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INSIGHT

into nuclear decommissioning

NDA

Nuclear
Decommissioning
Authority

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Dealing with the past. Protecting the future.

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Welcome to the first 2011 edition of Insight magazine, the NDA's round-up of activities across the estate.

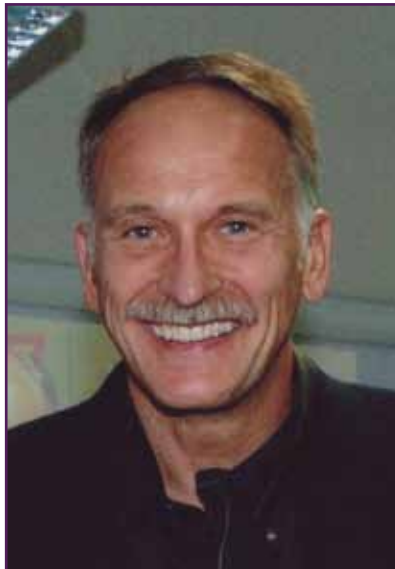
If you would like to receive copies on a regular basis, do send in a request. In the meantime, we would be interested in hearing your views and any suggestions for improving the format.

Comments to the editor Deborah Ward on 01925 802343 or deborah.ward@nda.gov.uk

Front cover: Hunterston A site in Scotland

We must spell out our expectations with clarity

Mark Lesinski, the NDA's Executive Director – Delivery, took up his newly created post towards the end of last year, following the NDA's restructure.



◦ Mark Lesinski: 'Different working model from the past'

The former Managing Director of Magnox South, who has been involved in the nuclear sector for more than 30 years, describes himself as "nuclear through and through" and sees part of his role as being to clearly define future expectations.

He points out that, while the early years of the NDA were closely focused on understanding the scale of the decommissioning mission and drawing up an appropriate strategy, the key goal of today's streamlined organisation was to get on with the delivery.

The reduced workforce, smaller by around 30%, reflects a confidence that the delivery partners – Site Licence Companies and Parent Body Organisations – are well placed to drive forward the decommissioning and clean-up programme.

He said: "The NDA has spent the last few years understanding and drafting strategies for tackling the challenges.

"Our job now is to convey the objectives clearly, to delineate what those goals are and then trust the SLCs to work towards them,

delivering in a cost-effective manner. Working through others is key to moving forward, as well as trusting their expertise and judgement.

"We will exercise an appropriate level of oversight, without overkill, but essentially, allow our contractors the space to develop the best tactics to deliver our strategy and achieve the milestones – or even better, to exceed them.

"This is a different working model from the past, and the changes will take time to become embedded. We are still in the process of assessing precisely how this will operate in practice both for our NDA teams on the ground at site level, and on a day-to-day basis, but will be sharing progress in the months ahead.

"Having been part of Magnox, working to deliver for the NDA, this wakes me up to the importance of being clear without being too prescriptive."

He pointed out that the critical challenges remain the high-hazard legacies at Sellafield, along with achieving success in the ongoing competition to find a new PBO for Dounreay.

The final phase of NDA's programme of competing the ownership of the SLCs will follow, with the subsequent competition for the 10 Magnox sites, along with the research sites at Harwell and Winfrith.

A new approach to Magnox decommissioning, meanwhile, will see two lead sites moving forward at relative speed, with the aim of developing the best approach to a range of issues. This should allow a concentration of effort and expertise in order to yield valuable lessons that could be implemented efficiently and cost-effectively at the remaining sites.

Historic milestone as reactors close

NDA Chairman Stephen Henwood was one of the guests when Berkeley Site held a ceremony to mark the official closure of its reactors.

Berkeley achieved a UK first by placing its reactors into 'Safestore', mode and they will remain sealed until 2074, when they will finally be demolished during Final Site Clearance.

The ceremony was attended by a range of stakeholders including site regulators, local dignitaries and past and present employees.

Dr Sara Johnston, the NDA's Head of Programme, said: "This is a hugely significant achievement, not just for the site but for the UK nuclear industry as a whole, demonstrating the progress being made in decommissioning.

"Reaching Safestore at Berkeley will also provide valuable knowledge and expertise that will assist with taking the remaining Magnox reactors into Care and Maintenance."



◦ Workmen remove pipework from one of the reactors



◦ Site director Sean Sargent (left) at the closing ceremony with guests Dame Janet Trotter, NDA Chairman Stephen Henwood and Penny Wride, Chair of the Site Stakeholder Group

Change of approach to cut timeframes

A new and innovative approach at the Magnox sites aims to cut several decades off decommissioning timeframes and reduce costs.

