

INSIGHT

into nuclear decommissioning

Delivering progress across the UK



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Front cover: Windscale pile.

Welcome to the autumn 2013 edition of Insight, the news magazine where we aim to provide a snapshot of some of the developments across the NDA estate.

If you have any comments, please contact the editor Deborah Ward on 01925 832280 or deborah.ward@nda.gov.uk

New consultation seeks views on site selection

The NDA has welcomed the launch of the Government's consultation on how aspects of the site-selection process for a geological disposal facility (GDF) for higher activity radioactive waste could be revised and improved.

The 12-week consultation, which runs until 5 December, seeks feedback on new ways of working with local communities who may be interested in learning more about potentially hosting the multi-billion pound facility in their area.

Welcoming the consultation, Bruce McKirdy, Managing Director of NDA's Radioactive Waste Management Directorate (RWMD), said: "For more than 50 years, we have all benefitted from the use of clean and secure nuclear energy, but we have not successfully addressed the long-term disposal of higher activity radioactive waste. Geological disposal is an internationally recognised, technically sound solution for higher activity waste management to protect people and our environment."

He added: "As the body responsible for the design, development and delivery of a geological disposal facility, we look forward to working with communities, stakeholders and the Government to take responsibility for our past and avoid passing the burden of legacy waste to future generations."

The consultation document is available at:

<https://www.gov.uk/government/consultations/geological-disposal-facility-siting-process-review>

A series of regional stakeholder and public events will be held during the

consultation period. Responses to the consultation will be used to develop an updated site selection process in 2014.

RWMD is responsible for technical implementation of the GDF, while DECC is responsible for the policy.

To support the consultation RWMD has published An Overview of International Siting Processes which looks at how other countries are approaching the issue.

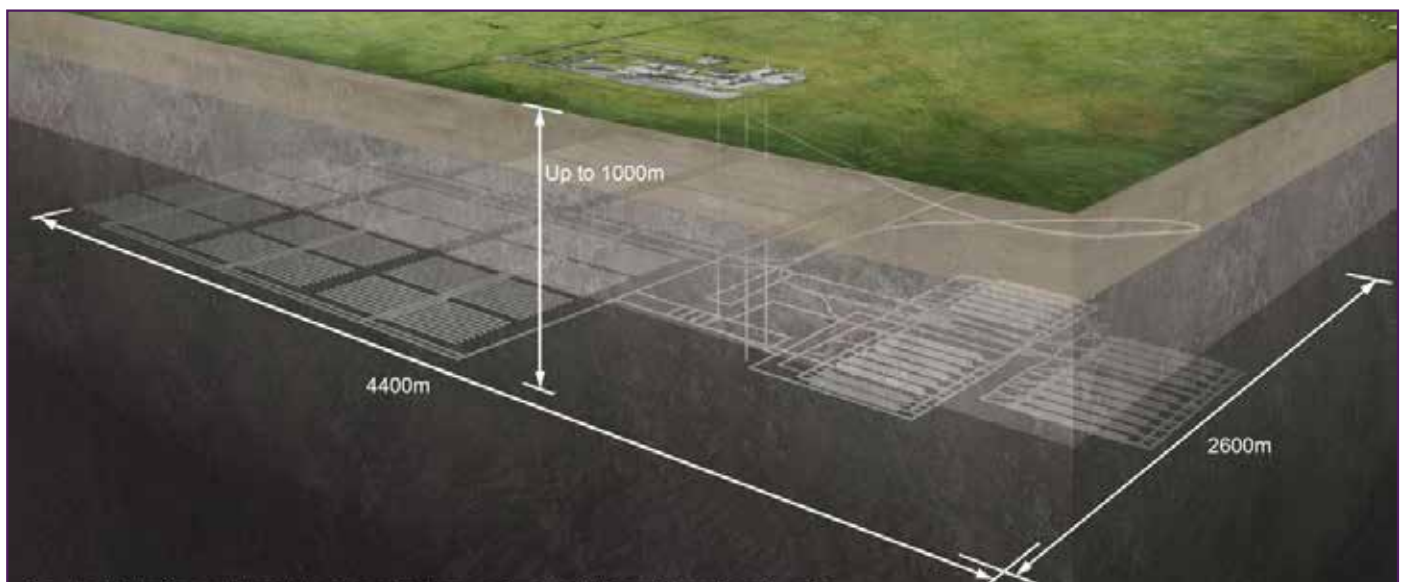
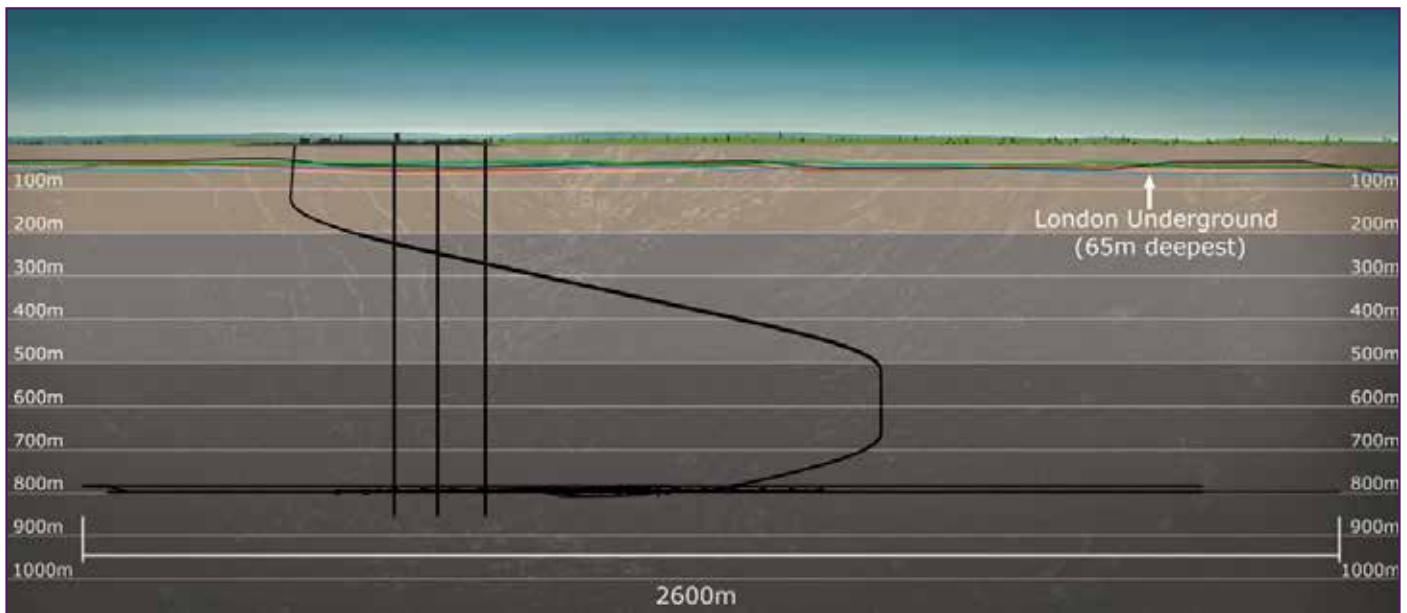
Geological disposal is recognised internationally as the best way to deal with higher activity radioactive waste and many other countries are also in the process of developing underground facilities. Some have opted to identify suitable geology as the first step, and then sought volunteer communities. Others, like the UK, have invited communities to express interest, followed by geological investigations.

