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NDA
Nuclear
Decommissioning
Authority

INSIGHT

into nuclear decommissioning

Delivering progress across the UK

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Front cover: Berkeley boilers on the move

Welcome to the summer 2012 edition of Insight, our news magazine that aims to provide an overview of some of the current developments up and down the NDA estate.

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

Nuclear gems acquire polish: page 19

Organisational changes

New Chief Executive John Clarke has made a number of organisational changes to the NDA structure to reflect the priority allocated to Sellafield.

The key feature is the appointment of Mark Lesinski, currently Executive Director – Delivery, to the new position of Chief Operating Officer, where his focus will be overwhelmingly on Sellafield.

Supporting Mark at the Cumbrian site will be Mark Steele who is confirmed as the new Head of Programmes – Sellafield, a post he already occupies as the interim replacement for Ian Hudson.

A new post managing oversight of DSRL, Magnox/RSRL and National Programmes will be created, reporting to Mark Lesinski and headed up on an interim basis by Chief Financial Officer David Batters, in addition to his existing duties.

The post of Business Planning Director, previously held by John, will not be replaced.

Adrian Simper will remain as Strategy and Technology Director reporting to John Clarke, and take over John's responsibilities as Chair of the Shadow Board at NDA's Radioactive Waste Management Directorate (RWMD) in preparation for its creation as a separate organisation. RWMD Managing Director Bruce McKirdy will report to Adrian. Adrian will also become Chair of NDA subsidiary INS.

Sean Balmer will remain as Commercial Director and continue to have accountability for the commercial activities managed by INS on the NDA's behalf.

Martin Liefeith, as Head of Business Planning, and Rob Higgins, as Head of Legal, will report to David Batters.

David will also lead a review of how performance is measured across the estate which, when complete, may lead to some further changes in the organisational structure.

The number of Executive Directors on the Board is reduced from four to three as a result of the changes.

New members join NDA Board

Two new non-executive members have been appointed to the NDA Board.

Chris Fenton is Group Strategy and Marketing Director for Amey plc, a major infrastructure services provider to the public sector, and has in-depth experience of complex public procurement.

He previously held a variety of senior international positions in the chemical industry. Chris studied material sciences at St John's College, Cambridge, before completing an MBA at Manchester Business School.

Murray Easton, CBE, is currently an adviser to the UK MoD, Chairman of QiResults Ltd and Governor of the Health Foundation. He is a former Executive Director of construction company Murray & Roberts, Managing Director of BAE Systems (Submarine Solutions) based in Barrow, a main Board Director at Babcock International Group plc, and Managing Director of Yarrow Shipbuilders Ltd.

Chris Fenton

Murray Easton

John Clarke was appointed Chief Executive of the NDA following the departure of Tony Fountain at the end of last year. Formerly the NDA's Executive Director of Business Planning, John has worked in the international nuclear industry for over 30 years.

John Clarke brings many years of nuclear experience to the role

Our remit is to get the job done

A career's worth of experience in the nuclear industry gives John an insider's understanding of the layers of complexity that need to be addressed in the years ahead, and he is absolutely clear about his priorities.

In line with the Strategy published last year, John's vision for the organisation is to keep the attention very firmly on Sellafield's high hazard facilities, particularly the ageing ponds and silos, to which significant amounts of funding are allocated. He is unapologetic about this while stressing that other sites and facilities are no less important but perhaps slightly less urgent.

"We will absolutely keep a healthy focus on the wider estate but we will always be turning an eye to Sellafield, which is hugely important and dominates our thinking – because it has to."

Approximately half of the NDA's £3 billion annual budget is spent at Sellafield, where ageing plant and assets have deteriorated due to a historic lack of investment, and where remediation and repair work is often necessary before the task of decommissioning can begin.

One of his first actions has therefore been to ask Mark Lesinski to increase his focus on Sellafield, with some changes to Mark's structure allowing him to do this. John is also looking to ensure that the NDA is seen as a professional, respectful organisation with a clear focus on our core mission of decommissioning.

"Our remit is purely to get the job done, and that is why we were established in the first place. We need to be clear in our requirements of our SLCs and Parent Body Organisations, to expect high levels of performance and to recognise the positions held and work undertaken by those who operate the sites," he added.

John grew up in Seascale, Cumbria, and is a Chartered Engineer and Fellow of the Institution of Chemical Engineers (FIChemE). His early career involved a range of roles in the design, development, commissioning and operation of nuclear fuel processing plants.

He joined the NDA Board in 2008 from International Nuclear Services Ltd where he was Managing Director. Prior to that he spent eight years as part of the Sellafield Ltd Executive team, with five years as Head of Environmental, Health, Safety and Quality (EHSQ), followed by three years as Director of Production, where he was accountable for the majority of operational activities at Sellafield.

However, his first day as NDA Chief Executive took him to the far north of Scotland for the Dounreay share transfer event where a two-year competitive process led to the appointment of Babcock Dounreay Partnership, who will guide the Site Licence Company through the next critical years while all the major decommissioning work is carried out.

"For the NDA, the appointment of a new Parent Body Organisation is an opportunity to harness international expertise and bring fresh thinking to issues. We are delighted to welcome BDP but are conscious that the hard work starts now - putting the plan into action and dealing with the inevitable issues that will arise. We are confident that we found an excellent partner in BDP, however, and that this is the best deal for the taxpayer."

Competition, and the introduction of world-class private-sector experience, has been a defining strategy for the NDA and the next competition process is already taking shape, with the 10 sites operated by Magnox Ltd and the two operated by Research Sites Restoration Ltd due to undergo the procurement exercise.

Shortly after visiting Dounreay, John found himself in Japan, alongside Prime Minister David Cameron discussing how the two countries might share expertise and collaborate as the decommissioning of Fukushima gets under way in earnest.

He believes the NDA, which has a long-standing commercial relationship with the Japanese nuclear industry, and the UK supply chain, together with international partners, will be able to offer valuable support should this be needed.

Back at home, John will be keeping up the pressure to accelerate high hazard work and deliver real progress, while ensuring safety and environmental responsibility remain a priority at all times.

spotlight on
Dounreay

Going, going ... hazard is finally gone

Dounreay has now completed destruction of one of the most hazardous legacies from the UK's early nuclear research.

A purpose-built chemical plant processed the last of 57,000 litres of sodium-potassium liquid metal alloy, NaK, which was lifted from the primary cooling circuit of the experimental fast breeder reactor.

The milestone was achieved one year ahead of schedule and to higher environmental standards than anyone thought possible during the early years of the project.

An estimated 1,000 trillion becquerels of caesium-137 were removed from the coolant during the process that turned the 57 tonnes of liquid metal into 20,000 tonnes of salty water and took four years to complete.

"This was very high on the list of hazards we wanted reduced across our whole estate," said Nigel Lowe, head of the NDA's Dounreay programme.

Two cooling circuits connected by heat exchangers were filled with more than 161,000 litres of liquid metal.

More than 100,000 litres from the secondary circuit were destroyed when the reactor closed in 1977. Work on the primary circuit – a labyrinth of pipes nine kilometres in length - stopped in the early 1980s when higher levels of radioactive contamination were detected.

