

# Power Responsive - Storage Working Group

## Summary

**Monday 5<sup>th</sup> December 2016 (10:00 – 15:30 hours) - The Amba Hotel Charing Cross, London**

This document provides a summary of the first Power Responsive Storage Working Group that took place on 5<sup>th</sup> December 2016 to energy industry professionals participating, investing, supplying, or interested in electricity storage markets.

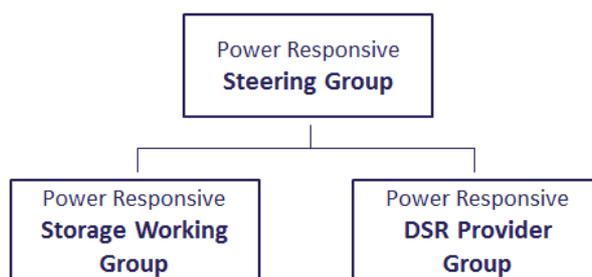
Feedback collected from participants regarding market barriers and proposed solutions have been included in Annex A and will be used with a view to shaping future working groups and the Power Responsive programme of activity.

### Purpose of the Storage Working Group

The Power Responsive Storage Working Group has been initiated to provide those within the storage community with a platform from which to discuss and share issues affecting their business and to learn of the opportunities and business models available to them.

Themes and areas requiring attention will be fed into the Power Responsive Steering Group on a quarterly basis.

### Power Responsive Working Group structure:



Lee Priestley, Head of Business Development, System Operator at National Grid will chair future Storage Working Group and DSR Provider Group meetings.

### Overview and Objectives

The aim of the first Storage Workshop Group has been to:

1. Introduce Power Responsive to the storage community as a programme of work within National Grid for growing the participation of flexible energy technologies.
2. Provide a learning opportunity on the markets available to the community.
3. Enable the storage community to feedback barriers to entry and inform future Power Responsive, National Grid and wider industry participants of areas to address.

**Attendees:** 133 delegates attended the workshop.

#### Chair

- **Lee Priestley** - Head of Business Development, System Operator, National Grid

#### Speakers

- **Paul Lowbridge** – Power Responsive Manager, National Grid
- **Deirdre Bell** – Senior Manager, Policy Analysis, Energy Systems Integration, Ofgem
- **Rachel Cooper** – Energy Strategy Networks and Markets, BEIS
- **Asheya Patten** – Flexibility Workstream lead Future of SO, System Operator, National Grid
- **Adam Sims** - Ancillary Services Flexibility Expert, System Operator, National Grid
- **Simon Bradbury** - Principal Consultant, Pöyry Management Consulting
- **Adriana Laguna** - Low Carbon Technologies Manager, UKPN
- **Dominique Laurent** - Business Development Director, AES

## Introduction

Delegates were welcomed to the first Power Responsive Storage Working Group by Lee Priestley, Chair. It was acknowledged that to see the room at capacity reflected the keen interest the energy market is seeing for storage. The agenda for the day was highlighted, and delegates encouraged to ask questions and provide feedback within the afternoons workshops.

## Session 1 – Policy and Operational View on Electricity Storage

### Paul Lowbridge - Power Responsive Electricity Storage Working Group - Overview

Paul Lowbridge provided background and context to Power Responsive and the programme's role within the System Operator function at National Grid. As momentum behind storage becomes more prevalent Power Responsive has recognised the need to create a platform for discussion and action that sits alongside the existing work being undertaken within DSR.

Other flexibility technologies were acknowledged in conjunction with storage.

An overview of the Power Responsive structure was provided, highlighting storage as a priority area of focus.

### Deirdre Bell & Rachel Cooper - Storage: Policy and Regulatory Overview

As the energy system faces four main challenges (increasing intermittency/inflexibility, increasing distributed generation, changes in consumer behavior, increasing demand) flexibility becomes central and storage is a key component of enhancing flexibility. Reports have identified that through reducing repair/maintenance costs (and other ways) the total estimated saving to GB in adapting a smart flexible system is between £17-40bn.

BEIS and Ofgem are looking for feedback in their Call for Evidence to determine the right areas of focus. Low carbon transition is the central focus of all these smart technologies alongside consumer cost reduction; three main methods are; storage, DSR, & interconnection. By moving to smart we will defer and avoid network investments, reduce overall back up capacity requirement, reduce system operation costs, maximise low carbon capacity through smart tariffs, and reduce repair/maintenance costs.

### Asheya Patten - Flexibility Planning and Opportunities

Moving towards a digitised, decentralised and decarbonised energy system brings a level of operational uncertainty. As a result, flexible technologies are required in order to help National Grid manage/operate the system, including interconnection, sync and async generation, embedded generation, DSR, and storage.

