

MEETING DATE: 8th April 2011

LOCATION: ERP HQ, 58 Princes Gate, London SW7 2PG

ATTENDEES:

Chair:

David MacKay DECC

Members:

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|-----------------|------------------------------|
| David Clarke | ETI |
| Brian Collins | DfT/BIS |
| Tom Delay | Carbon Trust |
| Sue Ion | Royal Academy of Engineering |
| John Loughhead | UKERC |
| John Miles | Arup |
| Graeme Sweeney | Shell |
| Alison Wall | EPSRC |
| Jeremy Watson | DCLG |
| Allan Jones | E.ON |
| Julian Allwood | University of Cambridge |
| Peter Emery | Drax |
| Neil Morgan | TSB |
| Robert Sorrell | BP |
| David Franklin | SSE |
| Ron Loveland | Welsh Assembly Government |
| Gordon Innes | BIS |
| Neville Jackson | Ricardo |
| Duncan McLaren | Friends of the Earth |
| Paul Lewis | Scottish Enterprise |

Non-Members:

| | |
|----------------|-------------------------------|
| Richard Neale | Atkins |
| Benjamin Sykes | The Carbon Trust (for Item 3) |
| Dave Raval | The Carbon Trust (for Item 3) |

Secretariat /Analysis Team:

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|--------------------|-------------------|
| Ian Welch | National Grid |
| Farida Isroliwala | DECC |
| Richard Heap | ERP Analysis Team |
| Jonathan Radcliffe | ERP Analysis Team |
| Ilaria Longo | ERP Analysis Team |
| Mark Workman | ERP Analysis Team |

Apologies/Not present:

| | |
|---------------|----------------------|
| Martin Clarke | Atkins |
| David Eyton | BP |
| Nick Winser | National Grid |
| Mike Farley | Doosan Power Systems |
| Ian Marchant | SSE |
| Peter Bance | Ceres Power |

1 Chair's introduction

David MacKay gave an update on the state of the membership by confirming that Philip Sharman (Alstom), Pam Alexander (SEEDA), Alistair Buchanan (Ofgem) and Neil Bentley (CBI), have left the ERP. He welcomed new members Neville Jackson (Ricardo), Peter Emery (Drax), Duncan McLaren (Friends of the Earth), Julian Allwood (University of Cambridge) and Richard Neale (standing in for Martin Grant, Atkins); and noted that Gordon Innes is replacing Adrian Smith from BIS.

David MacKay stated that the Consortium Agreement is nearly ready, and will be circulated soon for signatures.

He also gave an update on the DECC-led cross-government Low Carbon Innovation Review. This will look at options for enhancing the delivery of direct public support for low carbon innovation technologies, focussed on the spending review period and beyond. The findings from the review will be made public in late summer/early autumn 2011.¹

The minutes of the previous meeting were approved.

2 International Comparisons of Emission Abatement Options, Tom Delay/Mark Workman

Tom Delay introduced the item, noting it originated from the meeting with Greg Barker in November 2010. The aim is to understand UK abatement choices compared to other countries. Some high-level findings would be presented which should allow ERP to determine if this project could be sufficiently useful to continue, and in what direction.

Mark Workman outlined the methodology used, initial high-level findings and proposals for next steps.

Framework methodology, data gaps and uncertainties

The project took a bottom-up approach in order to focus on how individual energy technologies could be used to provide energy services and emissions reductions.

The ability to undertake the full project as a desk based exercise from open source material to derive the data needed would not be feasible: there would be a need to undertake interviews and obtain unpublished data.

A brief comparison has been made for the emissions profiles and 2020 targets for UK, Germany, France, but the main work has been on China and India. Mark outlined the emissions profiles for China and India, and the abatement potential of mitigation technologies and policy options. These have been considered at 2 levels - 'Green' includes carbon savings reasonably achievable and 'Stretch' includes what might be achieved with exceptional focus. The aggregated impact of these options was described for each sector.

Emissions Profile: China

Since 1990, China's economy has grown 4-fold resulting in a doubling of energy use, with the growth of coal resulting in CO₂ emissions growing faster than energy consumption. China's 2020 Emissions Target is a 40 to 45% Carbon Intensity reduction based on 2005 baseline.

Power: Since 1990 energy use has doubled, mainly provided by coal.

¹ Details at http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/innovation/deliv_review/deliv_review.aspx.

