transported into the ILW Store, representing approximately 30% of waste in the five bunkers.

Bunker 3 break through is now almost complete and a return to waste retrievals is expected early July 2016.

Eventually, the contents will be encapsulated in grout and then returned to the store for the decades-long Care and Maintenance phase.

# 2015/2016 Highlights



*The last of the canned fuel is removed from the Pile Fuel Storage Pond*



## Key Achievements

The highlights of the last 12 months up to the end of March 2016 include a number of significant milestones in hazard reduction across the whole estate.

On the financial front, meanwhile, the NDA remained within the annual budgetary limits set by the government and generated income to offset the costs to taxpayers. The overall estimated cost figure for completing the NDA's mission over the next century has shown a slight decrease.

Achievements from the year include:

- Publication of our latest Strategy, which updates developments in our long-term approach since the 2011 version was published.
- Finalisation of a new management structure for Sellafield Ltd, where the NDA has become the owner of the Site Licence Company. This replaces the previous model where the owner since 2008 was a private-sector consortium.
- Marking a historic milestone, the bulk stock of metal fuel was removed from the world's oldest open-air fuel storage pond, Sellafield's Pile Fuel Storage Pond. This reduces its radioactivity content by 70%, making a major contribution to the safety of people and the environment.
- For the very first time, bulk quantities of radioactive sludge are being removed from the First Generation Magnox Storage Pond at Sellafield. The pond holds enough sludge to fill around half an Olympic swimming pool.
- A research breakthrough in understanding the characteristics of nuclear waste at the Magnox Swarf Storage Silo. This is set to accelerate progress and save many millions of pounds, not only at Sellafield but at facilities across the world.
- From Dounreay, good progress has been made on transferring a range of nuclear material south to Sellafield, where it will be consolidated with similar material.
- Completed Oldbury defuelling, thus removing 99% of the site's radioactive hazard.
- Continued defuelling and preparing for decommissioning at Wylfa which closed last December after almost 45 years of operation, including five years of additional generating life which secured £785 million extra revenue.
- Continued excellent performance in the diversion of Low Level Waste to alternative treatments such as recycling, combustion and use of licensed landfill sites. The total diverted now stands at 89% of material, reducing demand for space at the Low Level Waste Repository, established in 1959 as the UK's only disposal route for LLW.
- Cost estimates for the whole 120-plus year programme have shown a slight decrease to £117 billion.
- Commercial income of £1.1 billion, achieved through contracts for reprocessing and management of spent fuels, supplemented by income from electricity generation at Wylfa.



# View from the top

The past year has brought key developments both for the estate as a whole and at a number of our sites.

In addition to the government's Spending Review we have seen landmark developments at our highest-hazard Sellafield facilities, demonstrating that we are making real strides forward on retrieving waste.

Underlying our mission is the ongoing requirement for funding from the public purse. The Spending Review in autumn gave us a settlement that will require us to strengthen our focus on making substantial efficiency improvements in our operations, but also, critically, enables us to continue making progress across the estate.

It is an acknowledgement that our work is important to the UK and ensures we are able to maintain our ongoing commitment to the priority decommissioning programmes.

The provisions of the settlement are reflected in our third and latest Strategy, published earlier this year. The 2016 document looks ahead at long-term priorities and builds on the earlier strategy work of 2011, where we developed a series of themes. The approach remains broadly similar however we have refined our approach in a number of areas, particularly in waste management and options for reactor dismantling.

Our priority focus remains on Sellafield, where most of the year was directed towards finalising the new management arrangements for the Site Licence Company, Sellafield Ltd, which transferred to full NDA ownership in April. This simplified structure replaces the previous Parent Body Organisation (PBO) model where the owner since 2008 was a private-sector consortium.

This will also begin a new chapter in delivering risk and hazard reduction with greater efficiency, while accommodating more readily the challenges and uncertainties of this extremely complex site.

Elsewhere, we are confident that the new Magnox PBO contract will deliver significant savings over the full life

of the contract term. Among the achievements already secured are the merger of Magnox Ltd and RSRL into a single SLC, the completion of defueling at Oldbury, full clean-out of Hinkley A ponds and retrieval of waste from the Berkeley vaults.

Looking at supporting activities, we are continuing to direct a greater proportion of our annual spend with smaller businesses, or Small and Medium-sized Enterprises (SMEs), and also taking advantage of the opportunities afforded by collaborative procurement procedures to incorporate contractual terms that seek to include SMEs and take socio-economic considerations into account.

