UK Power Networks
Low Carbon London Time of Use Trial
Learning Event
Welcome

Low Carbon London Time of Use Trial:
Learning from our trial recruitment and initial findings

Monday 15 April 2013

Introduction to Martin Wilcox
Safety Message

15th – 21st April: Avoid Being a Statistic

Peak times for crashes are in the early hours and after lunch. Crashes are most likely to happen on long journeys on monotonous roads, such as motorways, after having less sleep than usual.

Avoid becoming a statistic by:
• Cancelling a long trip if you’re tired
• Remembering the risks if you have to start a long drive unusually early
• Trying to avoid long trips between midnight and 6am when you’re likely to feel sleepy anyway
• Taking public transport or share the driving.

Housekeeping
Low Carbon London

Introduction, refresher and progress to date

Michael Clark
### Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Who</th>
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<tbody>
<tr>
<td>9:35</td>
<td>Low Carbon – introduction, refresher and progress to date</td>
<td>UKPN</td>
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<tr>
<td>9:50</td>
<td>Residential Smart Meters and Time of Use (ToU) – what it means to the Distribution Network Operator</td>
<td>UKPN</td>
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<td>10:10</td>
<td>Smart Meter Roll Out – the journey to 6000 installs</td>
<td>EDF Energy</td>
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<td>10:30</td>
<td>Break</td>
<td>All</td>
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<td>10:45</td>
<td>The ToU Customer Journey</td>
<td>EDF Energy</td>
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<td>11:05</td>
<td>Dynamic Time-of-Use tariff trial</td>
<td>Imperial College London</td>
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<td>11:30</td>
<td>Next steps – what the trials will look like</td>
<td>UKPN</td>
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<td>11:45</td>
<td>Closing remarks (including Q&amp;A session)</td>
<td>UKPN</td>
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<td>12:00</td>
<td>Lunch</td>
<td>All</td>
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UK Power Networks
Context

Radical shift in UK energy policy:

- 35% electricity from renewable sources by 2020
- Electricity generation decarbonised by 2030
- 80% reduction in carbon emissions by 2050

Potential impact on our network (if we do nothing):

- Higher peak demands
- Thermal and voltage constraints
- Higher fault levels
- Less predictable load cycles
- Higher losses
- Potential of a doubling of demand by 2050 without ‘smart’ intervention
- Costly and disruptive capital investment
Low Carbon London – A Learning Journey

Learning how to create a smart low carbon city

A pioneering demonstration project, trialling new low carbon technologies, commercial innovation and design, operation and network management strategies...

• Smart Meters
• Residential ToU - Smart Appliances, Demand Flexibility
• Demand Response, Industrial & Commercial (I&C)
• Distributed Generation
• Electric Vehicles
• Heat Pumps
• Wind Twinning
• New Tools, Operational and Investment Practices
• Learning Lab
Why London?

London has:

- The highest carbon footprint of all GB cities…
- Ambitious sustainability targets and carbon challenges
- Highly utilised network
- Decentralised energy targets (25% by 2025)
- Most advanced plans for electric vehicles and charging infrastructure

... London’s characteristics are common to all major towns and cities
London’s target for decentralised energy: 25% by 2025

<table>
<thead>
<tr>
<th>Source: The London Plan</th>
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<td>© 2011. UK Power Networks. All rights reserved</td>
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<table>
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<tr>
<th></th>
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<th>2020</th>
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<tr>
<td></td>
<td>Total Installed Capacity (MW)</td>
<td>Total Output (MWh)</td>
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<tr>
<td>Offshore Wind Farms</td>
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<td>-</td>
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<td>On-Shore Wind Farms</td>
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<tr>
<td>Single Large Wind Turbines</td>
<td>6</td>
<td>15</td>
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<td>Small Stand-Alone Wind Turbines</td>
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<td>Building Mounted Micro-Wind Turbines</td>
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<td>Biomass Fuelled CHP / Electricity</td>
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<td>Hydro Power</td>
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<td>Solar PV (domestic) (MWp)</td>
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<td>Solar PV (commercial) (MWp)</td>
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<td>Tidal Energy</td>
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<td>Wave Energy</td>
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<td>Anaerobic Digestion^</td>
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<td>Sewage Gas®</td>
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<tr>
<td>Gasification / Pyrolysis</td>
<td>1</td>
<td>6.8^</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>9,321</strong></td>
<td><strong>99</strong></td>
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Low Carbon London In Summary