Political and planning systems, along with geological and cultural considerations, all influence the choices being made by overseas Governments. In each case, however, local communities are closely involved in the decision-making. Finland, Sweden and France are furthest along with the process.

<http://www.nda.gov.uk/documents/upload/Geological-Disposal-Overview-of-international-siting-processes-September-2013.pdf>

“Geological disposal is an internationally recognised, technically sound solution for higher activity waste”

Bruce McKirdy, Managing Director of NDA's Radioactive Waste Management Directorate (RWMD)



Feedback welcome

The consultation document invites views and comments on a number of suggested changes to the process. These include:

Providing communities with more information – on issues like geology and socio-economic impacts - at a much earlier stage.

Clarifying the scale and timing of community benefits and the likely investment in an area.

Designating the GDF as a nationally significant infrastructure development project and brought within the Nationally Significant Infrastructure Project planning regime.

Clarifying that communities would be represented throughout the siting process by their representative local authority - District Council or nearest equivalent (noting differences across devolved administrations).

Introducing a more continuous process with two main phases. The "Learning" phase includes the production of independently reviewed reports on local geology and the potential socio-economic impact of a facility. The "Focusing" phase would start if both the local authority and the Government wish to proceed. This is when potentially suitable local sites would be identified and investigated in more detail.

Providing communities with an ongoing right to withdraw from the siting process, exercised by the representative authority and introducing the requirement for a demonstration of community support as a final step in the siting process.

Prior to the learning phase there will be a public information programme to raise awareness about radioactive waste and geological disposal.

Images:

Top, graphic shows potential depth of a GDF.

Above, a cross-section of the facility.

spotlight on Sellafield



Giant crane built for retrievals

The installation of a giant-sized crane at one of Sellafield's oldest facilities marks a vital step towards retrieving the waste that has accumulated over the decades.

The Semi Goliath crane is an integral part of the new Waste Retrieval Facility (WRF) being built alongside the Pile Fuel Cladding Silo (PFCS). It will lift historic waste packages onto road transporters for transfer to an interim storage facility.

The PFCS was built in 1951 to store radioactive fuel cladding from the military Windscale Piles, and later stored cladding from Calder Hall and Chapelcross reactors.

Effectively a massive concrete container with six individual silos, PFCS has now reached the end of its life. To break through the thick concrete walls, extreme safe-breaking skills will be used, enabling the waste to be removed.

The WRF, a giant concrete superstructure, will be fitted with bespoke waste retrieval modules which will dock onto the side of the PFCS and

reach through specially designed silo doors to remove the waste.

Neil Crewdson, Head of PFCS Projects said: "The Semi Goliath arrived in 12 separate lorry loads and was erected over two weeks in an extremely tight space. The team had to carry out the delicate job with surgical precision in order to ensure the safety of the legacy waste silo and its radioactive contents."

The £3 million crane is extremely complex, with many years spent on the design and test phase before manufacturing began. Weighing 109 tonnes, the crane was effectively test-constructed at a site in Gateshead, where load and works testing were carried out.

Paul Foster, NMP Chief Operating Officer for Sellafield Ltd, said: "There's a complex jigsaw of pieces that need to be in place to decommission

the 1950s Pile Fuel Cladding Silo and erection of the Semi Goliath crane means we can now see the picture on the box."

The waste ultimately retrieved from the silo compartments will be packaged into 3m³ storage boxes and handled by the Semi Goliath Crane as they are transferred for transport and storage. A significant procurement process is under way for the manufacture of 2,000 3m³ boxes to accept the retrieved waste.

*Photograph:
The crane in action alongside the silo*

Contractors:

Semi Goliath Crane - Clarke Chapman Group; Silos Retrieval Facility superstructure - Sir Robert McAlpine; Waste Retrieval Modules - Bechtel Babcock Nuclear

Hands off as robots lead the way

A long-redundant medical isotope plant has become the first Sellafield facility to be taken apart using full remote control technology.

The Caesium Extraction Plant (CEP) once produced radioactive material for cancer treatment and became highly radioactive during its eight-year operational life, preventing workforce access for the 10-year decommissioning process.

An additional challenge was its location, built on top of a facility that still stores the Highly Active Residues (HAR) which fed into the medical process. Liquid HAR was refined, concentrated and encapsulated into platinum capsules for pioneering radiotherapy uses.

Andrew MacPherson, CEP delivery manager, said: “This ends a 10-year programme of decommissioning, removing redundant plant and clearing what was a highly contaminated legacy facility. It’s also the very first decommissioning project to be completed fully remotely on the Sellafield site.”

The plant comprised four rooms full of processing vessels and pipework, furnaces and shielded tanks. It was closed in 1958 after suffering a number of operational problems, and partially cleaned out. Subsequent surveys showed that significant quantities of radioactive materials remained and high radiation levels would prevent workforce entry.

The building was not sufficiently robust to withstand significant loading on the floor or roof, so a stand-alone 900-tonne decommissioning module was built on rails alongside, and was able to access all four areas.

Wherever possible, off-the-shelf tooling was used and innovative techniques developed to remotely dismantle the plant. The innovations produced significant savings, reduced the radiation dose to the workforce and minimised down time. Intensive training was carried out, plus operator familiarisation with the areas, to ensure continued nuclear safety at all times.

Paul Foster, NMP Chief Operating Officer for Sellafield Ltd, Decommissioning, said: “We’re faced with a unique decommissioning challenge at Sellafield

for which there is no blueprint and we’re constantly using innovation to clean up the legacy of the past. The expertise we have built up carrying out this project remotely has been invaluable and is being used on other decommissioning projects at Sellafield.

“I’m immensely proud of the workforce, who had to carry out this technically difficult job in a high radiation environment.”

Photographs:

Right, remote-control equipment was key to the project.

Below, staff supervise the work.





Clean sweep on iconic chimney

More than 50 years since the UK's worst nuclear accident halted all operations at the iconic Windscale Piles, engineers have begun to dismantle the towering chimney that still looms over the west Cumbrian landscape.

Two pile chimneys, featuring distinctive bulbous tops, were originally built for the reactors that produced weapons-grade plutonium during the Cold War but were sealed up after the 1957 fire. One was reduced in height 12 years ago, while the second chimney, the first-built No 1, posed more of a challenge due to heavy radiation contamination.

The accident could have been much worse: A full-scale catastrophe was averted thanks to an 'over-the-top' filter system added to the chimney tops at the insistence of Nobel prize-winning physicist John Cockcroft.

His concern was that radiation could not be contained in the event of an accident. However, construction was already under way so, too late for installation at the bottom of the piles near the reactors, the filter galleries were added to the top instead.

At the time, nuclear workers felt Cockcroft's approach, which was incredibly expensive and caused a delay, was over the top.

