

Imperial College London



UK-China Collaboration in Sustainable Energy Research

Professor Nigel Brandon

Shell Professor of Sustainable Development in Energy
Executive Director Energy Futures Lab

EPSRC Energy Senior Research Fellow

GO Science Focal Point in Energy with China



www.imperial.ac.uk/energyfutureslab

Introduction

- UK Government Office of Science (GO Science) Focal Point in Energy with China.
- UK Research Council Energy programme.
- UK Energy Research - collaboration with China.
- Summary.



UK Government Office of Science Focal Points

- Six UK focal Points have been appointed.
 - Clean and Renewable energies.
 - Climate change.
 - Nano-technology and materials science.
 - Space Technology.
 - Infectious diseases.
 - Biomedicine and the modernisation of traditional medicines.

GO Science Focal Point in Clean and Renewable Energy

- To facilitate partnership between UK and Chinese scientific/R&D communities in both academia and industry leading to actual collaboration projects.
- To explore new and innovative ways of promoting sustainable collaboration between the UK and China.
- To work with the UK FCO Science and Innovation team in China. (Nigel Birch leads on Energy, Julia Knights is based in Shanghai).

Energy Senior Research Fellow (SRF)



The Energy SRF is described as an ambassador for UK energy research. The role includes:

- Raising the profile of UK energy research at both a national and international level.
- Representing the research council energy programme within the energy community, Government and the media.
- Providing strategic advice to the research council energy team.
- Supporting the development of the international strategy for the research council energy programme.
- 5 year appointment commencing Aug 2006.

www.epsrc.ac.uk/ResearchFunding/Programmes/Energy/AdviceConsult/EnergySRF.htm



SUPERGEN – Sustainable Power Generation & Supply

- Currently 14 consortia covering the following areas:
 - hydrogen storage, hydrogen production, biomass & bioenergy, marine energy, future network technologies, photovoltaic materials, conventional power plant lifetime extension, fuel cells, highly distributed power systems, excitonic solar cells, energy storage, biological fuel cells, wind energy, energy infrastructure.
- Latest SUPERGEN Brochure is available at:
<http://www.epsrc.ac.uk/Publications/Other/SUPERGENBrochure.htm>

TSEC

Towards a Sustainable Energy eConomy

- A portfolio of 'Whole Systems' research consisting of:
 - UKERC (The UK Energy Research Centre)
www.ukerc.ac.uk
 - TSEC Managing Uncertainties
3 Research Groups - Energy Transitions, Electricity Markets, Policy & Regulation, Lifestyles & Energy Consumption,
1 Research Network - Public Attitudes to Renewables (Network)
 - TSEC Keeping the Nuclear Options Open (KNOO)
 - TSEC Renewables & Carbon Management

Near Zero Emission Coal: – NZEC 1.

- NZEC is funded by Defra and BERR, and is being taken forward in partnership with the People's Republic of China Ministry of Science and Technology (MOST).
- Within the UK and Europe, the following are projects partners:
 - AEA (Project Managers, WP1, WP2 & WP5 Leaders)
 - Alstom Power, British Geological Survey (WP4 Leaders), BP, Doosan Babcock, Heriot Watt University, Imperial College (WP3 Leaders), Shell
- The Chinese partners are:
ACCA21 (the Administrative Centre for China's Agenda 21, Project Managers and WP1 & WP5 Leaders), Chinese Academy of Sciences (Institute of Geology and Geophysics), Centre for Energy and Environmental Policy (CEEP), China United Coalbed Methane Corporation (CUCBM), China University of Petroleum Beijing (WP4 Leaders), China University of Petroleum Huadong, Department of Environmental Sciences and Engineering at Tsinghua University (DESE TU), Department of Chemical Engineering at Tsinghua University (DCE TU), Department of Thermal Engineering at Tsinghua University (DTE TU), Environment Research Institute (ERI), Greengem (WP3 Leaders), Institute of Engineering Thermophysics, Chinese Academy of Sciences (IET), North China Electric Power University (NCEPU), BP Tsinghua University Clean Energy Research and Education Centre, Thermal Power Research Institute (TPRI), 3E Institute Tsinghua University (WP2 Leader), Wuhan University (WHU), Zhejiang University (ZJU), PetroChina Jilin Oilfield

Near Zero Emission Coal: – NZEC 2.

