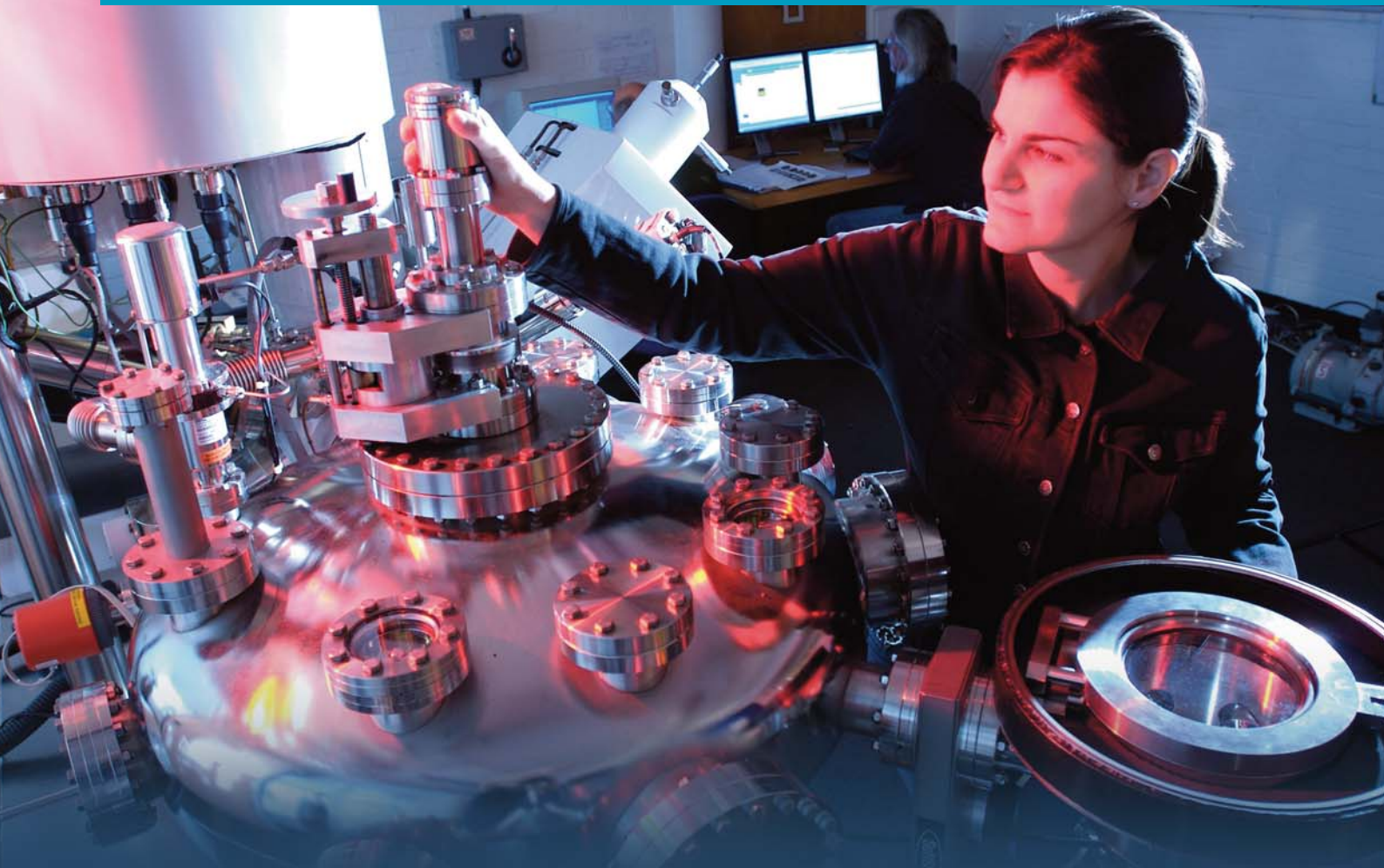




The Nuclear Industry &
England's Northwest
Delivering a Low
Carbon Britain



England's Northwest - Nuclear Expertise

England's Northwest is home to one of the world's largest concentrations of nuclear facilities with a renowned skills base and world class expertise in nuclear technology research & development. The region contains half of the UK's 45,000 highly skilled nuclear workers, several major nuclear sites supported by well established supply chains and the UK's main centres for nuclear research.

