Accelerating energy storage innovation
What is needed and how can it be achieved

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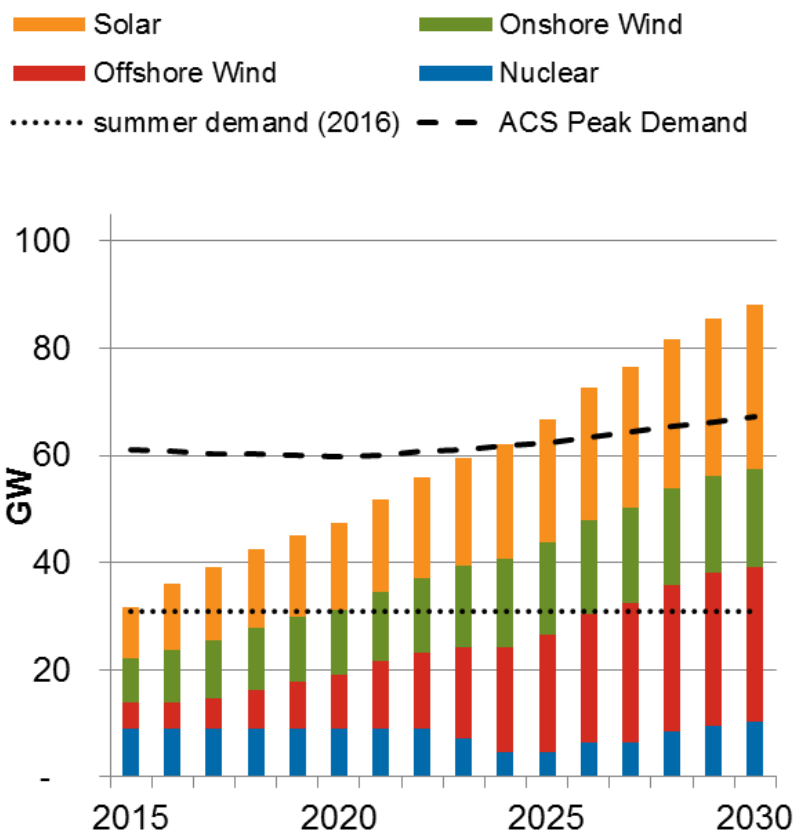
Overview

