

# Low Carbon London

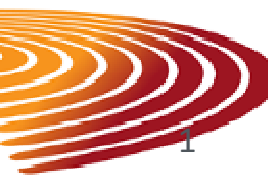
## Smart Meter Trial: an early perspective from our pilot trial

15 February 2012

Liam O'Sullivan  
Programme Director



UK  
Power  
Networks



- Welcome
- Housekeeping
- Safety

# Agenda

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- Low Carbon London – introduction, refresher and summary of progress to date
- Smart grids – context and consumer experience
- Lessons from the smart meter pilot trial – the supplier view
- Lessons from the smart meter pilot trial – the importance of team work
- Demographics – the logic behind the recruitment process for the main roll out
- Next steps – what the trials will look like
- Emerging issues

# Low Carbon London

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- A learning journey primarily funded by Ofgem's Low Carbon Network Fund
- Collaborative, 'end to end' programme to create and evaluate innovative ways to deliver sustainable electricity to businesses and communities in a low carbon future
- Series of participative trials covering residential, I&C and SME customers
- Looking at engineering, contractual and tariff based tools to assess their effectiveness in moving to a low carbon economy
- Detailed design of trials
- Engaging participants
- 18 month operation of trials
- Reporting findings

# Low Carbon London – some highlights <sup>Unrestricted</sup>

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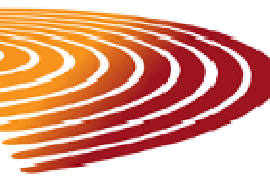
- Programme trial design complete
- Communication materials and strategy approval by Ofgem
- Learning event on the demand response trial and winter trial started
- Learning Laboratory at ICL set up
- Some EV trial participants recruited
- 500 smart meter pilot installation achieved
- Website live - [www.lowcarbonlondon.info](http://www.lowcarbonlondon.info)

# Smart grids – context and consumer experience

Rich Hampshire  
Logica



UK  
Power  
Networks

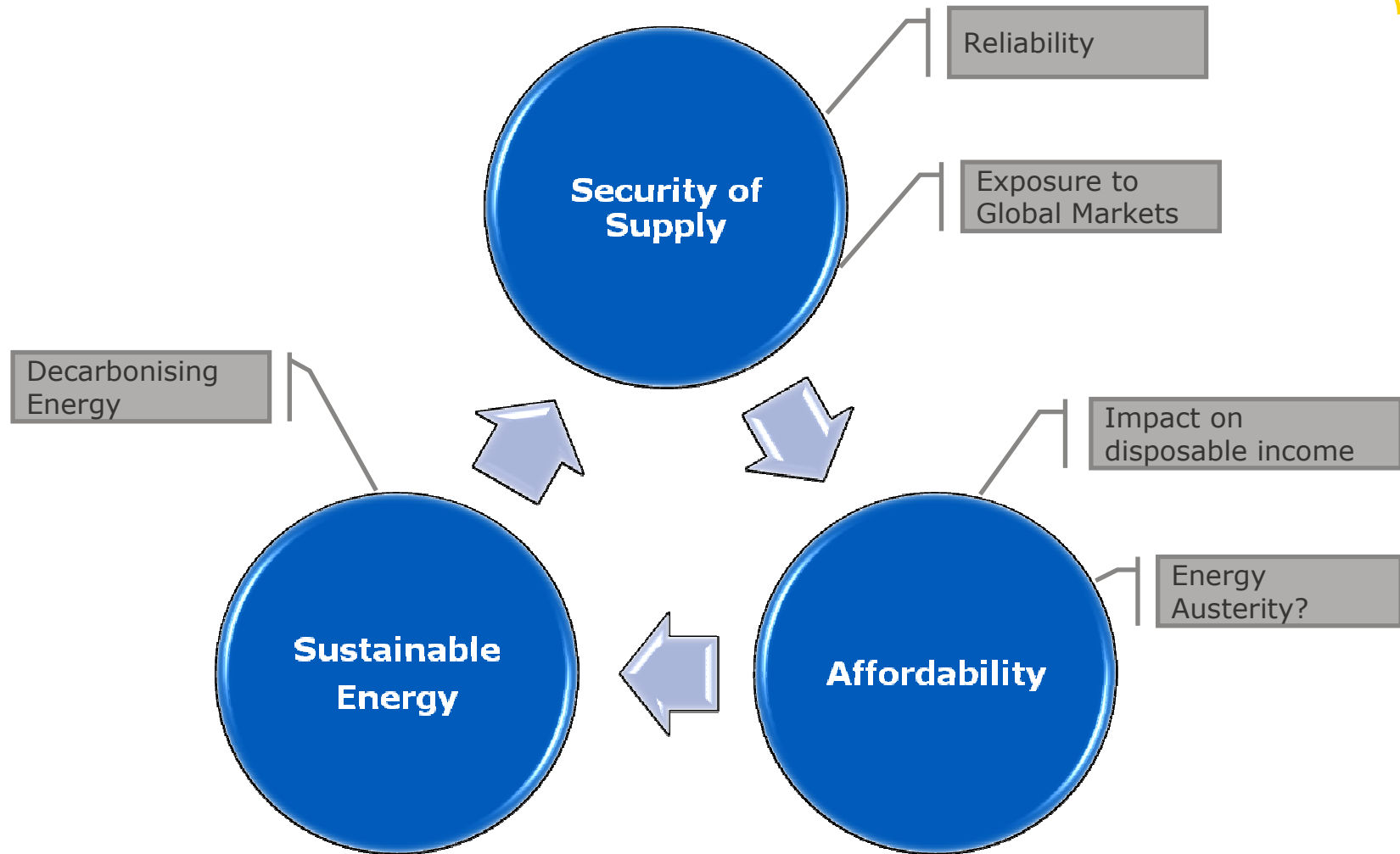


# Low Carbon London: More than a Learning Journey

Low Carbon London Knowledge Sharing  
Smart Meter Trial: An Early Perspective  
21 October 2010  
Richard Hampshire



## The Energy Challenge



Low Carbon London | Context  
Delivering Sustainable Energy |  
Enabling the Market for Low Carbon Technologies

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# Enabling a transformation in how we satisfy our energy needs

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It's all about **Consumers**:

- Britain is transitioning to a low carbon economy
- We must transform how we satisfy our demand for energy
- Our relationship with energy has to change

... so what does that mean?

- More **journeys** will be powered by electricity rather than petrol or diesel
- More space heating by **heat pumps** rather than gas boilers
- More energy demand satisfied locally by **micro generators**
- Replacement of centralised generation with more embedded, intermittent, **renewable sources**

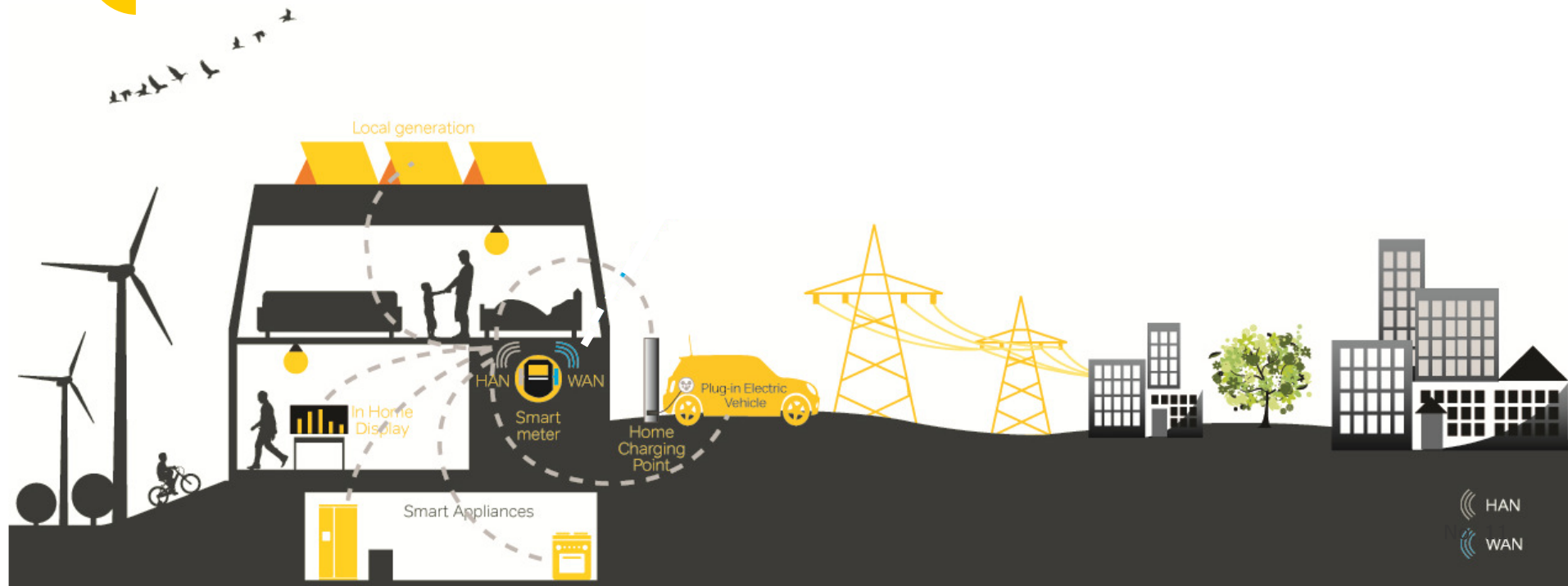
... and that fundamentally changes how we will design build and operate our energy infrastructure

- More intelligence further into the networks: A **Smart Grid**

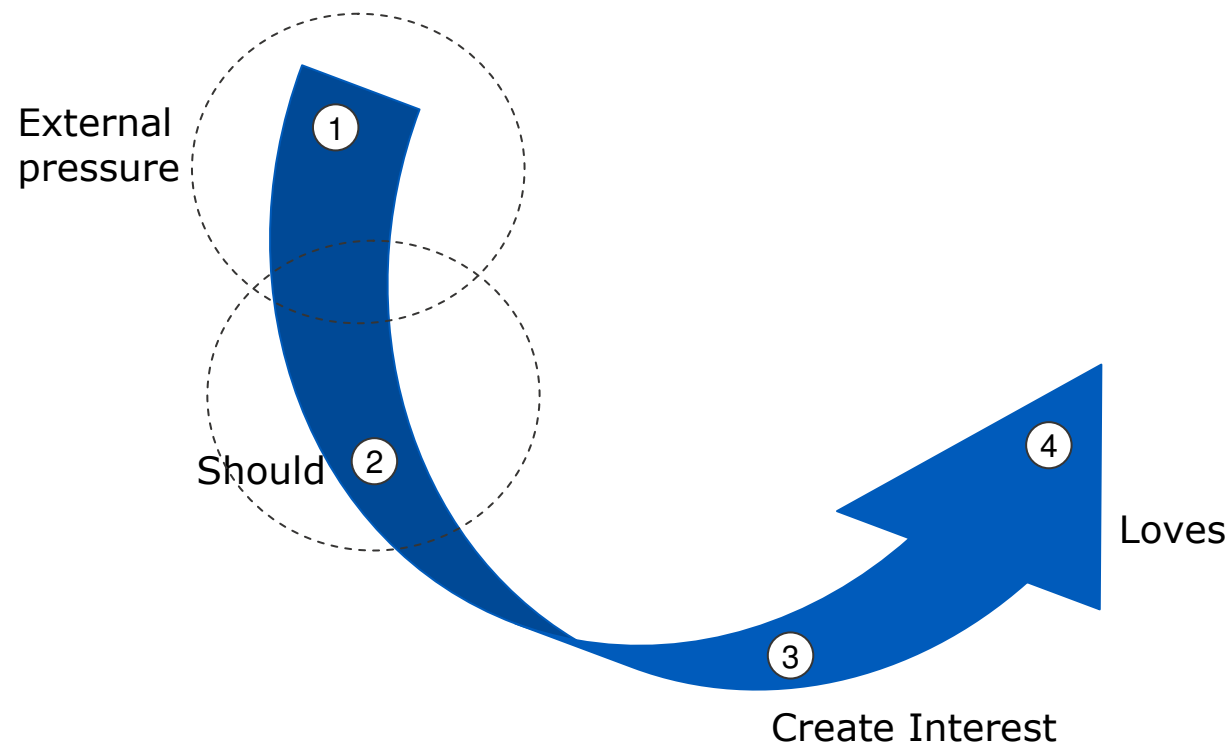


# From Sustainable Homes to Responsive Distribution Grids

- Renewable generation associated with intermittency of supply
  - Increase risk of interruptions to supply
  - Capacity margin would need to increase from 20% today to 60%
  - Plant utilisation would reduce from 55% to 30% by 2020 and to <20% beyond 2030
- Distributed Heat and EVs deliver controllable demand
  - ...but the ability to control demand to match available supply could push capacity utilisation back above 50%
  - That drives the need for responsive, intelligent distribution systems



## Creating Engagement – Making it Fun



Move people from feeling they ought to do something...  
...to wanting to act!



### But what about the consumer?

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- More than half (52%) of consumers believe renewable energy is at the heart of a sustainable future
- 7 out of 8 people haven't received information on smart grids
  - Yet, more than 1 in 3 (35%) anticipate will help them manage energy consumption
  - And almost 1 in 5 (19%) believe being connected to a smart grid will help them to lower energy consumption
- But there's contra-indications that tell us we need to engage people
  - 1 in 6 (17%) of respondents said they wouldn't use low carbon technologies connected to a smart grid
    - And the percentage grows in the over 55s
  - 34% always opt out of allowing use of their data



Source: Logica Eco Environment and consumer attitudes surveys

### Closing thoughts...

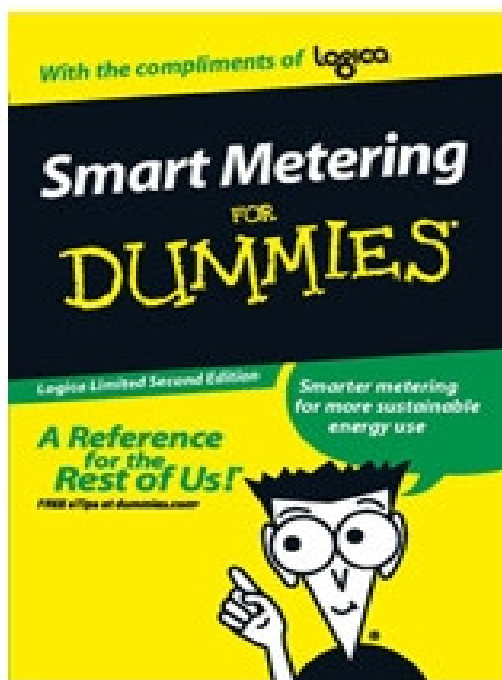
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- Consumers do see renewable energy at the heart of satisfying energy needs
- Intermittency creates challenges for the design and operation of our energy distribution systems
- But heat technologies deliver the opportunity to match demand and to available generation
- Smart meters deliver the information and communication infrastructure at the heart of this transformation
- Consumers need to be engaged
  - Our collective challenge is to provide them with meaningful choices to satisfy their energy needs
  - It's more about when you use it than, than how much you use
- Delivering a sustainable energy future relies on engaging consumers, incentives and technology

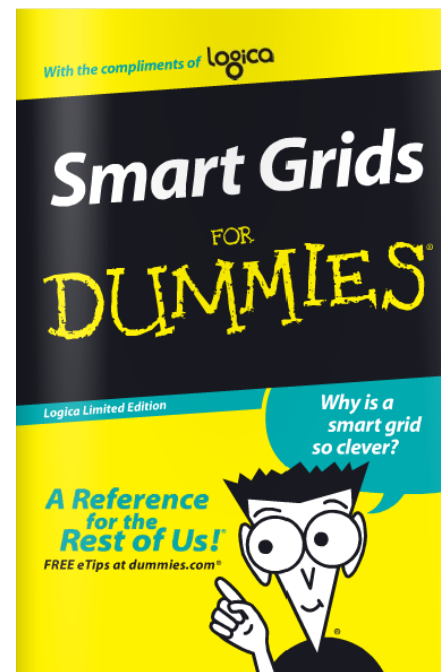


## More Information on Smart

More information about Smart Grids and Smart Metering can be found in Logica's "Smart Metering for Dummies" and "Smart Grids for Dummies"



<http://www.logica.co.uk/we-are-logica/media-centre/articles/smart-metering-for-dummies/>



<http://www.logica.co.uk/we-are-logica/media-centre/articles/smart-grid-for-dummies/>

## Maintaining the dialogue...

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Logica is a business and technology service company, employing 41,000 people. It provides business consulting, systems integration and outsourcing to clients around the world, including many of Europe's largest businesses. Logica creates value for clients by successfully integrating people, business and technology. It is committed to long term collaboration, applying insight to create innovative answers to clients' business needs.

Logica is listed on both the London Stock Exchange and Euronext (Amsterdam) (LSE: LOG; Euronext: LOG). More information is available at [www.logica.com](http://www.logica.com).

The company is a public company incorporated and domiciled in the UK.  
The address of its registered office is 250 Brook Drive, Green Park, Reading RG2 6UA, United Kingdom.

# Lessons from the smart meter pilot trial – the suppliers view

EDF Energy



# EDF ENERGY – Smart Metering Programme



# Agenda

- EDF Energy's commitment
  - What are we delivering for Low Carbon London
- Smart Meter Journey...what we did
  - Recruitment
  - Pre-installation, Installation and post-installation
- What's happening in the field
  - Recruitment
  - Installations
- Difficulties experienced so far
- Metrics
  - Customer Decline Reasons
  - Installation Abort Reasons



- So what do our customer participants think?

