



# Nuclear South West

## Development Opportunities and Capabilities in the Supply Chain

Case Study Pack





Module installation at Berkeley.

PEOPLE  
WHO  
DELIVER

## CASE STUDY:

# Berkeley Vaults

## OVERVIEW

The Berkeley Active Waste Vaults (AWV) retrieval programme comprises a number of discrete projects for the design and installation of mechanical handling and processing equipment required to retrieve legacy Intermediate Level Waste (ILW) from three subterranean vaults.

Cavendish Nuclear was tasked to deliver plant and equipment capable of retrieving, processing and packaging the waste for safe interim storage.

The programme is scheduled for completion during early 2020.

## KEY INFORMATION

**Customer:** Magnox

**Site:** Berkeley Power Station

**Value:** ~£100 Million (to date)

**Duration:** 2011 - present

**Capabilities:** Programme & Project Management,  
Optioneering & Design Services  
Complete project lifecycle:  
Engineer, Procure,  
Construct, Commission (EPCC)



Off-site integrated works testing at Cavendish Nuclear Limited, Whetstone.

## OUR SOLUTION IN DETAIL

### Our Approach

Cavendish Nuclear adopted a modular build strategy, the key benefits of which were:

- Maximisation of off-site assembly and testing.
- Reduced durations for both the onsite construction phase and overall project duration.
- Reduction in costly onsite rework
- Technical risk mitigation, facilities had been demonstrated prior to installation.
- Greater programme predictability particularly on critical path construction and commissioning activities.
- Health & safety - reduction in radiological and working at height hazards.

The technical solutions were based on the use of proven commercially available equipment. Cavendish Nuclear then applied integration expertise to provide facilities that were appropriate for the required application and operating life.

Programme constraints dictated that module fabrication and equipment manufacture had to be completed in parallel, at multiple locations. Cavendish Nuclear utilised long standing relationships with approved suppliers to ensure delivery to budget, programme and quality.

Cavendish Nuclear carried out module assembly and integrated works testing at their Whetstone facilities near Leicester. This integrated works testing ensured that hardware and software was appropriately demonstrated prior to delivery to the Berkeley site.



In vault Brokk deployment during commissioning.

### Collaborative Working

Cavendish Nuclear has a long-term relationship with Magnox, which is built on the back of a successful project delivery record over many years.

Collaborative working is the cornerstone of the relationship, key aspects of this are:

- Co-location of Cavendish Nuclear and Magnox engineering personnel as a single project delivery team, which minimised rework and allowed the design review and approval processes to be expatiated.
- Use of the off-site module assembly and test programme as an opportunity to carry out early familiarisation and training of Magnox operations personnel.
- Implementation of an externally facilitated workshop programme to ensure that collaborative working behaviours were maintained in demanding project delivery environments.
- Active Commissioning was carried out under Magnox working arrangements and in compliance with the site license conditions;

safe and timely completion of these activities required Cavendish Nuclear and Magnox to function as a single team.

- To facilitate vital knowledge transfer, Cavendish Nuclear provided post-handover technical support, which included the embedment of commission and engineering personnel into the Magnox operations team.

### Key Learning

- The use of commercially available equipment provides simplified technical solutions that can be reliably and repeatedly operated.
- Affordability is dependent on equipment specifications being commensurate with their application and operating life.
- Off-site integrated testing provides highly effective mitigation of technical risk to critical path construction and commissioning activities.
- Modular build reduces the time spent on site and reduces cost and programme inefficiencies associated with working arrangements on a nuclear licensed site,

### Achievement and Awards

- The Cavendish Nuclear Berkeley R2 project team were awarded the Babcock International Group Team of the Year for 2015
- R3 Project Team - Winners of the Cavendish Nuclear Team of the Year 2019.

## PROJECT SUCCESS FACTORS



Progress from concept design to operations took a little over four years, supporting the programme for transfer of Berkeley site into long term care and maintenance.



The use of commercially available equipment provides Magnox with an affordable and fit-for-purpose technical solution, commensurate with its application and operating life.



The facilities provide Magnox with the capability to retrieve and process all waste types from all vaults - reliably and repeatedly.



### FOR MORE INFORMATION, CONTACT:

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## Major Projects carried out during the last 3 years with references highlighting Nuclear & other relevant experience.