The skills agenda continues to be important for us, as well as for the UK as a whole, and we support a series of initiatives across our sites, from apprenticeships to graduate level and beyond.

Our Research and Development (R&D) investments are also paying dividends, and the collaboration with other public organisations such as Innovate UK is working well, leveraging significant additional funds to take projects forward, with particular support for smaller innovative businesses.

Summing up, it has been a good year in terms of overall site performance with important targets met or exceeded and the foundations firmly in place to succeed in the years ahead.

Finally, I remain hugely grateful to all those who contribute to our mission and our success from within the NDA, our subsidiary organisations, the SLCs, Parent Body Organisations, supply chain and communities in which we operate. Their commitment and professionalism are key to enabling progress, and delivering the critical milestones of the past year as well as continuing to ensure excellent performance into the future.



# Financial overview

During the year, the NDA has spent £3.1 billion in directly addressing the often complex tasks, and secured £1.1 billion income to offset this cost.

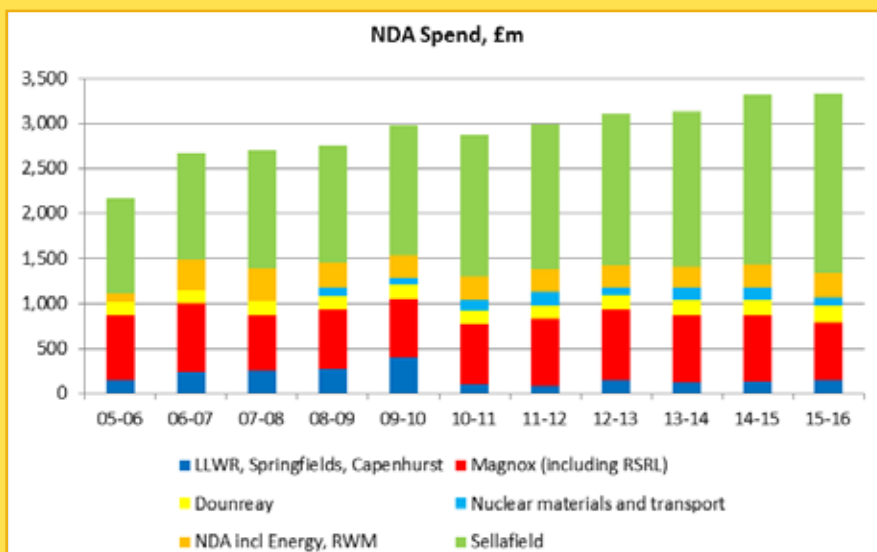
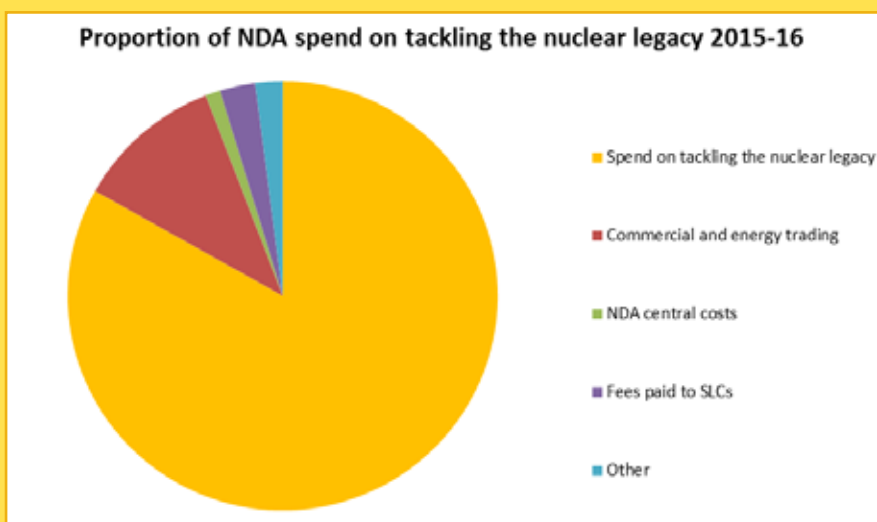
Over the full timeframe of more than 100 years, the undiscounted cost estimate of completing the decommissioning of the NDA's sites has decreased by £0.3 million to £117 billion. This forms the basis for preparing the Nuclear Provision which is included in the Annual Report and Accounts.

