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The Nuclear Technology Education Consortium: Helping to Build and Maintain Nuclear Capacity Globally

Dr John Roberts
The University of Manchester

International Conference on Human Resource Development for Nuclear Power Programmes: Building and Sustaining Capacity.

IAEA Headquarters, Vienna, Austria
12–16 May 2014

Energy Review: new build of reactors

International collaborations such as GenIV and GNEP

Replacement of Royal Navy's Astute propulsion reactors

National Nuclear Laboratory

Nuclear education & training

Decommiss -ioning and clean-up

Operation and life extension of existing plant

Waste Disposal and possible repository

Fusion programme and ITER

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UK Nuclear Sites

26 Magnox Reactors
(May 2014 – 25 being decommissioned)
14 AGRs
1 PWR
2 Fast Reactors
(May 2014 - both being decommissioned plus many other prototype reactors)

May 2014 10.1 GWe Total Capacity

13.11.13 23% UK electricity

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21st Century UK Reactors

EDF (Areva, CGN, CNNC) – EPR
Horizon (Hitachi) - ABWR
NuGeneration (Toshiba and GDF Suez) – AP1000

Bradwell, Essex
Hartlepool
Heysham, Lancashire
Hinkley Point, Somerset
Oldbury, South Gloucestershire
Moorside, Cumbria
Sizewell, Suffolk
Wylfa, North Wales

~ 16 GW (?) of new capacity
~ 3 GW on each of the five sites
2 EPR or 3 AP1000 or ABWRs

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Global Situation

1st May 2014	
Reactors Operable	434
Reactors Under Construction	72
Reactors Planned - Approvals, funding or major commitment in place, mostly expected in operation within 8-10 years	173
Reactors Proposed - Specific program or site proposals, expected operation mostly within 15 years.	309

Source: World Nuclear Association

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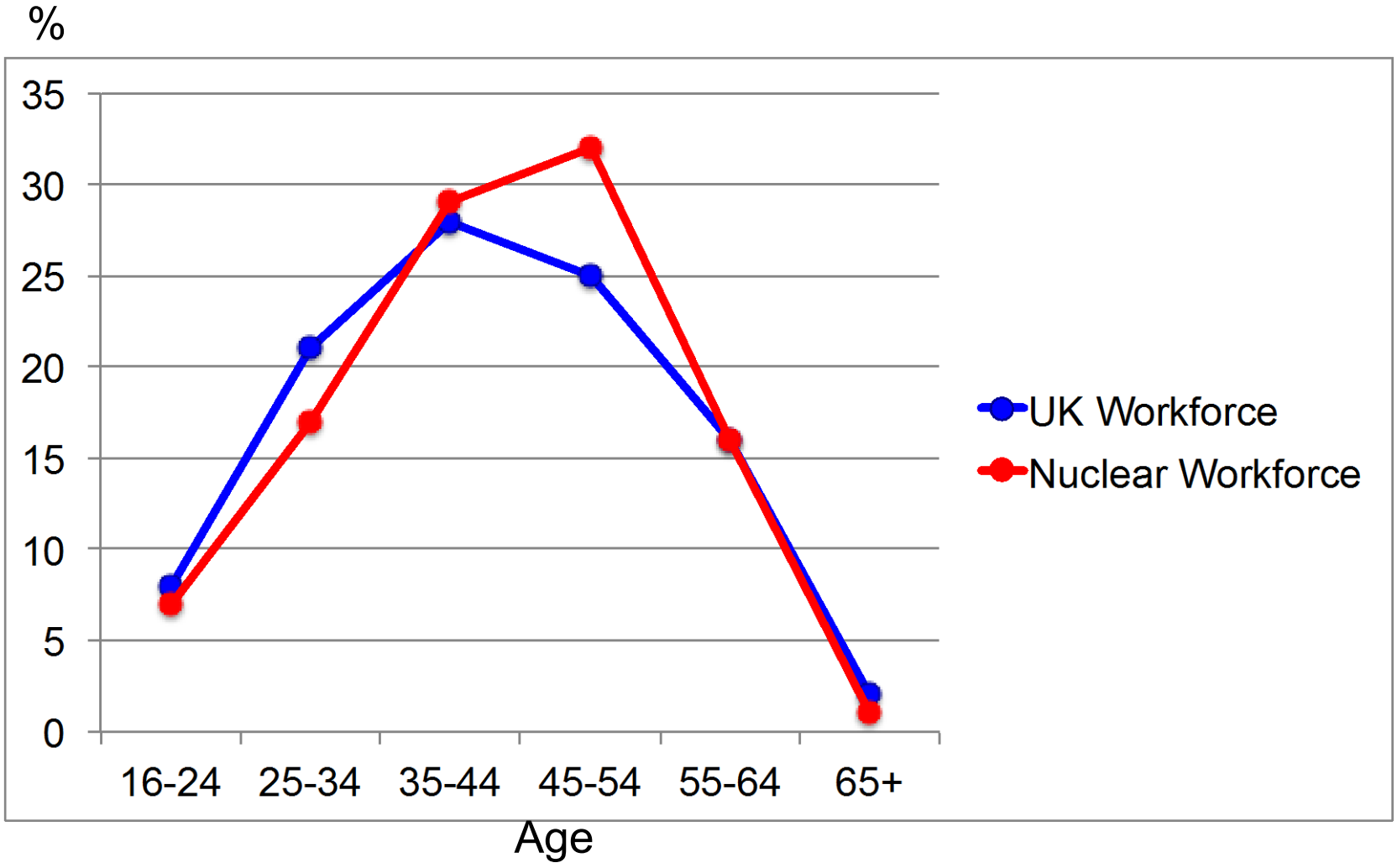
Age Profile Comparison



Renaissance Nuclear Skills Series:1, Power People: The Civil Nuclear Workforce 2009-2025, available at http://www.cogent-ssc.com/research/Publications/NuclearReportPowerPeople.pdf

