Delivering long-term change through effective energy innovation systems

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Investing in a brighter energy future: ENERGY RESEARCH AND TRAINING PROSPECTUS

Queen Elizabeth II Conference Centre, Westminster, London, UK

NOVEMBER 2013

25 June 2014
Energy innovation critical to meeting its energy targets

INNOVATION HAS POTENTIAL TO...

Reduce carbon emissions

Reduce the cost of energy

Improve energy security

Support economic growth

BUT how can energy innovation support be optimised?
The Energy Strategy Fellowship – Aiming to improve the effectiveness of energy innovation systems

2 main tasks:

1. Develop a “prospectus” of research, skills and training needs across the energy landscape to meet the UK 2050 targets

2. Comparing the effectiveness of energy innovation systems across a number of leading countries
The Prospectus process

Fossil Fuels and CCS
8-9 January 2013
• with UK CCS Consortium

Energy in the Home and Workplace
5-6 February 2013
with DECC (EEDO)

Bioenergy
14-15 May 2013
with BSBEC and Biomass SUPERGEN

Energy Infrastructure
17-18 April 2013
With Ofgem, Smart Grid Forum

Transport Energy
11-12 June 2013
with Low Carbon Vehicle Partnership, DfT

Electrochemical Energy Technologies
25-26 June 2013
with RSC

Light-touch review
nuclear fission
wind/wave/tide
industrial energy

246 participants
4 one-day ‘strategy’ workshops
3 Advisory Group meetings
Synthesise an *Energy Research and Training Prospectus* of research, skills and training needs across the energy landscape to help the UK meet its 2020 and 2050 targets.

**Main report**

**9 subject-specific reports**
High level findings covered here

- Resources for innovation support
- Portfolio approach to energy research
- Joining-up activity across the innovation chain
- Capability
- Training and career development
Resources: energy RD&D spend is low (but has been increasing)

historically....

relative to peers.....


Source: Committee on Climate Change

£m pa

% of GDP

Aviation (GHG)
Shipping (GHG)
Agriculture and LULUCF (GHG)
Waste (GHG)
Other non-CO2
Industry (CO2)
Buildings (CO2)
Surface transport (CO2)
Power (CO2)
2050 target
“...the research councils and other research and innovation bodies should press for public expenditure settlements that are better aligned with the UK’s wider climate change and energy policy ambitions.”
A portfolio approach – energy futures are uncertain
Outlooks to 2040 for primary energy supply
The energy landscape is complex and inter-connected.
A need for interdisciplinarity and cross-council working follows...

‘a single, well defined, cross-Councils’ energy research budget with coordinated deployment mechanisms be created to provide a common vision and strategy to the research community and to avoid conflicting priorities’.

- Significant progress in addressing the spirit of this recommendation through shared funding for specific investments e.g. UKERC, EUED Centres BUT...

- RCEP should be receptive to alternative ways of framing energy research challenges, e.g. not just EPSRC

- Councils should consider how disciplines that haven’t traditionally contributed to energy research could be engaged (e.g. law).

- Academic incentives operate against interdisciplinarity (e.g. REF, promotion)

- Specific opportunities for greater collaboration:
  - Bioenergy - BBSRC and EPSRC
  - Non-conventional fossil fuel extraction – NERC and EPSRC
  - Industrial energy demand - EPSRC and ESRC
Joining up the rest of the innovation chain...a non-linear process

**Research & Development**
- Basic R&D:
  - speculative, science led
  - industry needs led
- Applied R&D to address technical issues

**Demonstration**
- Underpinning R&D to mitigate perceived technical, market & financial risks
- Feedback of R&D needs

**Deployment**
- Technology Considered “Commercially Proven” & Economies of Scale Achieved
- Pre-Commercial Full-Scale Implementation

**New Ideas**
- Pilot Scale Demonstrator

**Technology Push ...**

**... Market Pull**

Source: Energy Research Partnership
Integrating actors working along the innovation chain

Source: DECC
Research councils and the other innovation bodies

- Research needs in many areas are application-inspired need for close links between RCs & later-stage innovation bodies e.g. ETI, TSB.
  - Shared planning/use of joint funding calls?
  - Energy Catalyst
- Low Carbon Innovation Coordination Group (LCICG) has a role to play
  - But need to manage expectations about what LCICG can do
- Ofgem’s role in energy innovation through RIIO
  - Low Carbon Network Fund/Network Innovation Fund will raise significant resources for network innovation ~ £100m pa
  - Impacts on researchers working on networks, energy demand and behaviour
  - Ofgem’s role in LCICG should be upgraded from associate to full membership given its role in stimulating energy
Capability: Data curation

- Data sharing key to innovation…*standing on the shoulders of giants*

- Some research councils have ‘strong’ data sharing policies, others are ‘expectations-based’ (i.e. EPSRC & BBSRC).

- Therefore some ‘common good’ data may not end up being shared (e.g. built environment, crop trials, materials properties etc)

- IP and data protection issues will need to be addressed.

- Be more specific about which data is ‘common good’ and *mandate* the deposition of such data?
Capability: Experimental facilities

- Not enough resources to make full use of existing infrastructure facilities (e.g. Diamond, ISIS @ STFC Rutherford Appleton Laboratory).

- Separation of decisions about capital and operating budgets leads to misallocation of resources. Need to be more closely linked & consider life-cycle operation.

- Need to strike a balance between continued support across all facilities against more intensive use of a more selective group of assets?
Training and development

- Transferability of research skills is crucial given uncertain energy futures. Students need:
  - *Wider context and broader skills*
  - *Industrial experience*

- Blend of different training models to suit individual needs (i.e. CDTs, project-based and Engineering Doctorates) because different models provide different benefits for different people
1. Comparing the effectiveness of energy innovation systems across a number of leading countries.

   a) to map out systems of energy innovation for a range of countries and technologies;
   
   b) to attempt to measure the effectiveness of these different arrangements; and
   
   c) to compare different approaches with a view to learning lessons for successful energy research and innovation policy

### Countries
- UK
- Germany
- US
- Finland
- China
- South Korea
- Also: Japan, Sweden, EU, Demark

### Innovations
- Unconventional gas
- Heat pumps
- Smart grids
- Wind
- Wave energy

Thank you

More information: [http://www3.imperial.ac.uk/rcukenerystrategy](http://www3.imperial.ac.uk/rcukenerystrategy)