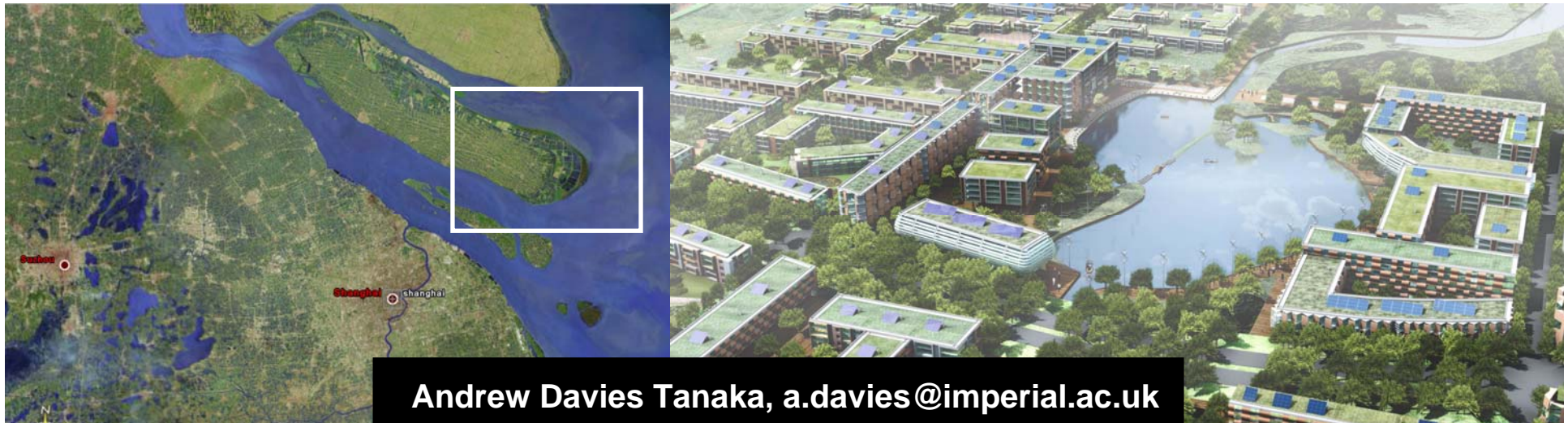
The joint UK-China Near Zero Emissions Coal (NZEC) initiative addresses the challenge of increasing energy production from coal in China.

The EU-China NZEC agreement seeks to demonstrate advanced, near zero emissions coal technology through carbon capture and storage (CCS) in China and the EU by 2020.

Phase 1 will explore options for demonstration and build capacity for CCS in China. Phase 2 will carry out further development work on storage and capture options leading to Phase 3, which will construct a demonstration plant by 2014.

Ecocit

- Ecocit was established, with support from the EPSRC, to investigate the processes associated with the planning, design and implementation of eco-cities.
- It has a special focus on Dongtan, on Chongming Island close to Shanghai. Arup is responsible for the master plan and design of Dongtan.
- Ecocit is led by Imperial College, working with Tongji University.



Andrew Davies Tanaka, a.davies@imperial.ac.uk

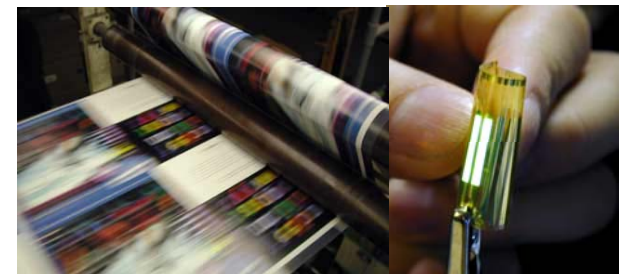
Other UK Dongtan Sustainability networks

- City History and multi-scale master planning (CHaMSpam) Prof. Alan Penn a.penn@ucl.ac.uk
- Sustainable urban energy systems to transfer achievable implementation (SUSTAIN) Prof. Nick Tyler UCL n.tyler@ucl.ac.uk
- Co-ordination group led by Prof. AbuBakr Bahaj dongtan@soton.ac.uk www.dongtanepsrc.org/



EPSRC Energy Programme 1.

- Nine projects have recently been funded to support collaboration between the UK and China in new and renewable energy, totalling over £6M.
- A team from Imperial College London led by Donal Bradley will be working with partners in China to develop stable, high efficiency printable photovoltaics for large scale energy production.
- Chinese partners are Changchun Inst. of Applied Science, East China Univ. Science & Technology, South China Univ. of Technology, and Beijing Jiaotong University.
- Work is focussed on new polymer and electrode materials, along with scaleable production methods.



EPSRC Energy Programme 2.

