Nuclear decommissioning and clean-up
Supporting customers across the entire nuclear lifecycle

connected excellence in all we do
The challenge of delivering the next generation of nuclear power stations, coupled with the need to extend the lifetime of the existing fleet while safely decommissioning the legacy, is one Amec Foster Wheeler understands well.

Our mission is to help our customers meet this challenge by creating long-term partnerships with them to design and implement innovative, cost-effective, fit-for-purpose solutions.

We have more than 3,300 nuclear specialists - some of the most renowned world experts in the industry - who support customers around the world by providing solutions to complex problems. Furthermore, as part of a global business, we can access the resources and skills of over 40,000 engineering, consultancy and project management experts worldwide.

Our people outperform the competition. We bring world-leading expertise, technology and scientific capability, combined with local knowledge and cultural awareness. No matter where you are in the lifecycle, we can help you with the challenges you face.

In this brochure, you can read about our decommissioning and clean-up expertise.
Safety and quality assurance

In everything we do, safety is always our foremost priority and our overriding objective.

No matter where we work or what we’re doing, we never compromise on the safety of our people, our partners or anyone affected by our projects.

Our relentless commitment to safety is encapsulated in our ‘Beyond Zero’ strategy for achieving sustainable, world-class health and safety performance. What’s more, our breadth of expertise across the entire nuclear lifecycle enables us to holistically manage nuclear safety and wider health, safety, security and environmental (HSSE) issues at every level.

Beyond Zero

The essence of our ‘Beyond Zero’ philosophy is the ceaseless pursuit of excellence. This commitment to continuous improvement is reflected in our company values down through our HSSE policy and management systems.

Our HSSE performance is a critical factor of our success. We do not regard a project as successful unless it is delivered safely. We never stop working to refine and strengthen our safety management approach to ensure it continues to meet the demands of a continually evolving industry.

Quality assurance

With our network of experienced assurance professionals and world-class integrated management system, our approach to quality assurance helps to ensure projects are consistently delivered on time, in full and free from errors.

We are committed to ensuring that our products and services conform to the expectations, needs and requirements of our customers. We are approved to international standards of quality, including: ISO 9001; ISO 14001; and OHSAS 18001.

In particular, we operate Lifetime Quality Assurance (QA) Programmes, which ensure quality policies are regularly reviewed, and we integrate quality, HSSE, project delivery and governance into a coherent approach that ensures projects are delivered to our customers’ requirements.

Working towards our Beyond Zero philosophy in the ceaseless pursuit of excellence
Decommissioning and clean-up
Our world-leading decommissioning and clean-up expertise

We can support our customers through every aspect of the decommissioning and clean-up process, from front-end design to site restoration and everything in between.

Decommissioning
The design and delivery of complete decommissioning and clean-up solutions, including R&D, design, manufacture, testing, installation of equipment and technology for an array of decommissioning operations including retrieval, size reduction, decontamination, remote handling and treatment of radioactive waste.

Waste management
We offer a comprehensive range of services, from waste characterisation, waste minimisation and processing through to transportation and safe final disposal. Our expertise includes radiological monitoring and the segregation of contaminated material, design and use of remotely-operated equipment, the design and implementation of proven and innovative decontamination processes, and the repackaging and disposing of historical waste.

Site restoration and environmental remediation
We offer consultancy and analysis on environmental management, including land remediation. Where on-site analysis is unsuitable, we can provide analysis in our in-house laboratories.

Multi-sector experience
- 50 years’ decommissioning experience in Europe and North America
- Nuclear site management and governance
- Programme management
- Decommissioning strategies and costs

Strategic decommissioning partner
- Large provider of services to UK and Canadian civil nuclear sites
- Engineering and technical support for existing UK reactor fleet
- Major design / build capability across nuclear safety projects
- UK’s largest private sector radiochemical analysis laboratories
- Major multi-year integrated support frameworks
- Consultancy support to Nuclear Decommissioning Authority (NDA) and in-country regulators
- Environmental remediation and restoration (UK / US government)
- World-class science and research
- Decommissioning Sellafield, the most complex nuclear site in the world
- Find out more about our global experience in the following case studies.

