Smart Street
Project Partner Event

13th May 2014
Innovation within Electricity North West

Simon Brooke
Low Carbon Projects Manager
Agenda

- Electricity North West
- Innovation strategy & funding
- UK energy challenge
Connecting the North West

We’re not a big multinational we serve only the North West

We distribute electricity to approximately 5 million people at 2.4 million domestic and industrial locations consuming 23.5 terawatt hours of electricity annually

£12.3bn of network assets
- 57,500km of cable
- 15 grid supply points
- 96 bulk supply substations
- 363 primary substations
- 34,000 transforming points
Innovation Funding

**Innovation Funding Incentive (DPCR5)**
- Designed to encourage R&D
- Fixed proportion of eligible expenditure recoverable - 80% pa
- Capped at 0.5% of price control turnover, approx. £2.0m for 2012/13
- Internal spending capped at 15%

**Low Carbon Networks Fund (DPCR5)**
- Tier 1 provides fund for small scale demonstration projects
- Tier 2 is central fund for small no. of significant ‘flagship’ projects
- DNOs expected to fund 10% of Tiers 1 & 2 projects (refundable in Tier 2 subject to timely delivery)

**Network Innovation Allowance and Network Innovation Competition (RIIO-ED1)**
- New arrangements for RIIO-ED1, starting 2015
- NIA to replace IFI & LCN Fund T1 – 0.8% of turnover, based on innovation strategy
- NIC to replace LCN Fund T2 – value to be set
Our innovation strategy

Maximise use of existing assets

Delivering value to customers

Offer new services and choice for the future

Innovative solutions to real problems

Generate value for customers now

Proven technology deployable today

Generate value for customers now
Innovation strategy targets greater utilisation of existing assets to minimise the adoption costs of decarbonisation technologies

- C2C is designed to release significant EHV and HV network capacity by utilising ‘security of supply’ capacity in conjunction with post-fault DSR

- CLASS harnesses the aggregated demand side response generated by low cost retrofit voltage controllers and delivers a variety of operational benefits

- Smart Street (eta) aims to maximise the capacity of existing networks, minimise losses and reduce energy consumption by managing network voltage and controlling networks in meshed configuration

- 2014/15 proposed project aims to minimise fault level reinforcement arising from demand growth and DG using radical low cost approaches
UK energy challenges

- **2014 position** 1/3rd electricity, 1/3rd gas, 1/3rd oil

- **2020** 34% reduction in CO₂
  - 40% from wind / PV & new nuclear
  - 5% transport 120,000 EV / hybrid
  - 26M smart meters fitted

- **2050** 80% reduction in CO₂
  - Doubling in electricity demand

- **RIIO-ED1**
  - Traditional reinforcement unaffordable
  - DG represents the most immediate challenge

- Challenge to identify ‘smart’ ways of meeting customers’ future needs:
  - **£30 million** RD&D investment programme
  - ~ 60 ongoing projects
  - New equipment and technologies for step change in customer service
### The scale of the challenge

<table>
<thead>
<tr>
<th>Domestic demand profile 2014</th>
<th>Domestic demand profile 2025 - 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Graph showing domestic demand profile 2014" /></td>
<td><img src="image2" alt="Graph showing domestic demand profile 2025-2030" /></td>
</tr>
</tbody>
</table>

### Customer characteristics

- 2.2 million customers live in gas centrally heated home
- Network designed and operated with ADMD per property of 1.2kVA

### Network impact

- Customers’ new low carbon technologies (LCT) create new network demands
- Networks have limited ability to accommodate customers’ LCTs
- Network intervention always required
Questions & Answers
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An introduction to Smart Street

Cara Blockley
Low Carbon Projects Manager
Agenda

- Overview of Smart Street concept and objectives
- Workstreams and outputs
- Project delivery timeline
- Close
Flash video
Smart Street

Efficiency

Network

Customer appliances

Allows networks and appliances to work in harmony delivering efficiency across the energy supply chain

Low carbon ● Lower bills ● Faster LCT adoption ● Less disruption
Voltage regulation

Historic networks have no active voltage regulation
Problem - LCTs create network issues

LCTs rapidly surpass voltage and thermal network capacity
Smart Street

- Voltage stabilised across the load range
- Power flows optimised
- Low cost
- Quick fit
- Minimal disruption
- Low carbon
- Low loss
- Invisible to customers

Voltage stabilised across the load range • Power flows optimised
Now we can stabilise voltage, which level should we choose?

