



# Nuclear fuel cycle conference

23–25 April 2012, Manchester, UK

Conference programme and registration book



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23–25 April 2012

**Manchester Conference Centre, Manchester, UK**

## Introduction

Substantial new-build of nuclear power reactors is planned on an international basis to provide security of electricity generation, low carbon emissions, and independence from fossil-fuel market supply risks. For example, China plans construction and operation of 100 GW(e) nuclear capacity by 2020.

New facilities are under construction and planned for worldwide support of the front and back-ends of the nuclear fuel cycle. These include commercial uranium supply, enrichment, and fabrication facilities at the front-end. At the backend, national and international efforts support fuel storage developments prior to disposal. Recycling initiatives based on advanced reactor types to extend

fissile material supply and further developed fuel cycles to optimize waste management are also being progressed. The UK, after a several decade period of much reduced reactor construction now expects 5–10 commercial reactors to commence operation in the next two decades.

This brings the need to seek international expertise and supply, modernise some domestic plants, examine the potential use of existing nuclear materials, and further consider options for processing and geological disposal. Clearly, the international commercial arrangements and EU legislative frameworks for the nuclear fuel cycle will significantly influence the UK approach.

IChemE believes that nuclear power will continue to fulfil a significant part of global energy demand in the short and medium term and calls on decision makers and opinion formers to conduct a rational debate that provides a positive climate for further R&D in waste management, spent fuel processing and advanced reactor design.

A Roadmap for 21st Century Chemical Engineering, IChemE

# Conference programme

(Please note that the programme may be subject to alteration without notice)

## Monday 23 April, 2012

- 08:00 Registration
- 09:00 Workshop – Conference rooms, North and South Springfields, NNL, Preston (*optional extra*)
- 13:00 Westinghouse: Springfields site visit (*optional extra*)
- 19:00 Welcome reception in Weston room 1

## Tuesday 24 April, 2012

- 07:30 Registration
- 08:30 Welcome and introduction – Bill Harper – Chairman of the organising committee  
**Location: Weston Theatre**
- 08:40 Keynote speaker:  
Dr Harold McFarlane, Idaho National Laboratory, US  
*Technical developments in nuclear fuel cycle*  
**Location: Weston Theatre**
- 09:20 Keynote speaker:  
Ron Cameron, OECD-NEA, France  
*Trends toward sustainability in nuclear fuel*  
**Location: Weston Theatre**
- 10:00 Refreshment break, viewing of posters and exhibition -  
**Weston Room 2 & 3**
- 10:20 Keynote speaker:  
Dr Derek Stork, Culham Centre for Fusion Energy, UK  
*Technical challenges in realising the nuclear fusion fuel cycle*  
**Location: Weston Theatre**
- 11:15 Poster and exhibition viewing - **Weston Room 2 & 3**
- 12:30 Lunch
- 13:30 Keynote speaker:  
David Shropshire, JRC Petten, The Netherlands  
*Economics of the nuclear fuel cycle*  
**Location: Weston Theatre**
- 14:10 Delegates move to parallel sessions

	Weston Theatre	Cockcroft Theatre
	Theme: Fuel / front end Chairman: Glyn Rossiter and Robert Gregg (NNL)	Theme: Alternative SNF management Chairman: Bruce Hanson (NNL)
14:15	Synthesis of Uranium dioxide microspheres by water and nitrate extraction from uranyl-ascorbate sols <i>M Brykala, A Deptula, W Lada, T Olczak, D Wawszczak, A G Chmielewowski</i> Institute of Nuclear Chemistry and Technology, Poland	PRISM Fuel Cycle <i>D Powell, GE-Hitachi, UK</i>
14:45	A review of the experimental investigations into the diffusion coefficient of fission gases in nuclear fuel <i>M Gentile, T Abram</i> School of MACE, University of Manchester, UK	Melt refining of metallic fast reactor fuel <i>C Humrickhouse &amp; J Walter</i> Texas A&M University & TerraPower, US
15:15	MOX in reactors: present and future <i>M Arslan, Remi Coulon, JP Gros &amp; A Marincic, E De Villele</i> AREVA NC & AREVA NP, France	Inductive heating for partitioning of fission products from spent nuclear fuel <i>N Shcherbina, N Kivel, I Günther-Leopold, D Kulik</i> Department of Nuclear Energy and Safety, Switzerland
15:45	The characteristics of spent AGR fuel and what we can learn from spent LWR fuel? <i>G Rossiter</i> NNL, UK	Spent fuel contingency: drying <i>A Allen</i> Sellafield, UK