Numerous regulatory/commercial barriers to storage are identified; e.g. legal clarification on storage, contractual exclusivity, charges and levies.

National Grid's Flexibility Programme is working towards investable and accessible markets for all by 2021. The Flexibility programme is focusing on four delivery areas; information provision, shared services framework, simplified products and structural market change, with the challenge to provide the following outcomes:

- Greater clarity on the requirements of the system
- Lower barriers to entry for flexibility providers
- Unlocking the ability to provide multiple services to multiple market participants (e.g. SO/Supplier, SO/DNO)
- Wider range of flexibility suppliers and improved product landscape to provide better commercial signals
- Clear shared vision of the appropriate future market framework and clear road map
- Increased investor confidence

### **Adam Sims – Enhanced Frequency Response**

The Enhanced Frequency Response (EFR) tender ran in July and August 2016 with 1.3 GW submitted by 37 providers across 64 sites. 8 tenders and 201MW were successful at a total cost of £66m over 4 years.

Engagement with industry to develop the service was necessary to ensure that EFR worked for both National Grid and new technology providers. The service focuses on rapid response over a short period. We worked closely with stakeholders on service design throughout the process, being flexible to make tweaks to the service where it would support participation.

The inertia issue that was the driver for EFR is still prevalent in 2020/21 and 2025/26 forecasts.

A follow-up document to National Grid's System Operability Framework (SOF) 2016 document (published in November) will focus on:

- Future and existing requirements – what does all this analysis mean
- How existing and new services interact
- How we intend to engage with the industry and procure these services
- Set out a road map to longer term goals of the flexibility workstream

## **Q&A – Session 1**

### **Question 1**

What are the incentives from BEIS/Ofgem for the SO?

#### **Responses**

- The System Operator is incentivised through its current BSIS framework (Balancing Service Incentive Scheme).
- Fundamentals are changing the energy landscape, e.g. changing system requirements, new technologies and different market models.
- New parties are providing us with services. A lot of the new parties we come across have a very different skillset/requirement to previous ones and the SO also needs to adapt to its new environment which signals a need to review the basis of our regulatory framework.
- Ofgem signalled that there was a need to look at the incentives regime for the SO earlier this year.
- Later this year Ofgem/BEIS will be publishing a consultation for incentivising the SO.

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### **Question 2**

Is there a geographical element to where we need the services and to what level?

#### **Response**

Yes, the follow-up document to the SOF (as mentioned in the presentation) will provide some further thoughts on geographical elements.

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### **Question 3**

Is there any tie up between your department and Government (BEIS) departments to extend capital allowance schemes in order to get tax relief?

#### **Responses**

- A study by The Carbon Trust is ongoing to determine whether or not storage should be included in the list of tax relief technologies.

## Session 2 – Electricity Storage Business Models

### Simon Bradbury - Type of Storage Business Models

All storage models have their own tailored strategies due to the diversity of the technology applying itself to different applications and services. The extent to what it applies to really depends on the balance between the storage discharge duration capability verses its power rating.

There are broadly three markets or user cases for storage:

1. Ancillary Services and Grid Operation
2. Energy Trading
3. End Consumer

Business models can be categorized into the four key areas of:

1. DNO Driven
2. Market Driven
3. Behind the Meter
4. RES location

Currently most models are market driven due to many suppliers wanting to maximise potential service revenues.

### Adriana Laguna - DNO View on Electricity Storage

Working with a number of partners UKPN's SNS (Smarter Network Storage) project has not only outlined their position on storage but has also attempted to answer technical and commercial feasibility questions, including; *how fast can it respond, can it do several things at the same time, and is there value to customers from investing in this technology?*

Results have shown value to the DNO through deferred reinforcement (£6.2m to increase the capacity of the Leighton Buzzard substation), voltage support, and provision of different services utilising its Active and Reactive power capabilities.

Four key factors are identified as determining the business case for storage:

1. Capex
2. Opex
3. Revenues
4. Financing

The project has provided a lot of evidence to BEIS & Ofgem.

### Dominique Laurent - Electricity Storage Case Studies (AES)

AES have nearly a decade of storage project experience with 432 MW in operation, construction or late stage development around the world.