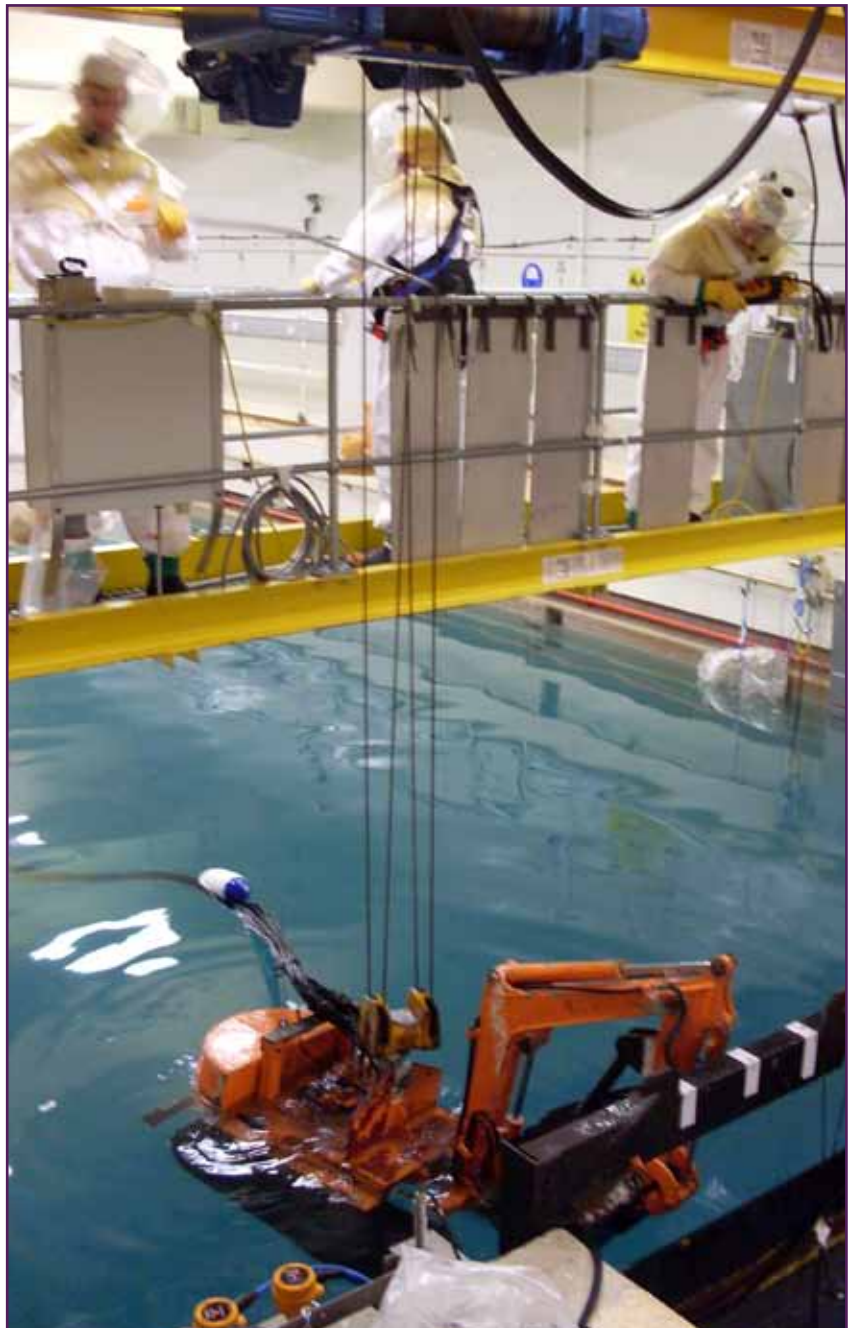
The 'optimised' plan will see two of the 10 sites setting the pace in clearing hazards and testing innovative practices, with the intention that this creates a proven benchmark for other sites to adopt. Although a funding boost is required in the short-term, the longer term will yield significant savings and reduce the cost of clean-up.

The strategy previously focused on gradual, incremental progress taking place across the whole fleet, an approach that was already in place when the NDA was formed six years ago. This would have delivered a single site into 'Care and Maintenance' by 2020, with the last site reaching this milestone by 2034. The revised approach should bring the dates forward at six proposed sites by 5-12 years, cumulatively totalling 30 years, while work is temporarily deferred elsewhere.

The principle behind the new approach is to comprehensively address challenges at the lead sites, trial and refine innovations and absorb the lessons before introducing them elsewhere. Specialist teams are being formed to build up expertise on cross-site issues and develop best-practice, making the most efficient use of resources.

Dr Brian Burnett, the NDA's Head of Programme for Magnox, said: "These changes represent a complete re-engineering of the way we tackle Magnox station decommissioning. We aim to concentrate effort and expertise on the challenges that are shared by all sites, such as ponds clean-up, asbestos removal or storage of intermediate level waste. Once we have arrived at the best solution, the textbook is effectively written for the remaining sites which will be able to apply the learning with real confidence.

"This enables us to use resources more efficiently and make substantial progress in the full knowledge that we are applying the best techniques. We have built the costings into our planning from the outset and



◦ Bradwell is spearheading the approach on ponds clean-up

estimate that savings for the taxpayer could be more than £1 billion in total. Having set this new benchmark, however, we fully intend to continue with the search for further efficiencies and technological improvement."

Trawsfynydd and Bradwell are already well advanced on the decommissioning path and are now

set to forge ahead with early work on retrieval and clean-up of waste materials, as well as demolition projects. Both, however, are subject to sufficient funds continuing to be available in the years ahead.

Bradwell's Site Director Dick Sexton said: "The site teams, alongside specialists from Magnox, EnergySolutions and the supply



◦ Trawsfynydd site (above) in the Snowdonia National Park is transferring packaged waste into its ILW store (below)

chain, have worked very hard to put in place the building blocks for this optimised delivery. We spearheaded a programme approach to clean-up, including ponds decommissioning, the adoption of Fuel Element Debris treatment and Intermediate Level Waste recovery and storage, to move towards accelerated Care and Maintenance at Bradwell and Trawsfynydd.

"This is a great opportunity to lead the way and put the UK at the forefront of global decommissioning, while ensuring that our exemplary safety record is upheld."

All the sites are working towards the passive 'Care and Maintenance' phase which will leave only the reactors on site together with a waste store, while radioactivity decays before final site clearance around 60 years later.

The opportunity to streamline the strategy arises from regular ongoing reviews of the existing approach, along with the emergence of new technologies and the drive for efficiencies amid the economic squeeze.

A further factor is the recent merger of Magnox North and Magnox South, which are now legally combined into



Magnox Ltd. Work towards the full integration of management and other functions will continue over the next few months.

Having restructured, the business has now split on-site activities into three separate groupings that reflect the 'optimised' approach and the focus of work required, as follows:

- Lead sites at Bradwell and Trawsfynydd
- Fuelled sites, covering the full generating sites at Oldbury and Wylfa, together with Chapelcross, Dungeness A and Sizewell A which are in the process of defuelling
- Hunterston A, Hinkley Point A and Berkeley decommissioning sites, where the focus is on keeping them safe and delivering value for money.

Construction of waste plant to begin

Magnox is investing in mobile decommissioning equipment that can be moved around to tackle the waste legacy at a number of its sites.

A multi-million pound contract has been awarded to Costain to develop a plant that treats and dissolves radioactive waste, massively reducing the amount that needs to be disposed of.

The process will target fuel element debris, or FED, which is made up of metal components removed from the casing of fuel elements after use and, in terms of volume, represents the largest radioactive waste-stream after the fuel itself.

Dissolving the FED in acid reduces the volume by 97%, leaving much smaller quantities for packaging, long-term storage and disposal.

The process has been pioneered over 10 years at Dungeness and now has the potential to shave around £100 million from the cost of cleaning up the Magnox sites.

FED Programme Director Steve Walters said: "Our intention is to create as much of the plant as possible using separate modules that can be used across our sites, recognising that we'll need some customisable retrieval equipment to tackle different vault designs.

