#powerresponsive

## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Chair / Speaker</th>
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<tbody>
<tr>
<td>10:00</td>
<td>Welcome to the January Power Responsive</td>
<td>Colm Murphy – Electricity Market Change Delivery Manager, National Grid ESO</td>
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<tr>
<td></td>
<td>Flexibility Forum 2020</td>
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<tr>
<td>10:10</td>
<td><strong>Session 1:</strong> Policy and Regulation</td>
<td>BEIS: Russell Jenkins &amp; Nina Klein</td>
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<td></td>
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<td>Ofgem: Louise van Rensburg</td>
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<tr>
<td>11:10</td>
<td><strong>Session 2:</strong> Flexibility Market Developments &amp; Updates</td>
<td>Balancing Services Update: Faye Relton (National Grid ESO)</td>
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<td></td>
<td>ENA Open Networks Update: Randolph Brazier (Energy Networks Association)</td>
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<td></td>
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<td>Wider BM Access and Project TERRE: Richard Hanson and Sophie Hind (National</td>
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<td>Grid ESO)</td>
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<tr>
<td>12:30</td>
<td>Lunch &amp; Networking</td>
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<tr>
<td>13:20</td>
<td><strong>Session 3:</strong> Future Opportunities and Local Flexibility</td>
<td>Stability Pathfinders: Nick Harvey (National Grid ESO)</td>
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<td></td>
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<td>Distributed ReStart: Daniel Auty (National Grid ESO)</td>
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<td></td>
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<td>Cornwall Local Energy Market: Sam Wevers (Centrica)</td>
</tr>
<tr>
<td>14:40</td>
<td><strong>Session 4:</strong> Distribution Network Opportunities</td>
<td>Western Power Distribution: Ben Godfrey</td>
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<td>Northern Power Grid: Andrew McKenna</td>
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<td>SP Energy Networks: Julian Wayne</td>
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<td></td>
<td></td>
<td>UK Power Networks: Stathis Mokkas</td>
</tr>
<tr>
<td>16:00</td>
<td>Flexibility Forum Close</td>
<td></td>
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</tbody>
</table>
Session 1:
Policy & Regulation Update

Russell Jenkins & Nina Klein

Louise van Rensburg
Smart Systems and Flexibility:  
2020 vision – policy update

Russell Jenkins  
Head of Smart Homes and Businesses  
Department for Business, Energy & Industrial Strategy  
russell.jenkins1@beis.gov.uk

HM Government
Energy Smart Appliances for Demand Side Response

PAS standards development with BSI

Dr Nina Klein
Energy Engineer
SICE (Science and Innovation for Climate and Energy)
1. Context for smart standards
   - policy drivers
   - aims, approach and impact

2. BSI ESA Programme
   - 2 PAS standards
   - timeline of activities

3. Domestic DSR operation
   - what is an ESA and a CEM?
   - system architecture and DSR
1. Context for smart standards
- policy drivers
- aims, approach and impact
Policy Drivers

Smart Systems and Flexibility Plan
• Strategy to realise benefits and mitigate risks
• Action 2.6: developing standards for smart appliances

Smart Appliances Consultation Response
• Intention to take regulatory powers for specific appliance cohort, based on 4 policy principles

EV Smart Charging Consultation
• AEVA gives powers to require chargepoints to be smart with related technical requirements
• Proposes mandatory compliance with ESA standard for smart chargepoints
• Calls for evidence on longer term approaches, potentially smart meters and/or DSR standard
Aims & Approach

Government is sponsoring standards to facilitate the domestic DSR sector (Note: I&C DSR is out of scope)

BSI – standards
- Develop a standardised technical framework for ESAs and DSR, in an industry-led process
- 2 PAS (publicly available specification) fast-track standards, covering ESAs and DSR, to help lower costs and promote innovation

HMG – appliances and principles
- The standards cover 5 appliance types, most suitable for domestic DSR
- 4 policy principles underpin the standards, developed in consultation with stakeholders
- The standards are compatible with, but don’t mandate, the GB Smart Metering system

Policy Principles

<table>
<thead>
<tr>
<th></th>
<th>Policy Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Interoperability</td>
<td>the ability of an ESA to work seamlessly across any DSR service operated by any system player.</td>
</tr>
<tr>
<td>2.</td>
<td>Data privacy</td>
<td>the secure storing of data on the device or with any controlling party.</td>
</tr>
<tr>
<td>3.</td>
<td>Grid-stability</td>
<td>the prevention of outages on the grid caused by erroneous operation of ESAs.</td>
</tr>
<tr>
<td>4.</td>
<td>Cyber-security</td>
<td>the prevention of unauthorized access to an ESA by third-parties.</td>
</tr>
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</table>

Domestic DSR

1. HVAC
2. Cold Appliances
3. Wet Appliances
4. Battery Storage
5. EV Smart Chargepoints
Impact

• **Accelerate the uptake** of safe, secure and interoperable smart products and services, benefiting both consumers and businesses

• Develop **technical specifications** which could be referenced and required by **future regulations**

• Demonstrate **UK leadership** on the international stage, by promoting published standards for international adoption
2. BSI ESA Programme
- 2 PAS standards
- timeline of activities
Timeline of Activities

**Stakeholders & Strategy**

- **SAG (Strategic Advisory Group)** trade associations, academia, regulators: e.g. ENA, BEAMA, Ofgem, UKAS, ESC etc
- Industrial Context, Policy Context
- Certification, Internationalization
- Next Steps

**Updates and guidance**

<table>
<thead>
<tr>
<th>SAG</th>
<th>Feb 2019</th>
<th>Summer 2020</th>
<th>Winter 2020/21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>SG 2</td>
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<td>SAG 1</td>
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<td>SG 3</td>
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<td>SAG 2</td>
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<td>Public Review period</td>
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<td>SAG 3</td>
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<td>SG 4</td>
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<td>SAG 4</td>
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<td>SG 5</td>
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<tr>
<td>SAG 5</td>
<td></td>
<td>Publication</td>
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**PAS Standards**

**DSR + ESA**

- **PAS 1878** Appliance-side: “**ESA specification for classification**” TA (technical author)
- **PAS 1879** Grid-side: “**DSR framework for operation**” TA (technical author)

**ESA SG (Steering Group)** manufacturers, platform providers, operators: e.g. TechUK, Moixa, OVO, SMMT etc

**Integration**

- **PAS Standards**
- **Integration**

**Department for Business, Energy & Industrial Strategy**
# Timeline of Activities

<table>
<thead>
<tr>
<th>Feb 2019</th>
<th>Summer 2020</th>
<th>Winter 2020/21</th>
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<tbody>
<tr>
<td>SG 1</td>
<td>SG 2</td>
<td>SG 3</td>
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<tr>
<td><strong>Public Review period</strong></td>
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<td><strong>Publication</strong></td>
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<td><strong>Integration</strong></td>
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## PAS Standards

<table>
<thead>
<tr>
<th><strong>PAS Standards</strong></th>
<th><strong>DSR + ESA</strong></th>
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<tbody>
<tr>
<td><strong>ESA SG</strong> (Steering Group)</td>
<td>manufacturers, platform providers, operators</td>
</tr>
<tr>
<td><strong>PAS 1878</strong></td>
<td>Appliance-side: “ESA specification for classification”</td>
</tr>
<tr>
<td><strong>DSR SG</strong> (Steering Group)</td>
<td>ESO, DNOs, suppliers, aggregators</td>
</tr>
<tr>
<td><strong>PAS 1879</strong></td>
<td>Grid-side: “DSR framework for operation”</td>
</tr>
</tbody>
</table>

- e.g. TechUK, Moixa, OVO, SMMT etc
- TA (technical author)
Timeline of Activities

SAG (Strategic Advisory Group) trade associations, academia, regulators  
e.g. ENA, BEAMA, Ofgem, UKAS, ESC etc

