ISSUE 7 2011

Nuclear
Decommissioning
Authority

INSIGHT

into nuclear decommissioning

Delivering progress across the UK

Contents

Front cover: Sellafield's Pile Fuel Cladding Silo

We have developed the design of Insight for the September 2011 edition to bring a brighter, fresher look, and hope you like it.

The content remains similar, focusing on a round-up of activities across the NDA 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 on the new look as well as any suggestions for improving the format.

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

WAGR special - page 8-9

Tony bids farewell

The NDA has announced that Tony Fountain has decided to step down from his role as CEO to return to a career in the oil and gas sector.

Tony joined the NDA in October 2009 following a 25-year career at BP. Tony said: "I have thoroughly enjoyed my two years with the NDA and it has been a very difficult decision to make because I believe strongly in the role of the NDA and its mission. I firmly believe the organisation is well placed to achieve further success. I have really enjoyed the opportunity to work alongside our many stakeholders and I would like to thank them for their important contribution to our progress."

NDA Chairman Stephen Henwood said: "Tony has made a huge contribution to the NDA's achievements over the last couple of years. He has reshaped the organisation to become more delivery-focused, and under his leadership considerable progress has been made. The NDA's mission remains one of the most exciting and challenging roles in the public sector and we look forward to finding a suitably experienced and skilled successor, a process that has already begun.

"Although disappointed to be losing Tony we are well placed to build on the momentum created over the last few years which has been underpinned by our Government approved Strategy and our funding settlement."

Fuels may be set for transfer to single location

The NDA is considering moving a range of radioactive materials from two separate UK locations to Sellafield, in line with its recent strategy commitment to make best use of existing assets and improve value for money.

Harwell in Oxfordshire and Dounreay in Scotland both hold irradiated materials left over from their research programmes. They require high levels of security and long-term management arrangements during the decades before a permanent disposal facility becomes available.

The NDA's Head of Fuel Cycle, Dr Paul Gilchrist, said: "We have examined all the options for these materials at length and believe that management at Sellafield, which has the best facilities for storing and processing such material, is the most logical and cost-effective solution."

At Dounreay, 44 tonnes of high density material from the fast reactor is held securely either in the reactor itself or in storage.

A solution to manage and dispose of the material, which represents 40% of the site's nuclear inventory, would need to be established at some point during the ongoing site closure programme - however, existing facilities at Sellafield already reprocess large quantities of similar spent fuel from the Magnox plants. In fact, some of Dounreay's material was dispatched to the Cumbrian plant between 1967 and 1972.

At Harwell, a range of spent fuels, nuclear materials and waste, dating from the site's early experimental days, are also stored awaiting a final treatment and disposal solution. Transfer to Sellafield would enable the material to be processed using existing facilities sooner than envisaged, while also reducing the environmental hazards.

Both sites would avoid the requirement to design and construct appropriate treatment facilities, while the environmental hazards would be reduced by earlier processing at Sellafield.

A process of engagement with local communities is currently under way, including local stakeholder groups and politicians, while rail transport options are also being explored. It is anticipated that any movements would not take place before 2012. A final decision on both projects is due to be made by the NDA this autumn.

Mike Graham is the National Secretary of Prospect, the trade union that represents many of the professional staff working in the energy sector. He outlines the benefits of a healthy nuclear industry.

Growth opportunities for the UK from all aspects of the nuclear sector

These are exciting and interesting times for the nuclear industry. As individuals and organisations involved in the industry, we strongly believe in the value of strong, safe civil nuclear generation.

However, there are many who are still sceptical and unconvinced and the need to talk with, and listen to, those in nuclear communities is essential.

I observe that the industry is good at communicating with itself but a little more of the evangelical approach, or just good, straightforward two-way communication, would not go amiss.

There are good examples of community engagement: the Magnox and Sellafield Site Stakeholder Groups; Horizon with their local community mass household leafleting and also public exhibitions; and the cross-organisation lobby groups from the Energy Coast, Energy Island and the more recent formative group in Gloucestershire.

This engagement focuses on the positive. We have nothing to hide and we should not be hesitant in promoting all that is good about nuclear.

For example, in Gloucestershire my union, Prospect, has initiated a group, with the support of the NDA, to promote the present and future benefits for Gloucestershire, South Gloucestershire and the wider travel-to-work area. We have focused on the positive long-term economic legacy of nuclear, whether this be investment, small business growth or the value of the nuclear £pound.

All the key, and varied, nuclear employers in the area have supported this initiative, along with local authorities and colleges. Nuclear has many advantages and we should not be backward at promoting these in going public with our powerful arguments.

From a Prospect point of view we, as a non-political affiliated union, have made it clear we will work on a cross-political party basis.

New nuclear build will provide highly skilled, relatively well-paid, stable jobs for many years with the operators and the supply chain. We also have the benefit of manufacturing and construction jobs, opportunities for small businesses and other entrepreneurial activities.

The history of nuclear in the UK is one of good employers, safe operations and good industrial relations.

Decommissioning, operations and the nuclear cycle provide growth opportunities for the UK on a global basis; it also will help drive economic growth and stability at a local level.

It is our duty to promote the benefits through engagement with local communities and stakeholders.

Mike Graham: 'nuclear can help drive economic growth'

spotlight on

Sellafield

Groundbreaking Sellafield Plan published

After two years of investigation and analysis, a groundbreaking plan has been published that sets out the medium-term future of the Sellafield site.

For the first time, the new Sellafield Performance Plan sets out the future operations, construction projects and decommissioning activities over the lifetime of the site but with particular focus through to 2025.

The 189-page Plan, available on the Sellafield website, was compiled under the guidance of Nuclear Management Partners (NMP), owners of the Site Licence Company, Sellafield Ltd, and is supported by a suite of more detailed technical documents.

It sets out how NMP will apply their global experience to improve operations, generate efficiencies and deliver detailed programmes of work with the aim of accelerating decommissioning and providing value for money, all delivered through Sellafield Ltd.

Sellafield is the most complex nuclear site in Europe, with a huge range of facilities both old and new, constrained for space within two square miles and with a workforce of 10,000 people.

As a top priority and in line with the NDA's recently published Strategy, the Sellafield Plan focuses on reducing hazards, particularly at some of the oldest facilities where the risks are considered to be intolerable.

NDA Chief Executive Tony Fountain said: "Over half of our total budget is now dedicated to cleaning up the Sellafield site, around £1.5 billion annually, an increase of 50% in the six years since the NDA was formed.

"I believe that for the first time we now have a credible plan that is underpinned both technically and in terms of capability that gives us all the best chance of success."

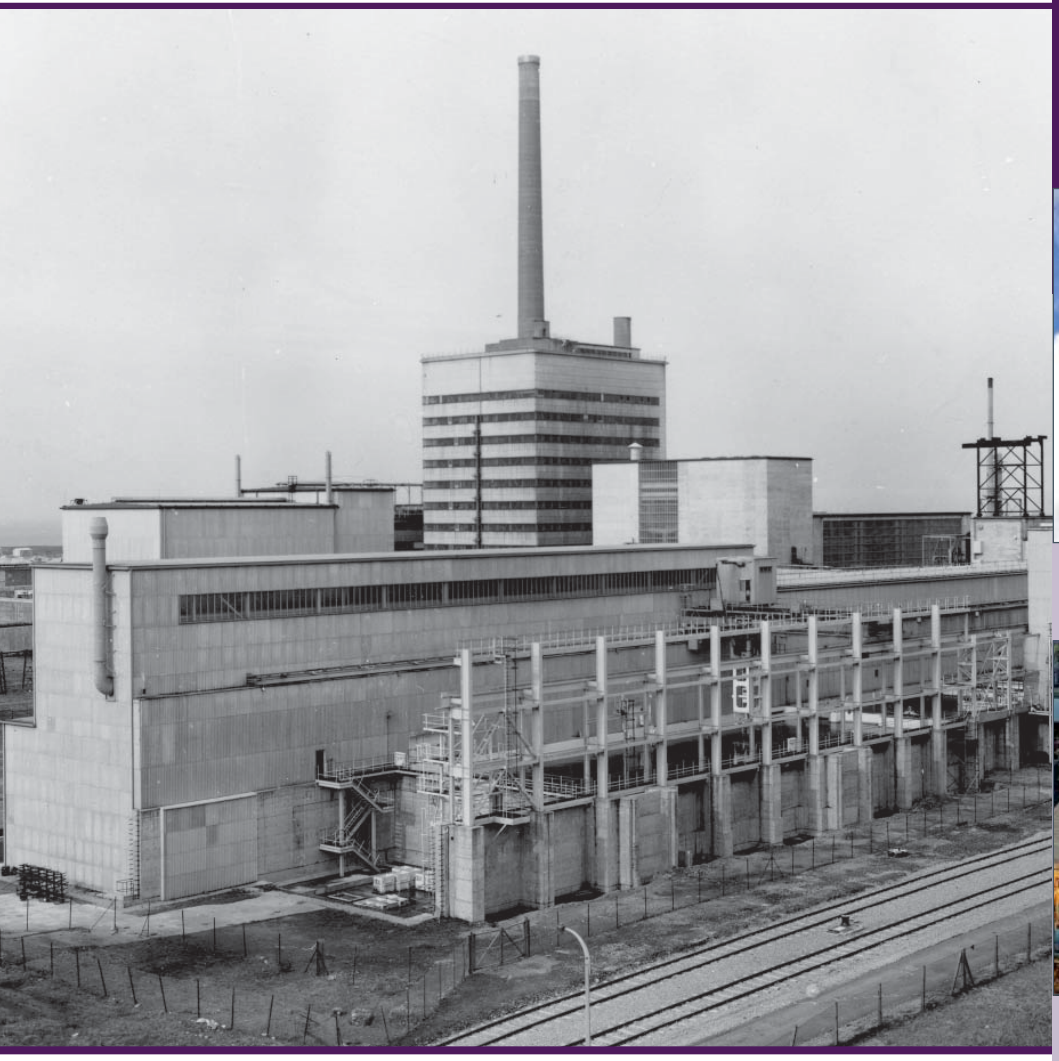
He added that NMP had begun working on the Plan after being awarded the Sellafield contract in 2008.

