

An Overview of UK Civil Nuclear R&D

Presentation by

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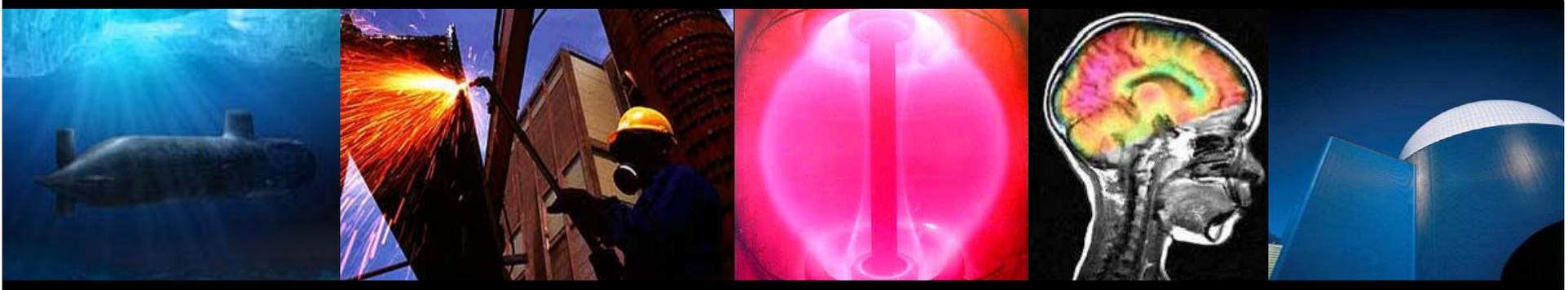
Dalton Nuclear Institute

The University of Manchester



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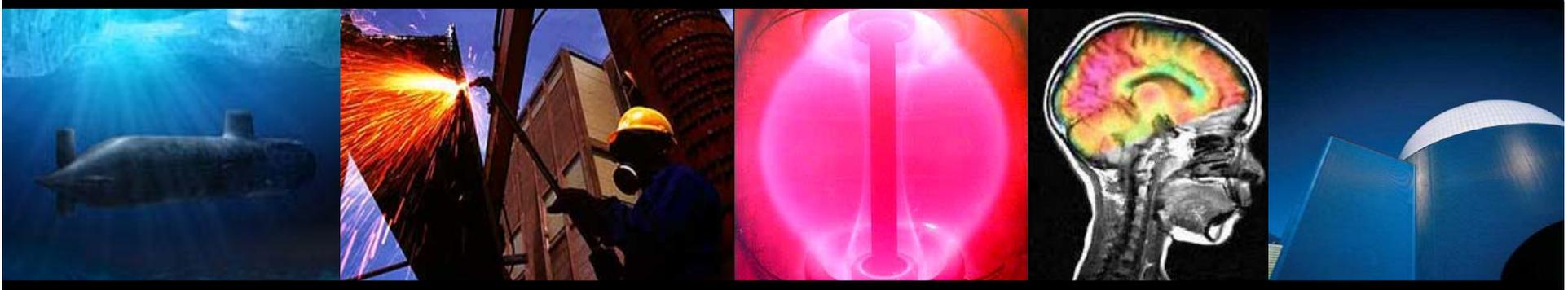
- Brief history of civil nuclear R&D in the UK
- Current challenges – the market for research
- Capabilities – examples of industry and academia





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UK Nuclear R&D – A Brief History

- The civil nuclear R&D programme grew out of the UK's post war military imperative to produce plutonium
- The research programmes were focused on the development of reactor designs and closing the fuel cycle
- A history of civil nuclear R&D is best presented as a history of the UK's nuclear energy programme