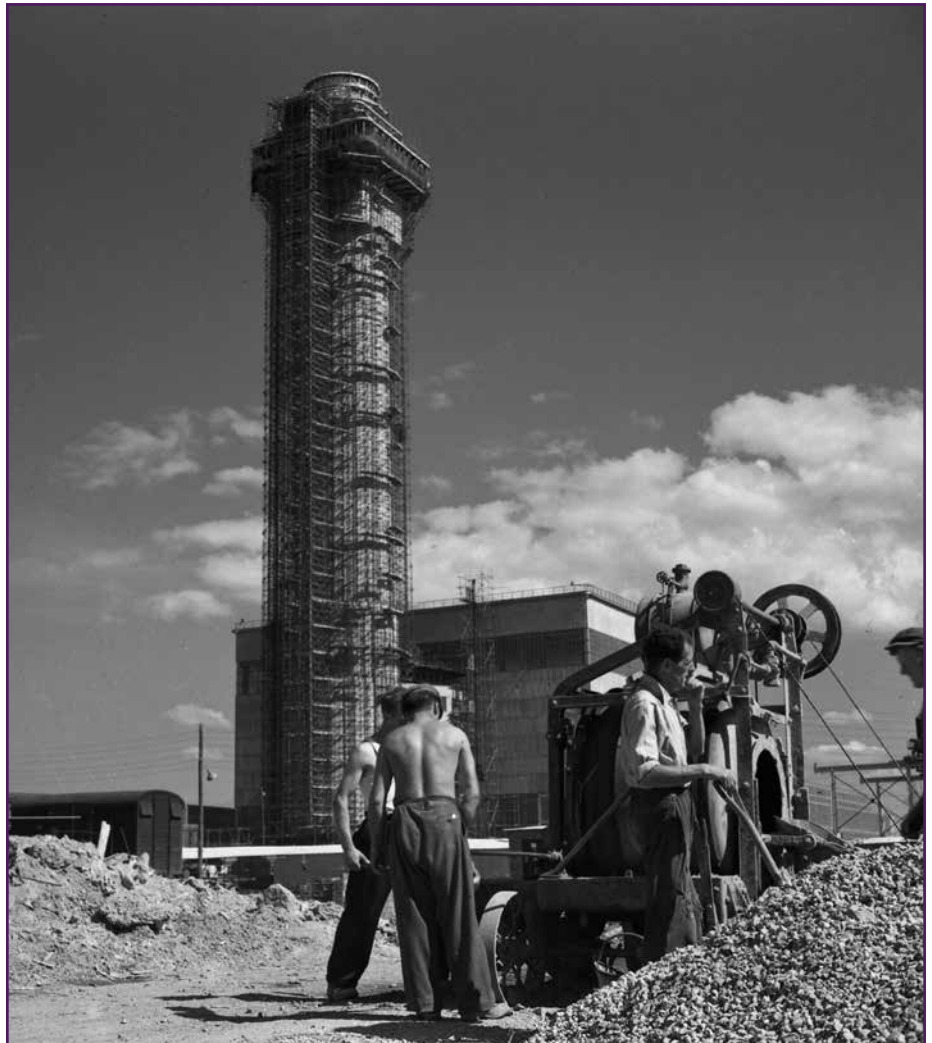
The filter galleries, nicknamed Cockcroft's Follies, prevented the incident at pile No 1 from escalating - some radiation was spread across the region but most was contained within the filter gallery.

Decades later with much of the radiation now decayed, chimney No 1 has been opened up for the first time in over 17 years.

Steve Slater, Head of Decommissioning, said: "No other structure in the world provides the same complexity in terms of both radiological and conventional decommissioning constraints. Bringing the chimney down will be a real visual demonstration of our commitment to cleaning up Sellafield."

"No other structure in the world provides the same complexity."

Steve Slater, Head of Decommissioning



"The chimneys were a real technical achievement in terms of construction, which minimised the effect of the fire and are testament to the nuclear pioneers who built them."

"Today, we're using the considerable nuclear expertise built up at Sellafield to safely bring the final chimney down. The plan is to remove the filter gallery by the end of next year and then the chimney diffuser by 2018. A tower crane will be built alongside and the chimney barrel itself will then be dismantled and lowered down in sections."

Chris Wilson, Pile Chimney Demolition Manager, added: "It's taken many years of real effort and energy to develop a robust, safe and effective plan."

More than 5,000 tonnes of materials will be removed as the 110-metre chimney is razed to ground level.

Photographs:

Far left, The Windscale pile chimney dominates the Cumbrian landscape.

Above, safety regulations were less stringent when the chimneys were built.

spotlight on Magnox



What are the options?

Overall, 17 potentially viable options have been identified. Feedback from the engagement will inform the NDA's decision-making on a shortlist of preferred options.

Next steps

The NDA expects to publish preferred options later in 2013, and after further engagement, make final decisions early in 2014. Implementation could begin later in 2014, subject to planning permissions.

Engaging on waste options

Communities around a number of Magnox sites are currently involved in an engagement process about how certain wastes are managed.

Workshops and discussions have focused on two separate NDA reviews about the storage of Intermediate Level Waste (ILW) and treatment of Fuel Element Debris (FED).

In England and Wales, Government policy is that ILW should be disposed of in a Geological Disposal Facility (GDF), expected to be available after 2040. Until then, ILW will be stored safely and securely in purpose-built stores.

The current plan is to build an interim storage facility at each site. The NDA study considers whether fewer facilities would bring financial or environmental benefits.

The study only focuses on the six English sites because Trawsfynydd already has an ILW store, while Wylfa will be one of the last sites to package waste.

An earlier, similar study in central and southern Scotland concluded that the existing plan for separate stores at Hunterston A and Chapelcross remained the best approach, however, ILW from EDF's Hunterston B station could also be stored in the neighbouring Hunterston A ILW store.

The ILW review reflects the NDA's 2011 strategy, developed in consultation with stakeholders: "... we will explore opportunities to share current and planned storage assets to improve value for money, reduce the environmental impact of new store build and impact on decommissioning timescales ..."

For FED, the preferred approach is to dissolve the metal in acid, reducing volumes for packaging and storage by 95 per cent. This approach has enabled Dungeness A to complete dissolution of its FED over a period of years, as well as treating Bradwell material.

Currently, the plan is to construct FED plants at Hinkley Point A, Oldbury and Sizewell A. The NDA's review looks at whether fewer plants would bring any financial or environmental benefits.

Other sites are not part of the review: Dungeness A has completed dissolution and Bradwell's facility is in the pipeline while waste at the remaining Magnox sites is unsuitable, or they will use existing on-site storage facilities. Other nuclear operators do not produce FED or do not have suitable material.

Fact File



- **Intermediate level waste (ILW):** There are several types of ILW, but mainly consisting of solid items such as metal components and wet waste like resins and sludge.
- **Fuel Element Debris (FED):** FED consists of metal components removed from fuel elements before they were dispatched to Sellafield for reprocessing.

Photographs:

Top left, Hunterston A's ILW store has been completed.

Above, a Yellow Box is checked before being used as an ILW container.

Defuelling passes the half-way stage

More than half of the 52,945 fuel elements have now been removed from Sizewell A's twin reactors.



Defuelling is due to be completed in September 2014 and Site Director Tim Watkins is confident his team will hit that target.

He said: "This is a significant milestone in Sizewell A's lifecycle. Our highly skilled teams are doing a fantastic job in keeping the fuelling machines online, defuelling safely and efficiently.

"Removing spent fuel from reactors and transporting it to Sellafield for reprocessing is a complex process, but Magnox is using all its experience and expertise to deal with the legacy of this first generation of nuclear power stations.