"They have spent necessary time and energy gaining an in-depth knowledge of the challenges at Sellafield in order to give us a true picture of the site and its challenges," he added.

The NDA will review Sellafield Ltd's performance against the plan throughout the financial year, with fees payable for meeting efficiency targets and delivery milestones.

The performance targets are captured in the Plan and are in the public domain so stakeholders can assess progress across the site both during and at the end of the year.

The Sellafield Plan published in August



The priority areas of work at Sellafield are four historic plants once used to prepare fuel for reprocessing or for storing waste. Known collectively as the Legacy Ponds and Silos (LP&S), the facilities were built in the early post-war years when all attention was on a military-driven programme and decommissioning was a concept best left for future generations.

Radioactive material has been accumulating in the LP&S for five decades and much of it has remained there since operations ended, while the condition of the buildings themselves has inevitably deteriorated over time.

Significant investment is now being made to ensure they are able to continue operating safely before decommissioning takes place.

More than half of the NDA's annual £3 billion budget is now allocated to Sellafield, which, in addition to the LP&S, has 200-plus nuclear facilities housed in more than 1,000 buildings. The LP&S are the NDA's top decommissioning priority.

Innovative technology is being used to retrieve the radioactive material for storage in modern facilities, before treatment, packaging and storage can take place.

"Over half of our total budget is now dedicated to cleaning up the Sellafield site, around £1.5 billion annually, an increase of 50% in the six years since the NDA was formed" Tony Fountain, NDA Chief Executive

Over this and future issues we will be looking at:

Pile Fuel Cladding Silo
(see page 6 and 7)

Pile Fuel Storage Pond

First Generation Magnox Storage Pond

Magnox Swarf Storage Silos

Top left: Historical aerial view of the First Generation Magnox Storage Pond

Work underway to start retrieving waste

Built 60 years ago, the Pile Fuel Cladding Silo, was Sellafield's first storage facility for Intermediate Level Waste (ILW) and, like any building exposed to British weather for decades, needs care and attention.

Its initial function was to store the outer metallic parts – the cladding - of the irradiated fuel elements from the Windscale Piles.

The cladding was shaved off in underwater decanning plants, to be stored in the facility as ILW, while more active spent fuel was consigned to a storage pond.

In later years, fuel cladding from the Magnox fleet, including Calder Hall and Chapelcross, was also transferred to the facility and by 1964, it was full.

The facility has six tall chambers known as silos, arranged side by side and holding more than 3,400 cubic metres of waste. Emptied in from above, the precise composition of this mixed radioactive material remains to be established before treatment can take place.

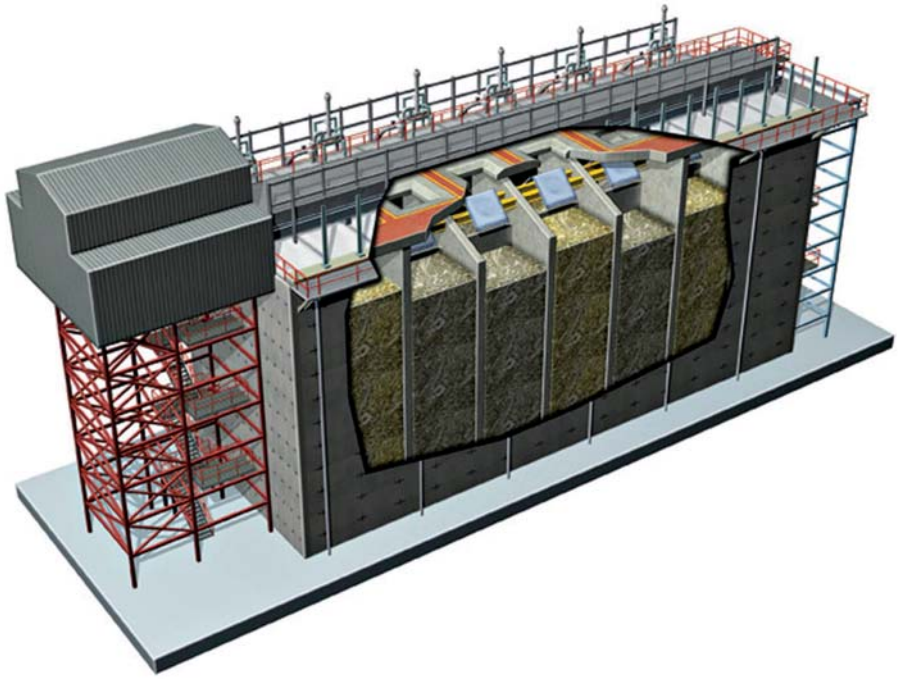
The atmosphere inside the chambers was changed in the 1980s from air to the inert gas argon, which reduces fire risks significantly but, although non-toxic, cannot be breathed and therefore prevents direct workforce access.

External refurbishment, including extra radioactive shielding, has already been carried out on the building to ensure that the safe storage of waste can continue. Meanwhile, the waste ultimately needs to be removed from the silo, treated and immobilised in cement for long-term storage until the deep Geological Disposal Facility (GDF) becomes available.

Finally, the facility will need to be decommissioned and demolished in a programme that will stretch well into the future, and cost at least £600 million. Planning and design work on the facilities needed has been under way for many years and work is now taking place to construct a super-structure adjoining the silo which will house a range of equipment to retrieve the contents.

Holes will be cut into the side of the silo so each compartment can be accessed in turn – trials of this work are under way. A remotely operated grab will then reach inside and bring out the waste for a process of analysis and characterisation before it is packed into boxes, with retrievals due to start in 2017. The collected data will be used as a basis for designing a waste treatment facility which will condition the boxed waste for long-term storage before it is eventually disposed of in the GDF.

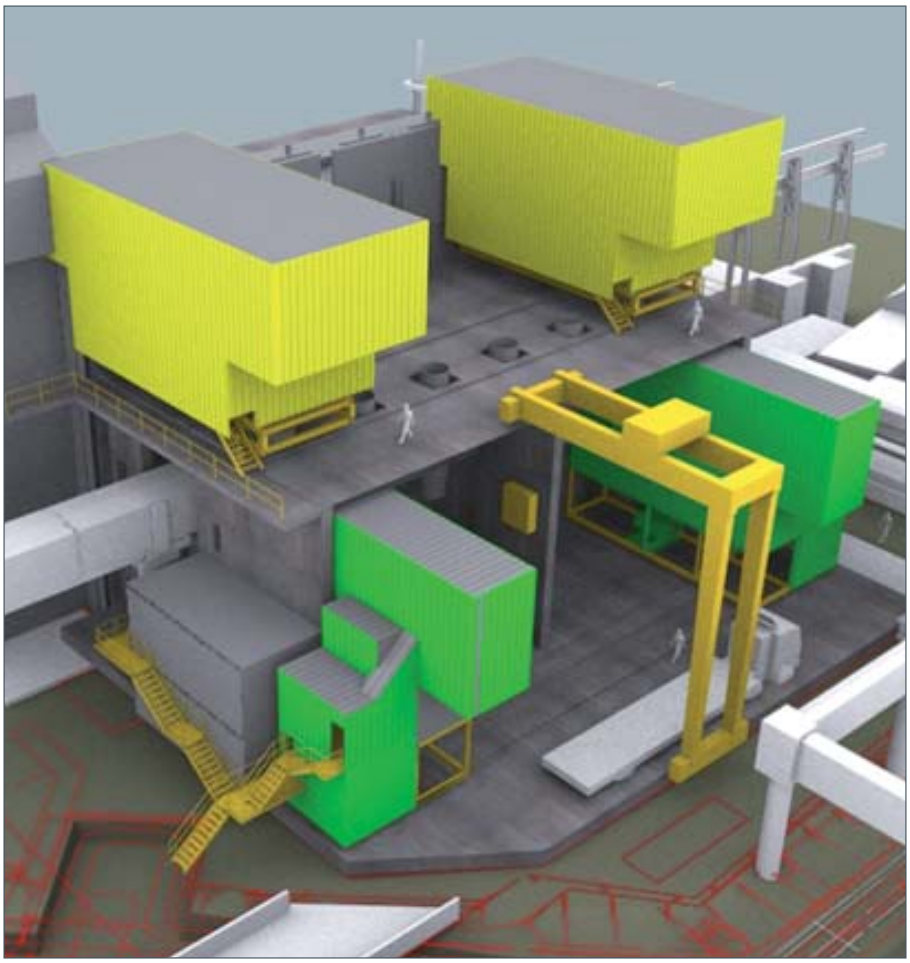
Above: Pile Fuel Cladding Silo
Top right: Schematic of Silo



A Silo Retrieval facility is currently being constructed adjacent to the building which will house all the equipment required to retrieve waste from the six silos.