"This has the potential to save significant amounts of money, but will also mean our specialist team will develop a thorough understanding of how it all works – generating substantial implementation and process savings."

Designs for the plant are due to be signed off later this year, ahead of operations commencing at Bradwell in 2012.

Hinkley Point A, Sizewell A and Oldbury are planned to follow and treat their FED, which was originally expected to remain on site until it could be moved to the deep Geological Disposal Facility (GDF) when it becomes available.



◦ FED (below) will be dissolved in a specially designed plant (above)



Fuel problem solved after 20 years

A long-running problem with damaged fuel at Wylfa has finally been solved 20 years after it was first detected.

Over the years, a number of projects were launched to deal with the corroded fuel elements in one of the dry stores, but subsequently halted due to technical difficulties.

But the last element has now been successfully removed and is ready to be transported to Sellafield for reprocessing.

Mike Hughes-Roberts, Project Lead for the project, expressed delight: "This has been a significant issue for Wylfa for many years and has provided the company and the NDA with a few headaches along the way. By having a dedicated team and the support of key stakeholders, the project has been able to respond to change in a very proactive manner and maintain momentum."

Unlike other Magnox plants, Wylfa uses a 'Dry Storage Cell' (DSC) system for spent fuel, rather than water-filled cooling ponds, which provides both cooling, storage and a biological shield from the radiation.

In July 1990, moisture from a leaking roof was found to have affected fuel elements in Dry Store Cell 4 and subsequent camera inspections identified that 19 out of approximately 21,000 fuel elements were significantly affected. Corrosion damage made it impossible to use conventional equipment designed for retrieving undamaged elements before transport to Sellafield.

The first attempt at recovery was made in the mid-1990s, but stopped after only two elements were retrieved as there was a fear that the main route for standard fuel removal would be contaminated.

A new project was started in 2001, but a technical assessment later concluded that the approach was too complicated and carried high risks.

In 2007, costs were escalating significantly but risks still remained. A decision was made to temporarily halt the project, while the original assumptions were re-visited, with

a number of previously dismissed options re-considered.

Eventually, the local knowledge of experienced plant staff proved vital in developing a solution involving a powered grab. This required detailed commissioning works and the training of operators to use the bespoke recovery equipment, as well as engagement with both stakeholders and regulators.

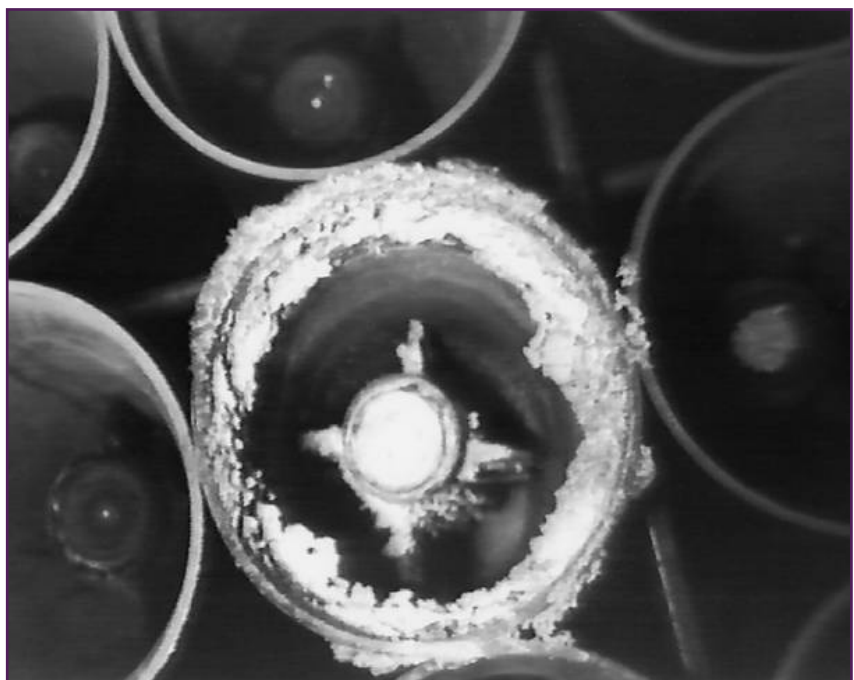
The campaign started again in December 2009, with the first damaged element recovered and placed in the transport flask just before Christmas. Further exhaustive modifications were needed to address the issue of debris surrounding the elements.

With persistence the elements were slowly recovered, each one requiring careful manipulation.

Stuart Law, Deputy Site Director and Plant Manager, said: "This shows how legacy from the past can be cleaned up in a safe manner. It is also a testimonial to the dedicated team involved who developed a simple solution to safely recover the elements – excellent teamwork."



◦ The grab in action



◦ Fuel element corrosion caused problems for many years

First human steps in 40 years

For the first time in more than 40 years, an engineer has been able to enter a contaminated tank at Winfrith in Dorset.

The entry to Tank 3 of Winfrith's External Active Sludge Tanks (EAST) was made to undertake a radiological survey as part of final decommissioning. It represents a significant milestone in the project and is the first time anyone has entered the tanks since they went operational in the late 1960s.

The four tanks were built to store the radioactive sludge generated during the operational lifetime of Winfrith's Steam Generating Heavy Water Reactor (SGHWR).

"Human entry into the sludge tanks allows us to carry out the final decontamination, in preparation for the decommissioning and eventual demolition of EAST," said RSRL project manager Cliff Strange. "We're extremely pleased with how well the work is progressing."

Over the past five years, the sludge has been transferred from the tanks and encapsulated in cement at the Waste Encapsulation Treatment Plant (WETP) and transferred for storage in the Treated Radwaste Store on site.

With this work now complete, and the last drum removed, final decommissioning of both WETP and EAST is proceeding.

As part of the post-operational clean-out, sandy material was removed from the bottom of the tanks and encapsulated in 180 drums, ready for low level waste disposal. The tanks are now being washed out and the



° At work inside the tank

contents transferred for settling, prior to final disposal on site.

The work to decommission the rest of the tanks continues. Diamond wire cutting techniques are being employed and the first access to

Tank 4 and the pipe corridor has now been cut.

A second access is currently being made into Tank 4, in preparation for removal of the tank roof.

Mission completed

The Waste Encapsulated Treatment Plant (WETP), meanwhile, completed its mission last year, producing more than 1,000 drums containing sludge bound in cement.



