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Winter School 2016

Co–organised by the 'EPSRC Centre for Doctoral Training in CCS and Cleaner Fossil Energy' & the 'UK CCS Research Centre'

15th to 18th February 2016

Winter School 2016

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Held at the Halifax Hall and Inox Dine, University of Sheffield

15th to 18th February 2016

Aim of the Winter School

The 2016 Winter School will involve researchers from the EPSRC Centre for Doctoral Training in CCS and Cleaner Fossil Energy (*www.ccscfe-cdt.ac.uk*) and the UK CCS Research Centre (*www.ukccsrc.ac.uk*).

The aim of the Winter School is to aid the development of interdisciplinary knowledge and capacity to apply research in conventional power, fossil energy and carbon capture and storage (CCS) technologies to solve problems in a range of global settings. The Winter School also enables researchers to develop an understanding of technical and social issues surrounding energy, the environment, climate change, development and socioeconomics in the UK.

Researchers will build on their knowledge and understanding provided throughout their research training to demonstrate critical thinking and multidisciplinary engagement aimed at finding novel solutions to real world problems in conventional power, fossil energy and carbon capture.

Learning Outcomes

On completion of the Winter School, students should be able to:

a) Knowledge and Understanding: assess the challenges of advancing fossil energy and CCS research in a range of global contexts; the need for cross-disciplinary understanding and stakeholder engagement when designing research solutions; the importance of cultural, economic, social, political and environmental awareness in enabling effective solutions to research problems.

b) Intellectual Skills: engage with a global and multidisciplinary literature; display advanced communication skills which span national and international contexts; develop reasoned arguments which take into account social, environmental and policy frameworks.

c) Professional Practical Skills: better present complex arguments and research findings in oral form to a non-specialist audience; collate data and ideas to develop and formulate research plans; network with engineers, social and environmental scientists to seek new solutions to national and global issues.

d) Transferable Skills: better define and deliver solutions to real world problems; interact effectively with the public, stakeholders, specialists and non-specialists; succinctly and clearly present complex ideas in oral form.

Attendees

Staff

• Prof Colin Snape	University of Nottingham
• Dr Anup Patel	University of Nottingham
• Ms Diane Vincent	University of Nottingham
• Ms Ciara O'Connor	UK CCS Research Centre
• Dr Fay Campbell	UK CCS Research Centre
• Ms Lisa Flaherty	University of Sheffield
• Mr Philip Sharman	Evenlode Associates
• Dr Rosemary Whitbread	Health & Safety Laboratory

Keynote Speakers

• Mr John Gale	IEAGHG
• Prof Jim Watson	University of Sussex
• Prof Jon Gibbins	University of Sheffield
• Prof Myles Allen	University of Oxford
• Mr Jeremy Carey	42 Technology
• Prof Jon Gluyas	Durham University
• Mr Matthew Billson	University of Sheffield

Students Centre for Doctoral Training in CCS and Cleaner Fossil Energy

• Sarah Angel-Smith	University of Nottingham
• Christopher Bridge	University of Nottingham
• Lawrence Coghlan	Loughborough University
• Patrick Daley	University of Nottingham
• Charles Dyson	University of Nottingham
• Haesul Fagcang	Loughborough University
• Genevieve Hodgins	University of Nottingham
• Hayden Morgan	University of Nottingham
• Daniel Neumann	University of Birmingham
• David Nichols	University of Nottingham
• Oluwaseun Olowojebutu	Loughborough University
• Joseph Perkins	University of Nottingham
• Jamie Pulsford	University of Nottingham
• Robert Railston	University of Nottingham
• Scott Russell	University of Nottingham
• Liam Reddy	University of Nottingham
• Robert Stirling	University of Nottingham
• David Walker	University of Nottingham
• Christopher Wiseall	University of Nottingham

Students UK CCS Research Centre

- Toluleke Emmanuel Akinola University of Hull
- Mohammed Dahiru Aminu Cranfield University
- Diarmaid Clery University of Leeds
- Ruta Karolyte University of Edinburgh
- Anthony Orji University of Hull
- Erika Palfi University of Edinburgh
- Kazeem Rabiu Loughborough University
- Matthias Schnellmann University of Cambridge
- Thomas Spitz University of Edinburgh

Venues

Halifax Hall Hotel

A beautiful period mansion, with a selection of conference rooms accommodating delegate numbers from 6 to 120. Halifax Hall is perfectly suited for conferences, breakfast meetings, away days and training days. Each room has been sympathetically refurbished, combining original 19th century features with state of the art conference equipment. The venue boasts landscaped gardens, perfect for taking discussion groups outside, open air lunches, barbecues and elegant drinks receptions on the lawn. With 38 boutique bedrooms, including three suites, Halifax Hall offers conference guests the opportunity for overnight stays and is the perfect setting to host guest speakers and VIPs.

