



UK Power Networks

Low Carbon London Time of Use Trial
Learning Event



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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



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Agenda

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

UK Power Networks



Cheung Kong Infrastructure Holdings Limited
長江基建集團有限公司



**UK
Power
Networks**



GENERATION

TRANSMISSION

DISTRIBUTION

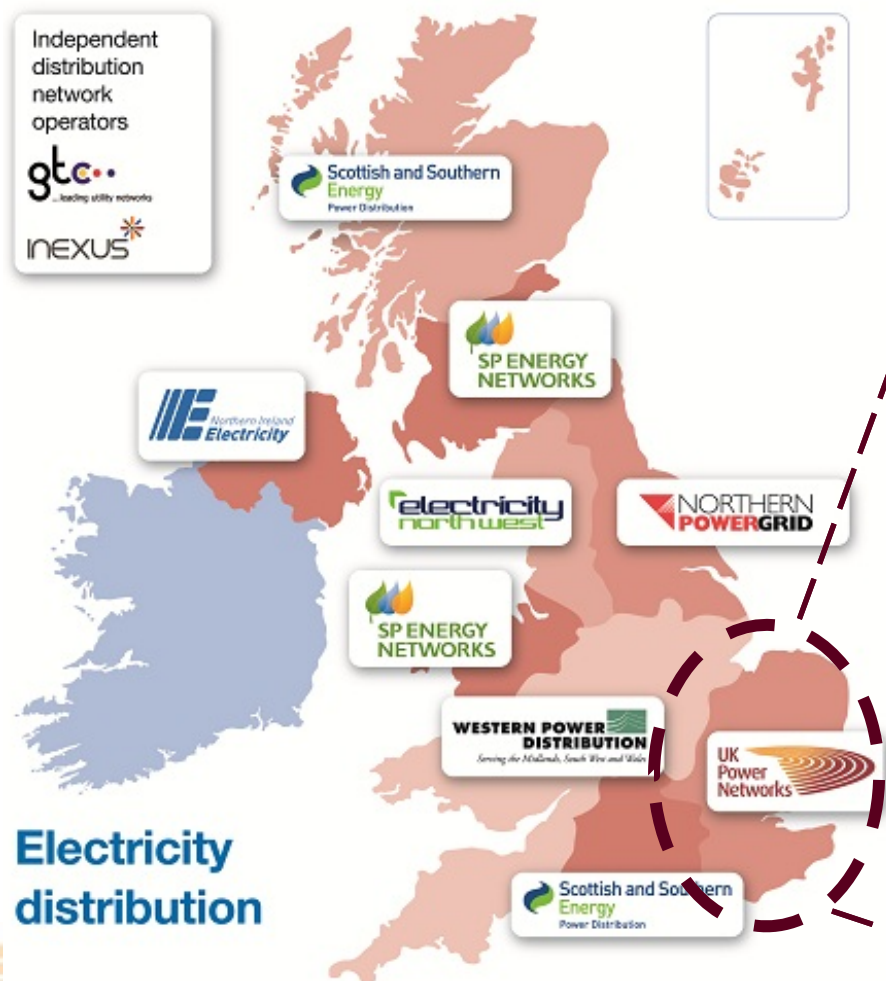
SUPPLY

INDUSTRIAL

COMMERCIAL

RESIDENTIAL

UK Power Networks



	Total	% of Industry
End Customers Millions	8.0	28%
Service Area km ²	29,165	12%
Underground Network km	134,767	29%
Overhead Network km	47,391	15%
Energy Distributed TWh	89.4	28%
Peak Demand MW	16,229	N/A
New Connections	130,768	35%

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

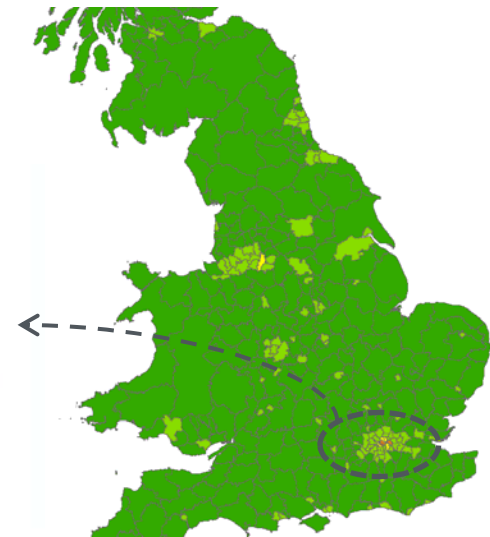
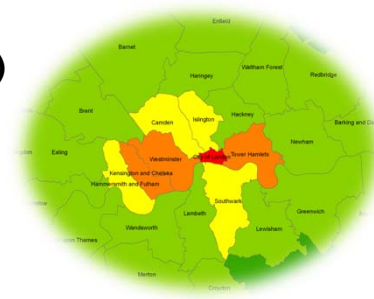
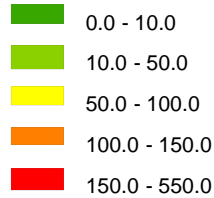


Why London?

London has:

- The highest carbon footprint of all GB cities...

Total CO₂/km² (kt CO₂/km²)



- 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

Targets for installed electricity capacity generated from renewables

	2010			2020		
	Number	Total Installed Capacity (MW)	Total Output (MWh)	Number	Total Installed Capacity (MW)	Total Output (MWh)
Offshore Wind Farms	–	–	–	–	–	–
On-Shore Wind Farms	–	–	–	–	–	–
Single Large Wind Turbines	6	15	26,280	150	45	78,840
Small Stand-Alone Wind Turbines	50	10	13,140	30	30	39,420
Building Mounted Micro-Wind Turbines	2,000	5	3,006	6,000	15	9,198
Biomass Fuelled CHP / Electricity	8	24	126,144	24	72	378,432
Hydro Power	–	–	–	–	–	–
Solar PV (domestic) (MWp)	7,000	15	10,500	21,000	45	31,500
Solar PV (commercial) (MWp)	70	12	8,400	750	36	25,200
Tidal Energy	–	–	–	–	–	–
Wave Energy	–	–	–	–	–	–
Anaerobic Digestion ^a	4	1.2	9,460	25	7.5	67,050
Sewage Gas ^a	2	10	31,124	6	30	93,372
Gasification or Pyrolysis ^b	1	6.8 ^c	42,048 ^c	11	94.6 ^c	662,957 ^c
Total	9,321	99	228,114	27,984	375.1	1,385,969



