

Programmisation – A Shift in Managing Decommissioning Challenges, Magnox South, UK - 10100

Mark Lesinski, Magnox South Limited, Berkeley Centre, Berkeley, Gloucestershire,
GL13 9PB, UK

ABSTRACT

Magnox South operates five, dual reactor nuclear sites across various geographical locations in the United Kingdom (UK). When the Nuclear Decommissioning Authority (NDA) was established in 2005 there were five individual site contracts which engendered a silo mentality across the business. From 2006 onwards, the NDA encouraged Magnox South to move towards operating as a joint Site Licence Company (SLC) with a single contract. In order to achieve this, Magnox South had to deal with the existing silos and break down barriers between the sites.

There were a number of management and technical challenges across the sites which were being addressed on a site by site basis. This approach was slow, costly and not the safest option with events potentially being repeated as opposed to lessons learnt at one site and transferred across the business with surety of implementation. Programmisation was seen as a solution to breaking down the silo mentality and achieving efficiencies in management, technical and safety aspects of major projects in the portfolio.

One key area of high hazard reduction work is in the decommissioning of the nuclear fuel cooling ponds. To pilot this new model of decommissioning in the UK, Magnox South took an experienced Ponds Decommissioning team from Hinkley Point A site and vertically integrated it with the Ponds Decommissioning team at Bradwell site. The combined 'One Team' then achieved a number of significant milestones, including implementing pond drain and seal, with very few technical or safety issues. The Bradwell pilot is an example of how the implementation of Programmisation has accelerated learning on site and led to improved performance, minimised site events and developed a consistent, efficient approach to decommissioning i.e. the learning curve climb was accelerated. The pilot owed its success to the vertical integration of the two teams, from Director to Operative, the hands on application of lessons learnt, use of tried and tested equipment from Hinkley and a hybrid of planning techniques and work control processes from both sites.

Programmisation was highly successful at Bradwell and Magnox South has extended this learning across both Magnox South and Magnox North sites for Ponds Decommissioning. In addition, other similar teams have been created for Fuel Element Debris (FED) dissolution and Intermediate Level Waste (ILW) Mini-stores, with implementation plans under development for all three product streams.

This paper covers Magnox South's approach to breaking down barriers between sites enabling greater efficiencies to be delivered across decommissioning programmes. The paper uses the Bradwell Ponds Decommissioning Project as an example of the benefits delivered through implementing Programmisation. It highlights the efficiencies achieved in management, technical and safety aspects of the Bradwell project through the use of vertically integrated project teams that enabled accelerated learning on site.

INTRODUCTION

Magnox South and Magnox North operate ten dual reactor nuclear sites across various geographical locations in the UK. Of the five Magnox South sites, two are currently defuelling (Sizewell and Dungeness) and three are now defuelled and are in varying states of decommissioning (Berkeley, Bradwell and Hinkley Point A). See Figure 1 for a map representing site locations.

When the Nuclear Decommissioning Authority (NDA) was established in 2005 there were five individual site contracts which engendered a silo mentality across the business. From 2006 onwards, the NDA encouraged Magnox South to move towards operating as a joint Site Licence Company (SLC) with a single contract. In order to achieve this, Magnox South had to deal with the existing silos and break down barriers between the sites.



Figure 1: UK map representing Magnox South (orange) and Magnox North (green) site locations

Post defuelling, one of the key projects to achieve entry into the Care and Maintenance phase is the decommissioning of the ponds complex. The cooling ponds complex on Magnox sites was originally used for the cooling of spent nuclear fuel prior to shipping to Sellafield for re-processing. Bradwell and Hinkley Ponds are now complex decommissioning projects with the ponds containing empty skips (previously used to hold the pond fuel), pond furniture and sludge accumulated over years of operation; all requiring safe removal and disposal prior to controlled draining of the water with initial decontamination and sealing of the structure.