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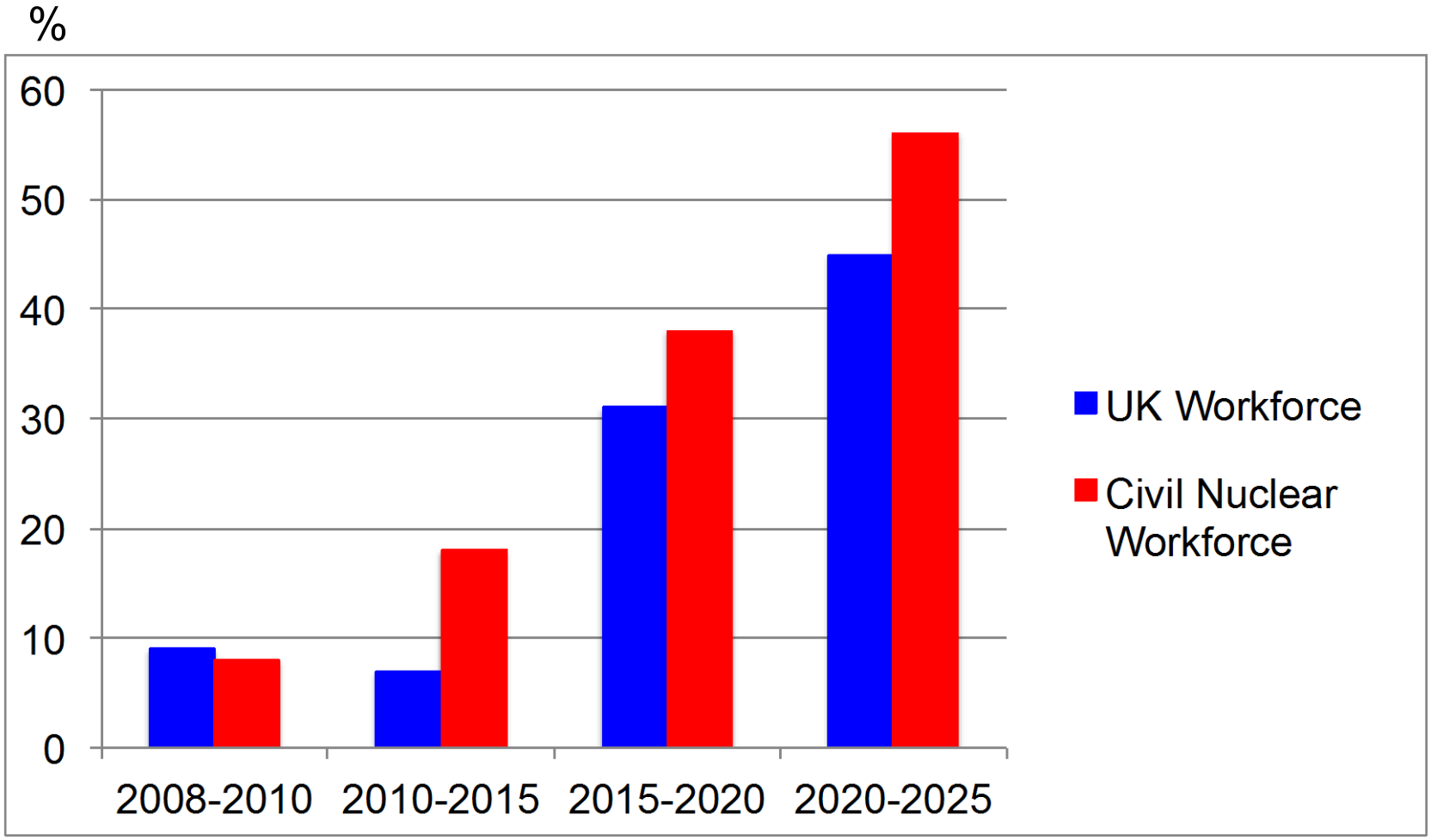
Retirement Profile



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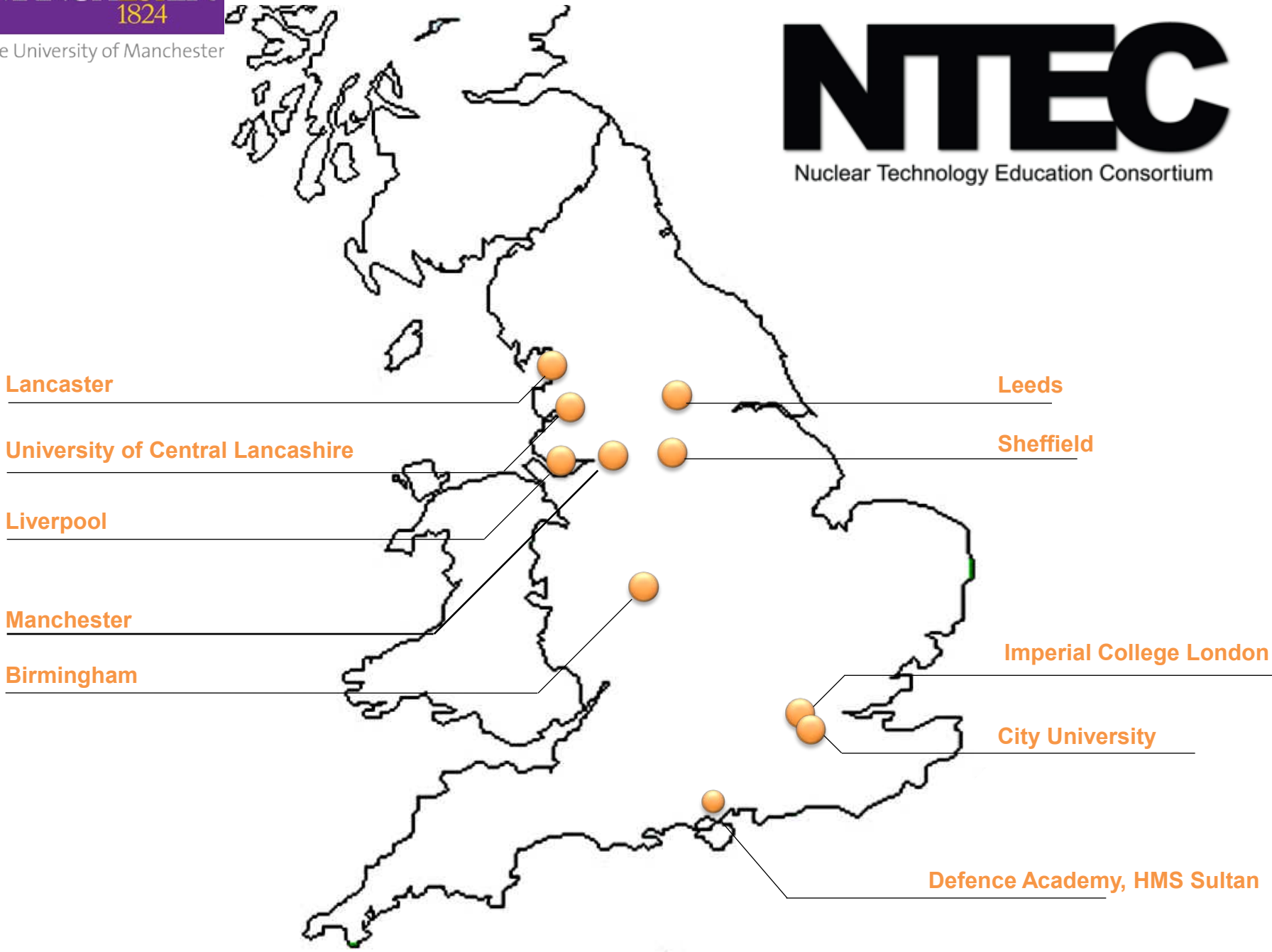
NTEC
Nuclear Technology Education Consortium