° The Waste Encapsulation Treatment Plant in its early days

The facility treated sludge generated during the operational phases of one of the site's experimental reactors, the Steam Generating Heavy Water Reactor.

During the plant's lifetime, a total of 1,068 encapsulated sludge drums were produced and transferred to a storage facility, pending final disposal off site.

During the final recovery of sludge a quantity of dense material, largely

comprising silica, and referred to as "sandy" material, was discovered at the bottom of the tanks.

A process was developed to recover the sand for encapsulation into 40-litre drums, using a formula agreed between RSRL and LLWR.

The successful completion of the recovery and encapsulation of SGHWR sludges marks a major milestone in the restoration of the Winfrith site.

NDA investment supports new Energy Centre for the South West

A new Energy Skills Centre in Somerset has been officially opened by the Secretary of State for Energy and Climate Change, the Rt Hon Chris Huhne.

The £8 million facility in Somerset, in the South West of England, supported by £450,000 from the NDA, will provide a first-class learning environment to meet the growing demand for training in science and engineering from local employers. It will also be the location for the South West regional training hub of the National Skills Academy for Nuclear (NSAN).

Funding was also provided by EDF Energy (£3 million), National Skills Academy for Nuclear via the Adult Skills Funding Agency (£2.25 million) and the South West Regional Development Agency (£2 million). EnergySolutions and the Kier Group provided additional sponsorship, while Sedgemoor District Council donated the land.

Mark Lesinski, NDA Executive Director - Delivery, who attended the opening, said: "We are delighted to invest in and support the Energy Skills Centre at Bridgwater College. The Energy Skills Centre will not only play an important role in the development of local decommissioning skills but will also help to ensure that the local economy is well-placed to make the most of the opportunities that lie ahead."

One section of the building will provide training in science and engineering including robotics, welding, electronics, process control and material science. A second section, the Realistic Working Environment, will train students in decommissioning and operating nuclear power stations.

The college roof, meanwhile, will have a wind turbine, solar heating and photovoltaic cells, forming a teaching area where students will be able to study and research green energy technologies.

The Energy Skills Centre is a key part of plans to deliver the region's economic and skills development objectives. Approximately 60% of the



◦ From the left: Derek Randall, Chair of Governors, EDF Energy Chief Executive Vincent de Rivaz, Chris Huhne, College Principal Fiona McMillan and Mark Lesinski from the NDA

training programme will be dedicated to raising skills in high-technology, knowledge-based industries, while the remaining 40% will support reactor decommissioning and prepare for nuclear new build.

EnergySolutions, the parent company of Magnox Ltd, which operates the NDA's Hinkley A site some 10 miles away, contributed funding for equipment while the site has also donated a training simulator used by their own staff, which included mock-up changing areas, confined space

trenches and a wall full of pipework, allowing people to practise cutting and de-planting techniques.

Bridgwater College provides education and training for 3,100 students aged 16-18 and approximately 11,000 adults per year. In addition to providing learning programmes in a wide range of subject areas, the College also has a large apprenticeship training programme with around 550 apprentices undertaking work-based training in local companies.

Industry underpinned by a top-class workforce

The National Skills Academy for Nuclear was established in 2008 by nuclear employers, including the NDA, and covers the whole industry from new build through to operational plant and decommissioning.

It aims to ensure that the industry and its supply chain have the workforce with the skills, competence and safety expertise needed for the current and future UK nuclear programme.

Until recent developments in Government policy ushered in a nuclear renaissance, the sector had been attracting relatively few young entrants, creating a potential skills shortage as an ageing workforce begins to retire just as new build is crying out for skills.

Chief Executive Jean Llewellyn is passionate: "We will need to

find 1,000 graduates and 1,000 apprentices every year for the next 10 years to maintain the required level of skills - mainly because of the age profile of the workforce."

She emphasises the importance of maintaining the correct levels of appropriately skilled staff in the right jobs. The existing workforce have developed unique skills and expertise over the years, but that knowledge now needs to be transferred to new entrants into the industry to allow the important decommissioning work to be carried out – a steep transition, said Jean.



◦ Jean Llewellyn

The NDA's sites are very aware of the value of specific knowledge held by the workforce, knowledge which is essential to decommissioning quickly, safely and efficiently.

Jean added: "Obviously, there is a challenge to maintain the skills at decommissioning sites while new build is happening. Our aim is to manage this while supporting the individuals who may want to move from decommissioning sites, ensuring that they get the right training, at the right place and at the right time.

"In speaking to graduates and potential entrants into the industry, I have noticed that the decommissioning side is seen as an extremely exciting area because of the challenge and the constant need for innovation. I tell these individuals that they have an opportunity to make a real difference and that the people who can solve decommissioning problems could be the industry leaders of the future – in the UK and overseas."

There is no escaping the current financial climate, but the view of Jean Llewellyn is that this builds the case for continuing investment in nuclear skills: "Our whole agenda is focused on safety and safe, efficient operations. We cannot afford to do anything which might jeopardise this, so we need to continue investing in the right type of training to work safely and maintain the public's confidence in our industry.

"This is the most exciting sector I've worked in. The employers see skills as important and have come together to set up the Skills Academy ... you don't do that if you're not committed to people. The nuclear employers are some of the most inspirational people I've worked with."

Nuclear skills training



◦ RSRL staff receive their NVQ certificates

Research Sites Restoration Ltd (RSRL), as an NDA SLC, has already benefited from the work produced by the NSAN hub which supports the National Vocational Qualifications scheme.

RSRL, which operates the Harwell and Winfrith sites, recently made presentations to some of those successfully completing their NVQ. Skills and Training Manager Iain Wilson said: "Our people drive our success and it is important to recognise that RSRL and our staff are committed to their continual development. Many people now hold National Vocational Qualifications attained over the

years, demonstrating to our stakeholders the capabilities of our staff. These qualifications take time and effort to attain and should be celebrated. We have many people working hard on qualifications which will benefit RSRL and our stakeholders."

Dr Bob Mudd, Bridgwater College Internal Verifier, commenting on the nuclear decommissioning NVQs said that both he and the external verifier were very impressed with the standard of the NVQ portfolios being produced by RSRL staff: "These portfolios clearly show a motivated workforce."

Work starts on £20 million research facility

Construction work has now started on the foundations for a new £20 million nuclear research centre in West Cumbria.