"It is good news that with defuelling recently completed at our Chapelcross site, Sizewell A now has priority for flasks and is making steady progress with fewer than 160 flasks of fuel left to dispatch.

"Once all fuel has been dispatched, we will have reduced the radiological hazard on site by more than 99 per cent."

Meanwhile, the Office for Nuclear Regulation (ONR) confirmed that Chapelcross has achieved fuel-free verification status ahead of its September target date. The Scottish site sent its last flask of spent fuel to Sellafield in February, marking the end of a four-year programme to defuel the four reactors.

The strategy for Magnox sites is to defuel the reactors while undertaking parallel decommissioning preparations. After defuelling, the focus is on further hazard reduction, waste retrieval and processing, and demolition of conventional buildings.

Once these activities are completed, the remaining buildings are secured and enter a passive state referred to as Care and Maintenance. Final dismantling and site clearance will take place around 80 years later.

*Photographs:
Left, fuel flasks are manoeuvred into place.*



The two leading Magnox sites, Bradwell and Trawsfynydd, are making steady progress towards achieving their goals of entering the Care and Maintenance (C&M) phase within the next few years.

Following intensive work programmes to deal with waste and demolish all conventional structures, C&M will leave both sites with just a handful of facilities, including waste stores and sealed-up reactors, which will remain in situ for several decades. Radioactivity levels will decay and, eventually, the residual facilities will be dismantled. The contents will be transferred to the

Geological Disposal Facility and the sites completely cleared.

A central 'hub' will be staffed by a small specialist team who will manage the sites during C&M until the final clearance stage. Their aim will be to ensure each site remains safe and secure, while overseeing the final emptying of stores and site clearance.

The acceleration of work at Bradwell and Trawsfynydd is part of the Magnox Optimised Decommissioning Programme (MODP) which covers the entire Magnox fleet. The MODP will save more than £1.3 billion from the overall lifetime plan and remove 34 years from the total time required to achieve C&M for all sites.

That's nicely finished

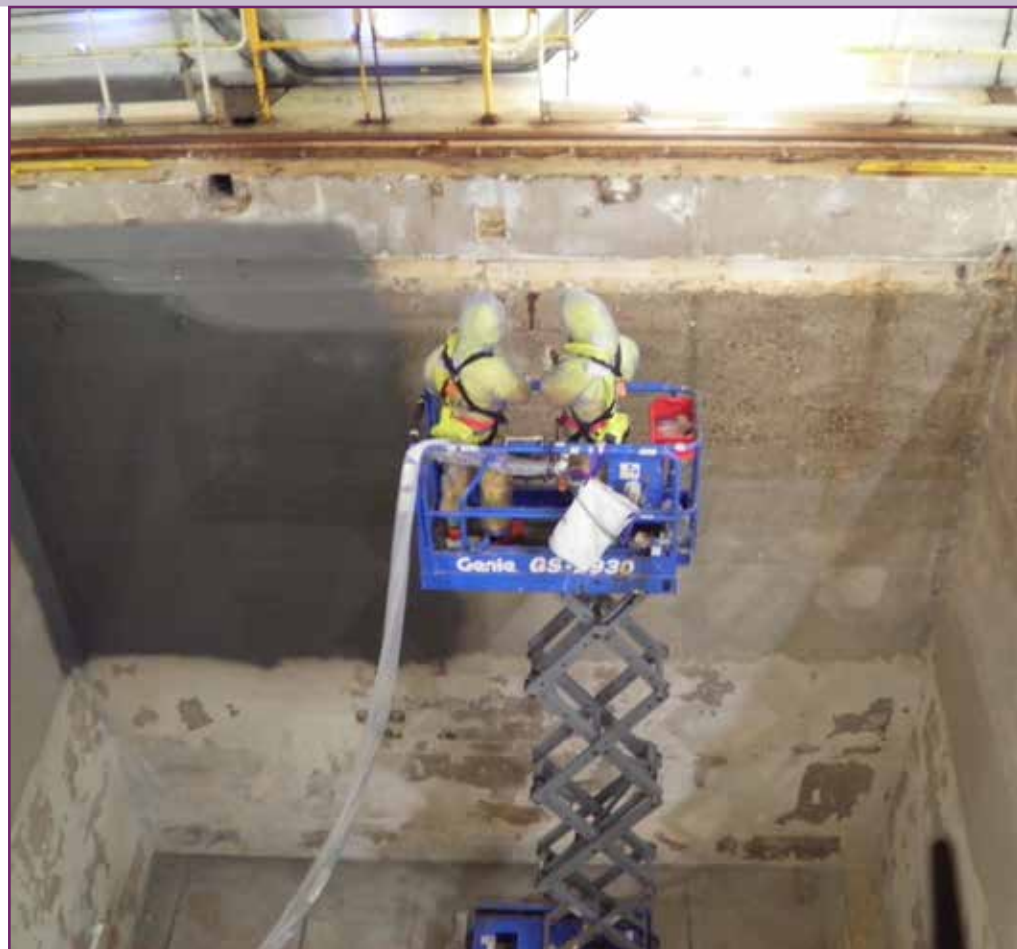
A tough spray-on coating has been used in UK nuclear decommissioning for the first time to seal the pond walls and floors of Bradwell's empty fuel storage ponds.

The polyurea material is more conventionally used as a protective lining for large surface area projects such as tunnels, tanks and bunds. Following tests and trials at the Magnox site, however, it has been newly approved by nuclear regulators as part of the requirements for site entering the passive C&M phase in 2015.

The Essex site's strategy for pond contamination is to seal it in, rather than take it off.

Bradwell's drained pond has already been cleaned up using ultra-high pressure water jetting. The coating will form a durable membrane that will help to improve the stability of the decontaminated surfaces and allow improved monitoring of potential defects during the C&M decades ahead.

The polyurea coating is sprayed on in a single application using several passes to build up a 4mm thickness. Trials have



shown it forms an excellent bond to the pond surfaces.

Alan Walker, the site's Pond Programme Manager, said: "As we drained the pond, we used UHP water jetting to clean the walls down to one metre above the floor, reducing operator doses and removing decontamination.

"We removed the remaining sludge and debris, and washed all the surfaces. Jetting was trialled on part of the pond floor but gravity works against you so we surveyed, sampled and analysed the remaining contamination before applying a thin layer of Dekguard sealant to

stabilise conditions and make it easier to monitor potential defects.

"The regulators challenged us on what more could be done to prevent movement of contamination. A search for suitable solutions led us to polyurea. Through trials and testing, we were able to demonstrate the enhanced stability, and the regulators agreed."

Contractor:
Protective Coating Solutions Ltd
(PCS)

Open for business

The Magnox fleet's first interim storage facility (ISF) has been officially opened at Bradwell.

The ISF will be used to house the ductile cast-iron containers known as Yellow Boxes until the permanent Geological Disposal Facility becomes available.

An official opening event was attended by NDA Chief Operating Officer Mark Lesinski and Magnox Managing Director Neil Baldwin.