In line with international accounting standards, this estimate has to be discounted to current values. The discount rate is specified by HM Treasury each December and in 2015, for the first time, a negative discount rate (minus 0.8%) was introduced for expenditure stretching beyond 10 years into the future.

This rate is used by all government bodies with long-term liabilities and, for the NDA, the effect of this negative rate is to increase the discounted Nuclear Provision by £89 billion, to £161 billion, compared to the provision calculated using the positive discount rate of 2.2% mandated the previous year.

As mentioned, the underlying estimate of the costs for completing the NDA mission is substantially unchanged. The undiscounted value provides a clear basis for comparing year-to-year figures as it is unaffected by changes in the discount rate.

The scale of work over the next century, meanwhile, is compounded by the complexity of many vital Sellafield projects, which are at an early stage of design and delivery,



and therefore subject to future uncertainty. At other sites, there is relative certainty over work needed and the associated costs. For these sites, the NDA has been able to run competitions under target cost contract arrangements, introducing more clarity and reducing the expected cost.

For more details, see the full Annual Report and Accounts 2015/16 at [www.gov.uk/nuclear-decommissioning-authority](http://www.gov.uk/nuclear-decommissioning-authority)

# spotlight on LLWR



Carl Smith, PCM Decommissioning Senior Project Manager

***"This is a culmination of hard work, dedication, focus and commitment over the previous two years"***

## Bunkers are going, going ...

A series of concrete bunkers that once stored Plutonium Contaminated Materials (PCM) look set to be decommissioned at least four years earlier than expected - and for £30 million less than expected.

Located at the Low Level Waste Repository near Drigg, Cumbria, the bunkers were known as magazines and stored PCM generated from operations at Sellafield in the 1950s-1960s.

Thanks to a dedicated non-stop effort to seek out efficiencies and improvements, the PCM Decommissioning Programme team last year delivered more work than planned and achieved the cost

savings, without suffering any lost-time accidents.

The team had already exceeded expectations by accelerating its 10-year decommissioning programme, from April 2013, to six years.

Now the programme is on course to be completed in 2018 - ahead even of the reduced six-year timetable.

The original cost forecast, meanwhile, is down from

£100 million to less than £70 million.

Last year saw more than 1,600 air-fed suit entries – more than the rest of the NDA estate combined and a 30% increase from the previous year with a smaller team. Carl Smith, PCM Decommissioning Senior Project Manager, said: "I am extremely proud and delighted in what the PCM Decommissioning team has achieved over the last 12 months."



“This is a culmination of hard work, dedication, focus and commitment over the previous two years where LLWR and NSG, our decommissioning partner, have formed a strong and delivery-focused integrated team.

“There have been difficult times in the past but the team stuck to the task and is now reaping the rewards. We can’t get complacent and there are still some major hurdles to overcome to deliver to our aspirational dates and cost savings.”

Following decommissioning, the remaining five magazines will eventually be demolished, making space for future development projects. Managing the PCM legacy is a priority for the site.

Improvements and efficiencies are always on the team agenda. For instance, when Magazine 10’s void concrete ceiling was taken away to allow access for decontamination, 144 slabs each weighing around 300kg had to be removed.

But the team developed a more efficient method and applied their learning to the next magazine, where only 27 slabs had to be removed before strategically drilled holes were able to provide access for checking contamination, saving time and money.

Andy Deall, Project Director North of NSG, said: “The team has gone from strength to strength, the benefit of our close working relationship is evident with the savings that we are currently realising.

“From the start we worked hard at collaborating. We formed a leadership team to take a step back and really look at all our current operations and planned activities, to tease out savings and better ways to deliver the works. This made a huge difference.”

*Top left: Demolition work underway at one of the Magazine Retrieval Facilities that are located at the front of the bunkers.*



## Go-ahead for new vaults

Planners in Cumbria have given the go-ahead for two new vaults at the UK's Low Level Waste Repository (LLWR), along with an extension to a third vault.

The news will ensure the future of the facility, near Drigg, until 2050, creating around 120 construction jobs and securing existing roles.

LLWR was opened in 1957 as the only UK location for the disposal of solid waste containing low levels of radioactivity. It provides an essential service for NDA sites as well as other industries that produce Low Level Waste (LLW). More than £100 million has been invested in the site’s infrastructure over the past decade to maintain it as an important national asset.