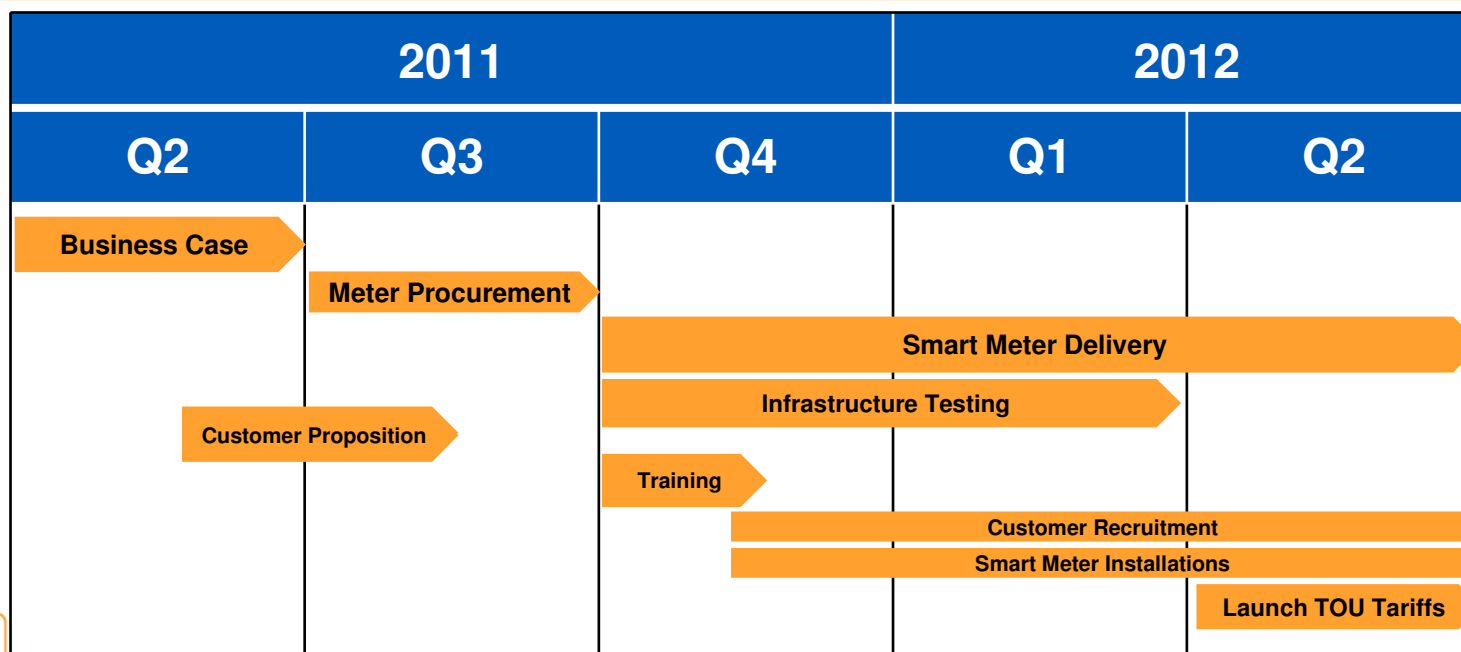
# EDF Energy's commitment...

## Aims & Objectives

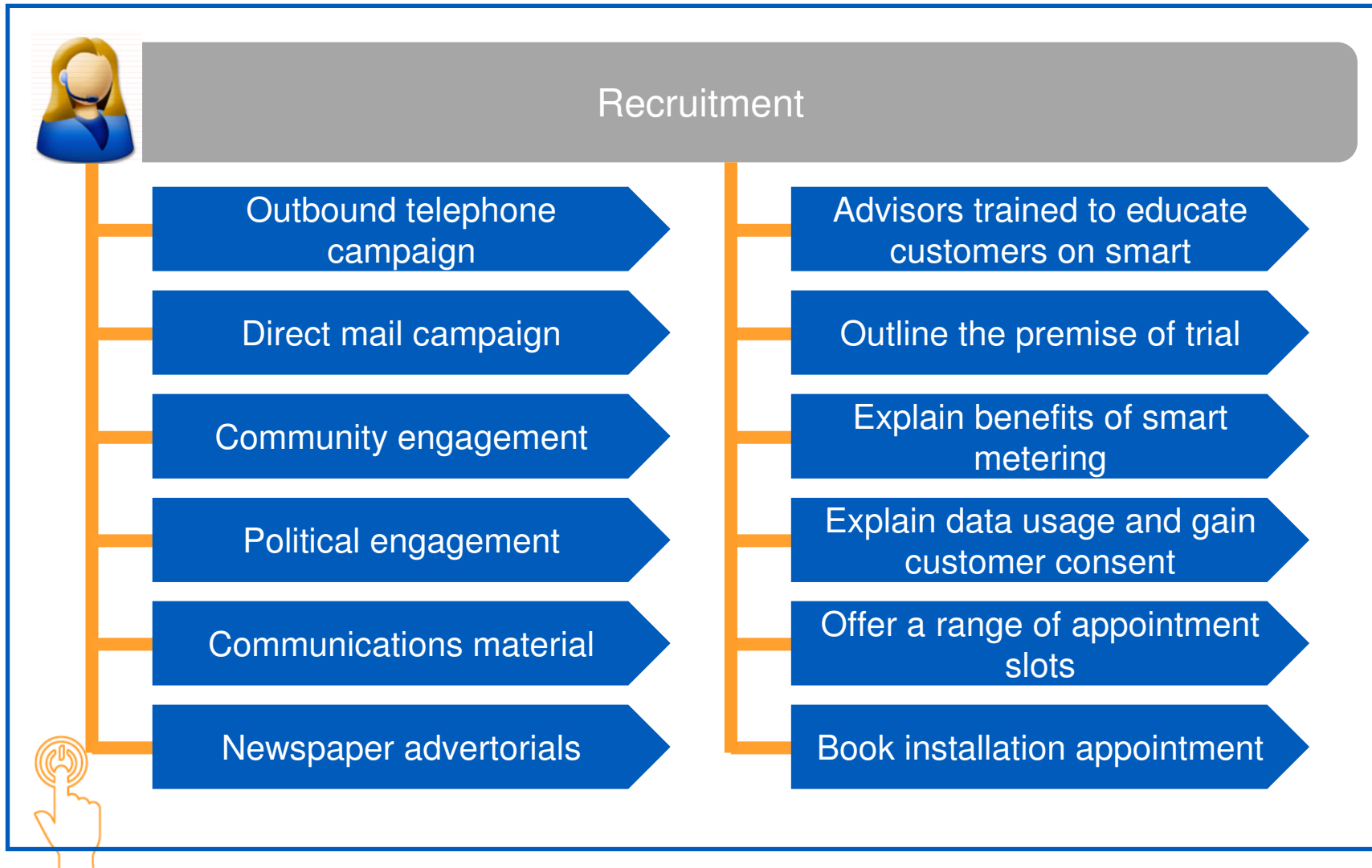
- Recruit and install 5000 smart meters for EDF ENERGY customers within the London region.
- Offer an In-home Display, accurate billing, energy efficiency advice as part of the 'Smart' proposition
- Offer customers a range of Time of Use tariffs
- Install smart meters as 'sub-meters' for Electric Vehicle (EV) customers

## Rollout Location

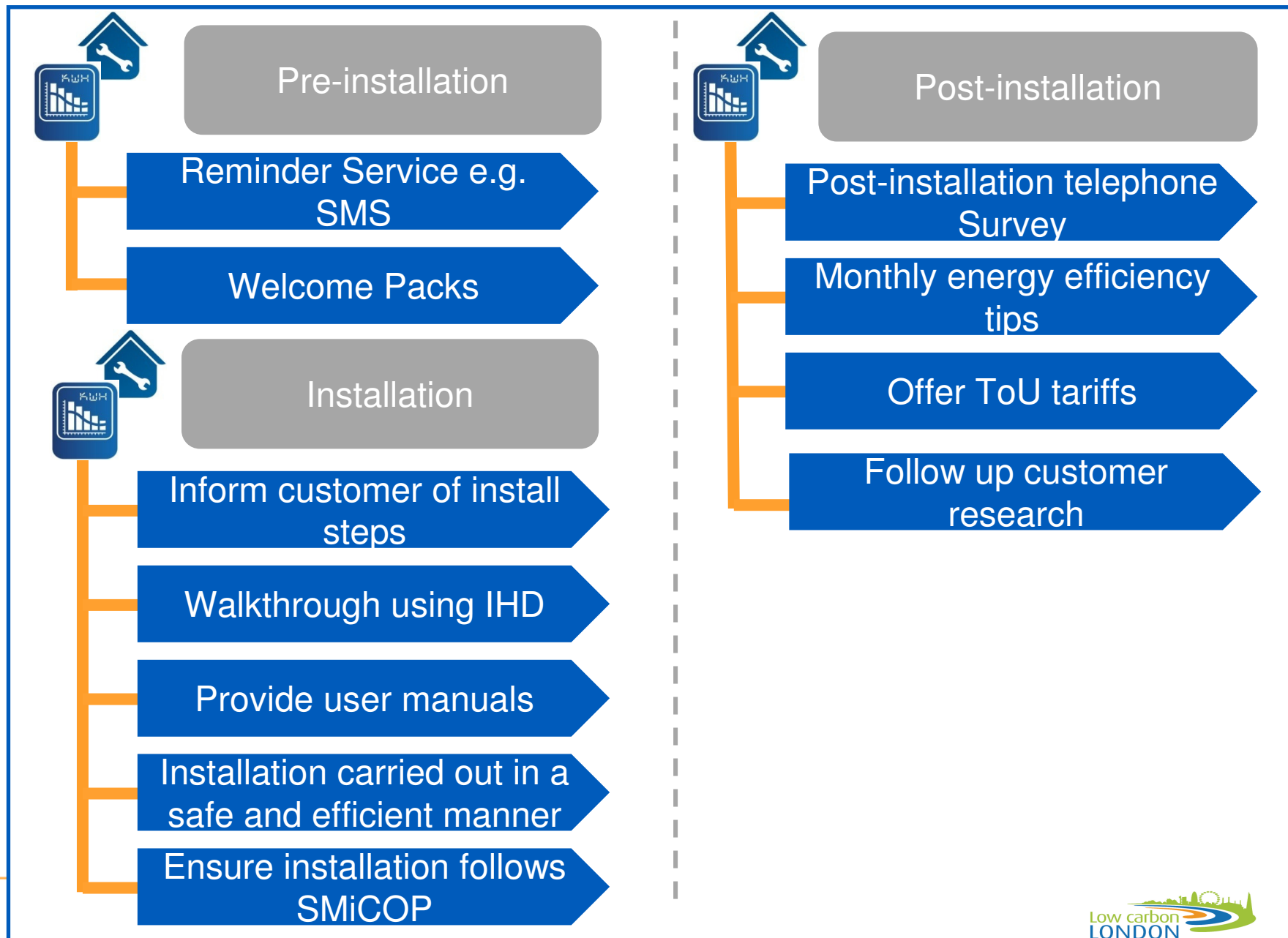
- Phase 1 - situated around DNO substations
- Phase 2 – customers across the London supplier region



# LCL – Smart Meter Journey...what we did



# LCL – Smart Meter Journey...what we did



# What's happening in the field - Recruitment



Sue Teague:

“When I spoke to a prospect, I understood they were a landlord for a number of properties. I therefore asked whether they would like a smart meter for the additional residences”



Tina Small:

“Initially on the first day, it seemed that customers found the terms & conditions to be too long and put them off”

## What did we learn?

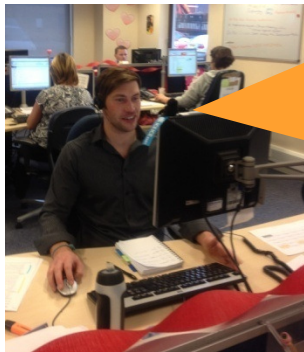
- Target landlords as a way to recruit more premises for install
- Landlords have a propensity to stay with the same supplier for their properties and therefore are a good source of recruitment for trials

## What did we learn?

- Terms & Conditions too lengthy and dissuading prospects from joining trial
- Quick turn around from Legal enabled 150 words to be removed from the script

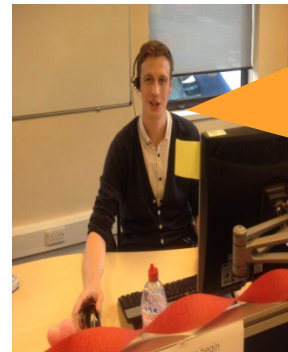


# What's happening in the field - Recruitment



Mark :

“Upon speaking to a prospect, there was some reluctance at first to carry on the call as they felt it was a sales call”



Chris Sercombe:

“When contacting customers from the Perry Vale area, it seemed as if they had a better knowledge of both LCL and smart meters leading to a better take up rate.”

## What did we learn?

- CSAs were very good at reassuring the prospect as to the nature of the call
- Providing the prospect with background of the trial and the benefits it could provide improved the customers perception.



## What did we learn?

- Liaising with the Perry Vale door knocking enabled the customers to be given an insight into the trial and smart meters
- The interaction with customers meant that they were ‘warm leads’.

# What's happening in the field - Installations

“Customers were appreciative that we talked them through what the smart is and how the IHD works, they were particularly happy with the personalised message we get them to read on the IHD”



“Signal strength has been a real problem which has meant some appointments have been aborted. It would have been beneficial for all engineers to have a range of meters with different SIM cards to try and combat the problem”

“We often find that premises we visit there are meter obstructions or intake rooms that are locked leading to an abortive call which is frustrating as the site overall is suitable for a smart meter installation”

## What did we learn?

- Using a single network provider for GPRS in the smart meter wasn't sufficient when installing in premises with signal strength problems.
- All engineers have signal strength testers and carry spare smart meters with alternative network provider SIM cards
- Providing a customer with an hour before call reminder service helps reduce No Access aborts.
- More efficient to schedule installations across London rather than have clusters in specific geographical areas.
- Good customer satisfaction in regards to install time taking less than advised upon recruitment

# Challenges Experienced with Low Carbon London

## Recruitment

- Large number of prospect volumes required
- Challenging to engage customers about Smart Metering
- Educating customers about smart metering and TOU tariffs
- Trying to gain access to customer data and educate about data privacy

## Pre-installation

- Ensuring customers are aware of appointment
- Understanding why a customer cancels their appointment
- Try to re-schedule when convenient
- Understand why a customer may wish to leave the trial

## Low Carbon London

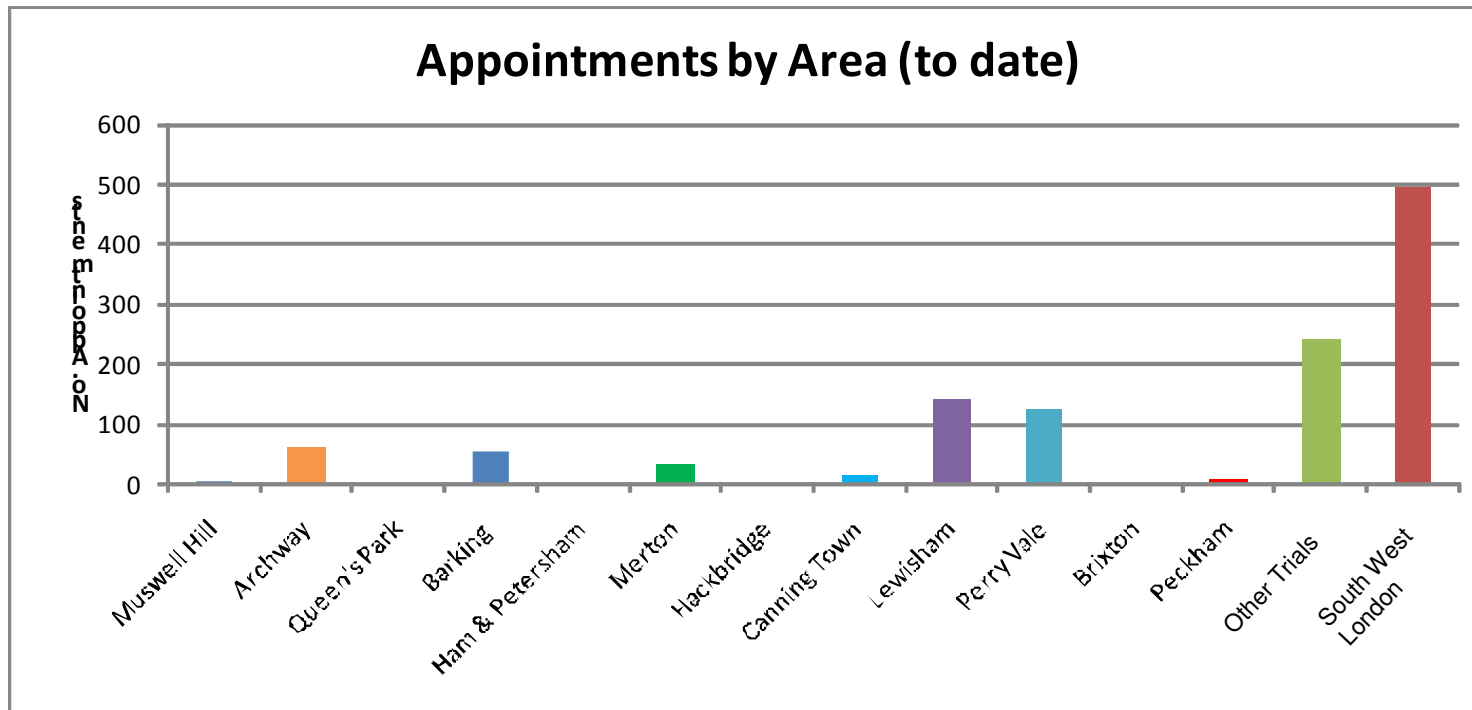
## Installation

- Issues with signal strength
- No access to customer properties despite reminder service
- Dealing with poor maintenance of old meters that prevents a new installation

## Post-Installation

- Ensuring customers response to post-installation survey
- Keeping customers engaged about the benefits of a smart meter
- Maintaining ongoing customer satisfaction

# Customer Uptake - Appointments

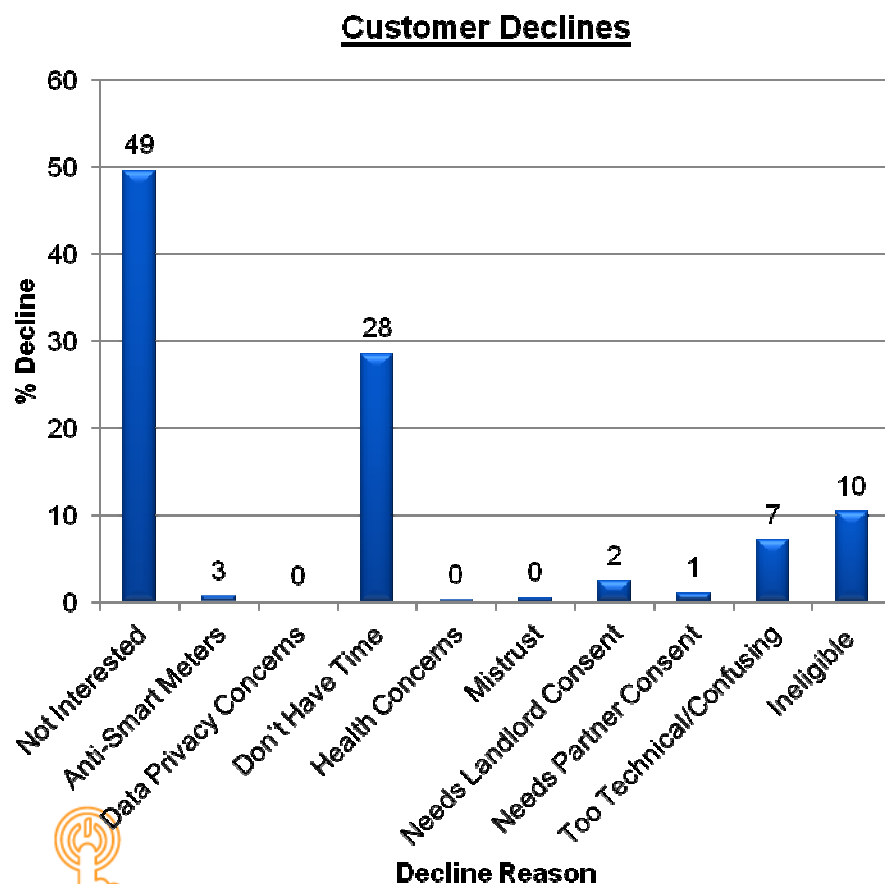


The graph indicated that from the original Low Carbon Zones targeted in the pilot, Lewisham and Perry Vale gained the most appointments. This is directly linked to the awareness campaigns in those areas which helped raised the profile of LCL and educated local communities of the benefits Smart metering can bring.