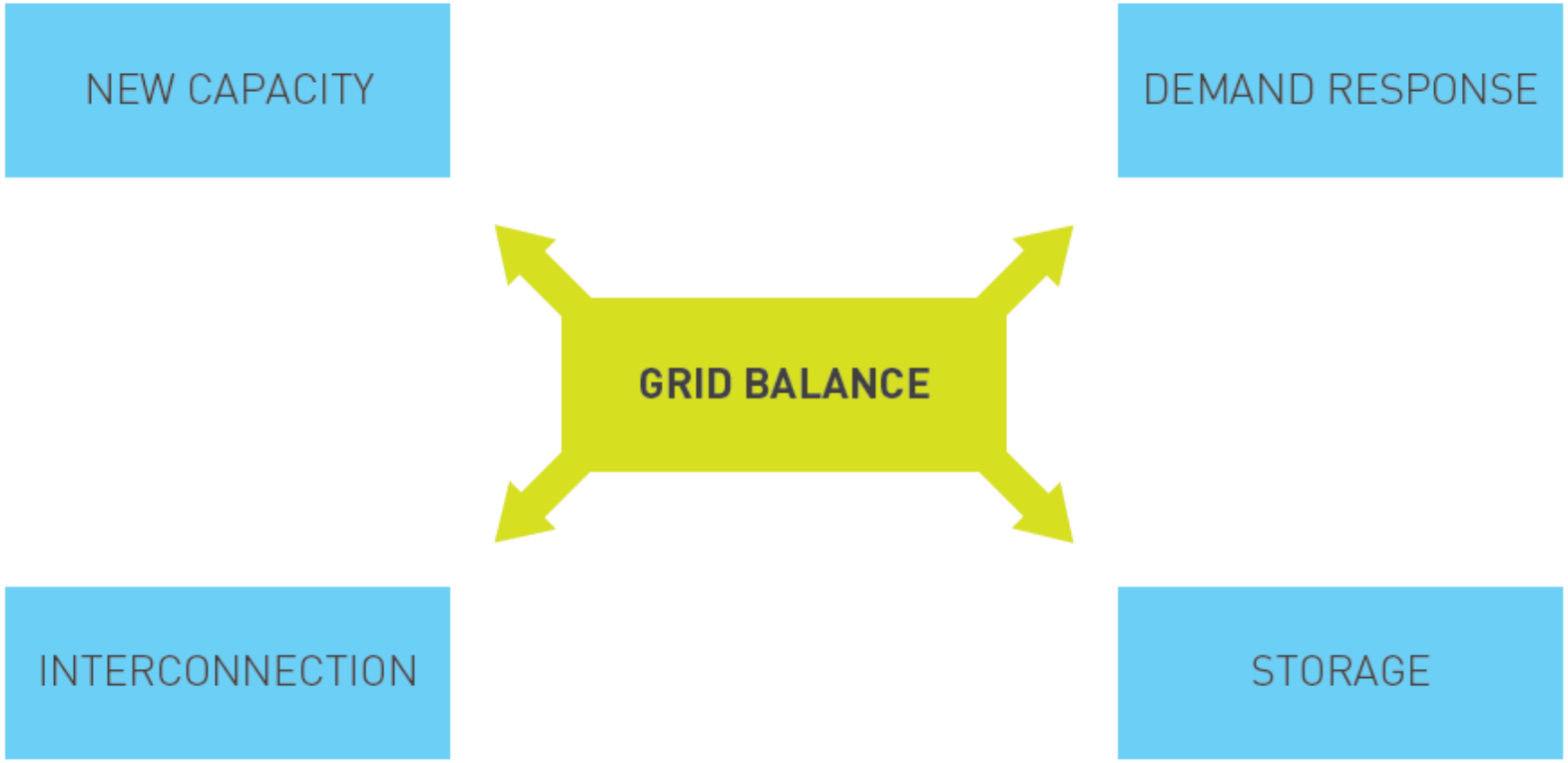
- The changing UK energy system
- Lessons from the innovation literature
- The UK innovation landscape for storage
- Views of stakeholders
- Conclusions

“Inflexible” generation capacity and electricity demand



Source: National Grid’s Gone Green Scenario

Options for providing flexibility



Source: Taylor, P.G., Bolton, R., Stone, D., Zhang X-P., Martin C., Upham, P. (2012). Pathways for Energy Storage in the UK. Centre for Low Carbon Futures.