Source: The London Plan

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



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Low Carbon London Residential Time of Use

What it means for the Distributed Network Operator

Andrew Alabraba



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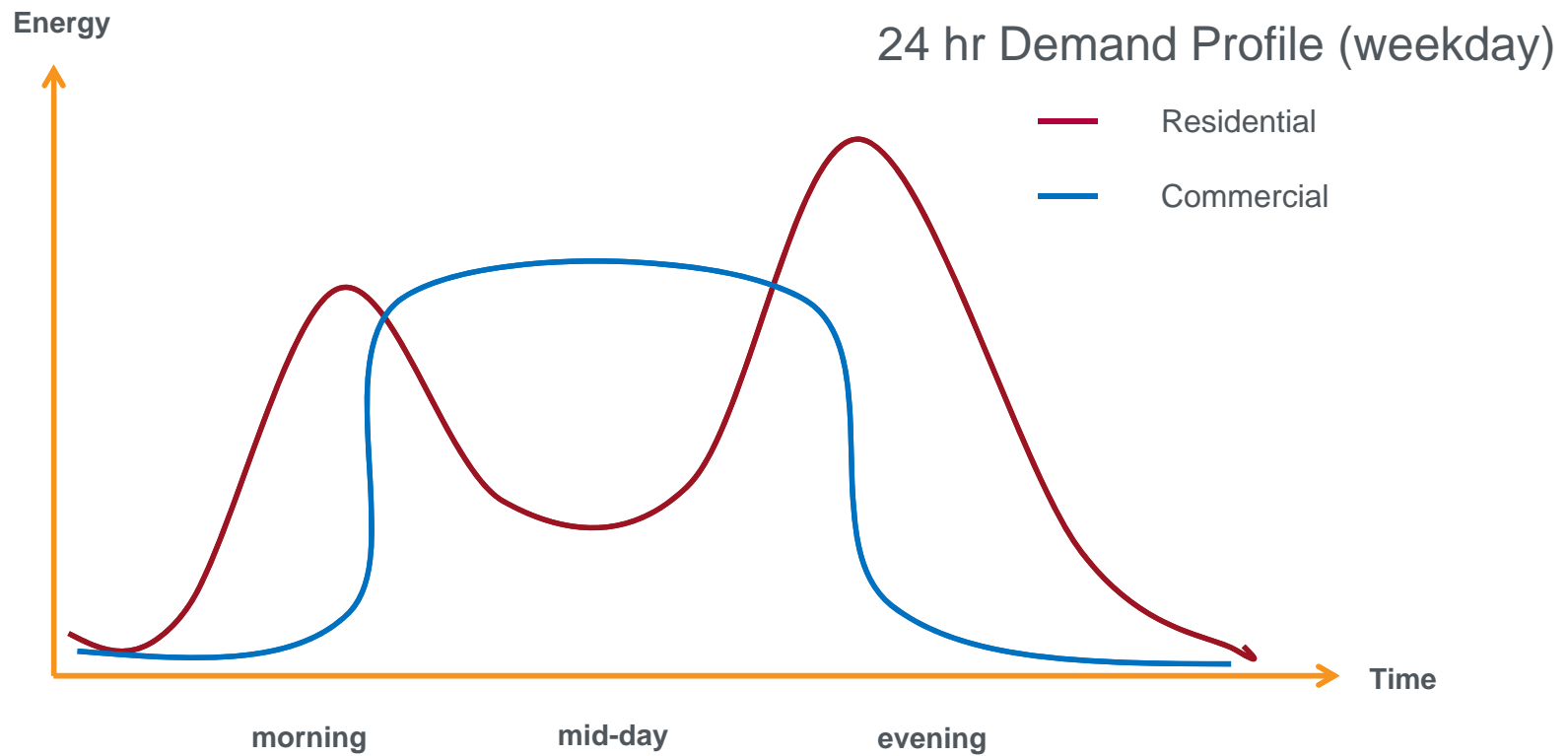
The future network

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

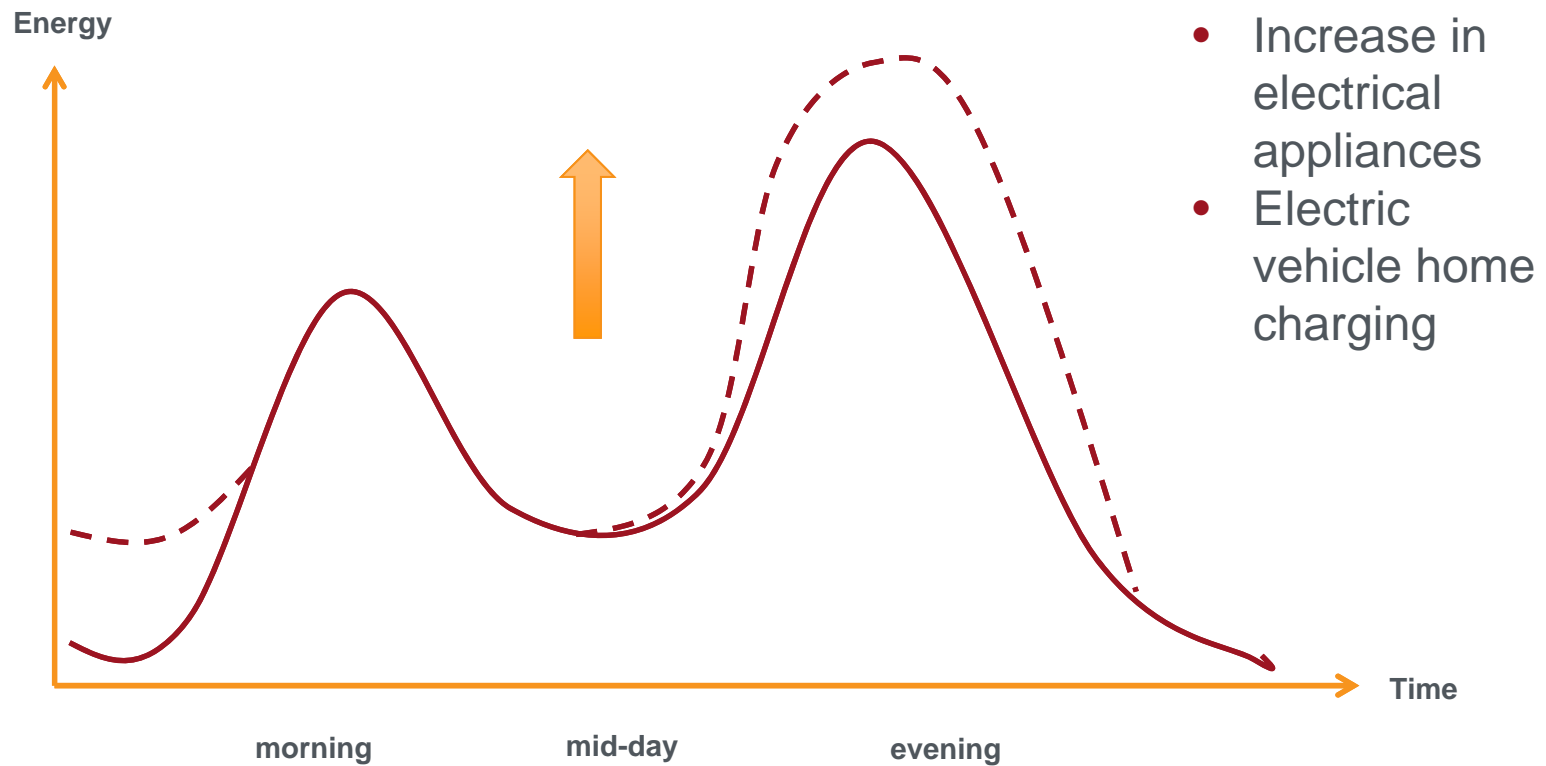
2 kVA → ???