Simply building the superstructure is no easy task given the congested area in which the construction team has to work, and the care needed to protect adjacent facilities and services. However those challenges are being overcome and will stand the site in good stead for future work in other areas.

"There is a highly skilled and motivated team driving forward the work towards the safe retrieval of waste from this legacy facility" Dr Ian Hudson, NDA Head of Programme, Sellafield



Progress so far has included:

Strengthening the existing building to prevent further damage and erosion from the weather

Installation of a passive argon gas system to reduce the risk of fire

Starting the construction of the superstructure to support waste retrievals

Testing the retrieval technology off site

Left: A schematic of the superstructure under construction

spotlight on WAGR

Iconic landmark reaches decommissioning milestone

WAGR was built between 1957 and 1961 and was the forerunner to the UK's second generation of power reactors

Today, WAGR has served its purpose and has now been safely decommissioned, although the outer sphere remains in place

Construction of Sellafield's iconic 'golf ball' in the 1960s paved the way for the UK's second generation of nuclear power stations which today provide around 15% of our electricity. Now, the safe decommissioning of this industrial-sized reactor, recently completed, marks a different kind of milestone as the NDA makes major inroads on its mission to clean up the nation's nuclear legacy.

More than 20 years of work, much of it carried out remotely in an atmosphere too radioactive for human access, reached a conclusion recently, when the final section of the Outer Ventilation Membrane was removed from the concrete radiation shield of the Windscale Advanced Gas Cooled Reactor known as WAGR.

Made safe, the outer sphere will remain in place as attention turns to higher-hazard projects, reflecting the NDA's commitment to prioritise spending on the most urgent issues across the estate. Monitoring and maintenance will be carried out until it is finally demolished.

Chris Halliwell, Head of Programme Delivery, Sellafield Remediation and Decommissioning Projects, said: "This is a fantastic achievement and the culmination of many years work. It is a true demonstration of the UK's ability to fully decommission nuclear power stations in a safe, cost-effective manner."

The decision was taken, when WAGR closed in 1981, to use the reactor as a national demonstration project for the decommissioning that would be required in future years.

Early years were spent developing the strategy and techniques, designing components, modifying the structure and installing the equipment. In 1999, dismantling of the reactor core and pressure vessel was started. By then, the project team had completed all testing of the principal methods to be used – namely robots, or remotely operated equipment - for dismantling of the components, overcoming numerous challenges and working closely with the supply chain along the way. Innovative thinking was key and the team has built up a vast wealth of skills and experience that are already being deployed in other high-hazard projects, both at Sellafield and across the wider decommissioning estate.

Each step of the journey also had to be safe and compliant, meeting all the stringent requirements of legislation and the regulators.

Peter Law, Windscale Senior Project Manager, said: "The WAGR team should be immensely proud of their achievements. Completion of the reactor dismantling has required a great deal of technical ingenuity and persistence."

The Low Level Waste (LLW) has been packaged and consigned to the national Low Level Waste Repository near Drigg in Cumbria, while Intermediate Level Waste (ILW) has been encapsulated in purpose-built shielded concrete boxes which are held in nearby storage until a permanent disposal solution is available.

WAGR represented one of the major hazards at Sellafield, however, it is just one part of the complex decommissioning jigsaw at the site and the priority now is to focus on other facilities which also date from the early days of nuclear development in the UK.

Dr Ian Hudson, the NDA's Head of Programme for Sellafield, said: "As we progress the clean-up mission, it is important that major milestones such as the successful completion of this phase of the overall decommissioning of WAGR are achieved as soon as possible.

"That's why I'm particularly pleased that the site has successfully concluded the decommissioning of the reactor itself."

"The WAGR team should be immensely proud of their achievements" Peter Law, Senior Project Manager

WAGR facts

WAGR was the forerunner to the UK's AGR fleet which followed the first-generation Magnox plants

14 commercial-sized AGR reactors, owned by EDF Energy, are operational at seven sites in the UK

Constructed from 1957-1961, WAGR's output was 33MW, around 7% the size of a standard AGR plant

It was operational for 18 years

Overall cost of the decommissioning project was £111 million

In recent years, it is estimated that around £3 million a year was spent in the local supply chain

Cutting the Top Biological Shield

More work to dismantle the reactor core and pressure vessel

The WAGR team

Plant set to close in wake of Japan earthquake

Sellafield's Mixed Oxide (MOX) plant, which recycles foreign-owned plutonium into nuclear fuel, is being closed as a result of the NDA's re-assessment of commercial risk following the Japanese earthquake and tsunami.

Japan's nuclear plants were key customers for the MOX fuel and the NDA Board concluded that closure was the only option after the events in Japan affected the plant's commercial outlook. The decision will ensure that UK taxpayers do not carry a future financial burden from the MOX plant.

The plant, which commenced active operations in 2001, but failed to perform as envisaged, took plutonium separated from used nuclear fuel during reprocessing and recycled it into new, mixed oxide, fuel for sale on a commercial basis.

Progress was being carefully monitored after new arrangements came into operation last May designed to increase production and reduce costs.

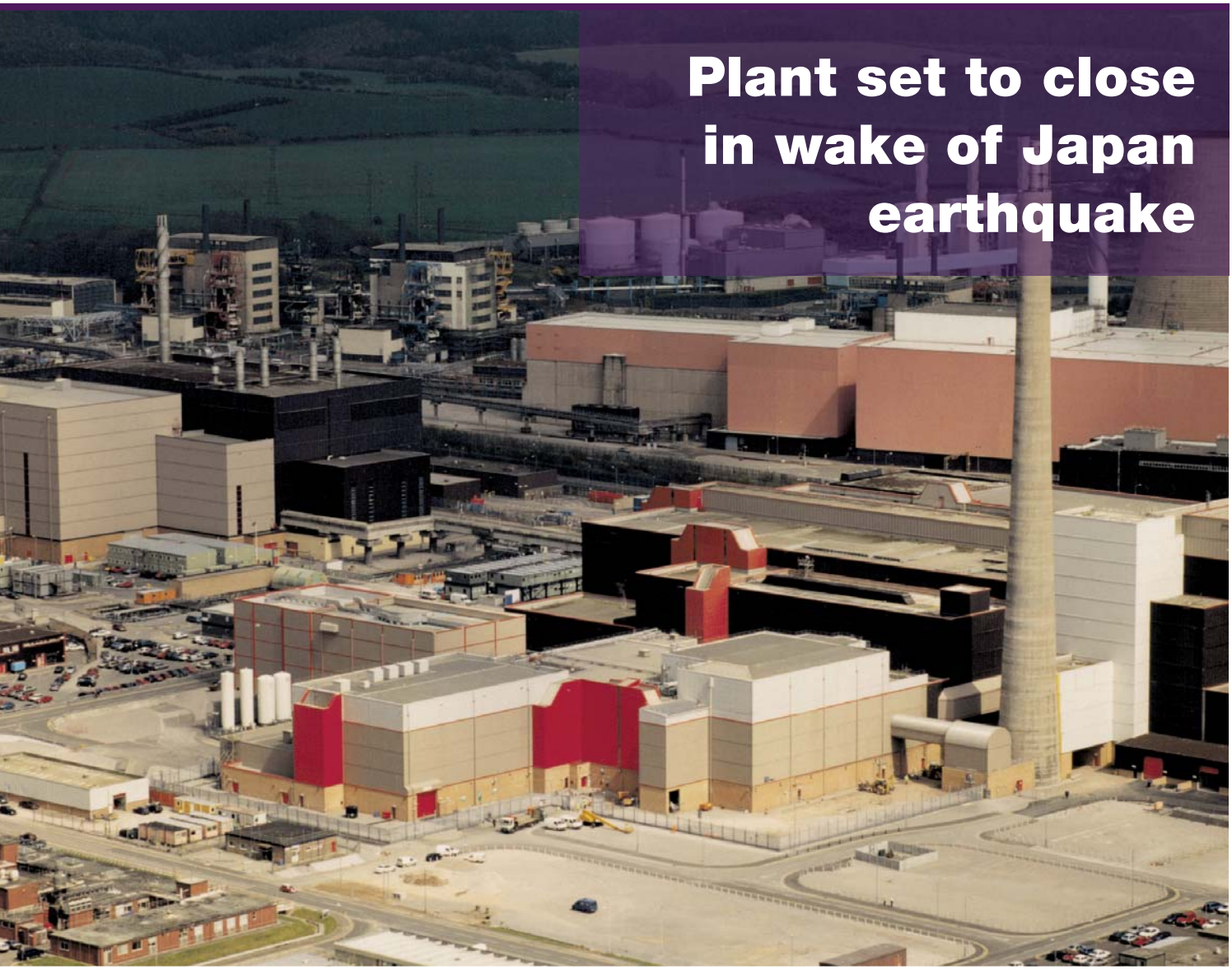
NDA Chief Executive Tony Fountain told staff the closure was no reflection on the 600-strong workforce who had improved the operating performance in the last 12-18 months.