Government energy policy identifies that nuclear power will play a key role in the future energy mix. With all elements of the nuclear fuel cycle in the region, Northwest companies will be playing a pivotal role in the design, construction and operation of new nuclear power plants, and in providing the fuel cycle operations and technology required to sustain the nuclear programme for many decades to come.

This is also an exciting time for overseas investors wishing to capitalise on nuclear new build opportunities. With experience of working with clients in a wide variety of industries and countries, the Northwest Regional Development Agency is ideally placed to facilitate and catalyse new business in the region.

The region has a proud history of nuclear science and engineering. Over 200 years ago John Dalton presented his atomic theory to the Manchester Literary and Philosophical Society and in 1907 Ernest Rutherford was appointed professor of physics at Manchester University and carried out pioneering research into the nature of alpha particles.

The Northwest of England has been at the heart of the UK's nuclear programme for over 60 years and is home to the world's first commercial scale nuclear power plant at Calder Hall in Cumbria. The UK is one of only a few countries to close the nuclear fuel cycle and the Northwest contains the UK's whole fuel cycle capability; uranium conversion, uranium enrichment, fuel manufacture, two operational nuclear power stations, spent fuel reprocessing, and waste management and decommissioning.

With world class facilities and capabilities, the Northwest's nuclear sector is playing the key role in the £70 billion decommissioning programme of the UK's civil nuclear sites and the Sellafield site, in Cumbria, represents one of the world's most challenging decommissioning programmes. Many of the organisations that have developed expertise in the UK's decommissioning programme will also be applying their knowledge to decommissioning and new build programmes on an international level.

In addition to its outstanding industrial, academic and research capability the Liverpool based Nuclear Directorate of the Health and Safety Executive is the UK regulator responsible for authorising the design and operation of new nuclear reactors and licensing the UK's nuclear facilities.

UK Energy Policy

New Nuclear Power Stations

Nuclear power has been a low-carbon part of the UK's energy mix for over 50 years and currently provides around 18% of our electricity.

UK energy policy addresses the twin challenges of climate change and security of energy supply and, in 2008, Government decided that new nuclear has a role to play in the UK's future energy mix, on the basis that nuclear power is:

- Low-carbon
- Affordable
- Dependable
- Safe
- Capable of increasing diversity of energy supply.

This decision was published in the nuclear white paper 2008: 'meeting the energy challenge' which set out the Government's view that:

- Nuclear should be part of the UK's low-carbon energy mix
- Companies should have the option of building new nuclear power stations
- The Government should take steps towards this.

The aim is to have new nuclear power stations generating electricity from around 2018.

Decommissioning

The Nuclear Decommissioning Authority (NDA), headquartered in West Cumbria, is responsible for the safe and efficient decommissioning of the publicly owned civil nuclear liabilities. Annual expenditure to deliver on-site programmes is around £2.5 billion, with two thirds of this targeted at sites in the Northwest. Sellafield accounts for around 60% of NDA's annual budget and represents one of the world's most technically challenging decommissioning programmes.

Decommissioning strategy is aimed at bringing in world class expertise to clean up sites in the most efficient way and in 2008 the NDA completed a complex public procurement programme when the shares in Sellafield Ltd transferred to Nuclear Management Partners Ltd (NMP), a private sector consortium consisting of URS Washington, AMEC and AREVA NC. NMP Ltd will own the shares in Sellafield Ltd for up to 17 years with the value of the work covered over this period around £22bn.

Waste Management

UK Government published a White Paper in 2008, setting out the framework for the long term management of higher-activity radioactive waste.

Geological disposal is internationally recognised as the preferred approach for the long-term management of higher activity radioactive waste and it was concluded that this approach, coupled with safe and secure interim storage, is the best UK option.

Construction and operation of a geological disposal facility will be a multi-billion pound, high technology project that will provide skilled employment for hundreds of people over many decades. The Government has invited communities to express an interest in beginning discussions on the possibility of hosting a geological disposal facility in the future and, in response, three communities in Cumbria have expressed an interest.