Many years of work were required to prepare the planning application, approved by Cumbria County Council, including submission of a detailed Environmental Safety Case (ESC) covering geology, hydrogeology, waste characterisation, waste processing, engineering of the waste vaults, potential radiological impacts, coastal erosion and engagement with stakeholders.

Dennis Thompson, Managing Director of LLW Repository Ltd, said: “We are absolutely delighted. After three years of hard work, millions of pounds of investment, utilising dozens of technical and scientific experts, we submitted a substantive technical document that makes the case that it is safe to dispose of LLW at the site.

“We submitted this case to the Environment Agency, and they did the same thing. They spent an additional three years reviewing it in detail. Every calculation, every model, every assumption was re-reviewed by the EA and their experts and they concluded that the case is made. It is safe to dispose of LLW at the LLWR both now and centuries into the future.”

Planning permission also allows the construction of a final cap over existing and new vaults and seven clay-lined trenches, where waste was disposed of before the first engineered vault opened in 1988.

Dr Richard Cummings, Head of Science and Engineering at LLWR, said: “We have no greater priority than the safety of people and the environment, which is why such a huge amount of work went in over three years to produce our ESC, on which our planning application was based.

“We had 80 technical experts working on it and considered environmental safety now and up to thousands of years into the future. The ESC comprised 17 reports and a non-technical summary, plus a further 100 underpinning reports.”

Work is expected to start in 2017 and construction phase impacts will be carefully managed and monitored to ensure minimum disruption to local residents.

# spotlight on skills

An undergraduate course sparked Jack's interest in nuclear.

## No escape from the NDA

Civil engineer Jack Hardy's connection with the NDA began by chance, with a university project on the underground waste repository that will eventually be constructed to hold higher-activity radioactive waste from all over England and Wales.

Jack was studying at Leeds where monthly discussions with the visiting NDA representative about the project sparked his interest in nuclear, leading to an application to the *nucleargraduates* scheme.

His first eight-month secondment was with the Technology Team at the NDA, his sponsoring organisation.

"This was a really useful introduction to the NDA's strategy and technical work," said Jack. "It enabled me to work with stakeholders from government, the SLCs and suppliers, as well as looking at improving opportunities for smaller businesses.

"Small R&D companies are often bursting with creative concepts but may lack support or investment to

develop their products and reach out to the market. My role involved further developing the NDA's existing partnership with the government's Innovate UK to encourage innovation in the UK supply chain to support nuclear decommissioning in particular."

Jack's next secondment took him to the Nuclear Advanced Manufacturing Research Centre (AMRC), near Sheffield, a collaboration of academic and industrial partners from across the civil nuclear manufacturing supply chain, with a mission to help UK companies win work at home and overseas. The work strengthened his interest in innovation.

"Although its focus is not just decommissioning, it brought me

into further contact with Innovate UK, with the NDA and with Sellafield Ltd, where I was able to support the early stages of a manufacturing improvements programme.

"From these experiences, I knew there was a wealth of other opportunities for the Nuclear AMRC to support the NDA mission while delivering its own mission and I've been keen to pursue this ever since."

After completing the *nucleargraduates* scheme with a final secondment studying the structural integrity of a shut-down nuclear power plant in Spain, Jack returned to the Nuclear AMRC as Project and Business Development Manager. Jack's ties with the NDA and its mission are stronger than ever.



The highly acclaimed *nucleargraduates* scheme was launched by the NDA in 2008 and provides a comprehensive training programme over two years. Backed by a wide range of leading public and private-sector organisations, the scheme aims to build the next generation of industry leaders. Secondments with UK and overseas organisations help to develop a broad understanding in key areas such as decommissioning, power generation and defence. Graduates from both technical and non-technical disciplines are eligible to apply to the scheme, which is now administered by Energus in Cumbria [www.nucleargraduates.com](http://www.nucleargraduates.com)

“The Nuclear AMRC is now delivering against a decommissioning sector strategy and has worked with the wider NDA estate, including collaborations with LLWR, INS, RWM, Dounreay, Magnox, Britain’s Energy Coast and key UK suppliers. In addition, we are now scoping our largest collaborative R&D programme to date with this sector, which aims to reduce Sellafield’s lifetime cost of Intermediate Level Waste packages through enabling supply chain innovation to challenge current specifications and assumptions.”

