

ERP Plenary meeting – final minutes

MEETING DATE: Wednesday 29 January 2014, 3:00 -17:30

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

ATTENDEES:

Chair:	David MacKay	DECC, ERP Co-chair
Members:	Keith MacLean	SSE, ERP Co-chair
	John Miles	Arup
	Martin Grant	Atkins
	Carl Arntzen	Bosch
	Tom Delay	Carbon Trust
	Rod Smith	DfT
	Peter Emery	Drax
	Alison Wall	EPSRC
	Philip Sellwood	Energy Saving Trust
	Duncan McLaren	Friends of the Earth
	Masao Chaki	Hitachi Europe
	Neville Jackson	Ricardo
	Paul Lewis	Scottish Enterprise
	Angus Gillespie	Shell
	Rob Saunders	TSB
	Ron Loveland	Welsh Government
Alternate	Peter Jones	ABB
Member attendees:	Bob Sorrell	BP
	Chris Pook	BIS
	Duncan McCombie	Energy Saving Trust
	Richard Knight	ETI
	Andy Bullock	GE
	James Macnaghten	Isentropic
	Chris Bennett	National Grid
Observers:	Peter Bance	Origami Energy Ltd
	Tony Robison	Scottish Equity Partners
	Mike Thompson	CCC
Invited:	Claire Swadkin	Shell
	Stewart Reid	SSE
	Andy Burgess	Ofgem
	Jeff Hardy	Ofgem
	Craig Lucas	DECC
Secretariat:	Farida Isroliwala	DECC
	Rufus Ford	SSE
ERP Analysis Team:	Andy Boston	ERP Analysis Team
	Mark Workman	ERP Analysis Team
	Richard Heap	ERP Analysis Team
	Simon Cran-McGreehin	ERP Analysis Team
	Helen K Thomas	ERP Analysis Team

1. Chair's introduction

Apologies were noted from: Stephen Trotter (ABB – with Peter Jones in attendance); John Perkins (BIS); David Eyton (BP - with Bob Sorrell in attendance); Steven Aldridge (DCLG); Stuart Mitchell (Doosan); David Clarke (ETI – with Richard Knight in attendance); Derek Grieve (GE – with Andy Bullock in attendance); Mark Wagner (Isentropic – with James Macnaghten in attendance); Nick Winser (National Grid – with Chris Bennett in attendance); Sue Ion (Royal Academy of Engineering), John Loughhead (UKERC), Julian Allwood (University of Cambridge) and Diego Villalobos (Ofgem).

The Co-chairs extended a warm welcome to ERP's four new Members (Bosch, GE, Energy Savings Trust (EST) and Hitachi) and one new Observer Member (Scottish Equity Partners (SEP)) who were asked to briefly introduce themselves. Guests and presenters at the meeting were additionally welcomed.

Members were notified that David MacKay's last meeting as Co-chair of the ERP would be in July 2014, as his secondment to DECC as the Chief Scientific Advisor (CSA) comes to an end. Craig Lucas, Head of Engineering at DECC will be shadowing David to provide continuity on behalf of DECC in case there is a gap in recruiting a successor CSA.

News of Nick Winser receiving a CBE for services to the energy industry in the New Year's Honours was announced with ERP Members asking Chris Bennett to pass on their congratulations.

The minutes from the October 2013 meeting were approved.

The key objectives of the plenary meeting were outlined as follows: (i) Discuss and provide feedback on the 'Managing Flexibility of the Electricity System' project/working paper. (ii) Discussion with Ofgem regarding their role in the energy innovation landscape and how we can work together going forward. (iii) Agree project timeline and proposals for 1) Economic Value Under Different Low Carbon Pathways and 2) Smart Grids and Flexible Demand.

2. Managing Flexibility of the Electricity System

Peter Emery introduced the item on 'Managing Flexibility of the Electricity System' noting that it was a complex but critical area for consideration. The draft working paper was referred to, which illustrates that systems and technologies currently providing flexibility are taken for granted and it was raised that the future energy system will have to account for a loss of these provisions as thermal plants are closed. Challenging areas for deliberation by the project Steering Group were outlined - these included decisions around the overall scope of the project and timeframes (2020 and 2030 ultimately decided on), plus the difficulty in providing conclusions and guidance for action, given the amount of uncertainty around the energy system out to 2030. Peter went on to thank the project Steering Group Members for their input and invited Andy Boston to present the findings from the project work so far.

