



Low Carbon London

Influencing Customer Profiles and New Interactions

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Low Carbon London

Influencing Customer Profiles and New Interactions

- **Introduction of Low Carbon London**
- Time of Use tariffs
- Results from the trials
- Deployment of Time of Use tariffs
- Customer reaction to dToU tariffs
- What did we learn?

Low Carbon London

Overview

One
objective

Present a holistic view of the smart distribution network - grounded in extensive real world data and experience, and justified through cost-benefit analysis and implementation strategies

Three
themes

Demand Side Response &
Distributed Generation

Network planning &
operation

Electrification
of heat &
transport

Six
trial areas



Demand side
response



Dynamic Time
of Use Tariffs



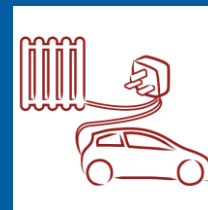
Active Network
Management



Smart meters



Instrumenting
a smart grid

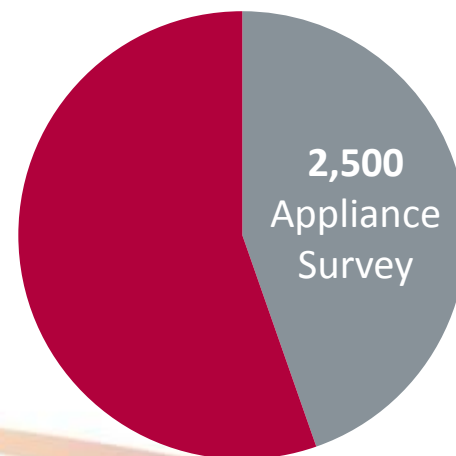
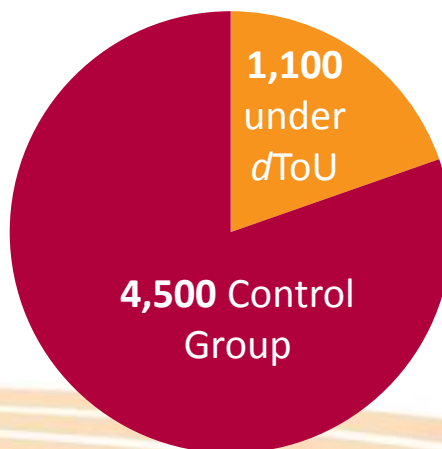


Electrification
of heat & transport

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Smart meters and dynamic tariffs

- Unique smart meter trial in Great Britain
- Statistically robust results: control group of c. 4,500 households
- First appliance survey of this magnitude: survey data from 2,500 households
- Insight to customer perception: 37 semi-structured in-depth interviews



