

ERP Plenary meeting – final minutes

MEETING DATE: Wednesday 23 July 2014, 15:00 -17:00

LOCATION: The Royal Academy of Engineering, 3 Carlton House Terrace, London, SW1Y 5DG

ATTENDEES:

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| Chair: | David MacKay | DECC, ERP Co-chair |
| Members: | Keith MacLean Martin Grant John Perkins Carl Arntzen Bob Sorrell Philip Sellwood Nick Winser Neville Jackson Sue Ion Angus Gillespie Marta Smart Rob Saunders John Loughhead Julian Allwood Ron Loveland | Independent, ERP Co-chair Atkins BIS Bosch BP Energy Saving Trust National Grid Ricardo Royal Academy of Engineering Shell SSE TSB UKERC Uni. Of Cambridge Welsh Government |
| Alternate Member attendees: | Peter Jones Chris Pook Michael Rea Craig Lucas Miles Elsdon Gavin Salisbury Andrew Haslett Andres Larriera | ABB BIS Carbon Trust DECC DfT EPSRC ETI Hitachi |
| Observers: | Peter Bance Mike Thompson Gareth Evans | Origami Energy Ltd CCC Ofgem |
| Invited: | Cameron Rennie Will Lecky Simon Cox Brian Greensmith Naomi Luhde-Thompson | BP DECC Defra Drax Friends of the Earth |
| Secretariat: | Farida Isroliwala Rufus Ford | DECC SSE |
| ERP Analysis Team: | Andy Boston Mark Workman Richard Heap Helen K Thomas | ERP Analysis Team ERP Analysis Team ERP Analysis Team ERP Analysis Team |

1. Chair's introduction

Apologies were noted from: John Miles (Arup); Stephen Trotter (ABB – with Peter Jones in attendance); Tom Delay (Carbon Trust with Michael Rea in attendance); Peter Emery (Drax with Brian Greensmith in attendance); Alison Wall (EPSRC – with Gavin Salisbury in attendance); David Clarke (ETI – with Andrew Haslett in attendance); Duncan McLaren (Friends of the Earth, with Naomi Luhde-Thompson in attendance); Masao Chaki (Hitachi, with Andres Larriera in attendance); Mark Wagner (Isentropic); Maggie McGinlay & Paul Lewis (Scottish Enterprise) and Tony Robison (SEP).

The Co-chairs extended a warm welcome to all alternate Members and Observers including: Marta Smart, who replaces Keith MacLean as SSE's representative now he has retired (NB: Keith is due to continue as ERP Co-chair until a suitable replacement has been found); Miles Elsdon, representing DfT now that Rod Smith has left; Gareth Evans, Ofgem, Cameron Rennie, BP and Will Lecky from DECC in attendance to support the Economic Value Assessment of Pathways project discussion later on the agenda.

Members were reminded that this was David MacKay's last meeting as Co-chair of the ERP, as his secondment to DECC as Chief Scientific Advisor (CSA) has come to an end. Craig Lucas, Head of Engineering, will continue to provide continuity on behalf of DECC until a successor CSA has been recruited.

The minutes from the April 2014 meeting were discussed and approved by Members with an action for the ERP Analysis Team to make contact with Ofgem to discuss their comments.

Action: ERP Analysis Team to make contact with Ofgem to discuss their comments.

The key objectives of the plenary meeting were outlined as follows: (i) Discuss and provide feedback on the conclusions and recommendations for the Resource Use Strategies project; (ii) Discuss and provide feedback on the conclusions, recommendations and possible areas of further work relating to the Economic Value Assessment of Low Carbon Pathways (EVAP) project; and (iii) provide awareness of ERP's 'Industry Leaders' Forum', to make members aware of the dinner event scheduled to take place in September, based around 'energy in transport'.

2. Resource Use Strategies

Martin Grant introduced the 'Resource Use Strategies' project work. The work was initiated to assess potential resource shortage impacts on energy system development to 2050. The presentation aimed to provide an update on the Minerals work and high level findings for Land, Water and Nexus issues.

Martin provided a brief overview of findings so far and emphasised that resource concerns were not new, but that there are far more complexities now because of the levels of global connectivity. This meant that considering the UK only was inadequate as we are strongly impacted by global activity.