Andy opened with a number of 'headline' statements and conclusions. These included:

- The investment signals that will ensure National Grid has the services it needs to balance the system are weak or missing entirely.

- The growth of intermittent generation greatly increases the need for flexible balancing services.
- Traditional providers are under pressure or disappearing from the market.
- A number of potential new providers exist but some services (like inertia) have no value attached to them and others lack long term bankable pricing.
- Short-term balancing has a significant effect on long-term performance. Simplistic scenario modelling will overestimate carbon benefits (and/or underestimate system costs) of wind and PV.
- Initial modelling suggests that, without new cost effective providers of flexibility, the cost of balancing the system will rise very significantly when wind penetration surpasses the National Renewable Energy Action Plan (NREAP) target of 28GW.

Scenarios that the work has drawn upon were noted as: National Grid's Future Energy Scenarios (FES) 'Slow Progression' and 'Gone Green' scenarios on 2020 and 2030 timescales. Other timescales where flexibility is required/considered for balancing supply and demand were additionally highlighted. These were: long-term e.g. by policy-makers on scales of years, decades, centuries, medium-term, e.g. by markets on scales of hours, days, weeks, years; and short-term, e.g. by System Operators or automatic control on scales of seconds and minutes.

Factors that are likely to have an impact on electricity system flexibility in the future were covered. These included:

- **Negative influences:** such as variability (of wind) on very short time-scales, forecast error, low inertia, stability, locational issues and closure of existing plant/reducing load factors.
- **Positive influences:** such as demand-side participation (e.g. it could be possible for electric vehicles (EVs) to provide flexibility), energy storage (it could compete in the flexibility market), and other new technologies such as CCS (that could also provide some flexibility).
- **Neutral influences:** such as EMR; its capacity auctions will incentivise plant to have high availabilities (to avoid penalties) and minimal fixed costs (to win contracts); but the Carbon Price Support and Contract For Difference will increasingly incentivise low carbon plant to be placed on the system and unabated fossil to move to lower load factors, discouraging flexible operation.

Examples of how markets in other countries are managing system flexibility were also drawn on, with work covering case studies from Germany and Ireland.

Andy then went on to summarise modelling work carried out so far (by ERP and Barrie Murray for DECC/ERP). Modelling for a particularly windy week was used to show how placing large amounts of inflexible energy on the system affects the need for reserve. It was raised that in some cases wind could provide (its own) reserve; i.e. operating wind turbines at deliberately lower load factors (or indeed switching them off) gives scope for them to increase their output to compensate for falling output from unrestricted wind turbines. A main point noted was that the modelling work supports other existing theses that wind power variability/intermittency presents serious challenges at installed capacities above 28 GW.

Finally, flexibility services that each energy technology can provide (and therefore the most capable technologies) were listed. These were notably coal/biomass converters, pumped storage/lake hydro, nuclear (Small Modular Reactors particularly), thermal with CCS, energy storage and demand-side technologies such as EVs & heat pumps.

Andy reiterated the conclusions of the work, actions for others and proposed further work. The latter would help clarify how flexibility could be suitably rewarded and advise how future legislation could ensure that appropriate signals are sent to investors.

Members were invited to discuss and provide feedback on the work so far. Main points noted were:

- The report raises challenges and provides some sound recommendations that are consistent with those highlighted in previous reports by National Grid.
- It was agreed that a requirement for long-term investment signals is of high importance.
- In the context of the ‘politics of energy’ the draft report (and any future work) should be carefully framed to avoid any inadvertent interpretation that intermittent renewables are the problem and do not bring benefits. The challenges arise from a combination of factors including growth of inflexible generation.
- Further modelling work to look at weather patterns and to relate levels of wind capacity to (future) level of demand to 2030 in particular was welcomed.
- It was agreed that further work should aim to provide more detail around the cost to the system of adding generation technologies. This would help members understand any non linearities in cost and the apportioning of costs to the different technologies in the mix. For example is the 28GW breakpoint for wind a function of nuclear build and what’s the system cost of adding additional inflexible plant? This all-inclusive way of costing technologies should include any insights into the differences between coal and gas, in terms of flexibility services.
- The level of flexibility that CCS can offer was also discussed, and it was proposed that any future developments ought to consider at design stage the need for balancing services on the grid and the opportunities a flexible CCS could bring to its operator.
- Models used should be calibrated so that they compliment each other and can be used together.
- It was noted that this project has looked at balancing generation and demand at a national level ignoring network constraint issues. It was asked whether National Grid could carry out upgrades to the transmission network that would have a material impact on balancing costs. It was unclear at the meeting what work had been carried out in this area. ERP could investigate and assess the need for further studies.
- Advice on how the work could be extended to look at market and subsidy implications (given that we’re no longer in a world of single energy prices) was additionally sought. It was noted that negative energy prices do not constitute a signal for subsidised plant to stop producing energy; in other markets, a negative price would be a clear signal to stop producing.

