

# UK INNOVATION IN FUTURE NUCLEAR SYSTEMS.

Institution of  
**MECHANICAL  
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**Examining fusion and fission  
research to solve nuclear  
engineering challenges  
and design for the future**

1 December 2011  
Abingdon, Oxfordshire

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## **BY ATTENDING THIS EVENT YOU WILL:**

- Gain a better understanding of the breadth and ambition of UK nuclear technology and expertise
- Better appreciate national capabilities in nuclear technology and the role of R&D
- Network with R&D experts
- Hear key project case studies

Image courtesy of CCFE

# UK INNOVATION IN FUTURE NUCLEAR SYSTEMS.

The future development of the UK nuclear industry gives rise to a number of challenges for the organisations involved. Overcoming these challenges requires innovative design solutions and an understanding of the latest techniques and technologies.

New nuclear systems projects for the future, including fission and fusion projects, will be discussed in detail at this seminar.

Delegates will learn about the technologies and expertise being developed in the UK, to help ensure that the engineering decisions they make in formulating design solutions for new reactors align with the latest techniques and understanding in the field.

Presentations will be given by key organisations on projects varying from innovative fission systems for electricity generation and civil marine propulsion, through to advanced fusion energy technologies utilising either magnetic or inertial confinement.

## THIS EVENT WILL ATTRACT:

- Engineering designers
- Nuclear consultants
- Researchers
- Nuclear project managers
- R&D personnel

## TECHNICAL ADVANTAGES:

- Help ensure that the engineering decisions made in new nuclear technology align with the latest techniques and understanding
- Gain an overview of the engineering work being conducted in the UK in developing new nuclear reactor technologies and supporting systems
- Learn about technical solutions to nuclear engineering problems
- Hear presentations from engineers working in nuclear research or as engineering consultants to the nuclear sector
- Gain an understanding of how conducting research will benefit the nuclear industry

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# UK INNOVATION IN FUTURE NUCLEAR SYSTEMS.

## 1 DECEMBER 2011

### CULHAM CONFERENCE CENTRE, ABINGDON, OXFORDSHIRE

#### 09:00 REGISTRATION AND REFRESHMENTS

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#### SESSION ONE: FISSION

Chairman: Dr William J Nuttall, Senior Lecturer – Technology Policy, University of Cambridge

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#### 09:45 CHAIRMAN'S WELCOME AND INTRODUCTION

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#### 09:50 FUTURE NUCLEAR SYSTEMS: THE UK ENGINEERING CHALLENGE

Steve Cowley, Chief Executive, Culham Centre for Fusion Energy (CCFE)

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#### 10:10 GENERATION IV FAST REACTORS IN A CLOSED FUEL CYCLE

- Reactors working within a closed fuel cycle
- Existing thermal reactors in an open fuel cycle
- Reactors using fission based on fast neutrons
- Brief history of the UK's experience with fast reactor technology, contribution to the development of Generation IV fast reactors and benefits of greater involvement on a national level

Dr Richard Stainsby, Technical Specialist, Advanced Reactor Analysis, AMEC

Richard Stainsby has over 26 years' experience in the UK nuclear industry. He first worked for UKAEA on fast reactor advanced fuel concepts and core and plant thermal hydraulics. Richard's experience with fast reactors then involved PFR decommissioning and work on Accelerator Driven Systems (ADS). Since joining AMEC in 2004, he has worked on three of the six Generation IV systems. He was also Coordinator of the Euratom FP6 Gas-Cooled Fast Reactor (GFR) Specifically Targeted Research Project and sits on a number of GFR committees and safety management Boards.

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#### 10:30 REFRESHMENTS

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#### 11:00 ACCELERATOR-DRIVEN SUBCRITICAL REACTORS

- Hybrid reactors may couple a particle accelerator to a subcritical core
- These accelerator-driven subcritical reactors (ADSRs) offer several advantages over normal reactors
- ADSRs have particular applications in the thorium cycle and for actinide burning
- Non-scaling FFAG accelerators offer a potential path to high-current proton drivers required in ADSRs
- Medium-power (kWth) demonstration is an important next step to demonstrating ADSR viability

Hywel Owen, Lecturer - Accelerator Group, University of Manchester

Hywel Owen has worked for a number of years on large accelerator projects, including a key role on the DIAMOND UK national X-ray synchrotron. More recently he worked on the UK's first free-electron laser, ALICE, and on the world's first non-scaling FFAG demonstrator, EMMA. He was previously a researcher at Daresbury Laboratory – now part of STFC. As well as lecturing at the University of Manchester, Hywel is part of the Cockcroft Institute for Accelerator Science & Technology and has close ties to the Dalton Nuclear Institute.

#### 11:30 COULD NUCLEAR BE THE GREEN MARINE POWER SOURCE OF THE FUTURE?

- The challenges for the marine industry
- A systems engineering approach to marine nuclear propulsion
- Key issues for the adoption of nuclear propulsion

Aidan Goldsworth, Head of Knowledge, Advanced Concepts and External Research, Rolls-Royce

Aidan Goldsworth has held a range of engineering, project and general management and engineering leadership roles during his 30 year career within the submarines business of Rolls-Royce. During this time he also gained an MSc in Nuclear Reactor Technology at the Royal Naval College and became a fellow of IMechE. Aidan's current role encompasses many of the strands that are needed for the business to sustain the development of its nuclear products

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#### 12:00 FUTURE NUCLEAR SYSTEMS IN MARINE PROPULSION

- Adaptation for marine use
- Core design and reactor physics
- Shielding and materials
- Thermal hydraulics and dynamics
- Safety and security

Dr Paul Chard-Tuckey, Head of Nuclear Engineering, and Dr Kirk Atkinson, Lecturer – Nuclear Department, Defence Academy, Ministry of Defence

Paul Chard-Tuckey's joined the UK Ministry of Defence as a ballistics trials & experimental officer, working with the Army on a range of prototype weapon systems. He then spent a number of years in the MoD Defence Equipment & Support organisation in Bristol as a Project Manager, involved with various projects in support of the Naval Nuclear Propulsion Submarine Programme. He is currently based at HMS Sultan, where he lectures Nuclear Materials Science and leads a materials & chemistry research team.