Three broad models of commercial route were considered:

1. Generation Alternatives – Utilities, Power Project Developers, System Operators
  - **Capacity Release** - use storage to provide system services and let generators generate.
  - **Frequency Regulation or Response** - Use storage to provide Frequency Regulation or Response services instead of plants.
  - **Flexible Peaking Plant** - use storage to provide local flexible capacity to utilities.
2. Transmission and Distribution alternatives
3. Commercial & Industrial customers

## Q&A – Session 2

### Question 1

Lack of inertia on the system is only one side to the equation. Is there any possibility of future contracts/tenders for inertia services?

### Response

Yes, this is something we are looking into currently. The possibility of inertia services/products is something that is being explored.

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### Question 2

Why do you think the EFR tender price came down so low?

### Responses

- Obviously it's the companies who know this, but from our perspective we suspect that, in some cases, there is a leveraging of some existing sites.
  - 4 year contract lengths.
  - 6/8 contracts were distribution.
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### Question 3

Are we sending the wrong message to long term investors who want to go out and buy batteries with 15 year life? How can we square the circle with a 4 year contract with components that have got a long life and obviously capital cost?

### Responses

- There is activity ongoing which is aiming to simplify our markets, making sure that services which are being provided are valued.
  - The 4 year contract offering is in reference to the Enhanced Frequency Response tender only. In our work, we are examining different timescales and different procurement alternatives.
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### Question 4

In regards to future EFR requirements will you try to look at other new technologies as well as just lithium batteries for any future opportunities?

### Responses

The aim is to create markets that facilitate participation from a range of technologies, so we don't define a specific storage technology for the service.

## Session 3 – Storage Working Group Workshops

Delegates were introduced to the existing balancing products and services within National Grid and the current thinking designed to simplify these services.

Delegates were then asked to break-out into their designated working groups categorised into:

1. *Investors, Consultancies, Law Firms, Government Bodies*
2. *Developers & Equipment Suppliers*
3. *Small/Large Scale Suppliers, Aggregators, DNO's, TO's*

Discussions were to focus on the simplification of National Grid balancing services, the wider challenges in building the business case for storage projects, and the identification of tangible solutions to be addressed within the working group, and in wider existing forums.

The outputs from each of the groups can be seen in Annex A.

#### **Session 4 – Round-up, Key Messages, Final Q&A's**

The final session saw feedback from session 3 workshop facilitators. Delegates were invited to contribute further thoughts that they considered to be relevant.

Delegates were invited to ask final questions to the days speakers before the workshop was closed and delegates thanked by Lee Prestley.

#### **Final Q&A**

##### **Question 1**

What extent did you trace the carbon intensity of the carbon you were using in the electricity you produced? Are you confident you are absorbing electricity of the right carbon footprint?

##### **Response**

We are working with imperial college to analyse carbon footprint of storage in general.

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##### **Question 2**

November has been very interesting, and market trades have been very profitable. Are you sure frequency response services are the most valued service?

##### **Response**

We have a contract with a supplier and we tested the total services and this was done back in March. At that point it definitely wasn't profitable, but through the changes we have seen, it would probably have been profitable to do an alternative route to frequency services. This is what businesses have to consider when developing storage business models.

#### **Presentation slides from the day**

##### **Session 1**

- Paul Lowbridge – National Grid: [Power Responsive Overview](#)
- Rachel Cooper (BEIS) & Deirdre Bell (Ofgem): [Storage: Policy and Regulatory Overview](#)
- Ashya Patten – National Grid: [Flexibility Planning and Opportunities](#)
- Adam Sims – National Grid: [Enhanced Frequency Response](#)

##### **Session 2**

- Simon Bradbury – Poyry: [Types of Storage Business Model](#)
- Adriana Laguna - UKPN: [Storage: The DNO Perspective - Evidence from SNS](#)
- Dominique Laurent – AES: [BES AES Case Studies](#)

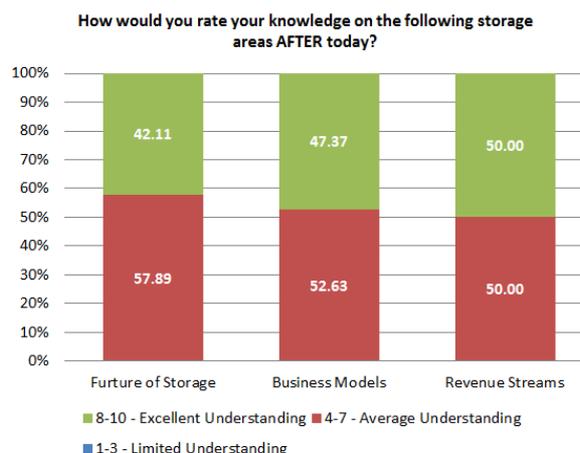
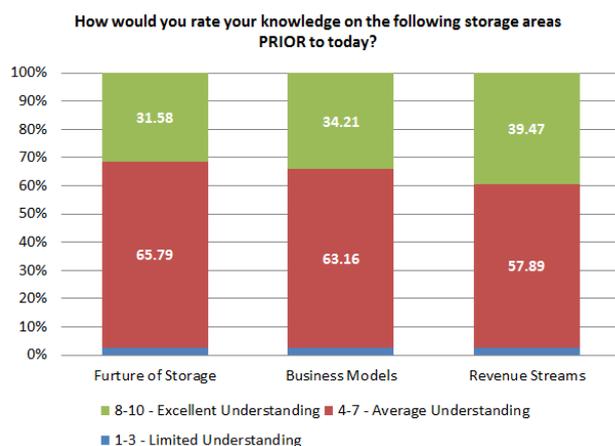
##### **Session 3**