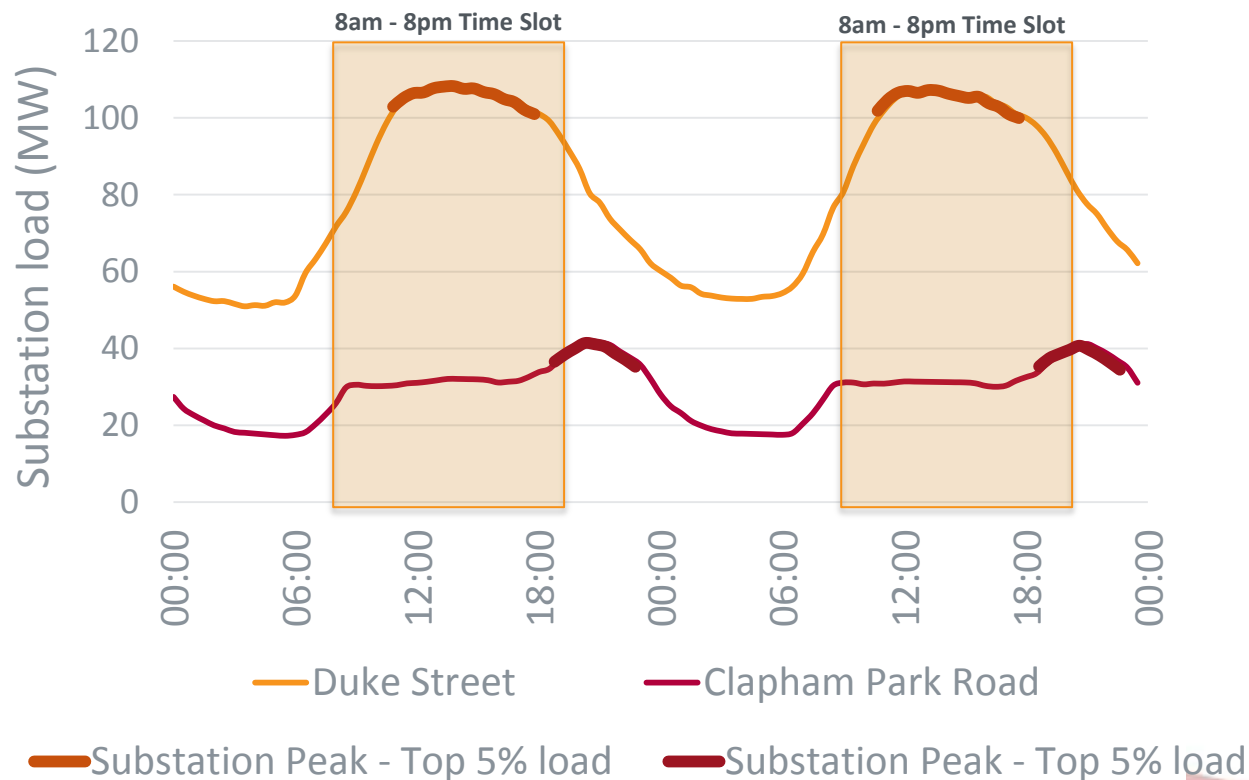
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Time of Use Tariffs