- Variable energy tariffs

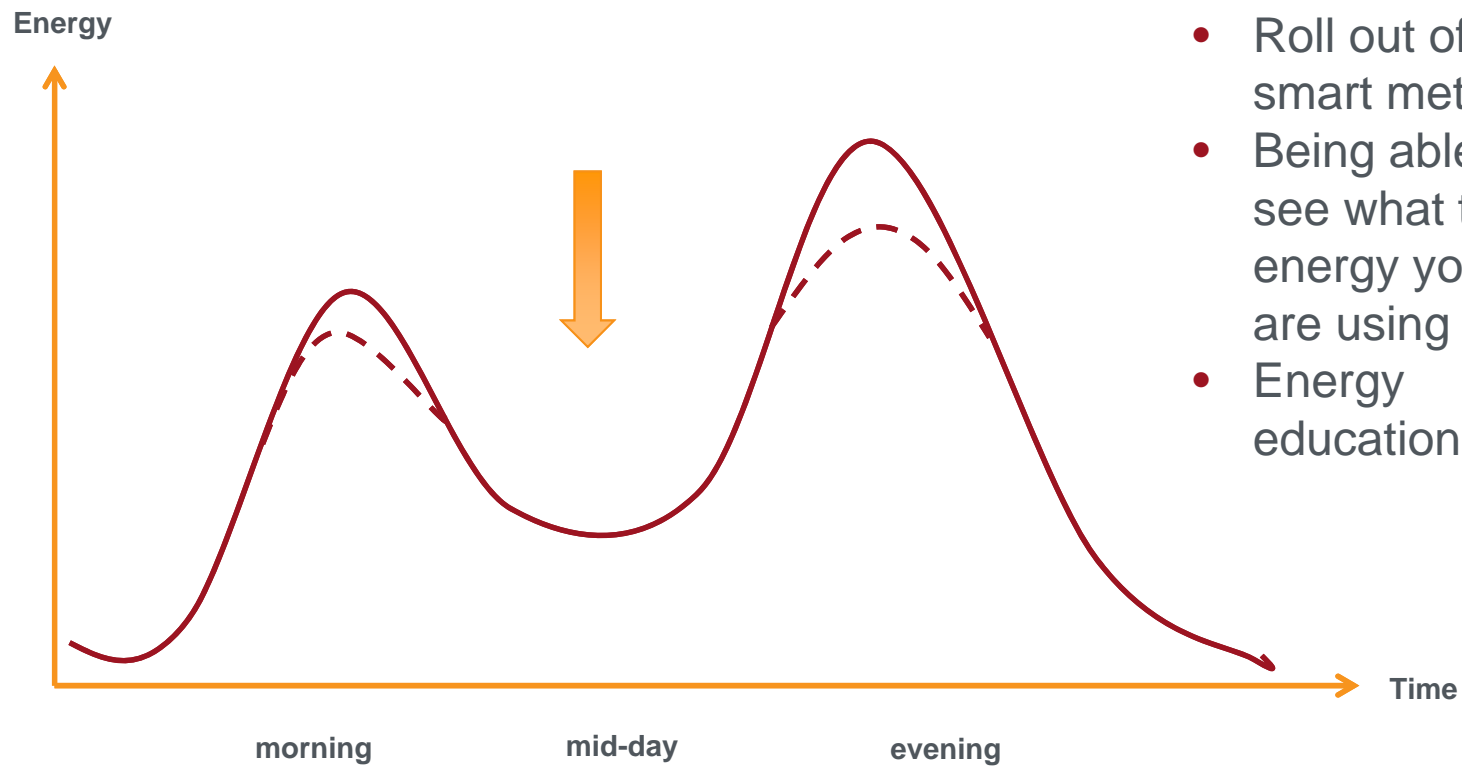
The potential impact



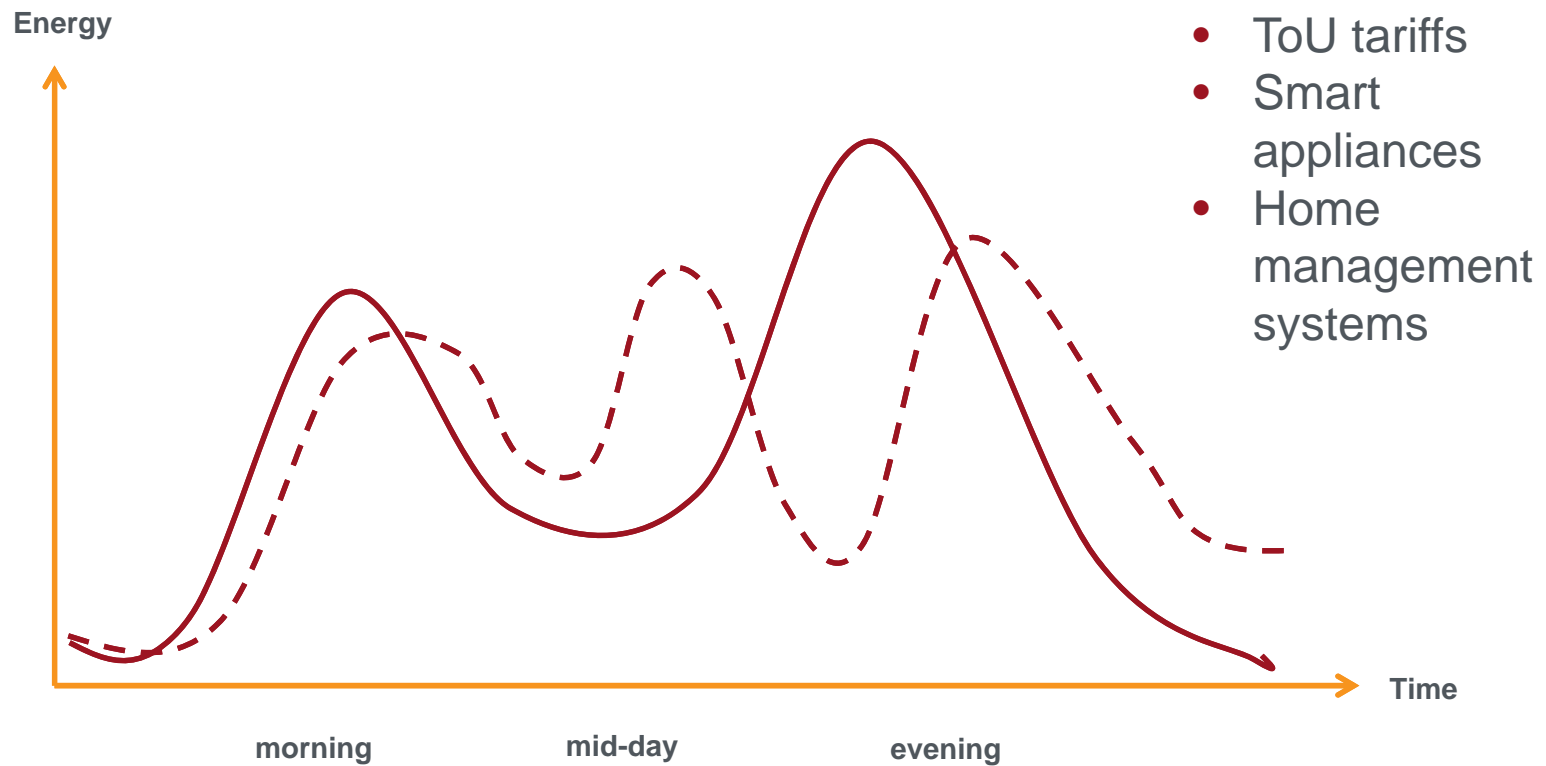
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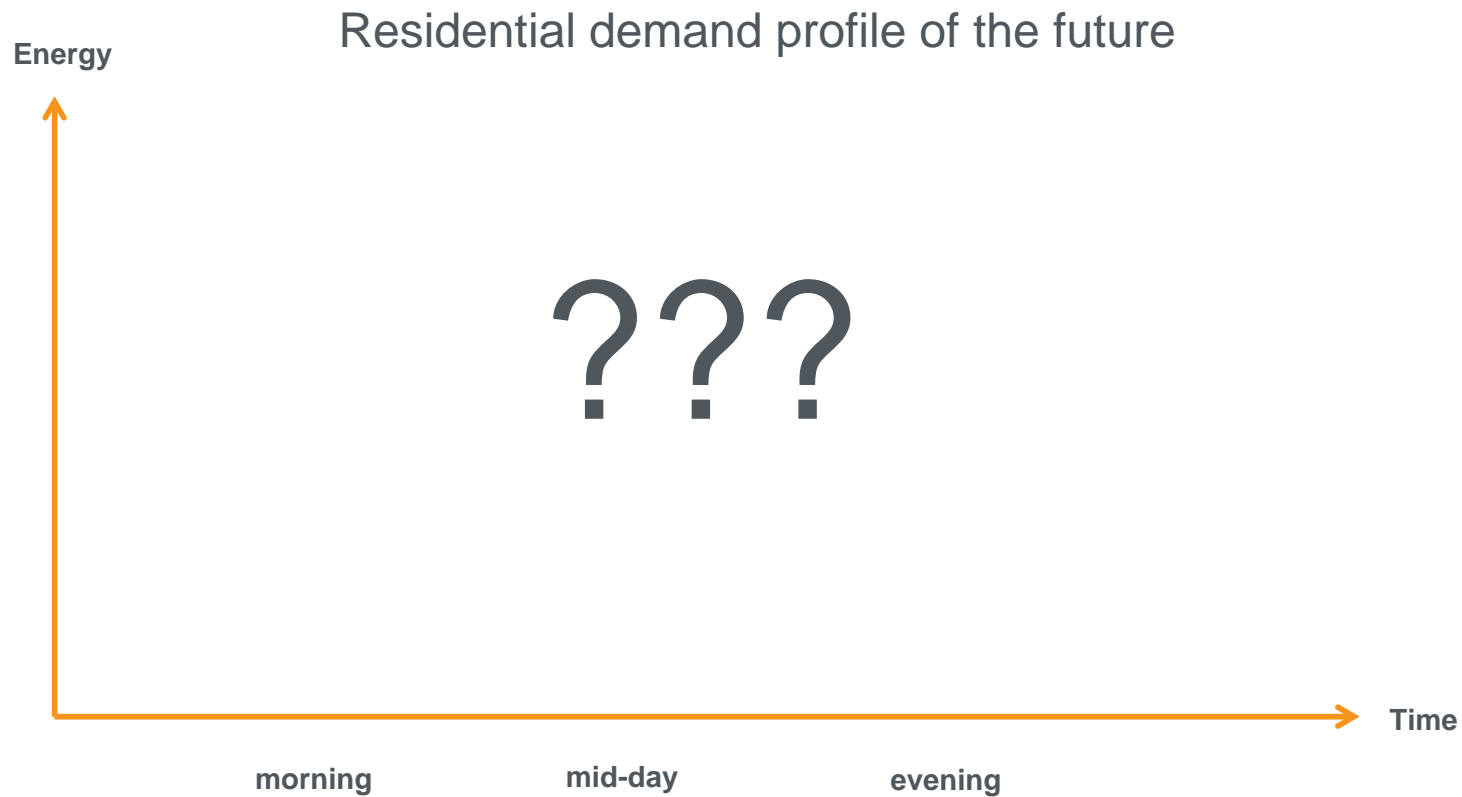
The potential impact



The potential impact



The potential impact



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



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welcome





The Smart Meter Rollout

Low Carbon London

The Smart Meter Rollout © 15 April 2013 EDF Energy plc. All rights Reserved.