UK Nuclear R&D – A Brief History

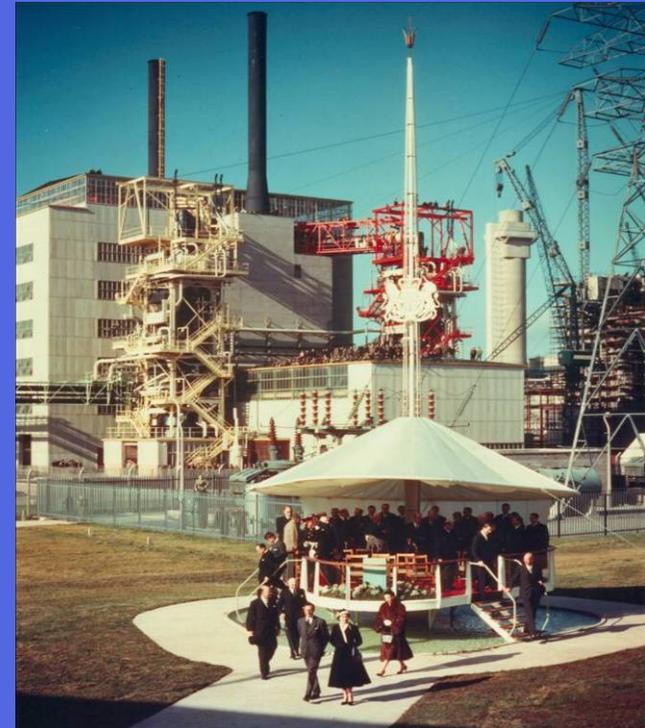
1940's – The first nuclear sites were established at Risley, Springfields, Windscale and Capenhurst



1940's 1950's 1960's 1970's 1980's 1990's 2008

UK Nuclear R&D – A Brief History

1950's – Calder Hall, the worlds first commercial nuclear reactor becomes operational



1940's **1950's** 1960's 1970's 1980's 1990's 2008

UK Nuclear R&D – A Brief History

1960's – First new build programme commences as the first Magnox station comes on line at Berkeley. 8 further stations follow.

Work also undertaken by UKAEA to look at alternative designs to improve performance

- Gas cooled - DRAGON at Harwell and WAGR at Windscale
- Water cooled - SGHWR at Winfrith
- Liquid Metal Cooled - Fast Reactor at Dounraey



1940's 1950's **1960's** 1970's 1980's 1990's 2008

UK Nuclear R&D – A Brief History

1970's – Second new build programme commences with the construction of the first AGR at Dungeness. 4 further stations follow

Civil nuclear R&D spend at £500m/yr

BNFL created to take forward industrialisation particularly around closing the fuel cycle



1940's 1950's 1960's **1970's** 1980's 1990's 2008

UK Nuclear R&D – A Brief History

1980's – Third new build programme consisting of two further AGR's and the UK's first PWR

North sea gas discovered leading to a decline in investment in nuclear R&D



1940's 1950's 1960's 1970's **1980's** 1990's 2008

UK Nuclear R&D – A Brief History

1990's – 'Dash for gas' leads to further decline in investment in R&D

UKAEA privatised

THORP becomes operational to give the UK a fully closed fuel cycle



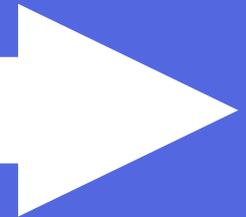
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UK Nuclear R&D – A Brief History

2008 – Energy security and environmental issues lead to a shift in UK energy policy. Announcement made of intention to commence the UK's fourth new build programme to be led by the private sector



