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Smarter Network Storage

Funding mechanism: LCNF Tier 2

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UK Power Networks and partners: £5.5m
Overall: £18.7m

Status: Live
Start date: January 2013
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Project concept/overview/challenge

We have installed a 6MW/10MWh energy storage device on our 11kV network and are undertaking trials to improve the understanding of the economics of electrical energy storage. The learning gained will help determine the cost effectiveness of storage and seek to provide a more sustainable, efficient and flexible way to reinforce electricity networks.

There are currently several challenges preventing the adoption of energy storage across distribution networks. Storage used for a single application, such as network support, is typically inefficient. However, business models for maximising the value of storage are unproven and difficult to implement. Evolution of regulatory frameworks is needed to better support the adoption of storage by distribution network operators (DNOs).

Stakeholder benefits

- Manages peak demand at Leighton Buzzard, reducing losses and improving asset utilisation.
- Cost effective balancing support to the wider electricity system.
- Saving in carbon dioxide emissions from displaced peak generation, estimated to be around 1.7k tonnes of CO^2.
- Validation of the business models and economics of storage when leveraged for full system value, building experience and encouraging adoption on a wider-scale.
- Supporting the development of the commercial environment for ESCO's, developers and investors in storage.
- Identification of the key market, commercial and regulatory barriers to effective deployment of storage.

What we are doing/deliverables

- Demonstrating how 6MW/10MWh of lithium-ion storage can be deployed on the distribution network to support security of supply.
- Trialling the multi-purpose application of this storage facility for a range of different system benefits to help maximise value, e.g. investment deferral and ancillary services.
- Developing a new optimisation and control system and trial the commercial arrangements for shared use of energy storage.

This project is trialling how energy storage could be used as an alternative to conventional network reinforcement and evaluating additional income that can be gained to maximise the value, and make storage a more cost-effective alternative.

In order to achieve these additional benefits, the storage is being used for a range of other system-wide services, to benefit other electricity system participants, testing both the technical and commercial aspects of these applications.

Trials are taking place serving, firstly, the DNO only and then serving a range of other participants in the electricity system across a range of applications. Finally the project will aim to demonstrate how these can be combined to maximise the overall value.

Findings

The project has published key new learning including the design and planning considerations for deploying large-scale storage, the design of a novel optimisation and control platform and findings relating to the smart commercial agreements needed for advanced use of storage.

Our key findings to date, include:

- Insights into the time and resource efforts required to secure planning consents for grid-scale storage facilities.
- The procurement process highlighted that storage supply chain is currently immature and constantly evolving, increasing procurement risks for storage systems.
- There are a broad range of options for ownership and operation of grid-storage at a distribution level but there are currently limited signs of a market for specialist energy storage operators and/or developers.
- Stakeholder concerns in the planning consent process were more focussed on local issues, such as spare land and visual amenity, rather than specifics around the storage technology.
- Batteries from different manufacturers can utilise different DC rack voltages, despite using the same technology, which has impacts for device footprint that need to be considered during design.
- The range of services currently available in the ancillary services markets are well within the capabilities of battery energy storage technologies, but the value of faster and more accurate responses are not yet recognised in the UK market.
- The requirement to commit in advance to different services on different timelines means that there are trade-offs required when optimising service value. It is difficult to fully optimise storage capacity at all times as commitment in advance is constrained by the uncertainty of costs and benefits and the potential penalties for non-delivery.
- The impact of the EU Third Energy Package, a legislative package aimed at opening up the gas and electricity markets in the EU, could restrict the development of energy storage business models. One directive concerns the unbundling of production and supply interests from DNO's, to prevent operators favouring their own suppliers.
- The efficiency of a storage system is likely to have most impact on the benefits achievable from energy arbitrage - a 10% reduction in efficiency could reduce the daily arbitrage revenue opportunity by over 40%.
- The manufacturer recommendations for calibrating the state of charge could have a significant impact on the business case.
- 'De minimis' business restrictions on regulated DNOs place a limit on the deployment of storage, which may be a barrier only in the longer term.

Next Steps

During the trial of the storage facility the project will be collecting a significant amount of data relating to:

- the performance of the storage facility in delivering a wide range of different services, to different parts of the network
- the costs and benefits of operating the device and how these might be aligned under different business models
- the asset management methodologies and procedures needed around energy storage
- the use of smart optimisation and control systems and how these might need to be embedded into Distribution System Operators (DSOs) of the future
- recommendations for improvements to the regulatory and legal frameworks to support future adoption of storage.

Partners

AMTSybex
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