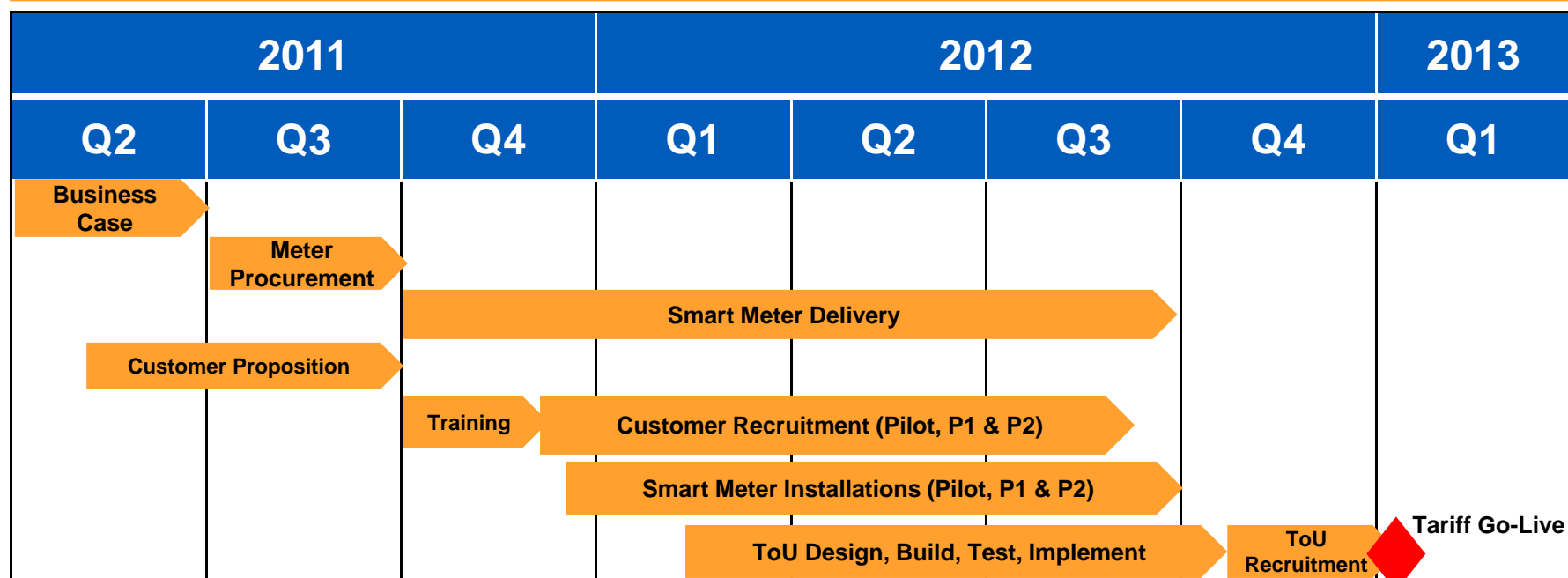
EDF Energy's commitment...

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



Customer Journey

1

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



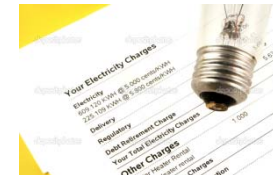
2

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

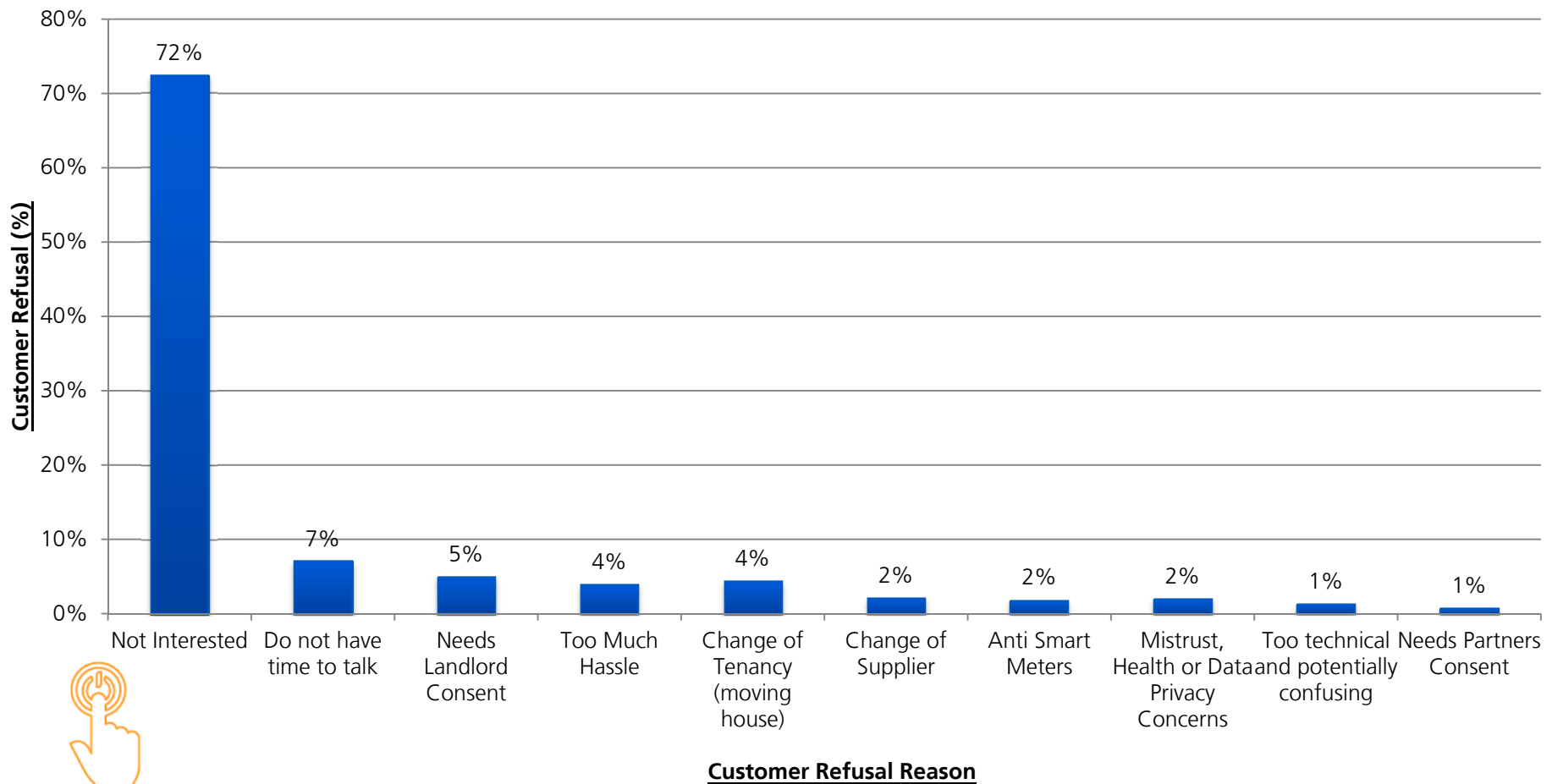


The installation experience was generally considered positive and majority felt well informed and happy with the amount of comms.