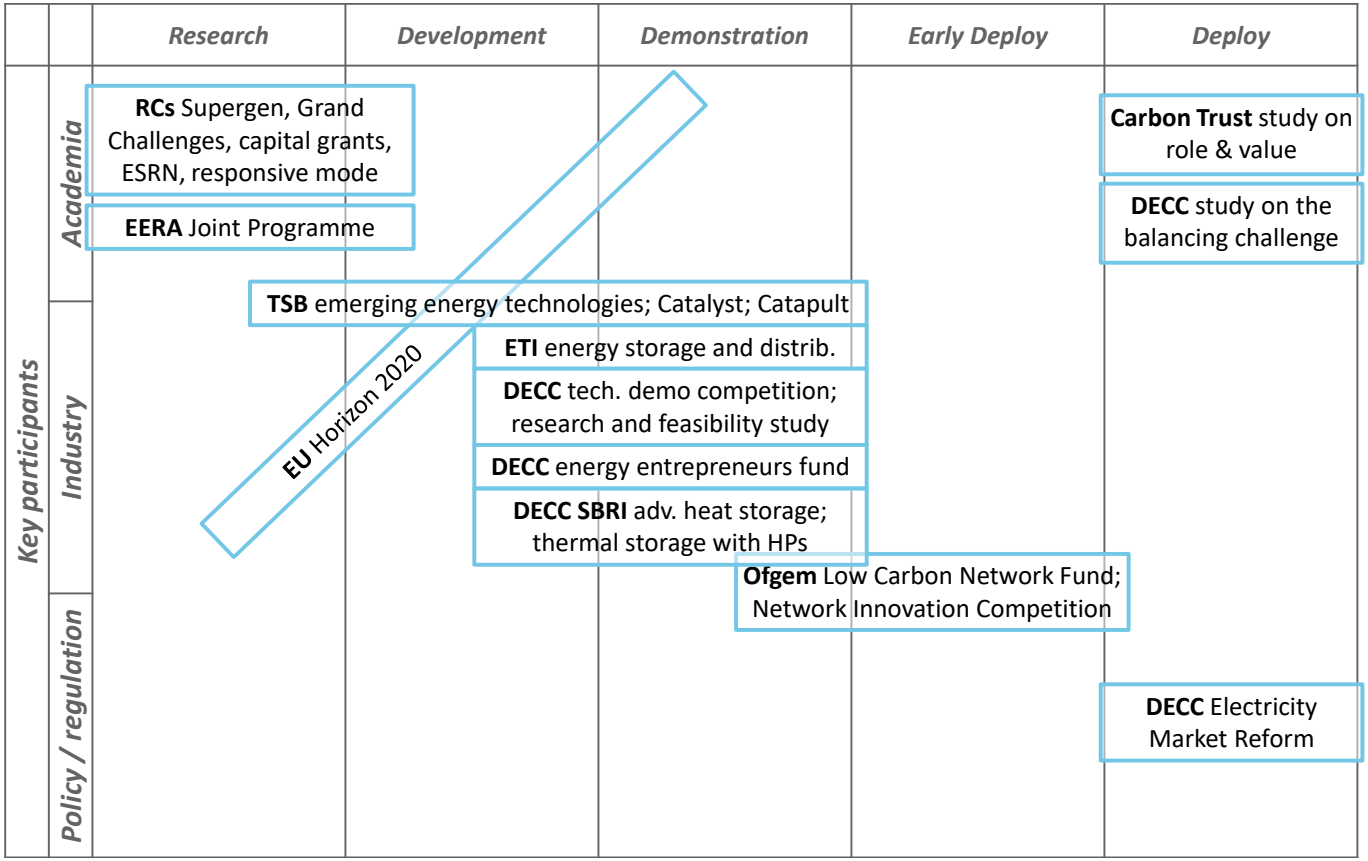
Innovation frameworks

- Technology Innovation Systems
  - Structure and function
- Multi-level perspective
  - Strategic niche management
- Co-evolutionary perspective

Some lessons from the literature

- Analysis of innovation needs to go beyond considering the technology itself
- Both the structure and function of innovation systems are important
- Path dependency and lock-in can be significant barriers
- Innovation systems take time to form – especially for radical disruptive technologies

UK energy storage innovation landscape



Source: Radcliffe, J; Taylor, P; Davies, L; Blyth W; Barbour, E (2014) Energy storage in the UK and Korea: Innovation, investment and co-operation. Centre for Low Carbon Futures

