EPSRC
Engineering and Physical Sciences Research Council

UKCCS RESEARCH CENTRE

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THE UNIVERSITY OF EDINBURGH

BGS 1835

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Winter School 2015

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

16th to 19th February 2015

Winter School 2015

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

Held at the National College for School Leadership, Jubilee Campus, University of Nottingham

16th to 19th February 2015

Aim of the Winter School

The 2015 Winter School will involve researchers from the EPSRC Centre for Doctoral Training in CCS and Cleaner Fossil Energy (*www.ccscfe-cdt.ac.uk*), the UKCCS 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 — UKCCSRC
- Dr Rosemary Whitbread — Health and Safety Laboratory

Keynote Speakers

- Dr Mike Colechin — Energy Technologies Institute
- Dr Robin Irons — E.ON
- Prof Jon Gibbins — UKCCSRC & University of Edinburgh
- Mr Matthew Billson — University of Sheffield
- Dr Andy Chadwick — British Geological Survey
- Mr Philip Sharman — Evenlode Associates

Students - Centre for Doctoral Training in CCS and Cleaner Fossil Energy

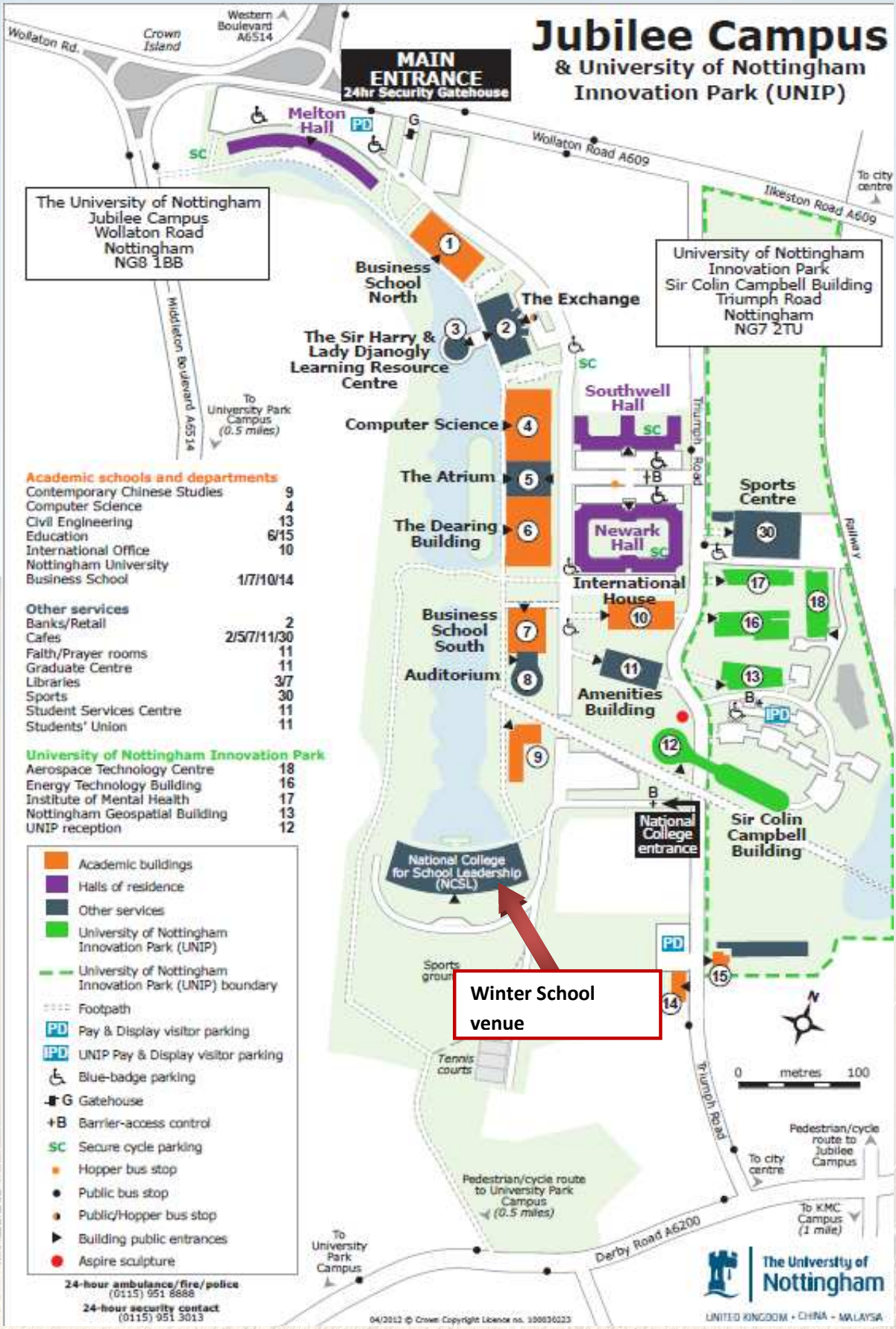
- Robert Stirling — University of Nottingham
- David Nichols — University of Nottingham
- David Walker — University of Nottingham
- Charles Dyson — University of Nottingham
- Patrick Daley — University of Nottingham
- Liam Reddy — University of Nottingham
- Robert Railston — University of Nottingham
- Hayden Morgan — University of Nottingham
- Sarah Angel-Smith — University of Nottingham
- Laurence Silvester — University of Nottingham
- Christopher Bridge — University of Nottingham
- Daniel Neumann — University of Birmingham
- Benjamin Roullier — University of Nottingham
- Thomas Hoey — University of Nottingham
- Shamal Crowther — University of Nottingham
- Rachel Lewis — University of Nottingham
- Oluwatosin Ogunniran — University of Nottingham
- Bilaal Hussain — University of Birmingham
- Gary Newbolt — University of Nottingham