### HPC Aggregates Jetty – Jetty Head Steelworks - Costain Limited

Due to Blackhill Engineering's heavy engineering capability and their 50 tonne lifting capacity, Blackhill were successful in securing a contract with Costain in 2016 to undertake a package of work linked to the New Infrastructure Jetty.

This work entailed the procurement and handling of over 650 tonnes of steel, which in turn was used to fabricate the 30 steel caps required for the piles supporting the top of the jetty, as well as the 48 steel bridge beams spanning the piles. Some of the bridge beams measured up to 14 metres in length.

The temporary jetty, which extends 500m into the Bristol Channel, had been designed to allow freight movement of cement, sand and aggregates away from local roads to more sustainable sea transportation. Some 80 per cent of the aggregates needed to build Hinkley Point C will be delivered to site via the jetty.

All works associated with the Aggregates Jetty were subject to nuclear level testing, traceability and documentation requirements (including full Lifetime Records) which Blackhill fully satisfied as part of the contract requirement.



Blackhill Engineering delivered the full scope of work under this contract on time and to budget, including successfully mitigating an initial delay of 3 months to work commencing, which resulted from a customer design change meaning the drawings not being available as previously planned. Based on our performance on this contract Blackhill were awarded "best Equipment Manufacturer 2017" and "Best Regional Supplier 2017" by EDF for the efforts in maintaining the schedule at Hinkley Point C.

Fabrication  
Site Installation  
Machining  
Mechanical Engineering  
Design Support Services

AMS Nuclear Engineering (AMS) is an engineering firm, based in Bridgwater, Somerset that have specialised in providing Control & Instrumentation systems, Environmental Sampling systems and Ageing & Obsolescence solutions to the nuclear industry for over 20 years.

Their Suitably Qualified & Experience Personnel (SQEP) have extensive plant and licenced site knowledge enabling them to provide their services across all parts of the nuclear industry including Generation, Decommissioning, New Build and Defence.

Case Study: MOISTURE MEASURING SYSTEMS Customer Organisation: EDF ENERGY Project value: ~£1.5m

#### Problem statement

Existing gas sampling and measurement systems, that had been in operation since station commissioning in 1976, had become obsolete and the systems had become too difficult to support and maintain. A new system was required that had to meet the new safety case requirements as well as the client's technical standards for C&I modifications and replacement.

#### Scope

AMS were tasked to design, substantiate, build, test, install and commission 8 moisture measuring systems. Against a new/revised safety case and updated reactor system operations AMS, in collaboration with the client, had to adopt innovative 'back to the drawing board' approaches to meet an evolving specification.

#### Outcomes

AMS' Nuclear SQEP resource successfully delivered a suit of moisture measuring systems on time and to budget. Key features of the solution included:

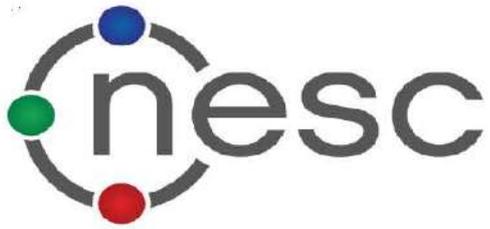
- Providing diverse measuring technologies within each system
- Improvements in sample gas path to enhance sample conditioning and system configuration.
- Removing the prescriptive nature of the current architecture thereby allowing installation of any type of analyser.
- Improvements in the system alarm philosophy to align with standard company practices.
- Full seismic qualification by design and shaker table test
- Full EMC qualification of the system taking an As Low as Reasonably Practicable (ALARP) approach.
- Modifications to the control logic to ensure that any single analyser going into an alarm state could initiate the alarm.



#### Feedback from the client

"We are very pleased with the progress on this project as it is looking to complete several months ahead of schedule. This is seen as a real success of a project"

<https://ams-nuclear.com/>



NESC are based in Plymouth, Devon. We are made up of a team of nuclear engineers with experience from both the civil and defence nuclear sectors.

The organisation was created to improve the provision of high-quality nuclear design and safety engineering services, in addition to filling the demand for well-respected Suitability Qualified and Experienced Personnel in the industry.

## Who Are We?

NESC is a reputable professional engineering support provider, specialising in high hazard and high consequence engineering and assurance. Principally focussed towards the defence and civil nuclear industries, NESC is a multi-disciplinary engineering consultancy, which thrives on tackling engineering challenges and finding cost-effective solutions to complex problems.

