

UKERC

UK ENERGY RESEARCH CENTRE

Annual Assembly 2007

Meeting Report

28th and 29th June, Cambridge

This report and the presentations given during the assembly are available to view and download from UKERC's website: www.ukerc.ac.uk

(The report on the first part of the assembly, attended by UKERC members only, is available to UKERC members from meeting.place@ukerc.ac.uk)

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Event organised and sponsored by:

UKERC
The meeting place

This document is a report by the organiser of a technical meeting set up as part of UKERC's research programme. It is believed to be an objective record of the meeting but has not been separately reviewed by the participants.

THE UK ENERGY RESEARCH CENTRE

Operating at the cusp of research and policy-making, the UK Energy Research Centre's mission is to be the UK's pre-eminent centre of research, and source of authoritative information and leadership, on sustainable energy systems.

The Centre takes a whole systems approach to energy research, incorporating economics, engineering and the physical, environmental and social sciences while developing and maintaining the means to enable cohesive research in energy.

A key supporting function of UKERC is the Meeting Place, based in Oxford, which aims to bring together members of the UK energy community and overseas experts from different disciplines, to learn, identify problems, develop solutions and further the energy debate.

www.ukerc.ac.uk

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Thursday 28th June

1. Welcome and Introduction

John Loughhead, UKERC Executive Director, and Jim Skea, UKERC Research Director, welcomed participants joining the assembly from organisations outside UKERC.

2. UKERC Highlights

a) Jim Skea, UKERC Research Director

- Mid-term review: generally very positive, especially as regards integration of research, networking and international aspects; need to focus on reducing the variability in the quality of work and ensuring fully adequate engagement with stakeholders and should give more prominence to those aspects that are less readily visible and not amenable to peer review.
- Training: excellent growth in interdisciplinary studentships - 35 by 2008; UKERC summer school very successful, model to be exported to India; SPARKS network for early career people established.
- Networking: NERN established; newsletter; Meeting Place events; direct linkages with other major Research Councils investments.
- Energy Research Atlas: peer review of RD&D landscapes nearly complete; UKERC roadmaps in production; Research Register covers 737 grants and contains searchable financial information.
- Policy linkages: regular informal networks; membership on various panels/Commissions, including ERP; responses to consultations; analytical support for Energy White Paper and Energy Review.
- International: bilateral links with other countries; membership on various international panels, committees; UK hosted major international events through Meeting Place.
- Research: integrating project underway; Markal model of energy system developed as well as sectoral models; interdisciplinary cross-centre projects; peer-reviewed publications.

b) Technology and Policy Assessment, Rob Gross, Imperial College.

As a core policy function of UKERC, the TPA produces evidence-based reports by drawing together research evidence on a topic. The TPA produced a report on intermittency last year, has recently published the "Investing in Electricity Generation: the role of costs, incentives and risks" report and is due to publish a report on the rebound effect in September. Other topics put forward by the Advisory Group for 2007/8 include: what works for low carbon transport policy; resilience; bioenergy; and peak oil.

c) Demand Reduction, Brenda Boardman, Oxford University.

The research is largely being driven by Government policy, the latest developments including: Climate Change Bill, 60% by 2050; zero carbon new homes by 2016; banning incandescent bulbs; Merton Rule; EU mandatory vehicle CO₂ standards; EU ETS extension to aviation and road transport; utilities supplier obligation 2011-2020; smart monitors. Industry is also stimulating research by calling for carbon labelling of all products (Tesco). Environment Minister is supporting personal carbon allowances. People are also more supportive of reducing carbon e.g. 22% people are flying less.

d) Environmental Sustainability, David Howard, Centre for Hydrology and Ecology.

David's theme has made considerable progress as regards inputting to research landscapes and roadmaps for various technologies. The theme is involved in various integrated research projects:

- Micro-generation and demand management

Dan Brett (Imperial)

- Learning rates and technology innovation

Mark Winskel (Edinburgh)

- Life Cycle Analysis

Jeanette Whitaker, Gail Taylor, Sam Holloway & Luke Reade

David talked about the various approaches, methods and tools which are being applied, including Life Cycle Assessment.

e) Future Sources of Energy (learning rates) – Mark Winskel, University of Edinburgh

The FSE theme is dedicating some resources to learning rates because:

- these emerged as a significant issue from UKERC Research Road-mapping;
- for Markal modelling – learning rates are a key input, limited research evidence; and
- they represent an opportunity to bridge across the science, engineering and economics parts of UKERC, and beyond.