Delivery of this high hazard work was being addressed on a site by site basis. This approach was slow, costly and not the safest option with events being repeated across sites as opposed to lessons learnt at one site and transferred across the business with surety of implementation. Programmisation was seen as a solution to breaking down the silo mentality and achieving efficiencies in management, technical and safety aspects of major projects in the portfolio.

STANDARD APPROACH TO DECOMMISSIONING

The standard approach to decommissioning across Magnox South was to use site based project teams. In the case of the Bradwell ponds decommissioning project, the team had previously worked either in operations within the ponds complex or within projects.

This approach had benefits in that the people who knew the facilities best were able to apply their knowledge into the decommissioning of these facilities. Good progress has to date been made in decommissioning the ponds complex; the basic approach being to retrieve skips from the ponds, decontamination and disposal to the Low Level Waste Repository (LLWR). An innovative trans-frontier shipment route to the United States (US) for metal recycling was also being established as an alternative disposal method. The retrieval of sludge was planned post-skip retrieval and the ponds finally drained, sealed and scabbled using similar techniques to Trawsfynydd Site in Magnox North.

However, in the year from September 2007 to September 2008, there were a number of events on site. The issues associated with these events highlighted two key areas; the Quality of Investigation and Radiological Work Control.

In order to tackle these issues, Magnox South put in place an improvement board at Bradwell which implemented an internal reorganisation of the Control and Supervision capability, independent reviews, the introduction of new accredited Health Physicists and the procurement of new equipment.

Approaching decommissioning on a site by site basis capitalises on existing site knowledge but means that each site goes through the same learning curve individually as they develop the requisite decommissioning skills, without always capturing key lessons learnt from previous projects.

PROGRAMMISATION

In parallel with the reviews of events at Bradwell, the Project Delivery Organisation work-stream of Taking Magnox Forward (TMF) Business Unit Plan (BUP) had developed Programmisation as a solution to breaking down silos and achieving greater efficiencies.

Programmisation was an innovative and challenging move for Magnox South and comprised the injection of a high performing vertically integrated team made up from a cross section of staff from both an experienced decommissioning site and a Programme lead site that together had a wealth of knowledge and operational experience in radiological safety, waste management and decommissioning technologies. Bringing together these various skill sets and experts to work together, with one common goal enhanced and accelerated both learning and the delivery of high hazard work. The method had the potential to develop an integrated plan of how to deal with Magnox South and North as a whole, not just on a site by site basis.

The primary benefits associated with Programmisation focused around real **hands on cross-site learning**, avoiding reliance on traditional sharing methods (reports, peer groups, meetings etc), and offering real experience and knowledge from one site allowing rapid improvements in performance and increased learning in safety, project performance and culture in another. All of this had the potential to lead to greater efficiencies and more effective delivery across the Programme.

Ponds decommissioning was identified as a key area for Programmisation and Hinkley was identified as the experienced Ponds decommissioning site. A lead site scheme was designed to make full use of the learning that had already been gained at Hinkley over the last three years of Ponds decommissioning work which is recognised as “world class”, “best practise” and “leading the field” by regulators and independents in radiological decommissioning work. This scheme is intended to be the model for Taking Magnox Forward. A site was now required to be the lead for this initiative.

SITE SELECTION

Operational difficulties were encountered at Bradwell towards the end of 2007 with unplanned excursions of airborne contamination levels above control limits with little identification as to what should happen when the limits were exceeded. There were further similar events early in 2008 when the airborne contamination levels again exceeded control levels. Bradwell Site reviewed its approach to the work and instigated additional controls, however, there was a further event where workers received a small but unplanned dose and failed to take correct action upon receipt of alarms. Shortly after this event another unplanned excursion above airborne limits occurred. Magnox South put into place an improvement board at Bradwell which was to challenge the site to review its approach to decommissioning and to put in place a series of improvements aimed at preventing re-occurrence of the events. The root causes were identified as:-

- Poor working practices in contaminated areas
- Deviation from agreed methodologies
- Failure to identify risks and hazards
- Poor control and supervision
- Poor planning (including contingency planning)

The issues associated with these events highlighted two key areas; the Quality of Investigations and Radiological Work Control.