The case study of Ireland (in particular Northern Ireland) was referred to as a microcosm that is 10 years ahead of Great Britain in relation to these issues. The country has developed services it requires and has already started to calculate the economic value of these (e.g. transmission-related), determining how to ‘divvy up’ or allocate economic value. A deeper study into this and a consideration of how GB could similarly capture this was encouraged.

Finally, the role of smart meters (and other demand side technologies) in system balancing was discussed. Action is required to ensure that markets are creating the right signals for customers to respond. It was noted that there are not many contracts like this available yet and that there is currently no clear ownership for solving the problem.

Comments overall were extremely positive and the work was commended for providing clear messages and actions for further work. Members who had looked at related aspects recognised the issues raised and were pleased for their profile to be raised, especially as it became clear that no organisation was taking ownership of the problem. Members particularly praised the work for raising some interesting considerations such as the implications for installed capacities of wind above 28 GW.

3. Ofgem

Guest speakers Andy Burgess (Associate Partner, Transmission and Distribution Networks at Ofgem) and Stewart Reid (Future Networks Manager at SSE Power Distribution) were introduced and a presentation on Innovation in Energy Networks - Ofgem's RIIO Framework was provided. Topics covered within the presentation included:

- Ofgem's revised approach to network regulation to meet new challenges – RIIO
- Incentivising innovation
- Key features of network innovation competitions
- The annual cycle for Ofgem's assessment process

Main points noted were:

- Ofgem has reviewed the traditional way of regulating gas and electricity networks across GB that were focussed on cost reduction using the RPI-X approach. It has now introduced an evolving approach called RIIO (Revenue = Incentives + Innovation + Outputs (+ investments)). RIIO utilises and learns from best practice examples elsewhere and other countries are interested in this approach.
- Under RIIO, the network companies are allowed to raise revenue in return for delivering specific outputs. RIIO provides incentives for delivering outputs, and places an explicit emphasis on innovation in order to achieve outputs more cost-effectively.
- Under RIIO, the price control period has been extended from 5 to 8 years - this encourages the network companies to think longer-term. Ofgem is open to extending this period further in the future.
- The approach to price controls depends on companies' business plans that are submitted to Ofgem. If a plan is well justified, a fast-tracking process can be used whereby the price control settlement is agreed about one year early. This acts as an incentive for the companies to present their best-value plans. It gives a company more time to focus on delivering its outputs, and can also be of reputational value for a company.
- There are three innovation competitions as part of RIIO – two electricity competitions and one for gas. Companies submit bids and are encouraged to submit in collaboration with others (e.g. technology developers).
- Ofgem funds are 'ring-fenced' (effectively funded by the end consumer and should therefore not be viewed as 'free' money), so importance is placed on proposals having enough benefit for the end customer. Some interesting

ideas have not been eligible for these innovation funds because they lacked sufficient benefit for end users but it can be possible to identify other means of funding.

- Once a project is approved, Ofgem provides on-going reporting, support and assistance with shared learning opportunities and annual conferences.
- There are Intellectual Property (IP) rules within the framework, e.g. if new IP is created by the scheme using funding by consumers then consumers share in royalties.
- Ofgem's assessment process (annual cycle) is April – Nov.
- A major review of the LCNF is due to take place in 2016.
- More information on RIIO and assessment processes can be found on Ofgem's website here: <https://www.ofgem.gov.uk/network-regulation---riio-model>

Stuart Reid was then asked to present his points as someone who looks after future networks and innovation for Transmission and Distribution at SSE.