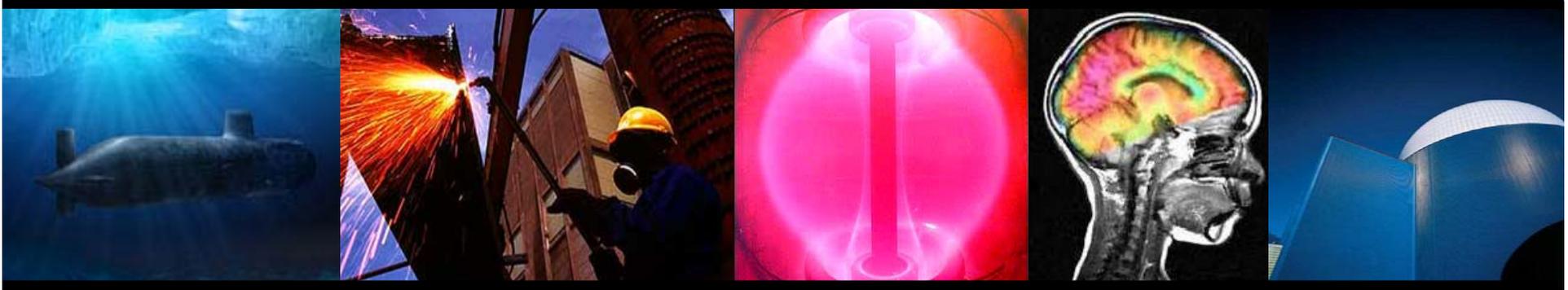
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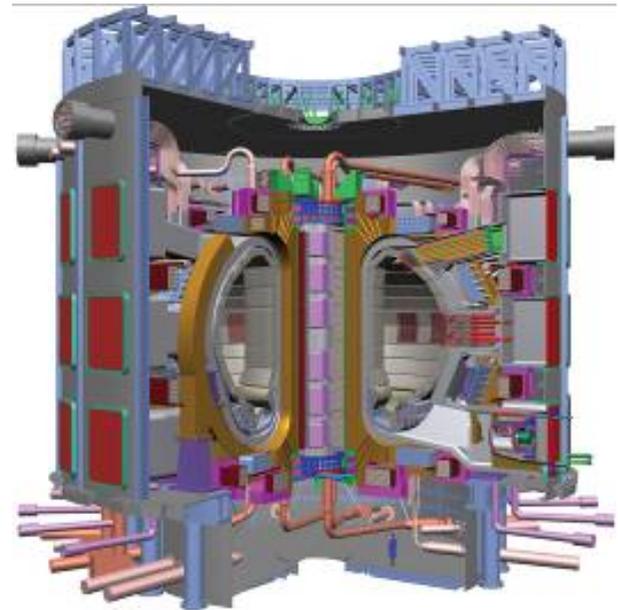
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Current Challenges

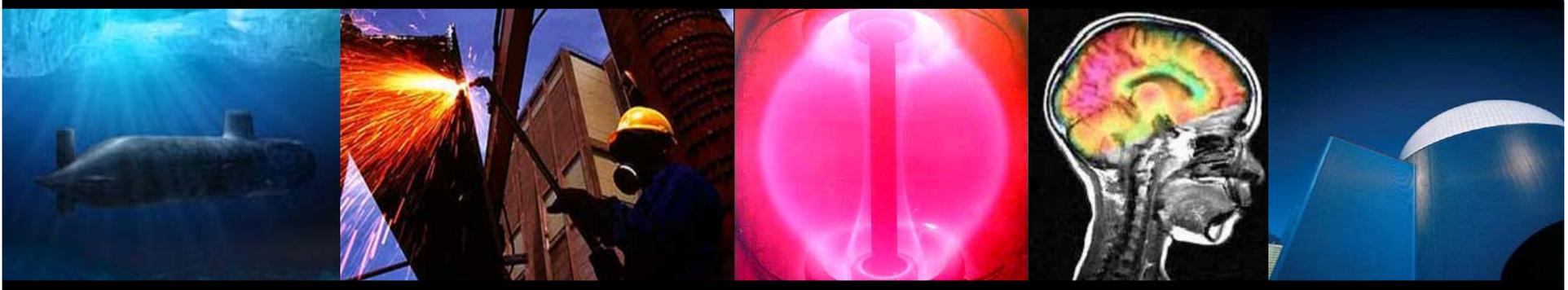
- Legacy waste management and decommissioning programme estimated at £70bn
- New nuclear reactor build estimated at £10bn to £20bn
- Support to continued operations of the existing fleet of nuclear power stations and the associated fuel cycle (THORP, MOX)
- Development of a UK repository for ILW and possibly spent nuclear fuel and high-level waste
- Next and future generation reactor systems
- Support to construction of ITER