The Dalton Cumbrian Facility (DCF), being constructed on the Westlakes Science and Technology Park, near Whitehaven, is scheduled to open in September 2011.

DCF will be a new research base for The University of Manchester's Dalton Nuclear Institute and is the result of joint investment by the University and the NDA.

Research will focus primarily on radiation science, nuclear engineering decommissioning and the management of radioactive waste.

Once fully operational, DCF will house around 40 post-doctoral and PhD researchers, lecturers and operating personnel and will aim to attract leading UK and overseas academics to carry out research and deliver lectures in West Cumbria.

DCF will incorporate detailed computer modelling capability and large-scale experimental laboratories, including extensive irradiation facilities and associated analytical and inspection equipment, to provide a comprehensive research environment.

The facility adds to the growing research, education and skills infrastructure which are integral elements in the Britain's Energy Coast programme that is designed to build on West Cumbria's world-leading capability in the nuclear industry.

Dr Melanie Brownridge, NDA's Head of Research and Development, said: "The need for a world-class nuclear research centre was a key part of the NDA's skills strategy.

"Locating the DCF here in West Cumbria close to other key facilities such as the National Nuclear Laboratory and Energus will provide an overall package of education and skills excellence that will both support the NDA's clean up mission and the broader development of the local economy."

Jamie Reed, MP for Copeland, said: "The investment in the DCF is an important step in maximising the expertise that exists here in Cumbria by building on the strength of the existing nuclear industry to create a solid economic future for the area.

"The new facility will add to the growing education and skills infrastructure in West Cumbria which will provide invaluable support to the development of Britain's Energy Coast."



° Prof Simon Pimblott, left, from University of Manchester who will be one of the facility's leading academics, with MP Jamie Reed and the NDA's Brian Hough

Uranium plant comes apart

Fifty years ago, the Dounreay chemical plant was a cornerstone of British research with highly enriched uranium.

Tonnes of fissile material passed through the plant and into the hands of Britain's top atomic scientists at sites across the country.

It was used in research reactors for industrial, military and medical applications. Dounreay-derived uranium products for example, produced material for millions of cancer diagnoses in Europe, according to the site's technical archives.

Today, the arrays of vessels, gloveboxes, evaporators and ovens that made up Britain's uranium recovery effort are coming apart.

And thanks to You Tube (http://www.youtube.com/watch?v=arOQ9_gPqol), the public can watch it happen.

A six-minute film produced by DSRL has been published online, showing the latest section of the chemical complex to come down – the uranium trioxide line.

Decommissioning this latest section of the chemical plant saw it shrouded in a giant plastic tent to contain any toxic residue.

Workers dressed in whole-body airline suits entered the sealed tent at the end of August to begin dismantling the chemical equipment.

Over the next two months they systematically stripped down and cut up the ovens, vessels, pipes and boxes.

Their exposure to any residual radioactivity was monitored constantly throughout the painstaking work.

"The main radiological hazard involved in work like this comes from the risk of internal exposure, which occurs if there is inhalation or ingestion of any airborne residues from the vessels and pipework as they are cut up," said Gordon Tait, senior project manager at Dounreay Site Restoration Ltd.

"That's why we take the precaution of erecting a containment barrier around the whole area and stipulating the use of airline suits to protect the health of workers.

"The team carrying out this work is a good example of how plant operators can make the transition to decommissioning, taking the skills they've learned and adding to them to get the job done safely and efficiently."

Almost 70 containers have so far been filled with radioactive waste over two months, requiring 10 workers in full protective clothing and breathing apparatus.

The material will now be processed as low-level radioactive waste, and the containers stored with other waste from Dounreay until a new low-level waste disposal site is ready in 2013.

Dismantling and demolition of the rest of the plant will take until 2019 to complete.

The decommissioning team is made up of workers from three companies – Dounreay Site Restoration Ltd, Nuvia and NDSL.



◦ Gloveboxes that formed part of the plant are being taken apart



° Dounreay

Formal talks under way

Formal talks are currently under way between NDA representatives and the consortia involved in the competition to secure a new Parent Body Organisation (PBO) for the Dounreay site.

The two consortia have already visited the site for informal information gathering and are now engaged in 12 weeks of intense and confidential dialogue. The dialogue phase is essential to enable participants subsequently to deliver the best possible final tenders.

Dialogue is scheduled to end in April. Subject to dialogue completing on schedule, the NDA will issue an invitation in May to submit final tenders. However, NDA reserves the right to extend the dialogue period if necessary to ensure sufficient readiness for the final tender stage of the competition.

The consortia are:

- Babcock Dounreay Partnership, comprising Babcock Nuclear

Services Ltd, CH2M Hill International Nuclear Services Ltd and URS International Holdings (UK) Ltd.

- Caithness Solutions comprising Energy Solutions EU Ltd and Amec Nuclear Holdings Ltd.

Day-to-day operations of the site will continue to be managed by the Site Licence Company, Dounreay Site Restoration Ltd (DSRL). The new PBO will take ownership, via share transfer, of the DSRL SLC for the duration of the contract.

Graeme Rankin, the competition project manager, said: "The dialogue phase really does constitute the crux of the competition process. It provides the platform for the development of the best possible

final tenders, and will therefore have a significant impact on making sure that we achieve the best possible outcome for the Dounreay site."

The NDA continues to anticipate contract award in the first quarter of 2012, which will be followed by a transition period before the new PBO is fully embedded.

Competition is a central core of the NDA's strategy, enabling the SLCs to benefit from the skills and expertise of the private-sector PBOs in delivering the sites' missions.

More information is available at: <http://www.nda.gov.uk/contracts/competition/dounreay/index.cfm>

Graphite options under scrutiny

Due to its position as one of the early pioneers of nuclear energy, the UK has acquired the world's largest stock of irradiated graphite, comprising around 100,000 tonnes, that will need to be safely disposed of.

Graphite, a form of carbon manufactured into bricks, was used in the reactor cores of the country's first nuclear power stations, the 11-strong Magnox fleet, as well as in the second generation of eight AGR plants which are owned by British Energy and are still operating. More modern reactors, such as Sizewell B, use pressurised water as a moderator for the nuclear reaction.