Main points covered by Stuart included:

- There is now a rich portfolio of projects across the UK funded by Low Carbon Networks Fund (LCNF), European Regional Development Fund (ERDF), DECC, Scottish Enterprise and TSB to name but a few. These projects cover a range of themes from EV charging, analytics through to DC systems and Energy Storage.
- Amongst these, two examples were mentioned from SSE's Power Distribution (SSEPD's) portfolio: Northern Isles New Energy Solutions (NINES) project in Shetland (56MW peak demand) - where SSE is unable to install more renewables due to system stability but intend to alleviate that by installing 120MWh of storage and DSM; and the New Thames Valley Vision.
- The PATHS project was also cited, being within an area of high wind generation. SSE would like to install a large electrolyser to create hydrogen gas that could be used for various purposes, including injection into the gas network, local use, or energy storage, but the options are restricted under LCNF because it could not be justified based on benefits to DNO customers alone.
- Further information on these and all other LCNF activity can be found at the ENA's Innovation Portal here: <http://www.energynetworks.org/electricity/smart-grid-portal/ena-smarter-networks-portal.html>
- It was noted that SSE receives funding from a variety of sources and that they run complex projects with layered relationships, which can disintegrate if part of one of the funding mechanisms is not quick enough to respond.
- Members were encouraged to engage and collaborate further e.g. Ofgem's LCNF expert panels should have links to ERP and other research-related issues. Here, an open invite to an annual event, where the industry shares its learning was extended to ERP Members.
- Specifically to address the issues of small companies, academics and entrepreneurs reaching the industry, the "Energy Innovation Centre" has been set up as a mechanism for individuals to understand the challenges that network operators face and as a means to present solutions for sponsorship and adoption within the sector. <http://www.energyinnovationcentre.com/>
- There was interest on the topic of ENA interaction with ERP and this has been raised for consideration with the ENA.

Members were subsequently invited to take part in discussions / a Q&A session. Main points for discussion were:

- LCNF does not allow non-network companies to apply, so third parties can only apply if the DNOs/TOs accept, i.e. they act as gate-keepers for Ofgem's process.
- Members were reminded that LCNF is part of RIIO, which is about getting the best from network companies. Legal advice is that customers' money can only fund projects led by certain organisations (network companies) and the point about end-customer benefit was reiterated.
- Members were also reminded that the aim is to convert the network companies to scenarios where innovation is part of 'business as usual' (BAU) rather than third parties working without the support of network companies, which can make that transition harder. It was also pointed out that there are other ways of infiltrating energy innovation ideas into the network.
- Interactions between LCNF and other funding was queried, especially public sector spending (much of which goes via BIS). The view was put forward that there seemed to be constraints around Ofgem's processes, e.g. why could only two proposals per company be submitted, and why only a 10% contribution from companies when this could be greater, creating wider partnerships etc.? It was put forward that Ofgem's approach differs from that of other public sector funders (regarding Value for Money) – this was noted and followed by the response that Ofgem is open to input from others and to considering alternative options in the future.
- It was also felt that Ofgem could do more to improve its understanding (and that of its expert panels) in relation to links to other funding schemes, both in the UK and abroad.
- Ofgem's continued involvement within the LCICG was discussed and encouraged.

Other points included:

- TSB funds a lot of early stage companies and shares the concern that DNOs are not the most natural parents of the most disruptive technologies.
- The TSB team has been working more with Ofgem, which has been of benefit but there is a need for greater detail around how TSB-supported companies interact best with LCNF.
- It was queried why there is underspend within LCNF and how success is being monitored? In response it was noted that Ofgem is still considering a number of bids and that the Gas & Electricity Market Authority (GEMA) won't approve projects just to make up the numbers. Proof that LCNF is working well is that it still receives a healthy amount of bids, which is more of an indicator than levels of spend. It has also changed companies' mind-sets to some extent. Members were reminded that many projects (e.g. SSE projects) are only part-funded by Ofgem and attract funding from other sources.
- Other concerns were raised around how well the consumer is being served by LCNF, which is very technology-focussed, when what consumers really want is services. It was put forward that Ofgem is forced by law / regulations into a silo-based approach. In response it was noted that projects are mainly (but not exclusively) technology-based, and don't always have to be. LCNF is a tool to change network companies. Ofgem is also involved in smart metering / grids policy, consumer engagement and DSR and are trying to simplify the market so that consumers can understand these products and move towards utilising them.