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: -



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 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

thank you

welcome

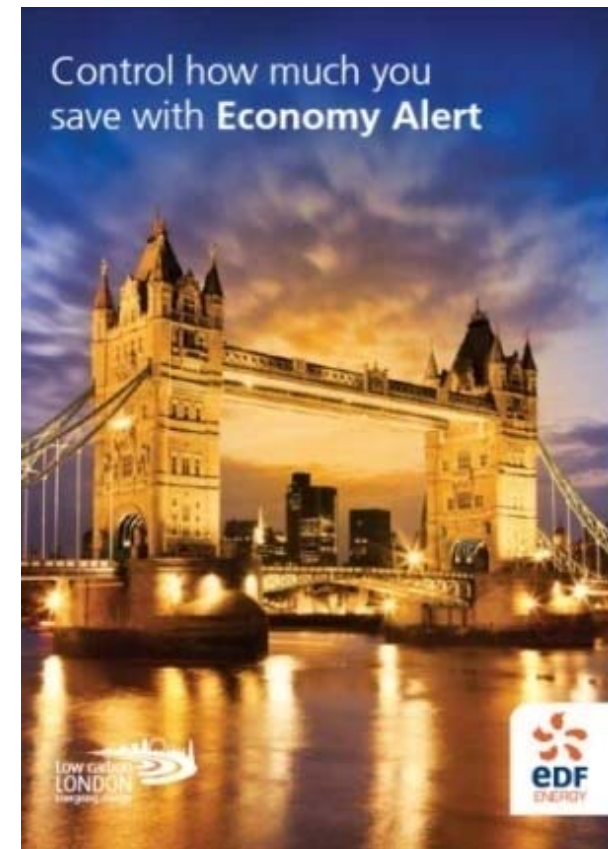
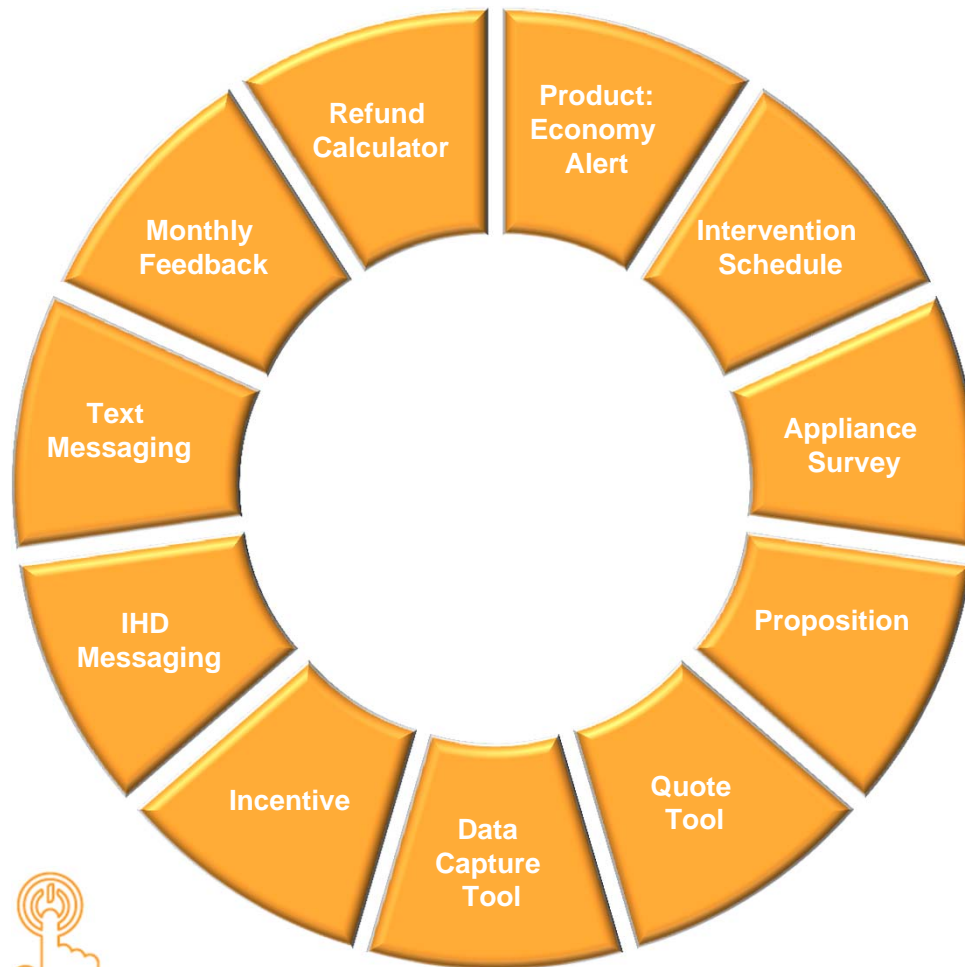


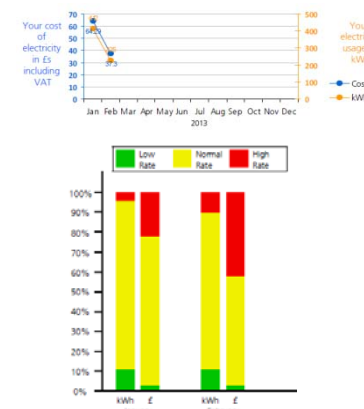


The TOU Customer Journey

Low Carbon London

Behind the scenes





Which means, you could receive up to £100, just for trying Ecoenergy Direct.