Its destruction remained on hold until a decade ago, when work started on construction of the clean-up plant, designed to lift the liquid metal in small batches, neutralise the alkalinity with acid and extract the caesium via ion exchange.

Designers thought the plant would decontaminate the effluent by a factor of 1,000, but in fact, decontamination rates of up to four million were achieved, reducing levels of radioactivity in the effluent to below the limit of detection.

Destruction of the liquid metal was among DECC's strategic national priorities.

With the liquid metal gone, almost 1,000 "breeder" elements positioned around the core are exposed, coated with residues of NaK. Their removal, cleaning and dismantling, using long robotic tools, will take another two years to complete.

The removal of all the liquid metal and nuclear material will leave an empty structure that can be dismantled. But radiation levels will still be too high for workers to do this manually, so much of the dismantling work will be done using robots. By 2025, when the entire structure has been dismantled, the total decommissioning bill is expected to be £240 million.

Photographs:
Above: The purpose-built plant's environmental performance was far higher than anticipated

Right: NDA Chairman Stephen Henwood tours Dounreay during the share transfer event

Highly efficient but uniquely complex

NaK is one of the largest single hazards left from the fast reactor research programme.

Dounreay was the only UK location to use NaK as a coolant.

With fast breeder technology, the fuel in the core could be burned much more intensely and some of the energy could be captured to "breed" a new fuel – plutonium – from an otherwise useless form of uranium that was packed around the core.

But the reaction was so intense that pressurised water or gas – the normal medium for removing the heat from a nuclear reactor - wasn't up to the task. The scientists used liquid metal instead.

NaK was extremely efficient at transferring heat from the nuclear reaction to the steam-generating plant that produced electricity.

During operations, it produced little waste.

NaK, however, is a volatile compound needing unique and complex treatment during its decommissioning.

It combusts in contact with air or moisture and is normally kept safe in a fire-suppressant atmosphere such as nitrogen

The NaK in the primary circuit of Dounreay Fast Reactor, which closed in 1977, became highly contaminated during its operation.

The secondary circuit, containing approximately 110 tonnes of NaK and 1,000 times less radioactivity, was cleaned out between 1979 and 1981.

Dounreay contract to save more than £1billion

The new Parent Body Organisation (PBO) is now officially in place at Dounreay following the signing of the contract between the NDA and the Babcock Dounreay Partnership (BDP).

The event marks the conclusion of the two-year competitive process to appoint a PBO to take the site through to the final stages of decommissioning. The contract is set to save well over £1 billion for the UK taxpayer and accelerate the decommissioning timeframe by up to 16 years.

BDP, a specially created private sector consortium, will take ownership of the shares in Dounreay Site Restoration Ltd (DSRL), the company that operates the site on behalf of the NDA, until all major decommissioning work of the redundant site is complete. The consortium consists of Babcock International Group, CH2MHill and URS.

The senior management team is led by Managing Director Roger Hardy.

NDA chairman Stephen Henwood said: "This is a significant milestone for the NDA. Not only have we successfully gained a world-class parent body to take ownership of DSRL which will continue to oversee the last and arguably the most difficult stages of decommissioning Dounreay, but we have also been able to reduce the decommissioning period by potentially up to 16 years, from 2038 to as early as 2022, representing savings to the UK economy well in excess of £1 billion."

Kevin Thomas, BDP chairman, added: "The Babcock Dounreay Partnership brings together a world-class team with unrivalled capability; with proven expertise in both international decommissioning and nuclear site management. We are looking forward to working closely with the NDA and DSRL to deliver this extensive decommissioning programme, safely, on schedule and within budget. By combining our breadth of experience and utilising both proven and innovative solutions, we will deliver significant savings to the UK taxpayer."

From 1955-1994, Dounreay was the UK's centre for fast reactor research and development, and is now Scotland's largest nuclear clean-up and demolition project.

Research at Dounreay, carried out by some of the nation's leading scientists and engineers, gave the UK the knowledge to generate electricity using a more advanced type of reactor, the 'fast breeder'. The experimental nature of these now-redundant facilities poses some complex decommissioning challenges, requiring real technological innovation in order to complete safe decommissioning.

Competition

In September 2009 the NDA launched a competition in accordance with EU procurement rules to secure a new Parent Body for Dounreay Site Restoration Ltd.

Key criteria for the competition were that bids should accelerate the current 2038 closure date by at least six years while reducing costs by at least £500 million.

The award of the Parent Body Agreement and Site Licence Company Agreement has been made for the period until the site reaches its Interim End State, or closure, when all major decommissioning work will be complete, including the retrieval and disposal or storage of wastes and fuel, as well as the demolition of the majority of buildings, potentially as early as 2022.

A competition is due to start later this year to appoint a new PBO for the 10 sites operated by Magnox Ltd and the two operated by Research Sites Restoration Ltd.

spotlight on
Dounreay

Landfill could be egg-cellent nesting site

As an old Dounreay waste dump is returned to nature, there is hope that sea birds will find its newly landscaped mound an attractive nesting spot.

The gravel covering on Landfill 42, which contains inert waste, was selected after Scottish Natural Heritage (SNH) suggested the surface would appeal to ground-nesting species such as gulls, oystercatchers and terns.

The site had lain unused by Dounreay Site Restoration Ltd (DSRL) since 2005, but was only recently identified as an ideal location for wildlife.

Now it has been re-profiled and capped in a £1.6 million project to seal the contents away from people and the environment.

DSRL and its contractors pulled 50,000 tonnes of material back 10 metres from the cliff edge and created a symmetrical mound.

The project team sank boreholes into the mound to allow monitoring, while a network of drains was constructed to divert water around the area to the coast.

The waste mound itself was covered with a heavy-duty plastic membrane, welded to form an impervious cap over the landfill.

A thick orange geo-composite fibrous layer was laid over the top to protect the membrane, before being covered with the 20cm deep layer of reddish-pink gravel.

The DSRL project team consulted SNH when designing the landfill's final surface. The finish is not unlike the shingle beaches of England's south coast and should provide an irresistible nesting area for birds.

Project sponsor Phil Cartwright explained that as the site was being demolished and returned to nature, great efforts were being made to encourage endangered and protected species to return and colonise the areas.

"We have set aside a wildflower meadow that is attracting an endangered species of bumblebee, and last year we moved a colony of the rare Scottish Primrose to protect it from excavation work," he added.

"Thanks to good teamwork between DSRL and its contractors, the project has been completed four months early, just before the start of the nesting season."

Photographs:

Above: The mound is covered with a layer of shingle, following recommendations from Scotland's environmental experts

Above far right: Workers cover the fibrous layer with shingle

Below far right: Landscaping work is carried out on the landfill site

Above right: Oystercatchers are among the sea birds likely to be attracted to the shingle

Right: Ringed plovers also breed on shingle

Berkeley farewell to generating giants of the past

The removal of five huge boilers from Berkeley site brought nearby town streets to a standstill, as each was moved at walking pace to local docks to be shipped off for recycling.

Roads were temporarily closed to traffic, telephone wires lifted and street furniture moved in order to accommodate transporters carrying the 310-tonne boilers – each weighing more than 25 London buses – to Sharpness docks for the first leg of the sea journey to a specialist smelting plant in Sweden.