A working group has been set up with the following aims:

- Examine the link between technology R&D and learning rates
- Join-up research road-mapping and Markal modelling
- Use the model to ask 'what is necessary?'
- Support UKERC integrative scenarios - address the technology supply 'what-ifs?'
- Identify R,D&D priorities, and assist policy development and delivery

3. Energy Research and Funding Overview, Alison Wall, EPSRC

Alison informed of staffing changes at the EPSRC, particularly who is now responsible for which aspects of the Energy Programme. The main issues of current concern to the EPSRC include: development of the ETI and ERP; development of the transport and demand reduction portfolio; delivery of CSR2007 plans; future direction of fusion.

Delivery of the CSR2007 plans will involve:

- Sustaining work on: power generation and supply
- Growing work on:
 - Demand and consumption
 - Security of supply
 - Energy and equity
 - Heat and other energy vectors
 - Underpinning science and engineering
 - Transport
 - Research capacity

The latest developments relating to ETI include the following:

- Partners: E.ON, EDF, Shell, BP, Caterpillar, Rolls Royce, DTI (EPSRC, TSB)
- Funding from DfT
- Legal structure
- Funding model
- IP model
- Director recruitment in progress
- Paul Garnham COO seconded from Shell
- Host selection
- RD&D priorities

Alison drew a comparison between the ESPRC Energy Programme and ETI. In brief, the former is concerned with basic science, proving feasibility and limited development. The latter is more focussed on proving feasibility, development and limited demonstration.

4. Sustainable Development, Bernie Bulkin, Sustainable Development Commission

Bernie began by pointing out that the UK faces tough choices with respect to integrating sustainable development into decisions relating to energy. Bernie discussed areas where the principles of sustainable development have been 'trampled' by Government in order to pass quick decisions.

a) Technology and behaviour. Bernie believes there are many opportunities where technology can be applied sustainably and talked of technology enabling behaviour change.

b) Systems thinking. Bernie pointed out that too many actions to reduce carbon are implemented in isolation. The Government is obsessed with being seen to do something. The implications are often not thought through adequately. Supply, demand and behaviour are closely interconnected so it is important to understand how the system responds to measures. Bernie thought the congestion charge in London is closest to a systems thinking approach. In London, the bus network has been improved, fares simplified, the Oyster card introduced etc. Aviation is an example of a systems problem. An opportunity might lie with the power generation sector. Ofgem is at heart of the system with regulating transmission and is required to take an interest in consumer issues such as fuel poverty, energy efficiency and renewable energy. Ofgem needs to consider the whole system – not just like for like replacement of large generators. Ofgem's actions should be aligned with the principles of sustainable development and not just with achieving the lowest costs for consumers.

c) Market mechanisms and the cost of carbon. Bernie believes that there is broad agreement in the UK that market mechanisms are the best way to decarbonise. There are two reasons underpinning this broad agreement: it is straightforward; it has been proven in the last 3 or 4 years that we don't know anything about elasticity of demand. Emissions trading is a sure way to deliver carbon reductions whereas a tax is not. Emissions trading makes managers ask the right questions. BP's internal trading demonstrated this. Although the EU ETS may be working it is clear that the price is too low. This can be corrected and should be the focus for the next period. Unless the price is right we won't get the new technologies into the system. Bernie suggests that one reason the price is too low, aside from too many permits being in circulation, is that there are still a lot of cheap things that can be done. The Government needs to focus on forcing innovation which will deliver a strong economy.

d) Tough decisions and how to make them. Bernie takes the view that the Government is having much difficulty with taking the difficult decisions. For example, the Energy White Paper talks about coal being part of the energy mix in 2020 but this is not consistent with other sustainable development goals. There are problems with public perception. For example, people are complaining about wind turbines compared to an open cast mine. There's also strong opposition to a barrage on the Severn river and nuclear. Biofuels are also controversial. How do we decide between a concentrated harm and a distributed good? Bernie suggests that we need a new approach to decision-making and the science community can help politicians here.

Discussion

There was some discussion on behaviour change. A participant pointed out that all technology modifies behaviour but Bernie responded that we are after certain kinds of behavioural change.

A point was made regarding the rise in emissions since 1990 and that we are now in a position which places heavy reliance on technology for reductions by 2010/15 but it will be too late. There is no hope of stabilising at 2 degrees Celsius, and maybe little hope at 3 degrees. Much more is required on the demand side, beyond technology. The participant referred to Mayer Hilman's 'radical' behavioural ideas and how it is necessary to implement some of these now if we are to avoid dangerous climate change.