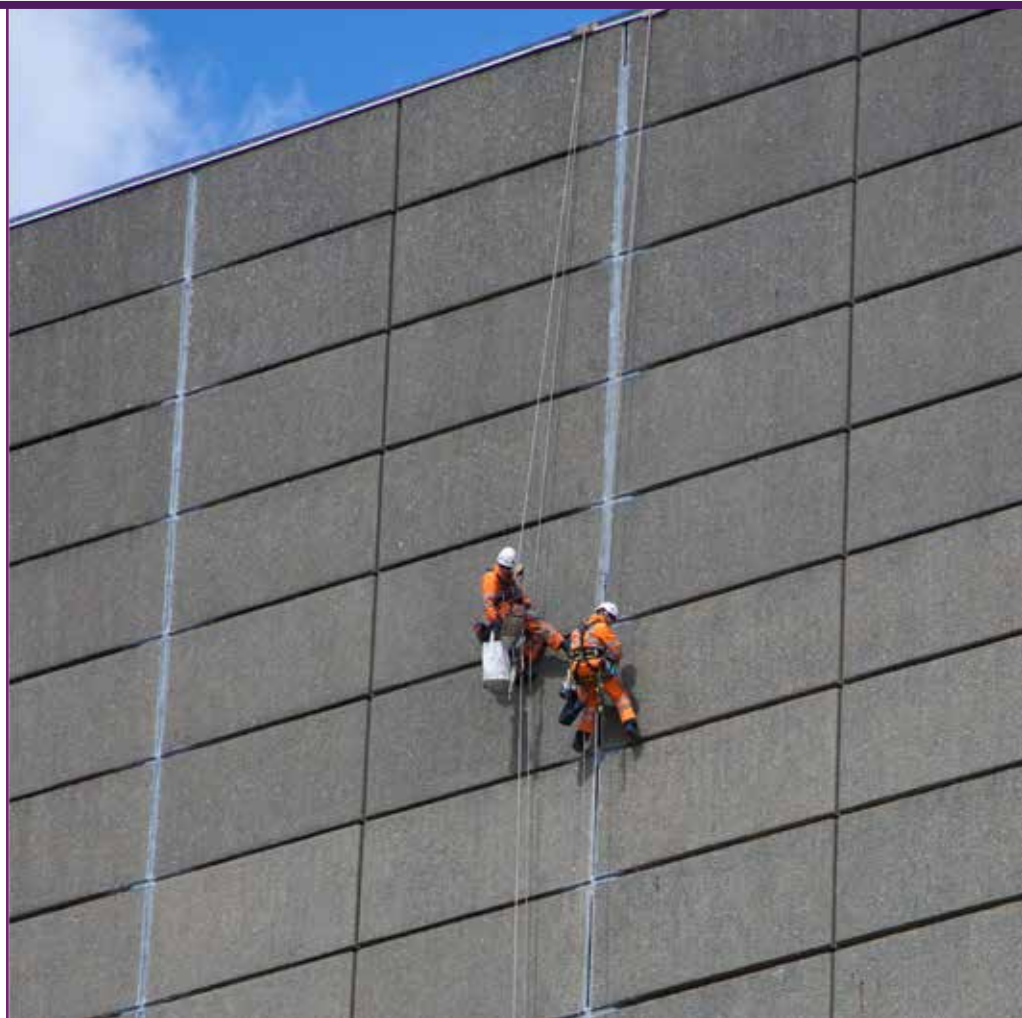
A number of containers have already been filled with Intermediate Level Waste (ILW) and are currently in temporary storage but will now be transferred to the ISF. They will be joined by many more as waste processing increases ready for entry to Care and Maintenance (C&M) in 2015.

Construction began in March 2012 with piling work to create the foundations. The main frame was constructed in just four weeks allowing the cladding of the building to start in October that year.

Mark Lesinski said: "It is great to see the ISF open for business. Bradwell is a fantastic example of a 'lead and learn' site where decommissioning experience is being developed and passed on to other sites. This first-of-a-kind ILW store is the perfect example of that."

Project lead Gary Codling said: "The building has been designed with care and maintenance in mind. The curved roof has been engineered so that rain water will simply run off into drains without any need for guttering. This significantly reduces the amount of maintenance that it will need."

Phil Sprague, ILW Programme Director, added: "We now have our first ISF taking waste and the learning from Bradwell has been shared as we progress similar ISF build programmes at Berkeley and Chapelcross."



Trawsfynydd edges closer

Trawsfynydd, Wales' first nuclear power station, has crossed the half-way point in the journey towards Care and Maintenance in 2016.

The site has seen a huge increase in activity since the plan to accelerate its C&M date was announced as part of the MODP in 2010. Many plant and buildings have been removed, nuclear waste is being treated, the reactor buildings are being prepared and new infrastructure installed to accommodate the increased number of people working on projects.

During the C&M phase, radiation levels will slowly decay naturally, allowing the two reactors and remaining building structures to be decommissioned safely and more efficiently from 2074 onwards.

Peter Burns, Site Director, said: "We have built real momentum here at Trawsfynydd. The team across the whole of Magnox has made excellent progress in taking the site closer towards our C&M goal. Key to this success is our framework contractor, ACTUS, and an effective local supply chain. We've

also built strong relationships with local stakeholders who are a vital part of all our activities on the site."

Brian Burnett, NDA Head of Programmes, which owns the Trawsfynydd site, added: "Delivering Trawsfynydd into C&M by 2016 is a challenging goal. I have been impressed by the sense of drive at the site and the excellent progress Magnox has been making."

Photographs:

Far left, workers spray the coating onto the pond walls.

Above, the reactor buildings undergoing preparation for C&M.

Contractor:
Actus



Just a short skip to recycling solutions

The recycling of redundant equipment is helping to save money across the estate and reduce the amount of waste that needs disposal.

Two recent projects include Chapelcross site, which is sending more than 50 pond skips for re-use at Sellafield, and Dounreay which has sold two 40-tonne generators for use in producing electricity from biofuels.

At Magnox's Chapelcross site, the original plan was to remove the skips from one of the ponds and cut them up for disposal to the Low Level Waste Repository near Drigg in Cumbria.

However, a double cost-saving opportunity was identified by the Ponds Programme team working with Sellafield, who were considering the manufacture of new skips to use in the Pile Fuel Storage Pond. Savings of £500,000 will be achieved by avoiding the cost of disposal for the skips.

Ponds Programme Director Steve Walters said: "Rather than treating these skips as waste, we identified an opportunity to re-use them. In addition to the cost savings that will be made, this initiative has prevented the production of additional waste. This is really a great example of cross-SLC collaboration in action."

As decommissioning at Dounreay gathers pace, meanwhile, the two generators were hoisted from the former diesel generator building that forms part of the Prototype Fast Reactor. The Caithness site is run by Dounreay Site Restoration Ltd,

The generators, sold along with ancillary plant, provided emergency power to the PFR for 20 years, between 1974 and 1994. Their removal paves the way for the demolition of the second and last fast reactor to be built in the UK, which generated power for the national grid while also providing a unique research and development design for the future operation of large commercial fast reactor stations.

Earlier this year, Berkeley site sent the last of 15 massive 300-tonne boilers to Sweden for smelting and recycling, with 95% expected to re-enter the market as scrap metal.

Photographs:

Left, one of the Dounreay generators is removed.

Top right, Chapelcross staff ensure skips are ready for transfer to Sellafield.



Dounreay contractors:

Babcock, Nuvia, JGC, Hugh Simpson Cranes, Caithness Scaffold (Dounreay)



Old lead baths are all washed out

Three highly contaminated lead-lined ‘baths’, weighing up to 28 tonnes each, have been hoisted out of the redundant Dounreay Fast Reactor (DFR).