An overview of findings so far was provided:

- There is currently no shortage of minerals but price volatility and the role of different actors in the minerals value chain are significant;
- Land and water impacts on energy system development will be manifest in many ways. In the UK, the low carbon energy system will require more land than the conventional one and the availability of fresh water will be dependent on climate change impacts.
- The UK has tended to take a non-interventionist approach in addressing resource issues. Although resource issues are not a major problem now, considering the potential risks, future monitoring is recommended.

Mark Workman then outlined the objectives of the work in more detail. These were:

- To understand the nature of the resource constraints agenda and its impact on UK energy innovation and energy system development to 2050.
- And within this aim were the following objectives of assessing the state of knowledge of minerals, land and water resources: (1) to develop the appropriate normative policy; (2) the impacts of climate change; and (3) resource inter linkages literature.

During the presentation, Members were asked to consider: (1) Has the work addressed the right issues? (2) Has anything been missed or under or over-emphasised?

The presentation went on to describe the key trends affecting resource use. These were noted as the:

- Rate at which the demand curve has grown;
- Greater connectivity and increase in volume of international resource trade;
- Impact that increased costs of resources could have on the development of the low carbon energy system; and
- UK Industry's concern with 40% of manufacturers' operational costs being materials.

The key findings from each section of the work were briefly showcased, as noted below:

Minerals

- There is no absolute shortage of any metal minerals. The impacts of economics and geopolitics more important than absolute availability.
- There would be an increase in minerals used in low carbon energy scenarios. However it was noted that criticality assessments are a poor tool to inform policy.

Land

- The low carbon energy system will potentially increase energy 'land take' relative to the conventional system by between one to three orders of magnitude.

Water

- The energy system's dependency on water will have an impact on the location and economics of energy production.

Nexus Issues

- The global resource system is becoming increasingly complex and interdependent making the risks difficult to quantify.
- It is becoming difficult to anticipate the system shocks no matter how reliable the quality of data sets or sophisticated the modelling.
- Governance aspects of interdependent resource issues is especially important and needs to be better defined at international and national levels.

Members were subsequently invited to discuss and provide feedback on the project work. Main points noted from the discussion were:

- Government departments such as GoScience, the Cabinet Office and FCO are very interested in resource risk and infrastructure resilience. There is therefore a definite interest beyond DECC.
- Regarding water requirements: the importance of terminology relating to power stations was emphasised. i.e. Power stations are not a 'consumer' of water *per se*, as most water is returned to rivers - the issue is more about access to *cooling* services.
- Assessments of particular technologies, scenarios or strategies would be useful. The project is currently collating all 'low carbon' issues together, but the situation is different for each technology and it would therefore be beneficial to look at demand across different technologies;
- The methodology is currently framed around 'predict and provide' as opposed to looking at saving resources - there is little on actually using *less*;
- It would also be interesting to consider how the UK's approach compares to other countries? E.g. China and Germany.

It was highlighted that NERC has initiated a Security of Supply project. In that work, a way of assessing the extent of minerals availability is by considering the capacity risk of a minerals supply chain and the capacity for that supply chain to respond to compensate for that risk. Recycling is often a problem for critical minerals because they are dispersed in small quantities making them expensive to extract. Primary sources a more responsive part of the supply chain e.g. minerals in tailings. It was noted that ERP's work had reached the same conclusions when looking at primary and secondary sources.

Other thoughts were:

- Findings in the report regarding interdependencies are interesting and BIS have focused on this in their Industrial Strategies work.
- ESRC have recently set up a Nexus Network and it would be worth linking ERP's work with this to compare approaches etc. ARPA were also mentioned as useful contacts.
- Rare earths can be energy intensive to produce, so it would be useful to be aware of the embedded emissions in processing these minerals relative to savings made during the operational life cycle; and finally,
- The question was raised regarding what the specific *technology* recommendations were forthcoming from ERP's work (other than 'to get a bigger shovel').

In order to help focus the work and bring it to a close, Members felt that:

- The work needed to 'unbundle' some more issues and it was therefore worth looking at a small number of specific technologies to help with this.

- It is worth considering how to develop better awareness of resource availability according to the McKelvey diagram and the poor understanding of terminology around the availability of resources.
- In addition to some of the comments above, the report requires an element of 'sharpening' to refine the conclusions etc.