Global Nuclear Renaissance:

There are currently around 440 commercial nuclear reactors operating in 30 countries and, between them, they supply 15% of the world's electricity. It is widely accepted that an expansion of nuclear power capacity is required to meet increasing demand for safe, clean and economically competitive electricity.

Over 40 new reactors are currently under construction in 11 countries and in all over 100 new reactors are planned and a further 250 proposed. As the first European country to plan construction of a fleet of new nuclear power stations the UK is an important market in the global new build programme.

The global civil nuclear market is worth £30 billion annually, with a forecast increase to £50 billion by 2023.

Low Carbon Britain:

The UK Low Carbon Industrial Strategy (LCIS), launched July 2009, has the core objective of ensuring British businesses are equipped to maximise the economic opportunities and minimise the costs of transition to a low carbon economy. The National Policy Statement for nuclear, due 2010, will set out the need for early new nuclear power to decarbonise our economy. To further develop low carbon economic activity across the country we will establish Low Carbon Economic Areas (LCEAs) to capitalise on distinct regional strengths. As a leading and well established low-carbon technology nuclear power is a priority sector for establishing a LCEA. England's Northwest, at the heart of the UK nuclear programme for over 60 years, is the natural base from which to stimulate and develop UK economic activity for the sector and act as gateway to UK's market and capability.

Nuclear Supply Chain

The UK new build programme will lead to around 15GW of new nuclear generating capacity being commissioned by 2025, involving construction of around 10 – 12 reactors. The cost of this programme is expected to be in excess of £30 billion and a recent study carried out by the Nuclear Industry Association (NIA), the trade association for the civil nuclear industry, concluded that, with suitable investment, UK businesses could supply up to 80% of a new power station. Competitive businesses would also have the opportunity to compete overseas in a very significant and expanding market.

Northwest businesses will undoubtedly play a key role in delivering new nuclear build internationally with the region incorporating a well established supply chain, ranging from major international companies to SMEs, which has been supporting full fuel cycle operations for many decades. The region also incorporates outstanding capability in linked sectors such as manufacturing and engineering. Four of the eleven sites nominated for new build in the UK are in the region.

The Nuclear Industry Association is leading a programme of national nuclear supply chain activities and events under the banner SC@nuclear. NWDA retain membership on the steering group and the events, supported by relevant Regional Development Agencies, are taking place at various locations around the country with the aim of raising

awareness of the opportunities that exist in the nuclear sector and strengthening and promoting the capability of the UK supply chain.

In July 2009 Government announced plans to establish a Nuclear Advanced Manufacturing Centre (NAMRC). The facility, to be located in the North of England, will combine the expertise of manufacturing companies and universities to allow suppliers to work together developing processes for the manufacture of nuclear components and assemblies, delivering training and workforce development programmes and achieving nuclear standards and accreditation.

Also in July 2009 Rolls-Royce announced plans to build a new factory in the North of England that will manufacture, assemble and test components for new civil nuclear power stations. These include pressure vessels, heat exchangers and other large and complex reactor parts, manufactured to exacting nuclear standards.

BAE Systems Submarine Solutions in Barrow maintains UK's capability to design, construct and commission nuclear submarines. The company's outstanding capability in the modular construction techniques applied to the submarines, together with ongoing experience in installing and commissioning nuclear reactors, represents an opportunity for diversification into the civil nuclear sector which the company continues to explore.

Westinghouse UK Ltd

Westinghouse UK Ltd, part of Westinghouse Electric Company, is a Preston-based organisation pursuing commercial nuclear power business throughout the UK and is one of only two companies to progress their reactor, the AP1000, through the design approval process enabling it to be built and operated in the UK.

Westinghouse also manages the Springfields fuels plant on behalf of the NDA. The company and the NDA are finalising arrangements for Westinghouse to lease the site for an extended period and permanently transfer ownership of Springfields Fuels Ltd, the site licence company.

The arrangement will cement Westinghouse's position at the heart of the UK nuclear industry and may facilitate considerable investment in the site bringing long term security to current employees and, potentially, new jobs.

Westinghouse is a long standing supporter of nuclear skills development in the UK acting as Chair of the Board of Directors to the National Skills Academy for Nuclear and Chairing the academy's Regional Sub-group for the NW/NE of England.