The boilers will be melted down and 90% of the metal returned to the open market as scrap.

Town residents received 'early warning' flyers about the exercise through their letter-boxes, while the site's local stakeholder group were involved in the planning.

Berkeley is the first former nuclear power station in the UK to remove and recycle its boilers, which are classified as low level radioactive waste (LLW).

Views around Berkeley site are dominated by the 15 boilers that have been lying on their sides outside the redundant reactor buildings since the 1990s, when they were lowered to the ground as part of the process to decommission the two reactors.

The boilers were brought to the site in pieces in the early 1960s during construction of the power station and welded together before being erected outside the reactors.

Major engineering works were required on site to ensure the roads were strong enough to carry the loads and that the whole logistics would run smoothly. Heavy-lifting sub-contractor ALE used specialist lifting equipment to load the boilers onto purpose-built transportation vehicles.

Ten further boilers remain on site, and Magnox is looking to the supply chain for further options to remove them.

Photographs:

Above: One of the boilers leaves the site for the journey to the docks

Far left: Workers watch as the boilers move off

Far left below: The boilers were lowered to the ground in the 1990s

Left: Multi-wheeled transporters were used to carry the heavy loads

Collaboration

The project to remove the boilers required extensive collaboration between the NDA, Magnox, which operates Berkeley site, the Low Level Waste Repository (LLWR) in Cumbria and the main contractor Studsvik, which owns the Swedish smelting plant and UK Metal Recycling Facility in Cumbria.

The original plan had been to keep all the boilers on the Berkeley site until the site's final clearance date in 2074, when they would have been assessed as to their level of radioactivity and appropriate management solution.

However, the UK's LLW Strategy, published in 2010, places much greater emphasis on early solutions, reducing the amount of solid low level radioactive waste generated, increased recycling and less reliance on disposal of materials that can be managed further up the waste hierarchy. Disposal at the LLW Repository, the nations' disposal facility, would not be a pragmatic solution for large metallic components such as these.

LLWR Ltd, as the central broker of a range of specialist LLW services to UK waste producers in its role leading UK strategy implementation in this area, was instrumental in establishing the procurement route via its framework for the treatment of metallic waste.

After a competitive tendering process, LLWR appointed Studsvik as the main contractor for the removal, transport and treatment of the boilers in Sweden.

The project has been successful in a number of ways, not least in demonstrating visible decommissioning progress and positive effective radioactive waste management.

Supporting our communities

The new Magnox socio-economic scheme has been launched, aiming to mitigate the impact of decommissioning on communities living near Magnox sites.

Mark Drulia, Magnox Communications Director, explains: "With the introduction of the Magnox Optimised Decommissioning Programme we were asked by the NDA to undertake an impact assessment of the work programme on Magnox sites and communities.

"We engaged with our stakeholders to gather their views and, having taken these into account, delivered a Magnox socio-economic plan, covering the period through to 2015.

"As we were developing the plan it became clear that in order to effectively manage a larger proportion of the NDA's socio-economic portfolio, we needed to change the way in which we managed our funding.

"This led us to build a one-stop-shop web portal, which will invest funding on behalf of both the NDA and our parent body organisation Energy*Solutions*, providing a higher level of governance.

"Our socio-economic scheme will ensure that we continue to support our communities as they move through their lifecycle from generation to care and maintenance."

The socio-economic scheme replaces arrangements previously in place for both NDA and Energy*Solutions* funding across Magnox South and Magnox North and enables applications for all levels of funding to be assessed in the same way.

Jon Phillips, Communications Director at the NDA, said: "The new delivery arrangements for socio-economic support will enable Magnox to manage a larger proportion of the socio-economic portfolio and is a good example of effective partnership working between the NDA, Magnox Ltd and Energy*Solutions*. We are confident that Magnox will now be better able to work even more closely with its communities, mitigating the impact of decommissioning as sites enter care and maintenance."

A socio-economic team, made up of members of the Magnox communications function, will manage the process and liaise with sites and site stakeholder groups on an ongoing basis. To find out more, or to apply for funding, log on to the new Magnox portal at: **www.magnoxsocioeconomic.co.uk**

Socio-economic criteria

Key criteria will be used to assess applications for funding:

- Employment
- Education and skills
- Economic and social infrastructure
- Economic diversification

SMART waste categorisation

Estimated savings of £46 million are set to be secured through a new approach to assessing volumes of low level waste (LLW) on Magnox sites.

The 'Smart' inventory process, developed by Magnox Ltd, is now being shared with other NDA sites in a programme of joint working, and is leading to a more detailed understanding of the nature of the waste, as well as quantities in the NDA estate and possibly wider.

Millions of tonnes of LLW are predicted to arise at old nuclear facilities over the coming decades as equipment is removed and buildings are demolished – an inevitable consequence of environmental restoration.

Some of the resulting soil, building rubble and scrap metal could however, be re-used, recycled or disposed via alternative routes while large quantities are also destined for the UK's Low Level Waste Repository (LLWR) near Drigg in Cumbria. Understanding waste quantities and characteristics more accurately are crucial to finding more sustainable ways to dispose of the material and make use of new treatment and disposal routes which were not previously available.

The SMART inventory process involves re-estimating anticipated volumes using a combination of techniques including a visual walk-down of all active areas of plant with reactor staff, plus remote assessment of inaccessible areas. The operating experience of reactor staff has been particularly valuable in identifying contaminated plant and areas of potential contamination which could be decontaminated based upon past experience.

Across the 10 sites operated by Magnox Ltd, the review has led to a significant improvement in the understanding of LLW volumes at sites and will potentially reduce the number of waste containers destined for the LLWR by more than 9,000, the equivalent of two national disposal vaults which cost approximately £20 million each.

Based on the work, earlier this year, Magnox, LLWR and Sellafield took part in the first joint project of its kind, involving a week-long waste inventory assessment of the Calder Hall site at Sellafield in Cumbria.

The main aim was to re-assess and challenge the current waste inventory projections for Calder Hall site and underpin the numbers using available documentation, key learning from existing Magnox sites such as Chapelcross, which shares many similar design features, and any other feedback from the site reviews. The process reduced the projected number of waste containers by almost 50%, from 1,100 to 578.

The work, expected to be the first of many reviews across both the NDA and non-NDA estate, is aligned to the collaborative drive to improve the understanding of LLW through the implementation of the UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry.

Last fuel leaves site

The last consignment of spent nuclear fuel has left Dungeness A site for reprocessing at Sellafield, marking the end of a five-year programme.

A flask is loaded onto the transporter

Defuelling has removed 99% of the radioactive hazard from the Kent site, and attention now turns to a period of focused decommissioning aimed at reaching 'interim care and maintenance' by 2019. This will leave the site in a safe and secure state, with all higher hazards stabilised or removed, allowing resources to be targeted at other sites.

Ray Jepps, Dungeness A Site Director, said: "The team has worked really hard to get this result. In the last year they have safely and progressively increased our defuelling performance to a point where we have been shipping four flasks per week."