16:15 Refreshment break, viewing of posters and exhibition –  
Weston room 2 & 3

16:30	Impact of Gd01.5 phase transitions on the processability of Gd01.5 and UO <sub>2</sub> -Gd01.5 blends <i>J B Henderson</i> Netzch Instruments North America, US	Spent fuel contingency: canister development <i>A Allen</i> Sellafield, UK
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17:00	Analysis of the UK Nuclear Fission Roadmap using the ORION fuel cycle modelling code <i>R Gregg, NNL, UK</i>	The long term pond storage of sensitised AGR fuel <i>D J Potter, C J Donohoe, BJ Hands NNL, UK</i>
17:30	Session closed	

- 17:30 Close of conference day one
- 19:00 Pre dinner drinks reception  
Macdonald Hotel Manchester
- 19:30 Conference dinner (optional extra)  
Macdonald Hotel Manchester

## Wednesday 25 April, 2012

- 07:30 Registration
- 08:00 Keynote speaker:  
Professor Timothy Abram, University of Manchester, UK  
*Advanced reactor systems and associated fuel cycles*  
Location: **Weston Theatre**
- 08:40 Keynote speaker:  
Robin Taylor, NNL, UK  
*Advanced fuel recycling processes*  
Location: **Weston Theatre**
- 09:20 Keynote speaker:  
Professor Laurence Harwood, University of Reading, UK  
*Selective ligands for actinide-lanthanide separations*  
Location: **Weston Theatre**
- 10:00 Refreshment break, viewing of posters and exhibition –  
**Weston room 2 & 3**
- 10:20 Delegates move to parallel sessions

	Weston Theatre	Cockcroft Theatre
	<p><b>Theme: Advanced U-Pu fuel cycles</b>  <b>Chairman: Laurence Harwood</b>  <b>University of Reading, UK</b></p>	<p><b>Theme: Decommissioning and waste management</b>  <b>Chairman: George Elder, Onet,</b>  <b>UK</b></p>
10:25	<p>Novel approaches to the separation of trivalent actinides from used nuclear fuel  <i>T Todd, INL, US</i></p>	<p>Trajectory tracking control of a wheeled mobile robot used in decommissioning  <i>B Lennox, A Stancu, University of Manchester, UK &amp; R Solea, University of Galati, Romania</i></p>
10:55	<p>Towards a new GANEX 2nd cycle process for the co separation of TRU  <i>K Bell, M Carrott, C Gregson, R Taylor, NNL, UK, C Carpentier, A Geist, D Magnusson, U Müllich, Karlsruhe Institute of Technology, Germany, X Hérés, CEA, France, R Malmbeck JRC, Germany, G Moldolo, A Wilden, Forschungszentrum Jülich, Germany</i></p>	<p>Synthesis of perovskite (CaTiO<sub>3</sub>, component of SYNROC C) by complex sol gel process for nuclear waste immobilization  <i>T Smolinski, A Deptula, T Olczak, W Lada, A G Chmielewski &amp; F Zaza INCT, Poland &amp; ENEA, Italy</i></p>
11:25	<p>Demonstration of a 1st cycle SANEX process for the selective recovery of trivalent actinides from purex raffinate using a CyMe4BTBP TOGDA solvent  <i>A Wilden, C Schreinemachers, F Sadowski, S Gülland, M Sypula, G Modolo, Forschungszentrum Jülich, Germany, D Magnusson, A Geist, Karlsruhe Institute of Technology, Germany, F Lewis, L Harwood, M Hudson, University of Reading, UK</i></p>	<p>Dealing with the UK's natural and low enriched uranic residue legacy  <i>G Gill, Springfield Fuels, UK</i></p>
11:55	<p>Mitigating the climate change by improving actinides recycling: Towards a sustainable nuclear energy  <i>C Poinssot, B Boullis CEA, France</i></p>	<p>Life cycle assesment of the decommissioning of nuclear facilities  <i>S Wallbridge, A Banford, A Azapagic University of Manchester, UK</i></p>

