Residential demand response – the dynamic Time-of-Use tariff

Session 2
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Agenda

• Before Low Carbon London
• LCL: dynamic Time of Use trial
• Results from the trials
• Survey results from participants
• Engaging with customers
• What does this mean for DNOs?
Before Low Carbon London

- Network management
  - Economy 7 with remote teleswitching (time based / static)
Residential Demand Side Response

Multiple Purposes

Customer relationship owned by suppliers

Willing pool of residential customers able to offer flexibility

Monday morning peak

DSR Service

DNOs: network constraints

Specific times

GBSO: reserve

High wind output

Suppliers: wholesale balancing
Low Carbon London trials
Objective: Emulate 2020 end–to–end energy supply

- Smart meter roll out
- Billing
- Balancing

DCC
- Data service provider
- Communications

Suppliers

Network operators
- Manage constraints on the network
- Manage smart meter data
- Topology association
Economy Alert
Tariff design and schedule

• Three price bands:

• Two applications tested:
  – Constraint Management and
  – Wind Twinning (Supply Following)

Notification
• Day-ahead
• 8.30am

Delivery
• In Home Display
• SMS Mobile phone
Schedules

Event Name

H12_11
L3_05
L3_08
P1_2D

Settlement Block

Source: LCL Report A3*

The Trials
Smart meters and dynamic tariffs

- Statistically robust results: control group of c. 4,500 households
- First appliance survey of this magnitude: survey data from 2,830 households
Dynamic Time of Use Tariffs

Results of the trials

- Aggregate response in high price and low price.
- Most highly ‘engaged’ customers respond independently of the measured response.

Source: LCL Report A3*

Low Carbon London dToU: Response observed

Demand response by time of day

Population = 922

Source: LCL Report A3*

Low Carbon London
Smart meters and dynamic tariffs

• ToU survey: 708 responses
• Post-trial survey: 418 responses
• Insight to customer perception: 37 semi-structured in-depth interviews
Low Carbon London survey: Most flexible appliances

- Most customers agree that wet appliances are the most flexible appliances for both high and low price bands

Source: LCL Report A2°

Impact on the electricity bill

<table>
<thead>
<tr>
<th>Actual savings (n = 922)</th>
<th>Min – Max</th>
<th>Mean</th>
<th>Median</th>
<th>% saving (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compared to Standard variable flat tariff</td>
<td>£40.21 loss £147.70 saving</td>
<td>£21</td>
<td>£16</td>
<td>4.31%</td>
</tr>
</tbody>
</table>

Source: LCL Report A3*

Preference to remain on Economy Alert tariff

Source: LCL Report A2

Potential for wide-scale application

If it encourages more efficient use of electricity and resources multi-rate tariffs like Economy Alert should be offered to everyone.

If it is a fairer way of charging people for the real cost of electricity at different times multi-rate tariffs like Economy Alert should be the standard tariff for everyone.

Source: LCL Report A2*

Dynamic Time of Use Tariffs
Low Carbon London Results

• 71% of survey responders felt they had a greater sense of control

• 91% of survey responders agree that dTOU should be offered to everyone

• 79% of survey responders reported that Economy Alert was not complex to use on a day-to-day basis

• 77% of survey responders agree that dToU helps households in planning and organizing and 80% consider it motivates them to get chores done
Engaging with customers

Survey | Recruitment Letter | Welcome Pack | Incentive | Go Live | Event Messages | Monthly Feedback | End of Trial

Low carbon LONDON
Energising change

Control how much you save with Economy Alert

Who's in control of how much you save?

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Monthly feedback to customers

Source: LCL Report A2*

Customer feedback
Recommendations for new tariffs

- Provide a clear rationale and reasons for rate changes. Clearly link supply-following tariff to real-world conditions of renewable generation
- Consider carefully the effect of price points on savings and feedback
- Better savings should lead to more positive, more motivated customers
- Assess the impact this feedback has on motivation and engagement
- Improvements to the In Home Display
- Feedback available online and via smart phones.
- Include advice on load-shifting and reduction
What does this mean for DNOs?

- **Constraint management response:**
  - Average reduction – 50W/household
  - Most engaged – 150W/household

- **Supply following response**

Mean change in consumption in response to Constraint Management events.

Mean DSR over all Supply-following events. Bars from lighter to darker shading represent the average for subgroups of the most engaged 25%, 50%, 75% and 100% of responders.

Source: LCL Report A3*

Other results

- Smart appliances and enhancing response in general could unlock the current unresponsive night time period
- Low price events may induce peaks in demand that are greater and happen at different times than the currently observed peaks

Supply Following event response by time-of-day

Source: LCL Report A3*

Time of Use Tariffs

Static time of use tariffs can present network benefits

Source: LCL Report A1
Dynamic Time of Use Tariffs

How can DNOs deploy such a tariff?

• To evaluate the deployment of tariffs specifically by DNOs we have looked at two scenarios:

  – **Voluntary**
    • Based on uptake from LCL trial
    • A specific £/customer to deploy and recruit customers

  – **Mandatory**
    • Where all suppliers pass through a dToU price signal through DUoS charges
    • We assume 100% response from all customers
Dynamic Time of Use Tariffs
Whiston Road Case Study

• Whiston Road case study: 19,500 domestic customers

<table>
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<tr>
<th></th>
<th>Voluntary</th>
<th>Mandatory</th>
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</thead>
<tbody>
<tr>
<td><strong>Uptake</strong></td>
<td>24%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Deferral of reinforcement</strong></td>
<td>No deferral</td>
<td>1 year</td>
</tr>
</tbody>
</table>

• In this specific case study, up to £25 contribution to costs could be funded by network benefits
Dynamic Time of Use Tariffs
Extrapolative Analysis

£2.13m of benefits could be available to the DNO through deferring reinforcement. However, this does not take into account recruitment costs.

Increasing ToU response availability as domestic load increases allows for greater deferral and value for the DNO.

Source: LCL Report A1
Network benefits
When would a dToU tariff work for a DNO?

For network benefits to be realised by GB DNOs as dToU tariffs are rolled out, the value through the whole industry supply chain needs to be maximised.

Key elements to determine how effective dToU would be are:

- Uptake of the tariff (closer to 100%)
- Responsiveness as per ‘more engaged’
- In-home automation leads to higher levels of response
- Other stakeholders are also able to apply dToU price signals
- Suppliers already have dToU-ready billing systems in place
Maximising benefits of residential demand side response

- 50kW response
- 200kW response

Cost £/household

LCL dToU

Lessons learned from first implementation

Automation / Smart appliances

Awareness

Proportion of customers involved
Maximising benefits of dToU: A coordinated industry approach

Customer relationship owned by suppliers

Willing pool of residential customers able to offer flexibility

DSR Service

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Monday morning peak

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DSR Service

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DSR Service
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

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