Industrial Context, Policy Context  Certification, Internationalization  Next Steps

SAG 1  SAG 2  SAG 3  SAG 4  SAG 5
Feb 2019  Summer 2020  Winter 2020/21

Stakeholders & Strategy
Timeline of Activities

**SAG (Strategic Advisory Group) trade associations, academia, regulators**
- e.g. ENA, BEAMA, Ofgem, UKAS, ESC etc

**Industrial Context, Policy Context**
- Certification, Internationalization
- Next Steps

**Stakeholders & Strategy**

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<tr>
<th>SAG 1</th>
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<th>SAG 3</th>
<th>SAG 4</th>
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</table>

**PAS Standards**

- **PAS 1878** Appliance-side: “ESA specification for classification” TA (technical author)
- **PAS 1879** Grid-side: “DSR framework for operation” TA (technical author)

**DSA SG (Steering Group)** (ESO, DNOs, suppliers, aggregators)
- e.g. ADE, WPD, NCSC, EDF etc

**ESA SG** (Steering Group) manufacturers, platform providers, operators
- e.g. TechUK, Moixa, OVO, SMMT etc

**Updates and guidance**
- Public Review period
- Publication
3. Domestic DSR operation
- what is an ESA and a CEM?
- system architecture and DSR
What is an ESA?

Energy Smart Appliance (ESA)
• An internet connected device that can modulate or shift its electricity consumption in response to signals. (Note: PAS scope is domestic DSR)

BSI - Energy Smart Appliance or ‘ESA’

BEIS - Smart Appliance Cohort or ‘SAC’

OLEV

Heating, Ventilation and Air Conditioning (HVAC)  Cold Appliances e.g. fridge-freezers  Wet Appliances e.g. washing machines  Battery Storage  EV Smart Chargepoints
What is a CEM?

Consumer Energy Manager (CEM)

- A logical entity, that can be physical or virtual, which translates information between the grid-side and appliance-side.
- Informs the DSR Service Provider (DSRSP) of the ESA flexibility options available and on request implements them.

2 CEM modes for DSR:

- **Routine Mode**
  - This is baseline DSR operation.
  - The CEM controls electricity consumption according to the consumers wishes and external stimuli, e.g. ToU tariff or local generation.

- **Response Mode**
  - This overrides the baseline during a DSR call.
  - The CEM controls electricity consumption according to the DSRSP’s chosen flexibility option, e.g. demand reduction or frequency response, unless the consumer manually overrides.
How will the system operate?

- A hierarchy of operation is defined for a functioning DSR system, in which the consumers reasonable wishes will always be respected.

### Operation Modes Hierarchy

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<tr>
<td>4.</td>
<td><strong>Device Fail-safes</strong></td>
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</table>
|    | This **overrides everything** else.  
The ESA on-board management system has hardware and software fail-safes to ensure no unsafe operation occurs e.g. a battery will not discharge rapidly if overheating would result. |
| 3. | **Consumer Override** |
|    | This **overrides any DSR call or baseline operation**.  
This is an additional manual intervention from the consumer to override operation for a specific duration. Note: the consumer preferences are already automatically considered in Routine and Response Modes. |
| 2. | **Response DSR Mode** |
|    | This **overrides the baseline during a DSR call**.  
The CEM controls electricity consumption according to the DSRSP’s chosen flexibility option e.g. demand reduction or frequency response. This lasts for the DSR call period, unless the consumer manually overrides. |
| 1. | **Routine DSR Mode** |
|    | This is **baseline** DSR operation.  
The CEM controls electricity consumption according to the consumers wishes and external stimuli e.g. ToU tariff or local generation. |
System Architecture

- Complex technical architecture with multiple routes to operate an ESA
- Enables the PASs to be fully compatible with both international smart grid standards and the GB Smart Metering system
- The PASs provide technical specifications for DSR service provision via the internet or smart meter, but neither is mandated

Note: All architectures achieve the same standards of:
- Interoperability
- Data privacy
- Grid-stability
- Cyber security
Summary

• **Policy context** for Energy Smart Appliances
• BSI programme and ESA + DSR PASs
• **Technical** operation of **domestic** DSR

Next Steps

• PAS **Public Review** period **Summer 2020**
• Final PAS **publication** Winter 2020/21

Please **contact me** if you would like to be on the **Invited Reviewers Panel** during the Public Review period.
Thank you

If you have further questions, please contact me:
Nina.Klein@beis.gov.uk

ESA Programme website:
www.bsigroup.com/smart-appliances-flexible-energy
Flexibility: Regulatory update
Aims and Linkages

Louise van Rensburg

Power Responsive Flexibility Forum, 15 January 2020
- The changes to the energy system will need **flexible resources** to manage the system peaks and changes in demand, to meet Net Zero at lowest cost
- **We want flexibility providers to realise the value they bring to the system:** End to end programme of work to achieve this goal

**Net Zero carbon target by 2050**
Genesis: The Smart Systems and Flexibility Plan

29 point plan: ~85% implemented by mid 2020

Removing barriers to smart technologies

- Regularity, clarity, and fair charges
- Define storage in regulation, planning reform, health & safety standards, innovation funding, deliver a storage licence, unbundling rules, update network charges, enable colocation with renewables.

Smart homes and businesses

- Infrastructure and system enablers
- Deliver smart meters, half-hourly settlement, smart appliance standards, cyber security, EV legislation, consumer protections, Crown Commercial Service support for DSR, DSR trial funding, Power Responsive.

Markets that work for flexibility

- Access to markets and new markets
- DSO/TSO evolution, SO incentives, Capacity Market amendments, rule changes; BM access of aggregators, SO simplification of Ancillary Services, TCR, Access reforms, ENA Open Networks project, network standards, trial funding

Smart Systems Forum helps identify areas of focus as developments evolve.

We are continuing to monitor and consider what further actions are needed.
# Ofgem focussed reforms needed to deliver a smart, flexible energy system

## Retail reforms

- Retail market reforms need to:
  - Ensure the retail market works well and facilitates the access of benefits of flexibility to consumers
  - Protect consumers, in particular those in vulnerable situations

## RIIO2 price controls

- RIIO incentivises overall efficiency through total expenditure (‘totex’) mechanism, which addresses bias toward capital over operating expenditure
- In RIIO2, we will extend role of competition, ensure outputs include flexible options for meeting network needs and embed whole systems incentives

## System operation reforms

- We want the Electricity System Operator (ESO) and Distribution Network Operators (DNOs) to:
  - Clarify boundaries & mitigate conflicts
  - Enable competitive markets, including through making data accessible
  - Neutrally tender network management and reinforcement requirements
  - Embed whole systems coordination

## Future Charging & Access

- Access reform will deliver better access right choice and stronger network charging signals to incentivise efficient use of the system and minimise future costs (called “network price signal flexibility”)
- Targeted Charging Review (TCR) will reform residual charges and address Embedded Benefits
Ofgem reforms will work together to deliver efficient outcomes

**RIIO2 Access reforms** - "network price signal flexibility"

**SO reforms** include "contracted flexibility"

**Technological innovation**

**Traditional reinforcement, including via competition**

**Remaining network requirements not met by network price signal flexibility**

**Competing solutions to meeting network needs**

**Most efficient solution to meeting remaining network requirements**

**Retail reforms and Data Transparency**

**Targeted Charging Review - residual charges**

**Reform of engineering standards**

**FES/D-FES**

**Allowed revenues to be recovered through charges**

**Input to business planning assumptions**

**Step 1:** Users respond to network price signals

**Step 2:** Competition amongst solutions to address the remaining network requirements, taking account of reformed engineering standards

