



RCUK Industrial Doctorate (EngD) Centre
Efficient Fossil Energy Technologies (EFET)

Led by the University of Nottingham involving collaboration with the University of Birmingham and Loughborough University, our partners in the Midlands Energy Consortium

Dr. Anup Patel, Centre Manager

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RCUK Industrial Doctorate (EngD) Centre **Efficient Fossil Energy Technologies**

- The goal of the Centre is to produce research leaders to tackle the major challenges over the next 15 years in implementing new power plant to generate electricity more efficiently using fossil energy with near zero emissions
- These leaders will be part of the new breed of engineers thoroughly versed in cutting edge research and capable of operating in multi-disciplinary teams, covering knowledge transfer, deployment and policy roles
- They will have the skills to analyse the overall economic context of their projects and to be aware of the social and ethical implications
- 60 EngDs based in industry over the next 8 years (50 funded by EPSRC)
- Demand is probably significantly higher, particularly due to proposed EU/UK demonstrations that are needed for deployment of clean coal CCS technologies by 2020

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What's so special about an Engineering Doctorate and what will it produce?

- 4 year duration with a general training programme
- Higher stipend than for a traditional PhD (*ca.* £20k)
- Extensive period of time of close to three years spent conducting basic research in industry
- Still an emphasis on conducting original research, indeed, aiming for PhD collating peer reviewed publications

To produce leaders who will be:

- *Thoroughly versed in cutting edge fossil energy research*
- *Capable of operating in multi-disciplinary teams, covering a range of knowledge transfer, deployment and policy roles*
- *Skilled to analyse the overall economic context of their projects and to be aware of the social and ethical implications*

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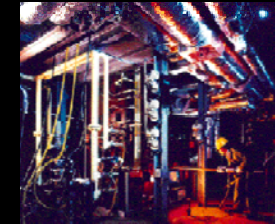


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University of Nottingham Research in Clean Coal Technology & Carbon Abatement Technologies

- CO₂ capture in combustion and gasification, novel adsorbents.
- Oxyfuel combustion
- Flue gas clean-up – Hg adsorbents, carbons for NO_x reduction.
- CO₂ storage/sequestration, coal seams and mineralisation
- Long-term CO₂ utilisation, photocatalytic reduction.



A multi-disciplinary internationally leading research programme

- Editorship of Fuel – John Patrick
- Nottingham hosted IEA sponsored 2007 International Conference on Coal Science & Technology.
- Colin Snape - 2006 Storch Award, the American Chemical Society
- Trevor Drage – EPSRC Advanced Research Fellow, MEGS\Associate Pro



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Birmingham, Loughborough and the social science inputs

- Prof Richard Green at Birmingham won a Philip Leverhulme Prize for his work on electricity markets, is workstream leader for training in the Supergen Flexnet consortium and the Specialist Advisor to the House of Lords Economic Affairs Com. inquiry on renewable energy
- Prof. Robert Dingwall is the founding Director of the Institute of Science & Society, has won over £5M in funding since 1998
- Prof. Michèle Clarke at Nottingham holds a Chair in Environmental has a Chinese Scholarship Council project with Dalian University of Technology on Chinese public perceptions of carbon abatement technologies
- Professor Rachel Thomson is Director of the Loughborough University, Materials Research School and leads Supergen consortium

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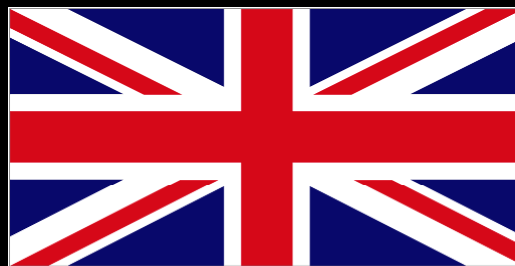


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The Summer Schools

- The annual Summer Schools are clearly a key feature in giving the EngD Centre identity, both nationally and internationally
- Will forge the dynamic interactions between the research engineers
- Considerable value will also be added to these events from the participation of our international contacts so that these events will build up to becoming recognised distinctive events



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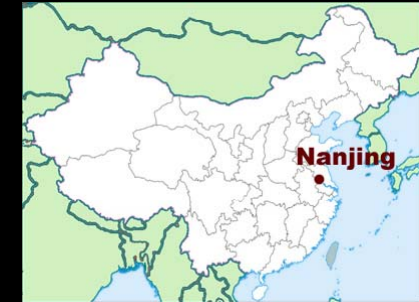
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China Summer School 2010



- *Southeast University, Nanjing, China*
- *12 to 16 July 2010*
- The UK and Chinese delegations amounting to over 70 attendees shared knowledge of policy drivers and technological developments to generate ideas to tackle these issues whilst learning from each others experiences



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India Summer School 2011

- *Centre for Energy, IIT Guwahati, Assam, India*
- *2 to 10 July 2011*



Objective

- To bring together bright Doctoral (PhD/EngD) students from India and United Kingdom to develop and broaden interdisciplinary knowledge to apply to research in fossil energy technologies to solve problems in a range of global settings



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Supervisory Arrangements and Industrial Support

- Each research engineer will be supervised by a multi-disciplinary team including:
 - the principal academic supervisor
 - the co-supervisor - often in a different MEC institution to the main supervisor
 - an industrial supervisor and
 - a mentor with the responsibility of guiding the RE through the formal training programme, drawn from our team of social scientists and economists
- In addition to £6M EPSRC funding and the inherent costs for hosting the research engineers, each industrial partner will provide an additional £40k for each project (£2.4M)

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Current Research Projects

- 2009 Research Projects

Industrial Partner	Project Title
Doosan Power Systems	Technical and economic optimisation for post combustion carbon capture
	Effects of Microstructure on Steam Oxidation of Austenitic Stainless Steels
	SO ₃ Behaviour and Absorption in CO ₂ Rich Atmospheres
RWE nPower	Analysis of the effect amount and composition of flue gas impurity has on the transportation of CO ₂
	Char characterisation in oxyfuel combustion
Alstom	Low Pressure (LP) steam turbines operate in a wet steam environment.
	Steam oxidation behaviour of Ni base materials at high temperatures and pressures
	Two phase mass flow and quality measurement technique for Nuclear and Fossil power stations
	An investigation into power plant steels
E.ON	Biomass Fuel Storage and Handling in Coal Co-firing Plants

Current Research Projects

- 2010 Research Projects

Industrial Partner	Project Title
Tata Steel	The Application of Carbon Capture & Storage Technology to the Steel Industry
CPL	Proposal for the Development of Manufactured Solid Fuels With Reduced Emissions of CO ₂
SSE	Biomass Combustion
BF2RA	Impact of Biomass Torrefaction on Combustion Behaviour in Co-firing
Air Products	Post combustion capture of CO ₂ using adsorbents in a PSA/TSA-type cycle
Doosan Power Systems	Ignition Testing & Flame Stability Prediction
	Optimised Fuel Stream For Improved Burner Performance
	Biomass Combustion
Alstom	Modelling of Rotor Steel for Steam Turbine Applications
	Relationships between ultrasonic signal and microstructural parameters in heavy rotor forgings
Johnson Matthey	Selective Catalytic Reduction of NO _x for Coal Fired Power Station Exhausts

First & Second Cohorts

2009 cohort



2010 cohort



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Further Information

- Dr. Anup Patel
- Centre Manager of EngD Centre in Efficient Fossil Energy Technologies
- The University of Nottingham

- Tel: 0115 84 67144
- E-Mail: anup.patel@nottingham.ac.uk
- Web: www.engineering.nottingham.ac.uk/efet/

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