12:25	<p><b>ACSEPT: Reprocessing for advanced fuel cycles</b>  <i>S Bourg, P H Guilbald, N Ouvrier, CEA, France, S Bouvet, ALCAN, France, C Cassayre, CNRS, France, G De Angelis, ENEA, Italy, C Ekberg, Chalmers, Sweden, AG Esperarero, CIEMAT, Spain, A Geist, Karlsruhe Institute of Technology, Germany, M Harrison, C Rhodes, R Taylor, NNL, UK, R Malmbeck, ITU, Germany, G Moldolo, Forschungszentrum Jülich, Germany</i></p>	<p><b>Particles: a decommissioning legacy</b>  <i>P Cartwright, Dounreay, UK</i></p>
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12:55 Lunch, viewing of posters and exhibition – **Weston room 2 & 3**

14:10 Delegates move to parallel sessions

	<b>Weston Theatre</b>	<b>Cockcroft Theatre</b>
	<p><b>Theme: Fuel cycle management, strategy and fusion.</b>  <b>Chairman: Colin Rhodes (NDA)</b></p>	<p><b>Theme: Waste management</b>  <b>Chairman: Anthony Banford (NNL)</b></p>
14:15	<p><b>Challenges for worldwide nuclear programmes: Some major technical and economic constraints on responses by various fuel cycles</b>  <i>G Butler, Integrated Decision Management, UK, S Howell, P Johnson, S Hall, D Liu, P Duck, University of Manchester, UK</i></p>	<p><b>Further development of a liquid jet sludge re-suspension model</b>  <i>G McArthur, Sellafield, UK</i></p>
14:45	<p><b>Future UK nuclear fuel cycle considerations and development requirements</b>  <i>T Semeraz, R Glenville, NNL, UK</i></p>	<p><b>Hot isostatically pressed wasteforms for future nuclear fuel cycles</b>  <i>E Maddrell, NNL, UK</i></p>
15:15	<p><b>Power reactor fuel fabrication scenario in India – Present and Future</b>  <i>H Rao, R N Jayaraj, Nuclear Fuel Complex Hyderabad, India</i></p>	<p><b>Characterising highly active nuclear waste simulants</b>  <i>N Paul, Institute of Particle Science and Engineering, UK</i></p>

15:45 Refreshments, viewing of posters and exhibition – **Weston room 2&3**

16:00	<p><b>Fuelling fusion reactors</b>  <i>S Knipe, M Kovari, L Garzotti, R Kemp, A Parracho, M Valovic, Culham Centre for Fusion Energy, UK</i></p>	<p><b>Investigation of water adsorption on metal oxide surfaces under conditions representative of PuO<sub>2</sub> storage containers</b>  <i>P Murphy, C Boxall, Lancaster University, UK, R Taylor, NNL, UK</i></p>
16:30	<p><b>The Jet Deuterium–Tritium fuel cycle</b>  <i>S Knipe, P D Brennan, JET–EFDA, Culham Centre for fusion Energy, UK</i></p>	<p><b>Measuring the erosion and dispersion of sediment beds in impinging jet ballast tanks using ultrasonic profilers</b>  <i>T Hunter, T Unsworth, S Biggs, School of Process, Environmental and Materials Engineering, University of Leeds, UK, J Peakall School of Earth and Environment, University of Leeds, UK</i></p>

17:00 Delegates move to Weston Theatre

17:05 YGN prize presentation

17.15 Panel discussion

17:35 Closing remarks

17:45 Conference closes

**Organised by:**



**Conference partner:**



**Supporters:**



# Poster papers:

## Fuel/front end

Crystal growth kinetics of uranium peroxide

*S Planteur, M Bertrand, CEA, France, E Plasari, ENSIC, France, B Courtaud, F Auger, Areva, France*

## Alternative SNF management

The storage of AGR fuel

*D Hambley, Z Hodgson, NNL, UK*

Elucidating the recipe for atmospheric degradation

*F Lydiatt, S Lyon, R Lindsay, University of Manchester, UK  
W Walters, NNL, UK, AG Thomas, Photon Science Institute, UK*

