THE NUCLEAR INDUSTRY IN THE MIDLANDS

A major economic growth opportunity

MIDLANDS ENGINE

Midlands Nuclear

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Contents

Purpose

This report is the result of an extensive roundtable discussion involving more than 40 leaders from industry, academia and government involved in the UK Nuclear sector. It aims to characterise the industry in the Midlands from an investment perspective: highlighting the region's key strengths, opportunities, and challenges, and builds upon the robust analysis of business and academic activity in **this report.**

By presenting this comprehensive analysis, the white paper seeks to support policymakers, businesses, and local growth entities in promoting the Midlands as a world-class hub for nuclear energy development and attracting prospective investors. A list of the organisations involved in this exercise can be found in the **Appendix**.

Executive summary

The Midlands and South Yorkshire are poised to become the heart of the UK's nuclear future, driving the next generation of nuclear power technologies.

This region is positioned to lead the development and manufacture of next-generation nuclear energy technologies, including fusion, small modular reactors (SMRs), advanced modular reactors (AMRs), and nuclear propulsion systems for space and submarines. With a 17% sector growth rate (sales) compared to the UK's 8% (2021-23) and nearly half a billion pounds of forecasted nuclear industry 'sales' in 2028/29, the Midlands is at the forefront of nuclear energy innovation and expansion.

The Midlands is home to 27% of the UK's nuclear and nuclear-related businesses, including major primes, offering a unique combination of advanced manufacturing, innovation and testing assets, and a 'nuclear culture' workforce.

The Midlands is set to host the future of nuclear, with the UK's only fusion prototype being developed in Nottinghamshire, and multiple siting opportunities for SMR and AMR generation, as well as one of the only viable geological disposal site proposals in the country. Nuclear power technology is developed, tested and built in the Midlands, and soon it will be generated here too.

Investment opportunities include:

- Nuclear manufacturing & component supply chains
- Fusion and fission energy generation
- Development, testing & validation of nuclear technologies
- Skills and training programmes
- Market certainty and export potential
- Geological disposal facilities and fuel recycling

However, in order to realise the full economic growth potential of these opportunities there are the following strategic asks of government and local stakeholders:

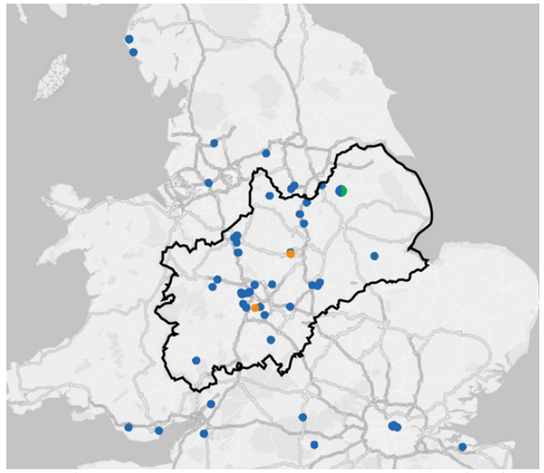
- Comprehensive map of the Midlands' civil nuclear capabilities
- Commitment to nuclear in the Industrial Strategy
- Support for nuclear manufacturing sites
- Develop nuclear generation sites
- Support for the fusion energy sector
- Support for export certification
- Shifting public perceptions of nuclear energy
- Support for Geological Disposal Facility Siting

The Midlands' nuclear cluster

Business & investment

The region's nuclear base is characterised by major manufacturing and advisory businesses including Rolls Royce (SMRs and submarine reactors), Cavendish Nuclear, and Ansaldo Nuclear – all of which contribute to the region's prominent standing within the global nuclear supply chain. These are under-pinned by a cluster of Fit4Nuclear SMEs manufacturing high integrity, advanced, high-value components.

These businesses with core capabilities such as machining, welding and forging, (as well as system controls for reactors) are established in the Midlands and South Yorkshire in companies with a 'nuclear culture', such as Nuclear Energy Components in Derbyshire and Capula in Staffordshire.



A map of Midlands Nuclear Company's business locations (blue), key nuclear R&D assets (orange) and STEP Fusion (green), with the Midlands Engine area highlighted. These businesses are predominantly advanced manufacturers.