Jack continues to meet his NDA mentor to progress towards his engineering chartership and also received an offer to study a part-time PhD at the University of Sheffield.

“The *nucleargraduates* scheme works really well at enabling participants to develop links, contacts and understanding across the whole nuclear sector. It helped me personally to enhance the links between Nuclear AMRC and the NDA estate, and is delivering real benefits for the UK nuclear industry. It’s exciting to be a part of it.”

The NDA’s Head of Technology Melanie Brownridge, who hosted Jack’s first secondment, added: “Jack’s experience and current role demonstrate clearly the value of investing in building expertise for the future. The *nucleargraduates* scheme enables individual careers to flourish, but it brings real dynamism and commitment into our industry. At the NDA, we have benefitted hugely from the fresh thinking and ideas brought to us through the graduates who have had secondments with us.”

## It’s all in the data



Gordon Cheung

Gordon Cheung, a graduate mechanical engineer from the University of Bath, didn’t have much exposure to the nuclear industry until a series of lectures on reactor technologies at university caught his attention.

“Providing energy security while protecting the environment is one of the biggest issues of this generation”, said Gordon. “After my brief encounter with the industry, nuclear

power just made sense. The challenges associated with decommissioning and managing radioactive waste really attracted me to the industry.”

That’s exactly what Gordon worked on as a *nucleargraduate* sponsored by the NDA. His role in the R&D team at the NDA focused on the UK Radioactive Waste Inventory (UKRWI). The UKRWI is the latest national record on radioactive wastes and materials in the UK. The UKRWI is updated every three years with the next due in 2016.

“Good quality inventory data is really important. It enables waste management planning, strategy development, stakeholder engagement and the UK to meet its international reporting obligations.”

“The experience I have gained at the NDA is invaluable. I was solely responsible for managing a major contract for two months and I’ve worked with regulators, DECC and every SLC. There are not many organisations that offer such a high level of responsibility straight out of university.”

Gordon’s next secondment takes him to nuclear industry contractor, James Fisher Nuclear Ltd. He will be working on the historic decommissioning of the Winfrith Steam Generating Heavy Water Reactor (SGHWR) core. This will be the first “power” reactor core to be decommissioned in the UK.

<https://ukinventory.nda.gov.uk>

# Flying high over Dounreay

Birds of prey have been flying high over Dounreay recently in a campaign to deter invading flocks of seagulls from nesting around the site.

In previous years, there has been an issue with aggressive gulls during the nesting period, resulting in health and safety concerns for staff on the ground. Gulls have also been known to choose inappropriate locations for nests, posing an additional challenge for decommissioning teams.

The falcons and hawks, first deployed last year, were recruited to provide an aerial deterrent to their feathered cousins and have proved to be highly effective.

National bird management consultancy NBC Solutions use their

birds of prey all over the UK, at places as diverse as football stadiums, airports development sites and harbours.

Experienced falconer Andy Higgins (below) said: "The falcons fly high in the sky to provide an aerial threat which all the gulls on site will be aware of."

Doug McGeachin, Deputy Environment Manager, said: "These deterrent measures have successfully made the site a less attractive prospect for the birds that are seeking out nesting sites."

*Gin, shown flying with the dome in the background, is a harris hawk - intelligent, laid back and relatively easy to train to fly as a bird deterrent.*

*The four other birds of prey on site are Tyrie, another harris hawk, peregrine falcon Mr Mojo, hybrid peregrine falcon Skye and 10-month old hybrid gyrfalcon Esther. Each bird is flown several times per day for anything up to half an hour.*







# Let's stick to simple solutions

Simple solutions sometimes work best so Dounreay staff stuck to this approach when searching for a way to take metal samples from the base of a reactor.

Saving millions of pounds in the process, their latest brainwave was Blu-Tack attached to a long flexible pole, lowered down into the Prototype Fast Reactor. The reactor decommissioning team needed the samples from the PFR reactor in order to check radiation levels.

During the planning phase, the in-house design team were tasked with the manufacture of equipment capable of doing this in a radiological and hazardous environment.

Inspecting the depths of a former nuclear reactor with remotely controlled devices usually requires smart thinking and the manufacture of bespoke equipment.

However, the team opted for simplicity over a new design and build project. Thinking creatively, they attached Blu-Tack to the end of a long flexible rod, which meandered almost 10 metres deep into the reactor core and picked up samples of the metal.