The heavy baths - in reality more like tanks - once held molten lead where cans containing irradiated fuel elements were submerged.

While the DFR was operating, irradiated elements removed from the reactor core were kept in cans with an internal lead lining. The hot fuel would melt the lead, which has excellent heat transfer properties, and therefore help with the cooling process once the cans were transferred to the cooling pond.

If heat from the fuel was insufficient, cans were also immersed in the molten lead to ensure a good thermal bond was formed before being placed in the cooling ponds for interim storage.

The internal liners of the baths eventually became highly contaminated.

Stripping out the old baths was a challenging legacy as decommissioning of the 50-year-old plant progresses.

Purpose-designed, purpose-built lifting frames were used to remove the large cast-iron baths, which were lifted as single units by DFR’s large crane.

Project manager Jack McCracken said: “Decommissioning DFR is one of the most challenging projects faced by the NDA. This project proves that with a dedicated and committed team of people all working together these challenges can be achieved safely and on time.

“Taking out the lead baths means a major radiological hazard has been removed from the DFR facility which allows future decommissioning projects to progress to meet the site closure programme.”

*Photograph:
Above, one of the lead baths
is checked over.*

Contractors:

Gow’s Lybster Ltd

Reactor heads for demolition

Scotland's first-ever reactor and its buildings are on the point of demolition, following a decommissioning programme that began more than 40 years ago.

Dounreay's Materials Test Reactor (DMTR) was used to test the effects of radiation on metal and operated from 1958 to 1969, when the first phase of decommissioning started.

Many of its ancillary facilities have already disappeared, including a cooling circuit and towers, fuel pond, workshops, laboratories, an active handling bay and administrative offices. Following two periods of care and maintenance, decommissioning has now been fully under way since 1999.

One of the most challenging facilities, the post-irradiation examination (PIE) cells, or cave, once had internal radiation levels so high that it would have taken less than one second for a worker to receive more than the annual permitted dose of 20 millisieverts. The cave was used to inspect irradiated components from DMTR and later from the Prototype Fast Reactor.

Using a new 'bulk approach' to waste disposal, that focuses on removing components in larger pieces, has enabled work to proceed more rapidly.

To reduce levels in the cave sufficiently for workforce entry, the project team used remotely operated manipulators to remove the Intermediate Level Waste and decontaminate the internal structures.

With the radiation and contamination levels reduced to an acceptable level, the team were able to physically enter the cave for the first time since it closed and complete the clean-up.

On a recent visit, the NDA's Chairman Stephen Henwood said: "I've visited this facility a few times during the decommissioning and I am always impressed by the progress which has been made since my last visit.

"The pace of this work and the fact it has been achieved in a safe and secure manner testifies to the ability and commitment of the Dounreay Site Restoration Ltd workforce and its supply chain partners."

DSRL project director Steve Beckett added that decommissioning the cave was a significant achievement: "This was a legacy facility that had been left under minimal care and maintenance, with a highly radioactive inventory, large waste volumes and defunct plant/equipment."

"The success of the project is due to the professional approach of the team doing the work, who had to apply innovative solutions in order to solve difficult engineering problems.

"Safety was a key aspect of this work and was built into the planning, monitoring and execution stages of the project, consulting the relevant specialists as appropriate.

"The knowledge, experience and skills gained by the team on this project will be useful to other projects."

Photograph: From the left, NDA Non-Executive Director Tom Smith accompanies NDA Chairman Stephen Henwood and Shareholder Executive Director Ken McCallum into the cave



Contractors:

Doosan Babcock and NDSL Ltd

spotlight on **SMEs**

Small and Medium-Sized Enterprises



Research business is aiming big

The array of powders, sludges, concrete chunks, containers, steel rigging and mixing machines might remind casual visitors of a builder's yard.

For scientists involved in radioactive waste, however, the materials and equipment on view at the Lancashire premises of NSG Environmental are a goldmine of potential solutions to some of the complex challenges being tackled on decommissioning sites.

How to retrieve or condition a particular radioactive waste stream, for example, or what kind of containment will remain robust during the decades of storage before a permanent disposal facility becomes available.

Research is one of the cornerstones of this niche business, which specialises in cleaning up radioactive waste. Replicating the chemical properties of materials that need treatment – but without the radioactivity – is a key requirement to finding innovative solutions and occupies some of the company's finest scientific minds.

"We use the test materials to understand the properties of the waste, and how it will behave in different conditions. This enables us to work on the development of tailor-made solutions. To support this, we mix tons of 'sludge' every day, all different types. For example some of the sludge found in cooling ponds is sloppy, some is sticky," said Business Development Manager James Rudd.

With six large test rig halls, plus a seventh in the pipeline, NSG is able to trial and test materials and containers, as well as build replica installations where clean-up solutions are trialled and refined.

NSG was launched more than 30 years ago, initially as a joint venture between Wimpey Construction and Gilbert Commonwealth with a focus on nuclear decommissioning.

The company was acquired by the NIS Group of companies in 1993. Work in the nuclear sector was sluggish during the early years but the advent of the NDA in 2005 galvanised UK decommissioning activities and opened up the market.

"When I joined around 10 years ago, we were turning over around £3 million



but now we estimate annual turnover will reach £18 million. Growth has been progressive and with the NDA support for small businesses, we are now on the cusp of outgrowing our SME status - which is wonderful in many ways," added James.

NSG employs 185 staff, many of them scientists, and is part of the NIS group, together with Hold Engineering of Cumbria, a manufacturer of engineering structures, and NIS Ltd, who provide high-tech bespoke equipment to the nuclear industry.

NSG's business is divided into three areas: Consultancy Services, Science and Technology and Site Operations.

In addition to work on Sellafield's legacy ponds and silos, NSG is undertaking waste management and decommissioning work on Magnox sites, the Low Level Waste Repository (LLWR) near Drigg, Ministry of Defence installations, together with R&D for the NDA's Direct Research Portfolio.

James said: "We have a unique scientific capability, focusing strongly on Research and Development which often provides the foundation for our decommissioning work."



NSG lead one of the five consortia who were last year awarded a framework contract by the NDA, under its Direct Research Portfolio, for research work associated with integrated waste management.

Photographs:

Far left, 'waste' undergoes analysis.

Top, the test halls play a critical role.

Above, at work in the lab.

Honour for Head of R&D



The University of Leeds has conferred a prestigious visiting professorship on the NDA's Head of Research and Development, Melanie Brownridge.

The title of Visiting Professor in the School of Process, Environmental and Materials Engineering is an acknowledgement of Melanie's experience in nuclear decommissioning technology.

The new role will bring the opportunity to share her knowledge with undergraduate and post-graduate students at the university.

Melanie, who completed a chemistry PhD at Imperial College London, said: "It's a great honour and such an opportunity to raise the profile of what is at the heart of our mission. I'm very excited about this."