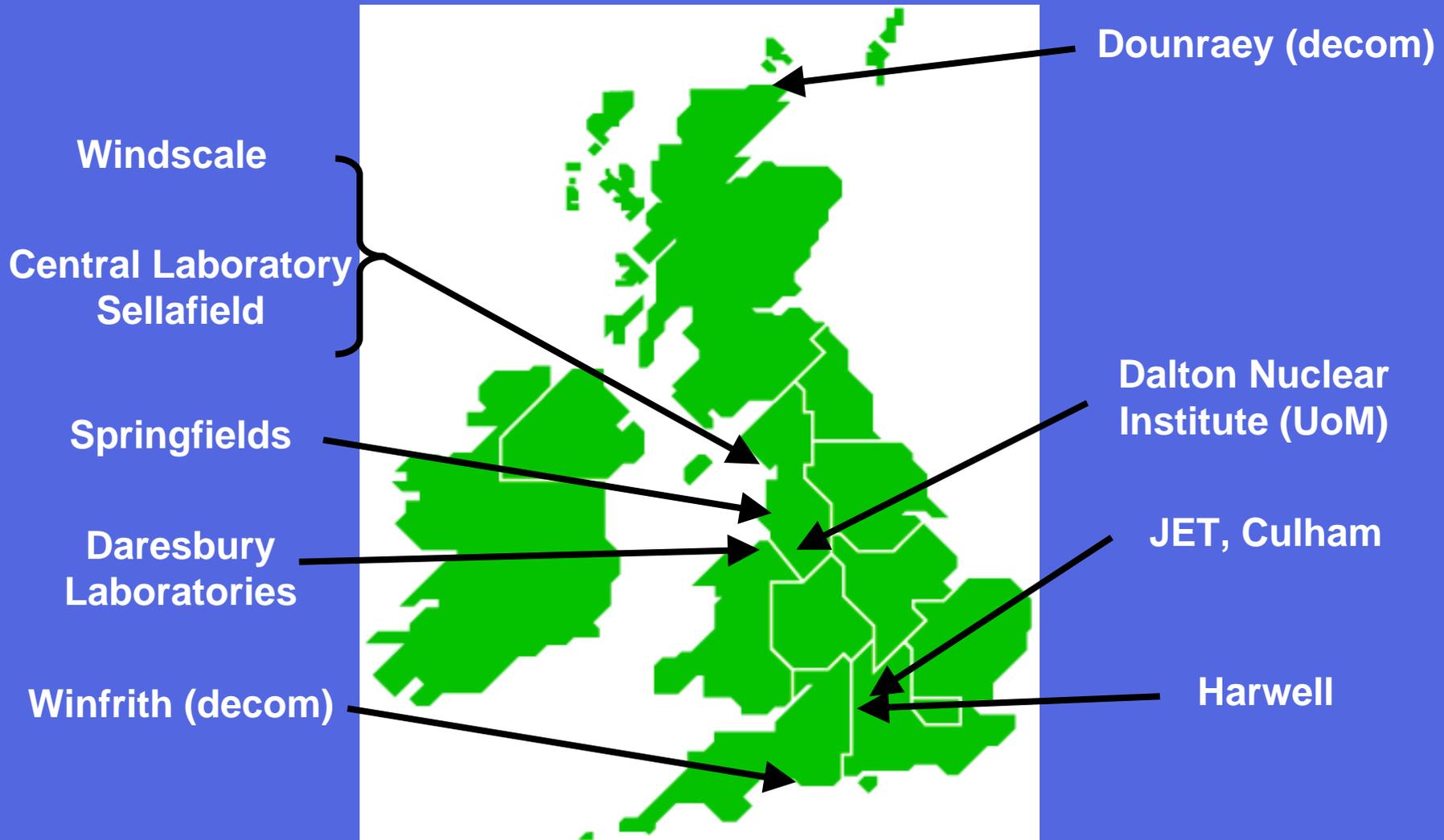


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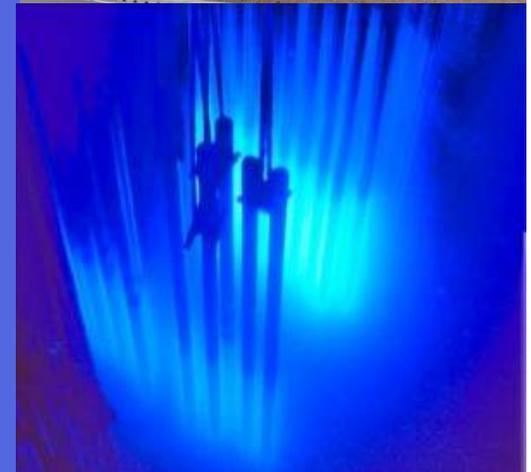


UK Civil Nuclear Research Facilities



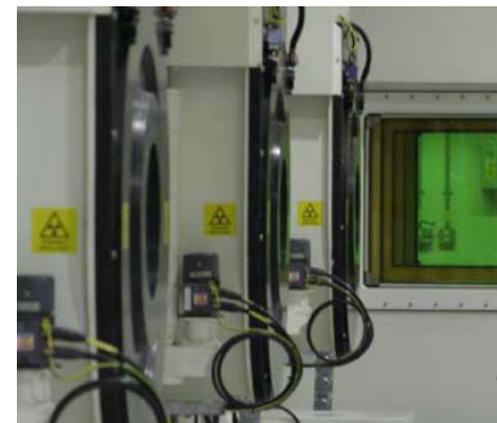
National Nuclear Laboratory

- The UK has recently created the National Nuclear Laboratory which was formerly Nexia Solutions, part of the BNFL group
- The NNL leads the way in respect of the delivery of UK civil nuclear R&D and has close links and collaborations with wider industry and academia
- It supports new reactor build, operation of existing reactors, operation of fuel processing plants and decommissioning and clean-up
- Following an extensive competitive tendering exercise a consortium of the University of Manchester, Serco and the Battelle Memorial Institute (US) were selected as the first contractor to manage the NNL on behalf of the Government



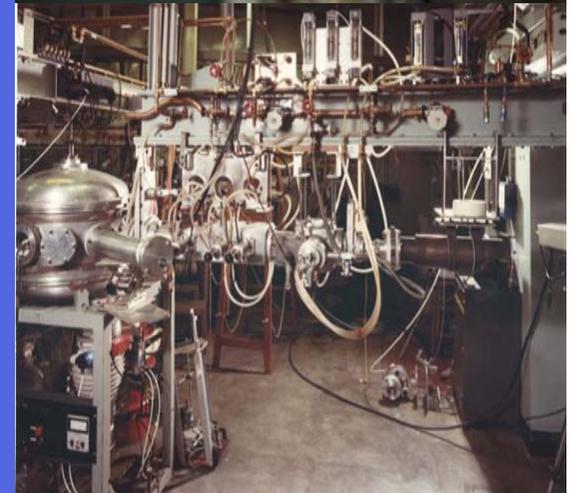
Central Laboratory

- The Central Laboratory at Sellafield is the flagship nuclear Research and Development facility in the UK and is operated by the NNL on behalf of the Nuclear Decommissioning Authority
- Experimental capability consists of
 - Non active labs - fume cupboards & workbenches
 - Active labs - gloveboxes and fume cupboards
 - MOX labs – gloveboxes to enable fabrication and examination of MOX fuels
 - HA cells – for modular experimental work
 - Uranium active rig hall



Dalton Nuclear Institute

- Part of the University of Manchester's ambitious expansion plans
- Dalton established to uplift the already significant nuclear research and education capability at Manchester
- Dalton's mission is
 - “To establish The University of Manchester as the UK's leading university in research and education in the nuclear field and be one of the leading players internationally.”
- Achieved through investment in people, facilities and programmes