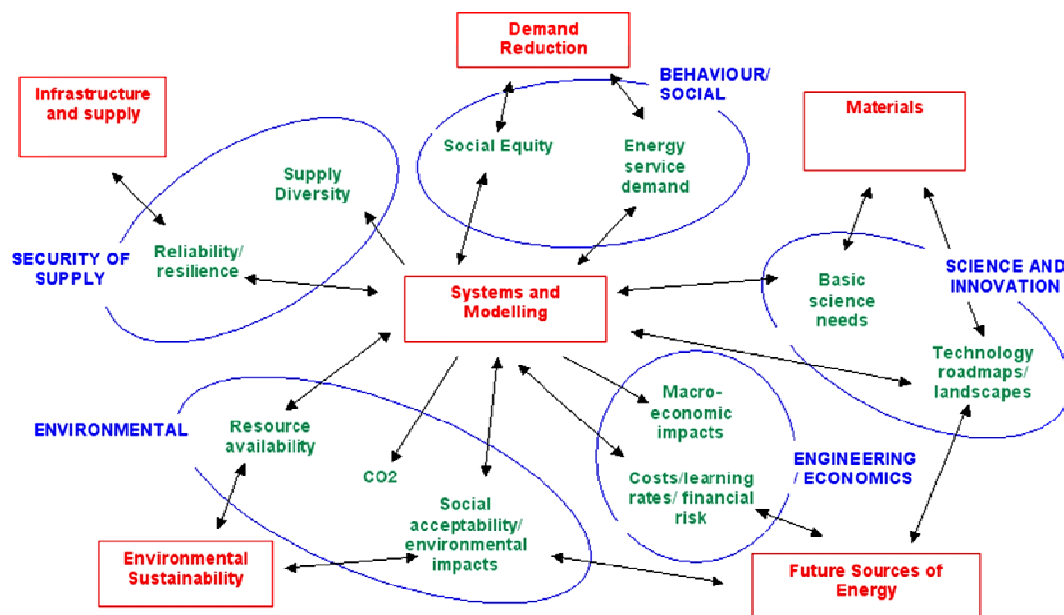
There was also discussion on systems thinking and the fact that innovation is so unpredictable. For example, electric cars have been in development for many decades but it is only now that we are starting to see hybrids on the road.

There was considerable discussion on the right price for carbon and how important it is for the R&D of numerous technologies, such as carbon capture and storage. The point was made that while uncertainty might be good for the value of options, we need price certainty (i.e. that it will rise each year) in order to send the right messages and secure the right kind of investment. Bernie responded that investors in companies prefer technologies that don't need subsidies and that can cope with competition e.g. cheap technologies.

On stakeholder engagement, Bernie takes the view that the Government is reluctant to move beyond the 'typical' consultation. The SDC has urged the Government to really engage the public on nuclear. Consensus could be achieved if there was adequate engagement.

5. UKERC Integration Project: Jim Skea, UKERC Research Director

The "Integrating Project" draws on all UKERC participants and has the broad goal of identifying pathways and the steps needed to achieve a low-carbon, resilient energy system by the mid-21st century. This project involves clusters of collaborative research requiring an interdisciplinary approach. Jim presented a diagram to show how the project brings together the themes (see below – UKERC themes are in red).



The broad methodology involves:

- underpinning by high-level scenarios which both build on, and inform, work conducted within the UKERC themes
- tweaking not transforming research activity in the themes
- “loose coupling” of themes
- no direct coupling of different models
- use of detailed insights round the research themes to fill in lack of “granularity” in high-level modelling tools, such as MARKAL

Jim outlined the outcomes of an internal UKERC workshop and comments of key stakeholders on the initial proposal for the integration project. The project has been developed with these comments in mind. Core scenarios have been developed for the project, focusing on two energy system attributes: resilience and low carbon.

The project aims to address the following key questions:

- What additional steps must be taken to secure deep cuts in CO₂ emissions by mid 21st century?
- How will this affect the share of fuels and technologies in the energy mix?
- How would emission reductions be distributed across sectors if costs are to be minimised?
- What is the additional cost of investing in resilience compared to CO₂ emission reductions?
- Will investing in an energy system that is resilient to shocks make it easier or more difficult to reduce CO₂ emissions? Will reducing CO₂ emissions make the energy system more resilient?