Martin Grant agreed the above would be helpful and that a 'sharpening' of the recommendations would be undertaken. The broad scope of the project was reiterated and the need to identify an audience to focus the messaging and the content of the final reports. The DECC Resilience Team and the GoScience / Cabinet Office Resources and Risk Group would be a fitting set of audiences considering the role of ERP. They would be met to address the messaging and content of the ERP Resources work whilst accommodating the comments of the ERP members.

Action: Members were reminded and encouraged to register their interest in a workshop taking place on Tuesday 2 December 2014 to address the understanding of interdependencies between energy and water and their governance.

Action: Members and any relevant colleagues were encouraged to make contact with Mark Workman to provide their views, plus any specific examples to assist with the completion of the work.

Action: Members of the Resources SG to meet DECC Resilience Team and the GoScience / Cabinet Office Resources and Risk Group.

3. An Economic Value Assessment of Low Carbon Pathways (EVAP)

Chris Pook introduced the item and summarised the approach to the project work, which ran over three months. It was explained that the project considered 4-5 key models related to five of the UK's major pathway and scenario works, and assessed them in regards to their use of a number of economic and socio-economic input parameters.

Findings from the paper were briefly covered. It was recommended that more work is required to enable a better understanding of current capabilities for modelling impacts such as effects on GDP, GVA, (regional) job creation etc. and to explore current modelling limitations. As Chair of the project, Chris felt there would be value in incorporating this type of analysis within modelling but highlighted that:

- (i) There were currently a lack of suitable models for carrying this out and
- (ii) Where these models do exist, they were not being utilised enough.

However, in relation to this, it was recognised that incorporating these types of assessments may not be viewed as rational and are often seen as too complex to attempt.

Helen Thomas went on to provide more detail regarding the scope and aims of the project work, which were based around the hypothesis that existing pathway or scenario analyses have tended to focus on the 'energy trilemma' - in particular cost optimisation or achieving the carbon targets. This has resulted in a neglect of assessments relating to the (socio)economic *impacts* and *value* that pathways may have.

It was also noted that a number of existing (often non-modelling) works provide figures for, or attempt to assess future energy system impacts on GVA, GDP and job creation, but that these lack detail and therefore a great deal of uncertainty remains. It was put forward that a better understanding of the future effects of these pathways (and technologies) could help to provide better information regarding UK value capture, flows and future investment opportunities.

The aims of the project were noted and it was reemphasised that these were mainly focused on considering how economic and socio-economic impacts are currently assessed within *five particular* pathway and scenario (modelling) works. The project therefore:

- Reviewed how and to what extent these impacts were considered by identifying a selection and asking: are these currently assessed within modelling works? Does analysis highlight these at more granular (e.g. UK-regional) level?
- Attempted to characterise the models behind the works and made assessments of modelling capabilities for carrying out this type of analysis;
- Provided a summary of the current state of play with recommendations for further work.

The varied modelling approaches behind each of the works assessed were briefly covered before the findings of the project were presented. Main findings noted were:

- The use of economic and socio-economic modelling inputs varies depending on the model type and remit;
- An inclusion of economic inputs very rarely results in the production of associated economic and socio-economic modelling outputs;
- As noted in the paper, there were a variety of reasons for excluding these types of assessments within the modelling works;
- There was a significant level of uncertainty regarding modelling capabilities, particularly for assessing (socio)economic value in future;
- There is currently a lack of top-down, econometric and spatial modelling approaches being used to inform the future energy system debate, although these models do exist and modelling integrations are possible (therefore more work could be done);
- There is a range of opinions as to whether these assessments should be included within pathway and scenario works.

Recommendations from the project were then presented as below and Members were asked to consider whether the ERP should have any further role in analysis, plus whether they agreed with the key messages and recommendations put forward. These were:

1. More strategic thinking and approach in regards to modelling of the energy system is required;
2. Continued analysis of UK models is recommended to better understand the full range of models and their capabilities (although the question of who this should be carried out by was posed).
3. The design, premise and limitations of modelling works should always be clearly communicated to avoid the risks of misinforming policy, over-interpretation or 'cherry-picking'.

Members were invited to provide feedback with the following comment used (by the ERP Co-chair) to initiate discussion:

Potential economic and socio-economic impacts are of great interest to government, but do industry members think this kind of work is of value? Do they use these kinds of models etc.?