Spent fuel contingency: strategy

*A Allen, Sellafield, UK*

Fuels and fission product clean up for molten salt actinide recycler and transmuter system with and without Th support

*V Ignatiev, NRC-Kurchatov Institute, Russia, M Kormilitsyn SSC Research Institute of Atomic Reactors, Russia*

## Advanced U-Pu fuel cycles

Uranyl(VI) complexes with diamide ligands

*S Wahu, CEA Saclay, France, J C Berhet, P Thuéry, CEA/Saclay, France, R Guillot, LSOM - ICMMO, France, C Bresson, CEA Saclay, France*

Hydrolysis of hydroxamic acid complexants in the presence of non-oxidising metal ions

*F Andrieux, S Edwards, C Boxall, Lancaster University, UK, R Taylor, NNL, UK*

## Decommissioning

A near passive analogue approach to caesium-137 analysis for decommissioning applications

*A J Parker, C Boxall, M Joyce, Lancaster University, UK*

Surface decontamination by photocatalysis

*R Wilbraham, C Boxall, Lancaster University, UK, R Taylor, NNL, UK*

## Waste management

Nuclear waste suspensions – measurements using acoustic and optical measurements

*H Rice, University of Leeds, UK*

The development of metallised membranes for radioanalytical separation processes

*M Bromley, C Boxall, Lancaster University, UK*

Thermal conductivity and mechanical strength of glass graphite composite encapsulate Tri-isotopic fuel particles

*N Hamodi, T Abram, MACE, University of Manchester, UK*

Mechanisms of fixed contamination of commonly engineered surfaces

*R Woodhouse, C Boxall, R Wilbraham, Lancaster University, UK*

Please note the programme may be subject to alteration without notice.

## Organising and Technical Committee

The conference will be co-chaired by leading thinkers from within the nuclear field. William Harper, chair of the organising committee and David Hebditch, chair of the technical sub-committee, who will each provide a strong industry perspective. Current thinking from the academic research sphere will be drawn together by Professor Simon Pimblott and Robert Hayman from the Nuclear Institute will ensure a balance between the two fields.

### Organising committee members:

#### Chair:

- Bill Harper, Chairman

#### Committee:

- Prof. Simon Pimblott University of Manchester
- Claire Coombes, EDF Energy
- Rosemary Cragg, IChemE
- George Elder, Onet
- Robert Hayman, Nuclear institute
- David Hebditch Babcock International Group
- Keith Miller National Nuclear Laboratory
- Ben Salisbury, EDF Energy
- Joanne Sharp, IChemE
- Bob Skelton, University of Cambridge
- Tim Tinsley, National Nuclear Laboratory
- Jeroen Veenstra, EDF Energy

### Technical Committee Members

#### Chair:

- David Hebditch, Babcock International Group

#### Honorary Co-Chairmen:

- Professor Timothy Abram, University of Manchester
- Professor Bruce Hanson, National Nuclear Laboratory

#### Committee:

- George Elder, Onet
- Professor Bruce Hanson, National Nuclear Laboratory
- Professor Laurence Harwood, University of Reading
- Zara Hodgson, National Nuclear Laboratory
- Ashok Patel, Magnox North
- Colin Rhodes, NDA
- Richard Underhill, Babcock International Group

# General Information

## Nuclear Technology Special Interest Group

IChemE's Nuclear Technology Special Interest Group provides a network and forum for the technical and professional development of chemical engineers working in the nuclear industry. Chemical engineers are involved in all aspects of the nuclear power generation process. For further details regarding this special interest group and activities please contact Sue Deacon.

**tel: +44 (0)1788 578214, fax: +44 (0)1788 560833**

**email: [sdeacon@icheme.org](mailto:sdeacon@icheme.org)**

## Location

Situated centrally in mainland Britain, Manchester has a population of 2.5 million and is one of the largest economic regions outside London.

The city has recently undergone one of the most ambitious urban regeneration projects ever undertaken in Britain and innovative new buildings having won the acclaim of architects world-wide.