Students - UKCCSRC

- Nuhu Musa — University of Hull
- Hui Meng — University of Hull
- Antonio Salituro — University of Leeds
- Fatemah Rezazadeh — University of Leeds
- Seyed Nabavi — Cranfield University
- Maria Moreno — Cranfield University
- Dawid Hanak — Cranfield University
- Karl McAlinden — University of Nottingham
- Mihaela Stevar — Imperial College London
- Rebecca Cunningham — University of Manchester

Students - Conventional Power Consortium

- Juntao Guo — Loughborough University
- Will Philpott — Loughborough University
- Lorenzo Tinari — Loughborough University


Jubilee Campus
& University of Nottingham
Innovation Park (UNIP)
MAIN ENTRANCE
24hr Security Gatehouse
Western Boulevard A6514
Crown Island
Wollaton Rd.
Melton Hall
PD
G
SC
Wollaton Road A609
Ilkeston Road A609
To city centre
The University of Nottingham
Jubilee Campus
Wollaton Road
Nottingham
NG8 1BB
University of Nottingham
Innovation Park
Sir Colin Campbell Building
Triumph Road
Nottingham
NG7 2TU
Business School North
The Exchange
The Sir Harry & Lady Djanogly Learning Resource Centre
Middleton Boulevard A6514
To University Park Campus (0.5 miles)
Southwell Hall
Computer Science
The Atrium
The Dearing Building
Newark Hall
Triumph Road
Sports Centre
Railway
International House
Business School South
Auditorium
Amenities Building
IPD
Sir Colin Campbell Building
National College entrance
National College for School Leadership (NCSL)