The workforce must now complete a programme of work to demonstrate that all fuel has gone before formally notifying the nuclear regulators, which will allow the site to be re-categorised, and move to the next stage of decommissioning.

Brian Burnett, NDA Head of Programmes for Magnox and RSRL, said: "The NDA is very pleased to see Magnox making such good progress on defuelling. This is an important milestone for Dungeness A and another success in our task of cleaning up the UK's civil nuclear legacy."

Near-term work priorities include a mix of conventional and radiological projects, from asbestos removal, de-planting and demolition, to the draining and sealing of its redundant spent fuel storage ponds and retrieval of legacy wastes.

Two down, two to go

Magnox hit a second defuelling milestone when the last nuclear fuel was removed from the second of four reactors at Chapelcross.

All 18,462 fuel elements have now been removed from Reactors 3 and 4 and safely dispatched to Sellafield for reprocessing.

Following formal permission in July 2008 by the regulator, the Office of Nuclear Regulation (ONR), to begin the process of defuelling, the first flask was sent off to Sellafield in April 2009.

Since then, Chapelcross has made safe and consistent progress in reducing the amount of radioactive material stored on site.

A total of 38,075 fuel elements are being systematically removed from all four reactors and safely despatched in approximately 260 flasks, with completion expected by June 2013.

Fact File

When Dungeness stopped generating at the end of 2006, its two reactors contained 55,000 fuel elements weighing a total 610 tonnes.

The site despatched an average 33 spent fuel flasks per year from 2007-2009, but accelerated its programme from 2010. Since then it has dispatched a further 268 flasks, including 147 during 2011.

Only 3,800 tonnes of spent fuel are left to be shipped from four Magnox sites, out of a total 50,000 tonnes originally manufactured, supplied and burnt in reactors at 10 sites across England, Scotland and Wales.

Shipments of spent Magnox fuel are organised in line with the Magnox Operating Plan (MOP). This is a plan of logistical arrangements to ensure the smooth supply and movement of flasks between Magnox sites and the reprocessing plant at Sellafield.

Magnox era drawing to a close

The early months of 2012 have seen the beginning of the end for electricity production at the UK's last two Magnox power stations, as Wylfa closed one of its twin reactors while Oldbury finally stopped generating completely.

The two plants are among the UK's 11 nuclear power stations based on the pioneering Magnox design, developed during the post-war years and the first in the world to generate electricity on a commercial scale. All but Wylfa are now closed and in various stages of decommissioning.

Brian Burnett, NDA Head of Programmes for Magnox and RSRL, said: "Oldbury and Wylfa have a long and proud history of safely generating electricity. Our thanks go to the Magnox workforce, who have been extremely committed to maximising the plants' generating lives, ensuring both were safely able to continue past their original planned closure dates. The additional income has been extremely valuable in supporting our mission to decommission the UK's first generation of civil nuclear sites.

"We will continue to support efforts to maximise the operating life of Wylfa's Reactor 1 within the currently agreed timeframe."

The additional income from both plants is so far estimated to be worth around £600 million to the UK taxpayer, income that supports the NDA's decommissioning mission.

Oldbury over the years

The early days of Oldbury Power Station

Oldbury as it looks today

Andrew Freeman has the honour of closing down Oldbury's reactor

The red button marks the end of generation at Oldbury

World's oldest nuclear power station

Oldbury, near Bristol, was the world's oldest operating nuclear power station and had been operating safely for 44 years, generating enough power, at 137.4 TWh, for one million homes for over 20 years. Its second reactor closed in February following the closure of the first reactor seven months earlier.

The historic closure marks the start of a new phase in the site's life as preparations get under way to start the decommissioning process, which will, over the decades to come, include removal of the spent fuel, management of the waste and eventual demolition of the buildings.

Originally scheduled to stop generating in 2008, the NDA, as site owner, took the decision to extend Oldbury's operating life following reviews with the regulators. The decision to shut down Reactor One was subsequently taken in November 2011 in conjunction with the regulator, the Office for Nuclear Regulation (ONR), after a review concluded that continued operation would no longer be economically viable.

During its extended operating life, since the end of 2008, Oldbury generated over 7.4 TWh of electricity, worth an estimated £350 million to the taxpayer and saving around 3.5 million tonnes of carbon from being released into the atmosphere.

Wylfa, the last of its type

Wylfa is the largest and last reactor of its type to be built in the UK, opening in 1971 and generating enough power for 40% of Wales. It was originally set to close in 2010, but was granted extensions after reviews with the regulators.

Wylfa could continue until 2014

Wylfa has generated over 200TWh (terawatt hours) of electricity to date, enough to power around three million homes for 10 years, or keep Turkey's lights on for one year.

In April, a single reactor, R2, was shut down and attention is now focused on maximising output from the remaining reactor through a programme of inter-reactor fuel transfer – removing partially used fuel from R2 to use in R1. The process was pioneered at Oldbury and is now awaiting the approval of regulators before it is applied at Wylfa. A decision is expected during the summer and could see operations continue until 2014.

International experts welcome Magnox approach

International reviews

The Vienna-based IAEA carries out reviews on request, using teams of internationally recognised specialists.

The main objectives are to provide—on the basis of international safety standards—an independent assessment of the safety of an activity or facility and to assist Member States in improving performance in the area or operation under review.

The reviews provide independent expert opinion and advice on proposed programmes and actions and implementation.

It also informs a Member State whether its programme is consistent with good practice in other national programmes.

A team of international experts have welcomed the new Magnox approach to decommissioning, where work is accelerated at two 'lead' sites in order to harness the learning and expertise across the remaining sites.

Magnox requested the International Peer Review, which assesses safety and performance against agreed international standards, in 2008.

The team of six nuclear specialists from the International Atomic Energy Authority (IAEA) focused on Bradwell in Essex, with a first visit in 2008, a further on-site meeting and completion of the final report earlier this year.

The three-year review period included the adoption of the revised strategy, the Magnox Optimised Decommissioning Programme, which will see Bradwell and Trawsfynydd entering the 'Care and Maintenance' phase much earlier than originally planned, a reduced decommissioning timeframe of around 34 years in total across all sites and expected savings of more than £1.3 billion.

The report noted the introduction of innovations and more efficient use of personnel, and stated: "The review team strongly welcomes the above changes which result in a much more coherent and efficient overall programme."

Paul Wild, Magnox Operational Resilience Manager, said: "We are always pleased to have the opportunity to get feedback from others within the industry. This approach demonstrates that we are making the same commitment to safety and knowledge sharing in a decommissioning environment as we have done during many decades of electricity generation."

Brian Burnett, the NDA's Head of Programme for Magnox, said: "The IAEA's recognition is a powerful endorsement of the 'lead and learn' approach, which is both simple and pragmatic. The concentration of effort and resources on a single set of issues at one or two sites allows for the development of definitive solutions that can then be applied elsewhere.

"This revised approach has effectively re-written the Magnox story, and provided a cohesive framework for all the sites to follow."

The report also proposed a range of recommendations including graphite solutions, characterisation of waste, interface with regulators and cost estimations.

