

7th Smart Grids & Cleanpower 2016 Cambridge 27-28 June <u>www.cir-strategy.com/events</u>

Smart Grids & Cleanpower 2016

Smart Energy Innovation

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Smart Energy - 2016



February 2016: National Infrastructure Commission Smart Power report – "on the benefits we can achieve through building a more flexible electricity system and the steps that will get us there".



March 2016: IEA-RETD report: "Policies for Storing Renewable Energy: A Scoping Study of Policy Considerations for Energy Storage"



May 2016: Open Utility report on Piclo – "Britain's first online peer-to-peer marketplace for renewable electricity".



June 2016: The BPVA and Haymarket Media Group launch the UK's first ever consumer focused magazine, covering Solar Power, Energy Storage, Smart Technology and Electric Vehicles.



UK Energy Innovation Support

Organisation/ Programme (National Programmes Only)	TRL 1-2 (Early stage Research)	TRL 3-5 (Applied R&D)	TRL 6-7 (Dev & Demo)	TRL 8 - 9 (Pre- commercial)	Commercial Deployment
DECC					
Innovation Programme [£505m] & Heat Network Funding [£300m]					
BIS					
National Innovation Plan					
Innovate UK – to become part of UK Research & Innovation (UKRI)					
Catapults: e.g. Offshore Renewables Catapult & Energy Systems Catapult					
Research Council UK (RCUK); to become part of UKRI					
DfT					
OLEV (Ultra Low Emission Vehicles) - funded jointly with DECC and BIS					
Advanced Biofuels Demonstrator Competition					
DEVOLVED ADMINISTRATIONS					
Scotland, Wales & Northern Ireland					
OFGEM	_				
Network Innovation Competition & Allowance (NIC/NIA) and RIIO controls					
PUBLIC-PRIVATE	_				
Energy Technologies Institute (ETI) (to 2017)					
Energy Research Partnership (ERP)					



DECC Innovation Support

DECC innovation programme aims: To help deliver our 2050 climate change targets and energy security objectives cost-effectively by ensuring that the right energy innovation happens.

We focus on technologies where there are clear market failures and programmes where intervention will have the greatest impact on meeting the climate change and energy objectives.

Both internal and external analysis and modelling are used to help UK Government to identify low carbon innovation needs (e.g. DECC inhouse dispatch model, Technology Innovation Needs Analysis (TINA) documents).

DECC is working closely with other public sector funders - including Innovate UK, Energy Systems Catapult, OLEV, EPSRC, Devolved Administrations - and with Ofgem. New Energy Innovation Board provides co-ordination and steer.



What Next....?

Smart Technologies – DECC/Ofgem Call for Evidence

Levelling playing field for smart technologies	 Address barriers to storage deployment Clarify role of aggregators
Delivering clearer price signals	 Incentivise consumers to offer up their flexibility
Catalysing further innovation	 Support through innovation funding those areas critical to the development of a smart energy system.
Examining case for more fundamental changes	 Consider what system functions are required in a future smart energy system and what are the resulting shifts in roles and responsibilities (e.g. from DNO to DSO).
Developing our analysis and evidence base	 Assess costs and benefits; how much flexibility might be 'least regrets'; and identifying evidence gaps more broadly in this area.



What Next....?

DECC Innovation Support for Smart Technologies

- In Budget 2016, Government committed **at least £50m of funding** to support innovation in DSR, storage and smart technologies.
- The DECC/Ofgem **Call for Evidence** will provide an opportunity for stakeholders to help shape the new innovation programme.
- **Grant funding** likely to remain a key support mechanism for smart and other low carbon technologies but also investigating other mechanisms.
- Delivery through DECC-managed competitions and potentially through other funding organisations.



What Next....?

UK Innovation Support for Smart Technologies

- Funding allocations and areas for focus under development, but could include:
 - DSR identifying and potentially trialling automated use of flexible loads in domestic and smaller business settings;
 - Flexibility dispatch models and systems to dispatch/trade flexibility at more local levels in the system;
 - Storage focus on cost reduction and larger-scale technologies (including very large, inter-seasonal storage) with strong potential for medium-long term.