Such businesses produce components to the standards required for nuclear applications and have done so for years with lifetime quality records, and are capable of innovative design and build, as well as other businesses focussing on make to print processes.

There are wider business capabilities that support the industry in the region. These include Laing O'Rourke's concrete production for nuclear site use and Lucideon's development of new coatings relating to advanced fuels, based in Stoke.

A summary of the region's nuclear capabilities

- **Nuclear safety engineering services**, regulatory compliance, reactor management, fail-to-safety engineering.
- **Nuclear power plant operations management**, engineering and PR.
- **Nuclear reactors:** manufacture, installation and maintenance.
- **Nuclear cooling equipment:** manufacture, installation and maintenance.
- **Construction of plant and equipment**: site development, reactor and buildings and power plant/ equipment construction.
- **Commissioning engineering services:** cooling & thermal control, engineering maintenance, instrumentation, power distribution, reactor & plant commissioning.
- **Sampling & testing services:** thermal control testing, remote monitoring, back-up plant monitoring and effluent discharge testing.
- **Nuclear scientific services:** research, laboratory testing and fuel management

The wider manufacturing business base in the Midlands already has many of the capabilities needed by a growing nuclear industry, and through initiatives like Fit4Nuclear can become supply-chain ready. Looking at three core capability areas there are:

938
advanced process control & automation businesses in the Midlands (23% of the UK total) in the Midlands, of which 582 headquartered in the region.

1,246
welding businesses in the Midlands (32% of the UK total), of which 829 are headquartered in the region.

481
forging businesses in the Midlands (31% of the UK total), of which 321 are headquartered in the region.

The growing Midlands Nuclear initiative acts as a cluster organisation – a single entity bringing together the region's nuclear supply chain, developers, generators, researchers and skills providers.

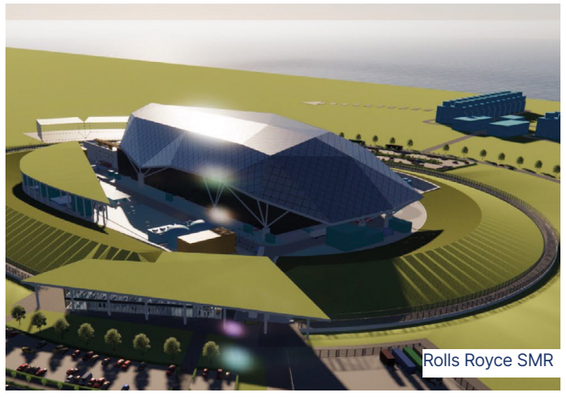
Midlands Nuclear primarily focuses on making the case for more investment into Nuclear (fission and fusion) and associated industries in the Midlands, particularly on the skills required and siting opportunities.

With a 17% sector growth rate (sales) compared to the UK's 8% (2021-23) the Midlands' nuclear industry is expecting continued growth, with £453.5m of nuclear related sales forecast in 2028/29. Growth in productivity when last measured (2019/20) was 13% for businesses in the Midlands, based on gross value add.

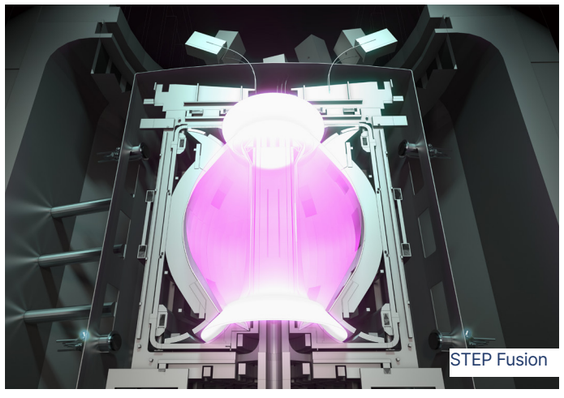
Although the focus of this report is on nuclear energy capabilities, the Midlands hosts significant capabilities in medical applications of radioactivity – with the University of Birmingham itself a producer of radioactive isotopes for medical purposes such as imaging and treatment.