Winter School venue
Sports ground
Tennis courts
0 metres 100
Pedestrian/cycle route to Jubilee Campus
To city centre
Pedestrian/cycle route to University Park Campus (0.5 miles)
To KMC Campus (1 mile)
Derby Road A6200
To University Park Campus
Academic schools and departments
Contemporary Chinese Studies 9
Computer Science 4
Civil Engineering 13
Education 6/15
International Office 10
Nottingham University Business School 1/7/10/14
Other services
Banks/Retail 2
Cafes 2/5/7/11/30
Faith/Prayer rooms 11
Graduate Centre 11
Libraries 3/7
Sports 30
Student Services Centre 11
Students' Union 11
University of Nottingham Innovation Park
Aerospace Technology Centre 18
Energy Technology Building 16
Institute of Mental Health 17
Nottingham Geospatial Building 13
UNIP reception 12
Academic buildings
Halls of residence
Other services
University of Nottingham Innovation Park (UNIP)
University of Nottingham Innovation Park (UNIP) boundary
Footpath
Pay & Display visitor parking
UNIP Pay & Display visitor parking
Blue-badge parking
Gatehouse
Barrier-access control
Secure cycle parking
Hopper bus stop
Public bus stop
Public/Hopper bus stop
Building public entrances
Aspire sculpture
24-hour ambulance/fire/police (0115) 951 8888
24-hour security contact (0115) 951 3013
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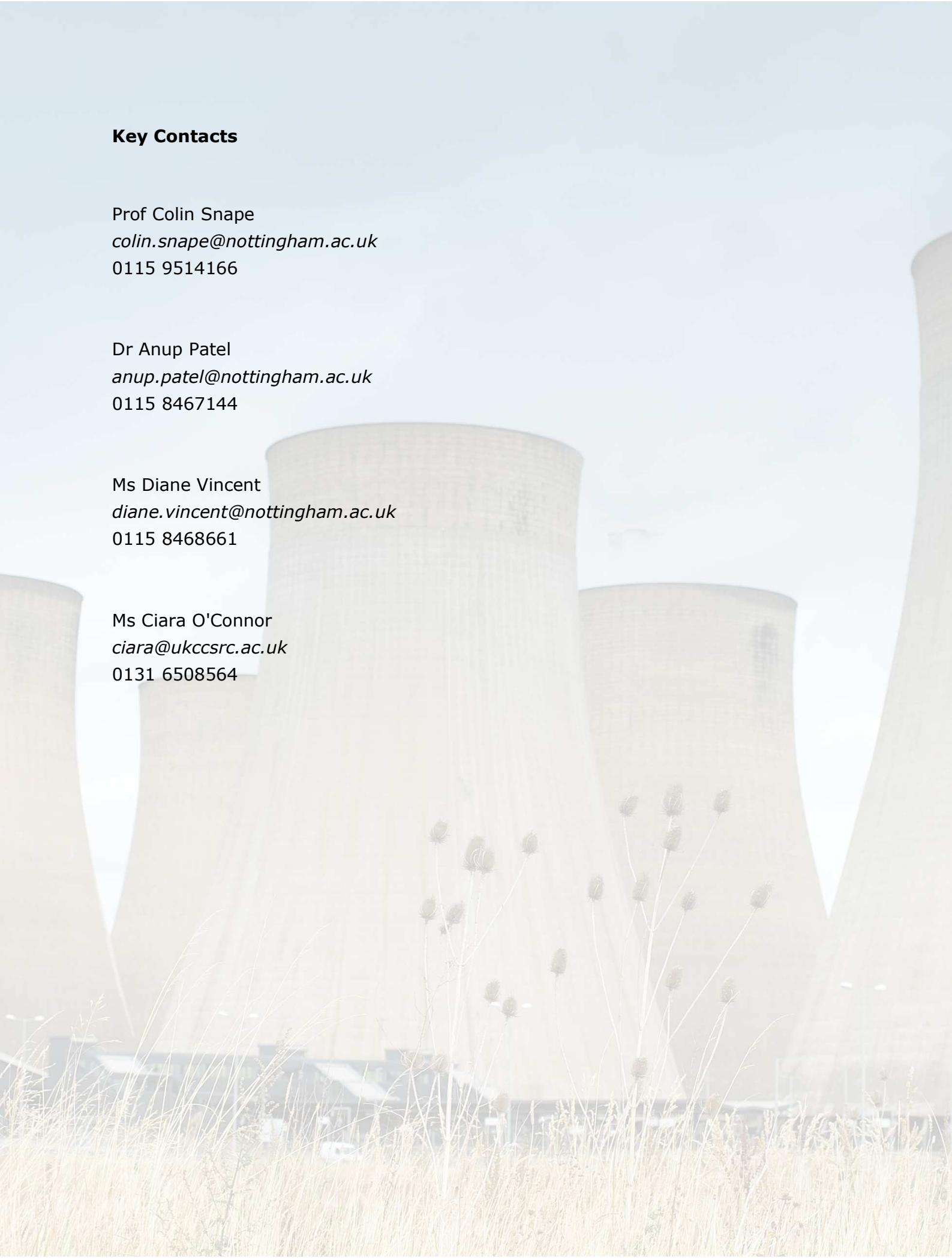
The University of Nottingham
UNITED KINGDOM • CHINA • MALAYSIA