DECC energy storage innovation projects by technology type



Battery (8)

- Flow battery (2)
- Power-to-gas (3)
- Flywheel (3)
- Pumped hydro/Gravitational (2)
- Thermodynamic (2)
- CAES (1)
- Other (3)



DECC Innovation Support for Storage (2012-2016)

DECC: Energy Storage Component Research & Feasibility Study Scheme

Lead bidder	Partner organisations	Title & outline of proposed energy storage demonstration project
C-Tech Innovation	University of Southampton; Warwick University	Improvements to Soluble Lead Redox Flow Battery Components: Project to address the failure modes associated with soluble lead flow batteries. The project will incorporate new cell components into a functional, kW-scale industrial flow-stack; test the validity of and optimise the new cell components.
ITM Power	AEG Power Solutions Ltd	Reversible Alkaline Electrolyser: Fuel Cell for Energy Storage: Project to develop a novel alkaline membrane electrolyser for use in a reversible fuel cell aimed at stationary energy storage applications.
Quarry Battery Company	n/a	New Possibilities for Pumped Storage in the UK: Feasibility Study looking at the potential for wider deployment of new pumped storage facilities in the UK through use of non-conventional sites and novel site development strategies.
EA Technology Ltd	6 GB DNO licence holders; National Grid; Energy Networks Association (ENA)	Good Practice Guide: Project to develop a Good Practice Guide for the use of electrical storage in the (UK) electricity networks. <u>http://www.eatechnology.com/products-and-services/create-smarter-grids/electrical-</u> energy-storage/energy-storage-operators-forum/esof-good-practice-guide
Kiwa Gastec at CRE	n/a	HyHouse Project: The Kiwa Study will investigate safety issues surrounding hydrogen as an energy storage vector & aims to quantify some of the risks and address the safety concerns associated with using hydrogen in a domestic setting. http://www.igem.org.uk/media/361886/final%20report_v13%20for%20publication.pdf
Sharp Laboratories of Europe Ltd	Faradion Ltd	Low Cost Residential Energy Storage Project: Project to develop and scale up new Na-ion battery technology for residential and community scale storage systems, in particular for coupling with PV renewable energy generation.



DECC Innovation Support for Storage (2012-2016)

DECC: Energy Storage Technology Demonstration Competition				
Technology	Title & outline of proposed energy storage demonstration project			
Li-ion batteries	Moixa Technology Ltd : Distributed energy storage for consumer, distribution network and grid-scale needs. Install & demonstrate deployment of 0.5MW/0.5MWh of distributed storage across 250 domestic sites. Grid-connected via aggregator. http://www.moixatechnology.com/contents/media/blog/decc-pilot.php			
Li-ion batteries, including recycled EV batteries	EVEREST Consortium (Electric Vehicle Embedded Renewable Energy Storage and Transmission) Project to develop and demonstrate a 150kW modular battery storage solution partly using recycled batteries from electric vehicles to provide 'Plug-In-Vehicle' and rapid charging infrastructure. Demonstrator can be charged using local renewable generation (small solar array and wind turbine) or from the grid. http://www.futuretransportsystems.co.uk/projects/everest-energy-storage/			
Vanadium Redox Flow Battery	REDT UK Ltd: Project to build and test a 1.2MWh flow battery storage system on the Isle of Gigha (Scotland) to store surplus wind energy for use in the island's own electricity network when required. http://www.redtenergy.com/case-studies/gigha-utility-scale-storage#			
Liquid Air Energy Storage	Highview Ltd and Viridor Waste Management Ltd: 5MW/12MWh liquid air demonstrator system; using 'waste heat' to improve efficiency. The system will provide balancing services in the commercial markets (via an aggregator). http://www.highview-power.com/pre-commercial-laes-technology-demonstrator-online-mid-2016/			

DECC Innovation: Energy Storage Technology Demonstration Projects

Moixa – Distributed Energy Storage for consumer, distribution network & grid needs.