**Step 3:** The most efficient solutions are selected

**Step 4:** Access reforms and these solutions are embedded within RIIO2 arrangements

**Step 5:** Allowed revenues are reduced from increased efficiency

**Potential reduced need for reinforcement**

**Retail reforms and data transparency**

**Technological innovation**

**Traditional reinforcement, including via competition**

**Remaining network requirements not met by network price signal flexibility**

**Competing solutions to meeting network needs**

**Most efficient solution to meeting remaining network requirements**

**Retail reforms and Data Transparency**
• Flexibility provision is essential in helping us meet NetZero targets at least cost to consumers.
• We believe that flexibility providers should be able to compete on a level playing field, with access to value streams that can realise the benefits they provide.
• We are working proactively to help ensure that these value streams are better coordinated so that the benefits of a more flexible electricity system can be fully realised.
• Communication and collaboration remains vital.
Thank you

Louise van Rensburg, OFGEM

Louise.vanRensburg@ofgem.gov.uk
Session 2: Flexibility Market Developments & Updates

Faye Relton
Randolph Brazier
Richard Hanson & Sophie Hind
Ancillary Services update

- Our Commitments
- Response and Reserve Roadmap
- Auction Trial Phase II
- Next steps
Building the future ancillary service market

By 2023 all market participants 1MW and above will be able to participate directly in our balancing service markets

- New market and auction platforms to promote competition
- Fundamentally review and reform our response and reserve products to align with future operability needs
## Roadmap for Reform of Response and Reserve

### Frequency Response Services

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Activity</th>
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<tbody>
<tr>
<td>2019/20</td>
<td>Q4</td>
<td>Report on design and implementation plan for Dynamic Containment</td>
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<tr>
<td>2020/21</td>
<td>Q1</td>
<td>Publish strategy on mitigating barriers to entry for frequency response services</td>
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<tr>
<td>2020/21</td>
<td>Q2</td>
<td>Release of Dynamic Containment service</td>
</tr>
<tr>
<td>2020/21</td>
<td>Q3</td>
<td>Consultation on final design of end-state services, publish implementation plan</td>
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<tr>
<td>2020/21</td>
<td>Q4</td>
<td>Phase out FFR service</td>
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### Frequency Response Auction Trial

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Activity</th>
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<tbody>
<tr>
<td>2021/22</td>
<td>Q1</td>
<td>Review 100 MW requirement and 20 MW cap for the Auction Trial</td>
</tr>
<tr>
<td>2021/22</td>
<td>Q2</td>
<td>Issue initial report on the Auction Trial</td>
</tr>
<tr>
<td>2021/22</td>
<td>Q3</td>
<td>Trial separate procurement of LF and HF response services</td>
</tr>
<tr>
<td>2021/22</td>
<td>Q4</td>
<td>Publish plan for day-ahead procurement and consult on ending auction design</td>
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### Reserve Markets

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<tr>
<th>Year</th>
<th>Quarter</th>
<th>Activity</th>
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<tbody>
<tr>
<td>2022/23</td>
<td>Q1</td>
<td>Consult on strategy for more competitive procurement of optional fast reserve</td>
</tr>
<tr>
<td>2022/23</td>
<td>Q2</td>
<td>Go-Live of Project TERRE</td>
</tr>
<tr>
<td>2022/23</td>
<td>Q3</td>
<td>Study impact of completed reforms and consult on further development of reserve services</td>
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### RIIO2 Business Plan Proposals

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<tr>
<th>Year</th>
<th>Quarter</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>2022/23</td>
<td>Q4</td>
<td>Single market platform for all services</td>
</tr>
<tr>
<td>2022/23</td>
<td>Q1</td>
<td>Single day-ahead response and reserve market go live</td>
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## FFR Weekly Auction Trial (Phase II)

### Trial closer to real-time procurement

- **Launched Winter 2019**

### Promoting Competition

### Feedback

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<th>Last month 06/12</th>
<th>Last week 10/01</th>
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<tr>
<td><strong>Total volume DLH (MW)</strong></td>
<td>8,020</td>
<td>11,168</td>
</tr>
<tr>
<td><strong>Average volume DLH (MW)</strong></td>
<td>47.7</td>
<td>66.5</td>
</tr>
<tr>
<td><strong>Average price DLH (£/MW)</strong></td>
<td>7.06</td>
<td>7.60</td>
</tr>
<tr>
<td><strong>Total value DLH</strong></td>
<td>£ 56,664</td>
<td>£ 78,080</td>
</tr>
<tr>
<td><strong>Total volume LFS (MW)</strong></td>
<td>5,964</td>
<td>5,552</td>
</tr>
<tr>
<td><strong>Average volume LFS (MW)</strong></td>
<td>35.5</td>
<td>33.1</td>
</tr>
<tr>
<td><strong>Average price LFS (£/MW)</strong></td>
<td>3.99</td>
<td>3.98</td>
</tr>
<tr>
<td><strong>Total value LFS</strong></td>
<td>£ 23,848</td>
<td>£ 22,498</td>
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What’s next?

New Suite of Response Products

- Dynamic Containment
- Dynamic Regulation
- Dynamic Moderation

Engagement with EnergyUK and ADE at the end of January

Fast-acting and post-fault

Launch by summer 2020

Procured via EPEX SPOT auction platform
Introduction to ENA

- 29 million electricity customers
- 21.5 million gas customers

- 180,000 miles of gas network
- 519,304 miles of electricity network
The Voice of the Networks

Electricity Networks – The Challenge

• The Electricity Networks are facing unprecedented change as a result of decarbonisation, digitisation and decentralisation
ENA’s Open Networks Project is a major energy industry initiative that will transform the way that both local Distribution Networks and national Transmission Networks will operate and work for customers. This is being driven by the 3Ds; digitisation, decentralisation and decarbonisation.

The Open Networks Project will help customers connect and realise value; as well as reducing cost for consumers through more cost effective planning.

The Open Networks Project is a key initiative to deliver Government policy set out in the Ofgem and BEIS Smart Systems and Flexibility Plan, the Government’s Industrial Strategy and the Clean Growth Plan.

We are taking a ‘learn-by-doing’ approach; we are using innovation funding to trial and test aspects of the various future electricity system options.

Short Animation that can be found at: https://www.youtube.com/watch?v=te_d34zldJ8&feature=youtu.be
Open Networks Workstreams

Workstream 3: DSO Transition

Workstream 1A: Flexibility Services

Workstream 1B: Whole Electricity System Planning & T-D Data Exchange

Workstream 2: Customer Information Provision & Connections

Workstream 4: Whole Energy Systems

Workstream 5: Comms & Stakeholder Engagement
WS1A: Flexibility Services – 2020 Focus Areas

• Continue to focus on least regrets work areas that deliver for customers
• Deliver standardisation and convergence in how flexibility services are procured and delivered
• 2020 Focus areas:
  • ANM vs. Flexibility vs. Reinforcement
  • Flexibility Valuation
  • Procurement Process
  • Common Active Power Services
  • Flexibility Contract
  • New Services
  • Dispatch and Settlement

2020 Project Initiation Document out for consultation next week!
• **Our Six Steps for Delivering Flexibility Services** outlines how the DNOs, GTC, TOs and the ESO are committing to make emerging flexibility markets work in practice.

• Offers households, businesses and communities a clear and transparent journey through the process of offering their services to the grid.

• Builds on the original commitment signed by DNOs, and now GTC, in December 2018.
  • Commitment to openly test the market to compare relevant grid reinforcement and market flexibility solutions for all new projects of a significant value.
  • This work was key in reducing the costs of new infrastructure investment and laying the foundations for a new, cleaner, more flexible network.