- Static time of use tariffs can present network benefits

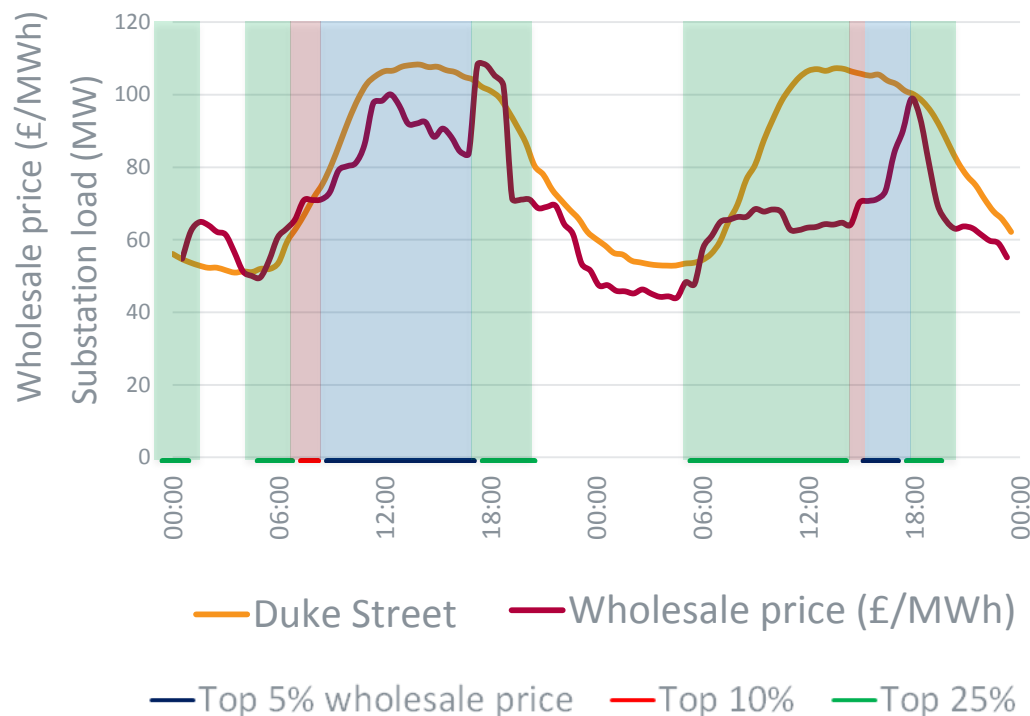


Dynamic Time of Use Tariffs

Wholesale price-driven tariffs



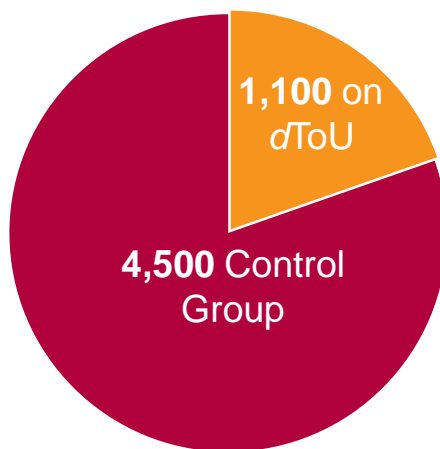
- Supplier needs and DNO needs are unlikely to be sufficiently aligned for network benefits to be realised as a result of a wholesale price-driven ToU tariff.



Dynamic Time of Use Tariffs

The Low Carbon London approach

- ToU initiatives in GB have been focused on static tariffs; **this is the first time a large scale *dynamic* ToU domestic tariff** has been tested in GB
- Three price bands:



High: 67.20 p/kWh
Default: 11.76 p/kWh
Low: 3.99 p/kWh

Fixed rate: 14.23 p/kWh

- Two applications tested: Constraint Management and Supply Following

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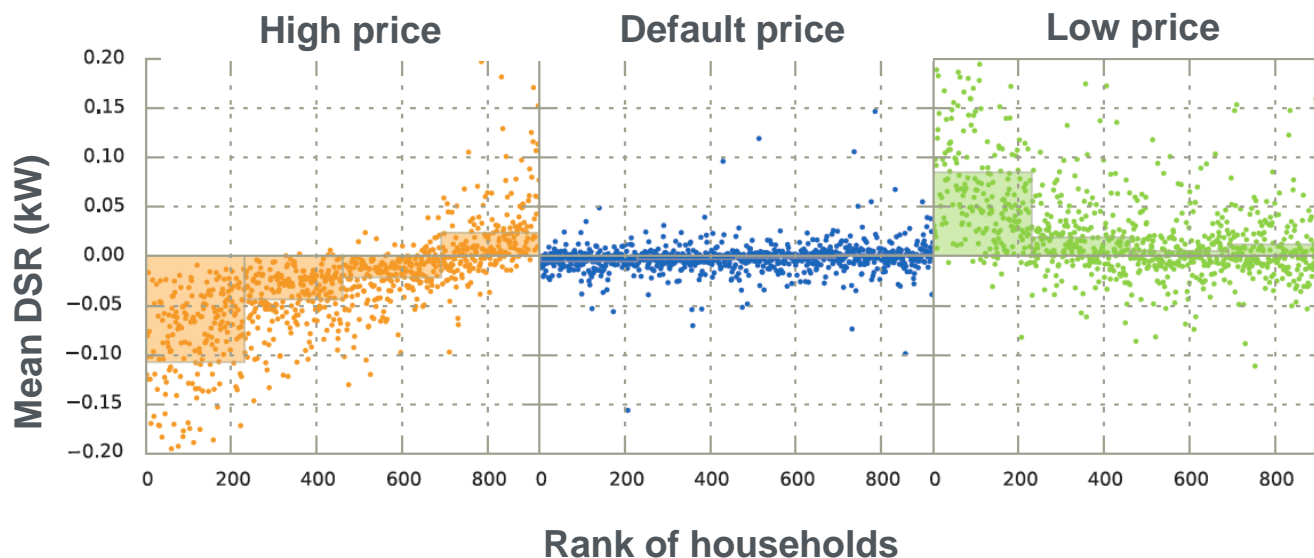
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Dynamic Time of Use Tariffs

Low Carbon London Results



- The results demonstrate a robust reduction in average load of approximately **0.05 kW/household**



Household performance rank against measured DSR, by price band

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Dynamic Time of Use Tariffs

How can DNOs deploy such a tariff?