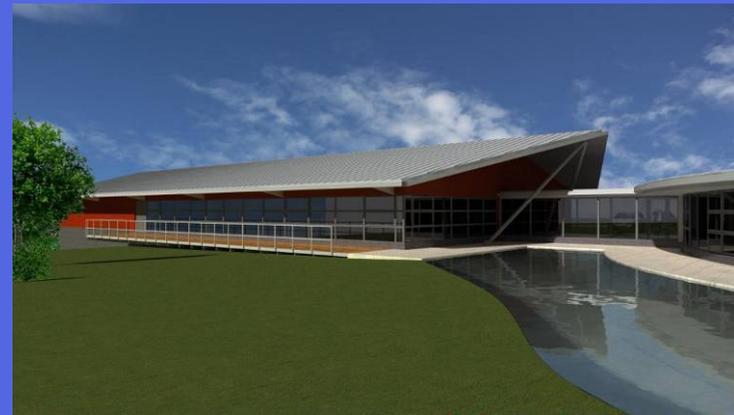
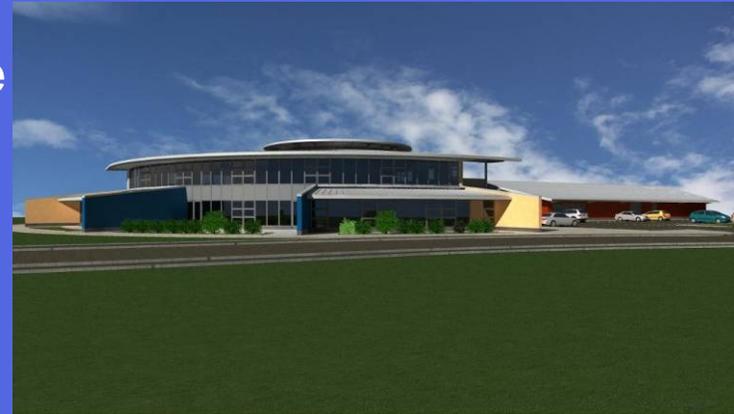


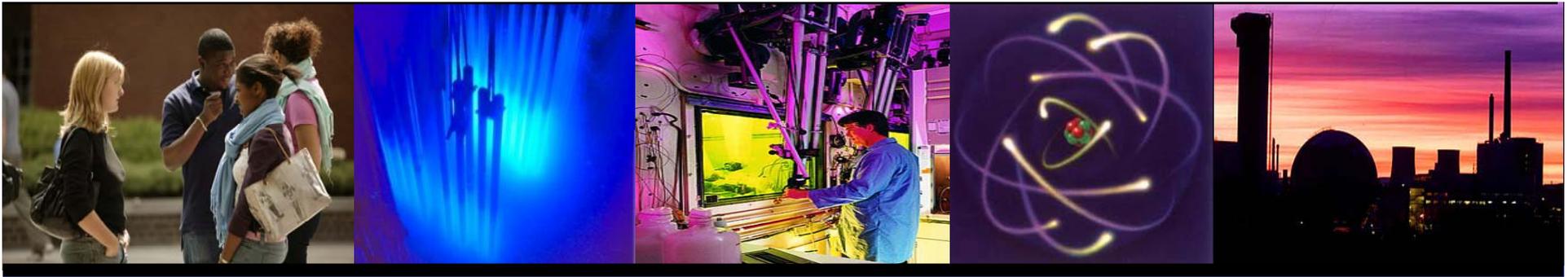
Dalton Cumbria Facility

- A high quality Nuclear Research Facility being built in West Cumbria as part of a £20m collaboration between UoM and the Nuclear Decommissioning Authority
- Occupancy - approx 60 to 80 people
- Cost £10m

Key capabilities

- Tandem Pelletron for simulated radiation experiments
- Enclosed “Gammacell” Co60 gamma-irradiator
- Analytical and wet chemistry laboratories
- Extensive modelling and simulation suite networked with existing computer clusters and advanced computational capability at Manchester





Thank you for listening
www.manchester.ac.uk/dalton