Principal Investigator	Holding Organization	Grant Title	Chinese Partners
Prof DDC Bradley	Imperial College London	High stability and high efficiency printable photovoltaics(OPV)for large-scale energy production	Prof Lixiang Wang, Changchun Institute of Applied Sciences Prof He Tian, East China University of S & T Prof Junbiao Peng, South China University of Technology Prof Yanbing Hou, Beijing Jiaotong University
Dr E Lester Prof M Pourkashanian Prof Y Yan	University of Nottingham, Leeds and Kent	Optimisation of Biomass/Coal Co-Firing Processes through Integrated Measurement and Computational Modelling	Mr Tao Gan, Datang Weihe Power Station Prof Kefa Cen, Zhejiang University Prof Huaxiang Wang, Tianjin University Prof Hongli Hu, Xi'an Jiaotong University
Dr CY Zhao	University of Warwick	Thermal Conductivity Enhancement of High-temperature Thermal Energy Stores for Use with Solar Power Plants	Prof Wen-Quan TAO; Prof Yaling HE, The State Key Laboratory of Multiphase Flow and Heat Transfer, School of Energy & Power Engineering Xi'an Jiaotong University
Prof P Mawby, G Y Tian, P J Tavener, Prof G M Asher, Dr M Mueller	University of Warwick, Newcastle, Durham, Edinburgh and Nottingham	Future reliable renewable energy conversion systems & networks: A collaborative UK-China project	Prof Gang Wu, Xinjiang Goldwind S&T Dr Xiaoming Yuan, GE Global Research Prof Guogu Yin, Sichuan University Prof Yongdong Li, Tsinghua University Prof Xiangning He, Zhejiang University Prof Yaohua Li, Chinese Academy of Sciences (CAS) Prof Ruijing Liao, Chongqing University (CQU)

EPSRC Energy Programme 3.

Principal Investigator	Holding Organization	Grant Title	Chinese Partners
Prof Y Ding, N J Hewitt, A P Riskilly	University of Leeds, Ulster, Newcastle	BMT-CES: Biofuel Micro-Trigeneration with Cryogenic Energy Storage	Prof Jincheng Huang, Guang Xi University Prof Jingyi Wu and Dr Zai-zhong Xia, Shanghai Jiao Tong University Prof Chunqing Tan, Institute of Engineering Thermophysics
Dr HM Xu	University of Birmingham	Impact of DMF on Engine Performance and Emissions as a New Generation of Sustainable Biofuel	Prof Shijin Shuai, State Key Laboratory of Automotive Safety and Energy, Tsinghua University Prof Shaohua Zhong, Wuhan University of Technology
Dr G Walker	University of Notttingham	Designing Novel High Capacity Multicomponent Hydrides for Near-Ambient Solid State Hydrogen Stores	Prof Ping Wang, Institute for Metals Research , Shenyang National Lab Dr Xuebin Yu, Shanghai Institute of Microsystem and Information Technology, CAS
Dr M Jovanovic, Dr D J Atkinson	Northumbria and Newcastle Universities	Performance Comparison of Traditional and Emerging Doubly-fed Generator topologies for Grid-connected wind Power Applications	Prof Fengxiang Wang, Shenyang University of Technology

EPSRC Energy Programme 4.

Principal Investigator	Holding Organization	Grant Title	Chinese Partners
Prof Haifeng Wang	Queen's University of Belfast, University of Strathclyde, Bath, Edinburgh and Manchester	UK-China Joint Research Consortium on Sustainable Electric Power Supply	Prof Jianbo Guo and Prof Xiaoxin Zhou, China Electric Power Research Institute (EPRI) Prof Yusheng Xue, nanjing Research Institute of Automation Prof Qiang Lu, University of Tsinghua Prof Zhenxiang Han, Zhejiang University Prof Chenshan Wang, Tianjin University Prof Shijie Cheng, Huazhong University of Science and Technology Prof Jianguo Zhao, Shandong University Prof Ping Ju, Houhai University Prof Yongping Yang, North China Electric Power University Prof Liye Xiao, CAS

The 1st Int. Conference on Sustainable Power Generation and Supply will be held in Nanjing, China, from April 8-9th 2009, to disseminate outputs from these and other programmes.