The wild side of nuclear life

Around other sites, some initiatives on NDA-owned land include:

- A pair of resident choughs, the rarest member of the crow family, who regularly raise chicks near one of Wylfa's dry store cells. The large, dry cavern-type area is safe from predators and similar to a natural cave. Three-quarters of the UK's small Chough population live in Wales and Wylfa's family, while in residence, are protected from disturbance and work put on hold until the youngsters fly off.
- Rare natterjack toads on NDA-owned land near Sellafield. Cumbria is home to more than half of UK natterjack colonies, with another located near Drigg, where LLWR have helped with funding. Shallow pools are the preferred habitat of these yellow-striped toads, alleged to be Europe's noisiest amphibians - during the mating season, the male calls can sometimes be heard over several kilometres away. The Sellafield reserve is managed by the Amphibian and Reptile Conservation Trust.
- Help for migrating salmon through the installation of special river skylights by the Environment Agency above New Mill Beck, where it flows through a culvert near Sellafield. Possibly a world first, the glass domes allow daylight into the tunnel, where the darkness was thought to be discouraging the salmon from swimming from the sea towards their breeding areas.
- At Dounreay, a bird-friendly gravel covering has topped off the landscaping on an old landfill site to appeal to ground-nesting species such as gulls, oystercatchers and terns.



Reactor site takes falcons' fancy

Two peregrine falcon chicks have flown the nest after hatching from their rooftop home on one of Bradwell's redundant reactors.

Their parents' arrival earlier this year brought an unexpected halt to cladding work on Reactor Two while special measures were drafted in to avoid disturbing the nest.

With around 1,500 breeding pairs in the UK, peregrines are a protected species. Their more usual habitat is along rocky seacliffs and the uplands of the North and West, while cliff edges are among the preferred nesting sites.

Tall buildings or bridges share some features of these natural elevations so have come to be second-choice locations and include, it seems, old nuclear reactors.

For some wildlife, there is clear appeal in the relative calm of buffer land surrounding nuclear licensed sites, which are securely fenced off and where unusual species can thrive undisturbed.

As well as Bradwell, a breeding pair have been known to nest on the Berkeley reactors, another elevated location that has been particularly peaceful since the two buildings were sealed up in 2010.

The NDA estate, meanwhile, supports a range of environmental initiatives around the UK.

The SLCs are involved in the maintenance of woodland habitats and several Sites of Special Scientific Interest (SSSIs) near their sites, including Hunterston A, Dungeness A and Winfrith.

An ancient apple orchard at Oldbury was originally planted by prisoners at a jail that has long since been demolished. Cider orchards have become increasingly rare in the South West, and Oldbury's orchard contains varieties such as Lambrook Pippin, Bulmers Norman, Tremlett Bitter and White Close Pippin.

The rural estate is managed on behalf of the NDA by Carter Jonas.

Photographs:

Top left, the glass domes let light in. Top, Peregrine falcons chose one of Bradwell's reactors as a nesting place. Far left, Cumbria is home to many of the UK's natterjack toads (photograph by Pete Minting).

Leaving a sustainable legacy

In line with the NDA's obligations to mitigate the socio-economic impacts of decommissioning nuclear sites, a range of socio-economic initiatives have been developed, many in partnership with community organisations.

For the Magnox sites, a 'one-stop-shop' web portal was launched last year, following publication of a socio-economic impact assessment and development plan.

The portal is the main vehicle for managing applications for funding. In the last financial year, the scheme invested £822,748 to support communities around Magnox sites.

A total of 182 organisations were awarded funding to benefit good neighbour schemes, contribute to sustainable communities and support transformational projects.

The first year of the Magnox one-stop-shop system attracted a huge amount of interest with more than 380 organisations from England, Scotland and Wales applying for support.

Saranne Postans, Head of Communications for Magnox Ltd, said: "Managing a larger proportion of the NDA's socio-economic funding on its behalf has enabled us to make some significant steps towards effectively mitigating the impacts of our work programme.

"With a focus on Bradwell, Trawsfynydd and Dungeness sites, we continue to work hard to build relationships with the districts and county authorities and support them with projects to develop the economic prosperity for the community."

One of the latest investments is a £360,000 contribution towards a £4.5 million skills development programme at Coleg Meirion Dwyfor.

The programme will create hundreds of training opportunities for young people in engineering, renewable and sustainable energy skills, with the aim of transforming the rural local economy around Snowdonia.



The leading-edge skills centre expects to start operations before Christmas 2013, and be completed by August 2014.

The project attracted £2 million from Grŵp Llandrillo Menai, which manages three of the region's colleges, and £2 million from the Welsh Government.

Jon Phillips, NDA Director of Communications and Stakeholder Relations, said: "We are committed to supporting endeavours to minimise the local impact of decommissioning Trawsfynydd Power Station and are delighted to be making this contribution. The skills centre will give young people excellent opportunities to access training and build rewarding careers locally."

Meanwhile, in Kent, the Marsh Million fund is now open for business. The three-year, £1 million fund provides interest-free unsecured loans for small and micro-businesses on Romney Marsh, with the aim of building a diverse and sustainable economy as Dungeness A moves towards Care and Maintenance (C&M) over the coming decade. The scheme is a partnership between Magnox, Kent County Council, Shepway District Council and Ashford Borough Council.

Damian Collins, the MP for Folkestone and Hythe, who opened a recent launch event for the scheme, outlined how important the fund was to the community in terms of creating "real jobs".

Around Bradwell, a significant piece of socio-economic work has been completed, looking at the impacts of entering C&M in the near future.

The report, commissioned by Maldon District Council with financial support from the Magnox socio-economic fund, outlines a number of themes for the community to consider to ensure that the economy continues to thrive.

The report was launched by the local authority to a range of local business people over the summer and was well received. Mike Gull, Bradwell Site Director, said: "It is hoped that this report will enable the district and county councils to plan for the ongoing economic prosperity of the area up to and beyond 2015."

Photograph:

Above, a new report has looked at the impacts of C&M at Bradwell.



£18 million office development under way in Cumbria

Construction work is progressing on the multi-million pound Albion Square scheme, led by the NDA, in Whitehaven, the largest office block to be developed in Cumbria for many years.

The twin four-storey buildings will have space for 1,000 office staff who will move from the Sellafield complex into the prestigious town centre location.

The project is worth more than £20 million in total, with the bulk of the investment provided by the NDA. The other partners are Sellafield Ltd and Britain's Energy Coast (BEC).

The NDA appointed, through a competitive process, UK construction and infrastructure company Morgan Sindall to deliver the scheme, which

forms a key project in the BEC programme to boost the Whitehaven economy by attracting new workers to the town centre.

RMJM acted as concept and design architects, Hurd Rolland Partnership as project architects with construction management provided by Deloitte's Real Estate.

Albion Square forms part of the wider West Cumbria Economic Blueprint, published by BEC last year, which outlines how BEC will strategically

invest its resources to help West Cumbria capitalise on a potential £90 billion worth of investment in the nuclear industry and seize new opportunities in renewable technologies.

More than 3,000 high-value jobs could be created over the next 15 years and new life injected into the area's urban and rural communities.

*Photograph:
Above, Albion Square takes shape.*



Step inside and celebrate with us

For the first time in many decades, workers can step inside a former waste store without full radiation protection suits.

The major decommissioning milestone at the Low Level Waste Repository (LLWR) near Drigg was achieved following the removal of more than 11,000 drums and 550 containers of bulk plutonium-contaminated material from a series of concrete bunkers, known as 'magazines'.

Further work to remove contamination from the walls of Magazine Four means that radiation protection is no longer needed in order to enter.

To mark the milestone, members of the community were invited to look inside the magazine at a special event.