• Future urban electricity network
• Aligns with stakeholders’ objectives to cut CO₂ emissions
• Control demand and generation
• Integrates technological and commercial innovation
• Engage with customers and communities
• Knowledge sharing
Thank you
Low Carbon London Residential Time of Use
What it means for the Distributed Network Operator
Andrew Alabraba
The future network

- High levels of intermittent generation on network including 34 GW of wind
- Lifestyle changes
- Increase in electrical devices in the household

2 kVA → ???

- Variable energy tariffs
The potential impact

24 hr Demand Profile (weekday)

- Residential
- Commercial

Energy

Time

morning     mid-day     evening
The potential impact

- Increase in electrical appliances
- Electric vehicle home charging
The potential impact

- Roll out of smart meters
- Being able to see what the energy you are using
- Energy education
The potential impact

- ToU tariffs
- Smart appliances
- Home management systems
The potential impact

Residential demand profile of the future
Potential benefits

- By 2019 most households will have smart meters installed
- Being able to see how much energy you are using in real time – leading to a reduction in energy consumption
- Improving network visibility and predictability
- Communication channels
- A device to support smart grid functionalities
- Potential for more advanced energy tariffs
  - Network constraint orientated (residential demand response)
  - Use of generation when available

......but will the DNO have access to smart meters?
Trial objectives

• To use smart meter data to build accurate profiles of residential customer demand on our network
• To understand how smart meters can support our network
• To design a tariff that could potentially be implemented by Suppliers in the future
• To understand how generation-following tariffs will impact the distribution network
• To understand to what extent residential consumers can change their consumption behaviour
• To understand how much flexible demand is in the home
• To determine whether time of use tariffs can be used as a viable tool to manage network constraints
Thank you
welcome
The Smart Meter Rollout

Low Carbon London
EDF Energy's commitment…

**Aims & Objectives**
- Recruit and install 5000 smart meters for EDF ENERGY customers within the London region.
- Offer an In-home Display, accurate billing, energy efficiency advice as part of the ‘Smart’ proposition
- Offer customers a Time of Use tariff
- Ensure the customer receives a positive experience throughout recruitment, installation and post-install

**Rollout Location**
- Pilot - situated around DNO substations (Low Carbon Zones)
- Phase 1 – customers across the London Network Area
- Phase 2 – remaining customers in the London Network Area not contacted to fill under target ACORN groups

<table>
<thead>
<tr>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
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<tr>
<td>Business Case</td>
<td>Meter Procurement</td>
<td>Smart Meter Delivery</td>
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Customer Journey

1. Direct mail sent to all LCL customers to inform of the trial

2. Inbound / Outbound calls to recruit customers

3. Customers recruited onto trial receive welcome pack and appointment letter

4. SMS Reminder and where applicable an hour before call provided to Customer

5. Smart Electricity Meter and IHD is fitted in customer premise

6. Field engineer provides a demonstration of IHD and explanation of Smart Meter

7. Customer receives Smart Services incl.
   - Accurate Bills
   - Energy Efficiency Messages
Summary of Post-installation Survey Findings

The majority of trialists were happy with the recruitment process although some felt more information could have been provided.

Welcome Pack was received and found useful by most but a significant minority either didn’t receive it or didn’t engage with it.

The installation experience was generally considered positive and majority felt well informed and happy with the amount of comms.