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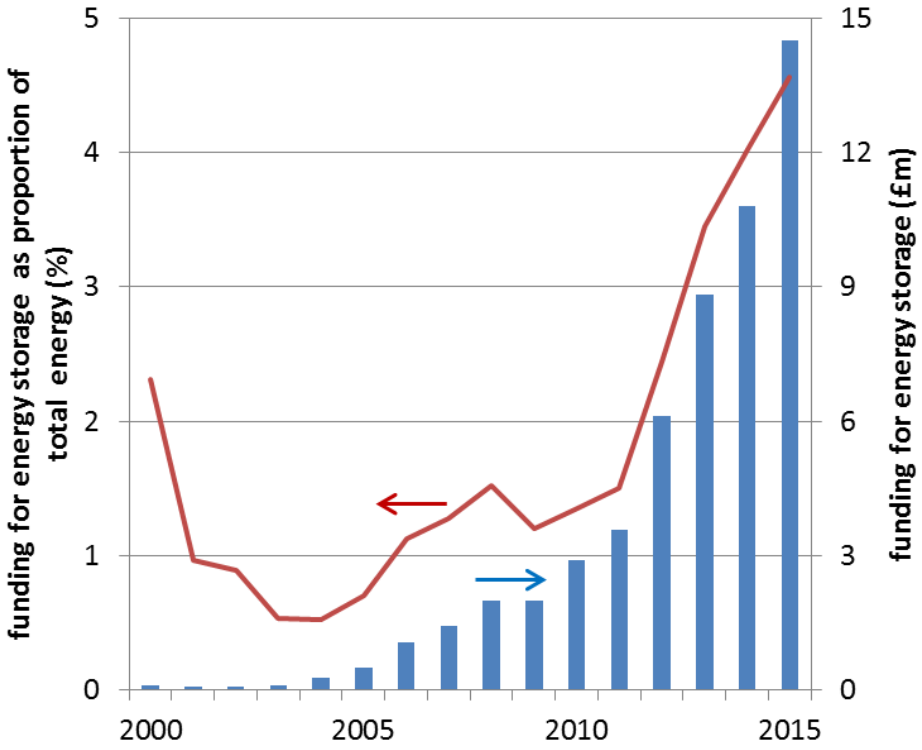
UK public sector funding for energy storage technologies



IEA energy category	Funding 2000 – 2009 (£k)
Energy storage	7,551
Wind energy	25,816
Solar energy	37,721
Ocean energy	39,511

Source: UKERC Research Register

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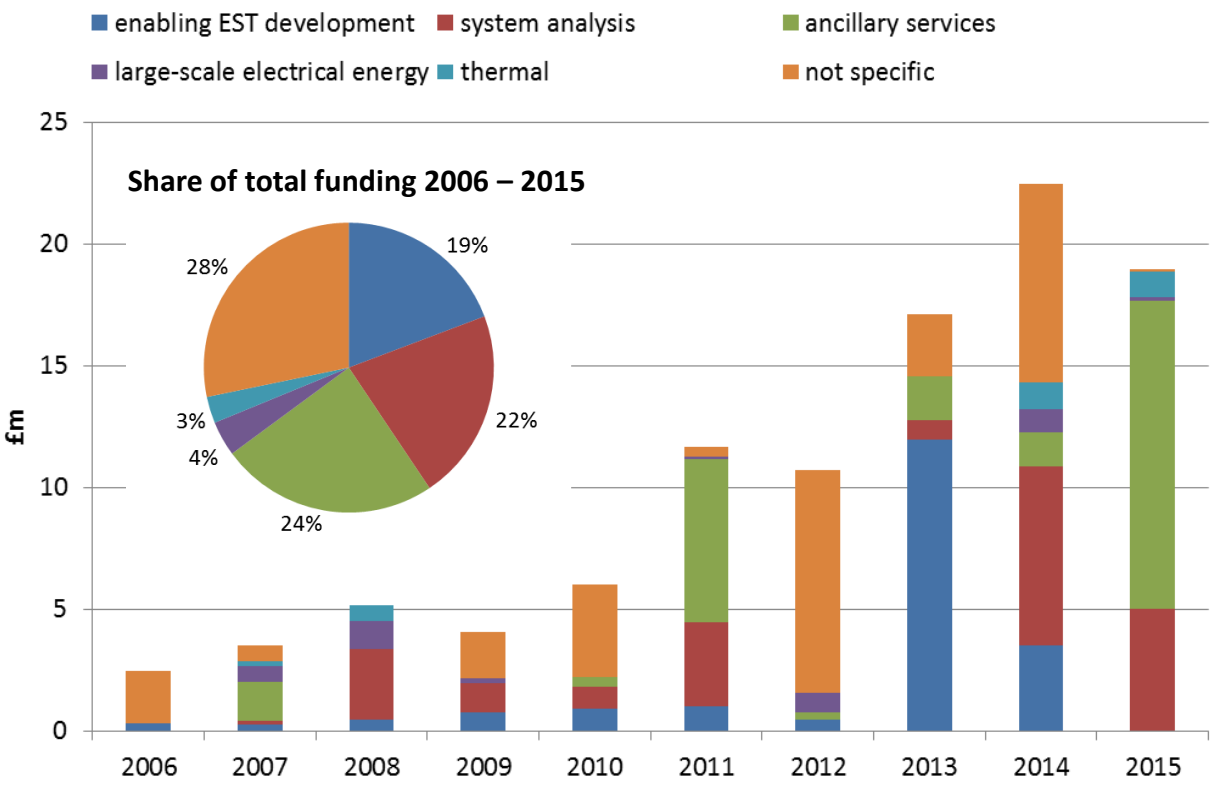
EPSRC funding for energy storage by main technology service