Adrian Dalton, a local resident and member of Drigg and Carleton Parish Council, was involved in a campaign to have the material removed.

He said: "It is gratifying to know that our efforts and the efforts of many others have brought about this day when we

can walk into a facility that has been out of bounds for many decades."

Former Sellafield worker, Henry Wormstrup, a Copeland and Cumbria County councillor, remembers the building.

"It's amazing to be standing here today in my street clothes when, not so long ago, people were working in here in a very contaminated environment wearing air-fed suits," he said.

"It really is a fantastic achievement to have completed this work and what's so impressive to me is that the community has been involved every step of the way."

Sara Johnston, Head of National Programme at the NDA, which owns the site, said: "The decommissioning of the old magazines is one of the top priorities we set for the LLWR site.

"The work builds on the successful transfer of the plutonium-contaminated material to modern storage facilities at Sellafield.

"I was extremely pleased to see first-hand the excellent work that has been undertaken to remove all radiological risk from Magazine Four."

The scale of work needed to make the structure safe meant that workers made more entries to the building using air-fed suits than were made on the entire Sellafield site in 2012.

Attention will now switch to the next phase of decommissioning the magazines.

Photograph:

Above, LLWR's Martin Walkingshaw (right) explains the store's background to Sara Johnston from the NDA (second right) and guests.

"It's amazing to be standing here today in my street clothes when, not so long ago, people were working in here in a very contaminated environment."

Henry Wormstrup, Copeland and Cumbria County Councillor.

Site to close 27 years earlier

The closure of Winfrith is being fast-forwarded by 27 years, and will set a UK precedent as the NDA's first site to be cleaned up and restored for a non-nuclear future.

2021 is now the target date for restoring the former research centre to heathland and opening it up to the public. Formal delicensing and de-designation – signifying the complete removal of all remaining nuclear regulations – will follow several years later.

The optimised programme that is now under way at Research Sites Restoration Ltd (RSRL) will also see Harwell, in Oxfordshire, taken to the passive Care and Maintenance phase five years earlier than originally planned.

At both sites, decommissioning activities will intensify across many projects in the years ahead, boosting employment and creating contract opportunities for suppliers.

Winfrith currently employs 150 people, plus on-site contractors, a figure that is expected to reach approximately 250, with substantial additional support from contractors, as activities increase.

The programme is expected to save £250 million from the costs of clean-up at both sites.

Among the major pieces of work will be the earlier decommissioning and demolition of Winfrith's two iconic reactors, DRAGON and the Steam Generating Heavy Water Reactor (SGHWR), taking more than 10 years off the timeframe for each.

Work has already been completed on Phase 1 of DRAGON decommissioning, with removal of all plant and ancillary equipment. Phase 2 will involve decommissioning of the reactor core and pressure vessel. The unique high-temperature gas-cooled DRAGON reactor operated from 1964-1976 and was widely regarded as one of Europe's most successful collaborations in applied science.

Additional work includes decommissioning of the Active Liquid Effluent System (ALES), as well as making radioactive waste passively safe, emptying Winfrith's Treated Radwaste Store and



transferring the waste off site; demolishing redundant buildings, remediating any contaminated ground, and finally restoring the heathland habitat.

At Harwell, meanwhile, planning permission has been granted for an Intermediate Level Waste (ILW) store, which will hold material until the Geological Disposal Facility becomes available. The store will also take material from Winfrith and Culham.

Around one fifth of the original Harwell site has now been released from all nuclear regulations through the de-licensing and de-designation process, following many years of decommissioning and clean-up. By 2028, only the ILW storage compound will remain on site, with 95% of the land available for the neighbouring science park.

Photograph: Above, decommissioning Dragon is one of the key challenges.

Tenders awaited

The four bidding consortia in the Magnox/RSRL competition have now been officially invited to submit their final tenders to the NDA.

The Invitation to Submit Final Tenders (ITSFT) also marks the end of the nine-month information-gathering phase, where bidders were able to visit Magnox and RSRL sites, as well as take part in a series of formal face-to-face dialogue sessions with the NDA team. The dialogue process is designed to assist the bidders in preparing their tenders.

The new Parent Body Organisation (PBO) will take ownership of shares in the two Site Licence Companies and introduce a new senior management team to oversee decommissioning activities. The existing site workforces will remain in place.

Andrea Livesey, the NDA's Competition Programme Manager, said: "The formal dialogue period has concluded successfully, after a huge amount of time and effort by all parties. This really formed the crux of the competition process, enabling the participants to understand our requirements and secure the information needed to put their proposals together."

Tenders must be submitted by early November and will be evaluated over four months before the identity of the Preferred Bidder is announced in March 2014. A subsequent period of transition will allow all legal processes and due diligence to be carried out, with the Share Transfer due to take place in September.

Currently valued at around £6-7 billion over 14 years, the contract represents one of the UK's largest public procurement exercises.

The consortia are:

- Reactor Site Solutions (Bechtel, EnergySolutions)
- The Babcock Fluor Partnership
- CAS Restoration Partnership (CH2M Hill, Areva, Serco)
- UK Nuclear Restoration Ltd (AMEC, Atkins, Rolls Royce)

The two-year competition process, launched in July last year, is being managed in compliance with EU procurement regulations.



New attractions for 2013 include:

- An innovation zone where leading-edge nuclear companies will showcase their technologies and present case studies.
- An international seminar with nuclear experts from other countries, who will update delegates on the overseas decommissioning market and opportunities that are available for UK companies. Representatives from Romania, Switzerland, Bulgaria, China, Taiwan, Germany, Japan and France have already confirmed their attendance.

Businesses sign up for networking event

More than 700 delegates have now registered for the prestigious NDA Estate Supply Chain Event 2013, which will be held at EventCity in Manchester on 13 November.

The one-day business event, now in its third year, is organised jointly by the NDA and all its SLCs who are confident that the blend of prestigious presenters, seminars, exhibitions and informal networking will ensure a hugely successful day.

A key aim is to improve access to opportunities for all the supply chain, and particularly for Small and Medium-sized Enterprises (SMEs). This reflects the Government's aspiration for public organisations to provide smaller businesses with wider access to their markets, as well as the NDA's three-year SME Action Plan which sets an estate-wide 20% target for the proportion of annual sub-contract spend (both direct and indirect) to SMEs by 2015.

Ron Gorham, NDA's Head of Supply chain optimisation and SME Champion, said: "We are tailoring the day to meet the aspirations of businesses at all levels of the supply chain, and encourage new suppliers to get involved. We are very conscious that the supply chain is vital to our mission, and we wish to ensure it remains healthy and dynamic."

The keynote speaker will be Government Minister Baroness Verma, from the Department of Energy and Climate Change (DECC), who will open the day with a presentation to delegates and exhibitors.

The number of exhibition stands has almost reached capacity, while time is still available to attend as a delegate – entry is free of charge.

Along with many of the Top Tier 2 suppliers, the NDA and SLCs will have 'Meet the Buyer' stands where businesses will be able to discuss potential contract opportunities on a face-to-face basis.

The annual event aims to promote greater visibility of contract opportunities for businesses seeking to work in the UK's decommissioning market and to provide an informal networking forum.

To register an interest in attending:
www.decommsupplyevent.co.uk

*Photograph:
Above, Supply Chain Event 2012.*