- Adam Sims – National Grid: [Simplification of Balancing Services](#)

#### **Feedback**

Delegates were asked to complete a short feedback form to provide us with insight into a) existing levels of storage knowledge within the community and b) how helpful the workshop was to delegates.

**Results are as follows:**



The scores received in our feedback indicate that we progressed delegate storage knowledge throughout the day. Feedback comments indicate a desire for greater detail in future working groups. We anticipate that this will contribute to improved scores for future workshops.

**Comments**

Feedback Themes	Occurrences
Content was too high-level. Needs greater detail, less presentations, and technical subgroups.	9
Further discussion around the evaluation/bundelling/sharing of the services	8
Need a clear route-map / definition of storage	7
Needs greater DNO involvement	6
More case studies on current and future projects from both DNOs and developers	3
Introductory material to each workshop	3
Working group should have fewer numbers	2
Maintain representation from diverse sectors and stakeholders	2
More engagement by/with technology providers	1
More Gov. participation	1
More NG participation	1
Workshop meeting should be bi-monthly	1
Bring forward outcomes of the workshop challenges and solutions	1
Need an emphasis on Low Carbon	1
Work programme to the 'So what of SOF'	1

**Next Steps**

1. We will be assessing comments and feedback from both the feedback forms and workshops to a) shape future workshop agenda's and b) feedback in the 2<sup>nd</sup> Storage Working Group in early 2017.
2. The next Storage Working Group date is being finalised and Power Responsive stakeholders will receive invitations in early 2017.

**Thank You**

Thank you to all those who attend the first storage working group. The next storage working group will be scheduled for around March 2017, date to be confirmed.

**ANNEX A – Storage Working Group Workshop Feedback by categorised group**

Group 1 - Challenges	Occurrences
Transparency/Clear in product/market design, procurement and value functions (no bilateral agreements).	7
Evidence and clarity on price stacking of multiple services.	4
Market and service exclusivity.	4
Clarity on the purposes of storage and what is needed, where it's needed and when for investor confidence.	4
Link with the DSO. Could TSO/DSO measure behind meter storage. More DSO independence?	4
Storage asset values need to be recognised alongside the asset cost as well as being allowed to be used flexibly.	3
Longer contracts to increase revenue certainty	2
Regulatory environment and commercial frameworks/incentives	2
Technology/warranty to provide confidence in products	2
Cost of simplification and is simplification undermining the need and favouring aggregators	2
Interactions and understandings with other markets	1
Definition/Classification of the assets	1
Greater local authority knowledge understanding	1
25% cost penalty in EFR	1
Clearer information investment opportunities/business models	1
National grids procurement impacting on DNO connections	1
Different levels of underestimating revenue streams	1

Group 1 – Proposed Solutions	Occurrences
Early clear transparent communication on storage system requirements, product needs. (SO What Of SOF - When? Where? How Much?)	5
Allow benefit stacking/multiple services with clear rules on connection, metering, remuneration	4
Grading chart of ramp rates/availability duration (tech grading approach)	3
Disincentive/penalties for being irresponsible throughout all participating technologies	2
Solutions need to be holistic, stable and enduring	2
Link cost reduction to consumer costs reductions and communicate these back to local authorities	2
Consistent feedback to BEIS/Ofgem and putting into action	2
Larger broadcasted message but working groups should be smaller and more effective with a balanced representation	2
More regular tenders for smaller amounts	1
Assess value not purely on cost	1
Actually be tech agnostic. Not biased.	1
Provide investor security and certainty through market size assumptions etc	1
Setting floors and ceilings, structuring balancing markets like this	1
Engage investors	1
Better TSO/DSO links	1
Multiple duration for contracts allowing multiple bids	1
Setting pre-work/reading prior to the working groups to enhance engagement	1

