# ENERGY RESEARCH PARTNERSHIP



### LEVERAGING TODAY'S PERSPECTIVES...

• Debate Challenges • Inform Policy • Guide Investment

... FOR TOMORROW'S ENERGY

erpuk.org

# FOREWORD BY CO-CHAIRS

Managing the transition to a low carbon economy while, at the same time, continuing to ensure energy security and affordability is one of the greatest challenges of our age.

Since it was formed in 2006, one of ERP's prime purposes is to act as an impartial forum where the public and private sectors work together on current and future energy technology challenges, and inform decisions on the innovation needed to deliver a secure and sustainable energy system for the UK.

Our broad and senior membership provides unrivalled expertise and knowledge around the table to openly discuss issues, priorities, needs and challenges. Our plenary meetings provide a safe space where senior energy stakeholders can debate and inform the innovation process.

As a public private partnership, ERP is great at providing insights into what the wider energy views are on topics. For example, an ERP CEO Forum dinner that included a few senior ERP members and a DfT Minister helped inform the focus of ERP's projects on energy options for transport.



John Loughhead Chief Scientific Advisor Department for Energy and Climate Change As ERP has advanced, so has how it functions. The membership has developed to include stakeholders from academia, NGOs and the finance community, as well as to create a firmer commitment to this partnership, demonstrated by the creation of a dedicated Analysis Team. They work with the members and others from the wider energy community to produce insightful reports, some of which are highlighted in this brochure.

We are faced with critical technological questions if we are to meet our future energy and sustainability aspirations. There is uncertainty about both the future cost and effectiveness of some technologies, but that we need new options is undeniable. We are committed to ensuring that we are collectively doing all we can to support innovation in technologies, systems and how these interact with wider society.

Keith MacLean Managing Director Providence Policy

## THE ENERGY RESEARCH PARTNERSHIP

The Energy Research Partnership was established in the Chancellor's Budget in 2005, and provides a unique impartial forum for debating the critical challenges and long-term vision of the energy system.

We bring together key public and private funders of UK energy RD&D, to:

- Promote a coherent approach to UK energy challenges, within an international context
- Increase long-term energy related activity, and investment, in the UK

Our broad membership, from across the energy system, helps to ensure our projects and messaging are informed by as wide a range of views as possible. Members come from the public sector, industry, academia, NGOs, regulatory bodies, and funding bodies engaged in or committed to energy research and innovation.

We advise Government, industry and others, highlighting key issues, options, and potential solutions.

#### OUR FOUR KEY AREAS:



DELIVERY Creating market and regulatory models, and engaging the public in the energy transition



INNOVATION Developing partnership models to stimulate and deliver new technologies



POLICY Providing the factual basis to inform decision making



RESEARCH AND DEVELOPMENT Targeting UK priority

technology areas

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# SKILLS

The ERP addressed the high level skill shortages in the energy sector, especially in the innovation chain.

It mapped skill deficiencies with energy innovation and identified both the reasons for and options to address these.



## RECOMMENDATIONS AND IMPACTS

- Technical skills are in short supply with a shrinking pool of graduates.
- The problem is only at its early stages

   intervention such as 'outreach'
   initiative could influence future career
   choices among young people.
- Positively there is no evidence of post-training attrition; retention rates in the sector compare very favourably with those in other sectors.
- Interacting with young people at a very early age could make a significant impact on the number of recruits coming through, and improve general public perceptions.

Skills report

# ENERGY STORAGE

ERP has considered the role for energy storage in the UK's future energy system.

A report in 2011 presented a strategic review of the opportunities for electrical and thermal storage, and called on the Government to define a role for storage.

More recent work in 2016 considers the financial, legal, political, commercial and regulatory barriers to system-wide storage (including electrical, thermal, gas, hydrogen and storage in transport).