Both through a NDA review and a Magnox South internal review, it was recognised that Root Cause Analysis was not as robust as it should be. As a result Magnox South embarked on corrections through an Improvement Programme. This programme was designed to ensure:

- Golden Thread capture (capture of the links between key activities that led to an event)
- That senior management reviews are correctly targeted
- That actions developed are robust and appropriate and address the root causes

As a result, the independent inspection team has been centralised to allow cross site communication and learning and additional training has been delivered on Root Cause Analysis techniques to improve our understanding of events.

In order to tackle the issue of Work Control the Improvement Board implemented an internal reorganisation of the Control and Supervision capability, independent reviews, the introduction of new accredited Health Physicists and the procurement of new equipment.

In addition it was recognised that a number of the radiological events were characteristic of the type of events that had been experienced at Hinkley Point A in previous years, during the early establishment of their Ponds Decommissioning Programme. The team at Hinkley had quickly progressed through the learning curve to the point that they were successfully executing an aggressive decommissioning plan for the Ponds. They had built up a wealth of operational knowledge and experience in this area.

Bradwell were in the process of performing preparations to drain and seal the pond which represented one of the most significant hazard reduction activities for the Site and as such was a key project. The opportunity for **accelerated learning** (resulting in a reduced number of events) at Bradwell was clear and Programmisation was identified as a way of implementing further improvements and recovering the Ponds programme. As such the decision was made by the MxS Executive Team to select Bradwell as the lead site for Programmisation.

There were risks associated with the Programmisation approach:

- A Them and Us culture could form at Bradwell
- The Magnox South Ponds Team had little knowledge of the Bradwell Site
- Hinkley were losing key personnel for the duration

It was believed that these risks could be managed based on previous experience within Magnox South and would be greatly outweighed by the benefits.

The team from Hinkley site nominated to support Bradwell comprised a uniquely qualified set of individuals some of whom had previously been brought in to support Hinkley ponds decommissioning. These individuals had previously integrated with the existing Hinkley site personnel to enhance the capability of the Hinkley ponds decommissioning project. The Hinkley ponds team successfully developed with the support of these nominated personnel and the knowledge and experience of the individuals was disseminated and transferred to the original project group. The result was a high performing ponds decommissioning team that delivered year on year efficiencies and received wide ranging accolades. Consequently, the knowledge base at Hinkley had increased and the site could cope with releasing some of these key personnel to form the Magnox South Ponds Team and bring this experience to the Bradwell programme.

A further driver for Programmisation at Bradwell was that the schedule for the ponds draining and sealing required additional resources and this was an opportunity to **vertically integrate the Magnox South Ponds Team into the Bradwell organisation** instead of engaging the supply chain.

The key benefits of the Programmisation approach were:

- A consistent and common approach to delivery of the ponds projects
- Technological product knowledge and understanding of deployment best practices for Magnox ponds

- Reduced project risk and increased confidence in schedule with higher productivity
- Continued enhancement and adoption of radiological safety practices developed by the Magnox South Ponds Team
- Elimination of duplication of resources across different sites required to engineer and plan similar ponds work with consequent cost benefit
- Accelerated and enhanced learning and skill sharing opportunities
- Implementation of common skills and solutions
- Mobility of project team ensuring a coordinated, safe and efficient delivery across all sites
- Significant reduction in cost through elimination of duplicated solutions and increasing the speed at which a project moves through the learning curve
- A fully Suitably Qualified and Experienced Person (SQEP) Team with sharpened delivery focus

Based on this information the decision was made that using Bradwell as the lead site for Ponds Programmisation was the right way forward.