- ‘Disruptive’ technologies such as wireless controls (e.g. via Google) were discussed and it was queried whether these would make smart meters redundant? It was raised that most LCNF projects don’t rely on smart meters, so disruptive technologies wouldn’t cause duplication.
- The question of how to assess the benefits of cross-related projects, e.g. with generators and gas users was put forward, and also whether DNOs have enough input and share in the benefits (with just 10%). Ofgem focuses on benefits to consumers, which is not the same as large network customers. It also tries to fund things that wouldn’t be funded otherwise. IP goes partly to project organisations but Ofgem would be interested to hear views on who should receive the benefits.
- Finally, it was queried whether LCNF is encouraging a shift from capex to opex and from assets to services? The answer to this was: not explicitly, but Ofgem does encourage new thinking, so could go in that direction. Members felt that it could be beneficial to extend the time horizon to look at disruptive technologies out to 2050. Although predictions can’t be made perfectly, reviews afterwards should improve the next round of predictions.

To conclude, conversation moved to possible ERP interactions with Ofgem. Ideas included:

- ERP could provide a gateway to join up innovators and network companies.
- Interaction with the Energy Innovation Centre (EIC) was mentioned as a possible opportunity as most network companies are Members. Further information about this was welcomed.
- ERP could invite ENA to join ERP or interact more in the future.
- Assistance or greater interaction with LCNF expert panels (ERP Members could possibly meet with panel Members).
- Greater clarity for Members and organisations around assessment criteria used by Ofgem panel Members.
- Increase interactions with the Low Carbon Innovation Co-ordination Group (LCICG).
- Think more about making targeting of funding compatible with projects.

Actions:

- **Ofgem to look into ERP Member/Co-chair meetings with LCNF expert panel.**
- **SSE to look into the possibility of ENA interactions with ERP and provide an update.**
- **Details of LCNF Conference to be circulated to Members.**

5. ERP Forward Work Plan, Project Initiation Process (PIP) & New Project Proposals

David introduced the item and invited Andy to provide an overview of proposed projects. Members were asked to discuss/approve these proposals, which would be added to the Analysis Team’s work plan for 2014/15.

Andy briefly covered the Project Initiation Process (PIP) for the benefit of new Members and went on to provide brief overviews of the project proposals put forward.

Current proposed projects accepted by the Co-chairs were:

- Cities – to report in April 2015

- Economic value – to report in July 2014
- Smart Grids & Flexible Demand – to report in October 2014

Members were advised that the Cities project required further development to better define the scope of the work and Members were asked to provide input to Mark Workman of the Analysis Team.

The other two project proposals were approved and Members were encouraged to contact the relevant ERP Team Members should they wish to join Steering Groups or provide input.

The following additional points regarding ERP projects were noted:

- An ERP project focussed on transport is welcomed and should be of importance (although it was noted that transport elements have been included in ERP's Hydrogen work and will be included as part of the upcoming work on Cities).
- Members from Shell and BP agreed to work together to further shape/define the project proposal on Enhanced Oil Recovery.
- Smart Grids – it was suggested that the study include demand response as an important element. The link to the Managing Flexibility work was highlighted and consideration should be given to how the grid is managed. The idea of locational pricing was floated. The project should also consider cyber security, which needs to be qualified.

Actions: Members to contact Mark Workman to provide input/help define the scope of the new Cities project.

Members to contact the ERP Analysis Team if they are interested in being part of the Steering Groups for:

- **Economic Value of Low Carbon Pathways - contact Helen Thomas**
- **Smart Grids & Flexible Demand and Cities projects - contact Richard Heap.**

BP/Shell to work together to better define the scope of a project on Enhanced Oil Recovery.

Members to continue using the new Project Initiation Process (PIP) to develop new / existing proposals in consultation with fellow Members before putting them forward to the ERP Analysis Team.

6. AOB

Chris Pook announced there would be a Ministerial briefing session on the Low Carbon Innovation Co-ordination Group's Strategic Framework: Coordinating Low Carbon Technology Innovation Support on the **24 March** with speakers including: Greg Barker from DECC, Sir Mark Walport, Government's Chief Scientific Advisor and Keith MacLean, SSE (ERP Co-chair). ERP Members will be sent an invitation to the event.

Alison Wall informed the group that EPSRC are updating their Fusion strategy and advised Members to contact her if they would like to contribute or be updated.



Action: Circulate information regarding the LCICG Strategic Framework Ministerial Briefing session and regarding updates to the Fusion Strategy, including how Members can contribute.

David closed the meeting, reminding Members of the post-plenary session taking place afterwards. Members were encouraged to network with new and non-ERP Members as well as with each other.

Next meeting: Wednesday 9 April 2014, 09:45 – 13:00 (including lunch).