Source: EPSRC Gateway to Research

Views of stakeholders

- Interviews with stakeholders to understand perspectives on the need for greater system flexibility, the role of storage and barriers to its implementation.
- Government, regulators, electricity companies, R&D funders, technology manufacturers.
- Part of a larger study funded by the FCO looking at opportunities for storage in the UK and Korea and areas for co-operation.

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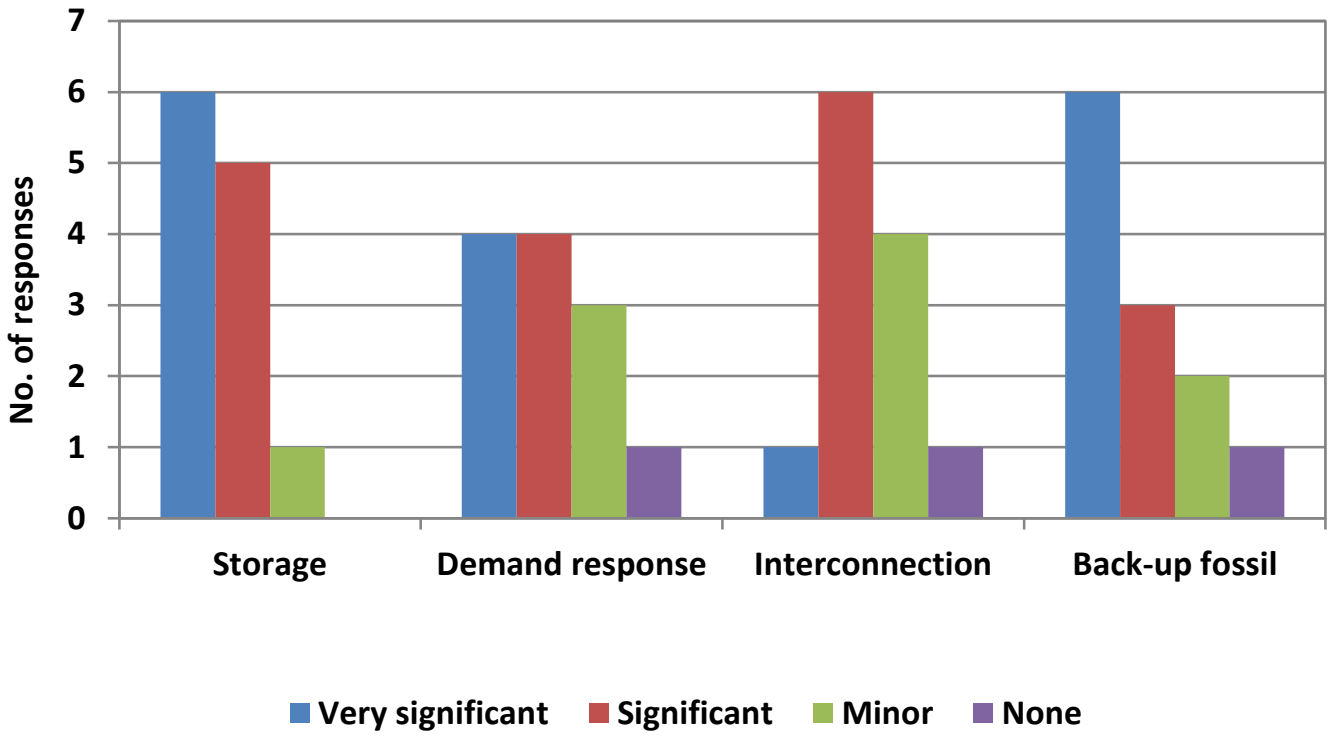
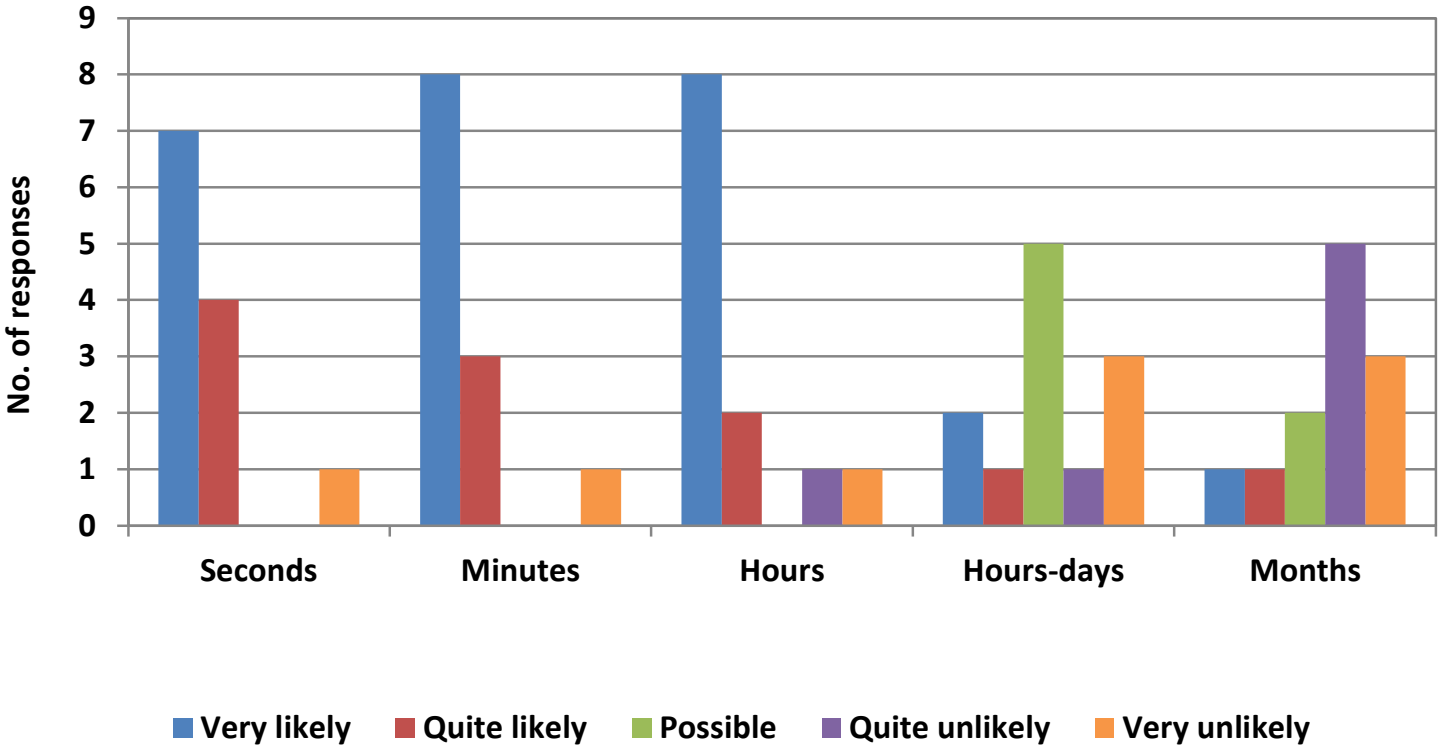
Role of options in providing flexibility to the energy system over the period to 2030