Compared to other forms of Intermediate Level Waste (ILW), irradiated graphite is solid, stable and relatively low hazard, though its radioactivity is long-lived. Naturally occurring graphite is used for a wide variety of industrial purposes including steelmaking, semi-conductors, and pencil lead.

The current strategy for graphite management is to dismantle reactor cores following a period of storage, which allows radioactivity to decrease (typically 85 years), and package the graphite for disposal. Disposal in a geological disposal facility (GDF) is the planned end point in England and Wales while in Scotland, the policy is for the long-term management of higher-activity radioactive waste in near-surface facilities.

Geological disposal was recommended by the Government's Committee on Radioactive Waste Management (CoRWM) following an evaluation of various options for the management of all types of HAW which included a period of public consultation. CoRWM also recommended that other options for wastes such as reactor decommissioning wastes should be explored.

The NDA is therefore committed to exploring other possibilities and, as a first step, has commissioned two graphite research studies which are being delivered by Babcock, with an extensive supply chain including Manchester University, Galson Sciences Limited, Serco and the National Physical Laboratory.

Early results are extremely promising, demonstrating that a computer modelling process developed by Babcock provides accurate results and can be used to predict the characteristics of irradiated graphite.

A more accurate inventory could enable segregation of the graphite, which may then allow the use of more than one option for the treatment and disposal of the graphite. Use of the right treatment and disposal option for the right graphite wastes could prove more cost-effective than a single option approach. Tests are ongoing to improve understanding of how the radionuclides in the graphite behave during treatment and disposal. The programme will be complete by Spring 2011.

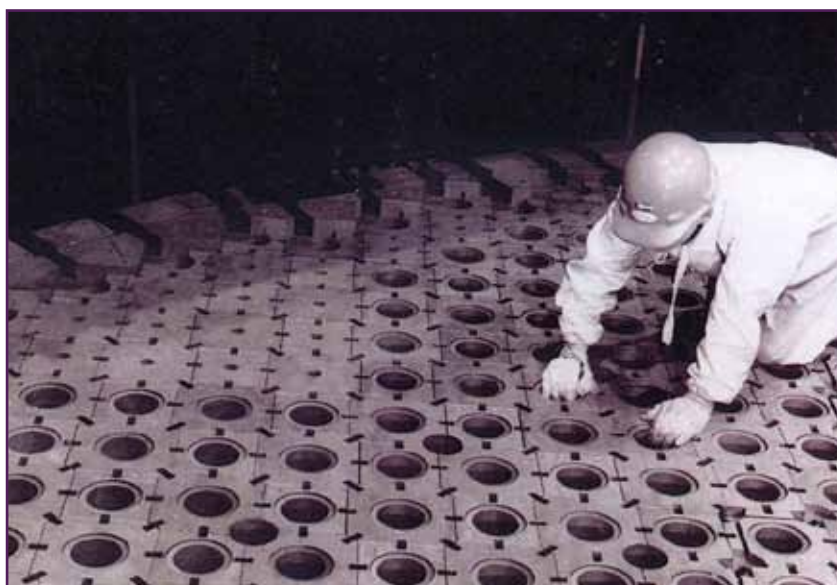
A number of options are being investigated for the treatment and disposal of graphite including gasification, sequestration and near-surface disposal.

Gasification involves heating graphite with steam, leaving a small amount of solid residue for immobilisation plus a gas stream that could be sequestered in an

underground geological formation, or subject to further treatment to isolate and immobilise radioactive components. Gasification trials are being undertaken on behalf of NDA by Studsvik who operate a radioactive waste gasification facility in the US.

Studsvik, Costain and Bradtec with Hyder Consulting have worked together to deliver the final package of work on the feasibility of sequestering gasified graphite. This study has looked at the progress of international Carbon Capture and Storage programmes for fossil fuel carbon dioxide.

Matthew Clark, Reactor Decommissioning Waste Project Manager, said: "This work will continue to develop our understanding of the options for managing graphite wastes from reactor decommissioning. From this work we will also better understand our graphite inventory and how it would behave using these alternative waste management options. The projects also form part of our ongoing contribution to international studies looking at the best way to manage graphite waste."



◦ Construction of the core graphite blocks at Oldbury Power Station near Bristol

Site looks at shallow facility

The NDA is also funding a study at Hunterston A site in Scotland to assess the feasibility of disposing of operational waste graphite in an engineered near-surface disposal facility. In the past graphite has been considered for deep disposal along with other ILW. However, it may be possible to demonstrate that it is safe to dispose of just graphite waste in a near-surface facility due to its relatively low hazard nature

The NDA has been working with its sister organisations around the world to find a solution for dealing with the graphite waste.

Near-surface disposal of low level waste and short-lived ILW has been safely practised in many countries for several decades (http://mrws.decc.gov.uk/en/mrws/cms/home/What_are_other/What_are_other.aspx), while the US has disposed of graphite wastes in near-surface facilities.

Hunterston A is an ideal site for conducting the study as, due to the

unique design of its fuel elements, there is a sufficient quantity of accessible waste graphite already in storage at the site. At other sites the graphite remains inside the reactor cores.

If the 12-month study, being conducted by Magnox Ltd on the NDA's behalf, demonstrates that a near-surface facility is safe, feasible and environmentally acceptable on a permanent basis, the approach could be considered as an option for graphite waste at the other power station sites. Local stakeholders are also being consulted on the project.



- The unique design Hunterston A's fuel elements mean it has readily accessible graphite stored on site

Nuclear transport

MP praises ships' safety at welcome event

MP John Woodcock has praised the safety of a new fleet of nuclear material transport ships which recently arrived in Barrow-in-Furness.

The Shadow Transport Minister, who is the town's MP, joined NDA Chief Executive Tony Fountain, community members and other nuclear industry representatives to welcome the Pacific Grebe and Pacific Egret, part of the Pacific Nuclear Transport Ltd (PNTL) fleet.

Mr Woodcock said: "It's great to see first-hand how impressive the vessels are and how seriously you take your safety obligations."

NDA-owned International Nuclear Services (INS) and subsidiary PNTL, the world's leading marine transporters of nuclear materials, have completed a fleet replacement



- NDA Chief Executive Tony Fountain, INS Managing Director Mark Jervis, John Woodcock MP, and NDA Chairman Stephen Henwood

programme that has seen three new vessels arrive in Barrow.

The vessels mark a £100 million investment in the transportation of nuclear materials from the UK and France to Japan over the next 25 years.