Calder Bain, a member of the PFR design team, said: "We are 60 years on from the decision to build the Prototype Fast Reactor and innovation has been the key to its success. There is a continual requirement for inventive methods to dismantle a complex nuclear reactor. The nature of the decommissioning work at Dounreay gives both our young and experienced engineers the opportunity to put their innovative skills and knowledge into practice."

Calder has worked at the site for many years and is proud to be sharing his knowledge with a team of DSRL engineers to pass on his years of expertise to a new generation of professionals who will be taking apart the reactor when the time comes.



*Rick with winning students Sophie and Claudia.*

## Research that's different and distinctive

More than 30 research students working on a unique four-year nuclear programme gathered in Bristol to share their progress and exchange ideas with around 70 representatives from industry, regulators and international organisations.

The PhD and post-doctoral researchers from universities in the DISTINCTIVE consortium (taken from Decommissioning, Immobilisation and Storage Solutions for Nuclear Waste Inventories) are involved in research into themes relevant to decommissioning the nuclear legacy.

Sponsors of the one-day event and the programme were the NDA, Sellafield Ltd, National Nuclear Laboratory (NNL) and the Engineering and Physical Sciences Research Council (EPSRC).

The DISTINCTIVE consortium was launched in 2014 to help develop the next generation of nuclear experts, and, at the same time, encourage greater collaboration between multi-disciplinary university research projects and industry.

The researchers are liaising closely with industrial supervisors from Sellafield Ltd and NNL to ensure their work addresses relevant issues. This kind of knowledge transfer between academia and industry is a cornerstone of developing and maintaining the key skills and capability that the NDA will need to continue its mission over the coming decades.

Students designed posters for the event, outlining progress achieved, and gave a series of presentations. Delegates were invited to vote for the Best Poster and Best Oral Presentation.

NDA Research Manager Rick Short awarded the poster prize to Sophie Rennie from Bristol, and the oral presentation prize to Claudia Gasparrini, an NDA-sponsored student from Imperial.

Rick added: "The industry derives major benefits from focussed academic research that is directed specifically at some of the challenges we face in dealing with our nuclear legacy. We very much welcome this kind of collaboration and look forward to seeing how these projects, which are now at the half-way stage, mature.

"It is hugely important that the students understand the context for their work and how it could be applied on the ground. We look forward to seeing their expertise develop and hope their skills will contribute to decommissioning progress in the years ahead."



## What it's about

DISTINCTIVE is led by the University of Leeds and includes the following universities: Lancaster, Birmingham, Bristol, Loughborough, London's Imperial and University Colleges, Manchester, Sheffield, Queens University Belfast and Strathclyde.

The National Nuclear Laboratory (NNL), NDA and Sellafield Limited collaborated with the Engineering & Physical Sciences Research Council (EPSRC) to initiate the £multi-million programme launched in 2014. The collaboration with EPSRC enables NDA and Sellafield Ltd to leverage their funding and also access support for the scheme, through the provision of assistance such as technical supervision or access to facilities.

Research falls into four themes: AGR, Magnox and Exotic Spent Fuel; Plutonium Oxide and Fuel Residues; Legacy Ponds and Silos Wastes; Structural Integrity.

DISTINCTIVE follows the success of a similar four-year programme, known as DIAMOND (from decommissioning, immobilisation and management of nuclear wastes for disposal) that concluded in 2013.

[www.distinctiveconsortium.org](http://www.distinctiveconsortium.org)

## Expertise for the future

A primary driver for NDA sponsorship of PhD-level research is to develop the skills required over the coming decades.

Programmes like DISTINCTIVE ensure that academic experts are kept abreast of the latest decommissioning challenges, and that a new generation of experts are ready to take up technical nuclear roles or academic positions.

Examples of DISTINCTIVE work include:

- Olivia Lynes (University of Lancaster), an NDA sponsored student investigating computational simulations of storage pond sludge disturbance.
- Luca Rizzo (Strathclyde), who is investigating nano-cracking in cement wasteforms.

These kinds of projects promote knowledge sharing between academia and industry, giving students good understanding in the on-the-ground challenges and potentially influencing future industry decisions.

# £12 million research contracts awarded

Research contracts worth up to £12 million in total have been awarded to a series of organisations, as the NDA continues seeking innovative solutions to technical challenges.

The framework contracts will be shared among 10 consortia whose members include UK universities, global corporations and around 20 Small and Medium-sized Enterprises (SMEs). Three of the consortia are led by SMEs and more than 70 organisations in total will be involved in the contracts over the next four years.