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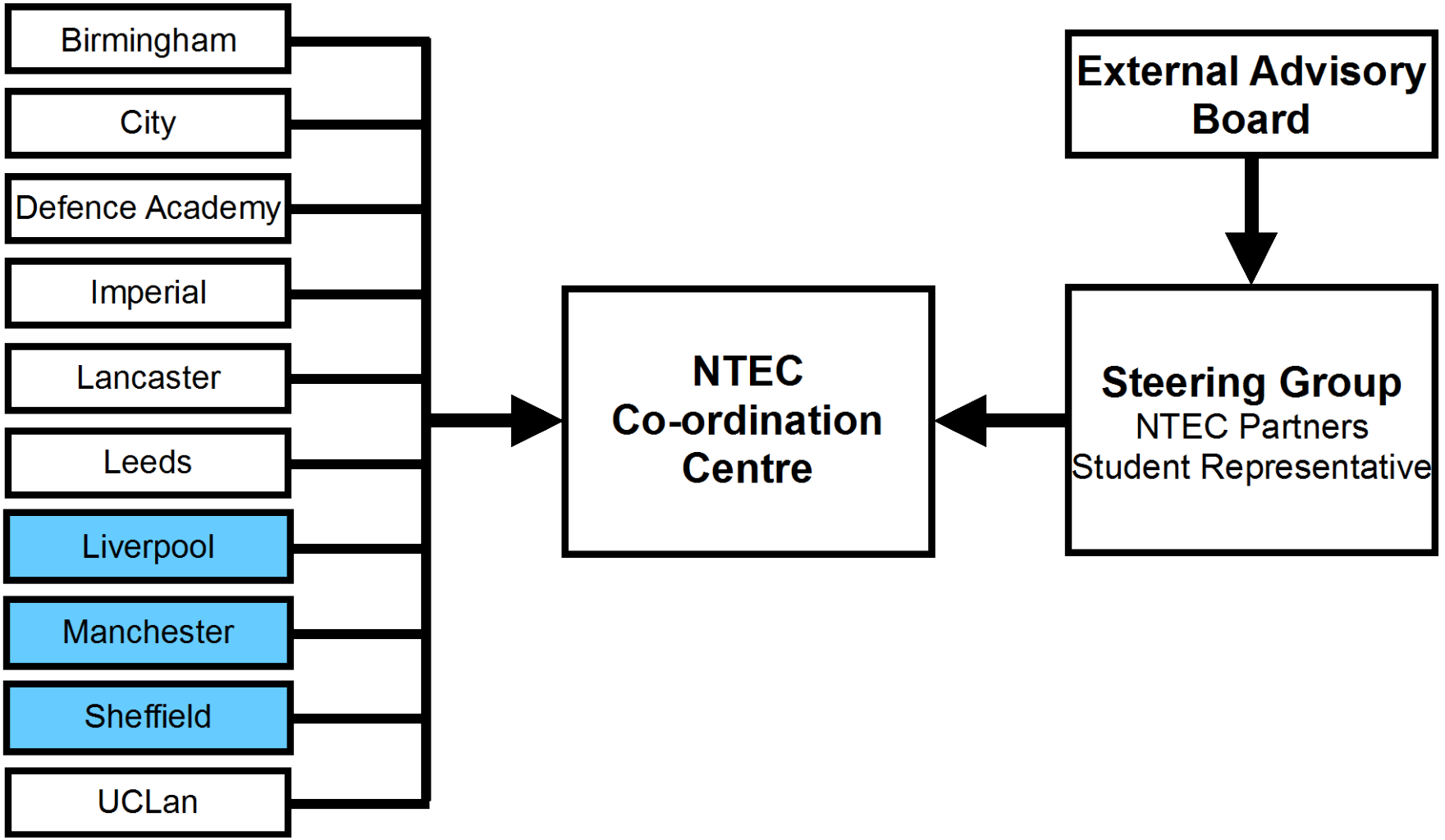
NTEC Management Structure



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NTEC Modules

• ***N01 Reactor Physics, Criticality & Design***	***The University of Birmingham***
• ***N02 Nuclear Fuel Cycle***	***University of Central Lancashire***
• ***N03 Radiation & Radiological Protection***	***The University of Manchester***
• ***N04 Decommissioning / Waste / Environmental Management***	***University of Central Lancashire***
• **N05 Water Reactor Performance and Safety**	**Imperial College London**
• **N06 Reactor Materials & Lifetime Behaviour**	**The University of Manchester**
• ***N07 Nuclear Safety Case Development***	***Defence Academy***
• **N08 Particle & Colloid Engineering in the Nuclear Industry**	**University of Leeds**
• **N09 Policy, Regulation & Licensing**	**The University of Manchester**
• ***N10 Processing, Storage & Disposal of Nuclear Waste***	***The University of Sheffield***

40 hours direct teaching – Monday to Friday - 150 hours of study
Modules available in eLearning format in italics

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NTEC Modules

• **N11 Radiation Shielding**	**The University of Liverpool**
• ***N12 Reactor Thermal Hydraulics***	***Defence Academy***
• ***N13 Criticality Safety Management***	***Defence Academy***
• **N14 Risk Management**	**City University, London**
• **N21 Geotechnical Aspects of Radioactive Waste Disposal**	**University of Central Lancashire**
• **N23 Environmental Impact Assessment**	**The University of Manchester**
• ***N29 Decommissioning Technology & Robotics***	***Lancaster University***
• **N30 Design of Safety Critical Systems**	**Lancaster University**
• ***N31 Management of the Decommissioning Process***	***The University of Birmingham***
• **N32 Experimental Reactor Physics**	**The University of Manchester (Atomic Institute of the Vienna University of Technology or Czech Technical University, Prague)**

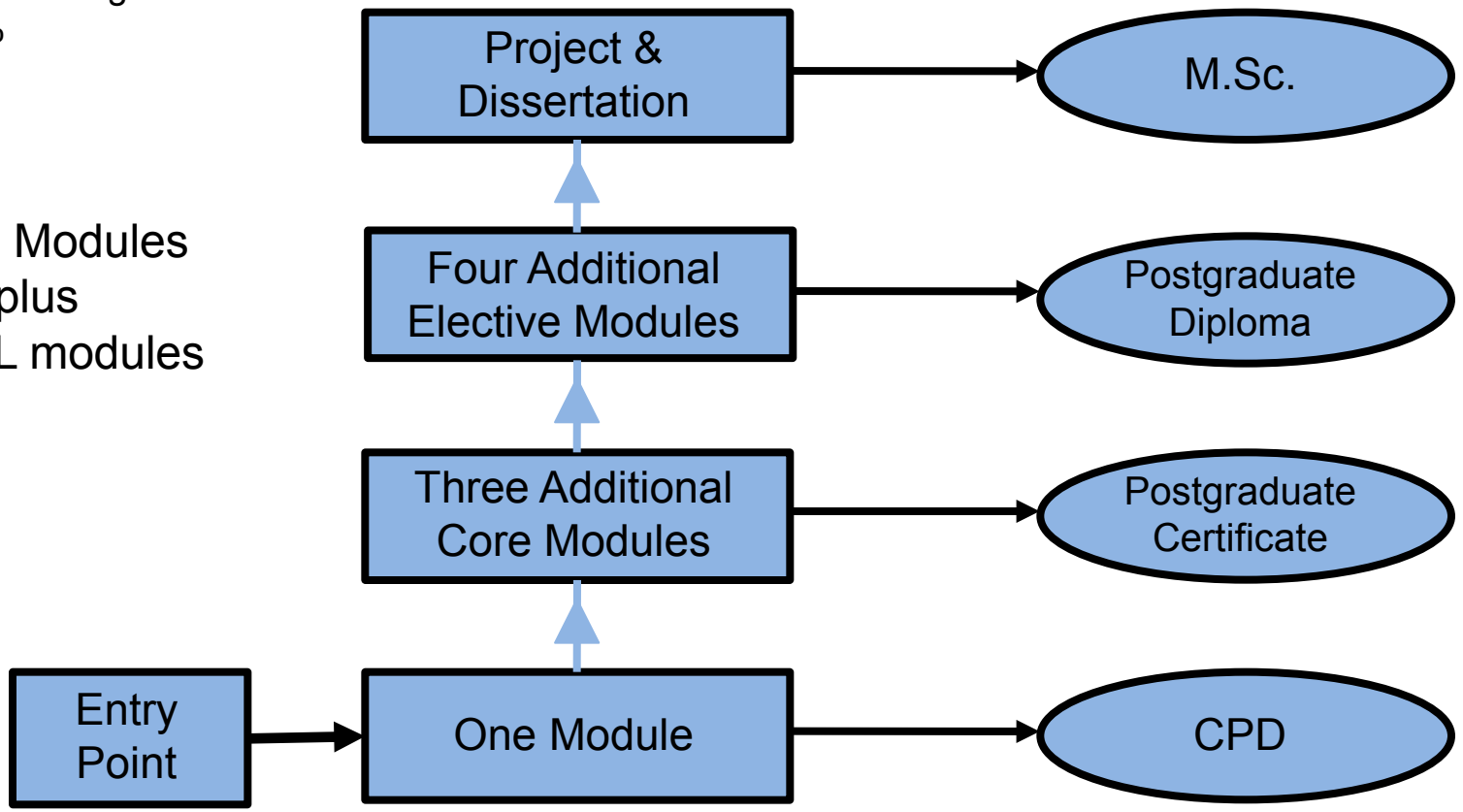
40 hours direct teaching – Monday to Friday - 150 hours of study