NESC are fully equipped to manage and undertake projects at our security certified offices, or equally happy to embed suitably qualified and experienced consultants into customer organisations, whether that be directly or through tiered provision. We pride ourselves in our flexible approach to supporting clients. All our operating practices are fully ISO9001 accredited.



## Safety Case Engineering

We have the highly skilled and technically experienced personnel capable of undertaking Safety Case work covering:

- the investigation and assessment of nuclear operations and associated hazards and risks
- Identifying improvement measures and delivering arguments and justifications
- Management of Emergency Arrangements
- Security considerations, including physical and cyber threats on industrial control and process systems
- We can, therefore, provide our clients with a complete safety case solution.



# Case Study: Magnox Hinkley Encapsulation & Disposal



Tradebe Inutec reduced the volume of waste for disposal by 20% through innovative technologies for sludge mixing, retrieval and cementation



## The Customer Challenge

A number of Magnox stations have Active Effluent Treatment Plant (AETP) sludges stored in a variety of tanks which require safe final treatment and disposal. These sludges have been expensive to manage, as they have had poor final volume utilisation of less than 40% within LLWR disposal ISOs. This often meant that these wastes were more likely to be kept at site, where they used up valuable storage space.

## The Tradebe Inutec Solution

20 Intermediate Bulk Containers (IBCs) containing 11m<sup>3</sup> of settled sludge from the HPA site were transported to Tradebe Inutec's facilities, where the sludge was remobilised, retrieved and cemented cement to minimise the volume of waste for disposal. Innovative, industry-leading mixing, retrieval and direct pouring techniques were used by Tradebe Inutec's experienced personnel within its Winfrith Nuclear Licensed Site to complete the project.

## Value to Customers

By applying innovative mixing, retrieval and direct pouring techniques, Tradebe Inutec was able to help Hinkley Point A realise a significant increase in volume utilisation to more than 60% leading to a more cost-effective solution that was also better aligned to LLWR's waste minimisation objectives.

#makingcomplexwastesimple



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# Case Study: Magnox Oldbury Sludge Processing



Tradebe Inutec helped Magnox's Oldbury Power Station to reduce project schedule and save disposal costs through an innovative sludge encapsulation project



## The Customer Challenge

A large tank at Oldbury containing historic AETP sludge needed to be removed, treated and disposed of so that operations could continue. The two main challenges were first to mix the sludge in the tank so that it could be reliably sampled and analysed to confirm its suitability for disposal as LLW and to develop a robust treatment formulation and second to encapsulate the mixed sludge retrieved from the tank to minimise the volume of waste for disposal.

## The Tradebe Inutec Solution

Tradebe Inutec's innovative solution included working closely with the Oldbury project team to use a new mobile plant to deal with the sludge at Oldbury as well as using pioneering air-driven technology to homogenise the waste in the tank without adding to the volume of the waste. Once removed, Tradebe Inutec developed a bespoke process to encapsulate the sludge into a cement treatment formulation that met LLWR requirements for disposal and used its proprietary direct-pour technique to make full use of the capacity of the ISO container.

## Value to Customers

Tradebe Inutec's team worked hand-in-hand with Oldbury's project team, providing a safe and flexible solution. Our unique approach meant that Oldbury needed to dispose of fewer ISO containers of waste to the LLWR. When combined with a 7-week reduction in processing time that helped shorten the overall project duration by four months, there was a saving of £800,000 for the UK taxpayer.

#makingcomplexwastesimple



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## CASE STUDY

# Winfrith Decommissioning



Over the last two decades, NUVIA has supported the Winfrith site with numerous decommissioning, hazard reduction and clean-up activities and projects. Based on this heritage, NUVIA's unparalleled experience and know-how for sensitive site decommissioning and waste treatment now span across 15 countries with a workforce of more than 3000 nuclear specialists.

From experience gained on projects at the Winfrith site, and internationally across the world, Nuvia can provide the overall management of decommissioning programmes, including new build requirements, from the development of safe and cost-effective strategies to final clearance. The strategies are developed into detailed methodologies, safety documents and schedules that include the following:

NUVIA's experience gained on the Winfrith site include support on the following projects.

**The operation, decommissioning and demolition of the Active Handling and Decontamination Building A59.**

The A59 Active Handling Building was an NII Category 1 facility. The facility contained two large, heavily shielded cave lines constructed from reinforced concrete, a decontamination centre, and a pressurised suit area together with a range of supporting workshops and laboratories.