The NDA's Direct Research Portfolio (DRP) forms a key part of the NDA's strategic research programme and focuses on direct funding for research that delivers innovation across multiple sites, develops technical expertise and informs NDA's strategy. The combined annual R&D spend by NDA and SLCs is typically more than £85 million.

NDA Research Manager Yvonne Morris said:

"It was very pleasing to see so many SMEs being engaged in the process and being part of successful consortia. Overall we were delighted with the high quality of the submissions and look forward to working with the

organisations on our strategic R&D programme. We now have new multi-supplier contracts aligned with our key strategic themes. With many new organisations involved for the first time we will have broad input into addressing our R&D requirements."

The procurement was launched via a supplier day, aimed at engaging smaller businesses in the process and enabling prospective business partners to form bidding consortia. The contracts, last awarded in 2014, were split into three 'lots':

The contracts will also address cross-industry R&D requirements identified by the Nuclear Waste and Decommissioning Research Forum. DRP projects often lead to more extensive R&D projects carried out by Site Licence Companies (SLCs) and the supply chain.

*Contract details on next page...*



# Details of research contract awards

## Lot A: University Interactions

Single consortium led by National Nuclear Laboratory

- **National Nuclear Laboratory:** Supported by Frazer-Nash Consulting

## Lot B: Integrated Waste Management and Site Decommissioning and Remediation

Six consortia led by Amec Foster Wheeler Ltd, Arcadis Consulting (UK) Ltd, Arup, Eden NE Ltd, Galson Sciences Ltd and NSG Environmental Ltd

- **Amec Foster Wheeler Ltd Consortium:** Brenk Systemplanung and Jülich Research Centre, Andra, Cogentus Consulting, DAS Ltd, Imperial College London, Longenecker & Associates, MMI Engineering, NuVision, OC Robotics, Fortum, University of Birmingham, University of Bristol, University of Cambridge, University of Manchester.
- **Arcadis Consulting (UK) Ltd Consortium:** AdvanSci, Applied Photonics (APL), Areva RMC, Aurora, ESI, MDecon, Pöyry, ProNu-Dec, Tradebe Inutec, TWI, University of Liverpool, Dalton Nuclear Institute, University of Surrey.
- **Arup Consortium:** Costain, Pöyry, Studsvik, James Fisher Nuclear Ltd, SN3, AdvanSci, MCM, Bilfinger GVA, Pinsent Masons, CL:AIRE, r3 Environmental Technology, Dalton Nuclear Institute.
- **Eden NE Ltd Consortium:** Cavendish Nuclear, DBE TECHNOLOGY GmbH, Golder Associates Limited, Tradebe Inutec, Project Time and Cost International Limited.
- **Galson Sciences Ltd Consortium:** National Nuclear Laboratory, Frazer-Nash Consulting, AdvanSci, Amphos 21, Cogentus Consulting, Integrated Decision Management, Jacobs, Kurion, Rodgers Leask, VTT, University of Bristol, Lancaster University, University of Leeds, University of Manchester, University of Sheffield.
- **NSG Environmental Ltd Consortium:** AECOM, ARC, Oxford Technologies, NPL, ESG, Quintessa, React Engineering, KDC, Tradebe Innutec, Synergy Health, Nuclear AMRC, Loughborough University, University of Manchester, University of Surrey.

## Lot C: Spent Fuels and Nuclear Materials

Three consortia led by AMEC Foster Wheeler Ltd, Areva NC and National Nuclear Laboratory.

- **Amec Foster Wheeler Ltd Consortium:** Andra, Brenk Systemplanung and Jülich Research Centre, Imperial College, DAS Ltd, Fortum, MMI Engineering, NPL, NRG, OC Robotics, Studsvik, University of Birmingham, University of Manchester, University of Bristol, University of Cambridge, Loughborough University.
- **Areva NC Consortium:** NSG Consultancy, MDecon, Quintessa, University of Liverpool, University of Sheffield.
- **National Nuclear Laboratory Consortium:** Frazer-Nash Consulting, Galson Sciences Ltd, ALD France, Aquila Nuclear Engineering, DBD, DAS, IDM, Jacobs, Kurion, Rodgers-Leask, University of Bristol, Lancaster University, University of Leeds, University of Manchester, University of Sheffield, Imperial College.