If you sign up now, and complete the appliance survey, we'll give you a £100. And if you complete the survey we'll give you another £50! The Ecoenergy Direct Survey on 1 January 2012 and ends on 31 December 2012. If you sign up to the Ecoenergy Direct tariff it will take up to 10 weeks to update your account and install smart functionality. The National grid band, which has a lower unit rate than our Standard Variable tariff will apply from 7 November 2012 and the new unit rate.

It's a good idea to act quickly as the tariff is only available to a limited number of customers and you must sign up by 15 December 2012.

Of course, you're free to leave the tariff at any time. If you decide. And we're so confident that you'll save compared to your previous tariff, we'll even reimburse you if the tariff doesn't give you the greatest rate of product compared to your previous tariff.

Sign up to Ecoenergy Direct by 15 December. Just call

0800 015 8787

or request a call back on enquiries@ecoenergydirect.co.uk

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Who's in control of how much you save?

100%
GREEN
ELECTRICITY
FROM
LONDON

100% Green electricity is generated by 100% renewable energy sources.



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

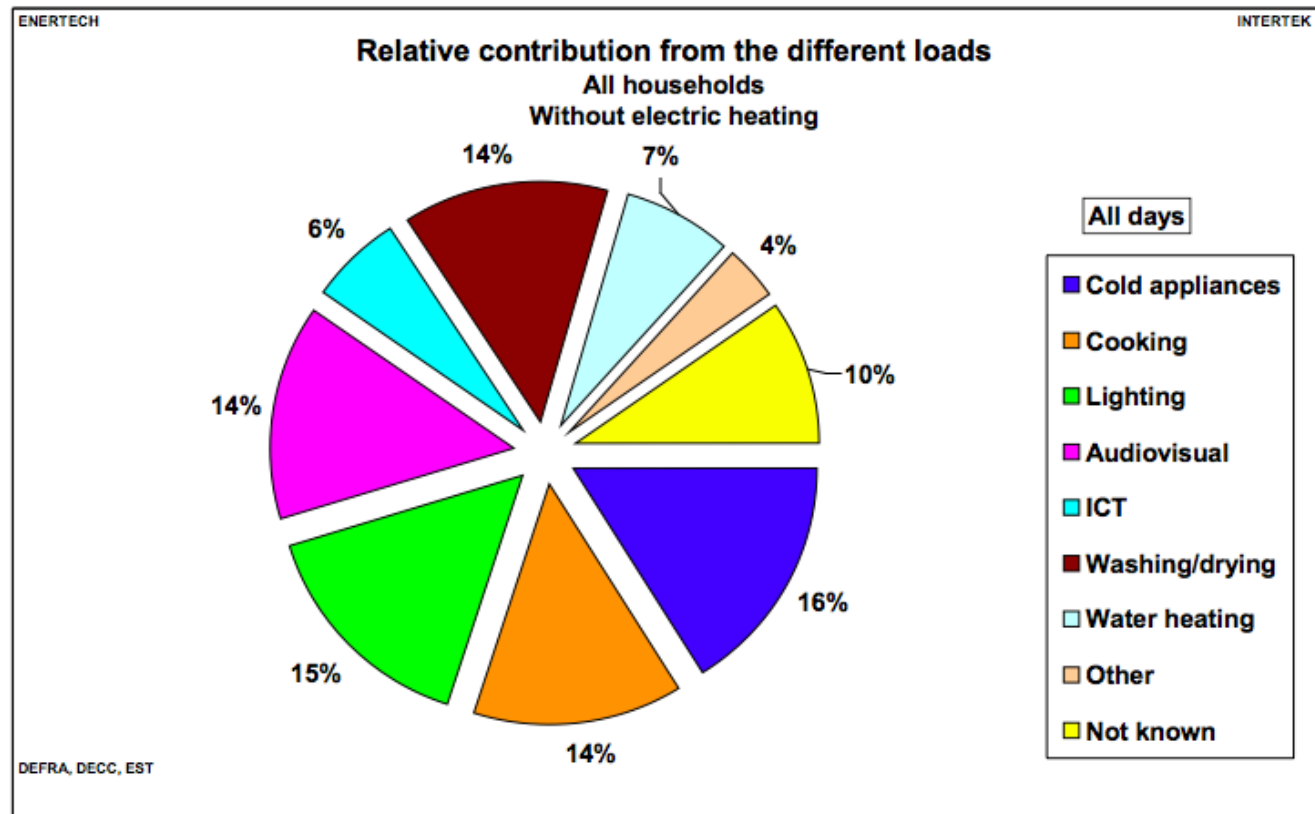


Figure 289 Relative contribution from the different loads – All days – All households - Without electric heating