Modules available in eLearning format in italics

NTEC Programme Structure

Typical Marking for Each Module
- Pre-module work 10%
- Post-module assignment 50%
- Exam 40%

MSc Nuclear Science and Technology
Full time: 12 months
Part time: 3 years



2,241 Modules
plus
346 DL modules

40 hours direct teaching
One week Monday - Friday
150 hours of study

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NTEC Delivery Structure

Full Time	One Year	Part Time	Year 1	Year 2	Year 3
September		September			
October		October			
November		November			
December		December			
January		January			
February		February			
March		March			
April		April			
May		May			
June		June			
July		July			
August		August			

Quality Control

- Module Review
  - Each module is reviewed by a lecturer from a partner university
- Comprehensive Student Feedback
  - Module Leaders have to respond
  - Feedback Analysis and Interpretation
- Part-time students also feedback through their company representative on the External Advisory Board
- Accreditation by
  - Institution of Engineering and Technology (IET)
  - Institution of Mechanical Engineers (IMechE)
  - Energy Institute (IE)
  - Institute of Materials, Minerals and Mining (IoM^3).

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Partnership with Industry

- Modules designed in partnership with industry
- External Advisory Board
- Industry location for projects
- Short-fat delivery optimised for industry
- Industry lecturers support the programme
- CPD income supports full-time students
- Industry recruitment of NTEC students is the real test

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Student Destinations

NTEC Nuclear Technology Education Consortium

- home
- introduction
- taught programme
- distance learning
- consortium members
- contact us
- fees
- applications
- links
- news
- student destinations
- refresher courses

Student Destinations

The map below shows the job title, location and year of graduation of previous NTEC students after completing the MSc in Nuclear Science and Technology course.

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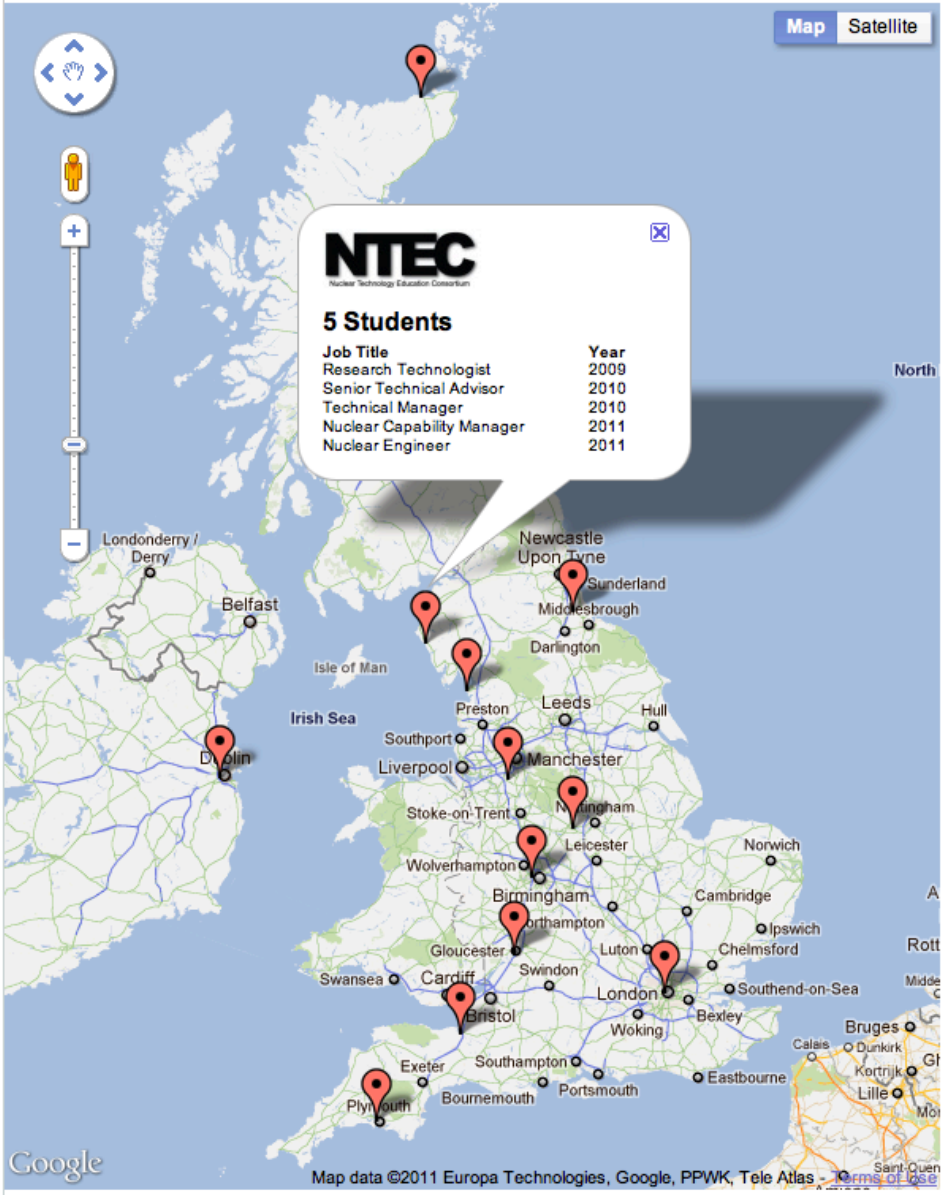
NTEC Nuclear Technology Education Consortium

Student Destinations

Student Destinations

The map below shows the job title, location and year of graduation of previous NTEC students after completing the MSc in Nuclear Science and Technology course.