For more details: **www.iaea.org**

"The IAEA's endorsement is a powerful endorsement of the 'lead and learn' approach"

Brian Burnett, Head of Programme for Magnox

£4 million research into geological disposal

Scientists from universities around the country have started work on five major projects to research the scientific challenges associated with geological disposal of higher activity radioactive wastes. Their findings will ultimately help demonstrate the safety of an underground disposal facility.

The five projects were selected from 70 initial responses

The £4 million four-year research programme is jointly funded by the NDA's Radioactive Waste Management Directorate (RWMD) and the Engineering and Physical Sciences Research Council, under the auspices of the Research Council Energy Programme.

The five projects were selected from 70 initial responses to a call for expressions of interest in 2010.

Neil Smart, RWMD's Science Director, said: "The five research projects will provide us with important information to help us with geological disposal of higher activity radioactive waste."

The projects, each managed by an RWMD scientist, are:

1. Corrosion processes in nuclear waste storage and Geological Disposal Facility (GDF) environments (University of Birmingham).

This is a collaborative project between researchers at the Universities of Birmingham, Manchester and Bristol and Diamond Light Source at Harwell in Oxfordshire.

Using a range of techniques the scientists will build a full picture of the causes and speed of corrosion processes.

2. Behaviour of UK specific spent fuels (University of Cambridge)

The aim is to understand the long-term behaviour of spent AGR fuel in a geological disposal facility and, therefore, contribute to the safety assessment for its disposal. Very little experimental research has been carried out in the UK on the direct disposal of spent AGR fuel.

3. Atomic and macro-scale studies of surface processes (Imperial College London)

The research will look at (i) how the surfaces of candidate materials in an engineered barrier system behave in a typical disposal environment; and, (ii) the effect of any alteration processes on radionuclide/surface interactions.

4. Carbon 14 (University of Huddersfield)

The aim is to get a better understanding of how carbon 14 is incorporated into graphite (in a nuclear reactor core); how it will be released from the graphite and how its chemistry and microbiology influence its movement out of a geological disposal system.

5. Engineered barriers (University of Strathclyde)

Experienced researchers will work closely with recently qualified researchers to create a new generation of UK experts in geological disposal covering civil engineering, earth sciences, mathematical modelling, geophysics and wireless monitoring.

spotlight on
Sellafield

The use of robot technology is essential in areas that are too radioactive for people, or where access is difficult. In the third part of our focus on Sellafield's historic facilities, collectively known as Legacy Ponds and Silos, we look at the First Generation Magnox Storage Pond.

Robot technology successfully helps nuclear decommissioning

A unique robotic arm has been able to remove redundant pipes at one of Sellafield's oldest and most challenging spent fuel ponds before carrying out cleaning and sealing work.

The open-air First Generation Magnox Storage Pond (FGMSP), built 60 years ago, represents one of the highest site hazards and its decommissioning is a priority for the NDA.

The bespoke Powered Remote Manipulator Arm (PRM), designed for the pond's high radiation environment, was able to isolate and remove redundant pipework, then clean and apply a specialist coating to seal a contaminated wall. It is now paving the way for further decommissioning work at the facility.

Wide-ranging preparations were required before work could start, including construction of a full-scale mock-up of the facility in Whitehaven. This enabled comprehensive testing of the equipment and all the procedures, while providing a low-risk environment for training the operatives.

Paul Farran, Head of Projects, FGMSP, said: "The operation demanded surgical precision in an industrial context to remove a significant radiological risk. The completion of this vital piece of work will allow us to get on with the job of retrieving nuclear wastes from the pond.

"We've worked with specialist contractors SA Robotics to develop a robot that could work in a high radiation area, where obviously we couldn't send our workforce. We've also drawn on space age technology by using software originally developed by NASA, to control our robot. In addition, new resins and foams had to be developed in conjunction with AMEC to both key and seal the pond wall, and to coat and isolate the pipework under extreme conditions."

He added: "The full operation was practised again and again in the test facility for 80,000 operating hours. Through intense practice, we were able to satisfy ourselves and our regulators that the job could be flawlessly executed and that every eventuality has been considered and prepared for. At all times, safety was the over-riding priority and although the job was high risk, it was a job that was long overdue."

Mark Steele, (NDA) Head of Programme for Sellafield, said: "Sellafield faces a complex set of decommissioning challenges in dealing with the legacy facilities on the site. Often innovative approaches and techniques are needed to overcome them and applying the expertise that exists on the site is key to successful delivery. Continuing this approach will help in our drive to accelerate progress on risk and high hazard reduction."

Successful completion of the work will now allow progress on emptying the pond and the eventual decommissioning of the building.

The condition of the FGMSP, which is open to the elements, had inevitably deteriorated over the decades and significant improvements were needed to bring the building to a state where it can be safely decommissioned.

Jim French, Nuclear Management Partners' (NMP) Executive Decommissioning Director, said: "We are committed to accelerated decommissioning and addressing the intolerable conditions that exist in some of our ageing legacy facilities as soon as possible. NMP has brought their expertise to Sellafield specifically to drive through decommissioning projects that really will make a difference. Completion of this remediation work is a significant achievement towards decommissioning the First Generation Magnox Storage Pond (FGMSP) safely."

Photograph:

The robotic arm is able to work in high-radiation areas

FGMSP Fact File

The FGMSP was built in the 1950s to store, cool and prepare Magnox fuel for reprocessing. During its 26-year operating lifetime, it processed approximately 27,000 tonnes of fuel - almost 2.5 million fuel rods.

Spent nuclear fuel from the UK's Magnox stations, along with Magnox fuel from both Italy and Japan, was held in the FGMSP.

The original facility comprised an inlet building for incoming fuel, an open-air storage pond, a building containing wet bays where fuel cladding was removed and a sludge settling pond.

The 1960s extension provided additional pond storage capacity and new large caves for improved fuel cladding removal.

Since 1992, considerable work has been carried out to improve the condition of the building.

This includes installing new equipment and removing redundant facilities in order to allow the safe retrieval of the nuclear materials stored in the pond.

The pond holds some 14,000 cubic metres of contaminated water, where the spent Magnox fuel is stored, radioactive sludges, miscellaneous nuclear wastes and skips.

The plan is to progressively retrieve and treat the facility's radiological inventory, reducing the ongoing risk posed by its storage and then reducing the inherent hazard posed by the materials.

The FGMSP is one of Sellafield's oldest

Exploring the depths

Decommissioning the FGMSP has reached new depths in risk reduction thanks to the use of mini-submarines.

The mini-submarine is lowered into the pond

More correctly known as Remotely Operated Vehicles (ROV), the mini-subs have been already successfully used to survey the pond contents and have now been used to pick up an individual fuel rod and place it in a designated container.

The 12kg fuel rod was recovered from the bottom of the pond using a robotic arm attached to the ROV.

Sellafield Ltd Technical Manager, Phil Toomey said: "The delicate operation required great operator dexterity in order to manoeuvre the ROV into position to safely pick up the fuel rod and place it in a fuel skip.

"The bespoke hydraulically driven manipulator arm was extensively tested and the operators trained and practised for several weeks in order to master the operation and reach this decommissioning milestone.

"Handling these rods for the first time in many years is further increasing plant knowledge for bulk retrievals and treatment."