"This is directly related to the tragic events in Japan following the tsunami and its ongoing impact on the power markets. As a consequence we no longer have a customer for this facility, or certainty of funding" he said.

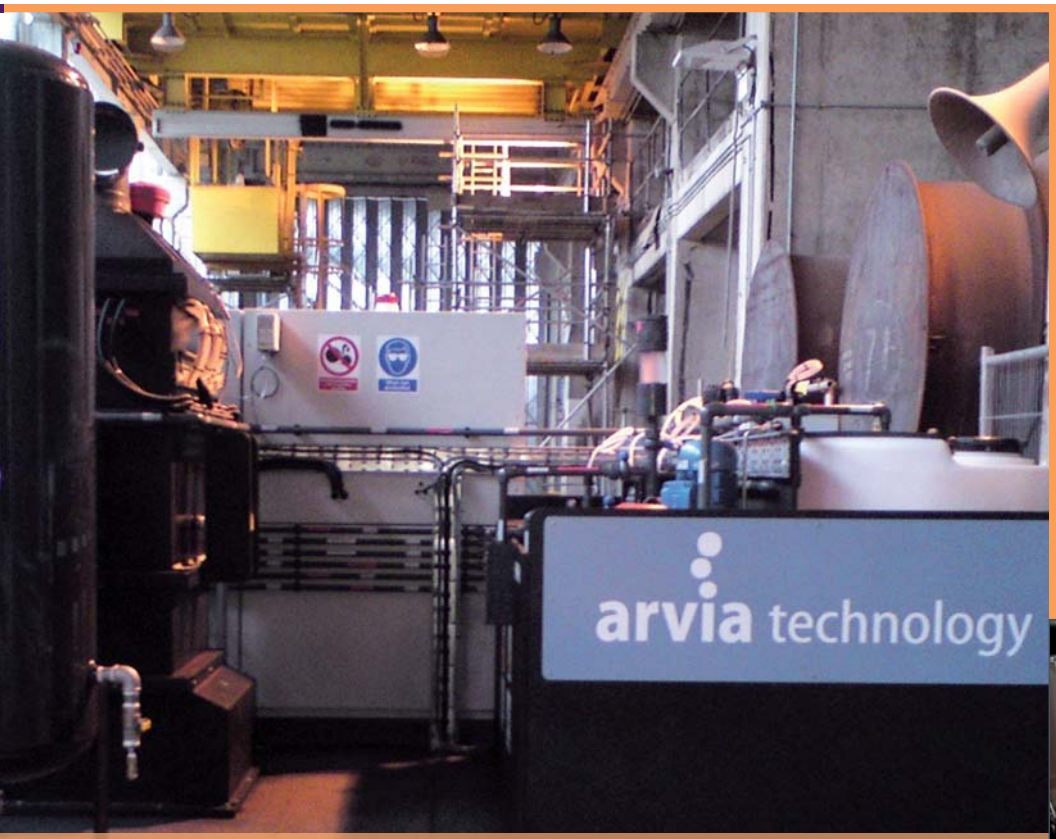
The NDA is working closely with Sellafield Ltd to mitigate the effect on employment, including the potential redeployment of staff within the wider Sellafield complex which has recently received record levels of investment to fund accelerated work programmes.

Japanese plutonium, meanwhile, will be stored safely and securely under international safeguards while further discussions on a responsible approach to the Japanese policy for re-using their material are progressed.

The UK Government is currently considering future policy on the UK's own civil plutonium stockpile after a period of consultation concluded in May.



Below: The MOX plant is being closed after the Japanese earthquake affected contracts for fuel



Oily waste treatment pioneered at Trawsfynydd

When oil and water mix

In the process that has been adapted for the nuclear industry, the oil is first emulsified with water before a unique material, Nyex, is mixed with air, where it captures the organic hydrocarbons.

Once the air is turned off and the Nyex settles, an electric current oxidises the hydrocarbons and the Nyex is regenerated for repeated re-use.

The radioactivity from the oil is transferred to the water, which can then be disposed of via existing authorised discharge routes.

Above left: The full-scale unit at Trawsfynydd site
Above: An operator at work

A pioneering waste treatment solution adapted from the water industry is transforming the disposal of contaminated oil at Trawsfynydd and has the potential to be used in the wider nuclear estate.

The treatment was developed and tested through a collaboration between innovators Arvia Technology and Magnox Ltd.

Radioactive oil, categorised as Intermediate Level Waste (ILW), is one of the most difficult waste challenges for the Welsh site, and exists in various quantities across the whole Magnox fleet. Strict regulations mean conventional disposal processes are expensive and require significant logistical resources.

Off-site incineration, at facilities as far afield as Sweden, incurs transport costs, the need for additional fuel to aid combustion and a residue of contaminated ash for subsequent disposal by the site operator.

Passive storage, the only other viable option, is limited by the tendency for oil to 'creep' over time and deteriorate its cement encapsulation.

John Collinson, Magnox's Waste Director, said: "For some ILW oil wastes incineration is simply not an option, leaving them as wastes with no identified practical management solution. Currently these oils are stored on-site awaiting a suitable treatment method."

Arvia Technology Ltd, based in the North West, has adapted water treatment technology into a practical on-site solution that is both low-cost and low-energy after site operator Magnox Ltd identified its potential benefits for nuclear decommissioning.

Originally conceived by the company's Technical Director Dr Nigel Brown and further developed through the University of Manchester, the technology, effective at treating stubborn and non-biodegradable wastes, has won a number of awards from leading institutions.

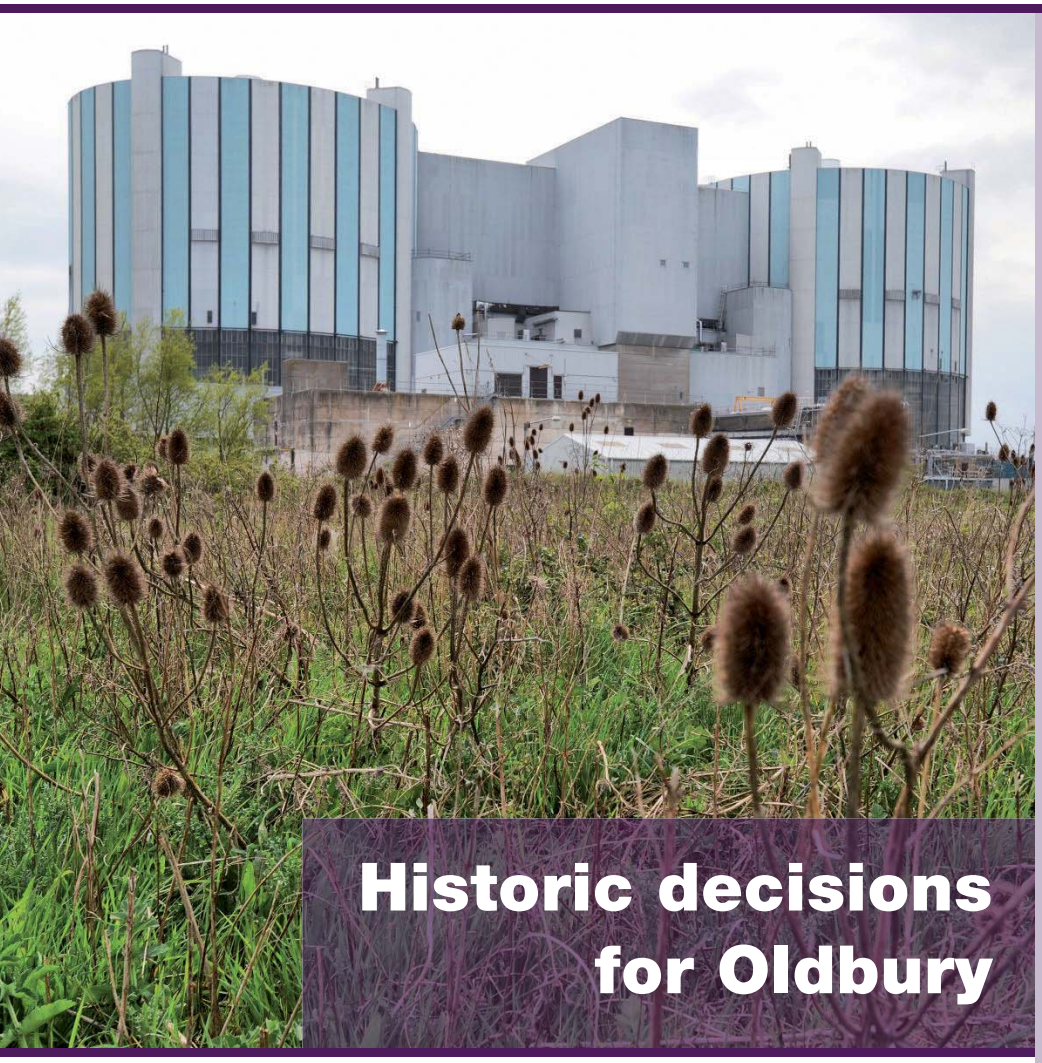
After successful bench-top trials, a full-scale treatment unit, the Arvia Titan, was introduced at Trawsfynydd, allowing Magnox to treat an initial nine litres of LLW and ILW oils.