Discussion

Neil Strachan and Paul Ekins of PSI added comments to the presentation. The working group had decided to focus on a small number of scenarios in detail rather than many scenarios superficially because of time constraints and to achieve an output that gives persuasive description about options and choices which are required to deliver chosen end points or carbon reductions. Much relies on qualitative description (e.g. institutional framework) of many features and issues that can not be captured by quantitative measures. Therefore, a detailed narrative will be developed to provide a basis for interpreting the model. As much work has already been done on the Energy White Paper and there have been numerous Markal related workshops, it is expected that the detailed technical assumptions to be used are ‘done and dusted’. Markal is not the only modelling tool that will be used – the team will be using others available.

There was comment that traditional metrics might be missing. Jim Skea questioned whether traditional measures are the right ones and whether they adequately capture the risks.

A participant commented that there will not be enough time to sort out all the technical details so although numbers are important, the focus will need to be at a higher level. No one gets the numbers absolutely right so it will be important to use ranges that are sensible and transparent. Neil Strachan responded that PSI is holding bilateral meetings with key experts to make sure the numbers are as good as possible but there is realisation that this must not be the main focus and that the integration project must focus on going beyond to bring in broader insights.

There was a suggestion to talk to practitioners. For example, there is a significant gulf between practitioners and modellers who work on buildings.

There was a proposal to carry out shadow scenarios which would not permit 'buy-out' through purchase of carbon reductions on an international market. The pathway to achieving a carbon reduction was emphasised as being particularly important i.e. whether it is convex or concave. It was also pointed out that what we already know must be correct – at present, the Markal model curve shows that emissions go down in 2005 and this is not correct.

Use of the term 'resilience' was questioned and 'availability of fossil fuels' was suggested as an alternative. Jim's response was that availability of fossil fuels is not the only factor relating to resilience and may not be the most important. It should be possible to get insights on trade offs – it is thought that all possible dimensions/indicators of resilience have been identified.

6. Hannah Chalmers, SPARKS network

SPARKS is a new network that brings together early career people within UKERC. The members of the network support each other and set up initiatives such as workshops/seminars. The next event is a biofuels seminar which will take place in October.

sparksnetwork@ukerc.ac.uk

Day 2, Friday 29th June

7. Materials & Energy, John Kilner, UKERC Co-Director Materials

John gave an overview of the activities of UKERC's materials theme. He outlined the key challenges and timeframe in which these challenges could be addressed:

- Near Term
 - Extended lifetime of current generating fleet
 - Photovoltaic materials
 - Materials for energy storage
- Medium Term
 - Materials for CCS systems
 - Materials for fission reactors
 - Materials for energy storage
- Long Term
 - Materials for the hydrogen economy
 - Materials for Fusion reactors

Energy materials is a very broad subject. It provides the basic underpinning science for the engineering of devices: from materials physics, chemistry, to metallurgical engineering; and for nanomaterials. There is also a very urgent need for accelerated materials discovery.

The UKERC research programme covers the following themes:

- Materials for hydrogen economy
 - High temperature electrolysers (Materials)
 - Bio inspired generation (Chemistry)
 - Storage (Chemistry)
- Materials for CCS systems
 - Composites for oxygen separation (Materials)
- Materials for Nuclear Energy

- Radiation hard (Materials)
- Materials for 3rd Generation photovoltaics
 - Materials processing (Physics)

Discussion

A participant voiced concern over the rapid rate of construction of coal fired power plants happening in China and why the realisation of materials to support carbon capture and storage (CCS) is targeted for the medium term and not sooner. John responded that materials for CCS are a long way from being delivered. The problems that the materials need to address cannot be solved by incremental improvements in materials – a step change solution is required.

Similarly a step change improvement is also required in the materials science applicable to fusion. The essential physics of fusion has been established but building a reliable and durable reactor is a huge challenge which materials science can help solve.

There was some discussion on the environmental impacts of new materials. David Howard and John Kilner are talking about scoping work to see if materials will offer environmental challenges. Considerable work has already been carried out on nanotechnology but this is not the only issue – there are other groups of materials that need to be looked at.

John wrapped up the discussion by giving mention to the fact that the academic community is changing the way it responds to research and business. Most universities now have well developed technology transfer routes. It remains to be seen if the system can respond to the changing pace in the need for developing new materials. Materials have a reputation for being difficult to develop rapidly e.g. the false starts relating to the rapid development of superconductivity. New methods of rapidly producing different materials are urgently needed.