Excellent transport links connect Manchester with the UK and Europe. Manchester Airport, sited only 20 minutes from the city centre, serves over 200 worldwide destinations directly and offers flights from 22 British and Irish destinations. London is only two hours away by train.

## Venue

The Manchester Conference Centre enjoys a privileged position only minutes away from Manchester Piccadilly Station with its 15-minute rail shuttle to the airport, just 8 miles away, making the Centre ideally placed for meetings in Manchester.

As well as being conveniently situated in Manchester city centre, the Manchester Conference Centre is a compact self-contained site and there is a multi-storey car park adjacent to the venue.

## Accommodation

Rooms are currently available in the Weston Building (in which the conference is being held), the Macdonald Hotel, London Road and at the IBIS Hotel, Charles Street., which are close to the Weston Building.

Delegates must make their own arrangements directly with either the Manchester Conference Centre, Macdonald Hotel or the IBIS hotel, and should do so early to secure this convenient accommodation, as availability is limited.

### ■ Weston building

Hotel Standard room: single occupancy £79.00 per night, double occupancy £89.00 per night inclusive of VAT, and full English breakfast

Enquiries and bookings/reservations should be directed to:-

The Manchester Conference Centre, Weston Building, Sackville Street, Manchester, M1 3BB. **Tel: 0161 955 8062 Fax: 0161 955 8050**  
**email: liame@days-mcc.co.uk.** Quoting "NFCC2012"

### ■ IBIS HOTEL

Hotel standard room £59.00 per night, inclusive of VAT. Buffet breakfast £6.50 each.

Booking reservations should be sent directly to: IBIS Hotel, Charles Street, Manchester, M1 7DL. **Tel: 0161 272 5000, Fax : 0161 272 5010,**  
**email: H3143@accor.com**

### ■ Macdonald Hotel

The 4-star Macdonald Manchester Hotel sits in the heart of Manchester, within walking distance of Piccadilly train station and close to major motorways. Hotel superior rooms £105 per night and city view rooms, £115 per night. (Breakfast included)

Booking reservations should be sent directly to: Macdonald Manchester Hotel & Spa, London Road, Manchester M1 2PG. **Tel: +44(0)844 879 9088**  
**www.macdonaldhotels.co.uk/manchester**

## How to get to Manchester

**By air:** Manchester's international airport serves over 200 overseas destinations and most of the world's major airlines – including nearly every major intercontinental and European scheduled carrier. Manchester has become a major hub for low cost airlines, reducing the cost of hundreds of short haul routes to continental Europe.

The average flight times to Manchester from Europe is 1 – 3 hours

**By train:** Most major cities in the UK have direct train services into Manchester. Virgin Trains now run a fleet of high speed trains which sees journey times between Manchester and London of just over two hours.

**By road:** Manchester's ring road connects Manchester to motorways North, South, East and West.

## Documentation

All delegates who are fully registered to attend the conference will be issued with a CD containing copies of the full manuscripts and posters. All presentations given at the conference will be available (subject to the author's permission) on the conference website after the conference.

## Official language

The conference language is English.

## Insurance

Delegates are advised to arrange adequate insurance, as the conference organisers cannot cover persons against cancellation of their booking or theft of possessions.

## Sponsorship and exhibition

A large number of prestigious companies have already taken up sponsorship opportunities for the event, but there are still a limited number of opportunities available. Alternatively, you could take exhibition space to take advantage of the unique opportunity to promote your products to the key names in the process intensification field in Europe.

If you would like to receive further information sponsorship opportunities or exhibition space, contact: Jo Sharp: [jsharp@icheme.org](mailto:jsharp@icheme.org)

## Social programme

To welcome you to the conference, on the evening of Monday 23 April delegates are invited to attend a welcome reception, which will take place in Weston Room 1 commencing at 19:00. The reception will include a selection of drinks and canapes. There is no charge for this event, please indicate on the registration form if you wish to attend.

## Conference dinner

A conference dinner will take place on the evening of Wednesday 24 April at the Macdonald Hotel. The evening will start at 19:00 with pre dinner drinks followed by a three course dinner with wine. The cost of the dinner will be £40+ VAT per person. Please indicate on the registration form if you wish to attend.