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#### 12:30 PANEL DISCUSSION

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#### 12:50 LUNCH

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#### IMPORTANT VENUE INFORMATION:

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## **SESSION 2: FUSION**

**Chairman: Mark Shannon, Engineering Support Group Leader, CCFE**

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### **13:50 ORION – INNOVATIONS ON THE JOURNEY TO THE HOTTEST DENSEST PLACE IN BERKSHIRE**

- Orion facility: introduction and overview – designing for optical stability (outline requirements)
- Building construction: general specification, key features, challenges
- Installed equipment: major components, design considerations, modelling
- Learning opportunities: what could have been done better?
- A new resource for UK nuclear innovation

**Simon Dillon, Engineering Manager, and Paul Morris, Group Leader, AWE**

Simon Dillon started his engineering career at AERE Harwell as a Mechanical Apprentice in 1977. Before moving to AWE in 2005, previous work experience included supplying ion implant equipment to the semiconductor industry, developing linacs for the medical industry and working at Culham on the JET project. After working on the Orion project for four years, he moved to supporting engineering operations in the Hydrodynamics Division, as part of the AWE Directorate of Science & Technology.

Paul Morris is Group Leader for Plasma Physics Engineering and Engineering Manager for the Orion Project. He was employed by the MoD during his university degree and has worked on projects including the development of novel inspection equipment for use in RA and explosive areas, precision machine tool improvements and development of maintenance processes to meet NII licence requirements. He was recruited to the Plasma Physics Department to manage the technical proposals for and subsequently the design of the Orion laser.

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### **14:20 HIPER: THE EUROPEAN PATH TO INERTIAL FUSION ENERGY**

- Overview of the principles of laser fusion energy
- The project's delivery strategy
- Recent scientific and technical progress in key areas
- How the project is moving forward

**Michael John Tyldesley, HiPER Integration Manager, Science & Technology Facilities Council (STFC)**

Mike Tyldesley has 25 years' experience in a wide variety of engineering design, construction and commissioning roles. He started his career as a Design & Service Engineer with Vickers Marine Engineering Division (VMED), progressing to specialist projects design, installation and commissioning for both Brown & Root Defence and Devonport Royal Dockyard. More recently he has been with AWE Aldermaston, serving as Head of Control and Instrumentation Engineering, Assistant Head of Engineering and Engineering Operations Manager before his current role on the High Power Laser Energy Research (HiPER) Project.

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### **14:50 REFRESHMENTS**

### **15:20 MAST – UPGRADE PROJECT INNOVATIONS**

- MAST and MAST upgrade aims
- MAST upgrade description
- MAST upgrade engineering challenges

**Dr Ioannis Katramados, Project Support Section Leader, CCFE**

Ioannis Katramados, Mechanical Engineer and Section Leader, has been with CCFE for four years. He is currently responsible for the design of the MAST upgrade machine, a project due to be delivered in 2015. He has an MSc and a PhD in Mechanical Engineering from UMIST, Manchester and previously worked with companies including Oxford Instruments in designing high-field superconducting NMR magnets and Oxford FMB in designing synchrotron beamlines. Ioannis is a Chartered Engineer and Assessor with IMechE.

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### **15:50 CULHAM INNOVATION IN ITER HEATING SYSTEMS DESIGN**

- Overview of ITER plasma heating systems
- Design challenges in a fusion environment
- Specific examples of designs

**Roel Verhoeven, Section Leader – Engineering Design Section, CCFE**

Roel Verhoeven has an MSc in Mechanical Engineering from the Eindhoven University of Technology in the Netherlands. He worked for four years as a Maintenance Engineer at Heysham 1 power station, where he was involved in specifying plant modifications and upgrades. In 2007 Roel joined CCFE, where he undertakes analysis and production of designs for fusion systems. Most of this work is related to 'neutral beam' heating systems.

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### **16:20 PANEL DISCUSSION**

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### **16:45 ROUND-UP REMARKS AND CLOSE OF SEMINAR**

This programme is subject to change.

The Institution is not responsible for the views or opinions expressed by individual speakers.

#### **Power Industries Division Organising Committee:**

Mark Shannon, Culham Centre for Fusion Energy  
William J Nuttall, University of Cambridge

#### **The Committee would like to thank the following supporters:**

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[www.imeche.org/events/S1647](http://www.imeche.org/events/S1647)

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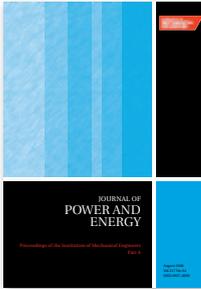
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One form per person only (forms may be photocopied)

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By submitting this registration form, you will be indicating your consent to periodically receiving information on our events and publications, unless you indicate an objection to receiving such information by ticking this box

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