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The NTEC Effect? – Bachelor's

- **University of Birmingham**
  - **B.Sc. in Nuclear Science and Materials**
  - **M.Eng. in Nuclear Engineering**
- **University of Cumbria**
  - **B.Sc. in Radiation Protection**
- **Imperial College London**
  - **M.Eng. in Mechanical/Chemical/Materials and Nuclear Engineering**
- **Lancaster University**
  - M.Eng in Nuclear Engineering
- **University of Leeds**
  - **M.Eng./B.Eng. Mechanical/Chemical and Nuclear Engineering**
- **University of Liverpool**
  - **B.Sc. in Physics with Nuclear Science**
- **The University of Manchester**
  - **B.Eng. in Mechanical Engineering and Nuclear Engineering**
  - **M.Eng in Mechanical Engineering and Nuclear Engineering**
- **Nottingham Trent University**
  - **B.Sc. in Physics with Nuclear Technology**
- **University of the West of Scotland**
  - **B.Sc. in Physics with Nuclear Technology**

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The NTEC Effect? – Master's

- **University of Birmingham**
  - M.Sc. in Physics and Technology of Nuclear Reactors
- **University of Cambridge**
  - **MPhil in Nuclear Energy**
- **University of Dundee**
  - **Master of Laws (LLM) and associated Diploma in International and Comparative Nuclear Law and Policy**
- **Imperial College London**
  - **M.Sc. in Nuclear Engineering**
- **Lancaster University**
  - M.Sc. in Decommissioning and Clean-Up
  - M.Sc. in Safety Engineering
- **University of Liverpool**
  - M.Sc. in Radiometrics: Instrumentation and Modelling
- **Nuclear Technology Education Consortium (NTEC)**
  - **M.Sc, Diploma, Certificate and CFD programme**
- **University of Sheffield**
  - **M.Sc. in Nuclear Environmental Science and Technology**
- **University of Surrey**
  - M.Sc. in Radiation and Environmental Protection
  - **M.Sc. in Radiation Detection and Measurement**

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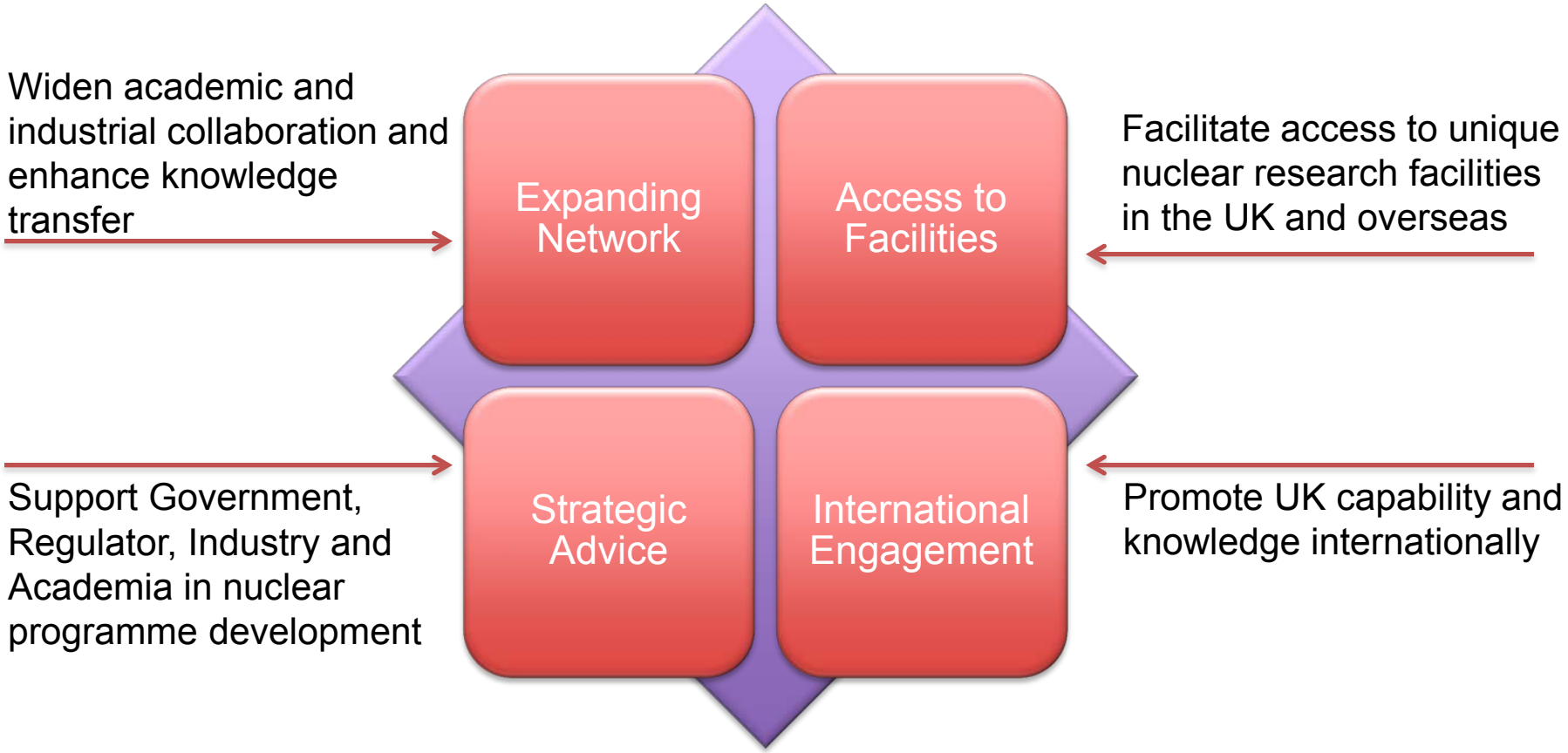
NUCLEAR Network

Nuclear Universities Consortium for Learning, Engagement And Research



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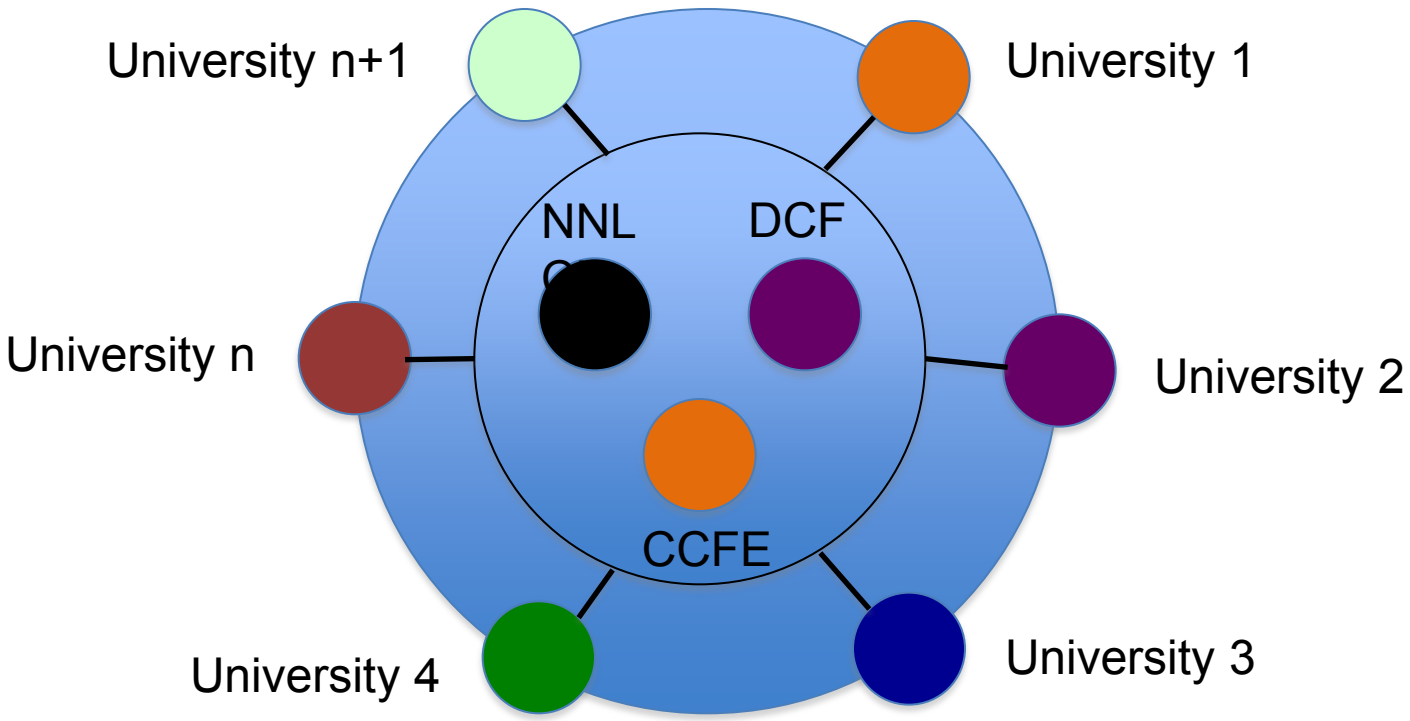
NNUF Concept