# Customer Decline Reasons

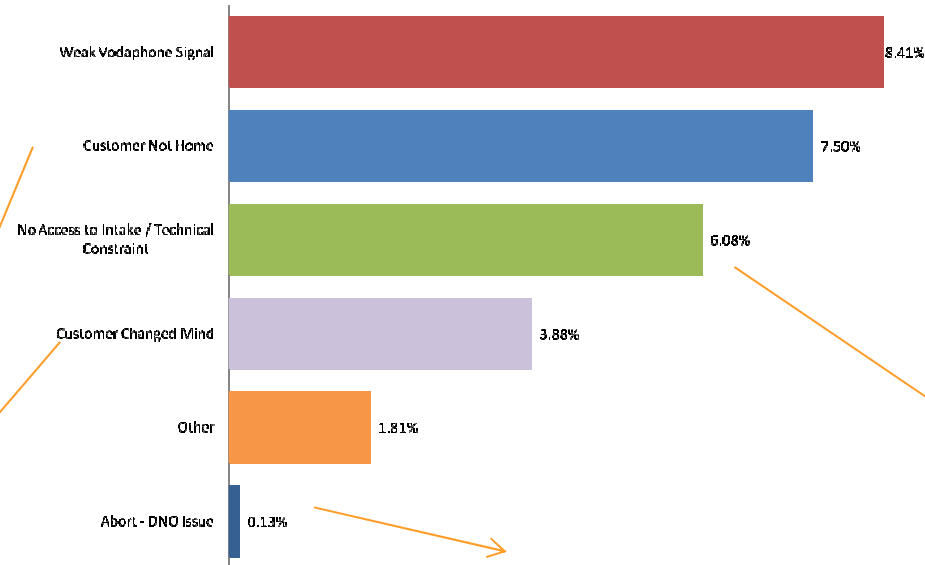
This slide indicates based on call outcome the reasons for why a customer has declined joining the LCL trial.



Decline Type	% of total declines	Why?
Not interested	49%	Customers feel more of sales call
Don't have time	28%	Customers called at time of day when not convenient
Ineligible	10%	Customer has churned or too much debt on account
Too technical /confusing	7%	Over introducing smart meters into the initial conversation can be too confusing . Some elderly customers find it difficult to understand what a smart meter is and the benefits it yields.
Consent required	3%	Customer needs partner or landlord consent
Others	3%	Anti-smart meters – aware of government mandate but suspicious of data privacy ('big brother' mentality) and/or if there are any clear benefits.

# Installations - Reasons for Abort...

Installation Abort Reasons



## Customer

- Customers not at premise so engineer cannot perform install
- Engineer leaves calling card so customer can re-schedule appointment
- Customers do change their minds upon installation

## DNO

- Installer visits premise and cannot remove and install meter due to issues with cut-out boards

## Building Network Operator

- Installer visits premise and cannot gain access to the meter due to either obstructions or locked intake rooms
- Responsibility is with customer to contact building network operator to ensure work is completed before a rescheduled appointment can be made

# Customer Communications and Awareness

## Customer acquisition

- Outbound telephone
- Direct mail letter
- Email

## Public relations

- MP Briefings: Joan Ruddock, Shadow Energy Secretary (Lewisham)
- Council / Ward / local assembly briefings and demonstrations

## Media relations

- Press Release: local and national and trade press

## Community Outreach

- Smart meter drop-in events
- Partner Events: Renew initiative
- Green Doctors: Door knock, leaflet drop

**How interested would you be in having a smart meter installed in your home?**

- Interested: **50%**
- Not sure: 26%
- Not interested: 24%

Source: Consumer Focus face to face survey, May 2011 Sample size 1,374



# Customer Communications and Awareness : Learning's

## **Customer acquisition**

- Community outreach drives awareness
- Awareness drives increased acquisition rate and reduced call duration

## **Public relations**

- Continue MP Briefings where appropriate
- Continue Council / Ward / local assembly briefings

## **Media relations**

- Press Release: case study based

## **Community Outreach**

- Partner Events: e.g. Renew initiative
- Partnership marketing



# So what do our customers think? We've asked them...

## Post-Install Customer Survey Objectives:

- **Capture all elements relating to the customer recruitment and meter installation experience for the first phase of installations**
  - To gauge customer experience from recruitment through to install, including NPS on recruitment, install and overall
  - To gain additional customer data for Imperial College/LCL Insight, eg demographics, household info, occupancy
  - To cover off/test some key areas which will be required for SMICoP compliance
- **208 quantitative telephone interviews**
- 10-12 minute interview
- No set quotas
- Conducted 1st December 2011 to 17th January 2012
- Unweighted data



# Main Reasons For Participation (Spontaneous)

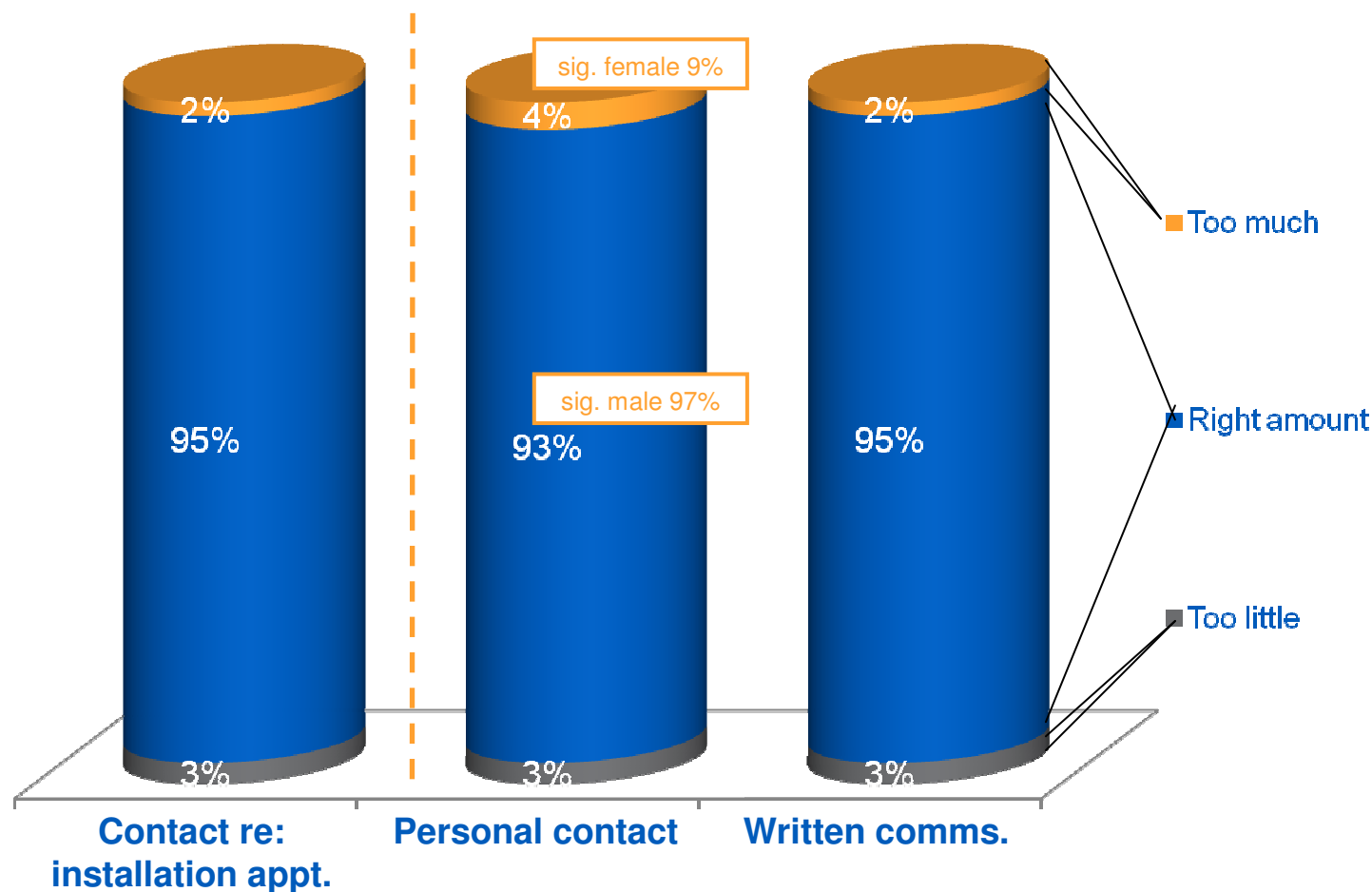
*Simply monitoring energy usage, (which is not necessarily intuitively linked to saving money), is the most common trigger to participation*

Nets	%	
Monitor/limit energy usage	47	sig. ABC1 54%, 3+ HH 67%, Kids HH 67%
Save money	19	sig. female 26%
Avoid the need for a meter reading (both self and inspector)	13	
Avoid estimated bills	10	sig. <54 17%
Help EDFE/with trial	10	sig. 1-2 HH 13%, No Kids HH 13%
Will become compulsory	8	
Help the environment	4	
Problems with existing meter	4	
Interested in new technology	3	
Participated before	3	sig. 55+ 5%
It's free	3	
Other	6	



# Contact With EDFE

*An appropriate level of contact seems to have been established*



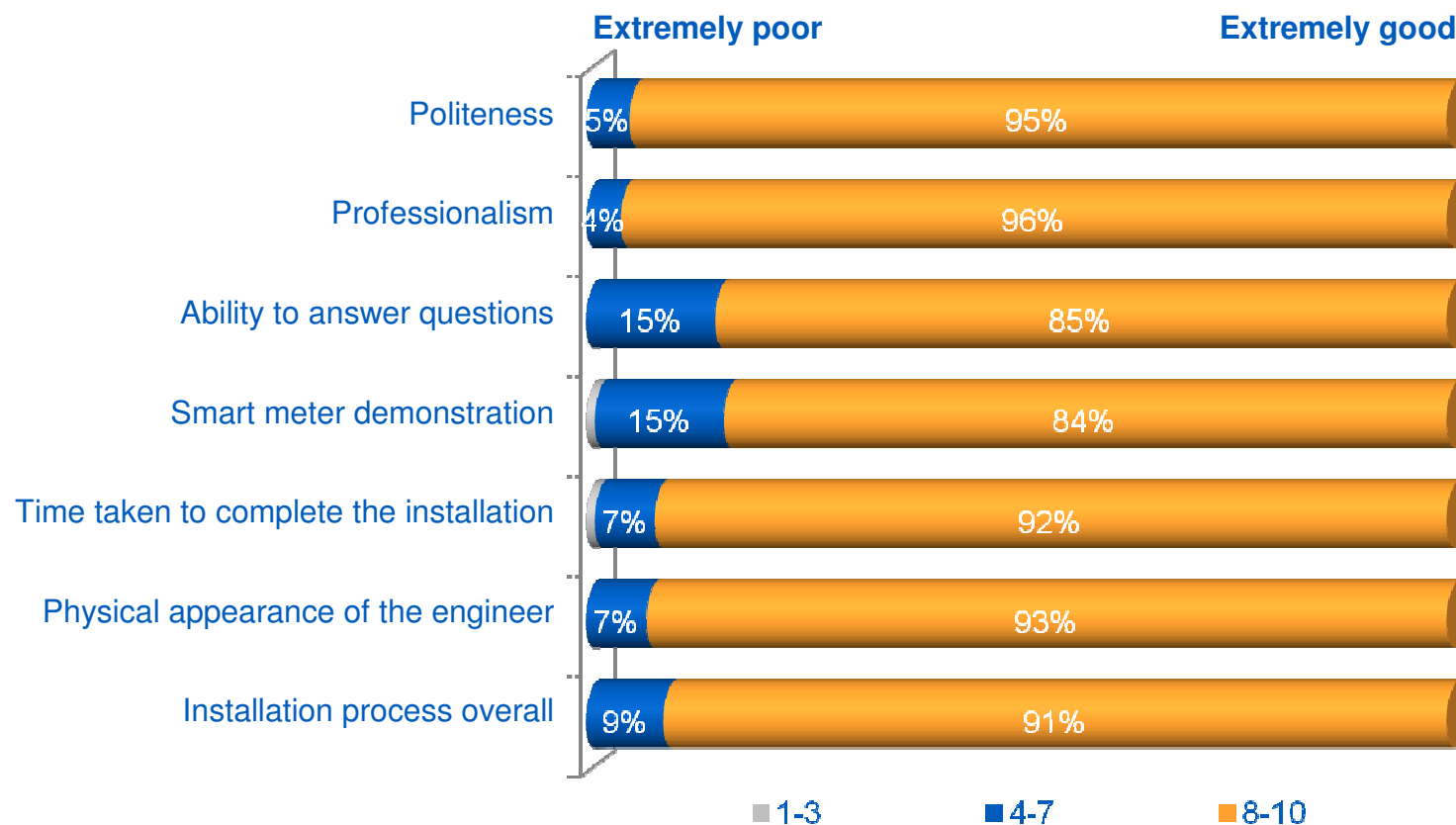
# Rep Ratings

*Almost universally positive ratings, although potentially room for improvement with regards to clarifying exactly what is involved in the trial*



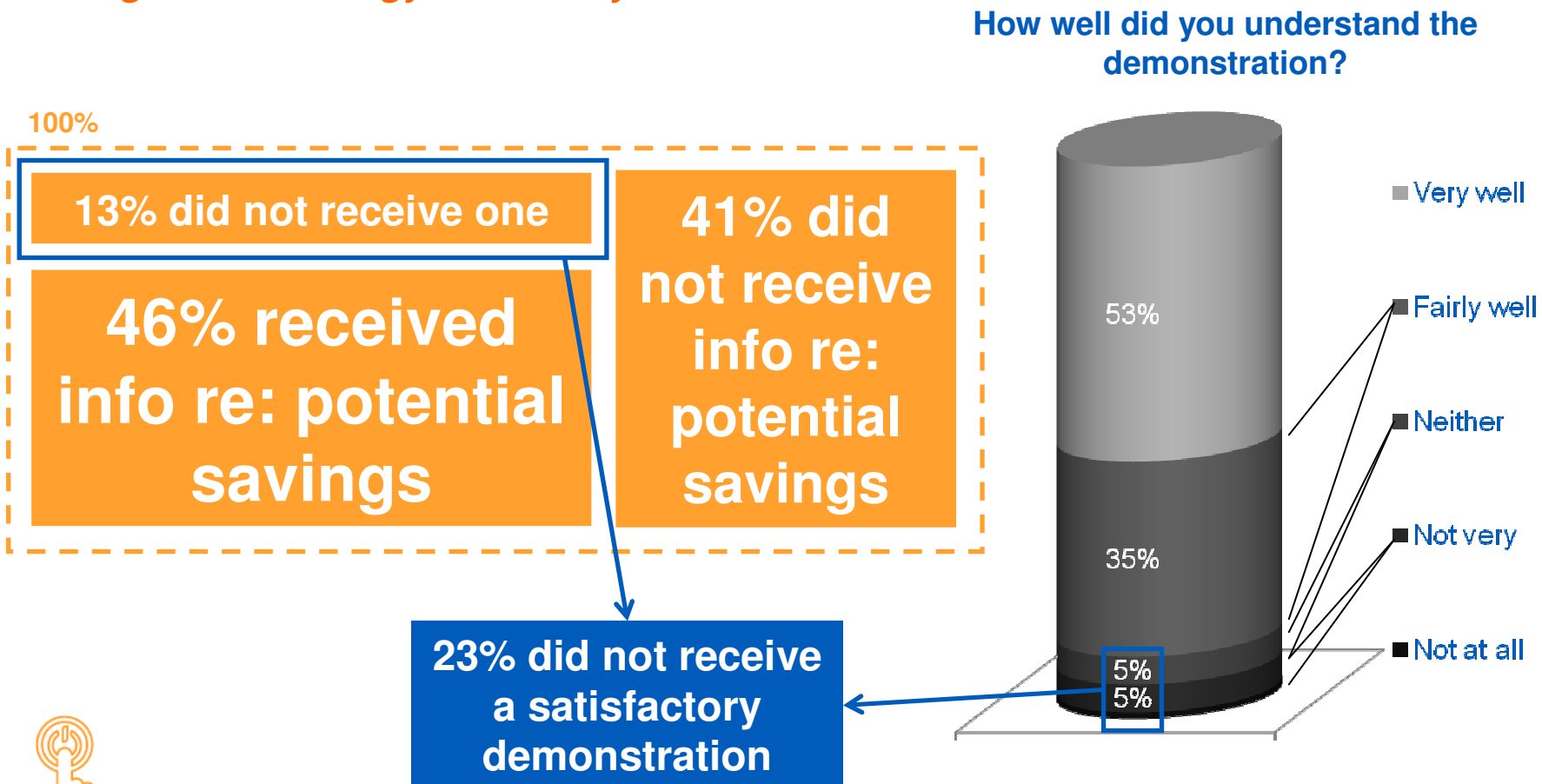
# Installation Process

*Largely positive ratings once more, although engineers' knowledge and demonstration skills should be marked for improvement*