• We will be building on these steps in flexibility developments within the Open Networks Project.
  • Networks are working together to deliver the smart grid and harmonise local markets for flexibility services
Our Six Steps for Delivering Flexibility Services outlines how Electricity Networks are committing to making these emerging flexibility markets work in practice:

1. Champion a level playing field
2. Visibility and accessibility
3. Conduct procurement in an open and transparent manner
4. Provide clarity on the dispatch of services
5. Provide regular, consistent and transparent reporting
6. Work together towards whole systems outcomes
The Voice of the Networks

DSO Services Process for Standardisation & Improvement

- Developing Common Commercial Terms/Contract
- Also developing facilitating other markets in addition to directly procured DSO services
• http://www.energynetworks.org/electricity/futures/flexibility-in-great-britain.html

• Single entry-point for providing Flexibility Services in GB. Includes:
  
  • Flexibility Commitments
  
  • Flexibility Figures
    
    o 304MW contracted to date (2018 and 2019) by DNOs
    o 947MW being tendered out in 2019 by DNOs
    o National Grid Flexibility also on website
  
  • Flexibility Timeline & Links
  
  • Flexible Connections figures and contacts
Flexibility in GB – 2020

• Same page and same sections +

• Forecasts for 2020 (and beyond)
• Improved interactive timeline
• Updated figures including National Grid
• Reporting against 4 standard active services products:
  o Sustain
  o Secure
  o Dynamic
  o Restore
• Other WS1A outputs
More Liquidity?

Constraints are geographical but……..

- Common products
- Better visibility and ease of access
- Standardised contractual terms
- Non exclusivity
- More stakeholder engagement
- Consistent reporting and monitoring
- Lower barriers to entry (eg: size)
- ……

- What else?
Learn-By-Doing: Flexibility Projects

- The Open Networks project is taking a learn-by-doing approach.
Stakeholder Engagement is Key

- **Opportunities for engagement**: We hold dissemination events, workshops, forums and webinars, along with ongoing engagement with the Advisory Group.

- **Public Consultations**: We hold public consultations to focus on key priorities – this year we will include one consultation on Flexibility.

- **Transparency & Access**: We have regular social media activity, public events and Open Networks Project newsletters. We uploaded all project materials to the ENA website and ensure regular contact.
Get Involved

Should you want further information about the Open Networks project, please don’t hesitate to get in touch with us at opennetworks@energynetworks.org

Or

visit our webpage

http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-overview/
BM Wider Access

Richard Hanson
New Business Development
Wider Access Commitments

Wider Access to the Balancing Mechanism Roadmap outlined our commitments to improving access to the BM.

NGESO seeking to remove barriers to the BM in 3 ways:
1. Improving existing routes to market.
2. Developing new routes to market.
3. Enhancing IS systems.
Progress to Date

2016: Relevant industry modifications raised for Wider Access/TERRRE

2018
   Aug: 1\textsuperscript{st} Aggregated BMU Go-Live \textit{(GC0097/P344 Ofgem approval)}
   Dec: FFR bidding for new BMUs

2019
   Jan: Distributed Energy Resources Desk introduced
   Apr: Fast Reserve bidding for new BMUs
   Oct: Operational Metering API Go-Live
   Nov: CMP 295 Approved by Ofgem \textit{(enabling VLP’s to sign up to CUSC)}
   Dec: EDL/EDT API Go-Live, VLP Go-Live

2020
   June: Planned TERRE Go-Live
Supplier Route (SVA)

Licensed suppliers can register additional BMUs to participate in the BM

Most popular route for new BM participants to date

Allows access to both the wholesale and balancing markets

Aggregate assets across a GSP Group
Virtual Lead Parties

Registration Process
Sign up to CUSC/BSC
Pre qualification through new online portal
5 month window from application following changes to European Balancing Guidelines

Key VLP Parameters
Only register secondary BMUs
Do not require a suppliers license
Enables BM, ancillary services and TERRE participation.
Cannot participate in wholesale market.
Not responsible for BSUoS & TNUoS
Project TERRE

Sophie Hind
Balancing Programme
Project TERRE

Establishing a European balancing energy market in order to facilitate competition and create a harmonized playing fields for Market Participants.

Will allow the exchange of Replacement Reserves (RR) in line with the Electricity Balancing Guideline (EBGL)

Design

• TSO-TSO model
• Marginal Pricing
• 30 min activation time
• 15 minute Blocks
• One auction per hour
Implementation

• LIBRA platform has gone live in first phase
  • CEPS (Czech Republic) have been using the platform within their own market since 6th January 2020.

• Next go live will be early March
  • REE (Spain) and REN (Portugal) will join the platform

• RTE (France) and NGESO will go-live during June, possibly also with Terna (Italy) and Swissgrid (Switzerland)
  • NGESO request to go-live at later date has now been approved by Ofgem. Go-live must be by 30th June or in line with RTE (whichever is sooner)
Market involvement (testing)

- Testing to take place in two phases:
  - RR EDT submission testing: To participate in this, you will need to be able to comply with the EDT specification and RR implementation guidelines that have been published [here](#) and be able to submit data using EDT and web services through the WA API.
    - *This testing will begin early Feb 20.*
  - Market testing – a continuation of the RR bid submission above, also including issuing of ‘dummy or test’ BOAs to MPs involved in testing.
    - *More detail will be shared on this at a later date.*

- If you are interested in participating in testing please get in contact with us at [Commercial.Operation@nationalgrideso.com](mailto:Commercial.Operation@nationalgrideso.com). Participation will be on a first come first served basis
TERRE parallel run

- NGESO expect to participate in TERRE parallel run testing from March 2020
- Allows the opportunity to test the RR business process in parallel with existing balancing processes before go-live.
- Following inter-operability testing, a period of business-operational testing will be conducted prior to go-live of the TERRE process.
- Effectiveness and operational resilience of the LIBRA platform and NG systems will be assessed and the associated RR business processes will be validated.

Objectives of Parallel run

- Provide NGESO to assess and to check on algorithm behaviour with “production like” data
- To simulate an end to end full process testing with “production like” data, in order to:
  - Test the exchange of information including submitted data quality.
  - Test and validate operational business process including fall-back & exception procedures.
  - Enable the National Grid business users to simulate operating the RR market alongside existing Balancing Mechanism (BM)
  - Test National Grid IT system and service readiness and connectivity with LIBRA Platform.

Testing participants will be asked to provide data for parallel run testing, more information will be shared with participants at a later date.
Thank you

Sophie Hind
Balancing Programme

Commercial.Operation@nationalgrideso.com
Lunch
12:30 – 13:20
#powerresponsive
Session 3:
Future Opportunities and Local Flexibility

nationalgridESO
Nick Harvey

nationalgridESO
Daniel Auty

centrica
Sam Wevers
Pathfinders: The story so far...

15th January 2020
System needs are changing

- The system is increasingly more complex to operate due to the growth in:
  - interconnectors,
  - solar panels,
  - electricity storage,
  - electric vehicles,
  - smart/micro grids etc.

- Balancing service needs are increasing as a result with greater extremes and more volatility in requirement.
Voltage management is increasingly challenging

- Costs and utilisation are increasing
- There is a significant difference in absorption and injection of MVAr.
- Trends suggests that costs will continue to rise

£330 million in last three years spent on managing voltage
Our ambition is to broaden the NOA in terms of needs and participants.

Current NOA:
- Boundary flow
- TO solutions

Future NOA:
- Broader needs and wider participants

Range of system needs:
- Expand to broader set of needs

Number of participants:
- Wider participants

Pathfinder projects:
- High voltage
- Stability
- Constraints

RIIO-2:
- End of life assets
- Connection wider works
By 2021, new high-level planning process

Outline future energy scenarios (FES)

Assess system needs (ETYS)

Identify solutions

TOs provide solutions to boundary needs

Tenders for solutions for voltage, stability, and thermal constraint solutions

Recommend most efficient solution (NOA)

System Operability Framework (SOF)

We will assess a wider range of system needs

We will publish tender results during year, in addition to annual NOA document

Market participants, DNOs and TOs can all compete

Assess system needs

Identify solutions

TOs provide solutions to boundary needs
We’re taking a learning by doing approach, through our pathfinders.
Progress & Acting on Feedback

How have we engaged stakeholders on this journey?