We combine our safety case management, environmental and radiological consultancy, and health physics support with our core engineering capabilities.

These include our strong safety and quality culture, testing and trialling facilities, and radiological laboratories. Through doing this, we can deliver all the skills and services necessary for any decommissioning project.

We can ensure radiological and conventional safety, while minimising the environmental impact. We manage the whole project lifecycle from the characterisation and conceptualisation of solutions, through to the active decontamination and decommissioning of facilities, paving the way for site regeneration. Furthermore, our services can be provided holistically or tailored to meet specific customer requirements.

Trawsfynydd – decommissioning site

Customer: Magnox
Location: Trawsfynydd, North Wales, UK
Scope: Design, construction, commissioning and operating facilities to retrieve and package intermediate level waste; decontaminating associated facilities.

The Trawsfynydd decommissioning site - the first UK nuclear site to be designated a ‘Demonstration Project’ by the Constructing Excellence Organisation - is due to begin its major care and maintenance phase by approximately 2016. This will involve the removal, as far as possible, of all plant, buildings and equipment from the former nuclear power station.

Amec Foster Wheeler is an integral partner in the ACTUS joint venture (Amec Foster Wheeler, Jacobs Engineering Group Inc, Costain and Babcock) undertaking these works in collaboration with Magnox. ACTUS has full accountability for the strategic planning and project delivery, and provides a comprehensive service, including: project management; project engineering; multidisciplinary design; construction management; safety and risk management; and project controls.

Benefits:
- Proactive supply chain engagement and management allowed accelerated; competitive procurement and site source justification, improving the project schedule
- Alignment of approvals, for design and operations, contributed to a collaborative team culture, which led to significant savings
- Fostered supply chain innovation with remote handling equipment to reduce the project’s cost, improve delivery and enhance safety
- Efficiencies in pond lane decontamination techniques and reduction in waste volume saved over £500,000
- Knowledge and experience of four companies ensured best practice, proven methodologies were used. This contributed to the saving of five years against the transition of the site to interim care and maintenance, resulting in savings against the lifetime plan.

Benefits:
- Proactive supply chain engagement and management allowed accelerated; competitive procurement and site source justification, improving the project schedule
- Alignment of approvals, for design and operations, contributed to a collaborative team culture, which led to significant savings
- Fostered supply chain innovation with remote handling equipment to reduce the project’s cost, improve delivery and enhance safety
- Efficiencies in pond lane decontamination techniques and reduction in waste volume saved over £500,000
- Knowledge and experience of four companies ensured best practice, proven methodologies were used. This contributed to the saving of five years against the transition of the site to interim care and maintenance, resulting in savings against the lifetime plan.
Clean-up and waste management
Cleaning up the nuclear legacy

Nuclear fuel manufacturing facility – decommissioning and land remediation

Customer: Key customer
Location: Connecticut, USA
Scope: Fuel fabrication facility – decommissioning.

Amec Foster Wheeler carried out a major programme of building decommissioning and land remediation, including decontamination and dismantling (D&D), leading to the release of the site from the US Nuclear Regulatory Commission (NRC) licence conditions and eventual redevelopment of the facility.

Amec Foster Wheeler, as the prime contractor, was responsible for the planning and performance of the D&D and remediation work at the 600-acre facility that included more than 13,000 sq. metres of buildings, including the packaging of waste for transport and disposal. Amec Foster Wheeler carried out the final status surveys to demonstrate that land and buildings are suitable for unrestricted release from the site US NRC licence.

Radiological contaminants of concern at the site included high enriched uranium (HEU), low enriched uranium (LEU), Th-232, Ra-226, and Co-60. Chemical contaminants that were regulated by the US Environmental Protection Agency (USEPA) and Connecticut Department of Energy and Environmental Protection included mercury, PCBs, asbestos, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), zinc and lead. The site’s NRC licence was terminated in 2013 with no restrictions allowing the client to redevelop or sell the site.