Further clusters of medical nuclear applications include:

- University Hospitals Birmingham Nuclear Medicine Department, providing a range of nuclear medicine diagnostic and therapies and development of new cancer treatments using Boron Neutron Capture Therapy
- Nottingham University Hospitals Trust's Nuclear Medicine Department, which also hosts the British Nuclear Medicine Society.



Rolls Royce SMR



STEP Fusion

Talent & Innovation

The January 2024 Nuclear skills report highlights the need for 30,000 to 40,000 jobs required across the UK supply chain in delivering the 16GW of planned nuclear capacity. In 2022 the Nuclear Industry Association identified an existing civil nuclear workforce of 64,509, of whom 3,967 were based in the East Midlands and 980 in the West Midlands. The more recent ERA report (Jan 2023) identified at least 5,474 jobs in nuclear businesses with confirmed recruitment plans exceed 2,000 and thousands more jobs planned through STEP.

Although there is some concern around general engineering capability, the demand for nuclear roles is evident, with one major company in the region noting 4,500 applications for 200 apprenticeship positions. This bodes well given the anticipated talent demand pipeline for at least 60 years across major projects such as STEP, GDF, AUKUS, and possible further SMR, AMR and fusion sites in the Midlands.

The timeline for the next generation of major nuclear construction, particularly STEP and possible SMR locations, aligns with the conclusion of other major projects such as High Speed 2 rail. This presents a further opportunity for job (welding, civil engineering etc) movement from the south west of the Midlands towards the East Midlands.

Rolls Royce Nuclear Skills Academy at the University of Derby

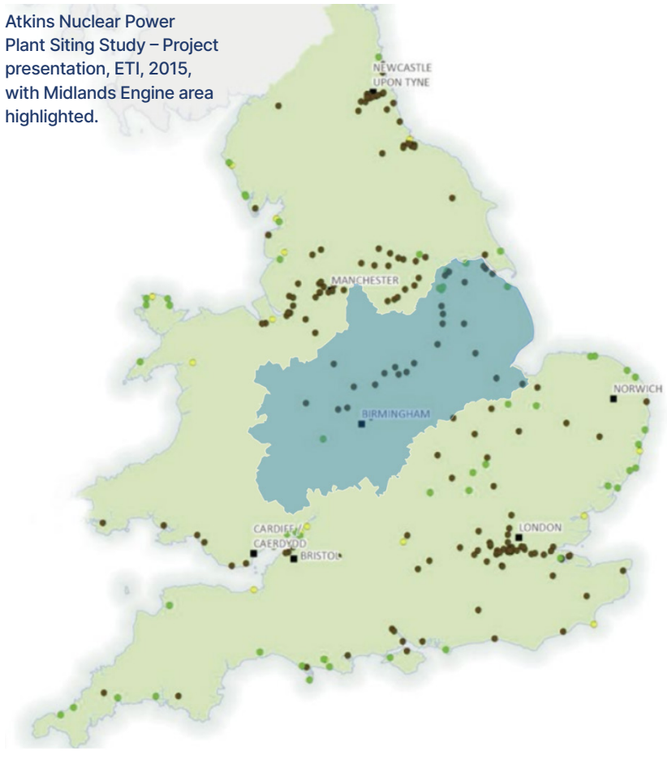
Investment opportunities in the Midlands nuclear sector

The following have been identified by industry and academia as key growth areas and opportunities for investors, both existing Midlands businesses and those seeking to grow from elsewhere.

Nuclear manufacturing & component supply chains

Investing in companies that produce critical components for nuclear reactors, including SMR and AMR (Rolls Royce SMR based in Derby), space propulsion systems and submarine reactors. The Midlands' established nuclear supply chain offers both domestic and international growth opportunities, especially for new supply chain entrants in small space reactor and fusion fields.

For primes and higher tier manufacturers, the Midlands and South Yorkshire already host dozens of Fit4Nuclear certified and wider supply chain manufacturing businesses with lifetime quality records and established 'nuclear culture'.



Atkins Nuclear Power Plant Siting Study – Project presentation, ETI, 2015, with Midlands Engine area highlighted.