Martin Leafe, head of FGMSP programme delivery, said: "This achievement is a real breakthrough and paves the way to recover fuel rods that have become dislodged from their containers and to repackage them.

"The use of ROVs has allowed us to work remotely underwater in a radioactive environment, while keeping our workforce safe. One of the biggest challenges for the team was the lack of detailed historic knowledge of the inventory in the ageing facility and the underwater survey provided valuable data about the fuel, its position and condition."

spotlight on Research & Development

It's a bug's life at Sellafield

Despite high levels of radioactivity, Sellafield's open-air spent fuel ponds appear to be a welcoming environment for a surprising range of micro-organisms that inhabit and sporadically cloud the water, reducing visibility and hampering retrieval operations.

Years ago, it was thought that such environments would be sterile but there is now intense interest in understanding the precise nature of the pond life, and how, ultimately, measures can be developed to inhibit its growth.

Doctoral research student Victoria Evans has spent six months at the National Nuclear Laboratory (NNL) on the Sellafield site, examining the DNA of microbes extracted from water in three of the oldest open-air ponds.

"The ponds are an extreme environment but they are teeming with bug life, which doesn't need much to survive, however, it's difficult to devise measures for decontamination until you know exactly what is in there," said Victoria, whose first degree in Environmental Geosciences was followed by a Masters in Applied Environmental Geology, both at Cardiff University, where she became interested in the disposal of nuclear waste.

She is now studying for a PhD at Manchester University's School of Earth, Atmospheric and Environmental Sciences, co-supervised by Prof Jon Lloyd, who specialises in the microbiology of the nuclear fuel cycle, radiochemist Prof Katherine Morris, and algal biologist Dr David Sigee.

Her research forms part of the work being undertaken by students associated with a consortium of six universities collaborating on Decommissioning Immobilisation and Management of Nuclear Waste for Disposal (DIAMOND). The consortium is funded by the Engineering and Physical Sciences Research Council (EPSRC). Victoria's research at Sellafield is sponsored by the NDA's R&D programme, which has provided additional funding to the consortium to enhance its research and develop key technical skills essential to the delivery of the NDA decommissioning mission.

Victoria, from Bridgend, South Wales, has been studying three of Sellafield's open-air ponds, including the historic First Generation Magnox Fuel Storage Pond, which pose some of the site's greatest decommissioning challenges.

Organic material is deposited in the demineralised water from wind-blown agricultural residues, from the rain, the sea and overflying birds. Noticeable algal blooms tend to arise in the demineralised water between May and October, similar to the effect seen in lakes and ponds around the country, causing visibility issues.

Water samples are collected from the ponds on a regular basis but Victoria only needs the DNA from the microbes for her studies. She has been carrying out this extraction process at the NNL laboratories on the Sellafield site before sending the DNA to the University of Manchester labs, where she subjects the samples to detailed forensic analysis.

"The algal growth can generate sludge and our work will assist in identifying more precisely what species are present, and potentially supporting measures to control their growth," added Victoria.

Such detailed analysis of the microorganisms in the pond water has not been carried out previously and the results of the research may enable a better understanding of how organisms contend with radioactivity.

"One of the organisms we have identified is a close relative of a fresh-water algal species that usually collects in shallow pools of water, such as bird baths, turning the water slightly pink. The reddish pigment seems to be a defence mechanism against high ultra-violet intensity. It's unusual to find it in such deep water and we are at the early stages of exploring whether it could be linked to a protective mechanism against ionising radiation from spent fuel," said Victoria.

Her studies will continue for a further 18 months and the outcomes will be published, with the likelihood that it will stimulate further research into ponds decommissioning and clean-up.

Following completion of her PhD research, Victoria hopes to progress to post-doctoral research and, ultimately, a career in nuclear, focusing on public and political perception of the industry. Her Sellafield experience has already provided an insight into some of the major challenges facing the decommissioning sector.

Nuclear gems acquiring polish

The DIAMOND (Decommissioning, Immobilisation and Management of Nuclear waste for Disposal) University research consortium was formed in 2007 following a call by the EPSRC for proposals on nuclear waste management and decommissioning.

The consortium is led by the University of Leeds and includes Imperial College London, Loughborough University, University of Manchester, University of Sheffield and University College London. The NDA is one of the sponsors, along with other private and public sector organisations.

The three-year research programme's unique approach is to encourage early interaction between highly specialised academics and industry, allowing business leaders to help guide research into relevant areas – such as ponds clean-up.

The third conference took place in Coventry at the end of last year, and was the last in the series, involving up to 40 students who have shared expertise, equipment and results.

The training and knowledge gained by the students through the DIAMOND programme gives them an excellent understanding of the challenges facing the nuclear sector and the associated career opportunities. Many of the programme's graduates, including chemists, physicists, engineers and geologists, have already been recruited into the nuclear sector.

NDA's Research Manager Darrell Morris said: "The DIAMOND programme has been an excellent example of industry and academia collaborating together to deliver high quality research. The students have also gained a good understanding of the challenges associated with nuclear decommissioning, essential knowledge for anyone wanting to undertake a career in nuclear decommissioning."

Photograph: Victoria at work in the lab at Manchester University

£15 million boost for collaborative research

Up to £15 million of investment is being made to support nuclear research and development (R&D) in the supply chain, following a joint initiative by Government organisations.

The funding partners, including the NDA's Melanie Brownridge, announce the £15 million investment at the launch event

The announcement was made at the end of a showcase event in the Nuclear Advanced Manufacturing Research Centre (NAMRC), Rotherham. The event, Collaboration Nation, highlighted a number of innovative projects that had previously received funding from the Government's Technology Strategy Board (TSB).

The latest investment is being made by the TSB, which is backed by the Department of Business, Innovation and Skills, the NDA, the Engineering and Physical Sciences Research Council (EPSRC) and the Department of Energy and Climate Change (DECC):

- Up to £12 million will be made available for business-led Collaborative R&D projects.
- Up to £2 million will be made available for Feasibility Studies, which must be collaborative projects led by a Small/ Medium Enterprise (SME).
- The remaining £1 million will be made available for Knowledge Transfer Partnerships (KTPs), which support the transfer of knowledge and skills from academia into industry.

Universities and Science Minister David Willetts said: "This is an important and exciting time for the UK civil nuclear industry. With potential for investment and innovation in the new-build and decommissioning markets, now is the right time to make sure that the UK is best placed to win orders and grow global market share.

"That's why we are launching this substantial new funding programme to enhance innovation and capability development and expand the UK nuclear industry to provide rewarding careers and contribute towards more stable and balanced economic growth."

The investment will support innovative technologies that can be used in all sectors of the civil nuclear industry, including construction, commissioning, operation, maintenance, waste management and decommissioning. The NDA contribution of up to £3 million is aligned with projects related to its decommissioning mission.

Melanie Brownridge, NDA Head of R&D, said: "The NDA is committed to encouraging innovation as it progresses the safe decommissioning of the UK's first generation of nuclear facilities. We see investment in R&D as a key element in this long-term mission and are therefore delighted to be working with Technology Strategy Board, EPSRC and DECC in promoting opportunities for collaborative innovation projects across the supply chain and academia."