Abatement in Green was 826 MtCO₂ and a further 580 MtCO₂ in Stretch. Technologies / policies that allowed this included: super-critical and ultra super-critical coal power, biomass co-firing, efficiency from sub-critical coal, nuclear fission, natural gas and large scale hydro.

Industry: accounts for two-thirds of emissions - including indirect emissions. A significant share of industrial production is related to products which are exported.

Abatement in Green was 247 MtCO₂ and a further 262 MtCO₂ in Stretch. Technologies / policies that allowed this included: implementing Best Available Technologies (BAT) for iron, steel, cement & chemicals, clinker substitution, retrofit programme, alternative fuels for cement and industrial motors.

Buildings: are currently only 23% of total. Emissions could expand with increasing numbers of households and urbanisation rising from 45% to 78% by 2050.

Abatement in Green was 248 MtCO₂ and a further 175 MtCO₂ in Stretch. Technologies / policies that allowed this included: appliance standards, lighting & residential and buildings codes.

Transport: represent 8% of emissions. Expected to rise quickly; potentially a 3 fold increase by 2020, as vehicle ownership increases - currently 59/1000 compared to a world average of 120/1000.

Abatement in Green was 119 MtCO₂ and a further 85 MtCO₂ in Stretch. Technologies / policies that allowed this included: Efficiency improvements, public transport and deploying HEV/PLEV/EV/FCV and Biofuels.

Collaboration: From the analysis the following areas of collaboration were identified:

- Development of statistical services for efficiency initiatives - especially in the buildings sector;
- Need to strengthen capacity to regulate efficiency of domestic and commercial buildings - limited green building capacity / knowledge;
- Collaboration on IGCC, nuclear, shale gas and CCS;
- Limited access to advanced materials technology for high temperature combustion; and
- The development of transport standards.

Emissions Profile: India

Energy CO₂ emissions in India increased 3 fold between 1990 and 2007 due to increase in coal in energy supply. India's coal is poor quality and expected to rely on imports more.

India's 2020 Emissions Target is 20 to 25% Carbon Intensity Reduction based on 2005 baseline (excluding agriculture which only contributed 1%).

Power: India's transmission and distribution losses are among the highest in the world, averaging 26% of total electricity generation in 2008, with some states as high as 62%. Estimates for growth in power demand to 2020 vary widely, from as low as 5.9% p.a. to as high as 9.8% p.a.

Abatement in Green was 230 MtCO₂ and a further 236 MtCO₂ in Stretch. Technologies / policies that allowed this included: clean coal, reduction of transmission and distribution losses, large scale hydro, nuclear fission and natural gas.

Industry: India has some of the most efficient plants in the world but also a high proportion of inefficient plants. The data is particularly poor in terms of allocation for each industrial sector.

Abatement in Green was 112 MtCO₂ and a further 68 MtCO₂ in Stretch. Technologies / policies that allowed this included: Steel BAT, steel energy efficiency, clinker substitution, motor system improvements and cement use of alt fuels.

Buildings: Residential and service sectors rely on a very large proportion of energy coming from traditional biomass up to 78%. Strong growth in energy demand is expected in the buildings sector: Standards of living, higher demand for services and migration from rural to urban areas will also play a role in increasing energy consumption.

Abatement in Green was 50 MtCO₂ and a further 64 MtCO₂ in Stretch. Technologies / Policies that allowed this included: Energy efficient lighting and appliances.

Transport: In India, transport energy use is dominated by buses and freight trucks, with smaller but fairly equal shares for most other modes except rail. The light-duty vehicle (LDV) share of energy use is far smaller than the world average. Again data is highly uncertain.

Abatement in Green was 50 MtCO₂ and a further 41 MtCO₂ in Stretch. Technologies / policies that allowed this included: 2-3 wheelers, improved fuel efficiency, public transport and biofuels.

Collaboration: From the analysis the following areas of collaboration were identified:

- Development of statistical services especially for transport and buildings.
- Administration of energy efficiency regulations especially those with mass application - skilled staff.
- Power sector rate of installation for new nuclear, wind, hydro and advanced coal limited by industrial capacity - especially skilled workers.
- Environmental concerns for deforestation due to expansion of biomass plants.
- Modernisation of India's power transmission and distribution system to reduce T&C losses – need for design capacity and metering represent opportunities for collaboration.