# Registration

To register on-line to attend this event visit [www.icheme.org/nfcc](http://www.icheme.org/nfcc) or alternatively complete the registration form below and return with your remittance to: Conferences department, IChemE, Davis Building, Railway Terrace, Rugby, CV21 3HQ, UK. Tel: +44(0)1788 578214, Fax: +44(0) 1788 560833

I am a member of IChemE:  Yes  No Membership number: .....

Last name: ..... First name: .....

Preferred name on badge: .....

Title (Dr/Mr/Miss/Mrs/Ms/ Prof/Eur Ing): ..... Gender:  Male  Female

Work details – company: .....

Job title: ..... Department: .....

Country: ..... Post/zip code: .....

Address: .....

Town/city: ..... County/state: .....

Vat Number: .....

Direct telephone: ..... Direct fax: .....

Email: .....

\*Any special dietary requirements: .....

## Registration fees

- Early bird registration (before 24 Feb) Non IChemE member ..... £499.00 + VAT
- Early bird registration (before 24 Feb) IChemE/All co-sponsoring organisation £350.00 + VAT
- Full registration (after 24 Feb) Non IChemE member £599.00 + VAT
- Full registration (after 24 Feb) IChemE/All co-sponsoring organisation £450.00 + VAT
- Author registration fee £350.00 + VAT
- Student £149.00 + VAT
- I wish to attend the symposium dinner (24 April 2012) as an optional extra of £40 + VAT
- I plan to attend the FREE reception and buffet on Monday 23 April
- I wish to attend the site visit (23 April 2012) as an optional extra of £30 + VAT
- I wish to attend the workshop (23 April 2012) as an optional extra of £30 + VAT

## Method of payment

(Payment must be received in full before the event date otherwise admission cannot be guaranteed). All fees shown in Sterling and VAT at the Standard UK rate of 20% is applicable.

Your booking will be confirmed by IChemE on receipt of one of the following:

- Official purchase order
- Cleared funds

Please debit my credit/debit card:

Cardholder name (as it appears on the card): .....

Billing address (if different from overleaf): .....

Post/zip code: .....

Mastercard  Visa  Visa debit/delta  Maestro  Amex  Debit Mastercard

Card number:

Valid from date:   /   Expiry date:   /   Issue Number: .....

Security code:

Card holder's signature: .....

Card holder's telephone number: .....

Cheque enclosed (made payable to Institution of Chemical Engineers)

Please invoice my company quoting purchase order number. Please note that registration cannot be processed unless a copy of your purchase order is received with your registration form. If your company does not use purchase order numbers, please attach a formal request to invoice on your company's letterhead.

#### Cancellation policy

Cancellations received in writing 28 days prior to the event will be subject to an administration charge of 10% of the fees + VAT. No refunds will be given for non-attendance or cancellations received less than 28 days prior to the event. Substitutions will be welcome at any time. We reserve the right to cancel or alter the programme.

In accordance with the Data Protection Act, IChemE (including staff, voluntary officers and companies processing data on IChemE's behalf) will hold and use the data contained on this application for administration purposes, to keep you informed of activities, and offer goods and services provided by IChemE. For members who live outside the UK, data may be transferred to their local centre.

It is the express wish of IChemE's Council that information relating to members is only available to IChemE and not for direct access by third parties. Arrangements are occasionally made with suppliers of goods and services for their mailings to be sent to members. All material is carefully vetted and the mailing list is never released to third parties.

IChemE is fully registered under the Data Protection Act.

The following statements do not apply to any correspondence relating to this booking. Emails will be sent confirming your registration, payment and information relating to the event, as well as joining instructions.

If you would prefer not to receive information via post about IChemE products, services, regional and subject group activity please tick the box.

If you would prefer not to receive the IChemE monthly member news e-mail, or other emails about IChemE products, services, regional and subject group activity please tick the box.

If you would prefer not to receive information about third party products and services please tick the box.

If you would prefer not to receive text messages about IChemE products, services, regional and subject group activity please tick the box.

IChemE is a registered charity in England and Wales, and a charity registered in Scotland (SC 039661)

**IChemE offices in Kuala Lumpur, London, Melbourne, Rugby, Shanghai and Wellington**

**[www.icheme.org](http://www.icheme.org)**

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