Venue

The **National College for School Leadership** has 96 very comfortable en-suite bedrooms, an excellent restaurant, a superbly equipped auditorium, ample glass-walled break-out rooms with dedicated IT, free shared IT/printing facilities, a spacious atrium for buffet lunches/coffee breaks/poster exhibition/networking, a second atrium with a well-stocked bar and comfortable seating, various other relaxed seating areas, ample barrier-protected car parking and beautiful grounds set around a large lake to meet the requirements of the Winter School.

For further information on the venue contact Sharon Parker:
Sharon.PARKER@education.gsi.gov.uk



Key Contacts

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Ms Ciara O'Connor
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0131 6508564

Outline Programme

Monday 16th February

12:00-13:00	Arrival of delegates Registration and check-in to rooms
13:00	Lunch and display posters
14:00	Welcome introduction
14:10	Mike Colechin – Energy Technologies Institute *'Creating an affordable low carbon energy system for the UK'*
14:50	Robin Irons – E.ON *'Developments in the UK power system – implications for fossil generation'*
15:30	Break
15:50	Jon Gibbins – UKCCSRC & University of Edinburgh *'CO_2 capture'*
16:30	Matthew Billson – University of Sheffield *'UK Government perspective on CCS'*
17:10	Introduction to task for group activity
18:30	Initial group meetings
19:00-21:00	Dinner

Tuesday 17th February

07:00-09:00 Breakfast

09:00 Andy Chadwick – British Geological Survey
'CO_2 storage: a UK perspective'

09:40 Philip Sharman – Evenlode Associates
'CCS economics & financing'

10:20 Break

10:50-12:30 Individual student talks on research – 20 minutes for each presentation and questions

Time	Name	Title
10:50	Benjamin Roullier	*Modelling the local environmental impact of underground coal gasification*
11:10	Antonio Salituro	*Eco-friendly synthesis of selective CO_2 sorbents for post-combustion capture: The key role of basicity*
11:30	Oluwatosin Ogunniran	*Microwave treatment of oil contaminated drill cuttings for offshore drilling platforms*
11:50	Karl McAlinden	*International cooperation and social learning in the diffusion of CCS with the People's Republic of China*
12:10	Rachel Lewis	*Degradation and corrosion of amine solvents*

12:30 Lunch and poster session

14:00-15:40 Individual student talks on research continued

Time	Name	Title
14:00	Daniel Neumann	*Ultrasonic attenuation: A fundamental approach*
14:20	Maria Moreno	*Improving the performance of calcium looping technology*
14:40	Thomas Hoey	*Integrity of coated ferritic alloys under high temperature creep and fatigue*
15:00	Mihaela Stevar	*Interfacial properties of fluids at reservoir conditions*
15:20	Shamal Crowther	*The development of an unsteady pressure probe for taking measurements in low pressure steam turbines*

15:40	Break
16:00-18:30	Group work in breakout rooms
19:00-21:00	Dinner

Wednesday 18th February

07:00-09:00	Breakfast
09:00-11:00	Group work in breakout rooms
11:00	Break
11:15	Group work continued
12:15	Lunch and poster session
13:00-18:00	Field trip to British Geological Survey, Keyworth
19:00-21:00	Dinner