John Collinson added: "This option has great potential for Magnox as we look for innovative and transformational solutions which will help us deal with our ILW inventory whilst delivering value to the UK taxpayer."

The NDA's Research Manager Dr Darrell Morris welcomed the technology's potential and added that progress on the trials had already been shared with others across the estate: "As well as supporting the development of this innovative technology, Magnox have used the Nuclear Waste Research Forum to keep the UK decommissioning sector up to date with progress.

"A number of other decommissioning projects are now investigating whether this approach could be applied to some of their more challenging wastes. The benefits of sharing this success could be considerable."

For further information on the technology, visit www.arvianuclear.com



Historic decisions for Oldbury

Oldbury Power Station reached a double milestone in the summer, when one reactor was given a new lease of life while the other ceased operating.

Reactor 1 has permission to continue generating electricity until the end of 2012 following a review with the site's regulators, and provide valuable revenue for the NDA.

The announcement came just one week before Reactor 2 finally reached the end of its operational life, in line with the agreed operating plan.

Reactor 1 began operating in 1967, followed by Reactor 2 a year later. Both were originally scheduled for closure in 2008 and subsequently granted extensions. Their parallel lives ended this year, however, when the decision was announced that will allow extended generation at Reactor 1 for a further period.

Limited fuel stocks do not allow both reactors to continue to operate.

Phil Sprague, Oldbury Site Director, paid tribute to the workforce: "As a result of excellent operation and maintenance by our experienced staff, the plant and equipment are in very good condition. We have worked hard with each of our regulators and they have no objection to the extended generation of Reactor 1. We are pleased that this work has been successful and that we will continue to contribute to the country's electricity supply as we have done for 43 years.

"Meanwhile, the closure of Reactor 2 marked a historic day for Oldbury and all its staff, past and present. Reactor 2 has operated safely and provided the UK with a vital source of power for over four decades, something that everyone who has worked on the site should be very proud of."

The income from Reactor 1 will continue to be used to support the NDA's clean-up mission.

As well as the many years of power generation, the site has starred in numerous television shows, including Doctor Who and Blake 7. It even appeared on Top of the Pops when Slade recorded a performance on the pile cap.

Oldbury and Wylfa, on Anglesey, are the only two Magnox sites still in operation in the UK.

On the move

The NDA's London Office, where a small number of senior executives are based, has moved to government-approved premises located a short distance from the existing Buckingham Gate address.

The new offices, close to Victoria Station, are located on the 9th floor of Eland House, which is predominantly occupied by the Department for Communities and Local Government.

As of 19 September, post for the London office should be addressed to: Nuclear Decommissioning Authority, 9th Floor, Eland House, Bressenden Place, London SW1E 5DA.

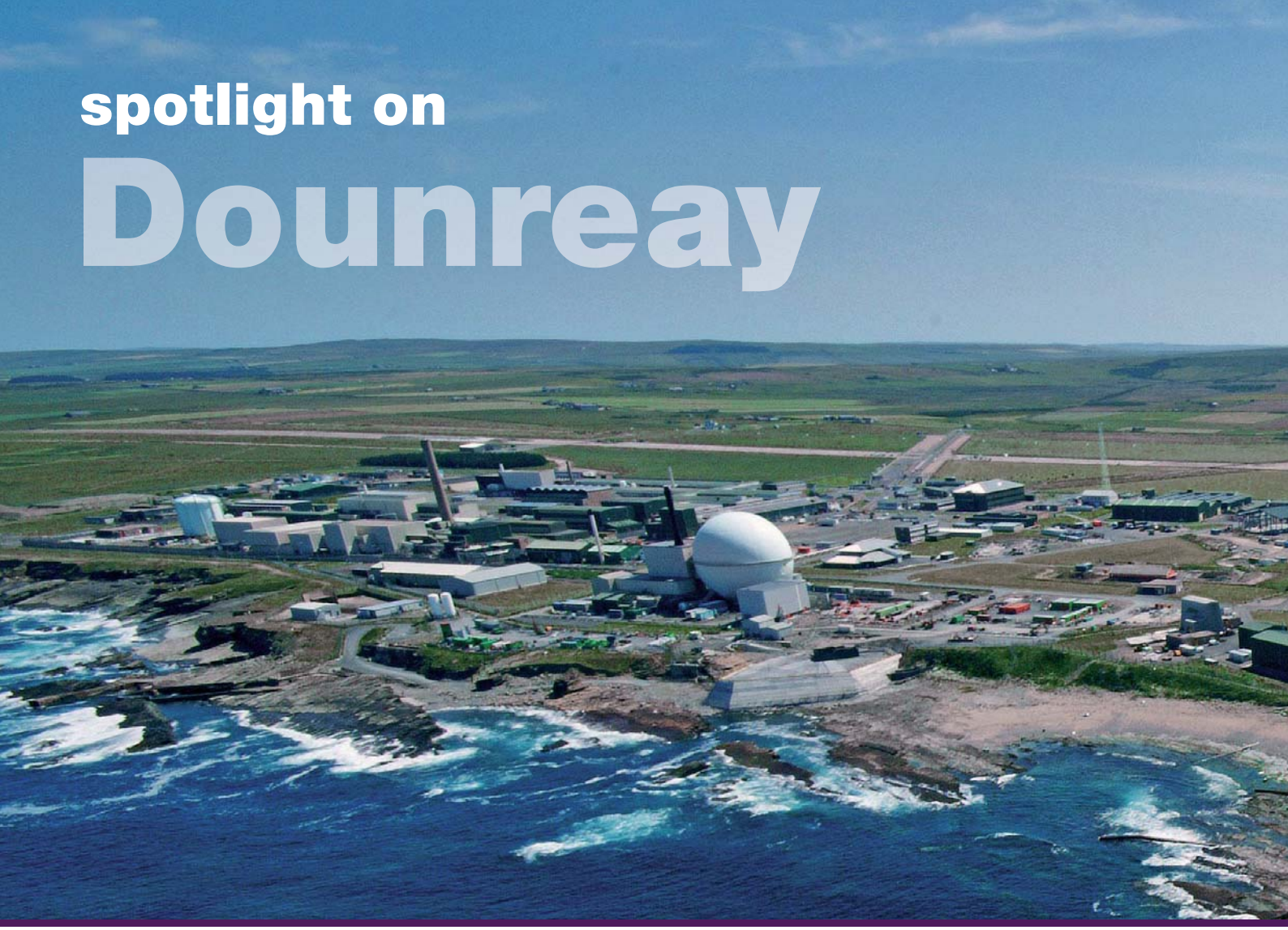
The NDA's main office remains at Westlakes Science and Technology Park in Moor Row, Cumbria.

NDA's new London office address:

9th Floor,
Eland House,
Bressenden Place,
London
SW1E 5DA

spotlight on

Dounreay



Dounreay competition heads into final phase

The NDA's competition team has now begun to evaluate the detailed tenders submitted by the two consortia taking part in the competition to appoint a new Parent Body Organisation (PBO) for Dounreay Site Restoration Limited.

An announcement on the preferred bidder is anticipated at the end of November, followed by a transition period of three months, starting in December, while the contracts are finalised and the prospective new PBO team begins a familiarisation and due diligence process.

Subject to a successful transition period, the competition will conclude when the shares are transferred to the new PBO in April 2012.

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.

The bid teams formed early in 2010 prior to the pre-qualification stage of the competition. Following the issue of the draft Invitation to Submit Final Tender in May, both teams have been working on detailed plans to take Dounreay to Interim End State and their bids were lodged at the end of August.

During the transition period, representatives of the preferred bidder team will be in Caithness, carrying out a due diligence process to verify their understandings and information given to them during dialogue and visits to the site.

They will also start to introduce themselves to DSRL employees and managers, and begin to outline their plans for the site. The current DSRL management team will remain in sole charge right up to the date of share transfer.

Graeme Rankin, the NDA's Competition Programme Manager, said: "While we are now a significant way through the process, and the announcement of the preferred bidder is an important milestone, the competition will not conclude until the completion of share transfer in April next year.

"We are pleased at the way DSRL staff have handled the competition process so far, and their co-operation and support in the process has been essential in helping us keep to the programme. I'm looking forward to the final stages of the Dounreay competition, and value DSRL's continued support in this. While the competition has been a lengthy process, we must remember that this is one of the most significant public sector contracts to be let in 2012, and so the complexity and thoroughness of the competition must reflect this."

It's been dubbed the most sophisticated Swiss army knife ever built.

A 16-piece tool has been designed to reach deep inside one of Britain's earliest nuclear experiments and harvest the material that once promised to revolutionise how the nation generated electricity.

Measuring 40ft in length, each of its 16 different tool-bits has been designed to withstand the harsh operating conditions inside the Dounreay Fast Reactor (DFR).

The reactor shut down in 1977 after almost 20 years of experiments and is now being decommissioned, allowing retrieval of the last of the plutonium and uranium from its unique "breeder" zone.

A custom-built retrieval arm will spend three years inside the reactor vessel, carefully cutting free 977 metal rods standing vertically in a hexagonal rack around the near-empty core. The rods need to be removed before the rest of the reactor can be dismantled safely.