# Demonstration

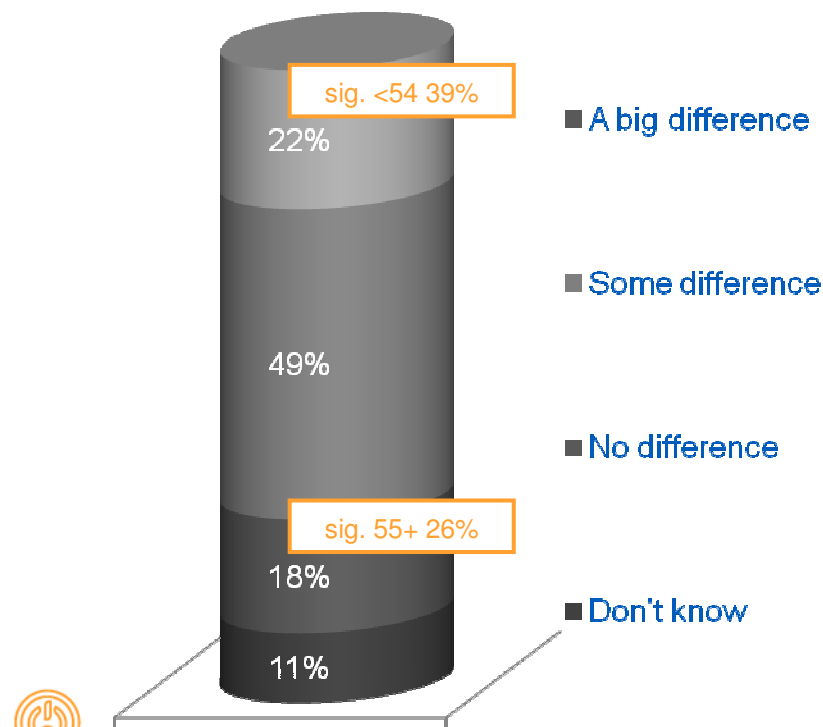
*Almost a quarter of respondents claim not to have received a satisfactory demonstration, and less than half received information regarding potential savings from energy efficiency measures*



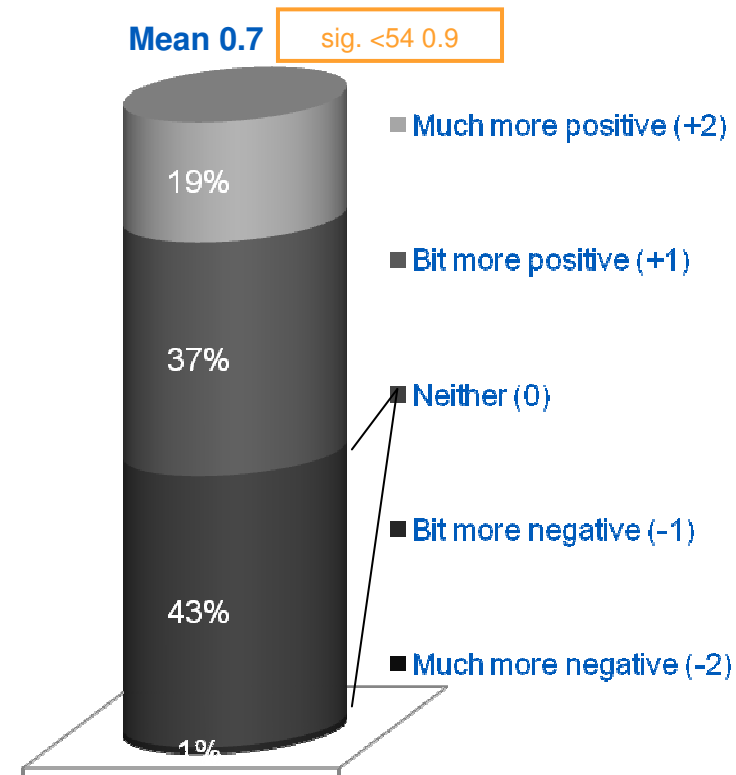
# Impact Of Trial

*The overwhelming response to the trial is positive – significantly more so for those aged <54*

Effect on energy usage

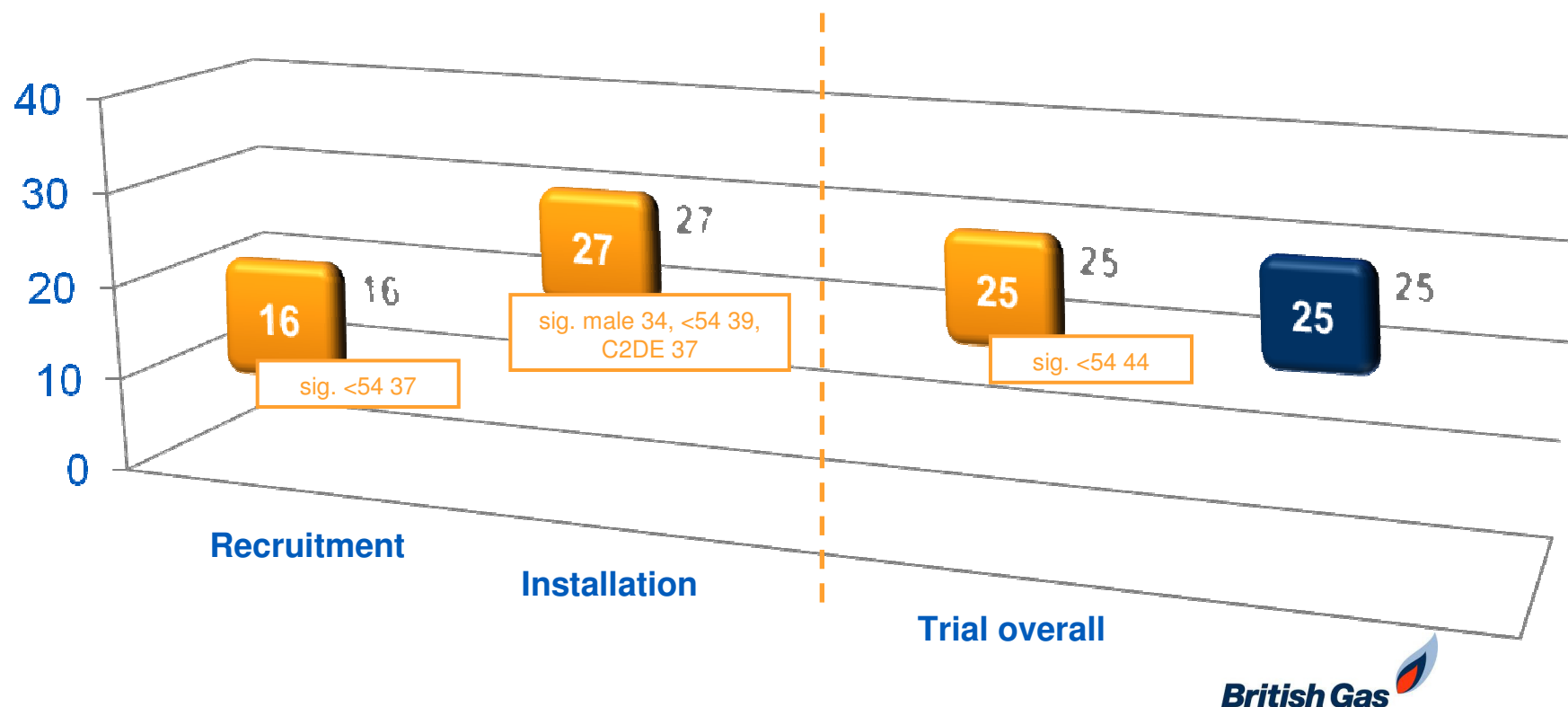


Perception of EDFE



# Net Promoter Scores

*Comparable overall score to that of British Gas' reported residential contact NPS\**



\*Source: British Gas Investor Slides, sl. 29, latest reported period in 2011



# Questions?



thank you

# Lessons from the smart meter pilot – the importance of team work

Loic Hares  
UK Power Networks



# Building relationships for the future

Unrestricted

- Excellent communication with energy supply partner: EDF Energy
- Transparency and team work
- Good issue resolution
- 500 pilot customers delivered under extreme time restrictions
- Relationships built with new external companies who were excited to be part of LCL:



Customer behaviour

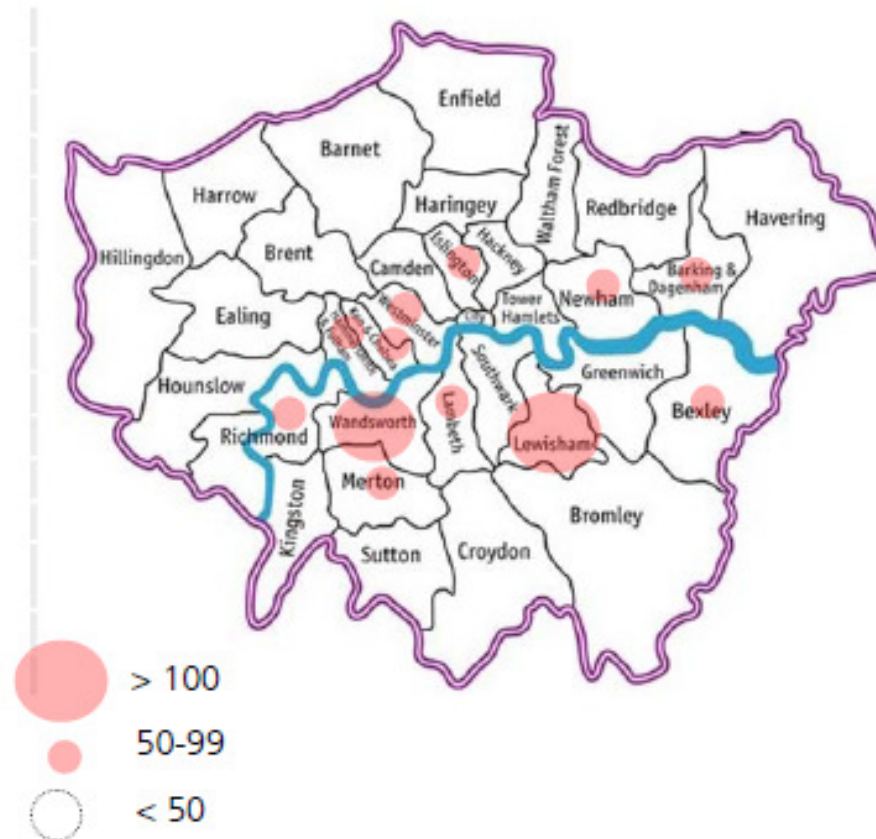


New technologies



# Where we are today

- Due to the nature of the LCNF programme it is vital that the findings from the trials here in London can be used across the UK
- Completion of the pilot trial revealed that the trial participants were biased towards certain demographics
- To ensure that the project had a statistically viable pool of participants, the recruitments strategy was changed
- Imperial College London represent the academic interests of the project and will now take you through the steps we have taken to ensure that we have statistically viable trials

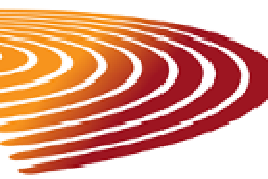


# Demographics – the approach for the main smart meter roll out

James Schofield  
Imperial College London



UK  
Power  
Networks



# Low Carbon London: sampling and trial design

James Schofield,  
Imperial College, London

# Content

- Sampling
  - What does London look like?
  - Our approach to sampling
- Residential demand response trial design
  - What are we testing?
  - considerations for tariff design
  - and experimental blocking

**WHAT DO OUR SAMPLE AREAS  
LOOK LIKE?**

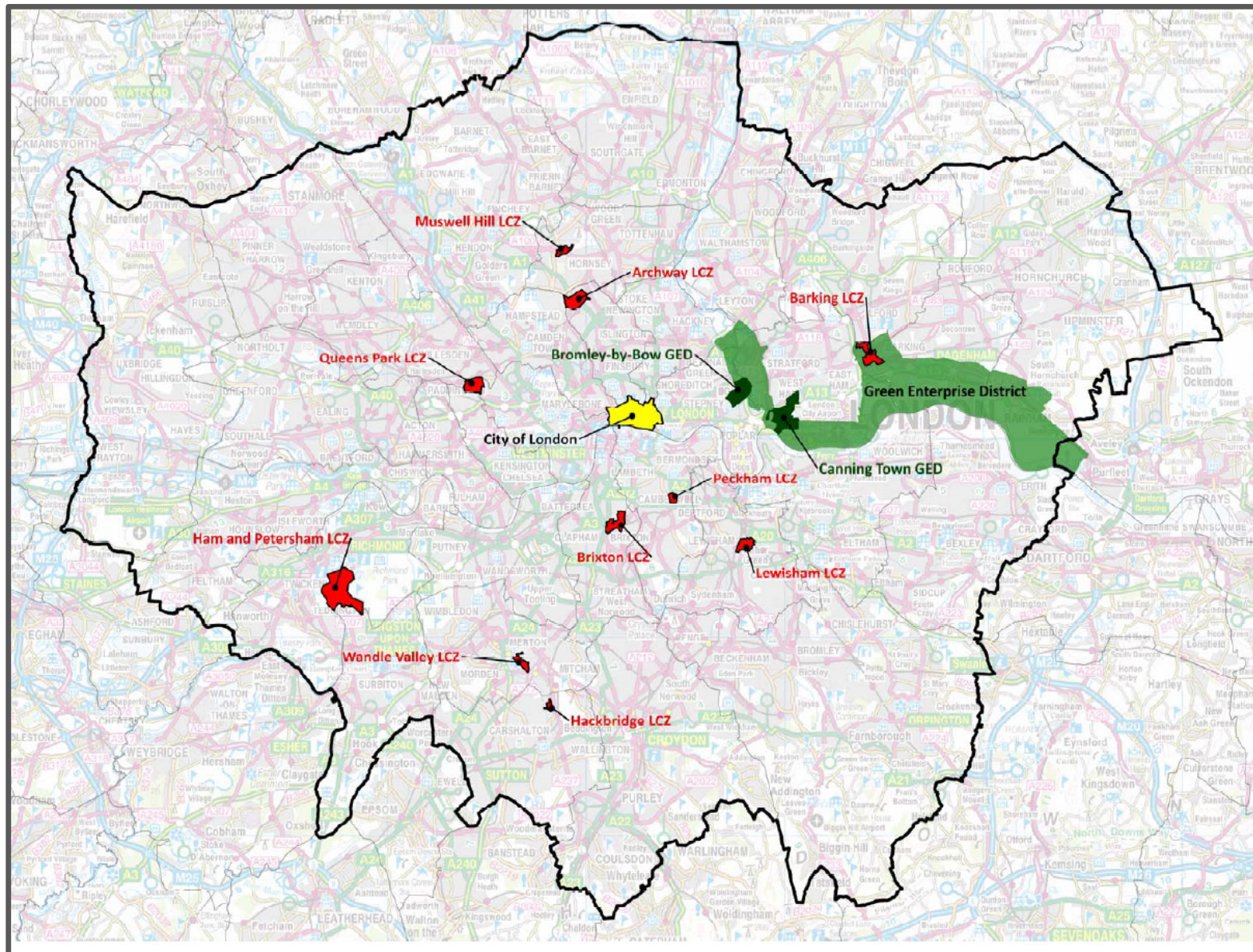
# Experian view



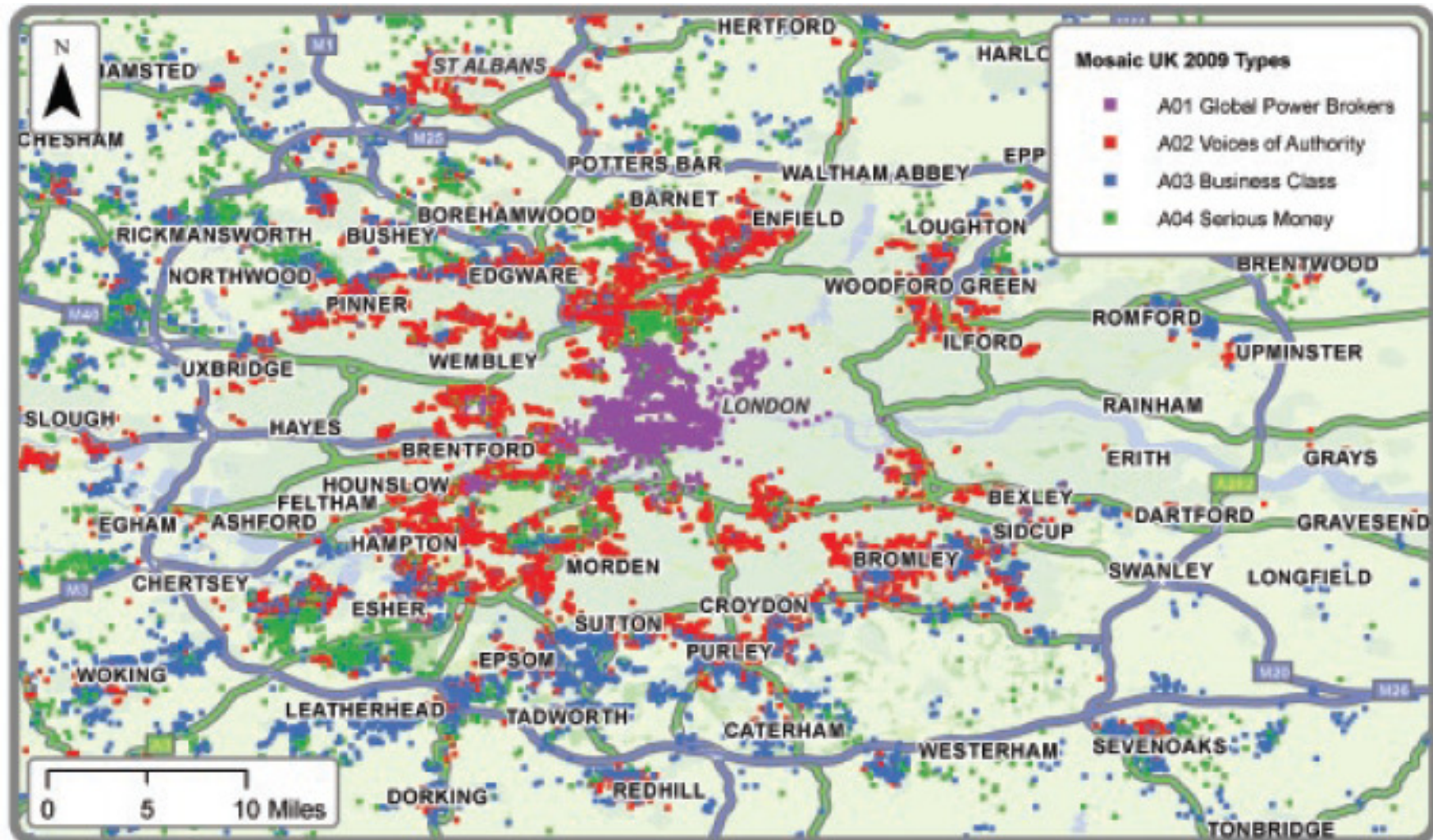
**Experian's Mosaic UK consumer classification provides an accurate understanding of the demographics, lifestyles and behaviour of all individuals and households in the UK.**

