Agenda

- Timeline of DSR and DG design standard development
- Low Carbon London: DSR trials and partners
- Results from the trials
- Contribution to DSR industry discussion
- Next steps – BAU rollout
- Distributed Generation in London
- LCL DG trials
- Security of Supply and Active Control
Timeline of DSR and DG
Design standard development

- **1978**: P2/5 need identified to consider DG
- **2006**: P2/6
  - ETR130 introduced: Focused on passive, industrial CHP
  - Based on 18 sites
- **2010 - 2014**: LCL and DNO industry trials active demand side services
- **2010 - 2014**: Concrete recommendations from LCNF Projects
- **2010 - 2014**: P2/6 Review

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Low Carbon London
Trial objectives

- Investigate the ability of Commercial Aggregators to provide demand response services tailored to the requirements of distribution networks through the control of I&C customers’ demand.
I&C DSR Trials
Overview

• 37 sites, 185 unique events
• 372MWh total delivered response

Source: LCL Report A4
I&C DSR Trials

Results

• 16.5MW total demand reduction available in summer 2013 trial
• 90% of events returned a measurable response

Source: LCL Report A4
I&C DSR Trials
Participation history

Low Carbon London DSR Trials

Legend
- 6MW Site
- 200kW Site
- Diesel
- CHP
- Load Reduction
- Gas

Availability Payment

Trial Period

Winter 2011-12
Summer 2012
Winter 2012-13
Summer 2013
Winter 2013-14
Winter 2014-15

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I&C DSR Trials

Results

Diesel Demand Side Response Example, Ebury Bridge

Four-Site Demand Response Portfolio (Building Turndown)
I&C DSR Trials
Payback

Source: LCL Report A7


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Demand Side Response

P2/6 Compliance

Reliability distribution defined on DSR contract performance (LCL data)

Network Profile defines duration of capacity requirements

Source: LCL Report A4
Demand Side Response

Key LCL Contribution

- DSR procurement needs to take into account the risk of the required level of DSR not being available in the required timeframe.
- We do this by establishing F factors which are dependent on DSR technology and a number of facilities available.

\[
\text{DSR Required to be Procured [MW]} = \frac{\text{DSR Required to Meet Energy at Risk [MW]}}{\text{F Factor [%]}}
\]

Trial results:

<table>
<thead>
<tr>
<th>DSR technology type</th>
<th>1</th>
<th>2…</th>
<th>5…</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>70%</td>
<td>72%</td>
<td>78%</td>
<td>80%</td>
<td>81%</td>
</tr>
<tr>
<td>Demand Reduction</td>
<td>54%</td>
<td>58%</td>
<td>62%</td>
<td>63%</td>
<td>64%</td>
</tr>
</tbody>
</table>
Demand Side Response
Assessment tool

Demand-side response parameters

| DSR unit characteristics |  |
|--------------------------|--|---|
| DSR type                 | Diesel |  |
| Average unit capacity [MW]| 1 |  |
| Average availability factor [%] | 98% |  |
| Average reliability factor [%] | 88% |  |
| Required testing events per year | 1 |  |

Portable diesel characteristics

| Unit capacity [MW] |  |
|-------------------|--|---|
| Average reliability factor [%] |  |
| Hire fee [£/MWh] |  |
| Running costs [£/MWh] |  |

Source: DSR Assessment tool
Demand Side Response
Contract templates

LCL:
• Developed key commercial terms
• Tested baselining methodology
• Produced contract templates

<table>
<thead>
<tr>
<th></th>
<th>One off service</th>
<th>Extended Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNO : Direct Customer</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>DNO : Aggregator</td>
<td>✔</td>
<td>✔</td>
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</table>
Demand Side Response

Next Steps

• Committed to £43m savings in the next 8 years of RIIO-ED1

• Service requirements to be fully detailed prior to engaging the market

• Procurement strategy:
  • Aligned with forecasting and network investment
  • DSR suppliers day and consultation held in January 2015
Distributed generation and security of supply

Low Carbon London set out to address the challenge of enabling and integrating Distributed Generation:

Enabling and Integrating Distributed Generation:

• U02.1 – Monitor and Facilitate DG Connections to the LV and HV Distribution Networks

• U02.2 – Active Management of DG to address security of supply and postpone network reinforcement
Distributed Generation
The DG scene in London

Growth in DG has been rapid and is expected to continue. The diversity of DG has also changed.

ETR130 data collected up to this point

Source: LCL Report A8
Low Carbon London trials
Data monitored

- As part of the LCL monitoring trial, 15 sites were fitted with ANM:
  - 13 CHP
  - 2 PV generators
- Extrapolated behaviour profiles were established using these sources enhanced by other data sets
- ANM trials for 2 sites one CHP and one gas turbine

Source: LCL Report A8
# Models to improve security of supply

<table>
<thead>
<tr>
<th>Monitor / Control</th>
<th>Diagram</th>
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<tbody>
<tr>
<td>Passive network management</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>Active Network Management - Active Dispatch</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>Active Network Management - Active Dispatch and facilitation of Maximum Demand</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Source: LCL Report A8
Distributed Generation
Passive vs. Active Management

If there is high confidence that DG will operate through the day and help meet an ‘n’ shape peak, then passive network management may be sufficient.

Alternatively, with an ‘m’ shape profile, active network management may better provide the necessary certainty that DG turns on early enough and stays on late enough to satisfy both peaks.

Source: LCL Report A8
Distributed Generation
ANM Facilitating DG connections

- Urban networks – fault levels are a barrier to DG growth in urban networks
- Rural networks – ANM can facilitate DG connections in rural areas with thermal and voltage constraints

**ANM-enabled DG capacity unlocked by network reconfiguration and STP generation**

<table>
<thead>
<tr>
<th></th>
<th>Using ANM to recognise network reconfiguration</th>
<th>Using ANM to recognise the status of STP generation</th>
<th>Both methods in combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of substations where additional headroom can be accessed</td>
<td>74</td>
<td>32</td>
<td>92</td>
</tr>
<tr>
<td>Total acceptable new DG capacity</td>
<td>437 MW</td>
<td>182 MW</td>
<td>619 MW</td>
</tr>
<tr>
<td>Average acceptable new DG capacity</td>
<td>5.91 MW</td>
<td>5.68 MW</td>
<td>6.73 MW</td>
</tr>
</tbody>
</table>

Source: LCL Report A9
Conclusions

• DSR and DG uptake will be particularly relevant to urban settings in the near future

• DG uptake will be a key enabler for landlords achieving 25% renewable target in dense networks

• DSR forecast savings of £43m will accrue to all UK Power Networks’ customers

• There is potential to assist new DG and distributed energy connecting to the network
The findings from **Low Carbon London** represent a step change in understanding the electricity network required for a low carbon future.

If you would like to know more about our reports please email us:
innovation@ukpowernetworks.co.uk

Partners:

- CGI
- EDF Energy
- ENERNOC
- flexitricity
- Imperial College London
- Institute for Sustainability
- Mayor of London
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- Siemens
- smarter grid solutions
- Transport for London