Tom Delay concluded by reiterating the aims of the project and by asking the members whether or not they thought that it was a worthwhile project to pursue. Highlighting the fact that the work will potentially identify the following:

- Are we missing opportunities for UK emissions reductions?
- Are we capturing business value creation, technology transfer and international collaboration opportunities

Discussion

Points raised in discussion included:

- The study should consider US (perhaps just California) and Japan for business value opportunities.
- Germany was specifically raised by the minister and should be looked at both as a benchmarking exercise and for industrial development potential. India and China could be assessed for business opportunities.
- The impact of locking-in global markets to international standards from low-carbon pathways should be assessed.

- A number of members highlighted that it is important to understand the contextual issues such as drivers, system impacts, behaviour, market structure, policy and incentives for deliverables on technology trajectories.
- The work could be undertaken on a technology basis with case studies and analysis as to the reasons for technology penetration being different for a number of different countries. Suggested case studies included heat pumps in France, solar in Germany and wind in Denmark.
- Additional analysis on transport could explore issues such as journey differentiation and types of vehicles and impact on GHG emissions. This would provide useful analysis for export opportunities.
- Analysis by BIS on abatement and business value creation opportunities was noted, which would be useful to the project.
- Caution was raised about collaboration and the risk that it could lead to the UK losing its competitive advantage.

Summing-up, the Chair noted that there was general agreement that the project was valuable and should continue. The work on China and India should be completed, with further work focusing on Germany, California and Japan.

The project should prioritise studying opportunities for emissions reduction, with some consideration of technology transfer, international collaboration and business value creation opportunities. The role of case studies on different technology penetration rates could also be an element of the project.

Action

Tom Delay and Mark Workman to refine the objectives and approach of the project.

3. Support for SMEs, Benjamin Sykes and Dave Raval - The Carbon Trust

Benjamin Sykes reported on work undertaken by The Carbon Trust looking at challenges facing SMEs.

Synopsis of the presentation:

BS highlighted that SMEs are vital to the low carbon economy, both in terms of commercial and carbon benefits. Nearly two thirds of commercial innovation comes from small companies, and the sector is growing strongly. Several hundred apply for funding from the Carbon Trust every year, although they find only 6% go on to become high-growth businesses, accounting for 50% of new jobs. However, it is challenging for low carbon technology SME's to grow successfully with private capital in the UK being scarce, due to market uncertainties, long timeframes for returns on investment and a lack of typical early adopter to drive down costs.

Business capability in SMEs is variable leading to significant gaps in understanding in what help they need. Many SMEs put more emphasis on seeking help with proving the technology and identifying grant funding, rather than understanding how to secure private funding and developing relationships with investors.

The development path for SMEs can be characterized as 3 possible routes:

- 1) Scale the business and sell products directly. This faces challenges with a recent decline in venture capital funds, due to long timescales to exit, high capital requirements and high risk. Other funding, such as angel funds, is available but often not sufficient. Access to procurement departments is also a significant barrier to SMEs selling directly, both into companies and the public sector. The UK SBRI scheme has some success but the commitment is small at £25 million in 2009.
- 2) Partner with a larger player, usually a corporate. This can be challenging as many companies are still learning how to engage successfully with SMEs. Unlike the pharmaceutical industry, corporates have yet to learn how to benefit from the innovations in low carbon technologies being developed by SMEs. Corporates therefore struggle to find SMEs and similarly access to the corporations is not easy, although, there are signs of improvements.
- 3) Sell to a larger player or corporate. This is only really applicable once the product or SME is established, so does not address the 'valley of death'. Non-UK corporates are more aggressive at acquisitions, leading to the economic benefits leaking out of the UK.

The risks and challenges slow down the transition of new technologies to the market with many failing. Resolving this will help produce economic benefits and improve the chances of meeting the UK's energy targets. To do this will require improving access to risk capital, particularly from corporates, as well as encouraging them to invest further up the supply chain of SME innovation. Government too can play a significant role through procurement, thereby reducing market risk for early-stage innovations. Schemes are also needed to provide business support services to SMEs.