Fusion and fission energy generation

As the UK progresses towards meeting its 2050 energy goals, there will be significant demand for new nuclear generation sites. The Midlands is home to the UK's first fusion production site in STEP Fusion in Nottinghamshire, as well as potential sites for SMR and AMRs – particularly along the River Trent 'megawatt valley', where a series of former coal-fired power station sites with existing grid connections are primed for redevelopment. This opportunity extends to fuel fabrication facilities, particularly those required for nuclear fusion.

Development, testing & validation of nuclear technologies

There are significant nuclear innovation hubs in Birmingham, Derbyshire, and Leicester – with £2.3bn invested in nuclear R&D in the Midlands in 2019-20 alone, and an extensive history of academic and industry collaboration.

For instance, The University of Birmingham's Centre for Nuclear Education and Research has hosted undergraduate and postgraduate nuclear degree programmes and a unique nuclear fission and fusion testing facility in the High Flux Accelerator-Driven Neutron Facility.

The University of Derby is collaborating with Rolls Royce on a skills programme, with the nearby Infinity Park Derby, neighbouring Rolls Royce, having hosted part of the Nuclear Advanced Manufacturing Research Centre.

Other key manufacturing and development assets in the region include the Manufacturing Technology Centre, Warwick Manufacturing Group, and Lincoln's Bridge Advanced Materials and Engineering Centre. The University of Leicester and National Nuclear Laboratory are collaborating in Space Park Leicester around nuclear power systems for space – with a spinout company Perpetual Atomics launched in 2024.

There are opportunities to work with these facilities to develop and test new technologies, with support provided through the Invest in UK University R&D Midlands campaign.

Skills and training programmes

With major existing initiatives such as the University of Birmingham's nuclear degrees, Destination Nuclear and Rolls Royce and University of Derby Skill's Academy, the Midlands has an established portfolio of training offers. These are already developing the future nuclear workforce through collaboration with universities, research institutions and industry partners.