IMPLEMENTATION

Background

In January 2009 the Magnox South Ponds Team from Hinkley mobilised and were deployed at Bradwell following the due process of management of change and contract approvals. The Magnox South Ponds Team was led by the Ponds Decommissioning Director, (previously the Hinkley Site Director) who had been embedded in to the Bradwell organisation, reporting directly to the Site Director. The full Bradwell ponds decommissioning project consisted of resource from Hinkley, Bradwell and supplemented by a small number of personnel from Sizewell who were available through mobility.

The nine strong team from Hinkley covered a wide range of roles from the Project Director and Technology Lead through dedicated Accredited Health Physicists to a number of trained and experienced operatives. The first challenge faced was the integration of this vertically diverse team within the existing Bradwell structure. The Magnox South Ponds Team were able to quickly form a cohesive joint team that was able to build upon the existing plans and develop and refine proven methods through accelerated sharing and learning. The integration happened with very few issues and the 'One Team' ethos was quick to emerge. The success of this integration was attributed to strong leadership and sponsorship from the two site directors involved.

Planning and Work Control

Following a cross-site meeting to discuss the work planning and work control process it was decided to establish a small dedicated planning and work control team specifically for the Ponds project. The team developed an alternative decommissioning plan and approach, planning each individual work task down to a daily operational schedule (level 5) and methodically integrating areas of operations and maintenance that had previously operated in isolation. The new plan was driven hard but with the unrelenting message that safety was paramount and everyone remained focused on ensuring no corners were cut.

Work was executed in a very calm and controlled manner in the Ponds, led by experienced supervisors, who focused on delivering work tasks rather than on milestones. This engendered a safe work focus and culture throughout the team. Early progress was positive with core drilling of samples completed three weeks ahead of schedule and the successful removal, decontamination and storage of twelve skips and seven inserts completed in early February. These successes were communicated across the Bradwell site which gave the whole site a morale boost.

Communications

Clear communications helped to develop a strongly motivated and informative team. A weekly newsletter was produced focused around the 'One Team' concept (Bradwell and Hinkley One Team) and this:

- Was sent out to the whole site and kept everyone up to date within the project

- Was circulated to major stakeholders and regulators
- Reinforced good practises
- Provided Safety announcements for pre-job work briefs
- Played a significant part in the change process
- Developed the team culture
- Acted as a catalyst for 'success breeding success'

These newsletters were important to maintain momentum and to advertise the successes of the team to the wider community and they were positively received across the business.

Centre Bay Drain Down

The team built on the early successes and by the end of the financial year 2008/9 the team had recovered the programme against the baseline, achieving all major deliverables, including a Performance Based Indicator (PBI) milestone, which was a Departmental Strategic Objective (DSO) for UK Department of Energy and Climate Change (DECC), on time and with no radiological events.

The Centre Bay drain down milestone was achieved through extensive planning, communications and execution across the whole site at Bradwell and it signified the success of the 'One Team' approach which was an important accolade for everyone.

Imported Equipment and Innovation

A number of achievements have been realised through utilisation of not only operational knowledge and experience but also through the use of imported equipment developed in the Hinkley ponds such as:

- Concrete core drilling rig – The site engineer who had completed similar scope previously at Hinkley joined the team to re-commission the core drilling equipment in readiness to take characterisation samples from the pond. The drilling rig was modified by the team to make it suitable for the task at Bradwell but the drill which was designed and built at Hinkley has now been transferred over as a Bradwell asset
- Videoray – a compact underwater explorer that was bought 'off the shelf' at Hinkley. Operational experience of the equipment at Hinkley had been passed on through the integrated team and the Videoray had been deployed during many of the activities in the pond. Video that was taken during searches was analysed, giving the team a clear picture of the obstacles, debris and sludge within the pond
- Remotely Operated Vehicle (ROV) mini-digger – Hinkley originally adapted a mini-digger for use in the ponds. It proved to be an extremely cost efficient and effective tool there and became an exceptionally valuable tool for use in pond decommissioning. It was re-commissioned for use at Bradwell where it was initially used to remove debris from within the transfer tunnels
- WEDA (trade name) underwater cleaner technology – Trials of the WEDA equipment were successfully carried out and training was given to the Ponds team. The cleaner was deployed into the Centre Bay in readiness for underwater cleaning below the scum line prior to drain down. Cleaning the scum line using this method resulted in a significant reduction in contamination levels