## RECOMMENDATIONS AND IMPACTS

ERP's work in 2011 was one of the first major reports to focus on the challenges of variations in energy supply and demand under future scenarios, over seasonal and daily timescales. It helped to start discussions amongst energy system stakeholders about the role of energy storage; in particular, ERP:

- Called for a more strategic approach to support for energy storage innovation, and outlined the innovation landscape for further development of storage in the UK.
- Identified market and regulatory barriers to electrical storage, emphasised the need to value grid services, and proposed reforming markets to recognize storage's benefits.
- Called for more funding (guiding the Research Councils' £8.5million 'Grand Challenge' in 2011) and informed policy through detailed analysis of storage's role and value.

Full report (2011) Full report due 2016

# NUCLEAR FISSION

With nuclear energy seen as playing an important and enduring role in the energy system the ERP report in 2010 identified an urgent need for a longterm strategy for developing nuclear power in the UK, combined with an R&D roadmap.

An understanding of the long-term role of nuclear was needed to:

- Identify the potential need for new fuel-cycle and reprocessing technologies.
- Avoid the UK losing its world renowned expertise in fuel-cycles and reprocessing, while growing international deployment of nuclear fission is offering new markets for these technologies and services.
- Define the UK's role in non-proliferation debates, which required RD&D to inform positions and support

## RECOMMENDATIONS AND IMPACTS

ERP coordinated a subsequent Technology R&D Roadmap in 2011, with NNL, NDA, EPSRC and ETI, which led to the Government undertaking a detailed review of UK's civil nuclear R&D landscape in 2012.



Nuclear Technology RD&D Preliminary Roadmap



# BIOENERGY

In order to achieve our 80% GHG emissions reductions target, bioenergy will need to play a key role.

There is substantial potential for the UK to develop bioenergy, but uncertainties remain as to its role in the energy system, and how it can be deployed at scale. ERP published a review into bioenergy technologies in 2011, identifying opportunities, and addressing challenges to further development of bioenergy technologies by 2050.

## RECOMMENDATIONS AND IMPACTS

Calling for DECC to be the crossdepartmental lead on bioenergy and develop as well as implement a co-ordinated bioenergy strategy – this was launched in 2012

**Commitment to research on bioenergy technologies** – which was realized in the form of the BBSRC Sustainable Bioenergy Centre and the Energy Technologies Institute Bioenergy Programme.

> Executive Summary Full Report

**OUTPUTS** 



# ERP MEMBERS



UK Energy Research Centre



# ENGAGING THE PUBLIC IN TRANSFORMING THE ENERGY SYSTEM

Published in May 2013, ERP's 'Engaging the Public in the Transformation of the Energy System' report looked at how to restore public trust in energy companies and government.

This is vital, if the public is to be expected to engage in energy system transformation, both in terms of informing decision making, and undertaking changes at an individual level.

## RECOMMENDATIONS AND IMPACTS

- Need to engage effectively with the public – ERP set out a structure for engagement, with key principles to improve outcomes
- Recommended development of a high level strategic narrative – ERP held a series of workshops with a range of stakeholders, including DECC, to define narrative and how to engage effectively
- Embedding public engagement Ensuring social dimension is part of energy system scenarios, and that social narratives are incorporated into our Horizon Scanning project



#### OUTPUTS

Executive Summary and Full Report

# LOCAL ENERGY PROJECTS: CITIES AND COMMUNITIES

#### The ERP has investigated the role of local energy projects run by city authorities and community groups.

The Cities project highlighted the role of local authorities in addressing demand reduction and demand side response, and in co-ordinating energy projects (due to the increasing spatial differentiation of the UK energy system as a function of the decarbonisation of heat).

## RECOMMENDATIONS AND IMPACTS

The ERP has promoted recommendations to UK and devolved governments for integrating municipal and national infrastructure plans, researching economic benefits, and providing toolkits and roadmaps for cities' decision-making.

OUTPUTS

Executive Summary

The ERP's Community Energy project highlighted projects that are delivering benefits for the energy sector and in wider society, and identified motivations for projects, challenges that they face, and the costs, benefits and risks that result.

The ERP concluded that the UK's limited evidence base and fragmented assessments hinder project proposals and policy decisions.