Network large-scale nuclear R&D facilities alongside smaller distributed projects

- Optimise facilities for UK nuclear R&D
- Facilitate access for UK research community

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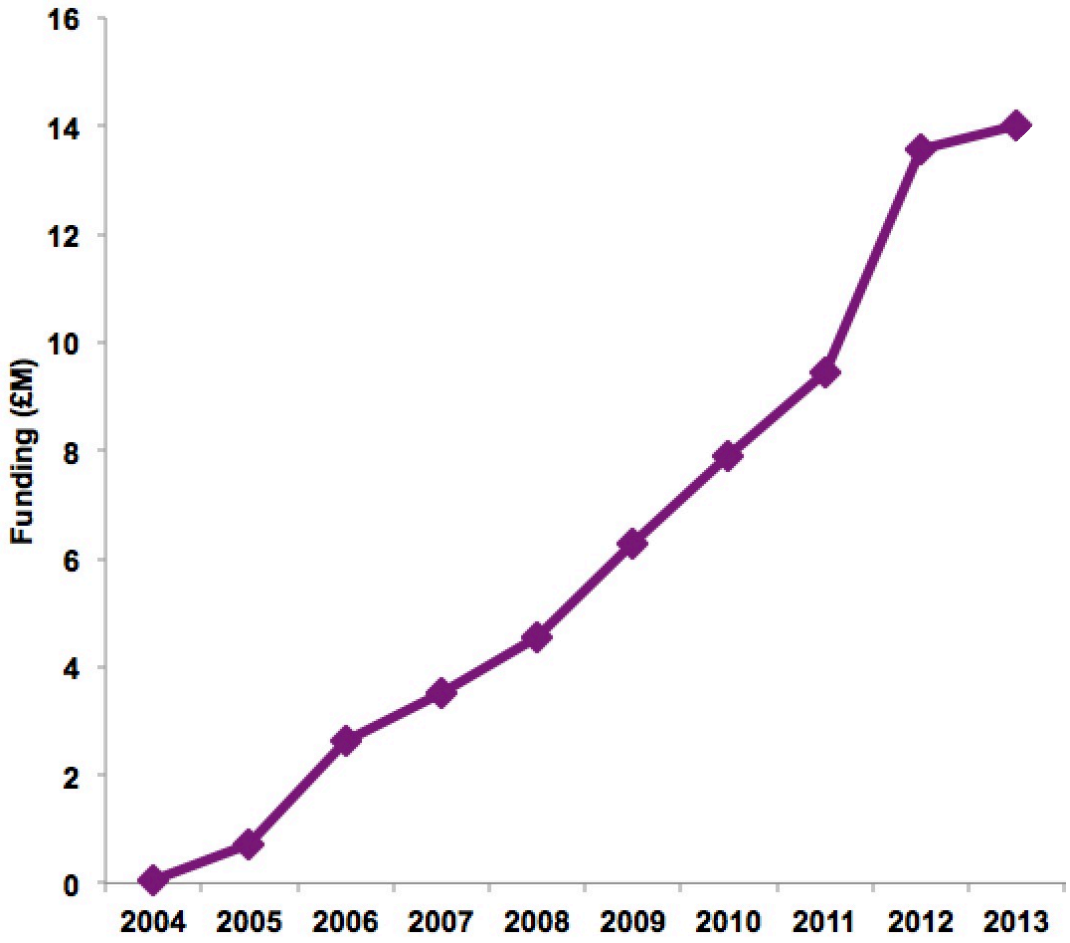
EPSRC Nuclear Fission Funding Since 2004



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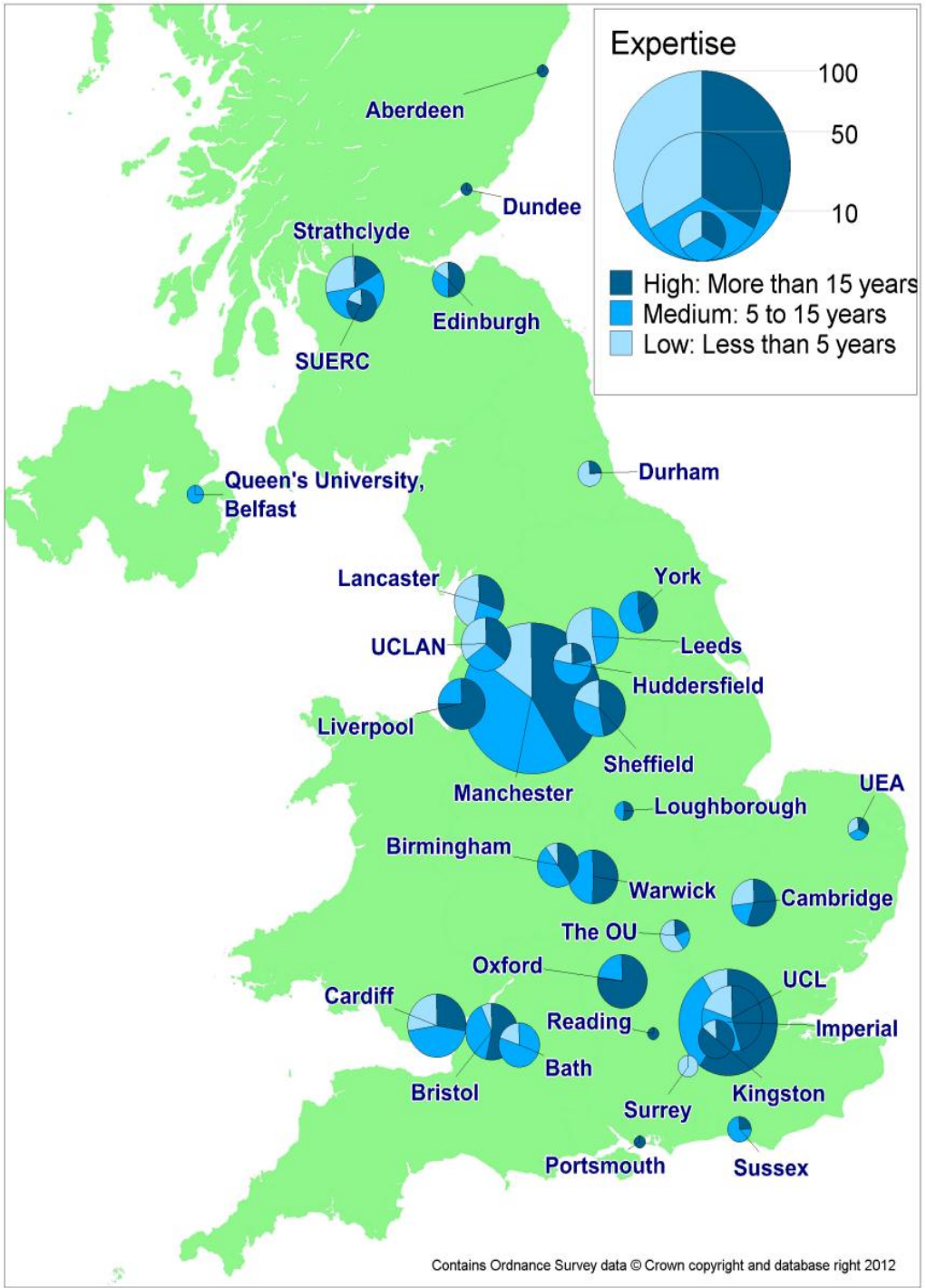
Quality and Quantity Of University Research Expertise in the UK