Thursday 19th February

07:00-09:00	Breakfast
09:00-11:15	Group presentations – 20 minutes using 2 slides and questions
11:15	Break
11:30-12:00	Prize giving (best student talks, best posters, best group) and closing remarks
12:15	Lunch (optional)

Winter School keynote speakers

Dr Mike Colechin
Energy Technologies Institute
mike.colechin@eti.co.uk

A Chartered Mechanical Engineer with over 20 years experience in the energy sector, Mike is currently responsible for ensuring that the Energy Technologies Institute (ETI) delivers value to its stakeholders, including funding members from both the public and private sector and the wider community of industry, public sector and academic players involved in energy in the UK. Prior to joining the ETI, Mike spent 15 years with E.ON, first as a combustion engineer and subsequently as a part of E.ON's R&D Management Team.

Dr Robin Irons
E.ON
Robin.Irons@eon.com

Robin Irons has worked on emission reduction from power plants for 28 years for the CEGB, PowerGen and E.ON. He has a BSc (Eng) and PhD, both in chemical engineering from Imperial College London. He is the company sponsor for E.ON's R&D work on CCS and also leads a team taking forward a wide range of other low-carbon technologies such as wind, solar PV and energy storage. He is a special professor of Chemical and Environmental Engineering at the University of Nottingham.

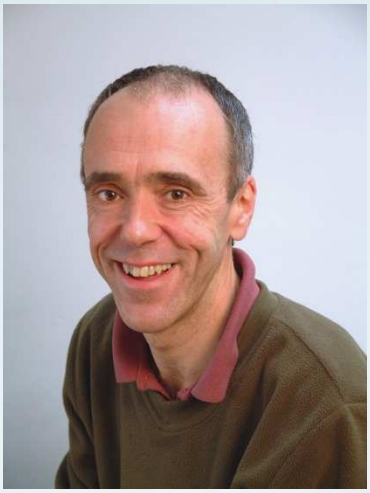
Prof Jon Gibbins
UKCCSRC & University of Edinburgh
jon.gibbins@ed.ac.uk

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 Edinburgh 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).

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.

Dr Andy Chadwick
British Geological Survey
rach@bgs.ac.uk



Andy Chadwick is an Individual Merit Research Scientist at the British Geological Survey. He specialises in deep subsurface geoscience and has been involved with CO_2 storage since 1998 participating in many European CO_2 storage research projects and a number of UK government and industrially-funded ones. His main interests lie in storage site characterisation, monitoring and regulation. Current research directions include quantitative analysis of time-lapse seismic data to characterise CO_2 plumes, and history-matched flow modelling to understand CO_2 migration in reservoirs. He has advised a number of national and international regulatory bodies and is particularly interested in developing pragmatic integrated monitoring systems and strategies for industrial-scale storage sites.

Philip Sharman
Evenlode Associates
philip.sharman@evenlodeassociates.co.uk

From 2012, Philip has been involved in a range of non-executive director, advisory and contract appointments/assignments for public and private sector organisations in low-carbon energy technology areas, including the Research Councils, Innovate UK – the Technology Strategy Board, DECC, Alstom, the Energy KTN and the universities of Nottingham and Oxford. Prior to this, he held the twin roles of Director of Technology (External Affairs) and Director of Technology (University Relations) for Alstom Power, where his focus was to develop stronger linkages with governments, research organisations and technology providers worldwide creating opportunities for Alstom's power businesses. Philip currently chairs the Board of the UK Advanced Power Generation Technology Forum (APGTF) and the Research Councils' Fusion Advisory Board. From 2010 to 2014 he was Chair of the Scientific Advisory Committee of the RCUK Energy Programme and from 2012 to 2014 Chair of the Board of the UK Carbon Capture & Storage Research Centre. He also represents the UK on the Technical Group of the Carbon Sequestration Leadership Forum (CSLF) climate change initiative. He is a member of EPSRC's Strategic Advisory Network, RCUK's Expert Group on UK Nuclear Fusion the University of Nottingham's Industry Advisory Board – Energy and the EPSRC Centre for Doctoral Training in CCS & Clean Fossil Energy Industrial Advisory Board. A chartered engineer, Philip studied at Imperial College London and completed the Advanced Management Programme at INSEAD (Singapore/France).

