



Distributed Energy

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Introduction

For the UK to achieve its challenging energy system decarbonisation targets while delivering savings for consumers, an increasingly significant role is required of integrated energy solutions that combine local generation sources with smart, flexible consumption and demand management.

As part of the Energy System Integration Guides: Distributed Energy project, Energy Systems Catapult carried out a feasibility study to investigate how the public sector estate could help stimulate the market for integrated energy solutions using campus scale sites (e.g. hospitals, prisons).

The challenge

Both public and private sector energy consumers and the supply chain, currently have limited expertise to scope, install and operate integrated energy solutions that will save carbon as well as money. This has been compounded by a focus on single technology solutions, which can have unintended negative consequences on the wider energy system. Informed consumers and an attuned supply chain for integrated energy solutions do not yet exist.

The innovation

Campus scale sites are ideal for integrated energy solutions because, typically, their energy demands are large enough to have material economic impact, but not so vast and complex as to be unmanageable.

Working with the Norfolk and Norwich University Hospital (NNUH) and Norwich Biosciences Institutes cluster of buildings and facilities, the Catapult team developed an early pilot methodology and suite of tools to assist campus energy managers to evaluate a range of potential integrated energy solutions.



Each option could be assessed for its suitability to the site and wider system ‘friendliness’, against a range of future ‘whole energy system’ evolution scenarios. The outputs from the Norfolk feasibility study included:

- 25 potential integrated energy options, compared against metrics such as cost savings, energy savings, future-proofing and new revenue; from which, six viable solutions emerged:
 1. onsite generation and storage
 2. physical interconnection and generation
 3. heat generation and network
 4. power to hydrogen
 5. virtual private wire
 6. mass electric vehicle enablement
- even without commissioning one of the six integrated energy solutions, the Catapult team found that a 20% annual energy saving for the site might be possible with simple changes in the short-term.





The outcomes

We found that while sites with distributed generation can benefit from reduced energy costs and reduce average demand on local network operators, the knock-on effect to the wider energy system was not well understood and therefore not considered. Individual site solutions, if designed without the wider system in mind, can be detrimental, requiring local network reinforcement and potentially avoidable investment in larger generation.

The public sector estate, which consumes 6% of total UK energy across over 1,000 sites, provides a unique market-making opportunity for integrated energy solutions that combine low carbon distributed generation with energy demand management and smart control systems. If wider system benefits are designed in from the start, cooperation with neighbouring sites and energy network operators would optimise the potential for a pool of local co-ordinated assets.

There is a clear gap in the UK market for innovators able to help site owners/operators scope, install and operate energy system transformation solutions. Capitalising on this opportunity could grow private sector capability to help the UK achieve a cost-effective energy system transformation: a potential¹ £100 billion annual global market, which also delivers savings for consumers.

The Impact

The ESIG: Distributed Energy project investigated the feasibility of utilising the public sector estate to assess the potential for stimulating the market in integrated energy efficiency solutions for campus scale sites.

The project delivered an early pilot methodology and a set of tools to inform decision-making and responsible practice for transforming the energy efficiency of campus scale sites for the benefit of both the site and the wider energy system.

The impact this had was as follows:

- **£2 million follow-on project:** The ESIG: Distributed Energy project, provided the business case that has enabled Energy Systems Catapult to create the Modern Energy Partners (MEP) follow-on project – in partnership with the Cabinet Office and the Department for Business, Energy and Industrial Strategy.
- **skills:** energy managers of complex sites struggle to have the time, resources, or up to date knowledge to confidently take on an energy transformation at scale with present practice. This project and MEP is equipping energy managers with the skills and tools they need to take on these challenges.

The Next Steps

Modern Energy Partners (MEP) is now live and running a pilot of design projects with a small number of campus scale sites in the UK to March 2019. Following on from this, the aspiration is to grow MEP to a larger number of sites and begin deploying integrated energy solutions on the ground at scale.

Cardiff University have also recently had success, winning funding from the EPSRC [National Centre for Energy Systems Integration](#) flexible research fund, off the back of support from the Catapult MEP team for their proposal to develop a 'Decision support tool for the operation of public sector multi energy systems'.

¹ The Energy Transitions Commission report 'Better Energy, Greater Prosperity' (April 2017) and supporting data pack on request.