The demonstration was generally well understood but did not always include information regarding potential savings.
Customer Refusal Reasons

The graph below depicts the range of refusal reasons at the appointment booking stage for not wanting to join the LCL trial:

- Not Interested: 72%
- Do not have time to talk: 7%
- Needs Landlord Consent: 5%
- Too Much Hassle: 4%
- Change of Tenancy (moving house): 4%
- Change of Supplier: 2%
- Anti Smart Meters: 2%
- Mistrust, Health or Data Privacy Concerns: 2%
- Too technical and potentially confusing: 1%
- Needs Partners Consent: 1%
Key Lessons Learned

Low Carbon London has been key for EDF ENERGY to learn invaluable lessons thus aiding the future deployment of smart meters to its customers as highlighted below:

**Recruitment**

- **Email Campaign**
  - Most successful medium for contact, received an inbound contact rate of 80% (based on sending circa 17k emails leading to 717 installs)

- **Local Engagement**
  - Greater uptake of appointments from areas within London where community engagement took place

- **Appointment Reminders**
  - Sending a text 24 hours prior to install improved access and success rates

- **Appointment Re-schedules**
  - Early stages customers didn't have calling cards
  - DNO aborts no feedback loop to inform of work completion

**Installation**

- **Signal Strength**
  - Operative having to carry 3 x SMS with different SIM cards due to varying signal strengths

- **Customer Changed Mind**
  - 10-12% average abort rate

- **No Access**
  - Decreased with CSAs offering more ‘Green’ appointments, where customer receives an hour before call

- **No Access to Intake**
  - Require further interaction with building network operators/landlord to ensure communal intakes were accessible
Behind the scenes

Refund Calculator
Monthly Feedback
Text Messaging
IHD Messaging
Incentive
Data Capture Tool
Quote Tool
Appliance Survey
Intervention Schedule
Proposition
Product: Economy Alert

Control how much you save with Economy Alert
Customer Journey
Customer Insights and Feedback

1. **Example Declines:**
   - “Too confusing”
   - “We haven’t got a dishwasher or tumble drier”
   - “Too complicated”
   - “Not prepared to fill out the questionnaire”
   - “No thanks – I’ve cut my bills in half since getting a smart meter and I’m happy with that”
   - “It’s hard to understand things which are complex”

   • **Trial Feedback:**
     - “A high evening tariff is the most difficult to adjust your lifestyle to”
     - “We have started listening to the radio during tariff highs, instead of watching the television”
     - “Three long consecutive low tariffs are difficult to take advantage of. All the washing has been washed”
     - “Our eating pattern has changed according to the tariff. If the electricity tariff is high – we only use the gas hob. If low, then the oven or microwave will be used. Also the time of our main daily meal can also change according to the tariff.”

   • **Withdrawals:** A small number of customers have withdrawn from the trial:
     - “Too complicated”
     - “Doesn’t fit with our lifestyle”
     - “Tariff too random”
     - “Decided to go back to Blue Fix 2013 and cancel Economy Alert”
thank you
Low carbon London
Dynamic Time-of-Use tariff trial

Dr. Mark Bilton (with thanks to Dr. Richard Carmichael and James Schofield) mark.bilton@imperial.ac.uk
Aims of trial

1. To understand consumer **attitudes** towards and **engagement** with a dynamic Time of Use (ToU) tariff.

2. To understand **flexibility** of consumption:
   - How much? When? Who?
   - Drivers and barriers?
Why run a Time of Use tariff trial

- North American trials: Consumers do respond to ToU (e.g., Sergici & Faruqui 2011).
- UK ToU trials: Static tariffs
- Need trials for UK context
  - Knowledge gaps.
  - Different demand (not air conditioners and heat-waves).
  - Different attitudes – to suppliers, tariffs, climate, changing habits, press, etc.
  - Controversies need empirical approach.
UK residential context

Figure 289 Relative contribution from the different loads – All days – All households - Without electric heating

Household Electricity Survey (EST, DEFRA, 2012)
Context

- First dynamic residential tariff in UK.
- Bold design (thank you EDF).
- Holistic design
  - Price events sweep all seasons and days of week
  - Messaging of events by In Home Display (IHD) and text messages.
- Feedback (crucial to embedding behaviour).
- Survey (demography, home and appliances).
Trial design & construction