Benefits:
- Amec Foster Wheeler met monthly client safety goals via the implementation of a safety incentive programme for employees and subcontractors
- A collaborative approach to develop mutual project goals led to completion of the project on time and on budget
- Use of innovative decontamination methods to reduce waste volumes led to significant cost savings
- Amec Foster Wheeler and the client worked together to establish a relationship, based on trust, with local stakeholders and regulators that led to an amicable relationship between all parties, including the public

Managing complex decommissioning
Safe, secure, clean and economic solutions to complex decommissioning problems

Chernobyl – Project Management Unit

Customer: Specialised State Enterprise, Chernobyl Nuclear Power Plant
Location: Chernobyl, Ukraine
Scope: Consultancy and project management services for the implementation of a liquid waste treatment facility and an interim spent fuel store.

As sole operator of the Project Management Unit (PMU) Amec Foster Wheeler’s role was to establish a liquid waste treatment plant and a facility for the interim storage of spent fuel for units 1, 2 and 3 at Chernobyl.

Amec Foster Wheeler managed the design and construction of the Liquid Radwaste Treatment Plant and the design, licensing and future construction and commissioning of the new dry fuel storage facility (SIF2). With a design life of 100 years, it comprises a spent fuel processing facility with provision for handling the radioactive wastes arising from the process and a series of storage modules and spent fuel storage casks.

Benefits:
- Introduced best practice contractor supervision and contract management, enabling our client to effectively evaluate key project management metrics within a large engineering procurement construction (EPC) project improving the management and control of the EPC contractor
- Trained client resources and local personnel in QA and project management tools and techniques introducing a project quality management system, which is now operated on site, significantly improving client project management capability
- Strengthened the client’s health and safety capability through:
  - The introduction and operation of a robust HSE policy
  - The development of processes and surveillance regimes to deliver HSE policy requirements
  - An integrated approach to site safety by working proactively with our delivery partners and the customer
Innovation
A track record of delivering innovative solutions in response to the industry’s most complex technical challenges

Our innovative solutions are applied across the full lifecycle, from sampling radioactive waste on site, radiochemical characterisation in our laboratories, and equipment and process trials, right through to developing bespoke, fit-for-purpose design solutions.

We take the time to truly understand our customers’ complex issues and drive innovation in our solutions to best meet their needs.

**SIAL® – Immobilisation and solidification of radioactive waste streams**
Amec Foster Wheeler developed an innovative geopolymers SIAL® matrix for the immobilisation and solidification of different radioactive waste streams, including borates. The SIAL® process allows fast, safe and cost-effective immobilisation and transformation of radioactive waste, such as sludge, resins and soils into a solid form, which is suitable for long-term storage or disposal.

This tried and tested technology (approximately 170 tonnes of waste immobilised) is applied by a mobile facility. It enables the easy retrieval of spent resins and sludge to treat them at room temperature within a 30 – 60-minute timeframe.

The parameters of the final product, waste fixed in the SIAL® matrix, are in most cases better than treatment to cementation or bituminisation.

This technology is characterised by excellent mechanical and physical properties, very high mechanical strength and low leachability of the immobilised components.

**Benefits:**
- Minimisation of radioactive waste volume - through the solidification of sludge and dewatered resins in the SIAL® matrix, the production of drums is only one quarter of the number reached compared to a cement matrix, saving storage capacity in repository
- Mobility, which allows in-situ operations and in-situ waste treatment
- Low leachability of the immobilised components.
- And physical properties, very high mechanical strength and
- This technology is characterised by excellent mechanical
- We provide the technology as a full turnkey service with hardware and software, in addition to engineers and technicians to set up and operate the systems

**ScanSort and ScanPlot – Radiation detection and measurement technology**
Amec Foster Wheeler provides rapid and accurate radioactive soil sorting, surveying and monitoring services using advanced radiation detection and measurement technology that is unique to Amec Foster Wheeler.