Responses noted were:

- Yes, this type of analysis is interesting to industry but results can be quite different depending on where the spatial boundary around a system is drawn.
- We need better use of various tools alongside modelling to improve policymaking and make the process more scientific. For example: the use of real world pilots for policy initiatives, which may detect complexities not revealed by modelling; and better evaluation of policies after implementation. This can also be used to validate and improve the models used.
- Yes industry is interested but mainly for planning its own activities. There's also a granularity problem and it's not always clear if something is investable at a company level even if total NPV is good.
- Industry is interested in these impacts but mainly as a secondary matter. It is interested either to understand policy interventions and their impact on investments or what the markets are going to reward, the latter is not about jobs.
- Shell scenarios have moved from qualitative to quantitative analysis so models are now propriety, although there is quite a lot of calibration with external sources where the value is in understanding the differences.
- Others agreed that the propriety nature of the modelling is a barrier to industrial modellers being involved in comparisons.

Other points of note were:

- The RAEng have previously looked at the physical assets required for the transformation of the energy system to 2050, based on what some modelling outputs are suggesting and whether it is feasible to deliver them. There is therefore a need to include practicalities and supply chain issues within modelling analysis. ESME carries out something along these lines and there was a plea for this type of analysis to be looked into further.
- There are three questions relating to assessing economic value. How much extra does a carbon restrained pathway or technology cost compared to an unrestrained one? What is value of a low carbon industry? And various interests in-between i.e. how do different pathways compare and the resulting policy approaches. The credibility of modelling is therefore key and macro-economic modelling (CGE or econometric models) are often very sensitive to inputs, so organisations are wary of using the results (e.g. CCC therefore use an 'expert approach' to their 4th carbon budget work instead of models).

Some felt there was an assumption that all types of industry have models but it was noted that this is not always the case. Many organisations e.g. SMEs would love more access to models, to help them choose and price their products but are not so interested in the bigger macro picture. It was additionally noted that the Energy Systems Catapult is looking to develop models and datasets to inform the SME community.

Members then went on to discuss the role and purpose of energy system models within the context of the above presentation:

- Energy systems models are not about predicting what is going to happen, but more about testing sensitivities.
- If economic & socio-economic impacts are considered, then modelling works often come to the same conclusions as The Stern Review (i.e. the impact would be somewhere between +ve and –ve and would be cheaper than we think).
- ETI have decided not to carry out this type of analysis because no one knows how to carry it out effectively. However, ETI are involved with some work with UCL for the CCC on *social distribution* and *affordability* issues. Affordability appears to be an important matter, as distributional effects appear to have a significant effect and that will influence what gets built (or doesn't).
- There was agreement that models can inform well but are often misused and can therefore misinform policy. Better government regulation on how to use models, (that they must state assumptions and ranges over which they are valid) was suggested, as this would help to better understand modelling outputs. In relation to this, HMT's 'AQUA book' relating to Quality Assurance was noted.

Members agreed that recommendations 2 and 3 (as listed above) were particularly important. Regarding recommendation 1, it was questioned whether there were any better ways (compared to current ones) of achieving a more strategic approach. Are the most useful approaches and outputs being used?

It was also pointed out that the models assessed were energy-system models not power models and were therefore not concerned about the rate of energy produced at a specific point of time. It was noted that this might be because the inclusion of power models alongside energy-system models is unfeasible. In response to this however, it was raised that the ESME model does (technically) take account of some of the instantaneous energy flow constraints.

In summary, Members agreed that this was an interesting topic to keep under review, but having already helped 'scope' the current situation, ERP should have limited involvement going forward. The paper should therefore be tidied up and passed to relevant organisations with an interest, or the potential to act upon its findings. The TSB Energy Systems Catapult and HMT were mentioned as being particularly suitable homes, as was the WholeSEM Consortium's work.

Action: Helen Thomas, Chris Pook and EVAP Steering Group to finalise paper and a short summary paper and disseminate to relevant organisations.