- Revenue-neutral if no change in behaviour.
- Simulated supply balancing and network events.
- Across time of day, days of week and seasons.
- Limited to 3 events per week.
- Price points currently: 3.99p, 11.76p and 67.2p.
- Types of price events (M-H-M/M-L-M/…).
- To run for the whole of 2013.
- Control group (matched for demographics).
Messaging

- Notice period – 8.30am day before.
Implications of messaging

- Consumer choices
  - Shift in-day (backwards or forwards).
  - Shift inter-day (backwards or forwards).
  - Reduce load.
  - Increase load.
Illustration of price signals and demand response

(thank you Andrew Crossley and Toby Read, UKPN)
Importance of feedback

• Empirical work has largely focussed on feedback to reduce energy consumption but some ToU related studies.

• ‘The orb flashes during the two hours before a ‘critical peak’ with high unit costs, and users who tried it out tended to reduce consumption well in advance of the peak and to continue with the reduction for some time afterwards. As a consequence, there was some overall saving as well as load-shifting’.  

  (Martinez and Geltz 2005)

• ‘When that red light is on we know we are exporting to the grid – so it’s time to put the washing machine on or it’s OK to boil the kettle. When that light is not on we make sure that everything is off – nothing is on standby because we know that it’s probably really costing us.’ Older couple, SW Lancashire with wind Turbine.

  (SDC 2006)
Importance of feedback

• We can’t test all approaches to feedback in one trial.

• Wood and Newborough tested a range of methods to inform UK consumers in terms of their use of cookers, with accompanying antecedent advice. Combinations of information sources and feedback proved most effective, with up to a 39% energy reduction.

  (Wood and Newborough 2003)

• By representing household energy use in comparison with other local households, demand was reduced in high use households, indicating an indirect form of social influence.

  (Wilthite, Hoivik et al. 1999)
Monthly feedback

- Both ToU and control groups get (a) – kWh and cost.
- ToU trialists also get (b) – breakdown by tariff rate.
- ToU feedback show impact of price differentials on bill.
Household survey

- Mailed to customers in Q3 2012.
- 2868 responses so far.
- Why is this important?
  - Current publicly available statistics on appliance ownership are poor and/or out of date.
  - Need a household 2013 baseline.
  - What are the determinants of demand?
  - What are the determinants of flexibility?
  - Plus some attitudinal questions.
Household survey

- Sections:
  - Household info
  - Property info
  - Lighting & appliances
  - Use of in-home display,
    e.g., Where do you usually keep your smart meter in-home display unit?
  - Attitudes to low carbon energy,
    e.g., How interested, if at all, would you be in getting your electricity from a renewable energy source?
  - Experience with bills,
    e.g., How confident or not are you that your electricity bill is accurate?
Going forward - Quantitative

- How does flexibility change?
  - Throughout the year.
  - Through the week and day.

- Are there patterns in flexibility?
  - Household types.
  - Appliance ownership.
Going forward - Qualitative

- ToU Trial Survey (June 2013)
  - Engagement with ToU trial, feedback, flexibility, etc.
- Depth Interviews with households.
  - cover a range of households.
  - repeat interviews later in trial.
  - better understanding of engagement and flexibility.
- Aim to combine quantitative and qualitative data - to increase insights and segment consumers.
Low Carbon London Residential Time of Use

Next Steps

Brian Kelly
Smart Meters and collected data

- Establishing a set of base profiles for customer demographics
- Planning for specific geographical areas
- Using demand patterns to influence assumptions such as the After Diversity Maximum Demand (ADMD) figure
- Continue to work with EDF Energy to understand how DNOs and Suppliers can prepare for the national roll out
Time of Use

• Analysing how much demand can be shifted for the use of the network if extrapolated for all of UK Power Network’s areas

• Identifying any conflicts and synergies between network constraints and energy following interventions
Reports

DNO reports

• Use of smart meter information for network planning and operation
• Network impact of energy efficiency at scale

Imperial College Reports

• Accessibility and validity of smart meter data
• Impact of energy efficient appliances on network utilisation
• Smart appliances for residential demand response
Thank you