[6]

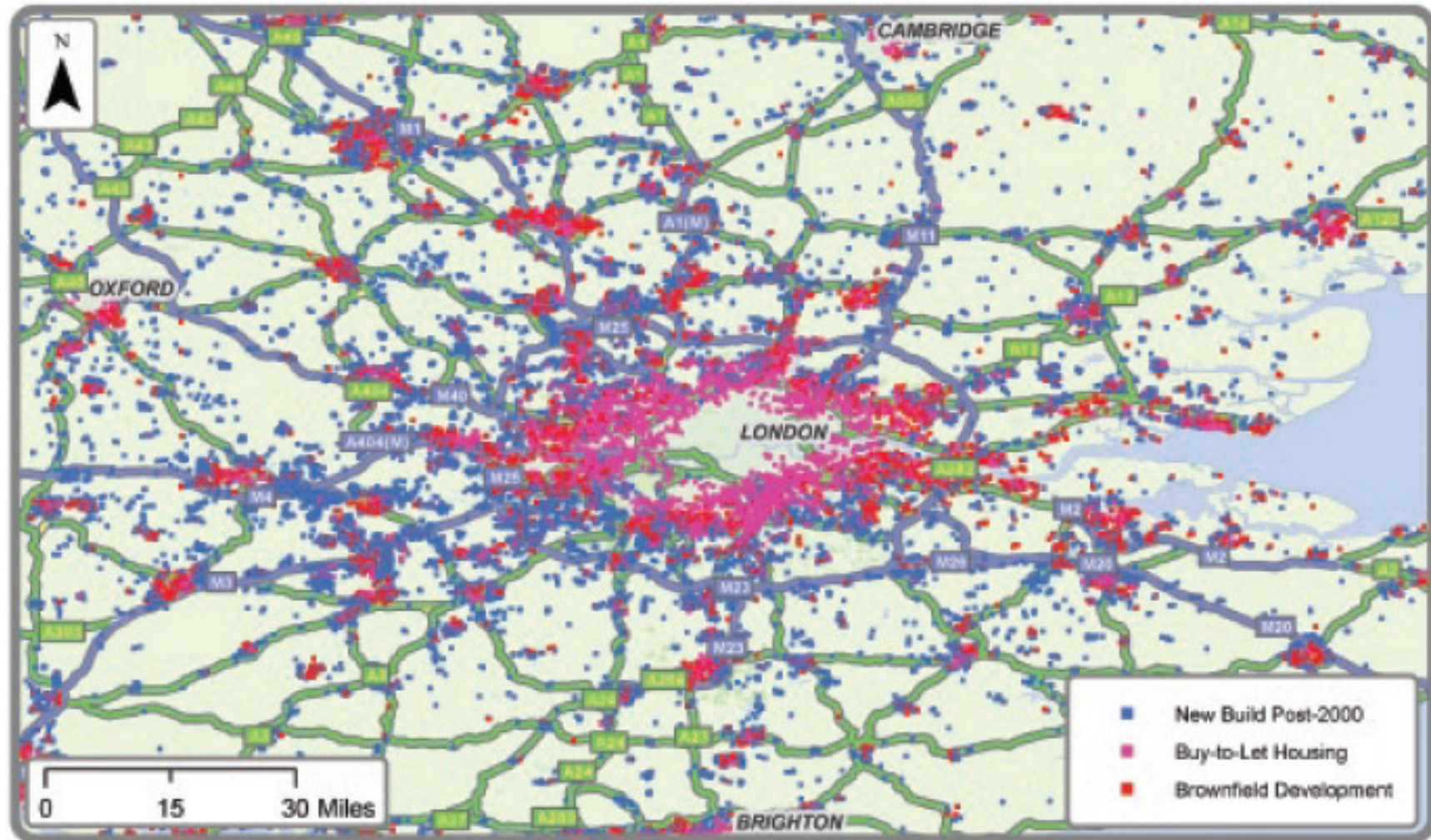
# LCL areas



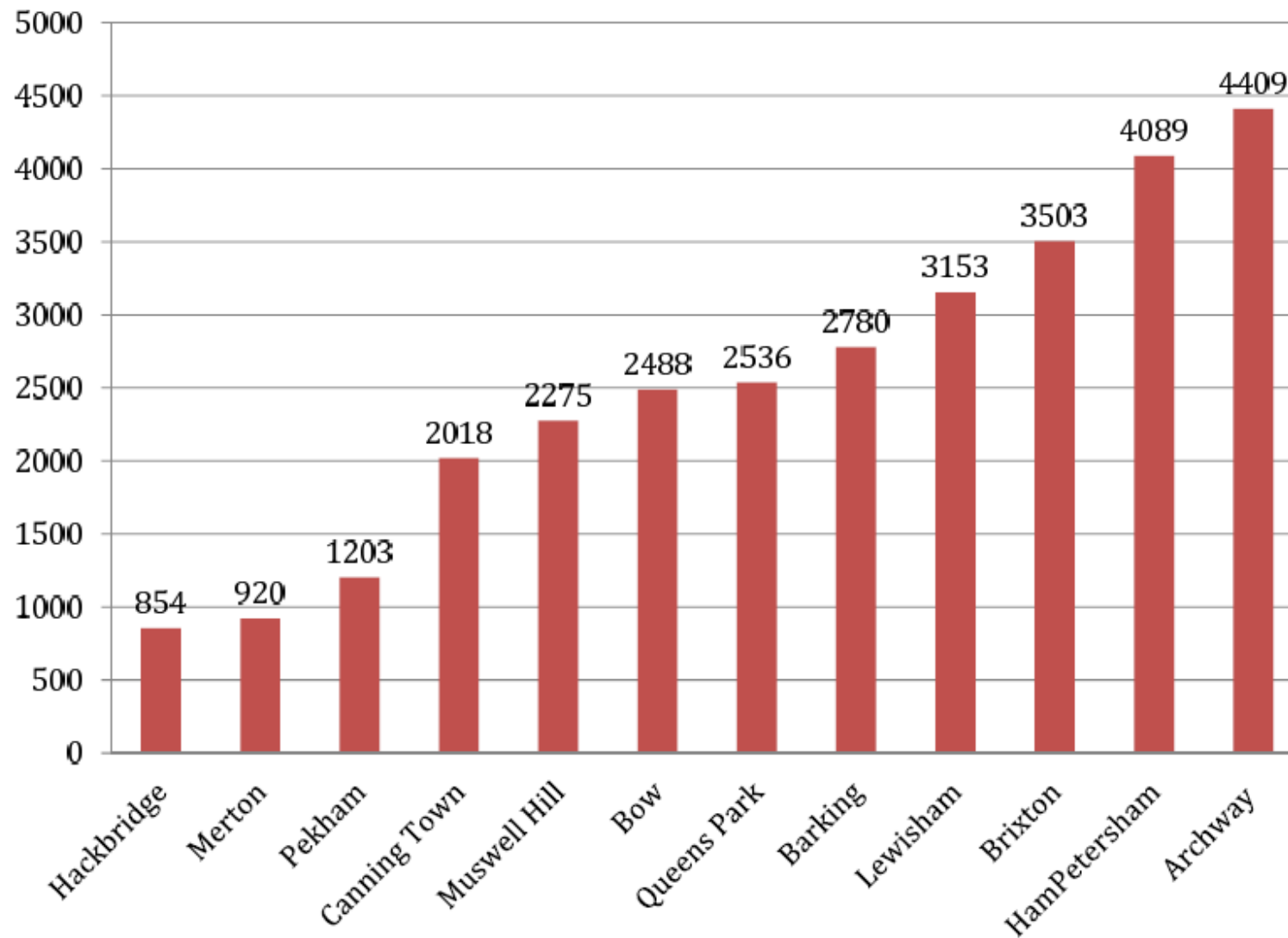
# London: money and power



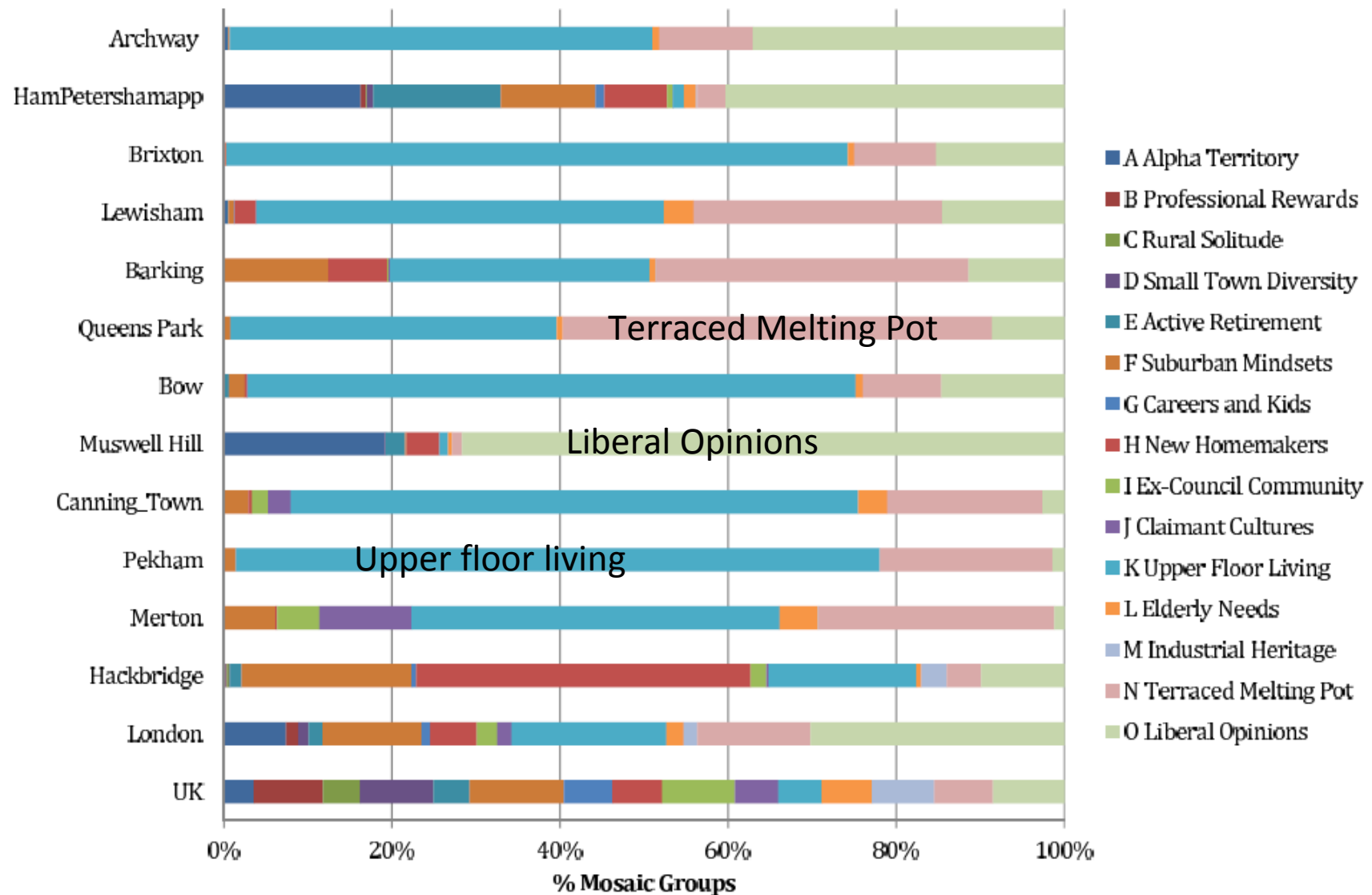
# London: growth



# Number of households by LCL area



# Groups by LCL area



# Predominant groups



## Upper Floor Living

- 5.18% of UK households
- Limited incomes and rent small flats from local councils
- Little money is spent on the purchase of large household appliances or electronic equipment



## Terraced Melting Pot

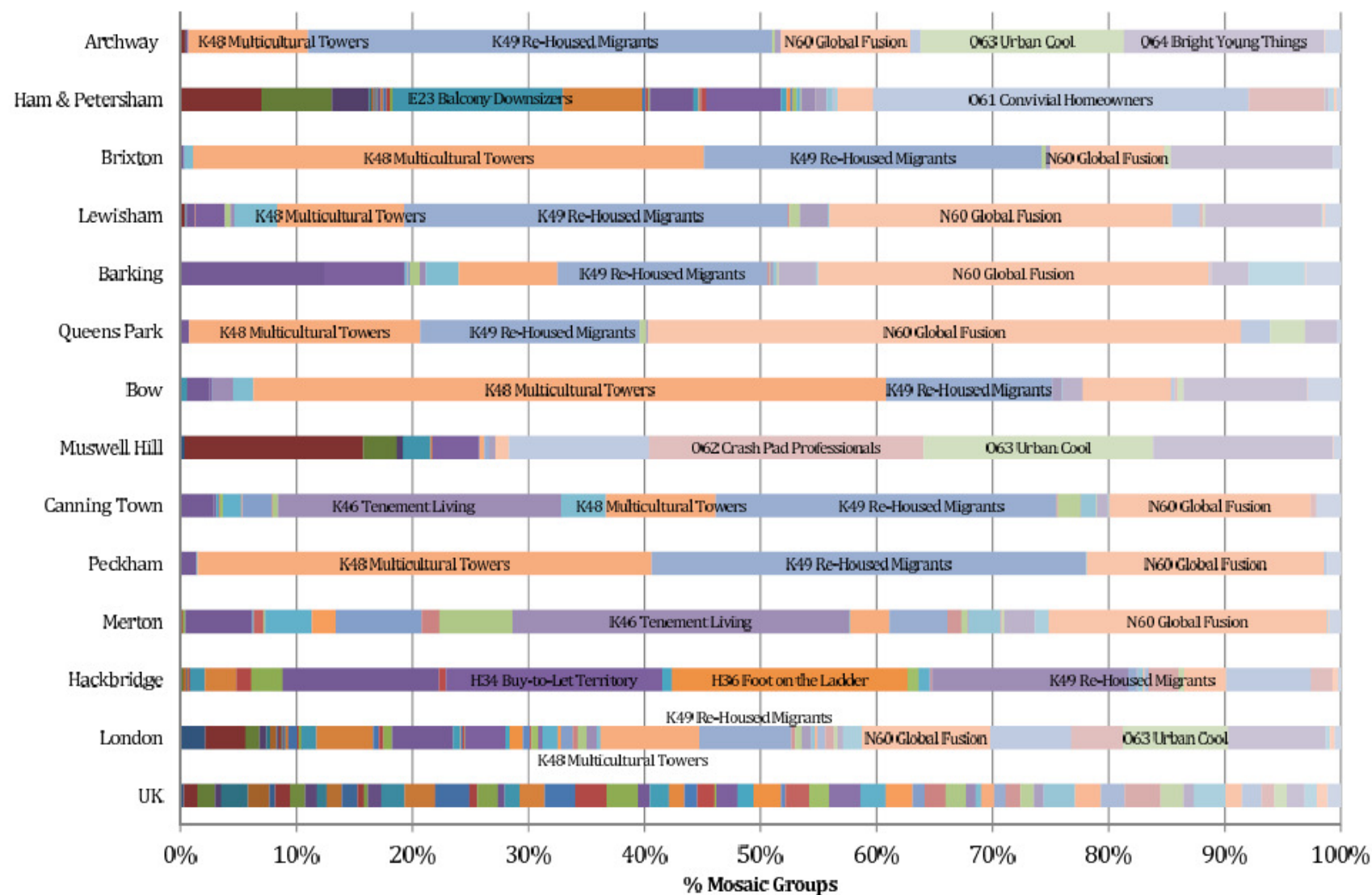
- 7.02% of UK households
- Many residents in these neighbourhoods belong to groups that have recently arrived in the UK
- Homes tend to be poorly maintained