Accommodation throughout the Winter School will be at this venue.

Inox Dine

Each room features the latest audio visual equipment and all rooms are flexible, allowing us to arrange them in the format you prefer and open them up to accommodate larger groups of up to 150. Most rooms lead out onto outdoor balcony areas with spectacular views across Sheffield city centre.

Map

Halifax Hall Hotel (blue circle)

Inox Dine (red circle - 118)

The distance between the two venues is approximately 1 mile, so around a 20 minute brisk walk

Key Contacts

Prof Colin Snape
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Dr Anup Patel
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Ms Diane Vincent
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Ms Lisa Flaherty
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Ms Ciara O'Connor
ciara@ukccsrc.ac.uk

Outline Programme

Monday 15th February – Halifax Hall

12:00-13:00	Arrival of delegates Registration and check-in to rooms
13:00	Lunch at Halifax Hall and display posters
14:00	Welcome introduction
14:15	Mr John Gale – International Energy Agency Greenhouse Gas *'Global overview of CCS'*
15:00	Prof Jim Watson – University of Sussex *'UK overview of CCS'*
15:45	Break and poster session
16:45	Prof Jon Gibbins – University of Sheffield *'Conventional Power'*
17:30	Break and poster session
18:00	Prof Myles Allen – University of Oxford *'The Carbon Price Trap: why conventional mitigation policies won't solve the climate problem — because they penalise CCS'*
19:00-21:00	Dinner at Halifax Hall

Tuesday 16th February – Inox Dine

07:00-09:00 Breakfast

09:00 Mr Jeremy Carey – 42 Technology
'CCS economics & financing'

09:45 Prof Jon Gluyas – Durham University
'CO_2 storage'

10:30 Break

11:00 Mr Matthew Billson – University of Sheffield
'UK Government perspective on CCS'

11:45 Lunch at Inox Dine

13:00-14:15 Individual student talks on research
15 minutes for each presentation and questions

Time	Name	Presentation Title
13:00	Sarah Angel-Smith	*The Characterisation of Diesel Deposits Using Advanced Analytical Methods*
13:15	Christopher Bridge	*Biomass Co-firing to Improve the Burn-out of Unreactive Coals in Pulverised Fuel Combustion*
13:30	Patrick Daley	*Bringing Ash Fusion Analysis into the 21st Century*
13:45	Hayden Morgan	*Does Oxygen Concentration, During Carbon Dioxide Injection, Affect Microbial Activity in Geological Storage Sites?*

14:00 Break

14:45-16:00 Individual student talks on research

Time	Name	Presentation Title
14:45	Daniel Neumann	*Ultrasonic Testing - Generating a Model to Predict Scatter in Complex Microstructures*
15:00	Liam Reddy	*A Parametric Study of FeCrB Powder Laser Deposition*
15:15	Scott Russell	*Assessment of Process Options for Producing BBQ Charcoal*
15:30	Matthias Schnellmann	*Multi-scale, Modular Simulation of Chemical Looping Reactors*
15:45	David Walker	*Advanced Steam Measurement Techniques*

16:00	Introduction to task for group activity and initial group meetings
16:15	Break
16:45-18:30	Group work in breakout rooms
19:00-21:00	Dinner at Halifax Hall

Wednesday 17th February – Inox Dine

07:00-09:00	Breakfast
09:00-11:00	Group work in breakout rooms
11:00	Break
11:15	Group work continued
12:00	Lunch at Inox Dine
13:00-18:00	Field trip to Drax Power Station
19:00-21:00	Dinner at Halifax Hall

Thursday 18th February – Halifax Hall

07:00-09:00	Breakfast
09:00-11:15	Group presentations – 10 minute talk using 2 slides
11:15	Break
11:30-12:00	Prize giving (best student talk, best poster, best group) and closing remarks
12:15	Lunch at Halifax Hall

Winter School Keynote Speakers

Mr John Gale
IEAGHG
John.Gale@ieaghg.org

John Gale has been associated with the energy industry for some 40 years. He has a degree in Pure and Applied Chemistry. He spent 18 years with The British Coal Corporation undertaking work on advanced coal fired power generation options. He then spent 7 years working as an environmental consultant with IMC Group Ltd. He joined the IEA Greenhouse Gas R&D Programme (IEAGHG) in 1999 and managed the Programmes activities on Non-CO_2 greenhouse gases, greenhouse gas abatement in energy intensive industries and geological storage of CO_2 before becoming General Manager in 2008. He also works directly to the Chair of the Executive committee and vice chairs on issues relating to strategic planning, etc., He represents IEAGHG on various IEA committees as required, such as the IEA Working Party on Fossil Fuels and coordinates IEAGHHG,s input to IEA publications like World Energy Outlook and Energy Technology Perspectives.