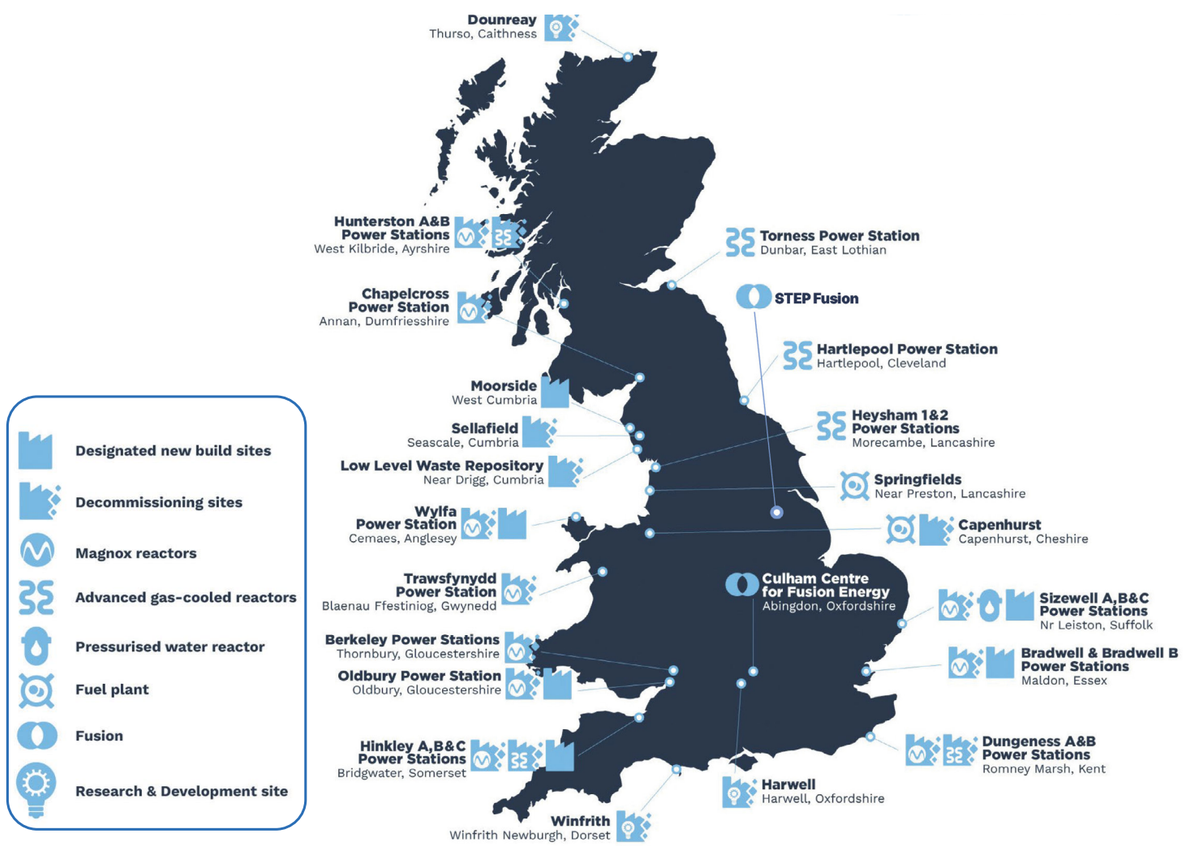
Market certainty and export potential

With a robust local supply chain, future certainty through major projects up to 2060, the Midlands is ideally placed to host businesses seeking a stable market. The Midlands also offers two Freeports with unique customs regulations and significant export opportunities, particularly to the North American and European markets. The Rolls Royce SMR programme is believed to be a £250bn export opportunity alone.

The Midlands' nuclear businesses produce high-end, advanced components with a focus on integrity and reliability, competing with cheaper production capabilities elsewhere in the world.

Geological disposal facilities & fuel recycling

The region hosts one of the few viable Geological Disposal Facility proposals at Theddlethorpe in Lincolnshire, close to multiple proposed generation sites, providing opportunities in nuclear waste management. This opportunity is enhanced by proximity to the British Geological Survey in Nottinghamshire. With nuclear generation expected from the 2040s onwards there is a further opportunity for localised fuel recycling.



Map of UK Nuclear sites and future sites, including STEP Fusion. Updated from UK civil nuclear facilities, Nuclear Industry Association, 2023.

Investor support

The Invest in UK University Research & Development campaign, promoting the collective capabilities of 17 universities in the region, profiles the Nuclear R&D facilities and expertise.

This unique concierge service can connect businesses and funds looking to partner with researchers to commission research, development products and technology, commercialise IP, and to co-locate business activities in this thriving ecosystem.

There are many Investment Promotion Agencies and local initiatives such as Investment Zones and Freeports who can support prospective investors and businesses in navigating the Midlands and finding the right location to grow their business. A breakdown of these services is provided here.

Strategic asks

With confirmed major projects such as STEP fusion and AUKUS, and others like Rolls Royce's SMR programme on the near horizon, the nuclear industry in the Midlands has a bright future. However, to support the sector in fully realising the economic potential of such significant opportunities, there is more that government (both national and local) and other stakeholders can do, and achieve through the Midlands Nuclear initiative:

1. Comprehensive map of the Midlands' civil nuclear capabilities

Several businesses have called for a register of assets and business capabilities across the region relevant to nuclear. Such a tool can not only facilitate better supply chain engagement (and competitiveness) domestically, but act as a compelling soft-landing tool for international investors.

This should include a full talent pipeline map, featuring apprenticeship and bespoke training initiatives through to existing staffing skills and future needs. The talent pipeline should be compiled for the Midlands and South Yorkshire, focusing on specific skill areas from general engineering (such as welding, machining, and systems management) to advanced fusion and fission expertise. There is a national need for more general engineering capability, but especially in the Midlands to fulfil future workforce demands.

2. Commitment to nuclear in the Industrial Strategy

The scale, longevity and value of the projects that drive the nuclear industry (from large power plant construction to international propulsion agreements), as well as its importance to national energy security, make the nuclear industry in the Midlands vital to the UK. The Industrial Strategy should recognise this significance and commit to supporting the sector long term.