Innovative thinking applied throughout the Ponds team allowed the project to realise the following benefits:

- Reduced the time required to reclassify a C3 to C2 area from 10 hours to 2 hours
- Increased ventilation dilution rate by a factor of 2
- Produced radiological control documents that were easier to understand
- Delivered As Low as Reasonably Practicable (ALARP) briefs that were better at highlighting additional information required for the job
- Improved radiological signage around the work area
- Improved pre-job planning with increased walk downs
- Increased use of radios for communications within the team

- Established a new egress point utilising ponds differential pressure and augmented by mobile extraction units to provide greater control when exiting from C3 conditions in a reduced background
- Established a temporary sub-change room in the solidification building
- Worked with the commercial team to introduce standard stock items use at Hinkley and Bradwell
- Use of Powered Air Purifying Respirator (PAPR) suits as per Hinkley procedures, allowing increased flexibility during operational activities through contingency planning etc.

This sharing of equipment and best practise again ensured knowledge transfer between sites, a consistent approach to decommissioning and cost savings within Magnox South.

Key Improvements

Key improvements realised on site have been:

- Increased control and supervision
- Accredited Health Physics from Hinkley now accredited at Bradwell
- Health Physics monitoring
 - Increased surveys to assess and react to area conditions
 - Improved work practises resulting in decreased dose uptake and airborne radioactivity levels
 - Improvement in Health Physics documentation issued since January

The Bradwell Ponds project was behind schedule, a key milestone was at risk and in the year from September 2007 to September 2008, there were four radiological work control events on site. Since implementing Programmisation in January 2009, the **integrated team** have recovered the schedule against the baseline achieving all major deliverables, including a PBI milestone, on time and with no radiological events.

This was a huge achievement for Bradwell and the 'One Team' and a turnaround of the Ponds project performance.

Lessons Learnt

Although highly successful Programmisation has not been without issues. Key areas that require further development going forward are:

- The cost estimate for the decommissioning of Bradwell ponds had increased from the Lifetime Plan (LTP). This is due to a better class of estimate being developed with hands on experience and knowledge applied to estimating the true costs associated with the scope of work
- Hinkley continue to deliver but the reduction in depth of the team may have had intangible consequences
- The Magnox South Ponds Team incurred travel and subsistence costs while working away from their base site

These key areas have been recognised and are being managed with lessons learnt taken forward through not just the Ponds Programme but other potential product streams also.

PARADIGM SHIFTING

Magnox South's response to the events and issues identified was robust and appropriate. It is important to note that throughout the period of these events no-one was injured, there was no significant internal or external dose uptake, there was no release of radioactive material and Magnox South's response was well received by the Regulators. The team at Bradwell moved through the learning curve and delivered high hazard work safely and to schedule.

The Programmisation approach has been recognised as an excellent example of how decommissioning benefits from several key factors:

- **Hands on experience** over raw knowledge alone
- Focused leadership and a **vertically integrated team** approach
- Questioning the status quo and not making assumptions

- Good planning for routine and exceptional conditions

In conclusion, Programmisation was highly successful at Bradwell and Magnox South has extended this learning across both Magnox South and Magnox North sites for Ponds Decommissioning. In addition, other similar teams have been created for Fuel Element Debris (FED) dissolution and Intermediate Level Waste (ILW) Mini-stores, with implementation plans under development for all three product streams.

The creation of focused teams and Programmes of work will achieve all the benefits seen at Bradwell for Ponds and other product streams across both Magnox South and Magnox North. A further update on progress will be provided at the presentation in March.