Nuclear Capability in England's Northwest

- 1** The National Skills Academy for Nuclear is headquartered in West Cumbria.
www.nuclear.nsacademy.co.uk

- 2** Energus - a new £21 million world class centre for the provision of vocational skills excellence, spanning both further and higher education, for the nuclear industry.
www.energus.co.uk

- 3** Sellafield is the largest and most complex nuclear site in the UK, with around 12,000 employees on site. Operations on the site include spent fuel reprocessing, fuel manufacture, decommissioning of redundant facilities and the management of nuclear waste. The Sellafield complex also incorporates the Windscale and Calder Hall sites, which are currently being decommissioned, and the Central Laboratory, headquarters of the National Nuclear Laboratory.
www.sellafieldsites.com

- 4** The Nuclear Decommissioning Authority is headquartered at the Westlakes Science & Technology Park near Whitehaven. www.nda.gov.uk

- 5** The Central Laboratory at Sellafield is the flagship nuclear Research & Development facility in the UK and is managed by the National Nuclear Laboratory.
www.nnl.co.uk

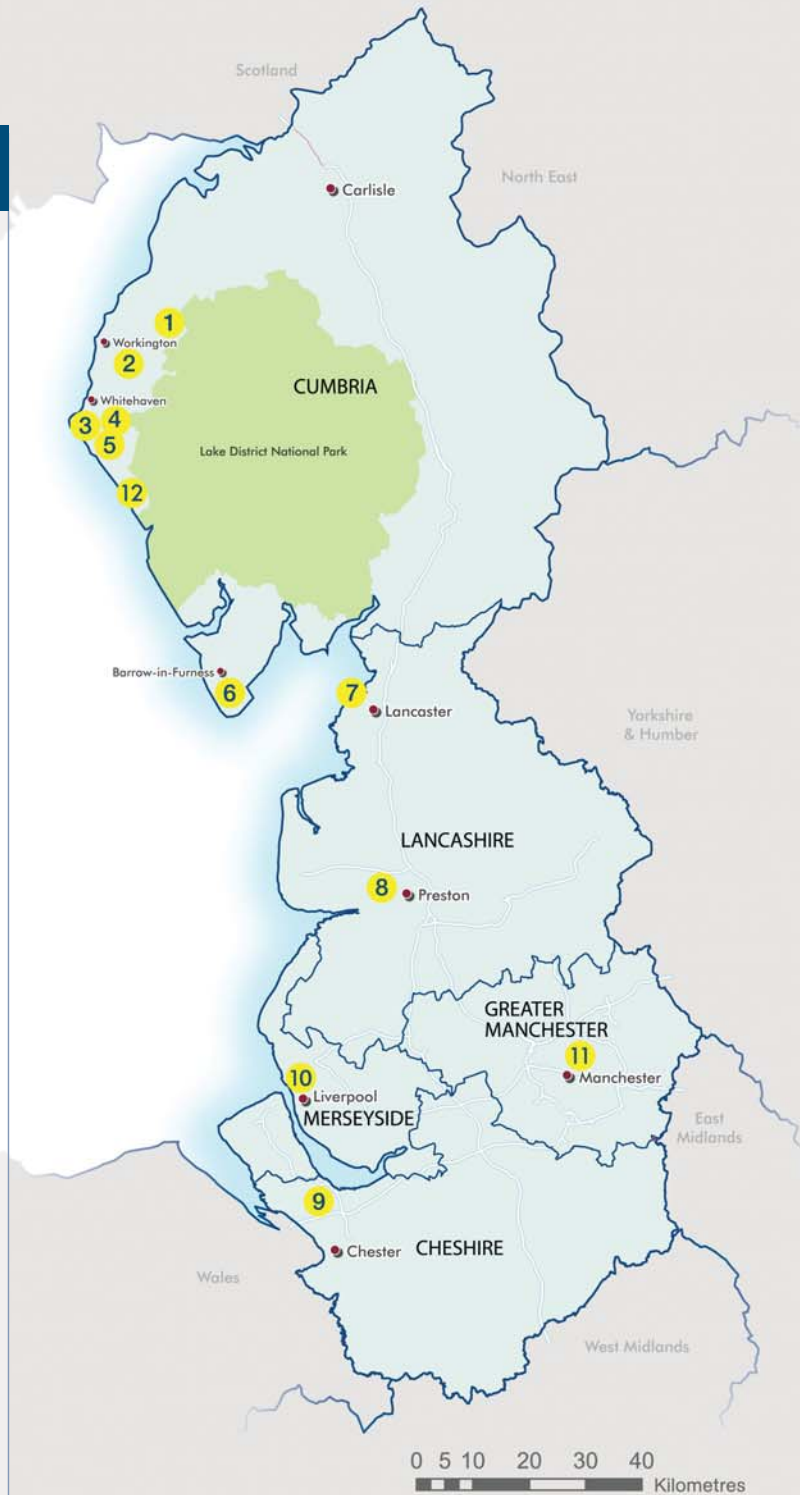
- 6** BAE Systems Submarine Solutions at Barrow employs 5000 and retains the UK capability to design, construct and commission nuclear submarines.
www.baesystems.com