8. Energy Security, Jonathan Stern, Oxford Institute for Energy Studies

Jonathan began his presentation by setting the UK context: the security risks identified in the White Paper and the suggested solutions; the UK moving from oil/gas exporter to importer. He then went on to discuss oil in more detail, providing information on world demand and proven reserves. He highlighted the fact that the world has been consuming more oil than it has been finding for decades and that the world is, without doubt, headed for peak production of conventional oil. The rise of “resource nationalism” was mentioned with the Middle East being the key oil resource region with serious geopolitical problems.

Moving to gas, Jonathan informed that unlike oil, which is a global market driven by international prices, gas is a regional market which is beginning to globalise because of liquefied natural gas (LNG). Jonathan outlined factors which define gas security: running out of gas in the future; importing a large proportion of demand from far away unreliable/unstable countries; lack of liberalised and competitive markets in Continental European countries; Producer/Consumer dialogue and a Gas OPEC. He argued that large scale Middle East pipeline gas supplies to Europe are currently unrealistic in any time frame. On UK gas security the key message was that import dependence and long term supply adequacy are UK preoccupations; but short term disruptions of domestic supplies and facilities are the biggest problems.

For all UK energy, 90% of energy security incidents are caused by domestic supply and infrastructure failure but 95% of the academic and policy literature on security is focused on the international dimension. Too much of the UK’s energy

security policy appears to be focused on the international dimension, particularly 'unreliable foreigners' and 'the right markets', and too little on the domestic dimension.

Discussion

Paul Ekins mentioned the concept of resilience and the indicators to be used for UKERC's integrating project. He asked whether import dependence should be an indicator and suggested that the consequences rather than the causes of disruption should be the focus.

There was discussion on what would happen if the UK reduced tax on oil and gas to compensate for price shocks. The Government would have to consider the pros and cons of doing this e.g. carbon reduction and the 'right messages'; benefit of the reprieve for the economy; HM Treasury income; political issue of 'windfall profits'.

The importance of EU friendships and the CEE were discussed. CEE countries have considered whether to diversify their imports to become less reliant on Russia but they know this would cost money. Also, complaining about Russia would create bigger problems. Further, Russia has its own agenda and gives concessions to political allies.

9. Summer School presentations

Presentations were given by the summer school students. Groups had been given a case study by 'clients' (UKERC members) that required the groups to develop solutions/recommendations.

10. Final wrap-up

John Loughhead, UKERC Executive Director, provided a final wrap-up and summary of the proceedings, thanking all the participants, speakers and organisers.

Annual Assembly Agenda

All plenary sessions will take place in Robinson College Auditorium

Day 1: Thursday 28th June

Time	Event	Speaker
12:45	WELCOME NETWORKING LUNCH (Dining Hall)	
13:45	Welcome & introduction	John Loughhead & Jim Skea, UKERC
13:50	UKERC highlights	<ul style="list-style-type: none"> • Jim Skea, UKERC • Rob Gross, Imperial College • Brenda Boardman, University of Oxford • David Howard, Centre of Ecology & Hydrology • Mark Winskel, University of Edinburgh
14:45	Energy research & funding overview	Alison Wall, EPSRC
15:15	BREAK (Dining Hall Balcony)	
15:45	Sustainability & energy	Bernie Bulkin, Sustainable Development Commission
16:30	UKERC Integration project	Jim Skea, UKERC & Paul Ekins, Policy Studies Institute
17:00	Open discussion	Chair: Jim Skea, UKERC
17:45	Free time	
19:00	FORMAL DINNER, Downing College (coaches depart Robinson at 18.45) After-dinner speaker: David Howarth, Liberal Democrat MP for Cambridge	

Day 2: Friday 29th June

Time	Event	Speaker
07:30	BREAKFAST (Garden Restaurant)	
09:15	Introduction to the day	John Loughhead & Jim Skea, UKERC
09:30	Materials & energy	John Kilner, Imperial College
10:15	Energy security	Jonathan Stern, Oxford Institute for Energy Studies
11:00	BREAK (Dining Hall Balcony)	
11:30	UKERC Summer School presentations	Summer School participants
12:45	Wrap-up & thanks	John Loughhead & Jim Skea, UERC
13:15	LUNCH & CLOSE (Dining Hall)	

UKERC Annual Assembly

28th-29th June 2007 – Robinson College, University of Cambridge

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