Each rod will transferred to a waiting basket, ready to be lifted through the roof of the reactor vessel inside the sphere.

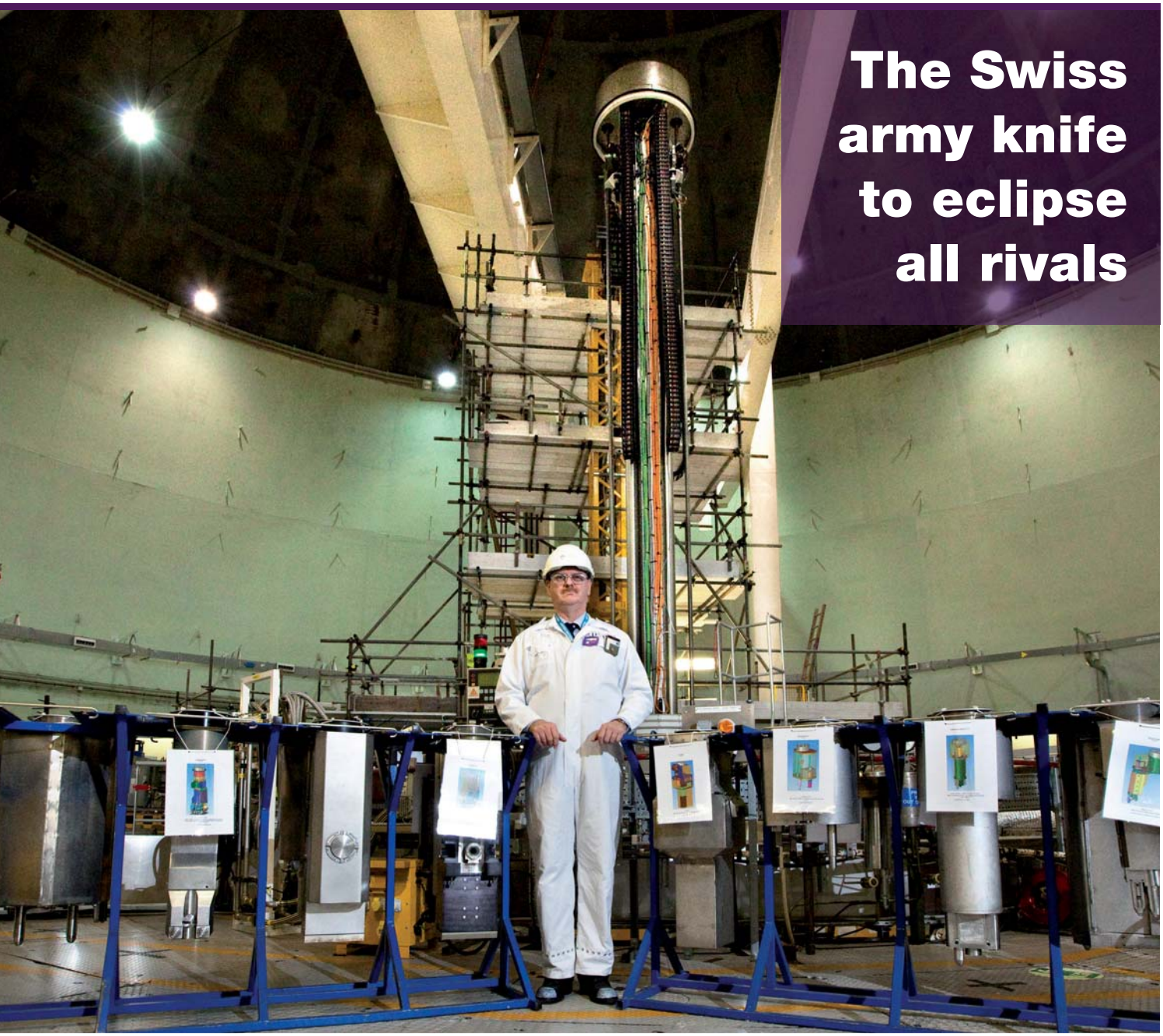
Built by French engineers Framatome at a cost of £20 million, the tool is ready to descend into the reactor vessel below and begin harvesting the valuable metal.

"The reactor was a one-off design and so is the tool we need to take out the breeder rods," said Alex Potts, the engineer in charge of the project at Dounreay Site Restoration Ltd, which manages the site. "It's too toxic in there for anyone to do the job manually – the radiation levels are still very high and the residual traces of liquid metal coolant add to the hazard – so we need a tool capable of doing the job by remote control. It's a pretty sophisticated version of a Swiss army knife the team came up with."

Each detachable tool-bit cost £100,000, weighs between 37-93kgs and covers the range of equipment needed to retrieve the metal rods.

Special radiation-proof cameras and spotlights will guide operators working around the clock in a control room 20 feet above, in the hall of the containment sphere.

Below: Each tool-bit has a different function



The Swiss army knife to eclipse all rivals

Driving down the hazard - at speed

Meanwhile, in a separate project, the hazard posed by highly toxic coolant in the reactor is being reduced at a rate that far outstrips even the most optimistic of predictions and is on schedule to be completed by early next year.

Decommissioning the experimental DFR first started in 1983 but stalled, due to technical difficulties, for almost 30 years. In 2005, the NDA declared the reactor a major environmental hazard and targeted its decommissioning as one of UK's highest clean-up priorities.

The key challenge was approximately 57,000 litres of highly toxic liquid metal, sodium-potassium or NaK, held up in the primary cooling circuit.

NaK was used to transfer the heat from the nuclear reaction in the core to the steam-generating plant where electricity was generated, and produced little waste during operations. However, it is a serious health hazard, both chemically and radiologically, that combusts on contact with air or moisture.

Now, a purpose-built destruction plant funded by the NDA has destroyed almost three-quarters of the metal and Dounreay Site Restoration Ltd is on course to complete the rest by March 2012.

"It has been phenomenally successful," said Andy Swan, Senior Facility Manager with DSRL.

The two-stage process involves chemical conversion and radiological decontamination to produce a salty water that is safe to discharge to sea.

Designers initially believed the plant would decontaminate the metal by a factor of up to 1,000. But clean-up rates of up to four million have been achieved and the levels of radioactivity in the effluent are now at the limits of detection.

Fast reactors were the only reactors in Britain to use liquid metal instead of gas or water in the cooling circuits. Only two fast reactors were built, both at Dounreay in northern Scotland.

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

The coolant is heavily contaminated with radioactive caesium

Three-quarters of the 57,000 tonnes of NaK are now destroyed

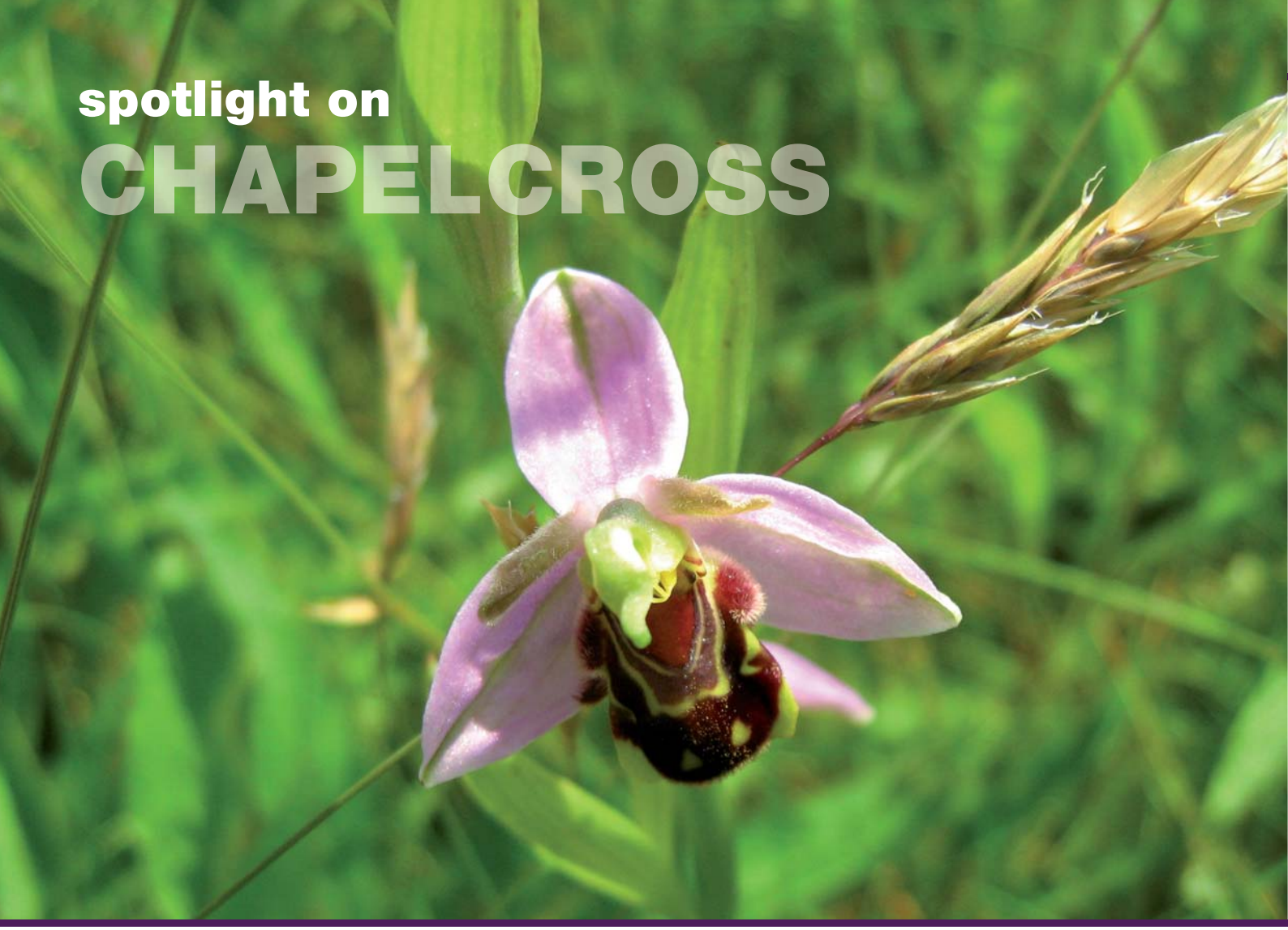
Destruction, taking two and a half years, will be complete in March 2012