## RECOMMENDATIONS AND IMPACTS

The ERP proposed steps to improve the evidence base for, and assessment of, community energy in the UK, and is working with the sector to implement these improvements, so as to develop the evidence base to aid in project design and in policy decisions.

OUTPUTS

Executive Summary Full Discussion Paper

# MANAGING FLEXIBILITY ON THE ELECTRICITY SYSTEM

ERP undertook modelling and analysis of a decarbonised UK electricity system dependent on variable renewables.

We wrote a new model, BERIC, to balance the need for energy, reserve, inertia and firm capacity on the system.



## RECOMMENDATIONS AND IMPACTS

- New zero-carbon firm capacity is essential Called for urgent action to develop technologies such as nuclear and CCS which require long lead times
- Market signals need improving With others we have called for a more bankable valuation of the services that ensure grid stability. This has encouraged Ofgem, National Grid and DECC to look at how to better remunerate new service providers.
- Technologies need valuing with holistic analysis of the system DECC are adapting their models to be more holistic, and we are hastening the move away from levelised cost of electricity.
- ERP is influencing policy makers, industry technology experts and academics in UK, US and Australia.

OUTPUTS

Executive Summary Full Report

# CO<sub>2</sub>-ENHANCED OIL RECOVERY

Using  $CO_2$  for enhanced oil recovery is dependent on a useable supply of  $CO_2$ .

For the UK the  $CO_2$  will have to come from CCS projects, but most of the best candidate oil fields are mature and could close before this supply develops.



## RECOMMENDATIONS AND IMPACTS

- CCS development, CO<sub>2</sub> transport and oil production need coordination, within Government, and across industry: we brought the Oil and Gas Authority and the Government Office for CCS together with industry
- Early policy decisions on CCS
   Phase 1 and 2 are needed: we made clear to policy makers that support must be secured for the two CCS demonstration and further commercial projects, by the end of 2017
- The offshore tax regime needs to support CO<sub>2</sub>- EOR's high expense and risks
- We recommended the establishment of a publicly supported CO<sub>2</sub> transport/infrastructure company to de-risk projects, and design a pipeline network

OUTPUTS

Executive Summary and Full Report

# TRANSPORT ENERGY

The ERP has investigated options for decarbonising transport, taking into account trade-offs with other transport objectives.

## **RECOMMENDATIONS AND IMPACTS**

The report's launch event was attended by experts from the transport and energy sectors, and the ERP is continuing to facilitate improved links between the sectors and with government.

The ERP is promoting consideration of strategic factors in transport energy decisions, including: use of limited energy sources; impacts upon energy supply chains, network operation, and primary energy demand; and weighing up each option's effort of deployment against its likelihood of success.

The ERP is promoting consideration of key steps that would be needed for deploying

each energy option and for managing their implications in particular their interactions with the wider energy sector. Steps include: research to improve energy options; regulations and incentives to drive uptake of options and delivery of their benefits; and strategic infrastructure decisions to facilitate energy options.



Full report and executive summary
 Annex (overview of options)



# HYDROGEN

Hydrogen could play a number of roles in the decarbonisation of the energy system.

It could integrate with other energy vectors in the energy system, providing valuable services such as energy storage and helping balance the electricity grid.



## THE KEY ROLES ARE:

- Heat (domestic and industrial) replacing natural gas with hydrogen could decarbonise heat supply, but producing bulk volumes of 'green' hydrogen will impact on primary energy and require CCS.
- Transport fast refueling and long driving range, with electrolysers at refueling stations. Vehicle costs are coming down.
- Grid services frequency response, STOR and utilizing surpluses in the electricity system, could produce low-cost hydrogen and be an effective grid management option.
- Niche markets hydrogen fuel cells are providing clear benefits to fork lift trucks, uninterruptible power supplies and domestic CHP units. Growing market bringing down the cost of fuel-cells.

OUTPUTS

Full report due 2016



For a full list of ERP projects, past and ongoing, and to sign up to our newsletters, visit erpuk.org Follow us @erpuk\_info

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