Group 2 – Challenges	Occurrences
Mixed messages on the long term clarity of revenues proving difficult for investment decisions.	5
Lack of a clear view on what is wanted (policy risks) and how the SO is incentivised.	5
Too many services/broad flexibility market.	3
Understanding how NG value assess storage (more complex than speed of response).	3
Contract lengths not creating any revenue certainty.	3
Lack of alignment between DNO/SO/Generators etc.	3
Recognising and understanding carbon effects of storage (Double ENN taxes paid).	3
What's driving storage forecasts? Is there any conflicts with NG investment plans? Is it in the consumers best interests?	3
Connections Infrastructure.	2
Simplification of products impacting investment (is simplification good for the market or not?).	2
Defining what storage is.	2
Having to be technology agnostic when facilitating markets.	1
Resourcing within NG/Ofgem/BEIS constraint to communication.	1
Too much is up for review (products, charging, regulatory frameworks).	1
Rules for aggregators.	1
Understanding the revenue mixes.	1
Downward trend on the revenues from the services.	1
Technology shifts (DSR Vs Storage).	1
How to meter/manage multiple services behind the meter.	1
EPC wraps and warranty on equipment usage.	1

Group 2 – Proposed Solutions	Occurrences
Consolidation on service requirements (a mini 7 year statement?)	5
Longer contracts	2
Definition for Storage	2
Revenue certainty and clarity	2
Timed/variable connection access	2
Greater DNO Engagement	2
Clarity on revenue stacking (EFR, Triad, FFR)	1
Rules for aggregators	1
Mandatory frequency response for all types of generators	1
Weighting to reward long term assets	1
Calculating the total carbon costs involved in storage	1
Identify the deficit periods	1
SO What of SOF should look at longer than 5 years	1
Appreciate and look at some of the involved transaction costs in storage	1
More frequent working group meetings	1

Group 3 - Challenges	Occurrences
Transparency on MW's contracted where/bilaterals and how much capacity is available	4
Unrealistic connection lead times for when services are due to go live	4
Clarity on price stacking of services / RES integration	4
DNO + TSO disharmony	3
Energy storage connection is treated as generator connection	3
Engagement with stakeholders (investor knowledge)	2
Risk appetite not well expressed (will the simplification work impact investments?)	2
Initiation time and service duration	2
Regional aspect to services/value (assist in where to build assets?)	2
Assets are designed on required services and market parameters aren't clear therefore developers holding off	2
Behind the meter actions (DSUoS/TNUOs)	2
Clarity on grid code changes	1
Service duration vs duration capabilities	1
No fixed test of delivery of services with different parameters	1
Other (please see Annex B)	7

Group 3 – Proposed Solutions	Occurrences
Market transparency (time value of each service/auction based platforms/procurement)	5
Roadmap/plan on what the ambitions are (day ahead declarations by 20XX?)	4
Define/simplify services with no overlap (clear operating periods)	4
Better TSO/DSO/DNO relationship/engagement for efficiency (must be in storage definition, also work to benefit both parties)	4
Ability to stack services	4
Clarity on the characteristics of each service (ramp rates/firm/un-firm)	3
Match services to align with new technology/asset capabilities (they can change across a day/season etc)	3
Statistical approach to risk allocation (Specific volume required per service, strict availability should be proportional to size)	3
Data accessible in one place (published month by month)	3
Locational value	2
Storage definition	2
BEIS/Ofgem Incentives - SO need to be appropriately rewarded as the market will provide whatever you ask for	2
Better explanation of risks and penalties	1
Merge DSR and Storage working groups together	1
Investors to accept liquidity don't necessarily need long term contracts	1
Other (please see Annex B)	7

**ANNEX B – Group 3 Other Category**

Group 3 - Challenges	Group 3 – Proposed Solutions
Data capture from new queries and what the enquiries would have presented from a system perspective	Remove mandatory requirements
Will historic frequency variations be lower, control room allow the frequency to vary more with all the batteries etc then to provide rest-bite	Keep a level playing field. Don't favour technologies
EFR - generally well-structured contract but allow non-firm and just value differently/de-rate	Allowing MFR to be delivered from batteries
Pay for MW not for MVA Non consistency of energy policy contract duration	Extend delivery across pre/post fault
1 min ramp rates make huge difference to connection costs/time	It's a complex area accept that most efficient outcome will be through trading market
Change of battery parameters over time	Pay for performance and greater emphasis on technical parameters
What is the right energy mix	Stirring up of the structure will bring investor uncertainty