INS Managing Director Mark Jervis said: "The vessels are a blend of our home-grown nuclear transport expertise and excellent Japanese ship-building. We have never had an incident involving the release of radioactivity during 40 years and more than five million miles of travel."



◦ ILW awaiting transfer

Safety documents to be published

Work to develop a geological disposal facility for higher activity radioactive waste is continuing in line with the Managing Radioactive Waste Safety (MRWS) process. Government is leading on the site selection process based on voluntarism and partnership with local communities.

Meanwhile our Radioactive Waste Management Directorate (RWMD) staff are working on the scientific and engineering preparations that will need to be in place. This will help ensure that once a site has been identified

a facility can be built and operated safely and securely.

In July last year, we published our **Geological Disposal: Steps towards implementation** report which set out

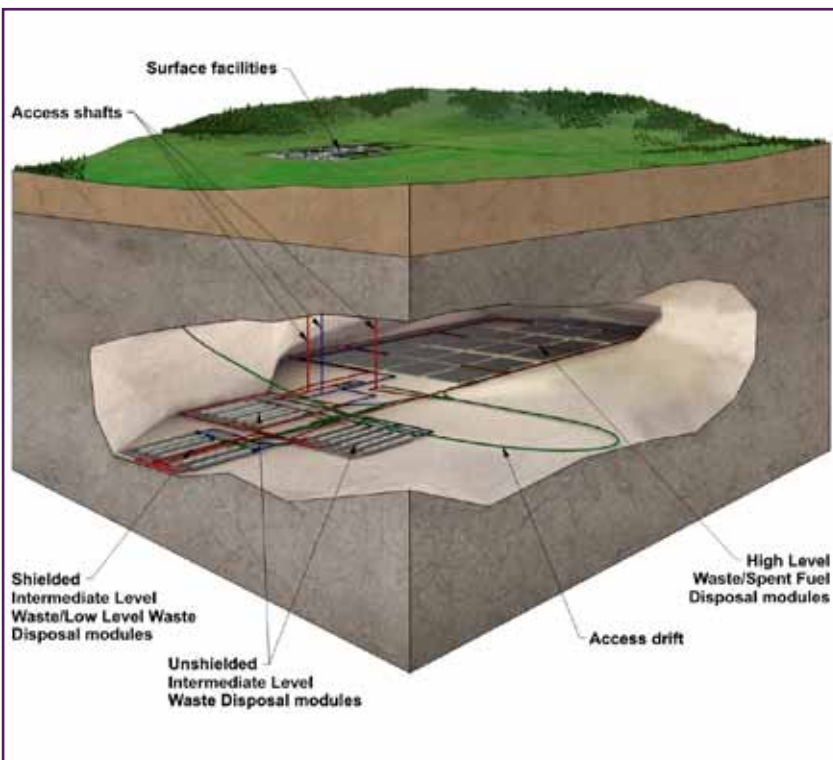
the steps required to bring such a facility to fruition.

As a next step in this process, we will publish a suite of scientific and technical reports which explain all of the safety factors that need to be considered when we submit an application to the nuclear regulators for permission to operate such a facility.

The reports, to be published at the end of February, have the broad title of generic **Disposal Systems Safety Case (DSSC)** and cover a host of safety issues including:

- The waste to be disposed of and how it will need to be packaged
- The safety of the transport to and within the disposal facility
- The safety of operating such a complex facility
- The safety to the environment during all of these phases and into the future long after the facility has been closed

The DSSC reports will be published in full on the NDA's website and highlighted in the next edition of Insight.



◦ A diagram showing how the GDF might look

Business Plan update



◦ Sellafield remains the NDA's most challenging site

The NDA has received 15 responses to the public consultation on its draft Business Plan for 2011 to 2014.

This is the fourth year that we have published a draft three-year business plan for consultation. Before 2007, we published plans for a single year ahead only.

Whilst the current economic dip could result in the deferral of some previously outlined scope, it is not anticipated that there will be major changes to the direction outlined in previous NDA business plans.

Stakeholder comments are now being reviewed and will be incorporated into a new draft of the plan which will receive Government approval at the end of March.

Over the next few weeks, Business Planning will review the comments received before submitting the final version to Government for approval by the end of March 2011.

Meanwhile, publication of the NDA's updated Strategy is also expected no later than March.

A statutory requirement under the Energy Act, this document follows on from the first Strategy document published in 2006.

It sets out long-term objectives and strategic direction which focus on ensuring the efficient decommissioning and clean-up of

the UK civil public sector nuclear legacy sites, while encouraging high standards in health, safety, security and environmental performance.

Your views are sought

Organisations and individuals interested in the NDA's work are invited to express their views on the key areas that the NDA will need to engage on over the next financial year, 2011-2012.

Feedback is sought in order to inform a Stakeholder Engagement Plan that is currently in draft form on the website.

The detailed plan of engagement activities will be published in March and will include:

- A timeline with a list of the key engagement needs
- A list of activities and milestones

For more information or to input your views please visit: <http://www.nda.gov.uk/stakeholders/engagement-plan.cfm>

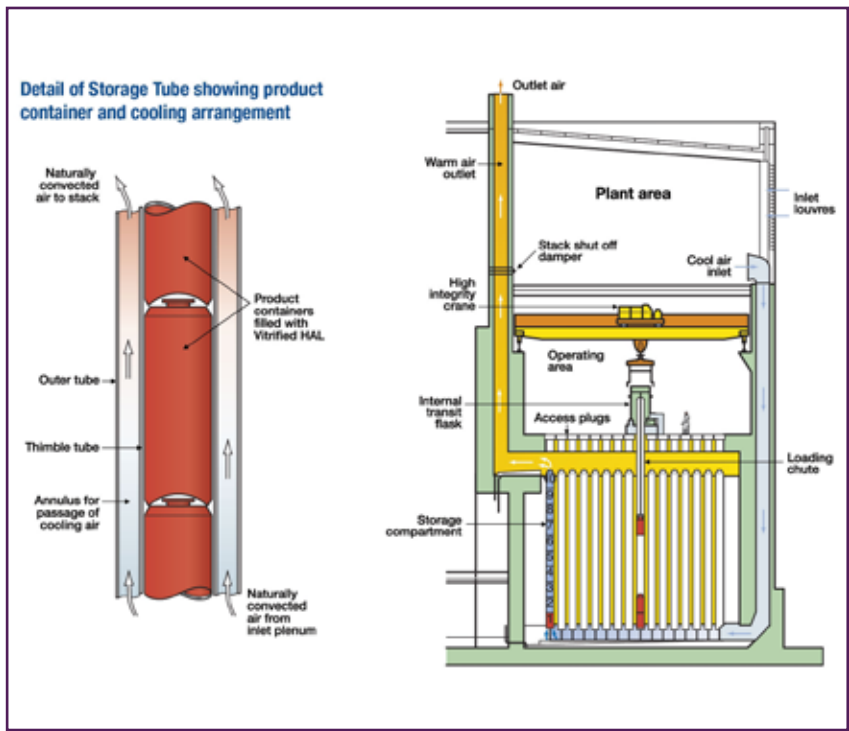
The NDA is also seeking to understand which topics are of interest to stakeholders and how they would prefer to be engaged on these topics. Please visit: <https://www.surveymonkey.com/s/GSMK9BJ> to let us know what you are interested in.

