



Transformative Science and Engineering for Nuclear Decommissioning

TRANSCEND: Collaborative Research Programme in **Trans**formative **Sci**ence and **Engi**neering for **Nu**clear **D**ecommissioning

Overview and Progress

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Transformative Science and Engineering for Nuclear Decommissioning

Acknowledgements

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The Energy Programme is a UK Research and Innovation initiative led by EPSRC and contributed to by BBSRC, ESRC, NERC and STFC

Code: EP/S01019X/1

EPSRC

Engineering and Physical Sciences
Research Council

We also gratefully acknowledge funding from our key project partners:



Background

- EPSRC Collaborative research programme workshop 19th September 2017, Nuclear Consortia Follow-on Funding call 3rd January 2018, submission 16th March, interview 5th June, offer letter 31st August
- Project started 1st October 2018 to 30th September 2022
- £4.59M EPSRC → total £5.73M, plus £3.70M from industry = £9.43M
- World-class University network:

Imperial College
London

Lancaster
University

QUEEN'S
UNIVERSITY
BELFAST

UNIVERSITY OF
BIRMINGHAM

University of
BRISTOL

UNIVERSITY OF LEEDS

MANCHESTER
1824
The University of Manchester

The
University
Of
Sheffield.

UNIVERSITY OF
Southampton

University of
Strathclyde
Glasgow

UNIVERSITY OF
SURREY

- Key project partners:

AWE

cavendish
nuclear

LLWR Ltd

NATIONAL NUCLEAR
LABORATORY

NDA

Radioactive Waste
Management

Sellafield Ltd

TUV
SUD

NUCLEAR
TECHNOLOGIES



Transformative Science and Engineering for Nuclear Decommissioning

Objectives

- To carry out internationally leading science and engineering research in area of decommissioning, immobilisation and management of nuclear waste
- To undertake research that leads to innovative technology developments that can be applied in industry
- To develop new multi-disciplinary research and innovation partnerships between academic and industry researchers
- To train next generation of UK researchers with relevant skills and experiences that can be applied in sector
- To provide focus for all stakeholders, including government, industry and academics, through which current and future research and innovation requirements can be discussed
- To provide route for public understanding of research and development needs, opportunities and solutions

Research Areas

Technical Themes

Integrated Waste Management (Leads: Claire Corkhill / Joe Hriljac):

- New Materials and Methods for Decontamination of Effluent / Modelling and Experiments for Understanding Pond and Silo Sludge Behaviour / Wasteform Science
- Focus on areas relevant to hazard reduction and decommissioning

Site Decommissioning and Remediation (Leads: Becky Lunn / Luc Vandeperre):

- Colloidal-Silica Grout / Electrokinetic Ground Remediation / Non-Invasive Monitoring of Soil Contamination, Structural Degradation, Assessment and Repair
- Focus on new technologies for monitoring, remediation and containment to minimise volumes of waste for disposal

Spent Fuels (Leads: David Read / Tom Scott):

- Properties and Reactivity of Bulk Corrosion Products / Pressing Fuel Barrier Corrosion / In-Situ Identification of Nuclear Fuel Materials and Surface Corrosion Products / Prediction of Long-Term SNF Behaviour
- Focus on improved understanding and identification of properties of corrosion products and fuel barrier corrosion issues

Nuclear Materials (Leads: Colin Boxall / Nik Kaltsoyannis):

- Surface Chemistry of PuO_2 under Conditions Relevant to Interim Storage / Plutonium Immobilisation in Advanced Ceramic Wasteforms
- Focus on option development: interim storage, and incorporation of Pu into wasteforms for disposition

Cross-Cutting Activities

Facilities (Lead Neil Hyatt):

- Includes EPSRC / NDA / RWM funds for active work

Impact (Lead Jo Renshaw and Impact Committee):

- Relationships and Networks
- Communication and Dissemination
- Public, Media and Government Engagement
- Training and Development
- Knowledge Transfer and Commercialisation
- Includes flexi-funds



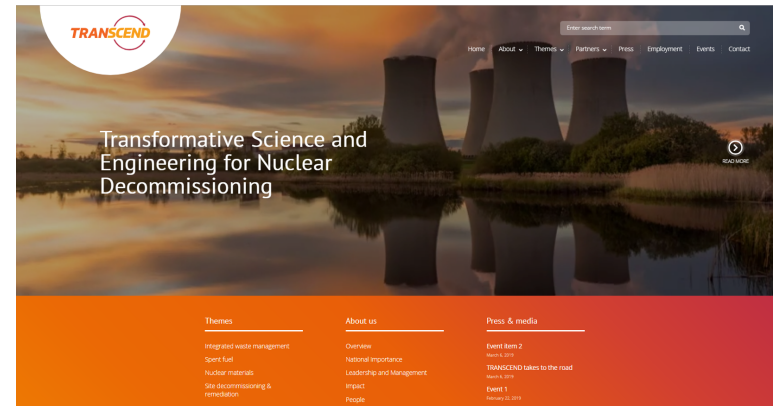
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Project Details / Recruitment