Decommissioning DFR, which contains the NaK, will take another 15-20 years

Top of page: At work on the destruction of the highly toxic NaK

spotlight on

CHAPELCROSS



Rare orchid found on nuclear site

A rare Bee Orchid has been found at Chapelcross Site, near Annan in Dumfriesshire.

The flower, which has protected status in some countries, was thought to be extinct in Scotland until recently and is more usually found in coastal locations of South East England. Its presence at Chapelcross was confirmed by one of the Site's Environment Team as part of a recent biodiversity study.

Jim Rae, Ranger from Eskrigg Nature Reserve at Lockerbie, was invited to formally identify the orchid in its unusual location. In his report, Jim identifies the Chapelcross site as a botanically important area because the soil has not been enriched with fertilisers over the years.

Lying inside the Nuclear Licensed Site, the orchid's environment is protected by strict security and environmental regulations and procedures. Chapelcross is currently in the process of defuelling.

Anne Marie Gemmell, from Chapelcross' Environment Team, said: "It is extremely exciting to have these special flowers on the site. It's a testament to Magnox's approach to the environment that we have found such a rare orchid growing here."

Chapelcross recently transported its 100th flask of spent fuel to Sellafield for reprocessing and has now completed almost 40% of its defuelling programme. Approximately 150 further shipments will be needed.

Top of the page: Bee Orchid. Above: An aerial view of Chapelcross

Turbine recycled to train apprentices

New life is being breathed into a redundant turbine from Chapelcross site after it was found to be in tip-top condition despite more than 50 years of constant service.

The No 1 turbine alternator will be used help train apprentices after its transfer to the extensive new Siemens training facility currently being built in Newcastle.

The innovative project began when Siemens asked the NDA about the availability of redundant generating plant.

Brian Burnett, NDA Head of Programme - Magnox and RSRL, said: "I am delighted that one of our assets, having been in service for several decades, will continue to be put to good use in serving the training needs of future generations of apprentices. I would like to thank Magnox for all its hard work in removing the turbine ahead of schedule."

The initiative supports the socio-economic objectives of Magnox and the NDA, as well as promoting training within the Nuclear and Generation Skills Academy.

Magnox Project Manager Dave Green was delighted with the condition of the turbine which was installed over 50 years ago to produce electricity from steam.

Chapelcross Site Director John Grierson said: "Having been an apprentice at Chapelcross and maintained these generators during my career, it is excellent that one of our turbine alternators is to be re-used to train apprentices for the wider benefit of the industry."

The relocated rotors, associated bearings and supports will allow hands-on experience for the Siemen's apprentices and tradesmen in dealing with turbine parts on a wide range of generating plant, from large steam turbines through to all types of wind-powered plant.

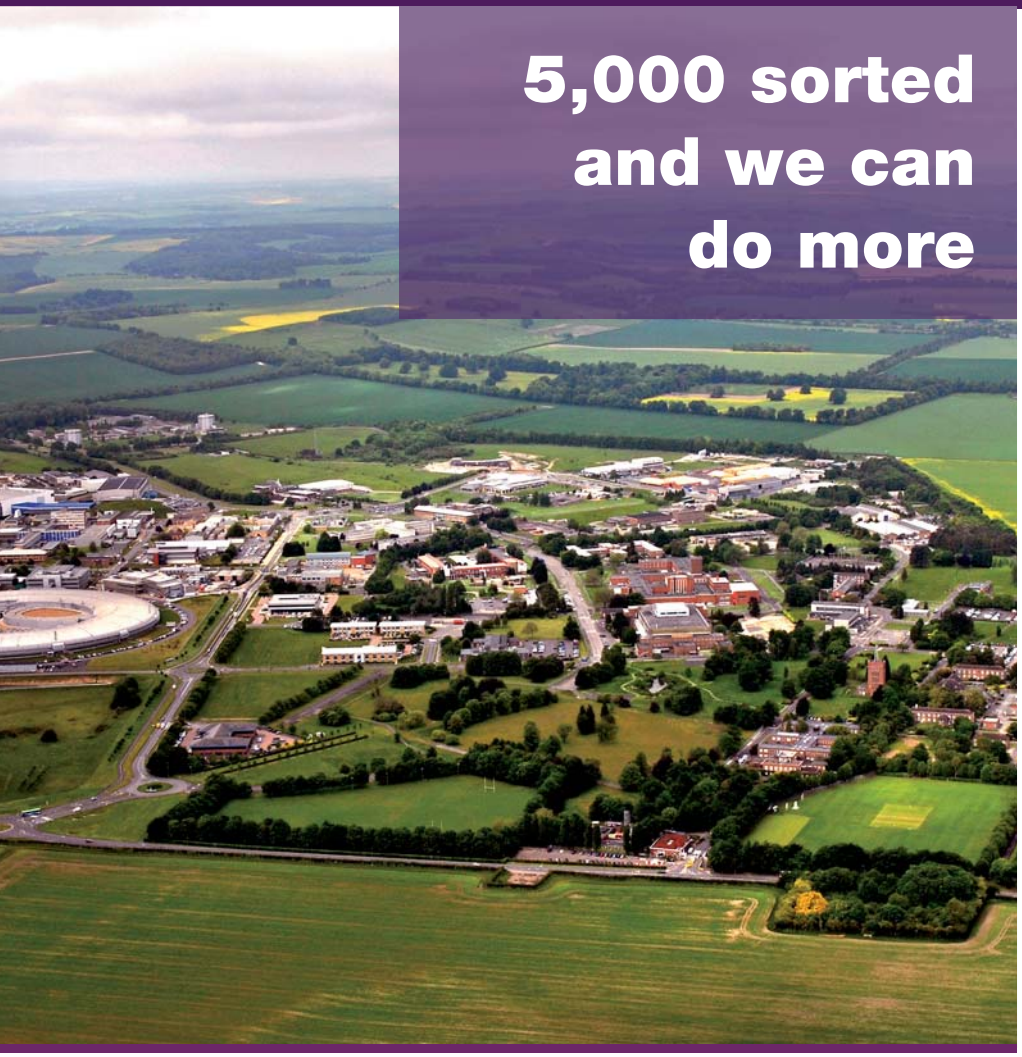
Graham Hartley, from Siemens, said: "The acquisition from the NDA of the Chapelcross generator and turbine centre-line is key to continuing to develop our skills base for both our current and future employees."

Meanwhile, the NDA will look to see whether the remaining seven turbines, which are in a similar condition, can also be recycled back into the energy industry.

The relocated turbine will be unveiled at an official opening ceremony of the training facility in November, attended by representatives of the NDA and Magnox Ltd.

Above and below: The equipment is lifted clear before being sent off to Siemen's training centre

5,000 sorted and we can do more



Dealing with historic waste is a central feature of work at the Harwell site in Oxfordshire, and a notable landmark was recently achieved with the processing of the 5,000th waste canister.

Alan Neal, Managing Director of Research Sites Restoration Ltd (RSRL) which runs the site, said: "This is a considerable milestone - an achievement only made possible by hard work and continuous improvement."

Intermediate Level Waste (ILW) has been stored in underground storage tubes at the former research facility since the 1950s, and is being gradually retrieved, examined and processed before being transferred to 500-litre drums for storage in the Vault Store. All the work is carried out remotely.

Cans of waste from the retrieval process are transferred to the Head End Cell suite in the Solid Waste Complex, where the processing and transfer to drums takes place.

A further 6,000-plus cans will be processed through the facility before the plant completes its purpose.

The processing of cans through the Head End Cells began in 2003, at an initial rate of around 350 cans a year. Since then, the introduction of efficiencies has led to a rise in the numbers processed until it is almost double the original figure.

"This efficiency process is rapidly becoming recognised as best practice by stakeholders and regulators alike," said Project Manager Gary Preston.

However, increasing the throughput has been challenging, as Gary explained: "With equipment so complex and remotely operated, breakdowns provide a challenge across many disciplines. To achieve such an improved throughput consistently relies on an adequate feedstock."