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Growth in International Collaboration for Selected Countries and the Proportion of National Output That This Represents 1996-2008

Knowledge, Networks and Nations: Global scientific collaboration in the 21st century

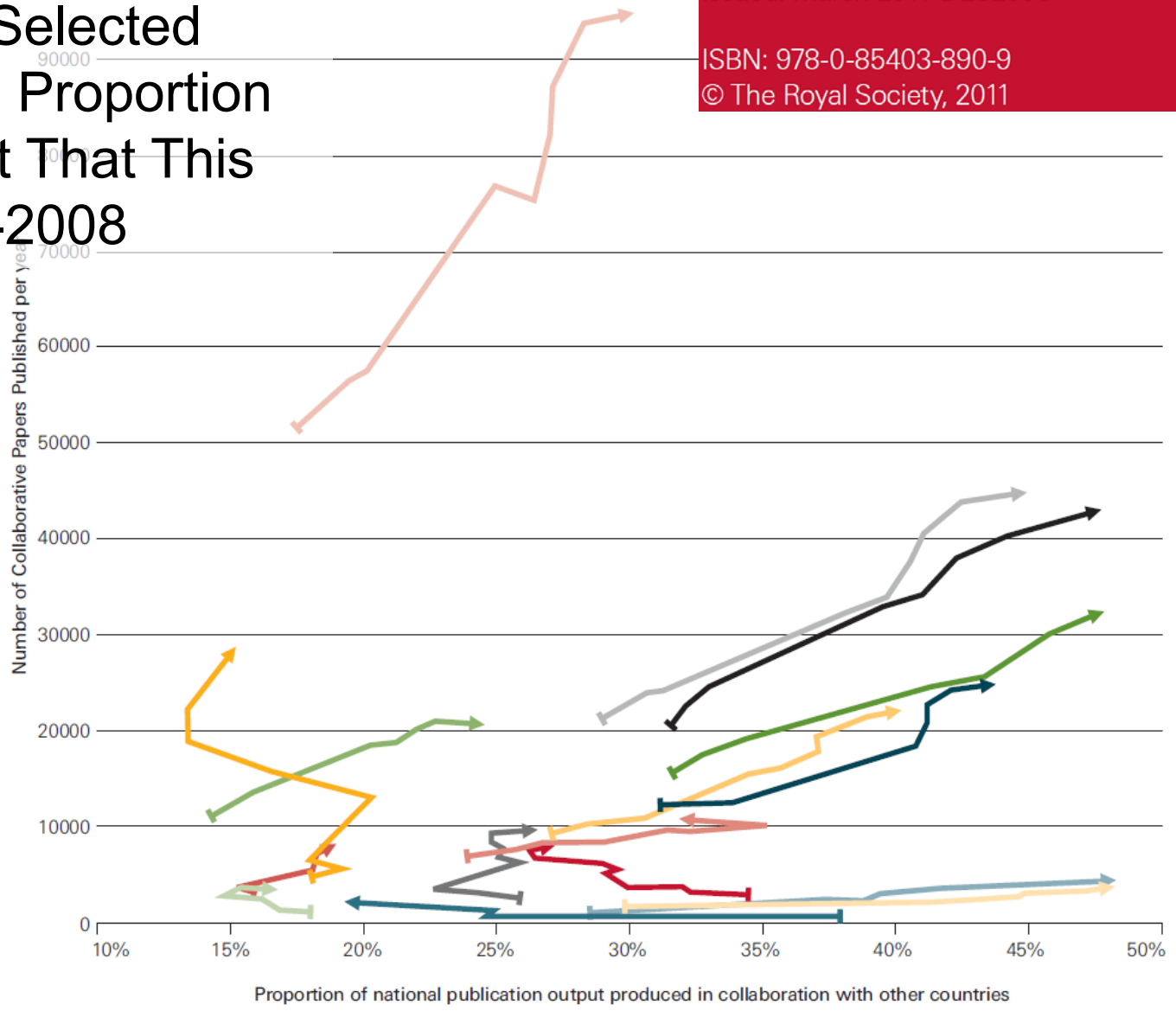
RS Policy document 03/11
Issued: March 2011 DES2096

ISBN: 978-0-85403-890-9

Key

1996 figures are shown with a dash, and 2008 figures with an arrow, indicating progression over time.

- Brazil
- Canada
- China
- France
- Germany
- India
- Iran
- Italy
- Japan
- South Korea
- Russia
- Singapore
- South Africa
- Turkey
- United Kingdom
- United States



UK Nuclear University Network

Welcome to the UK Nuclear University Network

The UK Nuclear University Network - the portal for all UK nuclear information. If you would like to comment on this website or send a suggestion please send an email to John Roberts j.w.roberts@manchester.ac.uk Please have a look at the UK Nuclear University Directory, do you know any university nuclear specialists that should be included? If you do, send their name and brief area of research to j.w.roberts@manchester.ac.uk

Forthcoming Events

Conferences

17 - 21 November 2013
Madrid, Spain
NESTet 2013
http://www.euronuclear.org/events/nestet/nestet2013/index.htm

27 - 28 November 2013
Manchester, UK
Managerial Competences and Leadership for Safety Culture
http://www.trasnusafe.eu