Proj No	Project title	University	Lead Investigator	PDRA/PhD	Funding	Researcher
Theme 1 IWM - Integrated Waste Management						
1.1.1	New materials and methods for decontamination of effluent	Birmingham	Joe Hriljac	PDRA	EPSRC	
1.1.2	Nanotechnology for effluent treatment and radionuclide assay	Imperial	Luc Vandeperre	PDRA	EPSRC	
1.1.3	Scoping studies of new ion exchange materials	Birmingham	Joe Hriljac	PhD	SL	
1.1.4	In-situ ion exchange studies of zeolites	Birmingham	Joe Hriljac	PhD	Birmingham	
1.2.1	Particle-laden flow characterisation and prediction	Leeds	Mike Fairweather	PDRA	EPSRC	
1.2.2	Radiation induced changes in effluents/sludges (RICHES)	Manchester	Fred Currell	PDRA	EPSRC	
1.2.3	Simulation of behavioural modification effects in suspension waste pipe flows	Leeds	Mike Fairweather	PhD	Leeds	
1.2.4	Advanced characterisation of waste pipe flows with polymeric behavioural modifiers	Leeds	Tim Hunter	PhD	Leeds	
1.2.5	Modelling nanoscale radiation physics/chemistry processes in sludges	Manchester	Fred Currell	PhD	QUB	
1.3.1	Durability of magnesium silicate cements	Imperial	Luc Vandeperre	PhD	Imperial	
1.3.2	Radiation effects on wasteforms	Manchester	Laura Leay	PhD	Manchester	
1.3.3	Encapsulation of orphan wastes using magnesium phosphate cements	Sheffield	Hyatt	PhD	Sheffield	
1.3.4	Novel approaches to encapsulation of low level waste	Strathclyde	Renshaw	PhD	0.5 LLWR / 0.5 Strath	
1.3.5	Characterisation of thermal treatment products	Sheffield	Claire Corkhill	PhD	NDA	
1.3.6	Process monitoring of thermal treatment of nuclear wastes	Sheffield Hallam	Paul Bingham	PhD	NDA	
1.3.7	Understanding glass melt chemistry in thermal treatment of nuclear waste	Sheffield	Russell Hand	PhD	SL	
Theme 2 SDR - Site Decommissioning and Remediation						
2.1.1	Inhibiting radionuclide migration during deconstruction and decommissioning	Strathclyde	Rebecca Lunn	PDRA	EPSRC	
2.2.1	Electrokinetic ground remediation, and combination with colloidal silica grouting	Southampton	Andy Cundy	PDRA	EPSRC	
2.2.2	Electrokinetic remediation application to soils, concretes and other site and process wastes	Southampton	Andy Cundy	PhD	Southampton	
2.3.1	In-situ groundwater monitoring to improve identification of ground/soil contamination volumes	Lancaster	Malcolm Joyce	PhD	SL	
2.3.2	Predicting gamma dose rates from buried pipelines based on limited information	Surrey	Caroline Shenton-Taylor	PhD	NDA	
2.3.3	Muon tomography for monitoring civil nuclear assets	Strathclyde	Marcus Perry	PhD	Strath/Cav Nuclear	
2.3.4	Field deployment of biomineral technologies for treatment/repair of concrete nuclear infrastructure	Strathclyde	Rebecca Lunn	PhD	Cavendish Nuclear	
Theme 3 SF - Spent Fuels						
3.1.1	Assessing the properties and release behaviour of products from metallic and exotic fuel corrosion	Bristol	Tom Scott	PDRA	EPSRC	
3.1.2	An investigation of corrosion and leaching of carbide fuels in a geological disposal facility	Bristol	Tom Scott	PhD	RWM	
3.1.3	MOX SIMFUEL, is it a good analogue?	Lancaster	Colin Boxall	PhD	RWM	
3.2.1	Characterisation of perforated AGR fuel and its behaviour during drying	Leeds	Bruce Hanson	PhD	NDA	
3.2.2	SCC in AGR cladding (micromechanical testing of irradiated clad)	Bristol	Scott	PhD	SL	
3.3.1	In-situ identification of surface corrosion products on spent nuclear fuels	Surrey	David Read	PDRA	EPSRC	
3.3.2	Predicting the corrosion of spent nuclear fuels	Surrey	David Read	PhD	Surrey	
3.4.1	Building the foundations of a predictive tool for spent fuel behaviour	Bristol	Ross Springell	PDRA	EPSRC	
3.4.2	Building the foundations of a predictive tool for spent fuel behaviour	Bristol	Ross Springell	PhD	Bristol	
Theme 4 NM - Nuclear Materials						
4.1.1	Fundamental surface chemistry of PuO ₂	Lancaster	Colin Boxall	PDRA	EPSRC	
4.1.2	Atomistic simulation of Am incorporation into PuO ₂	Lancaster	Sam Murphy	PhD	Lancaster	
4.1.3	Quantum chemical modelling of PuO ₂ surface chemistry	Manchester	Nik Kaltsoyannis	PDRA	EPSRC	
4.1.4	Gas generation from the radiolysis of water on uranium oxides and ThO ₂	Manchester	Fred Currell	PhD	SL	
4.1.5	Computational modelling of PuO ₂ : Ageing and storage phenomena	Birmingham	Mark Read	PhD	NDA	
4.1.6	Recombination of gas-phase gases	Lancaster	Colin Boxall	PhD	NDA	
4.2.1	Plutonium immobilisation	Sheffield	Hyatt	PDRA	EPSRC	
4.2.2	Disposability of wasteforms for plutonium immobilisation and efficacy of surrogates	Sheffield	Corkhill	PDRA	RWM	
40 projects / 12 PDRAs / 27 PhDs			28 Started		12 to recruit	

Other Progress

- Kick-off, Leadership Team and Management Board Meetings – 09-11/18
- Website (<https://transcendconsortium.org/>), social media (Twitter / LinkedIn) and branding – 03/19
- Industry Roadshows – 12/18 and 01/19
- Start of secondments to BEIS – 04/19
- Annual Meeting, Leadership Team, Impact Committee, Management Board and International Advisory Group meetings – 04/19
- First Theme Meetings upcoming – Conference Centre, Lancaster University, 11th-12th November 2019





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Thank you for
your attention
Any questions?