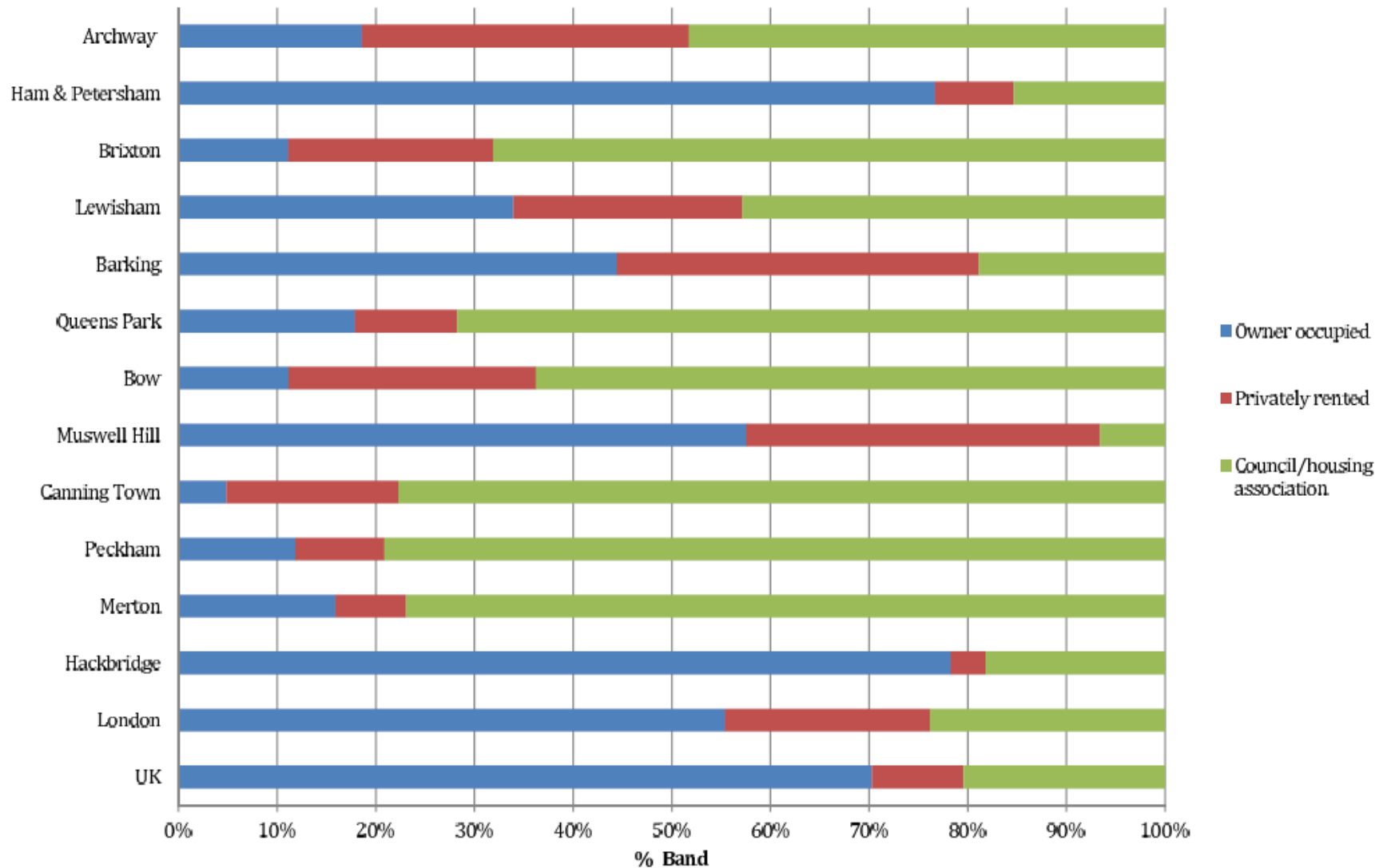
## Liberal Opinions

- 8.48% of UK households
- Young, professional, well educated people, cosmopolitan in their tastes, liberal in their views
- Small but smart rented flats, many of which experience a rapid turnover of tenants

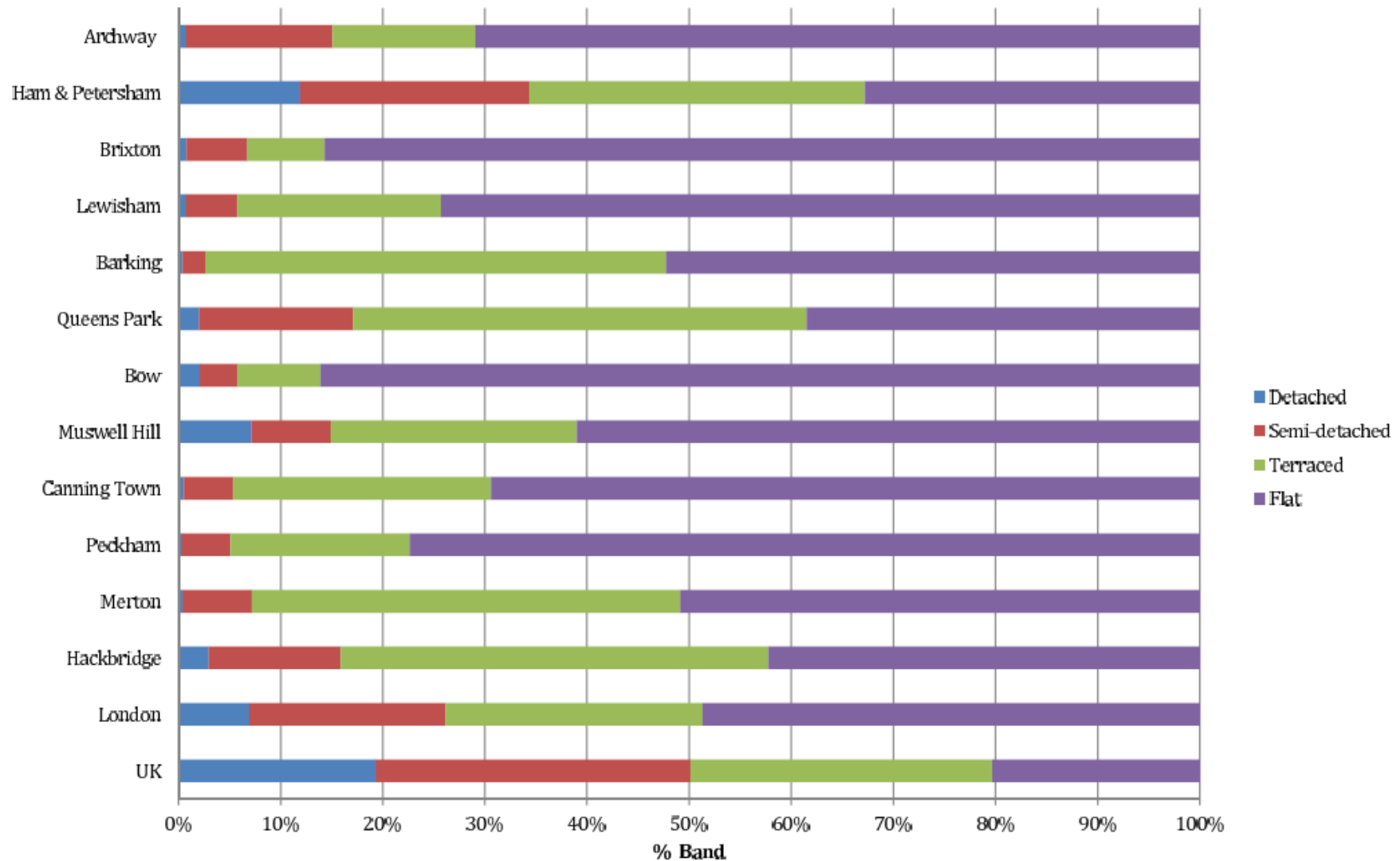
# Types by LCL area



# Tenure type by LCL area

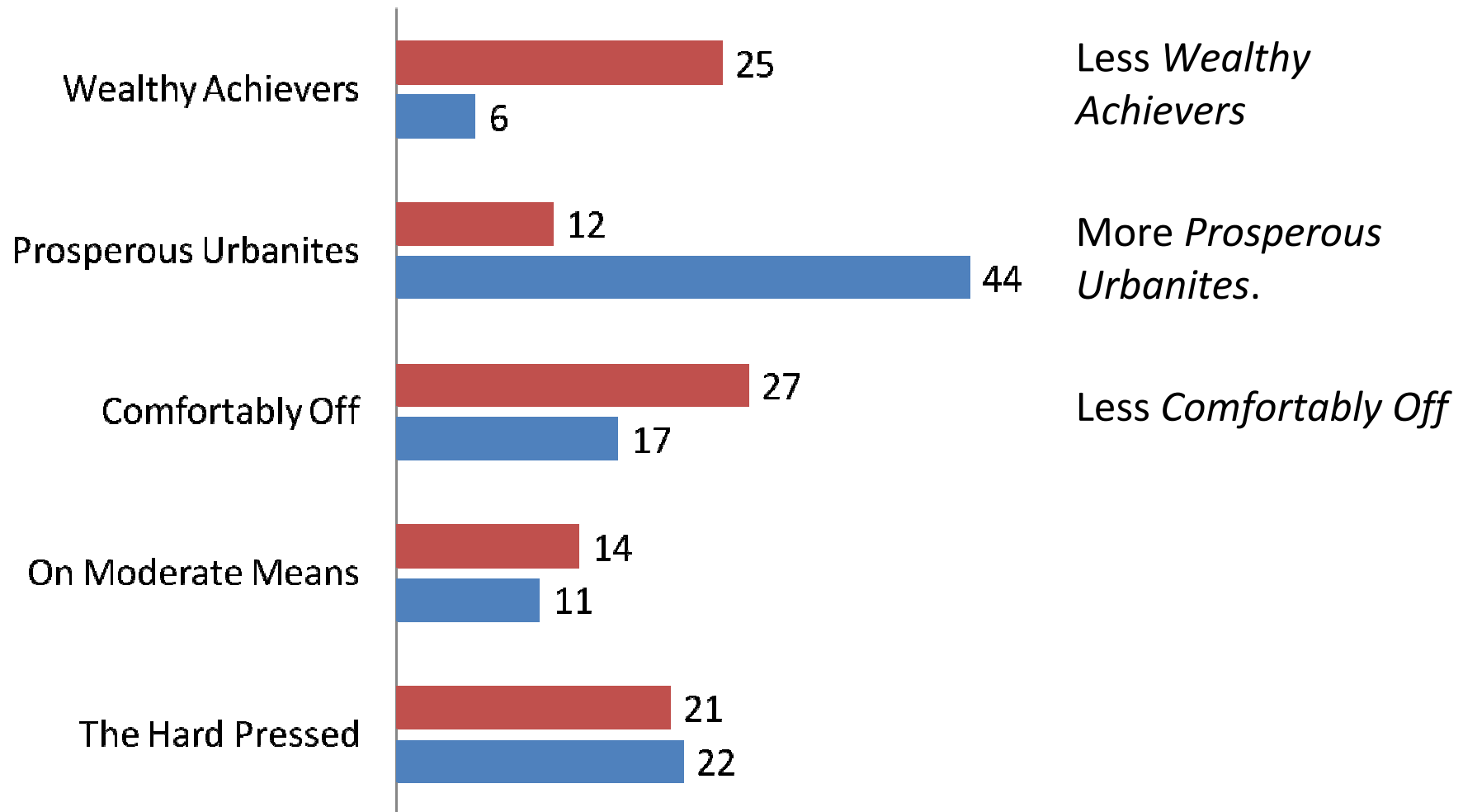


# Household type by LCL area



# CACI's Acorn analysis

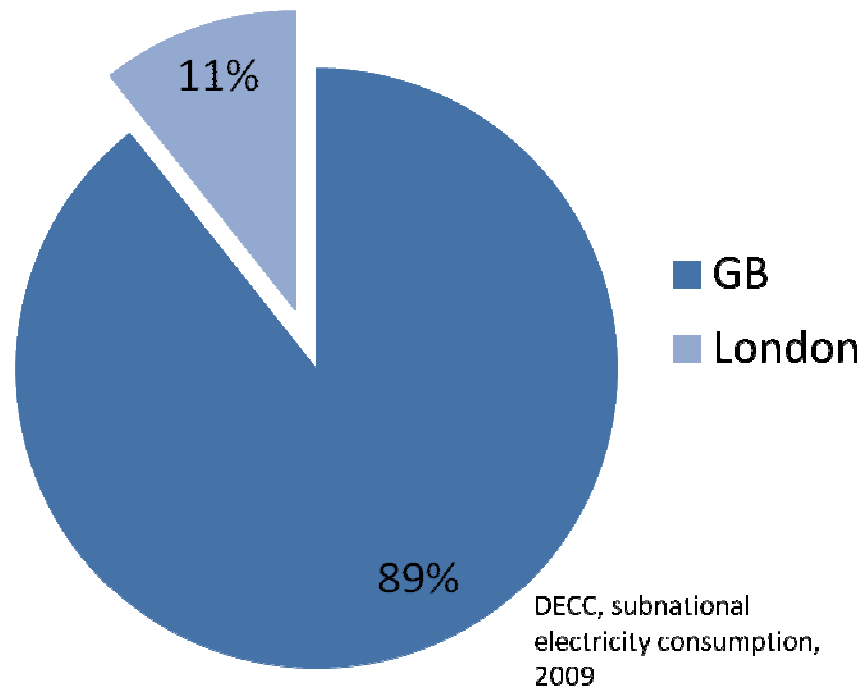
■ UK overall ■ Greater London



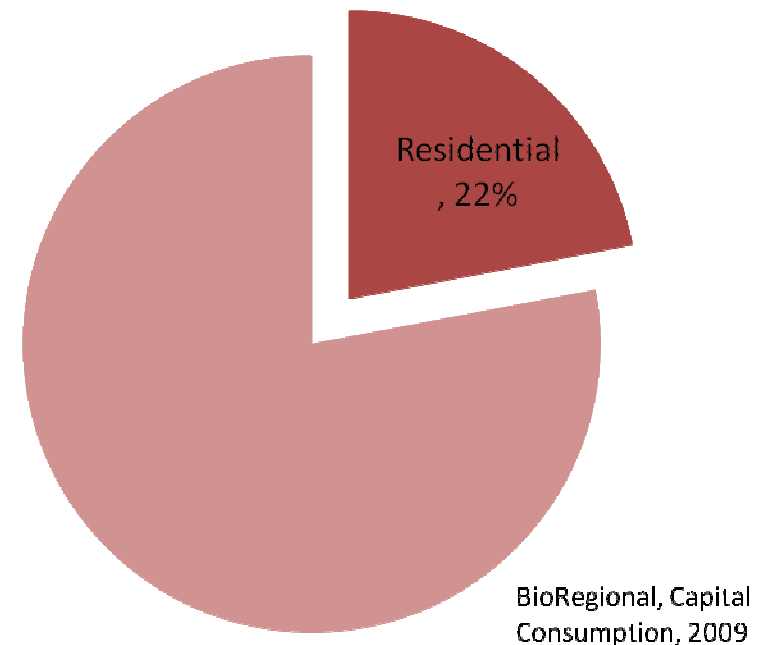
<http://www.caci.co.uk/395.aspx>

London may not be representative of the UK, but with a population of 8 million, a Low Carbon London is an essential part of a low carbon UK.

**Electricity consumption (GWh)**



**London energy use**



# Our approach to sampling

- We wish to represent London
- We are sampling within LPN network area
- We are using Acorn data as a guide to ensure samples are representative of Greater London
  - Income
  - Occupancy
  - Household make-up
  - Building type

# **TRIAL DESIGN**

# National Grid DR service descriptions

## **Frequency Response**

National Grid procures frequency response services, to keep the electricity system frequency close to 50Hz on a second by second basis, by automatically altering the production or consumption of electricity in real time. A typical demand side provider of frequency response services would have electricity load that could be shed instantaneously and automatically in the event of a significant variation in system frequency. Trigger levels are set to statistically manage how many times per year this is likely to happen.

## **Fast Reserve**

National Grid procures fast reserve to meet large, rapid rates of change of demand for which conventional power stations are too slow to respond. A typical demand side provider of fast reserve would be very large (e.g. tens of megawatts) and, upon receipt of an electronic instruction from National Grid, would be able to start backup generation and/or reduce demand very quickly (e.g. within a couple of minutes) and run for a short period.