ScanSort is a conveyor-based system that surveys, monitors and sorts material by segregating scanned material into above-criteria and below-criteria discharge piles.

ScanPlot is a mobile system that performs surface and shallow-depth radiological examination and characterisation of up to 20 acres of open land per day. It provides instant output in a customisable GIS report format and delivers spatially precise maps with plotted locations of detected radioactivity, including concentrations of each radioactive isotope detected and measured.

**Benefits:**
- ScanSort and ScanPlot are available as either part of our overall environmental characterisation and remediation services for radioactive material, or as stand-alone services
- We provide the technology as a full turnkey service with hardware and software, in addition to engineers and technicians to set up and operate the systems

Challenges and solutions
Developing solutions to some of the nuclear industry’s most complex challenges is second nature

The combination of our long industry experience, our world-class technical knowledge and innovative, pragmatic ethos means we can find solutions where others only see problems.

We have the unique capability not only to develop conceptual pragmatic innovations, but to fully develop and prove these solutions through our purpose-built testing and trialling facilities, as well as our extensive radiological laboratories.

**Czech Republic – Closure of a radioactive waste disposal chamber**

**Customer:** Radioactive Waste Repository Agency
**Location:** Czech Republic
**Scope:** Re-treatment and characterisation of radioactive waste at a waste repository.

This exemplar project involved the re-treatment and characterisation of radioactive waste disposed at the Richard Waste Repository, a former limestone mine used to store radioactive waste since 1964. Amec Foster Wheeler processed contaminated material, which posed a risk to the surrounding environment.

Amec Foster Wheeler developed an inventory of the radioactive waste stored in the repository’s drums, undertook drum inspection and dose rate measurements, and in some cases gamma spectrometric analyses.

To control the volume of radioactive waste, compactable drums were compressed and non-compactable drums were repackaged. All the processed waste was subsequently transferred to a disposal chamber and immobilised in concrete.

**Benefits:**
- Successfully operating radioactive waste repository, with reprocessed and safely stored radioactive waste
- All relevant safety requirements met
- Updated information and database of historical waste stored in waste repository

**Transfynnydd – pond scabbling and furniture removal**

**Customer:** Magnox Ltd
**Location:** Transfynnydd Ponds Building, North Wales, UK
**Scope:** Design and implementation of a remediation solution for contaminated ponds.

This project involved decontaminating the surface of the former spent nuclear fuel cooling pond by removing the surface of the concrete structures through ‘scabbling’.

Scabbling was deployed remotely and removed up to a depth of 40mm of the contaminated concrete surface.

The waste was vacuum extracted from the scabbling head into hoppers and disposed of via approved waste transportation routes.

The project also involved the de-planting and size reduction of pond furniture remaining from active operations.

**Benefits:**
- Innovative deployment of equipment via shield decks delivered savings in cost and time, and substantially reduced the volume of low-level waste generated by the project
- Operational improvements led to a 25% reduction in scabbling time
- Innovations with equipment design increased productivity with the scabbling process
Our facilities comprise more than 5,000m² of radioactive handling facilities, gloveboxes, irradiation facilities and more than 50 individual laboratories and test rig halls. In the UK, we have the largest UKAS-accredited commercial radiochemistry laboratory.

Our facilities are supported by more than 700 employees; the majority are PhD or degree qualified, delivering a wide range of technical services across the full scope of the nuclear industry.