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

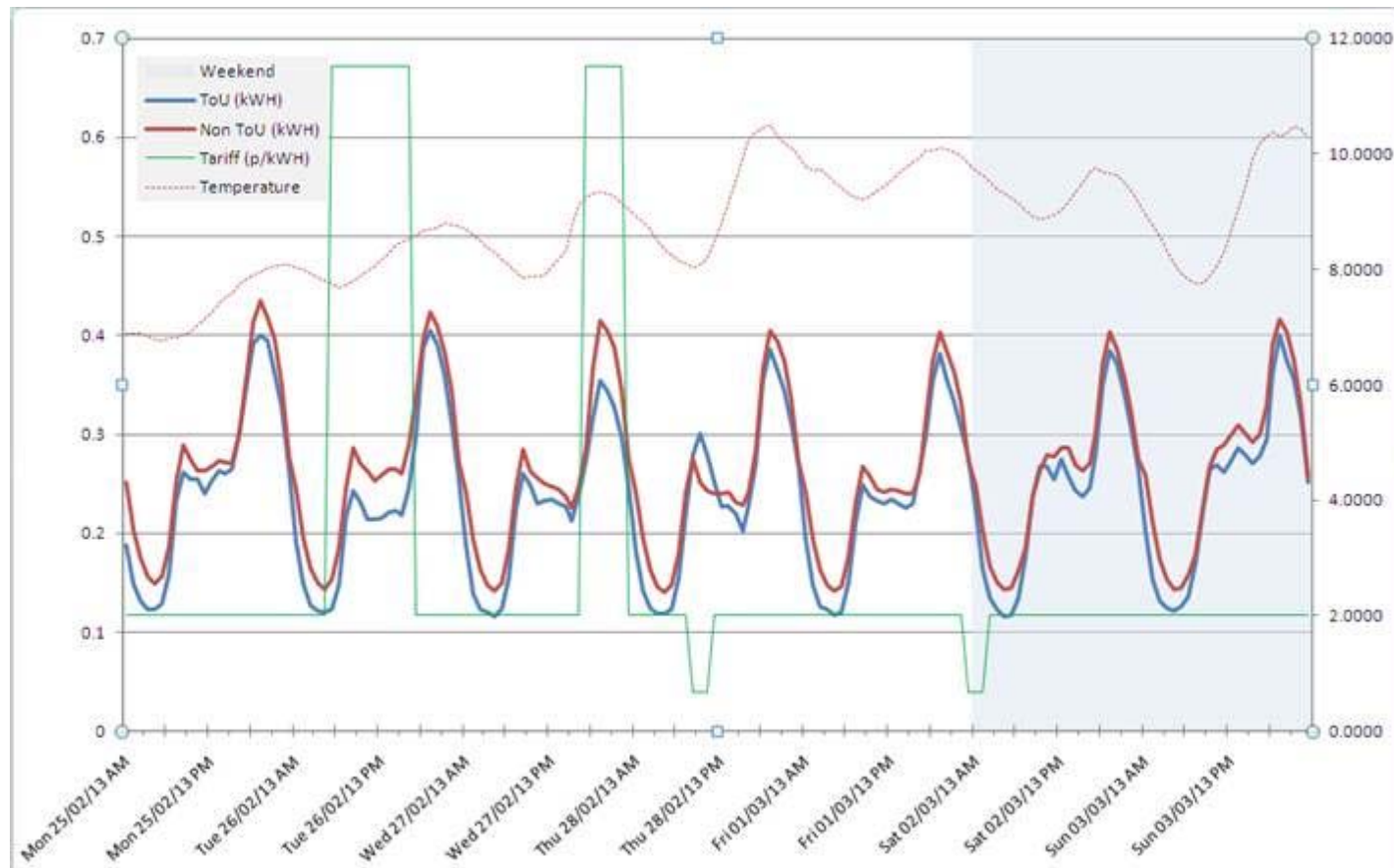
- Notice period – 8.30am day before.



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.

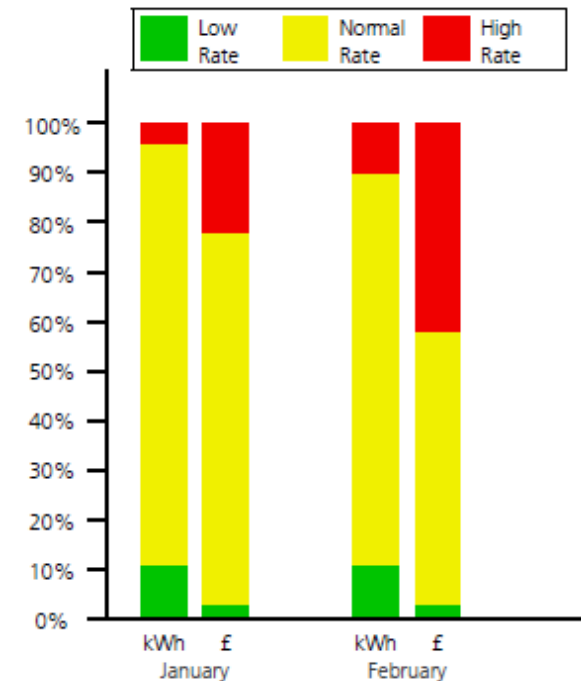
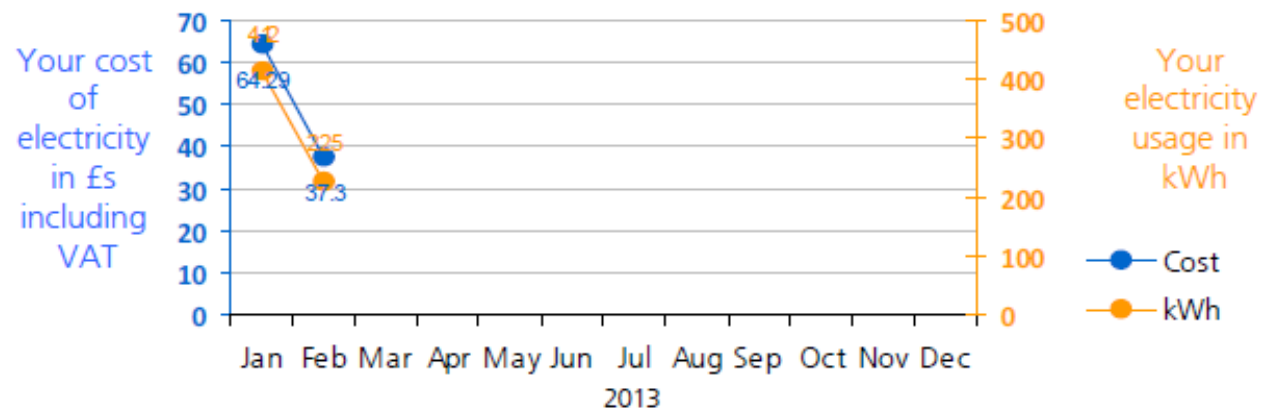
(SDC 2006)

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.

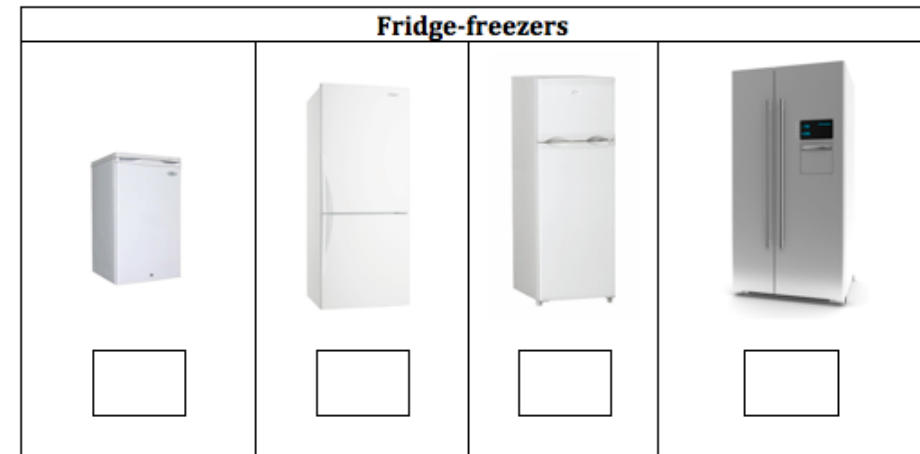


Household survey

- 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



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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



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