EVEREST – modular battery storage solution partly using recycled batteries from EVs.



REDT – 1.2MWh Vanadium flow battery system on the Isle of Gigha (Scotland).



Highview & Viridor – 5MW/15MWh liquid air system; using waste heat to increase efficiency.



Department of Energy & Climate Change

DECC Energy Storage Technology Demonstrators

Moixa Technology Ltd – MASLOW Domestic Battery Storage

Demo Project Aims:

- Test economic model: benefits 'stacking' stored electricity is used by home owner (peak shaving) & provides network storage services via aggregator;
- Optimise system for mass manufacture;
- Test control & remote monitoring systems;
- Develop rapid installation process for home storage;

Current Project Status:

- MASLOW operating in approx 250 sites (approx 500kWh);
- Many systems integrated with domestic PV;
- Systems providing services to the grid;
- Installer network established;

Next Steps:

- Moixa has secured commercial customers and additional project funding to test systems; including June 2016 announcement that 'Scottish Power has teamed up with Moixa and Bill Save UK to pilot smart energy storage batteries in customers' homes'.
- Moixa continuing to refine business model & user options e.g. 'GridShare' service.







EVEREST (Electric Vehicle Embedded Renewable Energy Storage & Transmission)

Demo Project Aims:

- Prove the viability of using 2nd life EV batteries;
- Prove the viability of a system which uses a mixture of new and 2nd life batteries of different types and sizes, smart power electronics/control system;
- Provide a solution for network-constrained EV rapid chargers;
- Demonstrate wider applications for this scale of batterypowered storage.

Current Status:

- 100kW demo system commissioned Feb 2015 (Hethel);
- More than 6MWh of energy managed through the system to date; battery cycle testing ongoing.

Next Steps:

- 'Connected Energy' formed to commercialise system;
- Key partners in place including Renault (batteries & joint development).







DECC Energy Storage Technology Demonstrators

redT Ltd – Vanadium Flow Battery (Isle of Gigha)

Demo Project Aims:

- Demonstrate large-scale vanadium flow battery (100kW/ 1.6MWh);
- Develop design suitable for manufacture;
- Prove use of system to relieve constrained energy limitation & time shift energy for additional export revenue;
- Stabilise island voltage and frequency operation (potential for additional revenue for Fast Frequency Response).

Current Project Status:

- Containerised system in final stages of manufacture by major US manufacturer Jabil Inc;
- First units now installed at the Power Networks Demonstration Centre near Glasgow prior to deployment on the Isle of Gigha later in 2016.

Next Steps:

 Deploying 40kWh units – based on the Gigha system – worldwide, including South Africa and the UK (May 2016 announcement: "Energy supplier Eon is to install a redT vanadium redox flow battery in Somerset as part of a research project to understand the potential benefits of storage to commercial customers").







DECC Energy Storage Technology Demonstrators

Highview-Viridor - Liquid Air Energy Storage

Demo Project Aims:

- Demonstrate large-scale liquid air energy storage system
 approx 5MW/15MWh operate plant for a year;
- Demonstrate use of waste heat to improve system efficiency;
- Deliver range of storage services, including: STOR, Peaking, Triad avoidance and testing for PJM regulation market (USA).

Current Project Status:

- System in final stages of installation and commissioning on site at Pilsworth (Manchester);
- Expect to start operation in summer 2016.

Next Steps:

 Develop plans & secure site & funding for larger-scale system (potentially up to 200MW/1.2GW).





- For further details of DECC funded smart innovation activities, please contact: <u>s.fenton@decc.gsi.gov.uk</u>
- For further details of the (Ofgem) Low Carbon Network Fund & NIC/NIA projects: <u>http://www.smarternetworks.org/Index.aspx?Site=ed</u>
- For further details about the Technology Innovation Needs Assessments (TINAs), published by the Low Carbon Innovation Co-ordination Group: <u>http://www.lowcarboninnovation.co.uk/working_together/</u> <u>technology_focus_areas/electricity_networks_storage/</u>