Services include:
- Chemistry and corrosion
- Mechanical testing
- Remote inspection and operations
- Inspection and validation
- Radiochemical and chemical analysis
- Waste technology and management
- Structural integrity, materials and engineering simulation
- Reactor physics and nuclear facility licensing/regulatory support
- Radiological and environmental assessments
- Criticality, shielding and human factors

www.amecfw.com/technology-innovation

Technology and Innovation
Exceptional facilities developing solutions for tomorrow’s problems
Services and experience across the entire nuclear lifecycle
New build and operational, right through to decommissioning and waste management

Our services
New build:
- Strategic support to our customers across the nuclear new build lifecycle.
  - Expert knowledge of nuclear regulatory framework in UK, US and Canada, as well as the IAEA regulatory framework
  - Programme management
  - Licensing and regulatory support
  - Engineering and safety

Reactor operational support:
- World-leading expertise to safely support nuclear generation through the entire asset lifecycle and operational challenges.
  - Working knowledge of, and experience with, all reactor technologies
  - World-class facilities to support plant lifetime extension
  - Programme and project management
  - Innovative, analytical approaches to life extension
  - Managing and maintaining plant and equipment to drive strong performance improvement
  - Outage support
  - World expertise in seismology, hydrology, risk assessment, plant safety and engineering

Decommissioning and clean-up:
- Long history of working on complex nuclear decommissioning sites and offer innovative ideas and solutions.
  - Waste management
  - Decommissioning
  - Remote operations
  - Radioactive waste processing and disposal
  - Site restoration and environmental remediation

Our experience
Multi-sector experience:
- 60 years’ experience leading the way in the nuclear industry
- Nuclear site management and governance
- Programme management
- Decommissioning strategies and costs

Major provider of services to the nuclear industry:
- Engineering and technical support for existing UK reactor fleet
- Major design and build capability and nuclear safety projects
- UK’s largest private sector radiochemical analysis laboratories
- Major multi-year integrated support frameworks
- Consultancy support to NDA and in-country regulators
- International experience with over 3,300 nuclear specialists around the world, supporting customers with local expertise while drawing on international experience
- Environmental remediation and restoration (UK / US government)

Management of complex waste streams -
Technical expertise and advice for waste produced:
- During decommissioning (conventional / nuclear)
- At the end of the cycle (deep storage, graphite storage)

Development of technical solutions and costs:
- Site investigation, radiological monitoring, waste characterisation
- Decontamination services (eg primary circuit, fuel pool)
- Waste retrieval, processing, conditioning (eg sludge)
- Regulatory and licensing support
- Geological disposal facility advice
Amec Foster Wheeler is a people business. We recognise that investment in our people is an investment in our future and in the future of the nuclear industry.

That’s why we have established the Amec Foster Wheeler Academy, to support the development of high level, leading-edge skills for our people, and for the benefit of our customers and partners.

What is the Amec Foster Wheeler Academy?
The Amec Foster Wheeler Academy brings together all the training and development programmes we currently offer across our business and delivers them via a consistent, integrated and accessible approach.

Our goal is to provide all our people with a clear, transparent picture of their individual career framework. We then support them in determining the development required to improve their skills and continue to meet evolving customer requirements as they progress through the business.

Elements of the Amec Foster Wheeler Academy
It is the Academy’s role to make sure that everyone has the opportunity to develop and reach their professional goal, while ensuring we have consistent knowledge embedded across the whole organisation. This helps to achieve our business aims and deliver the highest quality services to our customers, be that in management and leadership skills, project management, engineering and technical, supply chain management or business support functions.

Supporting our customers through the Academy
The Amec Foster Wheeler Academy also helps to support our customers directly, partnering with them to provide the knowledge they need to deliver and operate successful, sustainable nuclear projects.
World skills on your doorstep
A global business with local knowledge

- 3,000 nuclear specialists working at the forefront of the industry
- 36,000 employees operating in over 55 countries
- Deep understanding of the issues facing the industry now and in the future
- Ability to leverage cross-industry experience that brings unique insights and expertise
- Specialist expertise across the nuclear lifecycle that can offer innovative solutions to your challenges
- World-leading experience and capability available on your doorstep
- International decommissioning experience on complex sites
- Innovative approaches to industry challenges
- Independence from any one reactor technology and significant experience and knowledge of all current technologies
Contact us:

Darren Dudley
Director
+44 (0)776 481 0844
darren.dudley@amecfw.com

Nick Higginson
Key Account Director
+44 (0)781 296 1885
nick.higginson@amecfw.com