5. AOB

A number of AOB items were mentioned. These included:

- Brief feedback on the ERP 'Demand Reduction' workshop which was held in June 2014, with input from John Barrett (Uni of Leeds), Julian Allwood (Uni. of Cambridge) and Paul Ekins (UCL). A short summary paper will be circulated to ERP Members in due course.
- A notice of the Ministerial changes in July 2014: Amber Rudd is the new Minister for Climate Change at DECC, replacing Greg Barker; Matthew Hancock is the new Minister for Business, Enterprise and Energy at BIS and DECC, replacing Michael Fallon; and Greg Clark is the new Minister of State for Universities and Science at BIS, replacing David Willetts.

- An update from Andy Boston regarding ERP's **International Engagement** project, which is being reinstated. Members were encouraged to contact Andy regarding interest in joining the project Steering Group. Members were informed of the intention to provide a guidebook, which will be regularly updated as a resource to be used by anyone planning international engagement exercises, or wanting to know where technology hotspots are located.
- A notice of a recently published DECC document: *Delivering UK Energy Investment*, which outlines the scale of the UK's energy investment challenge and shows the investment opportunities and government's progress to date. Members were encouraged to take a copy of the document.
- An update from Keith MacLean regarding a recent meeting he'd had with the Energy Specialist Adviser at No10 and also Treasury - both are interested in the work of ERP and Keith and the new public-side Co-chair will follow up on this meeting asap. It was also raised that Scottish Government were interested in becoming more involved with ERP, possibly as full members.
- Information for Members regarding the ERP 'Industry Leaders' Forum' taking place on **10 September 2014** on the topic of '**Energy in Transport**', with a kind request that Member organisations consider sponsoring the event and more importantly, that Industry-side Members assist with inviting their board members to attend.
- And finally, a 'thank you' from fellow Co-chair Keith MacLean and all ERP Members / staff to Professor David MacKay for his support both as CSA at DECC and as ERP's Co-chair after nearly five years.

Action: ERP Analysis Team to circulate summary paper from Demand Reduction workshop to ERP Members.

Action: ERP Members to contact Andy Boston if they are interested in being part of the International Engagement Steering Group (Andy noted the current Steering Group is particularly short of Industry-side Members).

Action: ERP Members to disseminate information regarding the ERP Leaders' Forum to their organisations' Board Members and contact Andy Boston or Helen Thomas at the ERP Analysis Team with interested attendees.

At this point David closed the meeting, reminding Members of the drinks reception and dinner taking place afterwards. Members were encouraged to network with new and non-ERP Members as well as with each other. Industry-side Members were asked to stay in the room with ERP Co-chair Keith MacLean for a final meeting item.

Next meeting: Wednesday 15 October 2014, 09:45 – 15:00 (including lunch and a post-plenary session, TBC).

Industry Member discussion (short post-plenary session, 10 mins)

Keith explained to industry-side Members that he had now retired from SSE, but would be happy to continue as Co-Chair in the mean time until a suitable replacement had been found. This was to ensure a smooth transition given public-side Co-chair David MacKay's departure.

It was noted by acting Co-chair Craig Lucas (DECC) that there is currently strong interest in the centre of government regarding energy and the ERP's profile, through

its work, had increased. Craig encouraged ERP's industry-side members to make good use of this.

Keith went on to ensure that industry-side Members were happy to endorse his continuation as a now independent Co-chair – all those in the room were happy. He additionally urged anyone interested in the Co-chair position to approach him or former Co-chair, Nick Winser.

There was a discussion on the length of term that a Co-chair could serve and whether Keith would need special dispensation to continue past 2 years. The matter was not resolved at the meeting so it was agreed that Keith would check with the ERP Analysis Team/Consortium Agreement what the maximum term for his continued role could be.

[Post note: it has since been noted that in the renewal of ERP's Consortium Agreement in 2011, the reference to the Co-chairs terms was changed to: "A Co-chair representing government and a Co-Chair representing industry will be appointed by the Steering Committee (the Plenary) from time to time." Given that previous industry-side Co-chair Nick Winser was in position for nearly four years (from Jan 2009 to Oct 2012), there is clear precedent for longer-term appointments, when required.]

In the mean time, industry-side members were encouraged to consider taking on the role themselves. Keith felt it would be sensible for him to step down at some point in 2015 (unless a suitable replacement was found before then). Nick agreed it would be good to set an exact date for this to help with recruiting his replacement. **[Post note: Keith has since confirmed that expressions of interest should be solicited by July 2015 and appointment made at the October 2015 plenary.]**