Feedstock comes principally from a 240-tonne, fully shielded and contained moveable cell, known as Retrieval Machine 2 (RM2), used to recover ILW from the tubes. Its forerunner, RM1, and other waste streams provide the balance. Problems with any of the machines and other equipment along the route starve the feedstock and hence the throughput drops. The recovery programme is also affected.

The Solid Waste Complex therefore has its own resident RSRL staff to deal with the problems that arise. Over the years they have encountered a wide variety, from failures in the can and debris grabs and the cell hoist, to damaged hoist and power cables, as well as problems with ventilation, sealing and decontamination.

"On one occasion the grab became stuck in the storage tube and could not be removed," Gary Preston said. "We tried many techniques to release it without success.

"Eventually, the persistence of the operations staff paid off and the grab was released. Because of the diverse waste we deal with, such faults are difficult to predict – but we learn from these events. We now have built-in provision to deal with the situation with the grab, should it ever happen again."

Top of the page: Harwell. Above: The honour of assisting in processing the 5,000th waste canister, using remote handling equipment, went to NDA Programme Manager David Rushton

Problem fuel leaves site .... finally!

The transporter moved off slowly and staff at Wylfa watched with pride as its load, a standard spent fuel flask, began the journey to Sellafield.

Inside were 19 damaged fuel elements which had caused a headache of enormous complexity for more than 20 years.

Unlike the older Magnox plants which use cooling ponds, Wylfa's spent fuel is held in a series of dry stores prior to being sent for reprocessing. One of the stores, Dry Storage Cell 4, had been affected by water from a leaking roof, leading to varying levels of corrosion on a small number of the 21,000 stored fuel elements and making it impossible to retrieve them with conventional equipment.

In November last year, the last of the damaged fuel elements was successfully removed and transferred to the transport flask. Consent from the Department of Transport was subsequently granted and the flask has now been despatched, marking a significant milestone for the team.

In the interim, the team had been focused on removing the flask from the Flask Filling Cell where it was held.

Significant levels of contamination in the area required extra precautions, including erection of a special tent over the Flask Filling Cell, preventing the spread of contamination in the Diverse Discharge Route, to enable a 'pre-clean' of the flask prior to processing it further through the Flask Handling Area. Once sufficiently clean, the flask continued through the required processing checks before being loaded onto the transporter.

Mike Hughes-Roberts, Project Lead, said: "Seeing the fuel leaving site has been very satisfying for all the team. The project will not reach completion until decontamination of the Flask Filling Cell takes place, but there are a number of lessons learnt so far that can be used to benefit other projects in the industry.

"This successfully demonstrates how a complex problem can be overcome with a simple pragmatic strategy and utilising a dedicated team who have the determination to keep going in adversity."

Fact file

Corrosion damage was first detected in 1991

The first recovery attempt was made in the mid-1990s, but stopped after only two elements were recovered as there was a fear that the primary fuel route would be contaminated

Technical complications and escalating costs halted a number of subsequent projects before any of the elements were recovered

In 2008 the current recovery strategy began, using a bespoke recovery grab fitted to modified fuel route equipment painstakingly developed by the on-site team

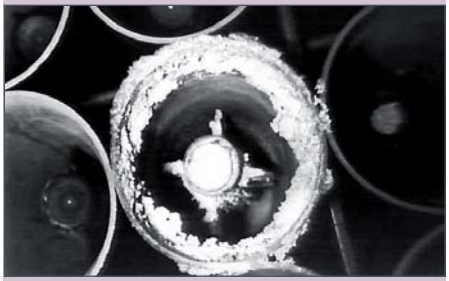
The first damaged element was placed in the transport flask just before Christmas 2009

A further 11 elements were recovered by February 2010, but the remaining seven were stuck in the debris

A package of tools was developed to break up the debris and free the remaining elements

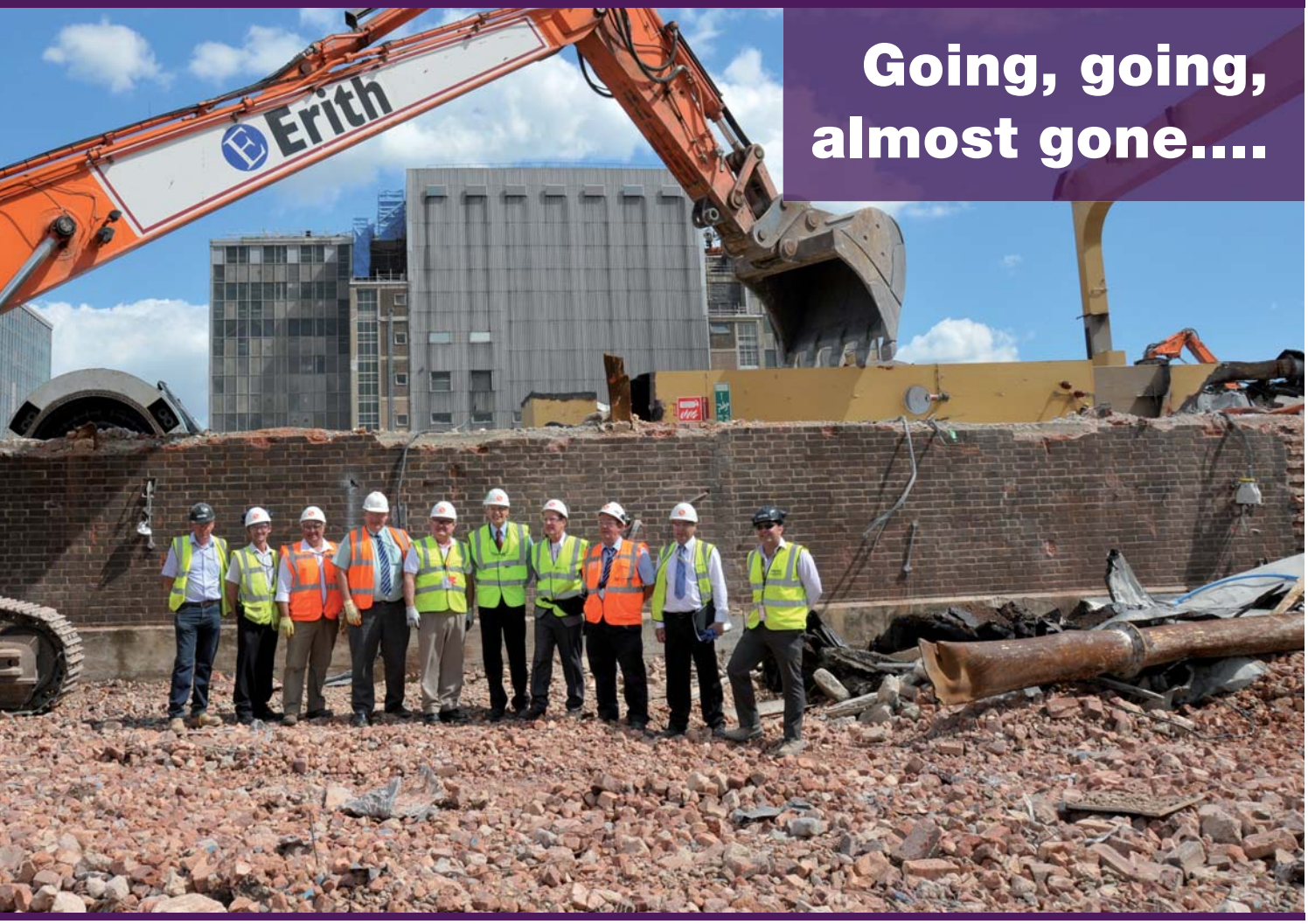
Persistence and determination paid off, and the final element was removed and transferred into the flask in November 2010

Project team members saw the problem solved after more than 20 years



Corroded fuel couldn't be retrieved using conventional methods

Going, going, almost gone....



Bradwell's skyline has changed dramatically as the largest single building on site, the main turbine hall, is systematically razed to the ground.

The building, constructed in the 1950s, has been stripped of its metal sheeting, revealing the main structure which is being demolished using high-reach excavators.

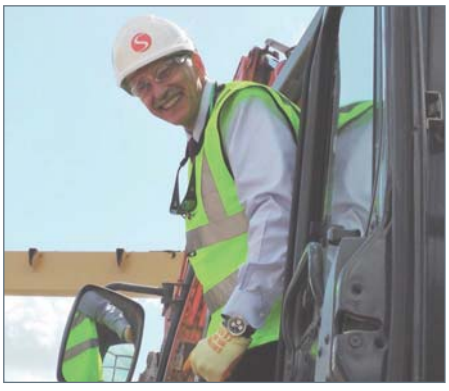
The demolition marks a significant milestone towards reaching the passive Care and Maintenance phase on the site by 2015.

The hall housed the nine turbines which generated electricity until 2002 and is the size of a football pitch.

The joint project between Magnox and specialist contractor Erith involved 100,000 man hours of work, recycling 6,000 tonnes of metal and the safe removal of over 100 tonnes of asbestos.

The main demolition was due to be completed by mid-September with the project coming to a close in November.

Top: A pause in work
Above right: NDA Delivery Director Mark Lesinski had the honour of helping out with the demolition
Right: More walls hit the dust



100,000
man hours of work

6,000
tonnes of metal recycled

100
tonnes of asbestos removed

Bradwell is one of two Magnox sites selected to lead the way on decommissioning and is scheduled to enter passive storage in 2015.