3. Support for nuclear manufacturing sites

There is the potential for a number of nuclear manufacturing facilities to be sited in the region, building on the Midlands' strong manufacturing base. These include facilities such as pressurised vessel production and heavy engineering, and nuclear welding and manufacturing expertise. One example of this is the heavy vessel manufacturing facility for SMRs being considered by Rolls-Royce.

Although neither site made the final selection, two sites in Lincolnshire (Associated British Ports site in Grimsby and Pioneer Park in Stallingborough), were among eight sites originally shortlisted for the SMR manufacturing facility, highlighting regional manufacturing opportunities emerging from the scale-up of nuclear in the UK.

Long-term future siting decisions should be expedited to provide certainty to supply chains and allow sufficient planning to avoid further lag and unproductive periods that can lead to workforce attrition.

4. Develop nuclear generation sites

The Midlands has no current nuclear generation sites. Whilst the first phase of new nuclear is focused on re-purposing older nuclear sites, there are opportunities for new sites to be put forward in the future. The Midlands could therefore place itself at the forefront of the development and siting of advanced reactors such as SMRs and AMRs.

Sites could include former fossil fuel power stations or other brownfield sites, for which there are multiple options in the Midlands, depending on grid connectivity and water availability. SMRs and AMRs have a potential wider role too – supporting heat, hydrogen and jet fuel production.

They also have the advantage that they could be linked to energy storage and are compact in size. Updating the existing National Policy Statement (EN-6) to provide more flexible siting options and supporting locally-led development can unlock the opportunity to accelerate the development of SMRs and AMRs in the UK.

5. Support for the fusion energy sector

The new STEP fusion power plant at West Burton, Nottinghamshire, provides a significant opportunity for the Midlands-based fusion sector and associated supply chains. There is a significant R&D programme needed to support fusion development, particularly in areas such as energy generation, tritium management and materials development.

6. Support for export certification

Support for bringing international certification mechanisms to the UK, co-locating with industry to enhance local business ability to export high-quality nuclear components to global markets.

7. Shifting public perceptions of nuclear energy

Despite exceptional safety and regulation, nuclear energy can be a controversial topic. With much of the major growth driven by significant siting projects (power plants, factories, disposal facilities), communities need to be informed of the realities of nuclear energy, the safety and the risks. This could be achieved through information campaigns and community engagement, and in turn would support further recruitment and underpin public support for the industry.

8. Support for geological disposal facility siting

Benefitting from the ask in #6 above, work with communities such as Theddlethorpe in Lincolnshire to provide information, where required, about any future application. Draw in academic and technical expertise from the region to help inform discussions. Examine the skills, community, and infrastructure needs and employment opportunities. Link to the wider network or activities in nuclear in the Midlands.

Conclusion

The Midlands is uniquely positioned to lead the UK's nuclear energy future, with a thriving nuclear manufacturing base, world-class research institutions, and a highly skilled workforce.

By supporting the key policy asks outlined in this white paper, working with Midlands Nuclear, government and industry stakeholders can ensure that the Midlands remains a global leader in nuclear innovation, contributing to the UK's energy security and economic growth.

Through investment in nuclear technologies, infrastructure, and skills development, the Midlands has the potential to become a global hub for nuclear energy, driving forward the UK's clean energy ambitions and creating high-quality jobs for decades to come.

Case Studies

Rolls Royce Small Modular Reactors

The Rolls Royce SMR is a factory-built nuclear power plat solution that can be constructed and made operational at a consistent and predictable rate, something conventional nuclear design has struggled with. The SMRs are capable of providing electricity to the national grid and off-grid demand.

With 90% of the plant factory-fabricated, SMR sites can be modular constructions, enabling easier delivery of parts by road and rail, reducing costs, lead times and risks that come with major construction projects.