RFI Processes

• Submissions from potential providers shapes contract and market design.
• Learning is incorporated to design.

Feedback Received

• RFI comments.
• 1:1 engagement.
• Reactions to tender launches provide both positive and challenging feedback.

How we’re responding

• Flexibility to adapt to feedback in short timescales, making changes in response.
• Staying true to requirements.
Overview of pathfinder projects

High Voltage Pathfinder

- Develop a methodology for the articulation and assessment of regional transmission voltage needs including:
  - Develop processes for the development, submission and assessment of market, DNO and TO solutions
  - Ensure consideration of a wide range of options, including market services and asset build to identify the most economically efficient set of solutions
  - Develop capability and process for Cost Benefit Analysis for non-MW solutions
- Included methodology in 2019/20 NOA methodology
- RFI and tender for long-term service in Mersey area published.
- We are currently in the technical assessment phase of the LT Mersey Voltage Tender
Explore benefits of NOA type approach to system stability
- Stability of voltage, frequency and the ability of a network user to stay connected under normal conditions, during a fault and after a fault
- Define ESO requirements for an area
- Develop and test process to obtain and evaluate options to meet the requirements set out, through technical and economic assessment
- Develop a methodology for inclusion in the NOA methodology for 2020/21
- RFI in summer 2019
- Phase 1 tender released 05\textsuperscript{th} November 2019
- Phase 2 tender planned March 2020
Overview of pathfinder projects

- We aimed to promote network competition and procure a long-term product to alleviate network constraints by focusing on a wider pool of solutions.
- Our webinar was held on 13th May across the industry.
- We continued the network and market studies based on our needs and external stakeholders’ feedback.
- We launched RFI/market engagement on 17th Dec 2019. This remains open until 28th Feb 2020.
- Future steps:
  - Second webinar planned 22nd Jan 2020.
  - 2020 Q2: Launch tender for constraint management.
## Progress

### What has been delivered so far?

<table>
<thead>
<tr>
<th>Oct 19</th>
<th>Nov 19</th>
<th>Dec 19</th>
<th>Jan 20</th>
<th>Feb 20</th>
<th>Mar 20</th>
<th>2020/21</th>
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<tr>
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<td>08 Nov Tender Closes</td>
<td>Commercial and Technical Assessment</td>
<td>Contract Award 17 Jan</td>
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<td>Tender Period</td>
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### ST Mersey Voltage

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<th>Tender Opens 25 Nov</th>
<th>13 Dec</th>
<th>Tender Results 31 Jan</th>
<th>28 Feb Tender Closes</th>
<th>Contract Award 24 Apr</th>
<th>Contracts Start April 2022</th>
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<tr>
<td>Tender phase 1</td>
<td>Technical Assessment</td>
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### LT Mersey Voltage

<table>
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<th>Tender Opens 05 Nov</th>
<th>17 Jan Tender Closes</th>
<th>Tender Period</th>
<th>Assessment</th>
<th>Tender Results 2021</th>
<th>Contract Award Dec 20</th>
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<tr>
<td>Note: Phase 2 Timeline is being reviewed. The following is what was presented in October but will flex based on Phase 1 feedback and tender extension</td>
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### Stability Phase 1

<table>
<thead>
<tr>
<th>Tender Opens Jan '20</th>
<th>EOI</th>
<th>Tender, Feasibility and Assessment</th>
<th>Feasibility from Apr '20</th>
<th>Oct '20 Tender Closes</th>
<th>Contract Award Dec '20</th>
<th>Contracts Start April 2023</th>
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</thead>
<tbody>
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<tr>
<td>Note: Final publication date for the RFI is subject to approval but is targeting mid-December</td>
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### Stability Phase 2

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<tr>
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<tbody>
<tr>
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</tbody>
</table>

### Pennine Process

(from Jun '20 for Apr '23 start)
How can we incorporate DERs into Black Start strategy?

- To reduce carbon emissions
- To reduce costs to consumers
- To accelerate restoration time scales
<table>
<thead>
<tr>
<th>Event/Report</th>
<th>Date</th>
<th>Location</th>
<th>Details</th>
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<tr>
<td><strong>Power Engineering &amp; Trials</strong></td>
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<td>milestone report published</td>
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<td>ReStart Customer Connection Seminar</td>
<td>05/11/2019</td>
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<td>milestone report published</td>
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<td><strong>Organisational Systems &amp; Telecommunication</strong></td>
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<td>Project Managers Annual Report – published</td>
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</table>
Stakeholder Engagement

- Other projects/initiatives
- Joint Radio Company
- Black Start participants
- Stakeholder Advisory Panel
- BEIS
- Suppliers, manufacturers and service providers
- Energy Networks Strategic Telecommunications Group (ENSTG)
- OFCOM
**Project Timeline**

- **Dec 2019**
  - Project Milestone 1
- **8th Nov 2019**
  - Project Milestone 1
- **31st July 2019**
  - PET Report
- **31st Dec 2019**
  - Project Milestone 2
- **31st Jan 2020**
  - Project Milestone 3
- **2nd Oct 2020**
  - Project Milestone 4
- **30th Sept 2021**
  - Project Milestone 5
- **31st Mar 2022**
  - Project Milestone 6

**Distributed ReStart**

- **Sept 2020**
  - Project Milestone 7
- **Oct 2020**
  - Project Milestone 8
- **Aug 2021**
  - Project Milestone 9
- **Dec 2021**
  - Project Milestone 10

**Key Milestones**

- **Power Engineering Live Trials**
  - Dec 2021
- **End to End Procurement Design**
  - Dec 2021

**Control Systems**

- Defined: Oct 2020
- Designed: Oct 2020

**Process for Restoration**

- Defined: Oct 2020
- Defined: 31st July 2019

**Project Managers**

- Report: Final YR PMO
- Report: YR 1 PMO
- Report: YR 2 PMO

**Distributed ReStart**

- Project Managers Report: Final YR PMO

**End Date**

- 20th Dec 2021
Assessment of Black Start from DER viability was based on the 10 case studies, under 3 main areas

1) DER (anchor & additional) - Survey of all case study DER (capability and resilience)
   - Technical issues – e.g. What control modes do they utilise/have e.g. MW, frequency, power factor, voltage? Block load capability?
   - Resilience issues – e.g. What’s your resilience timeline?, what’s required to make self-starting/maintain operability?

2) Distribution Network
   - Power system studies – Voltage profile/step change, reactive capability & transformer energisation. Fault level & protection
   - Resilience – Substations safe to energise after a black out? E.g. are protection and control systems available?

3) Distribution Island
   - Discussed issues such as low fault level, low inertia, 33kV voltage control...
   - Discussed role of automation with initiating, maintaining, growing, and synchronising a power island.
   - Discussed options for initial energisation strategies and wider strategies to expand the island

Steven’s Croft biomass power station 45MW, Lockerbie (Chapelcross case study)
What we've learnt

• Anchor generator requires 20% of its rating to stabilize through incremental small loads
• An electrically local flexible demand is needed to achieve this
• A new switchable 33kV Earth is required to enable protection to operate appropriately
• New voltage droop control settings are needed to manage network gain for legacy DERs
• Energisation of the transformer will not cause voltage to exceed limits
• Additional protection settings are needed to operate under lower fault level
• Distribution substations may only have resilience for 18-72hrs
• Low voltage fuses will operate as expected
• Growth of the network to real demand will involve near simultaneous switching of network and flexible demand to reduce block seen by generator so automation is needed
Known challenges

**DER:**
- How do we communicate?
- Who operates the unit?
- 'Anchor' unit synchronous or asynchronous?
- Must be located on a network which can be islanded
- Voltage regulation needs to change
- Fuel must be resilient to loss of supply

**Flexible demand:**
- Microgrids unproven at full DNO scale
- Instantaneous switching
- Frequency response provided through this unit?
- Can we value stack to improve economic efficiency?
- Can the flexible demand provide additional services?

