Key Insights from ERP Inputs & Scoping Workshop: Barriers to System-Wide Energy Storage
Workshop Date: Thursday 14th April, 10:00 – 15:00

This paper provides key insights from a workshop organised and facilitated by ERP to discuss *Barriers to System-Wide Energy Storage*. The workshop is part of a wider ongoing project which will result in a publication in October 2016 (objectives below).

A broad range of workshop attendees from across the energy system - from the electricity, gas, heat, hydrogen and transport sectors, specifically with knowledge relating to the financial, legal, political, commercial and regulatory challenges for energy storage - were invited to help ERP uncover the barriers and in turn, inform our project work.

Other documents in support of this key insights paper are:

1. Results from an interactive voting session that workshop attendees took part in on the day;
2. A full detailed summary of workshop paper with notes of *per table* discussions, a panel session & debate, and presentation from DECC regarding its recent *'Towards a Smart Energy System'* publication and upcoming call for evidence on Smart Energy.

Workshop documents/presentations are available via the workshop link at: ERP's project webpage

Objectives of ERP Project - Barriers to System-Wide Energy Storage

The objectives of ERP's wider project work are listed below. The workshop aims & objectives were directly related to **project objective 1** below:

- ERP's work will focus on the *financial, legal, political, commercial and regulatory* challenges to **system-wide** Energy Storage
- The work will consider the whole system need for storage and will:
  1. **Identify barriers** & ways to overcome them
  2. In doing so, will **provide clarity** for: policy-makers, regulators, network operators, customers, investors & ES developers (tech & supply chain developers) to…
  3. Where appropriate, **help catalyse & mobilise Energy Storage supply chains** of value to the UK, stimulating investment.

Workshop discussions were therefore largely focused around identifying the *barriers* to system-wide energy storage. Some solutions were also raised for discussion and have been noted in the summary below. Discussions around solutions often posed further questions however and will therefore provide ongoing considerations for the ERP.

In the first half of its work, ERP plans to focus on the barriers identified, ensuring these are highlighted amongst ERP members and wider parties for discussion. Where questions regarding solutions have been posed, these will be considered in the second half of ERP's work (post-July 2016).

A note to workshop attendees

ERP would like to extend their thanks to all workshop attendees for their time and contributions on the day which has helped to inform ERP's overall project work & publication. If you have any further comments, considerations or feedback to add following the dissemination of this workshop summary, please contact helen.thomas@erpuk.org

1. Key insights regarding the energy system in the context of storage:

Key insights from the day fall into two main themes. Discussions have brought to light some wider energy system issues/barriers that could affect the need and deployment of storage but could also affect technologies, services and solutions more generally. Other barriers and discussions relate to energy storage services more specifically.

Market Structure:

- There is currently a fragmented, siloed institutional energy system arrangement made up of decision-makers, the system operator, network owners/operators, individual energy sectors (heat, power, transport) and consumers.
- Alignment of these groups and a more combined, coordinated arrangement would help value non-asset services that are currently undervalued or not accounted for, such as energy security, resilience and flexibility, and would help facilitate solutions such as energy storage (where there is a system need or a strong market signal). Regulatory structures that support contracting for system resilience and flexibility (and not just the cost of power) are required.
- In relation to these issues, a reconceptualisation, redesign or adaptation of the current market structure is required. A clear whole-system direction resulting from whole-system thinking would help to integrate and value solutions such as energy storage.
- A particular tool noted to enable this whole-system thinking is in the form of a "system architect". This role should be provided by a dedicated, independent party or dedicated government body – (**see interactive session results**) to design, advise on and facilitate the UK energy system from a whole-systems perspective. This will help accommodate energy storage (in all its forms) and other solutions.
- Although there is a role for markets, these alone are not enough. Whole system direction plus clearer government decisions regarding the role of the market are required.
- There is likely to be a revolution in relation to energy system regulation and governance for smaller system and localised generation. However, there is still the need for a central government push for large flexibility assets (e.g. interconnectors or large scale storage).

Policy:

- Current regulation and policy design is too 'top-down'. There needs to be a balance between top-down decisions that should set the overall energy system framework and provide visibility of a future energy system. The market can then take over, allowing individual technologies and solutions to flourish and benefit consumers in this way.
- Policy needs to engage a wider range of consumers and in particular, engage further with smaller users / micro-generators. It is important to segment the market for policy solutions and recognise the differing needs and policy solutions required for larger vs smaller generators.
- A government report/publication on resilience and 'the winter outlook' is called for to enable consumers to better understand and feedback on energy security and the need/role for storage.
- To optimise the needs of varying stakeholders to ensure the full benefits of storage are achieved for consumer benefit, more in-depth coordination between institutions i.e. DECC, Ofgem, DfT, National Grid, DNOs, plus the energy sectors is required.

- Energy costs are disproportionately borne by the costs of electricity. Government attempts to reduce the carbon intensity of energy are therefore borne by those who use electricity rather than other/all forms of energy. This makes energy storage options more expensive and should be reconsidered.
- Regulatory systems should incentivise solutions that deliver on the long-terms energy trilemma.