The model is entirely scalable, with potential for exports exceeding £250bn. In fact, there are already memorandums of understanding in place with Estonia, Turkey and Czechia market partners. Once the SMR programme is fully operational, Rolls-Royce SMR is expecting to create 40,000 regional UK jobs by 2050 and generate £52bn in regional economic benefits. **Read more**

STEP Fusion

The UK Industrial Fusion Solutions' Spherical Tokamak for Energy Production (STEP) programme prototype fusion power plant will be constructed in the Midlands, being built on the former coal-fired power station site at West Burton in Nottinghamshire. With an entire research and development and supply chain hub set to develop around the site, STEP is targeting full operability in the 2040s. The STEP prototype will be more compact than other fusion energy machines, which could lower costs and will potentially reduce the plant's physical footprint. The plans will pave the way for commercially viable fusion. **Read more**

Nuclear Skills Academy

The University of Derby and Rolls Royce's Nuclear Skills Academy is ensuring a pipeline of early career nuclear talent, supporting 200 apprentices each year for at least the next ten years. Demand is high – with thousands of applicants. Building on Rolls Royce's 60 years of submarine nuclear expertise, the training covers disciplines including design and manufacture to finance and supply chain, accredited by the University of Derby's National College of Nuclear, and with further support from the Nuclear Advanced Manufacturing Research Centre. **Read more**

Ansaldo Nuclear

World class engineering and manufacturing capability allows the delivery of tailored solutions to the Civil and Defence Nuclear sectors including New Build, Fusion and Decommissioning. Ansaldo cover the full life cycle from project management, initial research, design, procurement, fabrication, installation, commissioning to through life support and decommissioning. Ansaldo started its involvement with the original tranche of Magnox reactors and has accumulated 70 years of experience to date. **Read more**

Cavendish Nuclear

From decommissioning redundant nuclear facilities, through supporting the Continuous at Sea Deterrent, to supporting the operation and build of nuclear power plants, Cavendish Nuclear offers a suite of services to oversee installation, commissioning, operation, and decommissioning of nuclear power plants. **Read more**

Capula

Capula have a range of control system products, including advanced technical systems such as automation control, panel builds, cyber security and digitalisation. Capula has more than 50 years of Nuclear industry experience, providing full lifecycle support over civil and defence customers. **Read more**

Nuclear energy components

With more than 70 years of civil nuclear experience and an ingrained safety culture, NEC manufacturers components and supports assembly for civil and defence nuclear machinery. Core capabilities include welding, advanced tooling and milling, design for manufacturer and produce development at secure sites. **Read more**

High Flux Accelerator-Driven Neutron Facility

The first of its kind in the UK, this University of Birmingham facility enables researchers to study the properties of materials used in nuclear energy production, supporting the development of the UK's next-generation nuclear energy generators.

Part of the National Nuclear User Facility, the machine also provides research and training opportunities – from understanding how neutrons interact with matter, to better understanding the nuclear fusion reactions that take place in stars.

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Further research opportunities include:

- Gaining a better understanding of the nuclear processes associated with both fusion and fission
- Understanding the long term effects of radiation on material used to store nuclear waste
- Designing the targets required for next generation neutron scattering facilities or subcritical nuclear reactors
- Exploring the use of neutrons in medical therapies such as boron neutron capture therapy, used in selective treatment of cancer cells.

Read more

Appendix

This discussion builds upon engagement with the following organisations:

Nuclear Businesses
- Ansaldo Nuclear Energy
- Assystem Energy & Infrastructure Limited
- Bourne Nuclear
- Brown and Holmes
- Capula
- EDF UK
- LucidCatalyst Limited
- Lucideon
- Moltex Energy Limited
- Newcleo
- Nuclear Energy Components
- Oxford Sigma Limited
- Rolls Royce
- NSAN

Industry Bodies
- Energy Research Accelerator
- Midlands Net Zero Hub
- Midlands Nuclear
- Nuclear Decommissioning Authority
- Nuclear Institute Midlands Branch

Consultants & Data Providers
- Arup
- The Data City
- Beauhurst
- CBI Economics
- Cogent Skills
- Equilibrion
- Inner Circle Consulting
- Midlands Engine Observatory
- Wavteq

Universities
- Midlands Innovation
- Cranfield University
- Loughborough University
- University of Birmingham
- University of Derby
- University of Lincoln
- University of Nottingham

Growth Entities & Government
- Engineering and Physical Sciences Research Council
- Bassetlaw District Council
- East Midlands Combined County Authority
- Innovate UK
- Lincolnshire County Council
- Marketing Derby
- West Midlands Combined Authority
- West Midlands Growth Company