**Networks:**
- Can we back-energise the network?
- Where should we install a new earth and who should own it?
- What level of automation is appropriate?
- How can we effectively segregate networks?
- How can we synchronise power islands?
Delivery & Forward View

**Delivered so far:** Viability assessment

**Delivery by October 2020:** Design process, roles, requirements, systems and Operational Telecommunications

**Delivery by project end:** Test and refine

Organisational Models
- Initial Options
  - Code requirements
  - Procurement options
  - Power engineering requirements
- Case studies for progression
- Optimal Model(s)
  - Process design
  - System selection
  - Testing proposals
- Refined Solutions
  - Code requirements
  - Procurement options
  - Power engineering requirements

Operational Telecommunications Options
- Initial Options
  - Mobile 5G
  - Satellite communication
  - Private radio
  - Microwave communication
- Case studies for progression
- Optimal Model(s)
  - Board analysis
  - Solution to design model
  - Requirements to test
- Refined Solutions
  - Organisational system and telecommunication design

Organisational system and telecommunication design
Challenging environment..

Changing Industries

- Energy and telecommunication industries are undergoing rapid change

Black Start Stakeholders

Vast increase in:
- Number of data points?
- Amount and types of Operational Telecommunications?

Telecommunications resilience

- Inclusion of DER presents challenges across all areas of resilience
• Build workable manual processes
  With stakeholder consultation

• Identify the organisational, systems or automation requirements around pinch points

• Align with models being developed across industry
  Where appropriate

• Define data and telecommunication exchanges
  Functional specifications for systems and operational telecommunications (including resilience requirements)

• Refine and map processes to develop:
  Economic and technically viable processes and resourcing requirements
Options – worked example

LOT 1
- Anchor generator
  - Call-off A
  - Call-off B

LOT 2
- Block loading
  - Call-off B

LOT 3
- Inertia/stability
  - Call-off A
  - Call-off C

LOT 4
- Island control
  - Call-off C

Call-off A
- 1 year contract
- 3 months’ notice
- Bids submitted with detailed plans

Call-off B
- Quarterly contract
- 1 month ahead

Call-off C
- 24-hour contract
- Day ahead
- eAuction

*for illustrative purposes only
The review did not identify any significant gaps or blockers for Distributed ReStart services.

Many of the documents require minor changes or no change at all, although it would be useful to align certain conditions.

A number of the codes will require some key changes to ensure they capture the requirements for a novel restoration philosophy. (ESQCR, Grid Code, Distribution Code, G99)

It is also crucial to ensure consistency across some key codes such that all parties are defined and each is clear on their roles and responsibilities in different scenarios and tasks, and to ensure parity across license areas e.g. Grid Code, Distribution Code
A number of key next steps can be recommended based on the code review and associated horizon scan exercise.

- Conduct a thorough review of interdependencies to understand how changing clauses in a specific code or policy impact other documents

- Perform more extensive stakeholder engagement to develop potential solutions for key areas of concern e.g. earthing requirements in the ESQCR

- Continue to monitor ongoing projects and programmes that could impact future requirements for Distributed ReStart. For example, new telecommunications and Cyber Security standards, being developed under Open Networks, could impact how Black Start participants implement telecommunications and telemetry facilities at their sites

- Produce a timeline of known changes to relevant codes and policies e.g. introduction of the Black Start Standard in 2020, to better understand the impact of / on the Distributed ReStart project
Strategy development process

Define objectives:
- Define what we want to achieve and rank in order of importance

Inputs and analysis:
- Summarise what we know already about the service and environment
- Document requirement for change
- Internal and external analysis

Initiatives:
- Pose options that mitigate threats and leverage opportunities

Refine:
- Assess options against agreed objectives and assessment criteria
- Refine shortlist of options and develop delivery plan

Implement:
- Implement agreed deliverables and monitor plan
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<th>Project update, focus on OST and P&amp;C work-streams</th>
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<td>20/05/2020</td>
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Any questions?
Where to find more info?

Website Link

Email Us

ReStart@nationalgrideso.com
Cornwall Local Energy Market

Power Responsive Flexibility Forum

15 January 2020
Sam Wevers

The Cornwall Local Energy Market is part-funded by the European Regional Development Fund under the European Structural and Investment Funds Programme 2014-2020
Cornwall LEM overview

Platform
- V1 – ‘Quote and tender’ DNO flex procurement market
- V2
  - Auction-based market for local flex for constraint management
  - DNO & ESO buyers
  - Auto-clearing
  - Single point of access for sellers
  - Designed for optimal system value

Research
- Regs and policy barriers
- Quant. of systems benefits
- LEM value proposition

Business
- CHP, storage, renewables, DSR
- 6 installations
- 5,600 tCO2e saved / yr
- 100 energy monitoring grants

Consumers
- 100 homes
- Solar PV and Storage
- Micro-aggregation to LEM platform

Corporations and Organizations
- Centrica
- National Grid ESO
- Western Power Distribution
- Imperial College London
- University of Exeter
- European Union European Regional Development Fund
Why is Centrica doing the LEM?

An example of how flex markets can work

- Significant regulatory processes underway to shape flexibility markets
- Shifting towards shorter-term, more transparent procurement
- Transparent, competitive markets drive best value for customers
- Markets without conflicts of interest
- Long-term vs short-term procurement cycles (and impacts on flexibility)
- Sellers should control assets
- Value stacking and T/D co-ordination
LEM Platform

- The need for LEMs
- Our Solution
- Our trials
- A look at our platform
- Next steps
Why do we need LEMs?

Some new challenges for TSO and DSO

Less conventional generation at transmission level
- Need to find alternative sources of flexibility at distribution level

Grid historically designed for unidirectional flows of electricity. Congestion appearing on distribution grid due to DER. The options are therefore to:
- Reinforce grid and/or
- Incentivize flexibility through pricing signals

Avoid costly conflicting signals
LEM Platform

- The need for LEMs
- Our Solution
- Our trials
- A look at our platform
- Next steps
An integrated auction platform to unlock flexibility across transmission and distribution

- DSO
- Wholesale markets
- TSO

Cornwall Local Energy Market

Buys from:

- Aggregated / Direct

Sells to:

- Generation
- Flexible demand
- Storage / EVs
LEM explained
Key capabilities of the LEM platform

- Algorithm automatically clears the market
  ✓ Fairness
  ✓ Transparency
  ✓ Max Social Welfare
  ✓ Robustness

- Impartial clearing engine

- Reveals price signals

- Can submit price sensitive orders

- Pay-as-clear or Pay-as-bid

- Reserve and/or Energy auctions

- Contracts compliant with asset constraints

- T/D Co-ordination

- Grid secure contracts

- Grid secure contracts
A local flexibility market that runs regular auctions

Decreasing uncertainty on flexibility needs and congestion states

Auction Schedule
- M-3 Reserve
- M-1 Reserve
- W-1 Reserve
- DA Utilisation
- ID Utilisation

Can easily add other auctions or merge reserve + utilisation auctions
LEM Platform

- The need for LEMs
- Our Solution
- Our trials
- A look at our platform
- Next steps
Platform trials

~300MWh
Reserve contracts target

~150MWh
Utilisation contracts target

182 MWh
Reserve contracts secured to date

63 MWh
Volume Delivered to Date

11 locations so far:
7 Primary Substations
3 BSP’s
1 GSP

25MW+
Registered Flexibility in Cornwall

27 Dispatches
Including residential battery VPP

50 Auctions Run

DSO and ESO Activity

Seller Activity

End-to-End Platform Functionality

Site Demand (kW)
Metered Data
Baseline
Expected Profile
LEM Platform

1. The need for LEMs
2. Our Solution
3. Our trials
4. A look at our platform
5. Next steps
More than auctions
The platform manages the end-to-end process
An integrated solution

Users can interact via UI and API

- Create and edit bids
- Review T/D info
- See registered DER activity
- Manage contracts

- Register sites and assets
- Create and edit offers
- Review Buyer activity
- Manage contracts

Diagram showing various functionalities such as Baselining, Settlement, Advanced clearing engine, T/D Co-ordination, Site + Asset registration, Bid/Offer management, etc.
Easy to use
Buyer dashboard
T/D Co-ordination
Bid creation

Define a reserve bid at Callington 552:
- **Time period**: 11:00 to 15:30 (Mon–Fri).
- **Flexibility service**: Yes (Full MVV).
- **Maximum buy price**:
  - Reserve price: £1.
  - Utilisation price: £1.