The investment will be allocated through a competitive process, with applicants required to show how they will help strengthen the UK supply chain while contributing to the high-level, long-term challenge of developing cost-effective and safe solutions with high reliability and durability in the nuclear sector.

They must also take account of the key issues of regulation, health and safety and non-proliferation. The targeted call for Knowledge Transfer Partnerships (KTPs) will be run in parallel with the other competitions.

A number of brokering events have already been held to enable potential applicants to find out more about the process and link up with potential partners.

For further information and to register for the competition, which opens at the beginning of July, visit the Competitions page of the TSB website: **www.innovateuk.org**

Key dates are as follows:

Feasibility studies: Registration by 29 August, and full applications submitted by 5 September.

Collaborative R&D: This is a two-stage process. Registration is required by 29 August, and expressions of interest by 5 September. Stage 2 for invited applicants opens on 1 October and the deadline for invited applications is 14 November.

Knowledge Transfer Partnerships: Applicants need to submit completed applications by 4 October.

Engineering and Physical Sciences Research Council: **www.epsrc.ac.uk**

Department of Energy and Climate Change: **www.decc.gov.uk**

Technology Strategy Board (TSB)

The TSB is the UK's national innovation agency, established by the Government in 2007 and sponsored by the Department for Business, Innovation and Skills (BIS). Funding is drawn from a number of Government departments, the devolved administrations, research councils and regional agencies.

Its role is to stimulate technology-enabled innovation in the areas most likely to boost UK growth and productivity.

As well as investing in individual projects, the TSB is involved in spreading knowledge, understanding policy, spotting opportunities and bringing people together to solve problems or make new advances.

For further information:

www.innovateuk.org

Reaching the unreachable

The NDA's sites face a constant challenge to clean up highly radioactive or confined spaces where workforce access is impossible, and a key part of the solution is the deployment of remotely operated equipment.

Standard robotic machinery addresses many of the problems, but trials are currently under way on a more versatile alternative that combines two newly developed technologies and could offer significant benefits in terms of time and cost.

The LaserSnake is a lightweight and flexible snake-arm robot mounted with a laser-cutting head that slices with rapid precision through metal and concrete, generating only a tiny amount of debris.

The hollow-jointed snake-arm, with a tip-mounted camera, is highly manoeuvrable inside confined spaces, available in a range of diameters, and can be operated from a distance of up to 100 metres away, via a screen, using a simple joystick.

Its sensitive controls remain outside the confined zone, in 'clean' air, while the mechanical moving parts, which are re-useable and can be easily replaced, are able to access the contaminated area.

The unique self-supporting snake-arm robot was developed over 10 years by Bristol-based OC Robotics. The team at OC Robotics has already been awarded the Queen's Award for Innovation, and the snake-arm robot is currently being deployed in aerospace applications and in an operational Canadian nuclear plant. Interchangeable tool-bits, from water jetting to grabs and radiological inspection devices, add to its versatility.

The laser-cutting head was adapted for nuclear use by Cambridge-based TWI, supported by funding from the NDA's R&D programme, which aims to develop innovative decommissioning technologies from the supply chain.

The laser system was specifically designed for concrete scabbling and cutting up metal pipework, which represent major decommissioning challenges for the NDA estate in terms of the large volumes of material, high levels of radiation and number of facilities affected.

Collaboration between the two organisations has been facilitated by the Government's Technology Strategy Board (TSB) and enabled the demonstration project to reach fruition, showing its potential for use in difficult-to-access spaces.

NDA's Research Manager Darrell Morris said: "We are very pleased to see that the initial NDA R&D funding has been continued by TSB to combine two innovative technologies to deliver a solution to one of our key decommissioning challenges."

The integrated LaserSnake combines laser precision and speed with the flexible robot to arm to deliver a system that can work continuously with only a change in the operating personnel.

For further information:

www.twi.co.uk
www.ocrobotics.com

Photographs: The laser cuts easily through metal

First batch arrives

A consignment of Harwell rubble was the first waste from the nuclear industry to arrive at ENRMF.

Arising from the decommissioning of a drainage system at the former research site, the waste comprised approximately 20 cubic metres of rubble containing very small amounts of radioactivity and was transported by road in sealed packages.

Paul Atyeo, senior project manager at Research Sites Restoration Ltd (RSRL) which operates the site, said: "Up until now, there have been no readily available solutions for wastes containing small amounts of low level radioactivity, arising from the nuclear decommissioning process, as well as from other sources, such as science and research facilities, hospitals and manufacturing.

"There were simply very few sites that could accept them. Consequently, these wastes have accumulated where they originated, or were sent to the LLWR, though this was designed for much higher levels of radioactivity and has limited capacity.

"ENRMF provides a highly engineered solution to the problem of what to do with this kind of waste, the inevitable side-effect of clean-up work. RSRL intends to dispose of further wastes of this type through this route steadily over the next few years."

RSRL used services provided by the Low Level Waste Repository Ltd (LLWR) to access the disposal route.

Soft-sided waste bags are loaded onto a transport vehicle

RSRL carried out a feasibility study of all options for treatment, recycling and reuse of the waste material, as well as assessing possible landfill-based routes, and carried out a public consultation programme before reaching a decision on how to proceed.

Augean, in consultation with RSRL and others, subsequently prepared detailed designs, undertook environmental impact assessments and engaged with stakeholders, including the local community who were invited to a public exhibition, site visits and open days at the Northants facility.

The process to obtain all the necessary consents took four years, culminating in a public inquiry and a decision by the Secretary of State for Communities and Local Government to uphold the planning proposal. A number of legal challenges followed this decision but the courts judged that the approval had been robust.

An Environment Agency inspector checks the consignment

The Strategy

The publication by the NDA in 2010 of the UK Strategy for the Management of Solid Low Level Waste highlights the options available for managing this material.

One of these is the use of UK landfill sites for disposing of the substantial quantities of LLW that cannot be managed further up the waste hierarchy (ie. are unsuitable for recycling, combustion or compaction etc) and do not need the levels of containment provided by the LLW Repository to be managed safely.

Waste producers are responsible for waste prevention, minimisation and characterising the material at source. They are also responsible for ensuring the most appropriate and environmentally acceptable option for disposal, once all other steps in the 'waste hierarchy' have been considered.

The LLWR and NDA have recently set up a new working group that includes representatives from regional waste planning authorities and will look at the use of alternative disposal routes, including landfill and possible on-site options.

Site begins to take the waste

Waste from nuclear sites is now beginning to arrive at a specialised landfill site in Northamptonshire that has recently been authorised to handle lightly radioactive material.

Augean lab staff monitor composition of waste

The East Northants Resource Management Facility is the first in the UK to seek and receive the additional permissions required to dispose of lower-activity low level waste (LLW) in bulk quantities at its existing site.

Operated by Augean plc, the site is already permitted to deal with a wide range of hazardous wastes from sludges and incinerator ash to contaminated soil and asbestos.

For the nuclear industry, the authorisation was an important step towards broadening the disposal options for lower-activity LLW.

Historically, the industry's LLW was sent almost exclusively to the Low Level Waste Repository (LLWR) near Drigg in Cumbria, the only such facility in the UK and where space is limited. However, a new strategy published in 2010 established a more flexible approach.