In Co-operation with

IAEA International Atomic Energy Agency

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The National Skills Academy NUCLEAR

www.uknuclear.net

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Nuclear Outreach

http://www.nuclearinst.com/Nuclear-Reactor-Simulator

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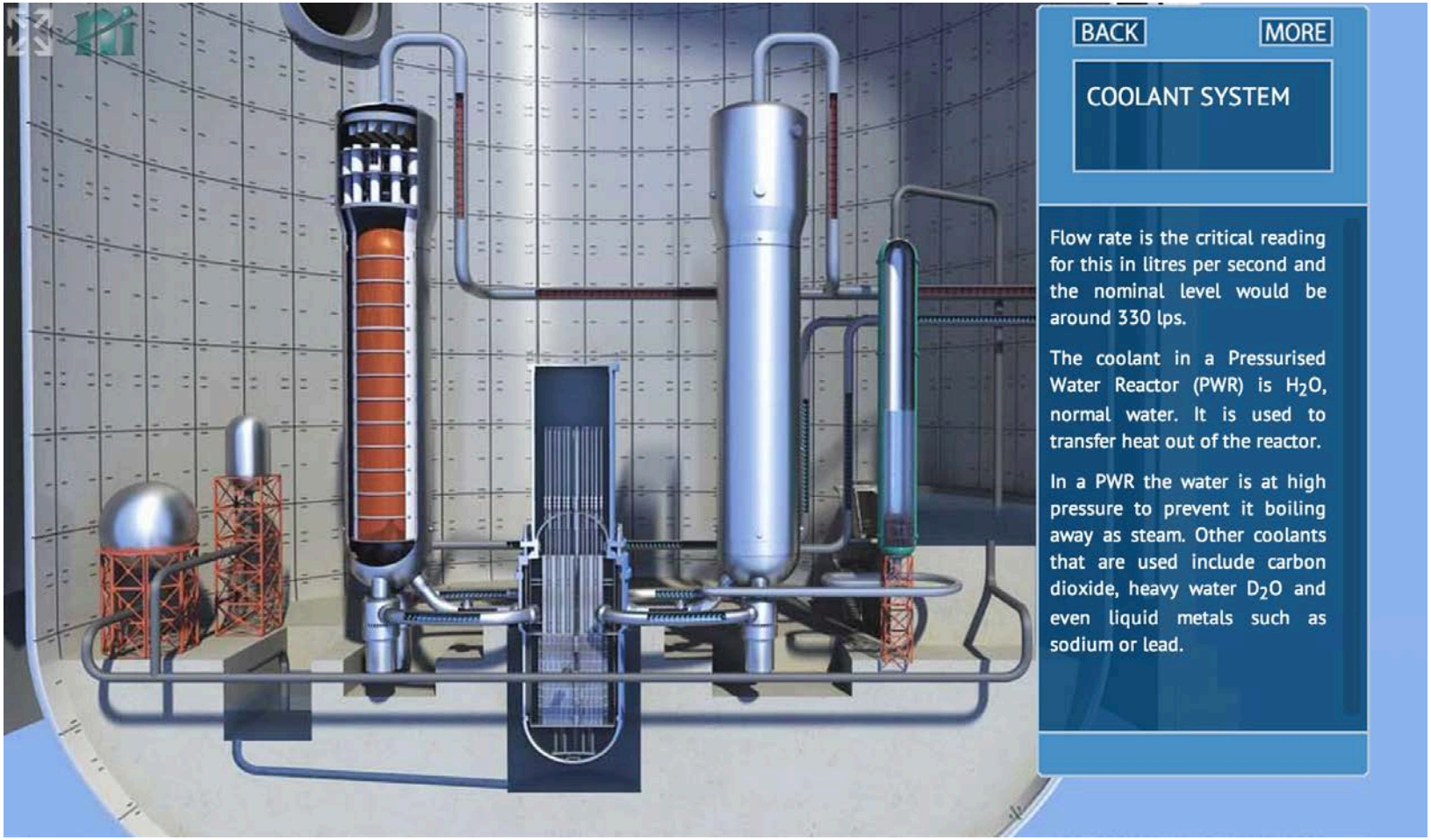
Nuclear Outreach



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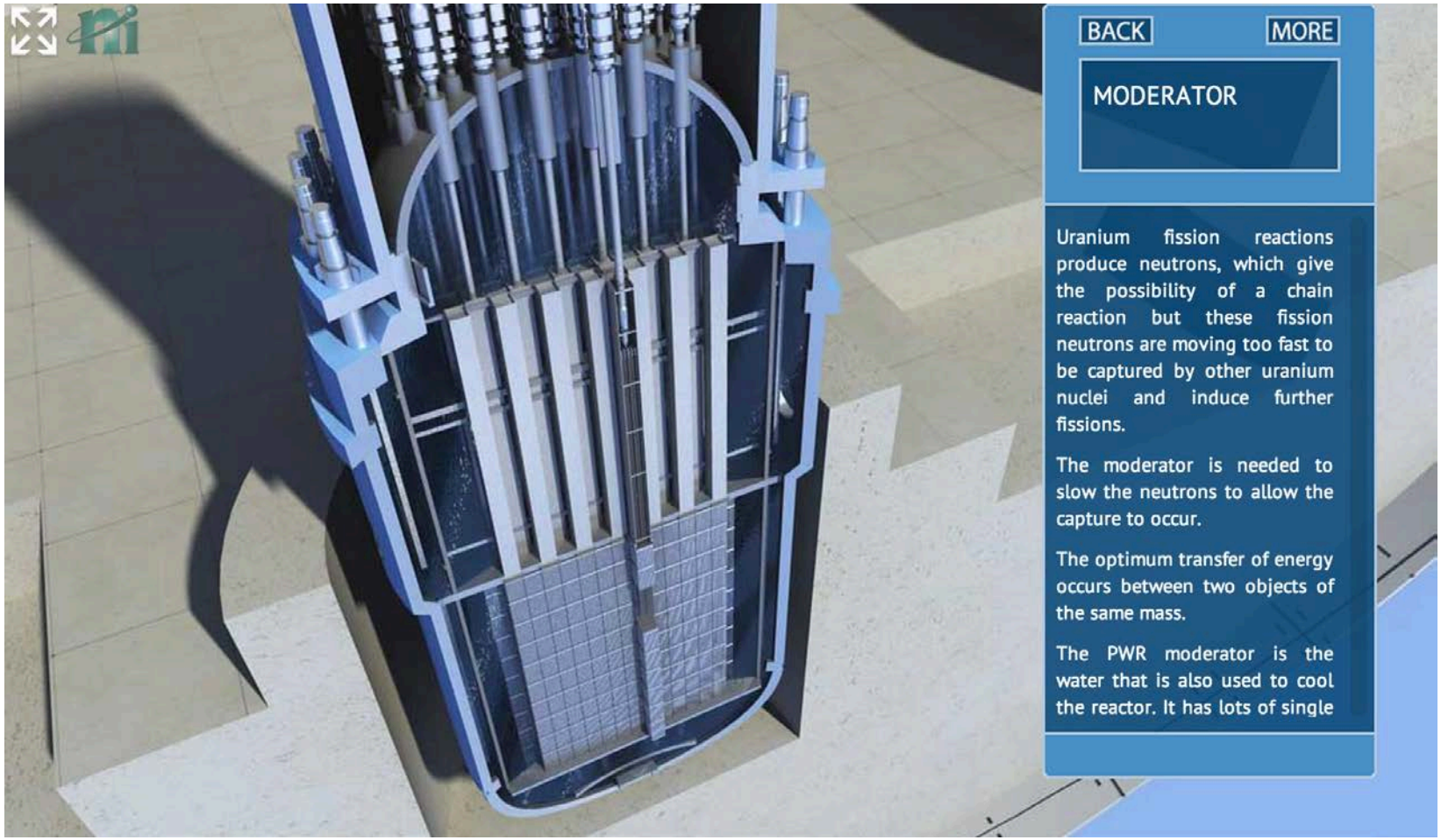
Nuclear Outreach



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Nuclear Outreach

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