(www.ukchinanet.com)



New EPSRC Energy Programme with China in Cleaner Fossil Fuels

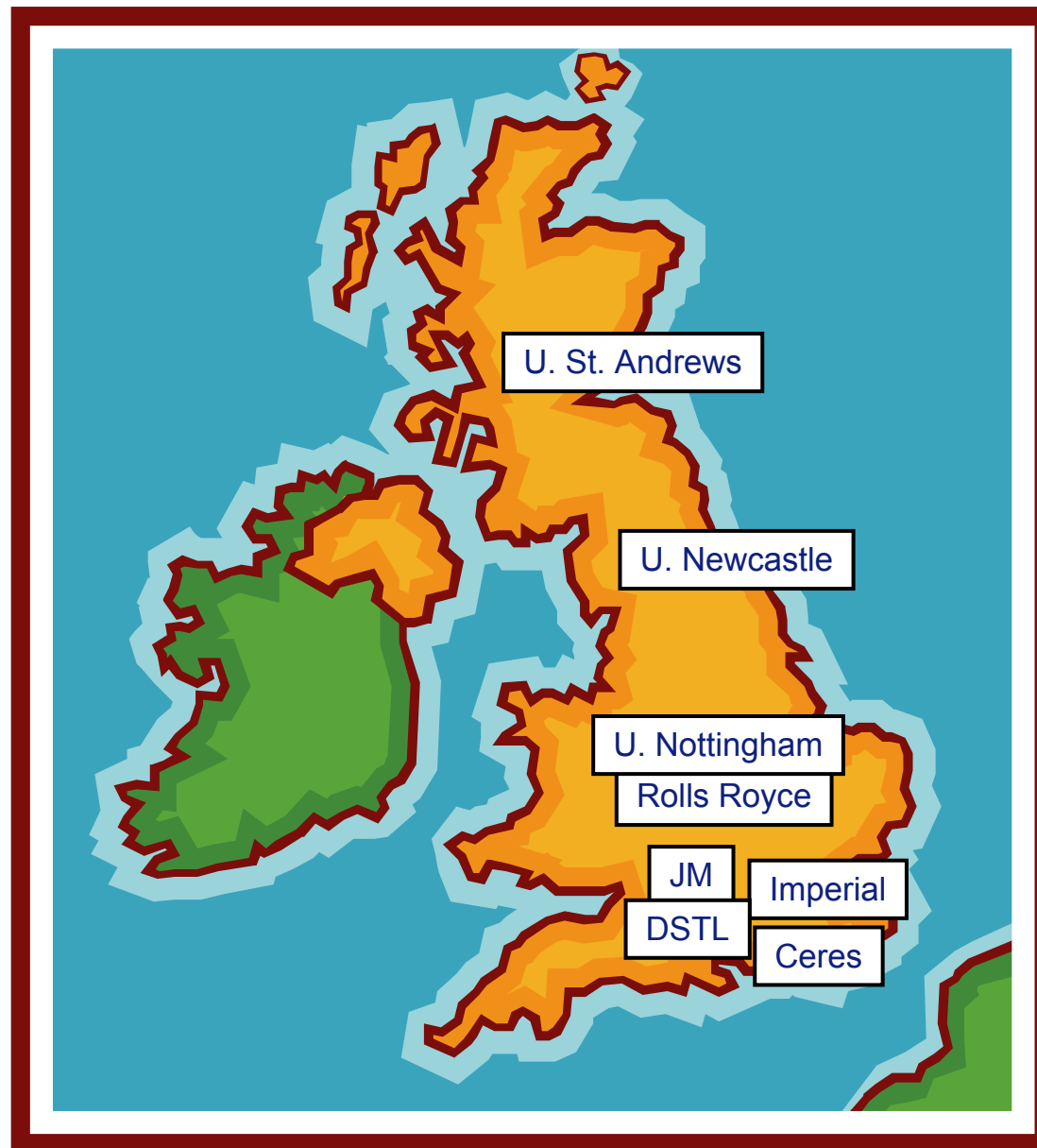
- A new call has been announced by the UK Research Councils to fund collaboration between the UK and China in cleaner fossil fuels, with up to £4M available.
- Entitled “**Collaborative Research with China on Cleaner Fossil Fuels**” it had a closing date of November 11th 2008.
- Two examples of possible areas of research include, but are not restricted to, carbon capture and storage, and reduced emissions from coal combustion and/or conversion.
- Proposals are up to 4 years in duration, and will start on or after the 1 April 2009.



EPSRC

Engineering and Physical Sciences
Research Council







IRG01

48V Architecture
1.2kW PEM Fuel Cell
Lemco LEM200 (2x)
48V x 800A Battery

IMPERIAL
racing green





The Way Ahead

- China is a strategic partner for the UK in the energy sector.
- Research consortia in the UK exist across many energy sectors, and specific programmes to stimulate collaboration between the UK and China are now in place.
- We now need to build on this, and encourage further collaboration and engagement to evolve.
- Do look out for the 'Supergen' event in Nanjing, China, April 8-9th 2009.



Thank you for your
attention

n.brandon@imperial.ac.uk