Energy Networks Association

Enabling Flexible Networks: ENA Open Networks Project

Nigel Turvey
Network Strategy and Innovation Manager – WPD and
Chair of ENA Open Networks Steering Group
28th November 2017
Energy Networks Association

- ENA represents the UK & Ireland Gas and Electricity Networks (T & D)

- Our Members cover:
  - 29 million electricity customers
  - 21.5 million gas customers
  - 180,000 miles of gas network
  - 519,304 miles of electricity network
Launched in January 2017, the Open Networks Project will lay the foundations of a smart, flexible energy grid in the UK.

It will enable the UK and Ireland’s electricity networks to:
- Address the challenges caused by the continued uptake of distributed generation, as well as the electrification of heat and transport. The UK now has approx. 30GW of locally connected generation.
- Move from their traditional role of simply delivering electricity, to one where they are a platform for new smart energy technologies - the ‘DNO to DSO transition’.

Network operators must meet challenges whilst:
- Continuing to deliver safe and secure operation of distribution networks.
- Ensuring efficient and timely access to the network for customer.
- Providing value for money.

The Open Networks Project is taking a whole energy system approach, across all networks and vectors, which has the potential for strong benefits and cost savings.
The objectives of the Open Networks Project for the first phase of work in 2017 are to:

1. Develop improved T-D processes around connections, planning, shared TSO/DSO services and operation
2. Assess the gaps between the experience our customers currently receive and what they would like and identify any further changes to close the gaps within the context of ‘level playing field’ and common T & D approach
3. Develop a more detailed view of the required transition from DNO to DSO including the impacts on existing organisation capability
4. Consider the charging requirements of enduring electricity transmission/distribution systems
Progress to date

• All products available online
What is the DSO?

- The DSO will be a ‘neutral market facilitator’, i.e. it will enable a range of sources to participate in new markets and provide flexibility services:
  - This will open up a range of opportunities, including increased investment, new businesses and job creation
  - Increase connection of low carbon and innovative technologies, helping the UK meet its carbon targets
  - Deliver low cost energy to customers
  - Network Operators will assess the most cost effective options for investment; flexibility services from the market alongside traditional investment
Promoting Energy Storage alongside all Flexibility

- The DSO will be technology neutral, and enable a range of low carbon and innovative technologies, such as energy storage and DSR, to participate in new markets.

- The UK gas and electricity networks have trialled a range of energy storage projects under Ofgem’s Innovation funding mechanisms.
The electrification of heat and transport as we move away from fossil fuels will have a major impact on our electricity system; traditionally, significant reinforcement would be required.

The DSO aims to use flexibility services provided by the market to reduce this impact, including that provided by EVs themselves.

There is a need to start looking more locally for where we get our energy from, helping the local economy and helping to minimise the movement of energy and the costs that come from this.

Ofgem and the EU have stated that DNOs/DSOs should not own and operate storage, with a few exceptions. This includes having to operate existing storage in separated businesses within network companies so as not to distort the market.
Alignment to Industry

• Ofgem & BEIS Smart System and Flexibility Plan
  – Open Networks will be the platform for addressing network challenges
  – Report for end 2017 from ENA Open Networks Project

• FPSA: We are working closely with the team and have analysed the overlap with the FPSA functions and how we reflect these in the functional requirements and SGAM modelling for DSO models

• Trials: we will be working with industry to run a range of DSO trials – Ofgem, Energy Systems Catapult, Innovate UK, Industrial Strategy Challenge Fund, etc
How to get involved?

- Join our mailing list!
  - Email our PM: farina.farrier@energynetworks.org

- All outputs posted online

- We welcome feedback and your input
How to get involved?

Open Networks Project Advisory Group

ENA Board

ENFG

Open Networks Project Steering Group

Workstream 1: T-D Process
Workstream 2: Customer Experience
Workstream 3: DNO to DSO Transition
Workstream 4: Charging
Workstream 5: Comms
Example projects exploring the use of storage

- Solar storage project
- Industrial and Commercial storage project
Solar Storage Project
Project Overview

- Trial of a behind-the-meter battery energy storage system (300kW/600kWh) on a large solar site (1.3MW) in Somerset.
- Quantify benefits of nine use cases for both the DNO & battery owner.
- See how use cases be combined and revenues stacked.
- Explore routes to market – challenges and rewards.
- Making the case for energy storage in new connection offers.
## Solar Storage Project

### Benefits split into 9 use cases

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Beneficiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Arbitrage - Sell electricity for a higher price per kWh</td>
<td>Owner</td>
</tr>
<tr>
<td>2) Provide service to nearby constrained customers.</td>
<td>DNO / Owner</td>
</tr>
<tr>
<td>3) Peak lop network demand by exporting from battery.</td>
<td>DNO</td>
</tr>
<tr>
<td>4) Raise minimum demand to limit voltage rise.</td>
<td>DNO</td>
</tr>
<tr>
<td>5) Voltage control via reactive power.</td>
<td>DNO</td>
</tr>
<tr>
<td>6) Peak lop generation where excess capacity installed.</td>
<td>Owner</td>
</tr>
<tr>
<td>7) Smoothing / Power Quality.</td>
<td>DNO</td>
</tr>
<tr>
<td>8) Peak lopping at temporarily reduced level (glass ceiling).</td>
<td>DNO/Owner</td>
</tr>
<tr>
<td>9) Co-ordination between multiple storage systems</td>
<td>DNO</td>
</tr>
</tbody>
</table>
Solar Storage Project

Learning so far

A number of teething problems resolved
- State Of Charge management – resolved with new CTs and changes to SOC algorithm.
- Air conditioning – insufficient cooling – units replaced.
- Some inappropriate tripping off now resolved

Use case learning
- Arbitrage not financially viable under existing power purchase agreement.
- Power smoothing works well but financial business case less clear.
- Voltage management via reactive power requires larger capacity to be effective.
- Battery impacts on power quality much smaller than the impact from the solar farm power electronics.
NEXT GENERATION NETWORKS

Industrial & Commercial Storage Project
Project Aims & Objectives

- Promote innovation, flexibility and non-network solutions
- Tesla PowerPack® units (each 50kW, 210kWh)
- Simulate various Industrial and Commercial Customers to test Energy Storage Systems with different business drivers
- Attitudinal analysis and performance assessment of participants within the commercial environment
- Development of new policies, processes and systems to support commercial deployment of Energy Storage Systems
- Provide technical knowledge to inform new regulations.
Operating modes

- Varied test configurations at 4 WPD sites

**Spilsby**
- Peak Shaving + PV integration
- At peak demand, storage can be used to eliminate peaks

**Taunton**
- Demonstrating Backup/Islanding
- Sensing either grid failure or a simulation of grid failure the energy storage system then energises the selected maintained loads

**Boston**
- Active control by WPD – Own controller and scheduling tools
- Flexibility and scalability for various trials - Operating the site at constant load, constant voltage, etc.

**Cardiff**
- UK “Standard Battery Storage” approach. Most common use case today in the UK
- FFR, Triad Avoidance and DUoS Charge reduction

© Western Power Distribution 2017
Wrap up

- There are challenges ahead if we want to meet our carbon targets while providing a safe and secure energy grid at an affordable price.
- However by enabling flexible networks we can help address these and open up new markets for low carbon and innovative technologies.
- The network companies are working together and dedicated to making this work via the Open Networks project at ENA.
- A lot of projects are being undertaken to trial various aspects of flexible networks.
- We welcome input either directly or via the Advisory Group within the Open Networks project.