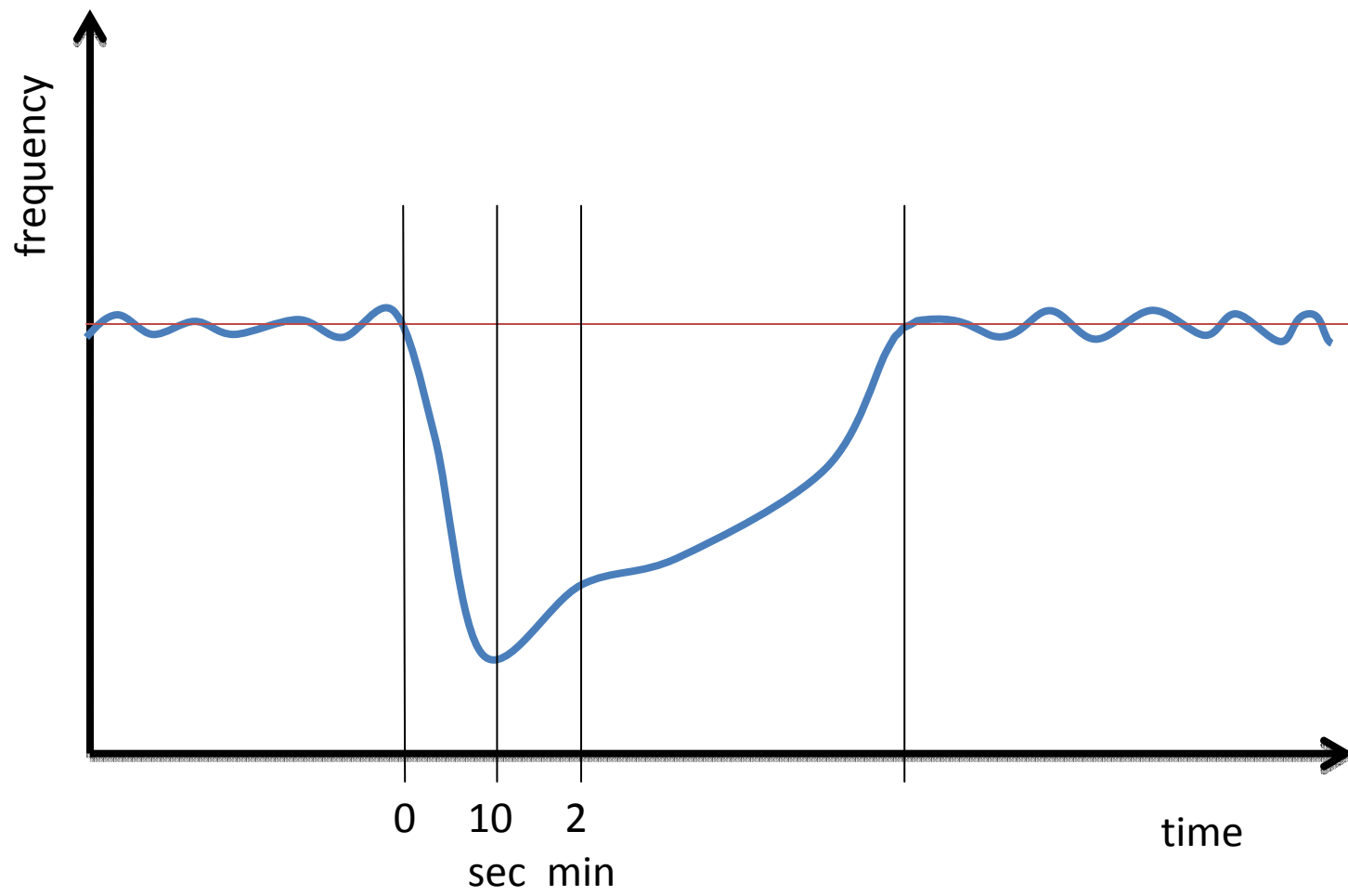
## **Short Term Operating Reserve (STOR)**

National Grid procures STOR during defined times of the day, in order to have reserves available to cater for general variations in demand and generation failures. A typical demand side provider of STOR would, upon receipt of an electronic instruction from National Grid, be able to start back up generation and/or reduce electricity demand within timescales of up to four hours, and be able to run for a couple of hours.

## **Constraint Management**

National Grid procures Constraint Management Services to alleviate localised power flow constraints on the high voltage transmission network, for example during a planned network maintenance activity. A typical demand side provider would be able to, on a pre-planned basis, shutdown its demand or run backup generation continuously for a sustained period, e.g. a number of days. Occasionally the need for the service would only be for defined periods during the daytime.

<http://www.nationalgrid.com/uk/Electricity/Balancing/demandside/servicedescriptions/>



What are we testing?

What are the opportunities for demand response?

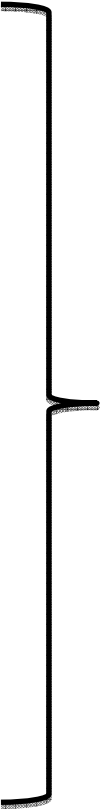
Service	Benefit	Required response time	Duration
<b>Frequency response:</b> automatic regulation of system frequency	<ul style="list-style-type: none"> <li>Improving generation system's reliability and security</li> </ul>	~ 2 secs	~ 2-30 mins
<b>Fast reserve:</b> for large rapid changes in demand or supply	<ul style="list-style-type: none"> <li>Reduced generation capacity margin</li> <li>Improving generation system's reliability and security</li> <li>Reduced CO<sub>2</sub> emissions as spinning reserve is substituted</li> </ul>	< 2 mins	> 15 mins
<b>Constraint management:</b> Unplanned outage	<ul style="list-style-type: none"> <li>Reduced load shed from outages due to reactive management</li> </ul>	mins hours	hours days
<b>Constraint management:</b> Planned outage	<ul style="list-style-type: none"> <li>Reduced load shed from outages due to reactive management</li> </ul>	days	hours days
<b>Constraint management:</b> Peak avoidance	<ul style="list-style-type: none"> <li>Reduced capacity margin and increased load factor from peak smoothing</li> <li>Investment deferral due to higher load factors</li> </ul>	N/A days	static dynamic
<b>Short term operating reserve (STOR):</b> for general variations in demand or supply	<ul style="list-style-type: none"> <li>Deferred investment in peaking plant</li> <li>Reduced CO<sub>2</sub> emissions as peaking plant is substituted</li> </ul>	< 4 hours	> 2 hours
<b>Supply following:</b> for renewable integration and absorption	<ul style="list-style-type: none"> <li>Reduced CO<sub>2</sub> emissions as fossil plant is substituted for renewable energy</li> <li>Reduced wind curtailment</li> <li>Truer to market interactions between the demand and supply side</li> </ul>	days hours	dynamic

Not technically feasible

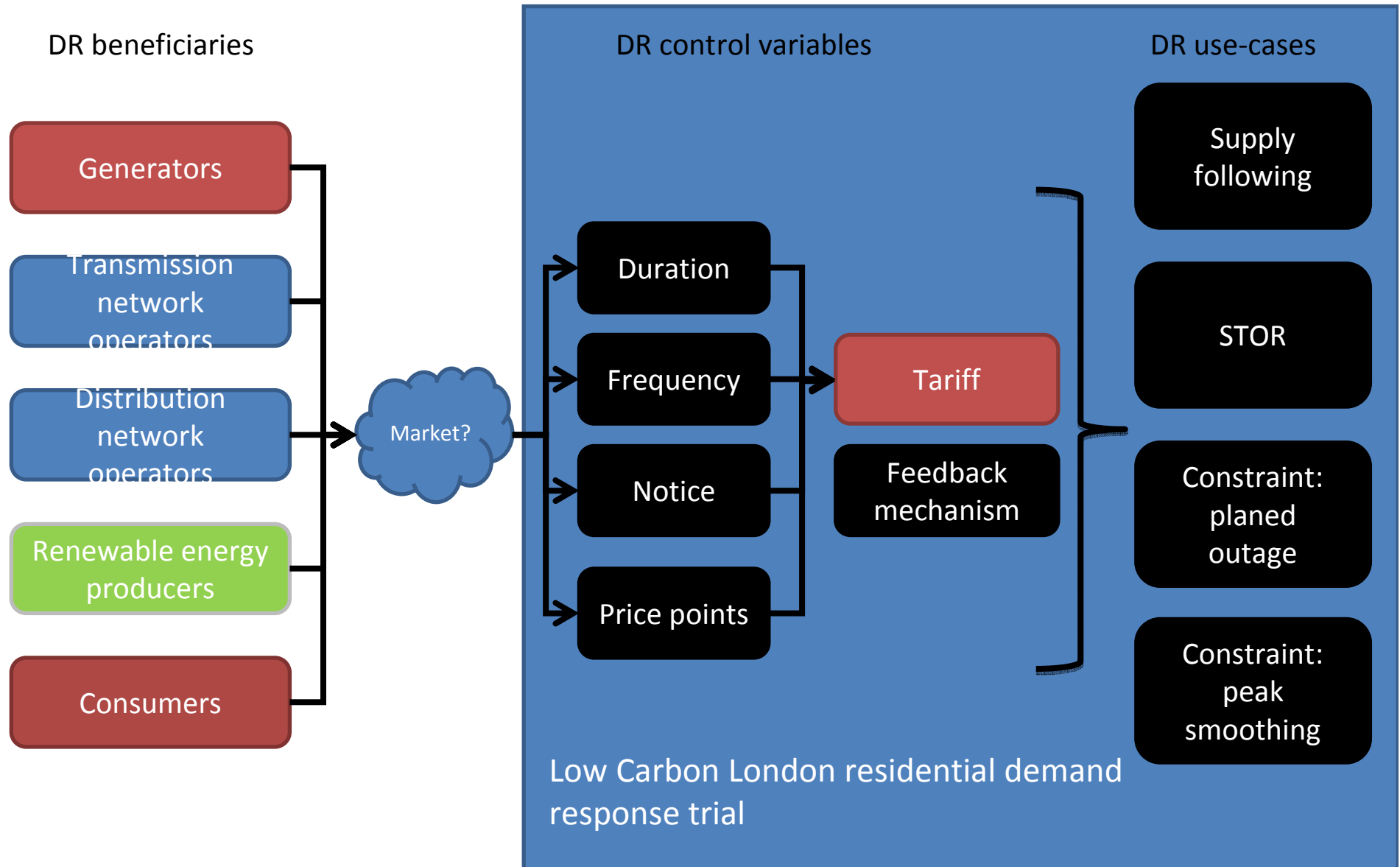
Potential for  
LCL demonstrator

# Tariff design

# What can we control?

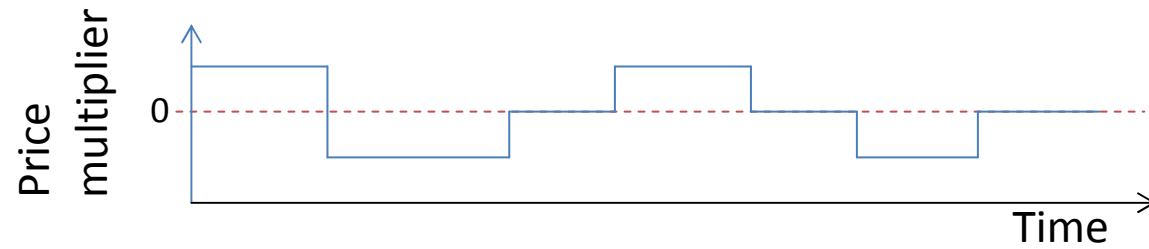
- **Duration** of DR action
  - **Frequency** of DR actions
  - **Notice** period of tariff changes
  - **Price points** (incentives and disincentives)
- 
- Tariff
- **Feedback** type and communications
    - E.g. in home display; website; paper bills...

# High level concept

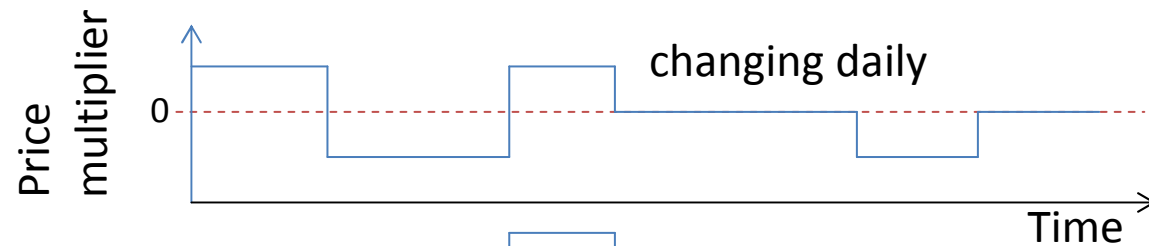


# Tariff type examples

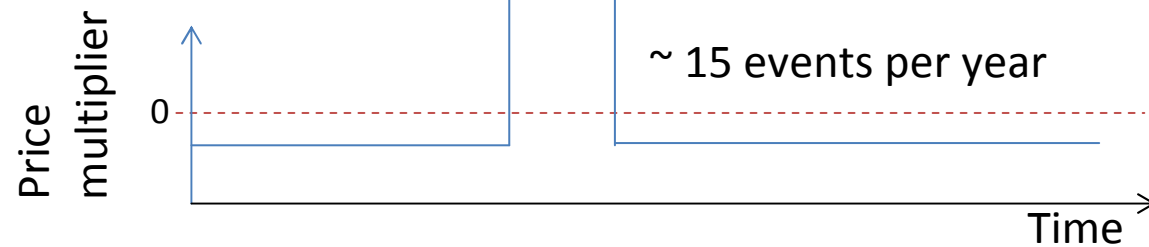
Static



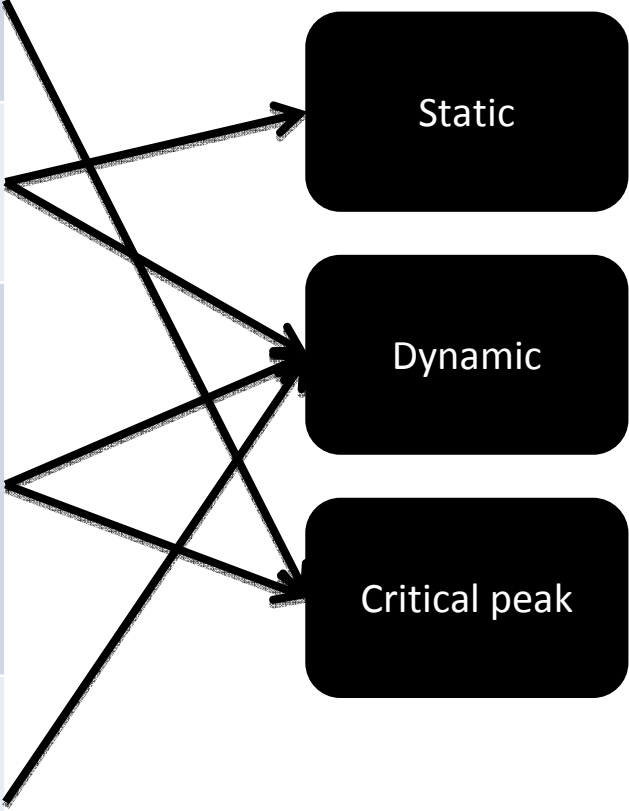
Dynamic



Critical peak



# Thinking about tariff structure (example values)

Use-case	Notice	Duration	Frequency	
<b>Constraint management:</b> Planned outage	days	hours days	yearly weekly daily	 <pre>graph LR; F1[yearly weekly daily] --&gt; S[Static]; F1 --&gt; D[Dynamic]; F1 --&gt; CP[Critical peak]; F2[continuous] --&gt; S; F2 --&gt; D; F2 --&gt; CP; F3[~3/week] --&gt; S; F3 --&gt; D; F3 --&gt; CP; F4[continuous] --&gt; S; F4 --&gt; D; F4 --&gt; CP;</pre>
<b>Constraint management:</b> Peak avoidance	N/A days	static dynamic	continuous	
<b>Short term operating reserve (STOR):</b> for general variations in demand or supply	< 4 hours	> 2 hours	~3/week	
<b>Supply following:</b> for renewable integration and absorption	days hours	dynamic	continuous	

This work continues...

Experimental blocking

# Volume increasing design

Complete factorial

$$y = \beta_0 + \underbrace{\beta_1 x_1 + \beta_2 x_2}_{\text{main effect}} + \dots + \epsilon$$

$$m = \sum_{k=0}^n \binom{n}{k}$$

$y = -1$  = Treatment 1

$\beta_7 x_1 x_2 x_3$  = Treatment 2

$$X_1 = 1$$

$$X_1 =$$

This is a big number.

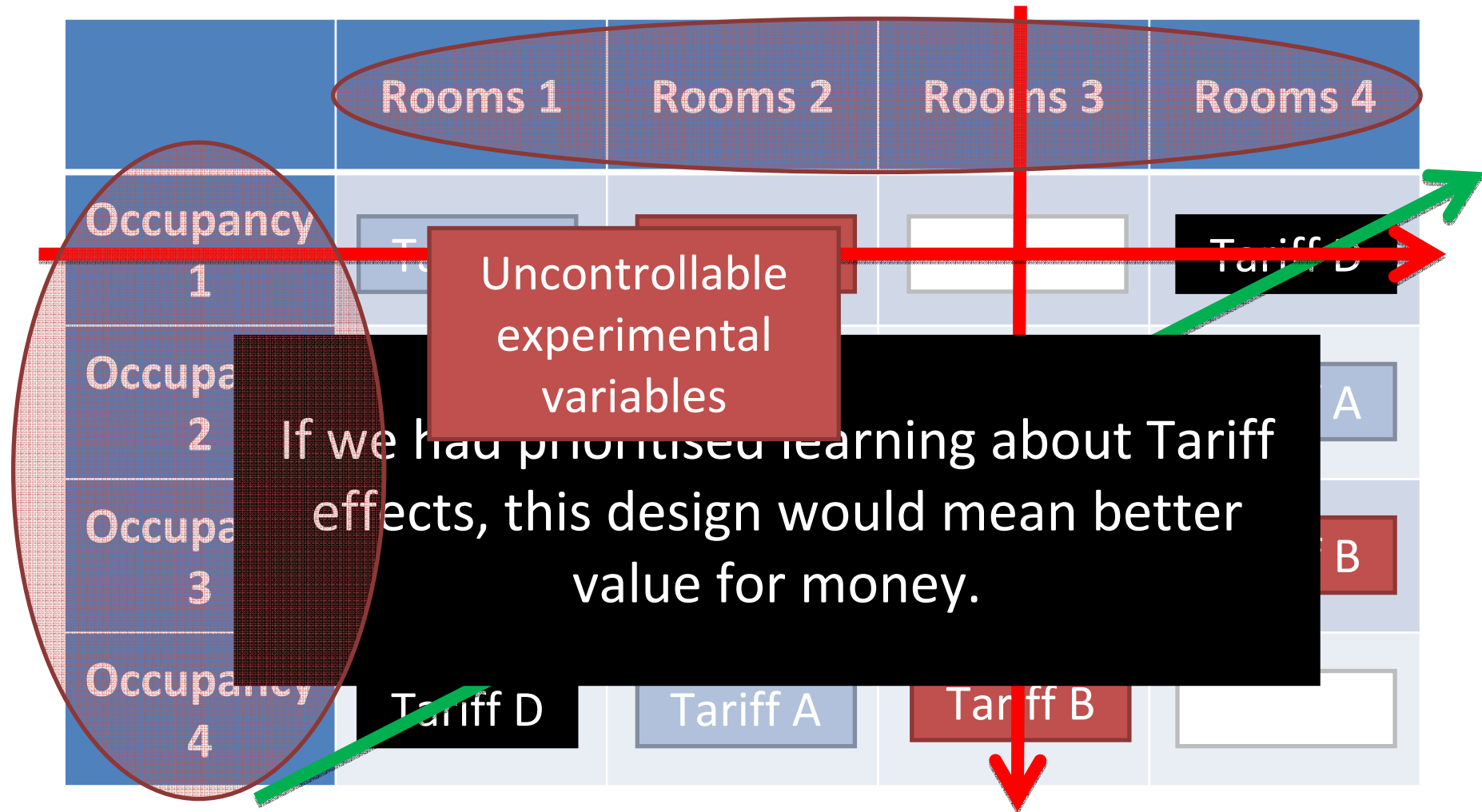
So, we can't observe everything.