With millions more tonnes of lower-activity LLW – mostly building rubble - set to arise as old nuclear power stations are cleaned up and gradually demolished, the need for additional facilities and disposal routes is pressing.

Jo Van Straaten, the NDA's National Programme Delivery Manager, said:

"Availability of appropriate management routes for this kind of waste is extremely important to delivering the UK strategy. Using these other means we are preserving scarce disposal capacity at the LLW Repository, which is required to meet the long-term programme needs for environmental restoration and responsible decommissioning of the UK's civil nuclear legacy.

"This change of approach to dealing with lower-activity LLW, which is at the lowest end of radioactivity levels, complements other areas of effective waste management in the national programme and it can be safely disposed of alongside other types of waste from industrial processes."

Jo added that Government policy of 2007 had endorsed the use of alternative routes, including appropriate landfill sites, as environmentally sound and cost-effective, and these options are reflected in the overall Strategy (see left).

The challenge now, said Jo, was to see utilisation of the small number of other sites currently available or awaiting permitting decisions to support the UK's needs for radioactive waste management.

Vital alternative route

Paul Blackler, Chief Executive of Augean, which operates the Northamptonshire facility, regards LLW as a natural progression for a business already highly experienced in dealing with wastes classified as 'hazardous'.

"There are many waste streams coming here from all over the country, and most of them are more difficult to deal with than LLW. We have the resources, including the skills, the experience and the capacity – and are confident that this site provides a much-needed alternative route for lower-activity LLW, as well as naturally occurring radioactive material. In addition, the costs will be significantly lower than disposal to the LLWR."

The East Northants site is around 12 miles from Peterborough, near the village of Kings Cliffe, close to major arterial routes and within reasonable transportation distance of some of the NDA's southern sites.

With 12 sites, UK-based Augean plc treats and processes around half a million tonnes of hazardous waste each year, with approximately 120,000 tonnes sent to the East Northants site. Specially equipped labs staffed by highly qualified chemists and technicians check samples from each consignment, with further treatment available on site if required.

Adaptations were required to take LLW but Paul points out that these were minimal compared to existing requirements for analysing, monitoring and treating the current waste streams that it has been handling for many years.

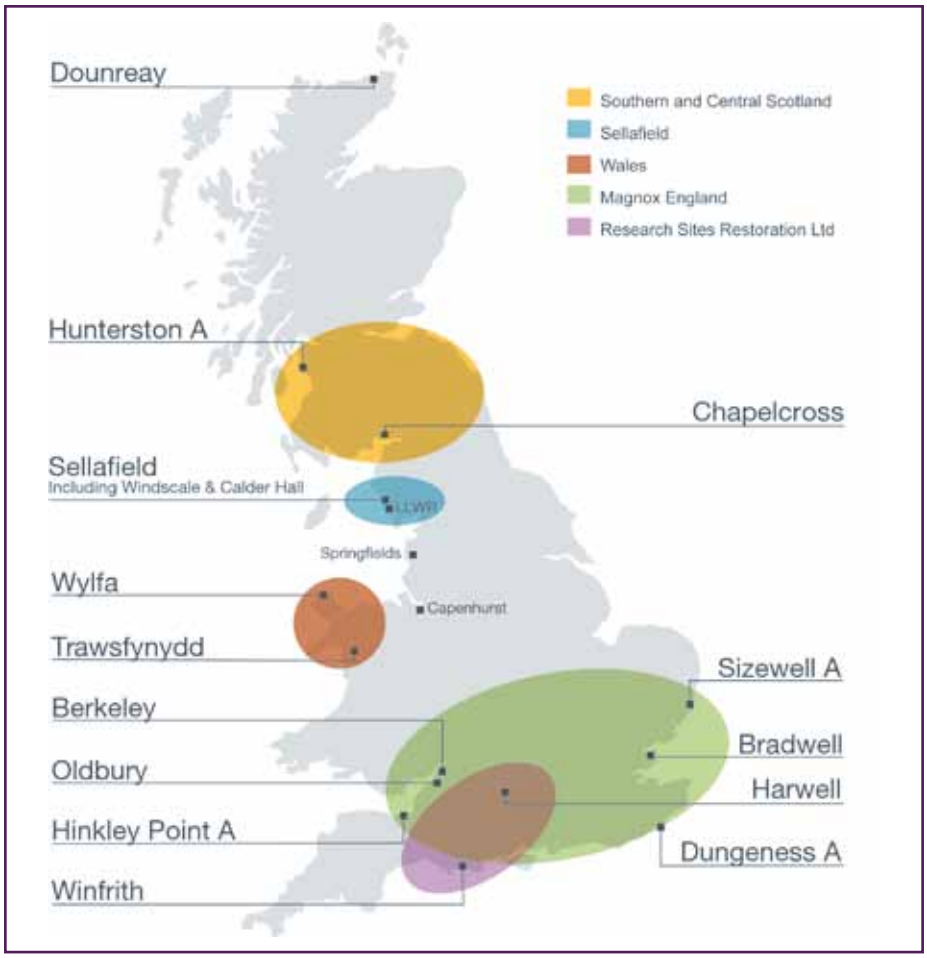
Deliveries sent to the Augean landfill are monitored and checked on arrival before being consigned to one of the bespoke impermeable cells. The LLW remains packed in the soft-sided delivery liners.

Regular data reporting to the Environment Agency is just one of a range of legislative safeguards, while the EA can conduct unannounced spot checks at any time.

Shared waste facilities under consideration

The NDA is considering sharing some of its planned Intermediate Level Waste (ILW) storage facilities as an option for a more flexible and cost-effective approach to managing some kinds of radioactive waste.

Above: Waste can be encapsulated in 500-litre drums.



The current approach for ILW has been to leave it at individual sites for a number of decades, packaged and safely stored, until it is permanently disposed of after the deep geological disposal facility (GDF) becomes available or managed in near-surface facilities in Scotland.

The 2011 NDA Strategy proposed exploring whether centralised shared facilities would reduce the cost and environmental impact of building new stores, as well as shortening decommissioning timeframes.

In addition to NDA waste, material from other producers in both the public and private sector could be included, such as EDF's AGR reactors.

James McKinney, Head of Integrated Waste Management, said that local communities and other stakeholders would be invited to express views before any decisions were made.

"Rather than looking for a site for one UK store, we are considering options on a pragmatic basis, with studies currently focussed on Central and Southern Scotland, Harwell and Winfrith (RSRL), and Magnox sites in England and Wales," he said.

The options would reflect the amount of waste at particular sites and could be a single or several stores, taking existing infrastructure into account. The general approach is to look at the estate from a regional basis, but James emphasised that the ultimate solution might well be at a more local level, for example, several stores within a region. Stakeholder views would be an influencing factor in reaching final decisions.

The NDA will provide updates in the coming months, outlining in greater detail how options for the new approach are likely to work, while engagement with stakeholders will also take place.

James added: "In principle, using fewer stores and sharing facilities should bring benefits but we need to examine the options more comprehensively. This would include issues such as transport arrangements, planning permits and local community responses."