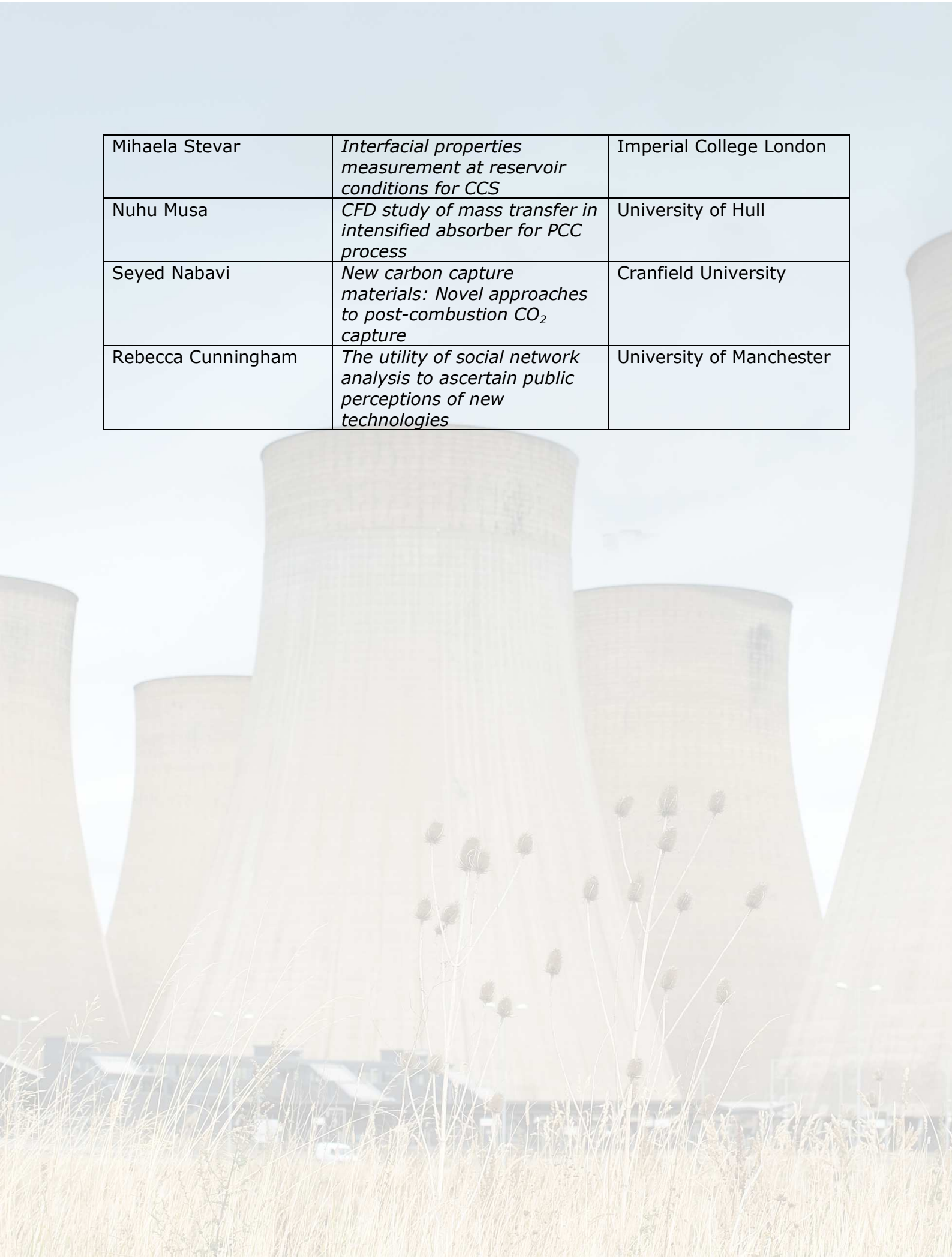
Oral Presentations

Thomas Hoey	*Integrity of coated ferritic alloys under high temperature creep and fatigue*	University of Nottingham
Benjamin Roullier	*Modelling the local environmental impact of underground coal gasification*	University of Nottingham
Oluwatosin Ogunniran	*Microwave treatment of oil contaminated drill cuttings for offshore drilling platforms*	University of Nottingham
Shamal Crowther	*The development of an unsteady pressure probe for taking measurements in low pressure steam turbines*	University of Nottingham
Rachel Lewis	*Degradation and corrosion of amine solvents*	University of Nottingham
Daniel Neumann	*Ultrasonic attenuation: A fundamental approach*	University of Birmingham
Maria Moreno	*Improving the performance of calcium looping technology*	Cranfield University
Antonio Salituro	*Eco-friendly synthesis of selective CO_2 sorbents for post-combustion capture: The key role of basicity*	University of Leeds
Mihaela Stevar	*Interfacial properties of fluids at reservoir conditions*	Imperial College London
Karl McAlinden	*International cooperation and social learning in the diffusion of CCS with the People's Republic of China*	University of Nottingham

Posters

Robert Stirling	*Hydrothermal treatment of biomass*	University of Nottingham
David Nichols	*Impact of high levels of biomass co-firing on ash composition and deposition*	University of Nottingham
David Walker	*Steam wetness measurement*	University of Nottingham
Charles Dyson	*Recommendations on standardisation of impression creep test method*	University of Nottingham
Patrick Daley	*Slagging and fouling prediction using an advanced ash fusion test*	University of Nottingham
Liam Reddy	*Fe-based coatings for fireside corrosion protection in biomass-fired boilers*	University of Nottingham
Robert Railston	*NOx reduction*	University of Nottingham
Hayden Morgan	*The effect of sulphate reducing bacteria on CCS*	University of Nottingham