Discussion

In discussion the following points were raised:

- Several members highlighted that government procurement was important and it was noted that the recent Budget had made moves to increase this, although it was emphasized that this requires expertise to be able to understand the products. The success of the SBRI varied between departments with MoD, DoH and NHS being very engaged with the TSB and SBRI, but the DfT were finding it very difficult. Questions were raised about how far upstream government procurement should go, as this would put more pressure on in-house expertise.
- Short-term decision making often meant that start-ups flipped between the three routes described, rather than understanding the importance of developing long-term relationships. In addition, it was noted that exit points are needed, but often the SMEs and investors have different views of how these are defined.
- SMEs tend to be biased towards demand-side as energy efficiency products are more system, knowledge and IT based, which do not require the expensive scale-up of most supply side technologies.
- National Grid noted that they were moving more towards trialing products rather than doing their own R&D, but this has risks that need assessment.

There was support for inviting a small number of SMEs to the October ERP meeting, to tell their story and describe the challenges faced.

Action

- Analysis Team/Secretariat to work with Carbon Trust and others to identify SMEs to invite to ERP October plenary meeting.

4 ERP Workplan, Jonathan Radcliffe

Jonathan Radcliffe introduced the current workplan by presenting progress of ongoing projects:

- **Nuclear fission** follow-up: Sue Ion reported that following ERP's report on nuclear fission, she and Richard Heap from the Analysis Team are engaged with roadmapping activity, being led by NNL and supported by EPSRC, ETI and NDA. A draft roadmap is expected to be ready by July.
- **Bioenergy**: Graeme Sweeney noted the main messages from the Executive Summary of the bioenergy report which had been circulated: he emphasised that the UK risks not turning this into an opportunity, and the EU moratorium on GMOs is holding up progress. The key messages for publication were agreed by ERP, and warranted engagement with Government. The full report is expected to be published in May.
- **Energy storage**: John Miles reported back that the project Steering Group was happy with the redrafted Executive Summary, following February's discussion at ERP, and would be publishing the report in May. The Steering Group saw an opportunity for some short follow-up work as a precursor to developing an energy storage roadmap.

Members supported the approaches being taken

Jonathan reported that the international engagement project was being resurrected to draw on the outputs of the TINAs. A Steering Group was being formed to guide the work – any interested Members should contact Jonathan.

Jonathan also noted ERP input to UK-Norway North Sea Offshore Networks meeting, 6-8 June 2011. There would be a half-day high-level forum on 6 June, followed by a workshop to produce roadmaps to address technical, regulatory and political issues.

The strategic aim of the work programme is to cover significant proportion of technology areas so that ERP is well informed enough to provide broad-based guidance on energy innovation priorities, and able to make comparative judgements on the merits of technology development. This comes from analyses in specific technology areas carried out by the Analysis Team, and the cross-cutting themes such as the scenario meta-analyses.

Two potential new projects were described in the papers:

- **Hydrogen**: which would start in July.
- **Demand side response**: which would start in October.

Other possible projects were:

- **Resource-use efficiency**: this had been discussed at ERP as follow-on project to bioenergy and also tied-in well with the industrial efficiency project. A proposal would be brought forward in July.
- **SMEs**: there may be some follow-up work following the item in October's meeting.

- **TINA follow-up:** the outcome of the TINAs was awaited before considering projects on off-shore wind, marine or other areas. Any proposals to be brought forward in July/October.
- **Unconventional gas:** the topic had been raised by some members: innovation for extraction of shale gas (in UK/by UK companies), impact on innovation in other technology areas, implications for energy system

The projects on hydrogen and demand side response were supported. In discussion the following points were raised:

- Work on hydrogen at the Office of Low Emission Vehicles would be relevant to the hydrogen project.
- The key point to address for the hydrogen project was to establish what the UK wanted to do in the area.
- Understanding the scale of shale gas resource, and effects of fracking, would be valuable.

Actions

- Members are asked to indicate interest in being part of Steering Groups for Hydrogen or Demand Side Response to the Analysis Team.
- Any further comments on ERP's future work should be sent to the Analysis Team.
- Members interested in the International Engagement project should contact Jonathan.
- Members interested in the North Sea Offshore Network meeting should contact Jonathan.

A.O.B.

David Mackay noted that this is Brian Collin's last meeting and thanked him for his contributions to ERP.

5 Chair's Closing Remarks

David MacKay closed the meeting and announced that a post-plenary workshop on Technology Innovation Needs Assessments (TINAs) would start at 12:30.

Date of next meeting

The next meeting is on the 7th July, 10 a.m. – 12 noon, and will be held at BIS Conference Centre, 1 Victoria Street, London SW1H 0ET.

Future meeting in 2011 will be on

- Thursday 6 October