The role of the vitrification plant

A key responsibility for the NDA is managing the spent fuel from the UK as well as from overseas customers.



◦ The operating area of the Vitrification Plant



◦ A diagram showing the layers of storage beneath the Vitrification Plant

Reprocessing takes place at Sellafield, allowing the uranium and plutonium to be separated for potential future use, while the residual highly active liquid must be converted into a more stable form that can be stored safely.

Ultimately, the high level waste will be transferred to the deep geological disposal facility (GDF) that is expected to become available around 2040.

Vitrification is considered internationally as the optimum process for converting the liquid into a form which can be stored safely, conveniently and economically and which is suitable for eventual transfer to the GDF.

Sellafield's Vitrification Plant converts the liquid waste into a solid form. In a process that involves mixing it with glass through a process called vitrification. This not only reduces the volume of waste



◦ Vitrification flasks

to one third of its original size but also solidifies it. Treating the waste in this way enables the material to be stored safely in preparation for eventual transfer to the GDF.

Initially, the process involves maintaining the Highly Active Liquor (HAL) in a safe state in the vitrification plant under suitably controlled storage conditions with cooling, agitation and monitoring.

Vitrification of the HAL is one of the most technologically advanced waste treatment processes in operation.

Firstly, the liquor is transferred from the reprocessing plant to an evaporator stock tank where it is fed into a rotating oven called a calciner. Here it is dried and roasted into a powder called calcine.

The calcine falls into the melter and glass frit is added. In the melter, the mixture is heated to 1,000°C so the glass melts and reacts chemically with the calcine, forming the product glass.

Key achievements to date

The Vitrification Plant has to date produced over 5,000 containers of vitrified highly active waste (HAW), representing 3,000 cubic metres of HAL processed.

It also sees the culmination of 50,000 tonnes of uranium processed through both the Thorp and Magnox reprocessing plants combined.

In January 2010, the first return of vitrified HAW from the UK to overseas customers commenced, with 28 containers returned to

Japan, while 28 were also sent to the Netherlands.

Overall the UK phase of the programme will return approximately 1,850 containers of vitrified waste and the VRR programme is planned to take around 10 years to complete.

The containers of vitrified waste are then transferred to a specially designed interim product storage facility on the site - the Vitrified Product Store (VPS) which has the

capacity to store 8,000 product containers. It also incorporates an export facility so that the vitrified waste can be transported off site and back to overseas customers.

Mention the name Copeland to anyone outside Cumbria, and the reaction is usually a blank look. Say Sellafield... and your audience immediately has a point of view, an opinion. So says Elaine Woodburn, leader of Copeland Borough Council since 2003 and the person best placed to comment on the importance of the UK's largest nuclear site in its local community.

Sellafield ... the word that always produces a reaction

"When I first became leader, I knew that the nuclear sector was vital to our economy," says Elaine. "But because I had never worked at Sellafield, my understanding was fairly limited and I certainly had no idea of how well known it is, not just in the UK but overseas.

"I've been amazed at how that one word instantly produces a reaction, no matter where in the world you happen to be. Sellafield is the main reason Copeland is recognised outside this area; its reputation and Copeland's reputation are intimately bound together."

Elaine recognises this as both a challenge, but also – if wisely and thoughtfully managed – as an opportunity. "Sellafield is the powerhouse of our local economy," she adds. "More than 50 per cent of local people in employment are directly involved in nuclear activities, and that figure is even higher if you count in the supply chain.

"Not only does the nuclear industry employ a lot of people, but those people earn significantly higher wages than the local and even regional average.

In fact, the average salary at Sellafield is just over £32,000 a year which is the highest north of Reading. Now, while this is fantastic for those who are earning that sort of money, it does create a bigger gap between the haves and the have-nots."

It also explains why, if Sellafield sneezes, Copeland catches the cold. "We are hugely reliant on the nuclear

industry and, given that Sellafield is funded by Government, we are highly vulnerable to cuts in public spending.

"Our role is to help create an environment in which the industry can prosper, while ensuring Sellafield delivers its commitments on safety, hazard reduction and social responsibility."

Balancing all those different expectations places a huge responsibility on Copeland Borough Council, its officers and elected members.

The council plays a number of roles, through its planning and regulatory functions and as a partner in economic regeneration, and this demands a high level of knowledge and understanding of Sellafield's operations, technology and business plans.

"Balancing all these requirements for the best benefit of the area demands strong partnership working", adds Elaine. "We can't operate in isolation – nothing would ever be achieved.

"So we work closely with our colleagues in other areas of local government, such as Cumbria County Council, the economic regeneration bodies and, of course,



◦ Elaine Woodburn, Copeland Borough Council Leader

central government who after all pull the purse strings."

Managing the nuclear portfolio and the partnership activities is a large part of the council's day-to-day activities, and one in which Elaine herself is deeply involved. "The decommissioning agenda and the potential for a nuclear renaissance are providing a unique opportunity for Copeland.

"We are the expert community on nuclear issues, in my view, and we have the right mix of skills, knowledge and experience to exploit opportunities that arise.

"Playing a leadership role in this community at this time is exciting but there are huge responsibilities attached to that.

"We need to understand what our community wants and expects, and what we can do to maximise the long-term benefit to West Cumbria.

"One thing is for sure. Working together with all our partners is the only way to ensure a positive, healthy, long-term future for the industry and for our community."