Professor Jim Watson
University of Sussex
W.J.Watson@sussex.ac.uk

Jim Watson is Professor of Energy Policy at SPRU, University of Sussex, and joined UKERC as Research Director in February 2013. He was previously Director of the Sussex Energy Group at the University of Sussex from Dec 2008 to Jan 2013. Jim trained as an engineer at Imperial College London and has a PhD in science and technology policy from Sussex. He has 20 years' research experience on a range of energy, climate change and innovation policy issues. His recent outputs include a co-edited book: New Challenges in Energy Security: The UK in a multipolar world (Palgrave, 2013) and co-authoring UKERC's reports: Energy Strategies under Uncertainty and UK Energy in a Global Context (2014). Jim is a Council Member of the British Institute for Energy Economics, and was its chair in 2011. He is also a member of the advisory boards of several research and policy organisations including DECC and Defra's social science expert panel, Carbon Connect, the Low Carbon Research Institute and the ESRC network plus on the social science of the nexus.

Professor Jon Gibbins
University of Sheffield
jon.gibbins@ed.ac.uk

Jon Gibbins has worked on coal and biomass gasification and combustion for over 30 years, at Foster Wheeler, Imperial College and the University of Edinburgh and on carbon capture and storage (CCS) since 2002. He is currently Professor of Power Plant Engineering and Carbon Capture at the University of Sheffield and Director of the UK CCS Research Centre (www.ukccsrc.ac.uk), which is supported by Research Councils UK to lead and coordinate a programme of underpinning research on all aspects of CCS in support of basic science and UK government efforts on energy and climate change. DECC and RCUK funding also supports the UKCCSRC shared Pilot Advanced Capture Technology facilities at Sheffield (www.pact.ac.uk).

Professor Myles Allen
University of Oxford
myles.allen@ouce.ox.ac.uk

Myles Allen is Professor of Geosystem Science in the School of Geography and the Environment, University of Oxford and Head of the Climate Dynamics Group in the University's Department of Physics. His research focuses on how human and natural influences on climate contribute to observed climate change and risks of extreme weather and in quantifying their implications for long-range climate forecasts.

Myles has served on the Intergovernmental Panel on Climate Change as Lead Author on Detection of Climate Change and Attribution of Causes for the 3rd Assessment in 2001 and as Review Editor on Global Climate Projections for the 4th Assessment in 2007. He proposed the use of Probabilistic Event Attribution to quantify the contribution of human and other external influences on climate to specific individual weather events and leads the www.climateprediction.net project, using distributed computing to run the world's largest ensemble climate modelling experiments.

Mr Jeremy Carey
42 Technology
Jeremy.Carey@42technology.com

Jeremy has 15 years of technology development and acceleration experience, including a period of 6 years in the power industry where he was the capture lead on the >£1bn Peterhead carbon capture and storage project. Initially a process engineer and then an advanced control engineer in the Oil and Gas Industry, Jeremy later spent 3 years at a small angel funded medical imaging device company where he developed the company's first commercially viable, FDA approved device that was also used by the pharmaceutical industry for wound angiogenesis studies. Jeremy holds a Chemical Engineering degree from Cambridge, a Diploma in Manufacturing and Computing from the Open University and an MBA from Cranfield. He now leads 42 Technology's energy campaign.

Professor Jon Gluyas
Durham University
j.g.gluyas@durham.ac.uk

Jon is Dean of Knowledge Exchange at Durham University and holds the Dong/Ikon Chair in Geoenergy Carbon Capture and Storage. With career experiences in both industry and academia, he worked for 28 years within the oil industry. From 2001 to 2009 Jon co-founded two oil companies, the latter one with $300 million of initial equity. His technical background relates to the redevelopment of old or abandoned fields, which combines both geosciences and reservoir engineering. From 1999 Jon held an honorary chair in petroleum geoscience at Durham University and from 2009 took up a full time post as Professor in Geoenergy and Carbon Capture and Storage. This has included working for the UK's Department of Energy and Climate Change to evaluate bids for the UK's national CCS Demonstration Programme as well leadership of the UK's CCS Research Centre Development Board. Jon now researches carbon capture and storage, geothermal energy and petroleum geosciences while maintaining strong links with industry. Recent work in the field of geothermal energy includes being involved in the drilling of the three most recently drilled deep geothermal wells in the UK.