- 7** The British Energy site at Heysham, comprising Heysham 1 & 2, is the UK's largest nuclear generation site with a total capacity of 2.4GW.
www.british-energy.com

- 8** Springfields Fuels Ltd employs 1400 people and manufactures nuclear fuel, intermediate uranium products and uranium hexafluoride.
www.nuclearsites.co.uk

- 9** Urenco UK Ltd's site at Capenhurst employs around 350 people and is a leading global provider of enriched uranium and associated technologies.
www.urenco.com

- 10** The Nuclear Directorate of the Health and Safety Executive in Liverpool is responsible for licensing all of the UK's nuclear facilities and for authorising reactor designs for deployment in the UK.
www.hse.gov.uk/nuclear



- 11** University of Manchester's Dalton Nuclear Institute
 The Dalton Nuclear Institute is recognised as one of the world leading centres of nuclear research and education and the Centre for Nuclear Energy Technology is a reactor technology centre that brings together a number of capabilities required to support academic and industrial interests in nuclear reactor systems.
www.dalton.manchester.ac.uk

- 12** The Low Level Waste Repository has operated as a national LLW disposal facility since 1959. Wastes are compacted and placed in containers before being transferred to the facility and all LLW is disposed of in engineered concrete vaults.



Skills

The National Skills Academy for Nuclear

The Government is committed to raising the skills base of the UK's nuclear workforce to meet forthcoming challenges in decommissioning and new build. The National Skills Academy for Nuclear (NSAN) is the leading body for an employer led strategy to develop a standardised and coordinated approach to education, training and skills in the nuclear sector. NWDA were instrumental in the formation of NSAN and, from its Head Office in West Cumbria, the Skills Academy operates via a regional network of training clusters to identify, develop and accredit local high quality provision, creating "centres of excellence" for the delivery of nuclear specialised training, enhanced where appropriate to respond to specific skill gaps as identified by nuclear employers.

Working closely with industry the Academy will focus on vocational and technical skills development and training, with clearly defined links to Higher Education and Higher Level skills development.

Energus is the Northwest flagship centre for the Academy and was launched in June 2009 by Ed Miliband MP, Secretary of State for Energy and Climate Change, at an event attended by over 200 nuclear employers, training providers and key stakeholders. The facility, in West Cumbria, is a world class centre for the provision of vocational skills excellence, spanning both further and higher education for the nuclear industry.

Energus provides Quality Assured training for 250 apprentices and a range of industry programmes featured on the Nuclear Skills Passport. It also works with the **University of Cumbria** to deliver programmes to 200 undergraduates and postgraduates.

Higher Education

British universities have been teaching in the field of nuclear science and engineering for more than 50 years, and there are courses taught at many universities across the country. These courses have developed to meet the needs of today and deal with all aspects of nuclear energy and radioactivity, from nuclear reactors to astrophysics, radiological protection and applications within medical and life sciences.

British universities also undertake both fundamental and applied research work on nuclear science and engineering topics, and in many instances are amongst the world leaders.