Set repeat bid(s) for Callington 552462:
Would you like to create a repeat sequence or choose specific dates to repeat your bid on?

**Step 1**: Set your repeat sequence.
- **Create a repeat sequence on all dates**.

**Step 2**: When do you want the sequence to end?
- **Specify end date**.
- No of repetitions.
Seller site and asset registration
Upcoming auctions for delivery on Fri, 5th April 2019

Next auction is: 3 hrs: 11 mins

<table>
<thead>
<tr>
<th>Auction date &amp; time</th>
<th>Auction type</th>
<th>Delivery date(s)</th>
<th>No. of offers</th>
<th>No. of sites</th>
<th>Vol. offered (MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today, 3:30</td>
<td>M-1</td>
<td>5 Apr - 4 May 2019</td>
<td>5</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>29 Mar 2019, 12:30</td>
<td>W-1</td>
<td>5 Apr 2019</td>
<td>10</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>4 Apr 2019, 16:30</td>
<td>D-1</td>
<td>5 Apr 2019</td>
<td>12</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

Auction results for delivery on Sun, 3rd March 2019

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of offers</th>
<th>Reserve vol. contracted/ offered (MW)</th>
<th>Avg. reserve clearing price (£/MWh)</th>
<th>Total reservation value (£)</th>
<th>Utilisation vol. contracted/ offered (MWh)</th>
<th>Avg. utilisation price (£/MWh)</th>
<th>Total utilisation value (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarms Mill Stop Ltd</td>
<td>1</td>
<td>0.047 / 0.025</td>
<td>£17.50</td>
<td>£200</td>
<td>0.025 / 0.015</td>
<td>£7.50</td>
<td>£190</td>
</tr>
<tr>
<td>Victoria power station</td>
<td>4</td>
<td>1.02 / 1.05</td>
<td>£4</td>
<td>£50</td>
<td>1.01 / 1.02</td>
<td>£4</td>
<td>£50</td>
</tr>
<tr>
<td>NPG Cornwall</td>
<td>6</td>
<td>0.071 / 0.504</td>
<td>£17</td>
<td>£150</td>
<td>0.068 / 0.07</td>
<td>£17</td>
<td>£90</td>
</tr>
<tr>
<td>South West Hydro</td>
<td>5</td>
<td>1.02 / 1.02</td>
<td>£3.50</td>
<td>£250</td>
<td>1.01 / 1.02</td>
<td>£3.50</td>
<td>£290</td>
</tr>
</tbody>
</table>
LEM Platform

The need for LEMs

Our Solution

Our trials

A look at our platform

Next steps
We are live
Cornwall LEM with WPD and National Grid ESO is live and trading

We are scalable
The platform is robust and modular, with in-built scalability. By importing a grid model, we are able to quickly spin up new instances of the LEM beyond Cornwall

We are expanding
New international pilots secured
We want to make regular, auction-based T/D flexibility markets a reality in 2020 across Europe
Session 4: Distribution Network Opportunities

Ben Godfrey  Andrew McKenna  Julian Wayne  Stathis Mokkas
DSO Flexibility across WPD

January 2020

Ben Godfrey
Network Strategy Manager
Delivering Flexibility First

WPD has always used the flexibility inherent in its networks to provide an economic and secure supply ahead of undertaking conventional reinforcement.

We have expanded this to include market-provided flexibility

Primary substations assessed and signposted for flexibility in 2019

Throughout the rest of ED1 we will assess 90% of our load related reinforcement investment for a more economic delivery by flexibility services.

For the remaining 10%, which is predominately at LV, we will continue to develop, test and evaluate other markets.
## Procurement to date and Results

<table>
<thead>
<tr>
<th>Procurement Cycle</th>
<th>Primaries Covered</th>
<th>MW Sought</th>
<th>Flexibility Contracted (MW Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>18</td>
<td>63</td>
<td>35.3</td>
</tr>
<tr>
<td>2019 H1</td>
<td>80</td>
<td>93</td>
<td>56.8</td>
</tr>
<tr>
<td>2019 H2</td>
<td>120</td>
<td>184</td>
<td>123.1</td>
</tr>
</tbody>
</table>

We’ve also signed a further 14.8MW of energy storage to operate under DSM in 2019/20.
Delivering a Flexibility First Approach

**Visibility**
- Forecasting of system needs
- Publication of flexibility data
- Signposting to where flexibility services will be required

**Accessibility**
- Multiple routes to market
- Access options for a wide range of participants
- Low barriers to entry

**Sustainability**
- Investable flexibility products
- Ensures value of flexibility is realised
- Aligned to decarbonisation

**Transparency**
- Open processes
- Auditable decisions
- Consistent outcomes
Using a similar functionality to our network capacity map, our network flexibility map is publicly available on our website:

www.flexiblepower.co.uk/our-schemes

This displays information on:

- Geographic supply area
- MW peak and length for availability
- Estimated MWh utilisation
- Months applicable
- Days applicable
- Raw data downloads
Using Flexibility Platforms

Building a smarter, more flexible system
Procurement Timelines

One to four year initial term forming into rolling contracts

We will follow a 6 monthly procurement cycle, bringing on new flexibility zones and ensuring we meet all our system needs
Enabling opportunities through DSO

Market Information

- Award winning visibility and signposting information
- Raw data downloads
- OJEU compliant tender process including Dynamic Purchasing System
- Tender Information and Results published
- 6 monthly cycles of procurement
- Standardised DSO products
- Payment Mechanics and contracts published
- System Investment Assessment methodology published
- Pricing Strategy published, including competition test and clearing process
- Dispatch principles published
- Month Ahead forecasting for flexibility dispatch
- Webinars conducted across procurement cycles
- Face to face flexibility surgery every 6 months
Procurement in 2020 H1

- 42 constraints across 174 primary substations
- 334MW required
- ITTs out in March
- To operate over summer and winter 2020
- Affects over £125m of reinforcement
- Additional zones signposted with future requirements over 5 years

Building a smarter, more flexible system
Find out more

Online: www.flexiblepower.co.uk

Email: wpdflexiblepower@westernpower.co.uk

Call: 01332 827436
Delivering Customer Flexibility

Andrew McKenna
Commercial Manager – Flexibility Services

15th January 2020
Northern Powergrid

We are:

- Regulated by Ofgem
- a ‘wires-only,’ electricity distributor
- 63,000 substations
- 4.4GW of generation connected

We serve:

- 3.9 million homes & businesses
- 2,900 employees
- 3 of the UK’s 10 biggest cities, 4 national parks and 5 Areas of Natural Beauty

£85: typical annual domestic bill (23p per day)
Flexibility - Setting the scene in industry
Our DSO plan

- Our DSO development plan
  - Customer and commercial development
  - Technical development
  - Data and systems development

Available from: www.northernpowergrid.com/DSO
What is customer flexibility?