**Maintenance and decommissioning work at other facilities on the Winfrith Site including:**

- SGHWR Reactor
- ZEBRA Reactor
- DRAGON Reactor

Nuvia carried out Stage 1 decommissioning of the Steam Generating Heavy Water Reactor, SGHWR, essentially the removal and packaging of all significant plant outside of the reactor.

**DRAGON Reactor Shield Door**

DRAGON was a research reactor constructed in the 1950s and shut down in 1975. Some decommissioning had previously been undertaken, but the next phase of decommissioning involved remote decommissioning of the reactor core itself for safe disposal.

NUVIA is designing, manufacturing, installing and commissioning specialist plant and equipment to deploy, carry out and support core segmentation and waste processing operations.

# CRYOGENIC COOLING

CONCEPT • DESIGN • MANUFACTURE • TEST • INSTALL • AFTER SALES

## Liquid nitrogen Cooling System for Tokamak fusion reactor

### Design Challenge

GRE were privileged to win a contract to provide a cooling / temperature control system for an experimental fusion reactor. The requirement was to provide thermal control to a total of TWENTY-SIX separate channels, all independently of one another. Furthermore, the requirement was to bring the system down slowly – at approximately 1K every ten minutes – from ambient temperature to liquid nitrogen temperature (-196°C).

The system must operate as a “black box”, entirely independently of any external control system.

### Solution

GRE designed, manufactured, tested, installed, and commissioned a complete system to deliver temperature control as specified.

Primarily the system will:

- Bringing in liquid nitrogen from a cooling source (storage tank)
- Produce warm gaseous nitrogen from the cold liquid by boiling
- Mix the liquid with the gas in a measured way, in order to produce the smooth ramp down required
- Distribute the gas/liquid nitrogen mix to the experimental fusion reactor
- Stabilise the entire reactor (> 8,000kg, mostly copper) at liquid nitrogen temperature
- Re-establish temperature control and bring back to liquid nitrogen temperature after an experimental energy release has been performed



LEADERS IN THERMAL ENGINEERING

# Decommissioning and New Connections



Steve Vick International offer solutions to the problems associated with decommissioning and sealing disused pipework, ducts, sleeves and ventilation shafts. Our technology can also be designed for the mass filling of large and complex voids and is a lightweight alternative to cement grout.

## Decommissioning of pipes, ducts or chambers

- ◆ Our bespoke hot-tapping systems allow for a fully contained insertion of our FOAMBAG™, effectively capping & decommissioning the pipe before it's cut
- ◆ The SVI FOAMBAG™ is excellent at encapsulating loose debris or contamination within the pipe
- ◆ Our products can be introduced from a remote location allowing application in contaminated or hard to reach places



Canadian Nuclear Laboratories carrying out a pipe sealing operation on an active pipe using a bespoke FOAMBAG™ kit designed specifically for their project



Foam cap-end installation at Harwell BEPO storage block

- ◆ Our techniques are able to seal off vertical, horizontal and tapered pipes with diameters up to and even above 1000mm
- ◆ Annular spaces between pipes and cables and their host pipe can be filled with our formulated closed cell expanding foams
- ◆ Our systems have been developed for use in underwater environments
- ◆ Suitable for all pipe materials including steel, asbestos, concrete and plastic
- ◆ Our techniques have radically reduced exposure times and costs during glovebox removal
- ◆ Our highly experienced technicians have carried out projects in the UK and Internationally. Alternatively, a range of our products are available in kit form for customers to perform their own sealing operations



Harwell BEPO storage block on completion of SVI foam filling operation with 250 bespoke FOAMBAG™



A foam filled chemical drain at Chapelcross



A new connection being made under live conditions using our under pressure system

## New connections

- ◆ Using our bespoke under pressure systems we can provide a method for making new connections to existing pipeline networks whilst under live conditions

## CCTV Surveys

- ◆ Through our pressurised hot-tapping system, we are able to carry out CCTV inspections under live conditions & from remote locations
- ◆ Our surveys can assess pipe conditions, allow for remediation and for removal of a pipe wall sample for metallurgical testing

Further information on case studies, nuclear products and our nuclear brochure can be found on our website

Over 30 Years Experience | International Coverage | Bespoke Project Design

For technical specifications please contact Richard Ditte:

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