Durations over which storage is the best-placed to provide flexibility



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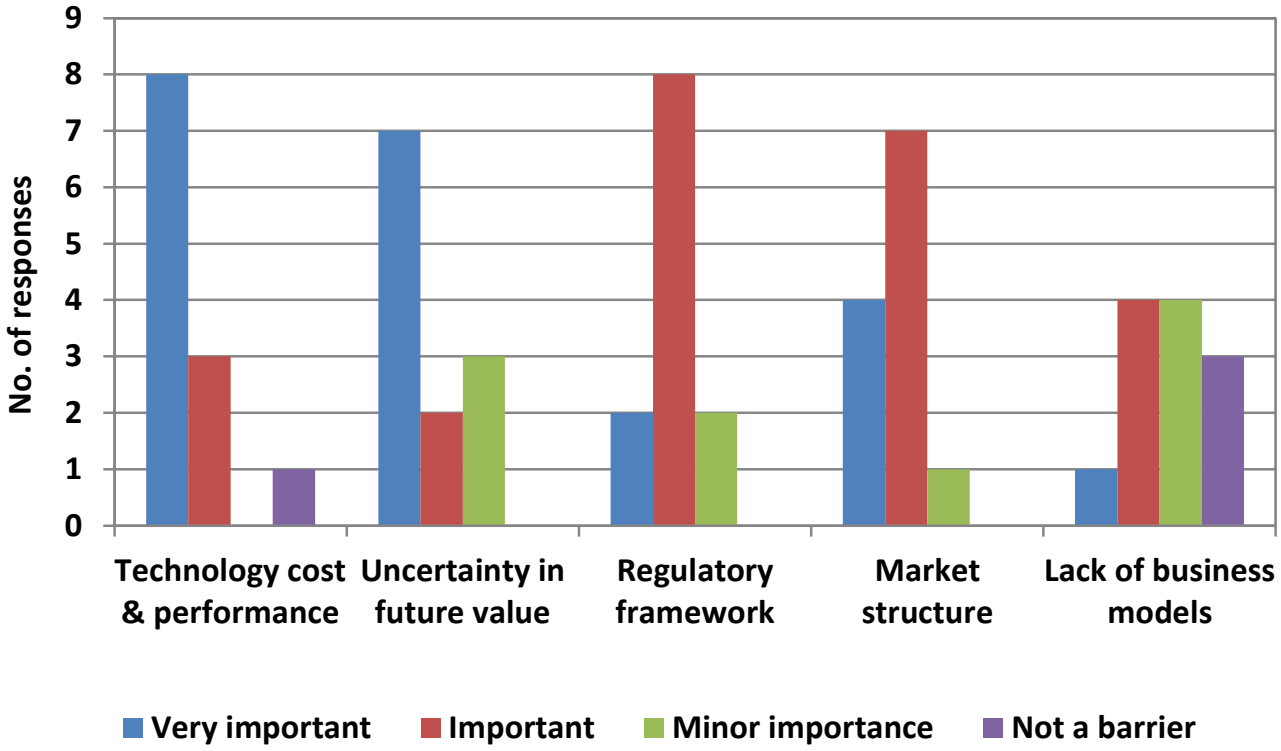
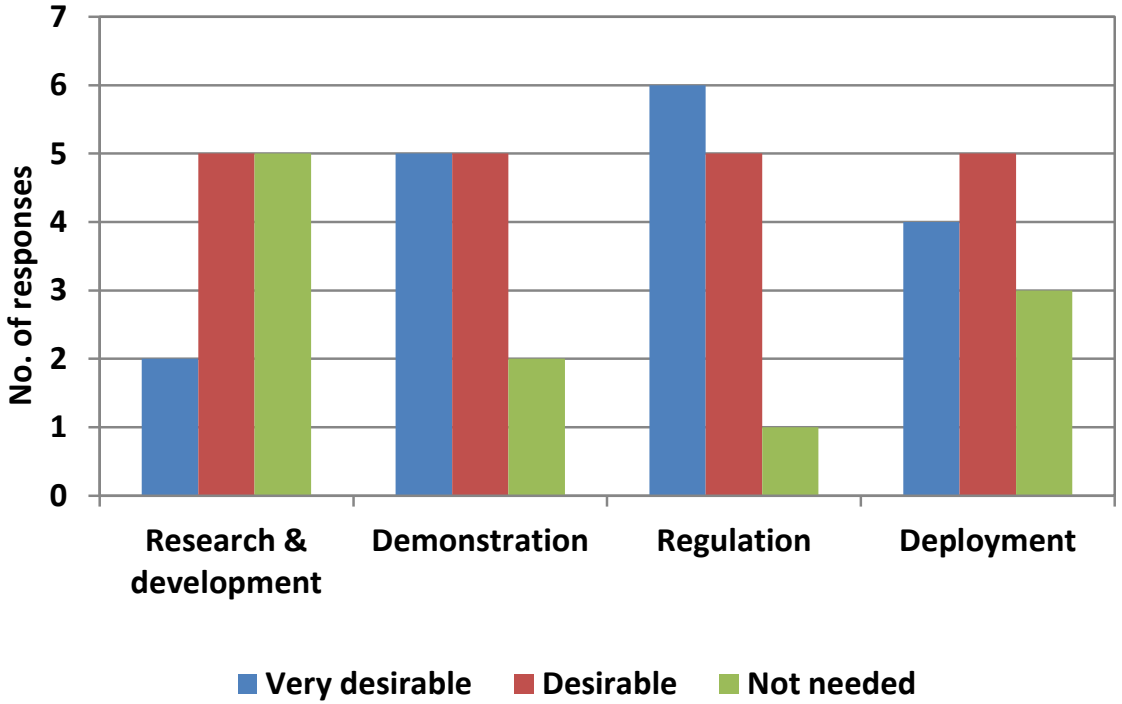
Importance of barriers to the deployment of energy storage over the next 5-10 years



Desirability of different forms of government support for energy storage



Summary of findings

- Energy storage provides an interesting case study for technology innovation systems.
- Near-term storage services likely to be over timescales of seconds – minutes, but high penetrations of “inflexible” generation means increasing need for large stores of energy over hours – days.
- There has been a lag in support, and lack of vision across the innovation landscape, which is needed to enable the appropriate technologies to be developed.
- Overall level of funding for energy storage, while increasing, is low compared to other technologies and not sufficiently joined-up. It is not sufficiently supported by policy to provide confidence to private sector investors.

Initial conclusions and further work

- The potential offered by energy storage will only be realised if the innovation system functions as a whole.
- We will be undertaking further research to explore in more depth some conclusions from our initial analysis:
  - In R&D, excellent science needs continued support; but capability needs to be grown in new areas that meet energy system needs.
  - Scaling-up to support manufacturing and demonstration will be crucial.
  - Policy and regulation should take account of the energy system requirements in the 2020s, while industry needs to consider new business models for maximising the value of storage.
- Innovation support must consider how the different parts of the 'whole energy system' will co-evolve, including heat and transport, and across temporal and spatial scales.

Further information and contact details

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