- We have committed to test the flexibility market prior to any significant network reinforcement.
- We have identified essential planned maintenance projects taking place in 2020 that could benefit from customer flexibility.
- We have recently launched customer flexibility as an additional means of restoration to our control room.
Standard industry use cases and flexibility products

NPg use cases

2018 WS1 P2 flexibility products

Product branding

Deferral of reinforcement
Scheduled constraint management
Pre-fault flexibility
Post-fault flexibility
Restoration flexibility

Planned maintenance

Sustain
Secure
Dynamic
Restore
Delivering customer flexibility in 2020

✓ Up to 100MWs of ‘Restore’ flexibility across seven locations on our network
  • Alnwick
  • Hartlepool
  • Middlesbrough
  • Pontefract
  • Grimsby
  • Bradford
  • Huddersfield

✓ Asset registration portal live on Northern Powergrid website – closes on 21st February 2020

✓ Procuring Customer Flexibility through e Auction

✓ www.northernpowergrid.com/DSO to register
### Transition to deep and flexibility markets in 2030 – a view of the future

<table>
<thead>
<tr>
<th>Types of customers</th>
<th>Short term</th>
<th>Medium term</th>
<th>Long term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019-20</td>
<td>2020-23</td>
<td>2023-30</td>
</tr>
<tr>
<td>I+C Customers</td>
<td></td>
<td>I+C Customers</td>
<td>I+C Customers</td>
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<tr>
<td>Aggregated loads</td>
<td></td>
<td>Aggregated loads</td>
<td>Aggregated loads</td>
</tr>
<tr>
<td>SMEs</td>
<td></td>
<td></td>
<td>SMEs</td>
</tr>
<tr>
<td>Domestic (including Evs)</td>
<td></td>
<td></td>
<td>Domestic +EVs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage level</th>
<th>Short term</th>
<th>Medium term</th>
<th>Long term</th>
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<tbody>
<tr>
<td></td>
<td>2019-20</td>
<td>2020-23</td>
<td>2023-30</td>
</tr>
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<td>EHV</td>
<td></td>
<td>EHV</td>
<td>EHV</td>
</tr>
<tr>
<td>HV</td>
<td></td>
<td>HV</td>
<td>HV</td>
</tr>
<tr>
<td>LV</td>
<td></td>
<td>LV</td>
<td>LV</td>
</tr>
<tr>
<td>Domestic +EVs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use case</th>
<th>Short term</th>
<th>Medium term</th>
<th>Long term</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2019-20</td>
<td>2020-23</td>
<td>2023-30</td>
</tr>
<tr>
<td>Peak load</td>
<td></td>
<td>Peak load</td>
<td>Peak load</td>
</tr>
<tr>
<td>Restoration</td>
<td></td>
<td>Construction risk</td>
<td>Construction risk</td>
</tr>
<tr>
<td>Restoration</td>
<td></td>
<td>Restoration</td>
<td>Restoration</td>
</tr>
<tr>
<td>Reactive power (potentially)</td>
<td></td>
<td>Ancillary services</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Service contracts</th>
<th>Short term</th>
<th>Medium term</th>
<th>Long term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019-20</td>
<td>2020-23</td>
<td>2023-30</td>
</tr>
<tr>
<td>Bilateral contracts</td>
<td></td>
<td>Bilateral contracts</td>
<td>Bilateral contracts</td>
</tr>
<tr>
<td>Flexibility &amp; Energy short term exchange</td>
<td></td>
<td></td>
<td>Flexibility &amp; Energy short term exchange Multilateral contracts (between DSOs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data for competitive markets</th>
<th>Short term</th>
<th>Medium term</th>
<th>Long term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019-20</td>
<td>2020-23</td>
<td>2023-30</td>
</tr>
<tr>
<td>Heat maps</td>
<td></td>
<td>DFES + enhanced forecasting</td>
<td>DFES</td>
</tr>
<tr>
<td>Automated data share</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cross industry collaboration - delivering the best solution for our customers

Open Networks Project –

Our six steps for delivering flexibility services

1. Champion a level playing field
2. Ensure visibility and accessibility
3. Conduct procurement in an open and transparent manner
4. Provide clarity on the dispatch of services
5. Provide regular, consistent and transparent reporting
6. Work together towards whole energy system outcomes
Thank you
SPEN – Flexibility Services Tender

In October 2019 SPEN launched a second phase of tenders for Flexibility Services:

**Timetable**

1. Requirements Published – 4 October 2019
2. Prequalification Period – 4 Oct 2019 to 6 Dec 2019
4. Results Announced – February 2020

**Requirements**

Total of 95MW required:
- Where: 10 Locations (6 in SPM and 4 in SPD)
- When: Service Windows - Apr 2020 to Mar 2023
- What: Post Fault, Restore and Reactive Services

**Pre-qualification Response**

Registered on the Piclo Flex platform at pre-qualification deadline:
- 23 Providers
- 522 Individual Assets
- More than 1GW of Active Import/Export Capacity
- Capacity registered in all locations
- Reactive power offered

**Initial Assessment and Next Steps**

- Initial assessment of 522 assets undertaken (e.g. area, total capacity within area)
- 8 locations progressed to competitive tender (4 in SPD and 4 in SPM)
- 80% of registered assets accepted to bid (for 2 locations insufficient capacity in required area)
- Final evaluation will be against technical, commercial and supplier criteria prior to contract award

**1st DNO to tender for Reactive Services and to issue Site Specific Pricing Signals**
Developing Local Flexibility Markets – Past, Present, Future

Stathis Mokkas

Energy Markets Lead – Smart Grid Development
Purpose

1. Flexibility – a BAU approach
2. The opportunities – March 2020
3. The future of flexibility – Trials in flight
Flexibility: Winter 2018/19 Tender

- 28 Zones Tendered
- 19 Prequalified
- 15 Bid
- 4 Met Operational Needs
- 3 with Smaller Volumes
- 43MW cumulative
- Full bid info published

Using Flexibility to operate the network
March 2020 Tender - Extending the Reach

£24m In Total

Up to 7 year contracts
We're Testing longer duration contracts

170MW
Capacity Requirement

55 high voltage network zones
Serving c.10% of our customers

60 low voltage zones
(DNO first)

Across areas & voltage
Flexibility Zone – Shepway, South Eastern Power Networks

Revenue: £142 - £184/MWh

Availability Needed
Nov–March, Mon-Sun, 5-7pm

Minimum Capacity
50kW (can be aggregated)

Your Voltage Connection
11kV or below

Service Required
Active Power, on instruction

Direction
Generation turn up or demand turn down

Easy to get involved
1. Register your assets online
2. Complete our pre-qualification questionnaire
   • Closes 02 March
3. Submit bids into tender
   • Opens 26 March
   • Closes 02 April
4. Choose contract length
   • 1-7 years

> Find out more at smartgrid.ukpowernetworks.co.uk <
A growing portfolio of opportunities

Power Potential – Solutions for the Whole System
A reactive power market to resolve transmission constraints

Energy Exchange – Facilitating the long term growth of renewables
Trading of generation curtailment
Shift – Smart Charging Market Trials

To investigate how DNO can support the market to manage smart charging

**Flexibility Procurement**

**Capacity Based Pricing**

Penalty price (£/kWh)

Self-nominated capacity (£/kW/h charge)

**DUoS  Time of Use**

Conclusions

• Flexibility is already BAU to operate distribution system

• Growing the opportunities for providers

• New solutions to future problems

> Find out more at smartgrid.ukpowernetworks.co.uk <
Email flexibility@ukpowernetworks.co.uk
Reflections and Summary

Colm Murphy
Future Markets, NG ESO
Thank you for joining us.

Have a safe journey.