Sarah Angel-Smith	*A study of fuel deposits: injectors filters and systems*	University of Nottingham
Christopher Bridge	*Biomass co-firing to improve the burn-out of unreactive coals in pulverised fuel*	University of Nottingham
Laurence Silvester	*Co-fired biomass and coal combustion*	University of Nottingham
Gary Newbolt	*Modelling of biomass milling*	University of Nottingham
Bilaal Hussain	*CCS strategy development*	University of Birmingham
Antonio Salituro	*Eco-friendly synthesis of selective CO_2 sorbents for post-combustion capture: The key role of basicity*	University of Leeds
Hui Meng	*Integration of supercritical coal-fired power plants with post-combustion carbon capture, energy storage with wind renewable energy*	University of Hull
Dawid Hanak	*A calcium looping process as an efficient CO_2 capture technology for coal-fired power plants*	Cranfield University

Mihaela Stevar	*Interfacial properties measurement at reservoir conditions for CCS*	Imperial College London
Nuhu Musa	*CFD study of mass transfer in intensified absorber for PCC process*	University of Hull
Seyed Nabavi	*New carbon capture materials: Novel approaches to post-combustion CO_2 capture*	Cranfield University
Rebecca Cunningham	*The utility of social network analysis to ascertain public perceptions of new technologies*	University of Manchester



Groups for activity

Group A

- Robert Stirling
- Hayden Morgan
- Hui Meng
- Juntao Guo

Group B

- David Nichols
- Robert Railston
- Mihaela Stevar
- Dawid Hanak
- Will Philpott

Group C

- Patrick Daley
- Liam Reddy
- Antonio Salituro
- Nuhu Musa
- Lorenzo Tinari

Group D

- Charles Dyson
- David Walker
- Fatemah Rezazadeh
- Seyed Nabavi

Group E

- Daniel Neumann
- Karl McAlinden
- Maria Moreno
- Rebecca Cunningham

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

British Geological Survey – Keyworth: *CO_2 Storage*

- Geology walk
- Test laboratories
- 3D visualisation suite