The Nuclear Technology Education Consortium (NTEC) consortium, coordinated by the Dalton Nuclear Institute, delivers training designed to meet the UK's projected nuclear skills requirements in decommissioning and clean-up, reactor technology, fusion and nuclear medicine. NTEC comprises the universities of Birmingham, Lancaster, Leeds, Liverpool, Manchester, Sheffield, City University, London, HMS Sultan, Imperial College London, UHI Millennium Institute & Westlakes Research Institute. Together NTEC represents over 90% of the UK's nuclear postgraduate teaching expertise.

The Higher Level Skills Partnership, operated by NWUA, supported by HEFCE and NWDA, funds foundation and postgraduate degree course development at the UCLan and is funding, with NSAN, the Open University to develop a postgraduate Certificate of Nuclear Professionalism.

Nuclear Science and Engineering

National Nuclear Laboratory

The National Nuclear Laboratory (NNL) demonstrates Government commitment to protect and grow the UK's national nuclear technology capability. NNL holds an unrivalled breadth of technology expertise, including many skills unique to the UK. NNL, headquartered in the Northwest of England, is managed by a consortium containing Battelle, University of Manchester and Serco.

NNL's Central Laboratory at Sellafield is the flagship nuclear R&D facility in the UK supporting new reactor build, reactor operation, fuel processing plants and decommissioning and clean-up. Some 500 staff at the £250 million purpose built facility run a wide range of radioactive and non-radioactive experimental programmes as well as offering a wide range of analytical services.

NNL continues to build relationships with academia and strengthen the quality of nuclear related skills coming into the industry via their University Research Alliances (URAs).



Academic research expertise

The **University of Manchester** has ambitious plans to become one of the world's leading academic institutions and nuclear research has been identified by the university as one of its major growth disciplines. The university already has the UK's largest concentration of nuclear research, training and educational activities and, in 2005, formed the **Dalton Nuclear Institute** to drive forward its ambitions. The portfolio of nuclear research educational activity has ramped up significantly and now stands at around £100m involving 200 researchers.

The University of Manchester, via the Dalton Nuclear Institute, is undertaking a joint £20m investment to establish a world class teaching and education facility in West Cumbria, linked with access to NNL's Central Laboratory. The facility will be equipped with state of the art equipment predominantly in the field of radiation sciences and the study of radiation damage of materials.

The **Centre for Nuclear Energy Technology**, established with NWDA support, provides the University of Manchester with a reactor technology centre that will bring together a number of capabilities required to support academic and industrial interests in nuclear reactor systems. In addition to the University of Manchester a number of other academic institutes in the region maintain research capability in nuclear science and engineering including;

- **University of Liverpool** has an international reputation in the fields of Condensed Matter Physics, Nuclear Physics, Particle Physics and Accelerator Science.
- **Cockcroft Institute** incorporates academia, national laboratories, industry and the local economy in researching, designing and developing particle accelerators
- **University of Central Lancashire's** John Tyndall Institute for Nuclear Research develops work in the areas of nuclear, science, technology and engineering
- **Lancaster University** maintains a multidisciplinary team of engineering researchers working on the combination of instrumentation and generic control. Lancaster co-ordinates the NDA funded Nuclear Graduate Programme, which is backed by more than 20 leading companies and aims to plug a nationwide skills gap in decommissioning.
- **University of Salford's** Joule Physics Laboratory carries out research into atomic collisions and ion-beam physics
- **University of Bolton's** Centre for Materials Research and Innovation is a multi-disciplinary centre designed to cultivate research and innovation activities in collaboration with industry and other academic institutions

The region's universities also are involved with consortia in delivering national research programmes, including;

- **DIAMOND** (Decommissioning, Immobilisation and Management of Nuclear waste for Disposal) is a university research consortium focussed on Nuclear Waste Management and Decommissioning.
- **Nuclear Engineering Doctorate Programme** - Led by the Dalton Nuclear Institute, provides nuclear Research Engineers with industry training
- **KNOO** (Keeping the nuclear option open) is a four-year initiative set-up to address the challenges related to increasing the safety, reliability and sustainability of nuclear power and development of skills
- **SPRing** (Sustainability Assessment of Nuclear Power: An Integrated Approach) is a university consortium project developing a decision-support framework to assess the sustainability of nuclear power relative to other energy options

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