Mr Matthew Billson
University of Sheffield
m.billson@sheffield.ac.uk

Matthew is currently at the University of Sheffield as co-Programme Director of their new energy innovation team, on secondment from the Civil Service. Matthew was previously responsible at DECC for overseeing the Government's £125m CCS R&D Programme, and liaising with its Research & Development partners (namely the Research Councils, the Technology Strategy Board and the Energy Technologies Institute). Matthew has spent over 10 years in the Civil Service, on a variety of roles working closely with industry with particular interest in innovation, new technologies and manufacturing.

Oral Presentations

Name	Title	Institute
Sarah Angel-Smith	*The Characterisation of Diesel Deposits Using Advanced Analytical Methods*	Nottingham
Christopher Bridge	*Biomass Co-firing to Improve the Burn-out of Unreactive Coals in Pulverised Fuel Combustion*	Nottingham
Patrick Daley	*Bringing Ash Fusion Analysis into the 21st Century*	Nottingham
Hayden Morgan	*Does Oxygen Concentration, During Carbon Dioxide Injection, Affect Microbial Activity in Geological Storage Sites?*	Nottingham
Daniel Neumann	*Ultrasonic Testing - Generating a Model to Predict Scatter in Complex Microstructures*	Birmingham
Liam Reddy	*A Parametric Study of FeCrB Powder Laser Deposition*	Nottingham
Scott Russell	*Assessment of Process Options for Producing BBQ Charcoal*	Nottingham
Matthias Schnellmann	*Multi-scale, Modular Simulation of Chemical Looping Reactors*	Cambridge
David Walker	*Advanced Steam Measurement Techniques*	Nottingham

Posters

Name	Title	Institute
Toluleke Emmanuel Akinola	*Dynamic Modelling, System Identification and Control of Power Plant and Carbon Capture*	Hull
Mohammed Dahiru Aminu	*Integrity of the Reservoir and Caprock in Carbon Storage: Numerical and Experimental Approaches*	Cranfield
Diarmaid Clery	*The Effects of Biomass Flue Gas Contaminants on Amines for CCS*	Leeds
Patrick Daley	*Bringing Ash Fusion Analysis into the 21st Century*	Nottingham
Charles Dyson	*Small Specimen Creep Testing for High Temperature Component Life Management*	Nottingham
Haesul Fagcang	*Rapid Engine Modelling using Component-in-the-Loop Methods*	Loughborough
Genevieve Hodgins	*Characterisation of Molecular Interactions Occurring in Combustion Processes*	Nottingham
Ruta Karolyte	*Water Oxygen Isotope Shift by Interaction with CO_2*	Edinburgh
David Nichols	*Modification of Biomass Ash Composition by Aluminosilicates and Other Additives*	Nottingham
Oluwaseun Olowojebutu	*Application of Kalman Filters in the Control of SCR Systems*	Loughborough
Anthony Orji	*Pyrolysis - Catalytic Processing of Plastic Wastes*	Hull
Erika Palfi	*S-EGR and its Impact on Power Plants*	Edinburgh
Joseph Perkins	*The Death of Oil Immersion Microscopy?*	Nottingham
Jamie Pulsford	*Novel High Velocity Oxy-fuel (HVOF) Thermal Spray Process for Internal Surfaces*	Nottingham
Kazeem Rabiu	*CO_2 Trapping and Geo-electrical Characterisation in the Context of Geological Carbon Sequestration*	Loughborough
Thomas Spitz	*CCS Power Stations at the Interface of CO_2 Transport and Electricity Transmission Networks: How to Deal with a Dual Set of Requirements*	Edinburgh
Robert Stirling	*Biomass Upgrading by Hydrothermal Carbonisation*	Nottingham
Christopher Wiseall	*Understanding the Physical Properties of CO_2 Gas Mixtures Relevant to CCS*	Nottingham

Groups for Activity

Activity Leaders: Philip Sharman and Rosemary Whitbread

Group Mentors

- Sarah Angel-Smith
- Christopher Bridge
- Daniel Neumann
- Scott Russell

Use two PowerPoint slides for a 10 minute group presentation

Group A

- Patrick Daley
- David Walker
- Haesul Fagcang
- Toluleke Emmanuel Akinola

Group B

- Charles Dyson
- Lawrence Coghlan
- Christopher Wiseall
- Mohammed Dahiru Aminu

Group C

- Hayden Morgan
- Jamie Pulsford
- Thomas Spitz
- Diarmaid Clery
- Ruta Karolyte

Group D

- David Nichols
- Genevieve Hodgins
- Joseph Perkins
- Anthony Orji
- Erika Palfi

Group E

- Liam Reddy
- Robert Stirling
- Oluwaseun Olowojebutu
- Kazeem Rabiu
- Matthias Schnellmann

Field trip - Industrial site visit on Wednesday 17th February, 13:00-18:00

Drax Power Station http://www.drax.com/