We must prioritise what we need to know. Treatment 3

Treatment 4

# Volume increasing design

Incomplete block – e.g. Latin square



Thank you for listening.

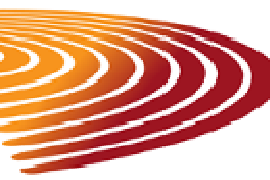
Any questions?

# Next steps – what the trials will look like

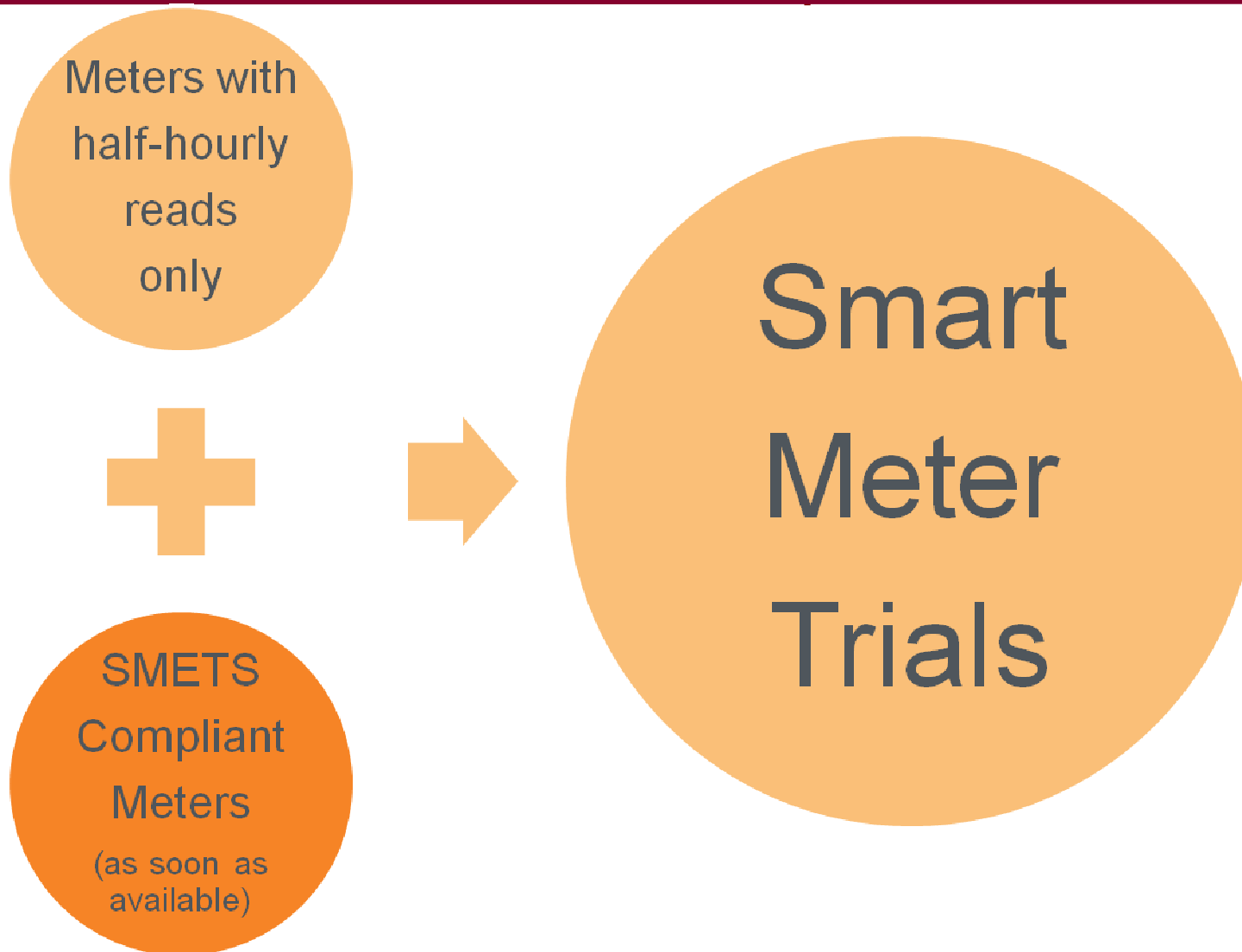
Brian Kelly  
Low Carbon London



UK  
Power  
Networks



# A mixture of smart meter capabilities



# Smart meters will be installed as both primary and secondary meters <sup>Unrestricted</sup>

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Primary meters



Smart  
Meter  
Tariff  
Trials

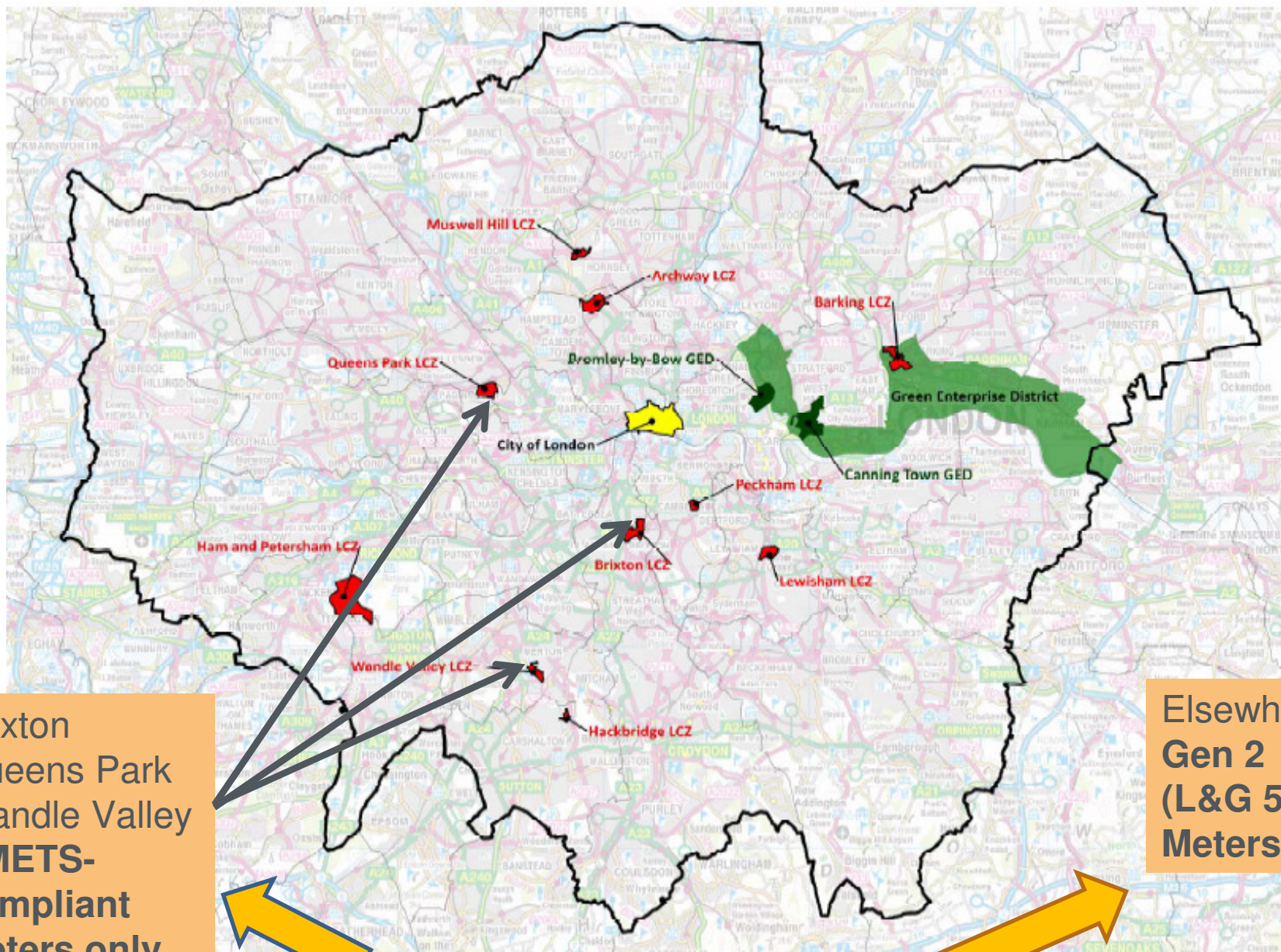
Primary  
or secondary  
meters –  
depending on  
participant's  
electricity  
supplier



Heat  
Pumps

PHEV

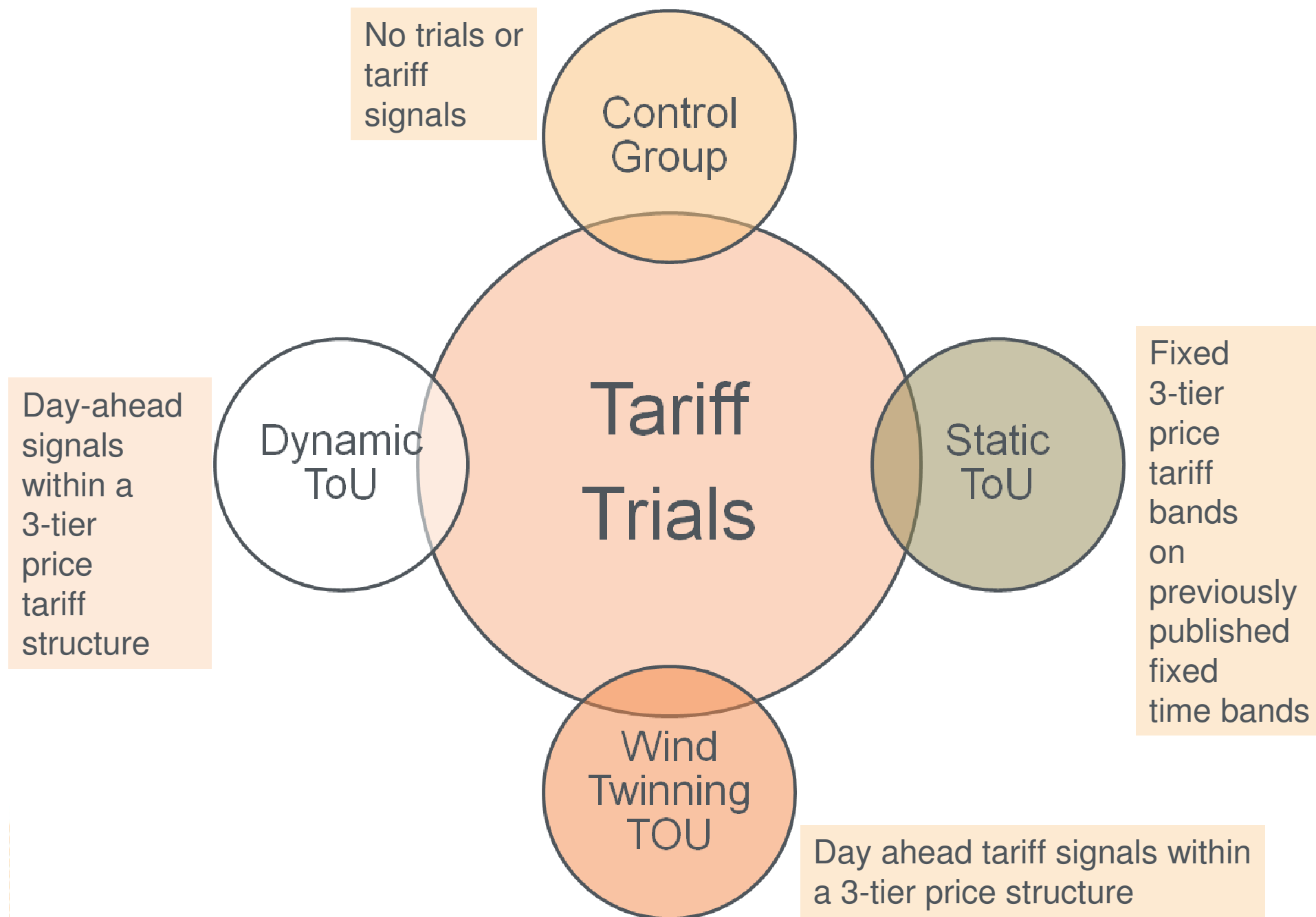
PV

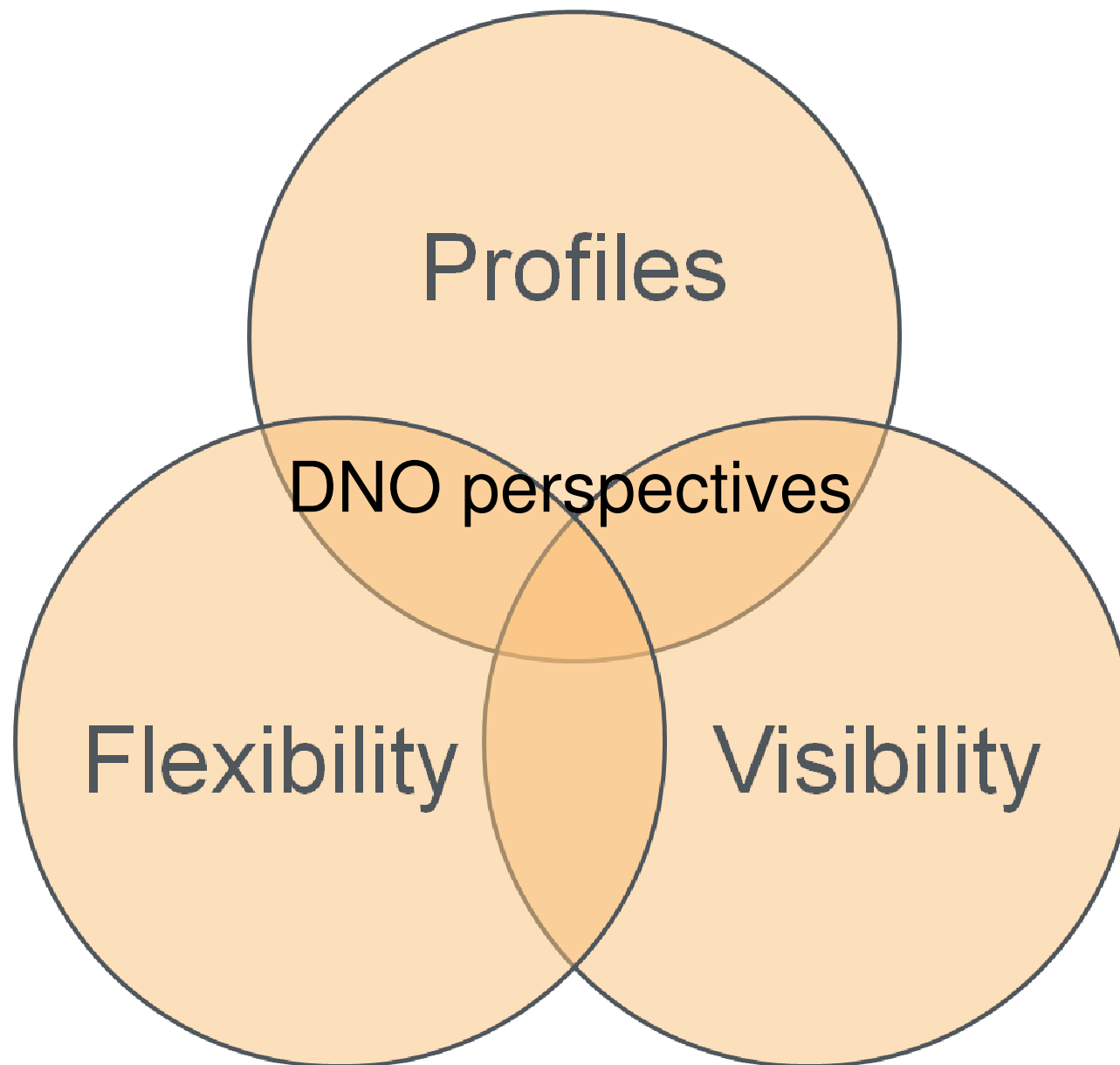


Brixton  
Queens Park  
Wandle Valley  
**SMETS-**  
compliant  
Meters only

Elsewhere:  
**Gen 2**  
(L&G 5236)  
**Meters only**

Same trial treatments in both





## Profiles

- Assess adequacy of current planning profiles
- Establish load profiles for consumers with low carbon technologies: EV, HP, SSEG, Energy Conservation
- Measure impact of low carbon technologies on power quality
- Understand long-term business scenarios

## Flexibility

- Establish how much load customers can shift
- Establish how much load customers will shift
- How can a DNO most effectively use its assets in a low carbon network?

## Visibility

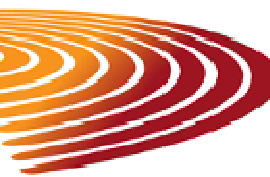
- What can we see and measure, and what can we do with the data?
  - Voltage levels
  - Fault identification and location
  - State estimation for confidence in network measurement and utilisation
  - Visible & managed output from DG
  - Visibility & control of EV charging
- Planning & operating a low carbon network

# Emerging issues

Liam O'Sullivan  
UK Power Networks



UK  
Power  
Networks



# Emerging issues

- Half hourly meter reads from the DCC – limited value to a DNO
- Will a DNO get funding to build its own smart grid measurement infrastructure?
- Why wait for a SMETS-compliant device if the DCC will only collect half hourly reads?
- How to reconcile the drive for tariff simplification with dynamic ToU tariffs?
- How will ToU tariffs work with PHEV charging posts?
- Can a DNO operate an effective ToU DUOS charge?



Thank you for attending, now for lunch!



UK  
Power  
Networks