Conservation Voltage Reduction

By operating towards the lower end of the range we can make customers’ appliances more efficient at no additional cost. Many appliances operate more efficiently; none use more energy. CVR is being trialled in a number of countries. First application on UK network configuration.

How much could customers save?

<table>
<thead>
<tr>
<th></th>
<th>House</th>
<th>GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforcement savings via DUoS</td>
<td>£330 over 25 years</td>
<td>£8.6b over 25 years</td>
</tr>
<tr>
<td>Reduced energy consumption, 2013 (from CVR ≈ 3 - 7%)</td>
<td>£15 - £30 pa</td>
<td>£390 - £780m pa</td>
</tr>
<tr>
<td>Maximise DG output (from maximising Feed In Tariff income)</td>
<td>£70 pa</td>
<td>£20m pa</td>
</tr>
</tbody>
</table>

Efficient network solutions ● Energy savings ● Carbon benefits
Smart Street summary

- Combine into one end-to-end system
- Optimisation

• First example of CVR
• First example of centrally controlled LV network
• Range of intervention solutions

• Faster LCT adoption
• Less embedded carbon
• Re-usable technology
• Optimise energy and losses

• Lower energy bills
• More reliable supply
• Reinforcement savings
Questions & Answers
Smart Street Hypotheses

**Hypotheses**

*Smart Street* will test the following hypotheses *(in the identified Workstreams)*:

1. The Smart Street Method will deliver a reduction in customers’ energy consumption *(Research Workstream)*

2. Customers within the Smart Street Trial area will not perceive any changes in their electricity supply *(Customer Workstream)*

3. The Smart Street Method will have no adverse effects on customers’ internal installation or appliances *(Research Workstream)*

4. The Smart Street Method is faster to apply than traditional reinforcement, supports accelerated LCT connection and reduces network reinforcement costs *(Research Workstream)*

5. The Smart Street Method facilitates the prioritisation of the range of solutions across differing LCT adoption scenarios based on a cost benefit analysis to accommodate customers’ uptake of LCTs *(Research Workstream)*

6. The Smart Street Method will deliver a reduction in overall losses through network configuration and voltage optimisation *(Research Workstream)*

7. The Smart Street Method facilitates real time control of a portfolio of LV network solutions, using retrofit technologies with application combined or in isolation *(Technology Workstream)*
Smart Street timeline

2014
Mobilise
Technology Build
Design Trials
Customer engagement
Learning and Dissemination activities

2015

2016
Live Trials (ON/ OFF)
Research
Customer engagement
Learning and Dissemination activities

2017
Close
### Project deliverables by workstream

<table>
<thead>
<tr>
<th>Technology</th>
<th>Trials</th>
<th>Customer</th>
<th>Research</th>
<th>Learning &amp; Dissemination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Street network design applied to trial networks</td>
<td>Test regime implemented to trial Smart Street combinations</td>
<td>Customer approved engagement and awareness materials</td>
<td>LV network design and operating standard</td>
<td>Smart Street website as repository for all deliverables</td>
</tr>
<tr>
<td>Specification, installation and application methodologies</td>
<td>Consumption data at substation for CVR benefit</td>
<td>Customer surveys deliver proof of no perceived change</td>
<td>Optimisation implementation and control operating regimes</td>
<td>Share knowledge to internal and external stakeholders through webinars, social media, events etc</td>
</tr>
<tr>
<td>Portfolio of network solutions and safe systems of work</td>
<td>Losses reduction data</td>
<td></td>
<td>Smart Street cost benefit analysis and carbon impact assessment</td>
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Questions & Answers