Key insights relating more specifically to energy storage:

- Energy storage is currently under-valued, in part due to investment costs vs payback periods, but also because there are missing markets for valuing the services it provides.
- Storage provides additional benefits to society which are not compensated for in existing market structures.
- There is currently a commercial risk relating to storage, mainly when considering it as a bolt-on or retrofit service to be added to existing sites with existing infrastructure and commercial arrangements. In these cases, adding storage to the mix can often place at risk, or invalidate these pre-existing arrangements. Therefore even if the overall economics will be improved, if there are strong environmental and social rationales, and therefore interest from investors and generators - there is reluctance to incorporate storage because this can add risk to core arrangements in place. Examples include risk to returns gained on existing assets via offtake agreements and loss of ROC or RHI payments.
- Storage does not require its own dedicated treatment (e.g. subsidies) which it is felt would only delay the issues until subsidy end, although there are other incentives for possible consideration such as tax breaks / tax credits.
- On the whole, it is felt that a truly flexible and resilient energy system or market should be able to successfully accommodate and incorporate energy storage services.
- However, in some respects, storage may require its own regulatory framework, or adaptations to existing frameworks, to better accommodate and value its services within the energy system, and/or to provide a level-playing field against other options.
- Some energy system assets (such as storage) are currently viewed as riskier to invest in and therefore have to be financed solely by equity (at a cost of 20+%). Large pension funds are keen to inject capital but require predictable returns. The current challenge is that there is arguably a shortage of risk capital. Improvements of regulatory systems can address the debt vs equity allocation mismatch and ensure that the lowest cost of capital is included within the transformation of the system.
- There needs to be a shift of capital away from financing assets only, to also financing services that energy storage can provide. There is no shortage of capital available for energy storage and there is a keenness to invest, however there is a lack of information for the finance sector regarding the types of storage to invest in. Successfully unlocking the initial 10,000s will help facilitate investment and unlock larger amounts of capital.

Electrical Storage:

- Transmission & Distribution charges don't currently encourage a level playing field and provide the right signals to value electrical storage at the right locations. It is best to optimise electrical energy storage at a grid level if possible, so it is important that charges should provide the right economically efficient price signals.
- Current electricity charging methods could be reconsidered towards a preference for setting charges at the consumer side as opposed to the generation side. A move away from volumetric or commodity-based charging (e.g. per kWh of usage) to capacity-based charging (e.g. charged according to the max peak used) should be considered.
- A stronger definition of electrical storage is required.

- There are distorted signals relating to regulation e.g. network costs for storage. 'Double charging' as both a generator and consumer is one of the factors that makes the economics of storage schemes more challenging.

Gas Storage:

- The full range of benefits that gas storage brings - particularly security of supply - is under-recognised and under-valued by both the gas and power sectors. These benefits are not reflected in today's market prices.
- If gas storage is seen as a critical part of the whole energy system, then changes need to be made to fully value the range of services and benefits that gas storage provides.

Thermal Storage:

- Heat could be more widely used as a form of storage from electrical generation, similar to the concept of a CHP system. Dual electricity-heat benefits would incentive take-up.
- Large amounts of heat storage is currently being lost or removed from the system. There is no real incentive to retain certain forms of heat storage (e.g. hot water tanks) within homes and policy has played a part here.

Hydrogen:

- Hydrogen can provide storage in the same way as fuels. It can also provide similar services to the electricity grid similar to other options, such as batteries and pumped storage.
- A key benefit of hydrogen is that it can serve multiple markets, e.g. power-to-gas, transport and heat, and therefore does not have to be converted back to electricity. However this requires a cross-sector approach to the energy system to fully assess the value hydrogen can bring.
- In addition to other key benefits e.g. storability, transportability, mobility and suitability for larger vehicles, along with the potential to use it for heat (instead of electrification), Hydrogen will start to look more attractive when considering a valuation for resilience.
- Despite the attractiveness of Hydrogen, the finance sector are somewhat cautious regarding investment because it is not yet clear whether there will be a global market, or what the related prices for provision will be. This was particularly noted in relation to transport, where an international market for pure EVs is developing, with uncertainty about the development of Fuel-Cell EVs. This view was challenged, in relation to the benefits of Hydrogen for assisting with the seasonality of heat in particular.

Transport:

- Storage from transport (EVs) can provide a useful solution to assist with grid balancing but requires planning as part of system-wide solutions.
- There are opportunities to re-use or 'second-life' older batteries from EVs to assist the grid with charging requirements. These can be used as localised storage to mitigate the challenge of reinforcing local networks in order to manage a local peak load caused by multiple vehicles attempting to recharge at the same place and same time.
- The risks and trade-offs of building national infrastructure for EV charging need to be considered in terms of other solutions e.g. market entry of hydrogen/fuel cell vehicles.
- Transport currently already provides a certain level of storage in fuel tanks and within transport energy infrastructure itself.