We have looked at two scenarios:

- **Voluntary**

- Based on LCL uptake from LCL trial:

- Assumes 24% uptake
 - Costs of £207/customer

- **Mandatory**

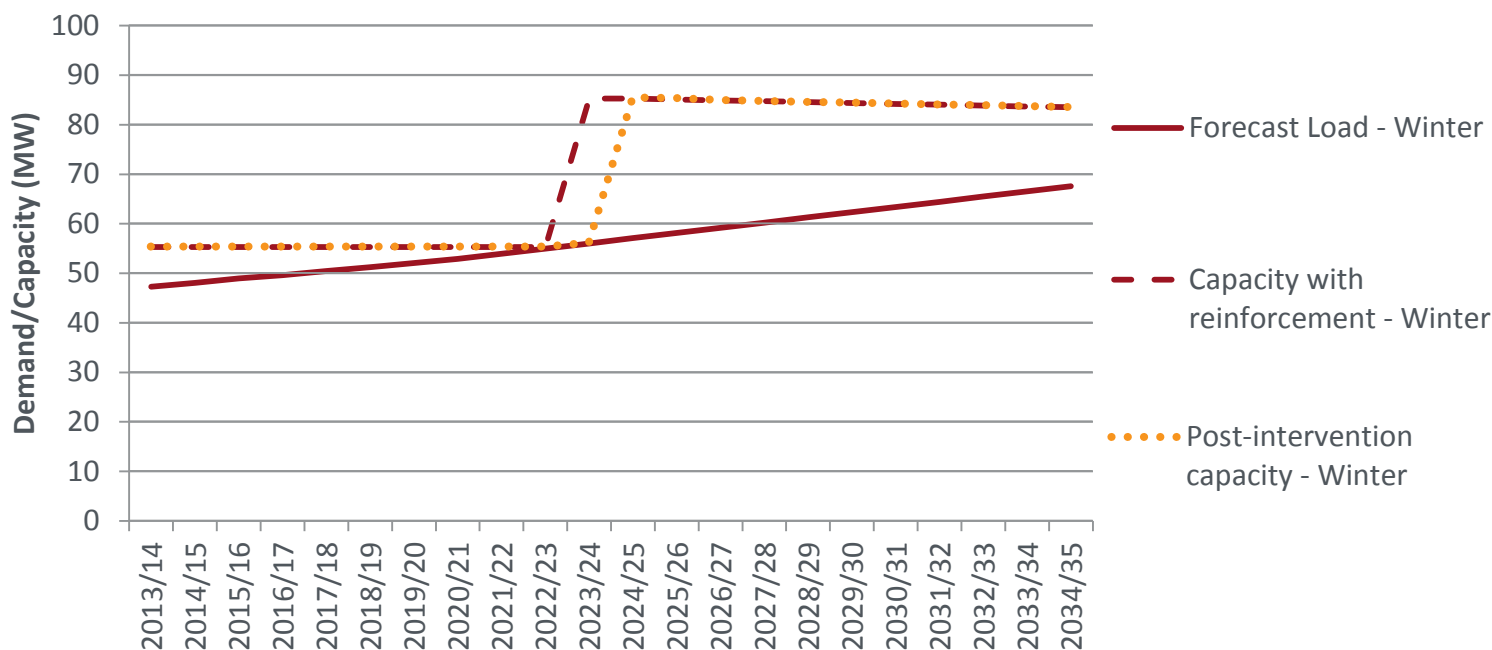
- Where the tariff is imposed (i.e. assuming 100% response)

- mandating suppliers to pass through a dToU price signal through DUoS charges

Dynamic Time of Use Tariffs

Whiston Road Case Study

- Whiston Road case study: 19,500 domestic customers



Dynamic Time of Use Tariffs

Whiston Road Case Study

- Whiston Road case study: 19,500 domestic customers

	Voluntary	Mandatory
Uptake	24%	100%
Deferral	No deferral	1 year
Cost per household	£207 based on trial costs	Viable only if <£25

- Up to £25 contribution to costs could be funded by network benefits

Dynamic Time of Use Tariffs

Cost Benefit Analysis



- A $dToU$ price signal could be used to defer reinforcement spend at some substations
- The value of $dToU$ may triple if the average response improved
- High costs and low benefits mean that voluntary uptake of $dToU$ tariffs is unlikely to be of value to the DNO
- The benefits of applying $dToU$ to manage outages are outweighed by the costs

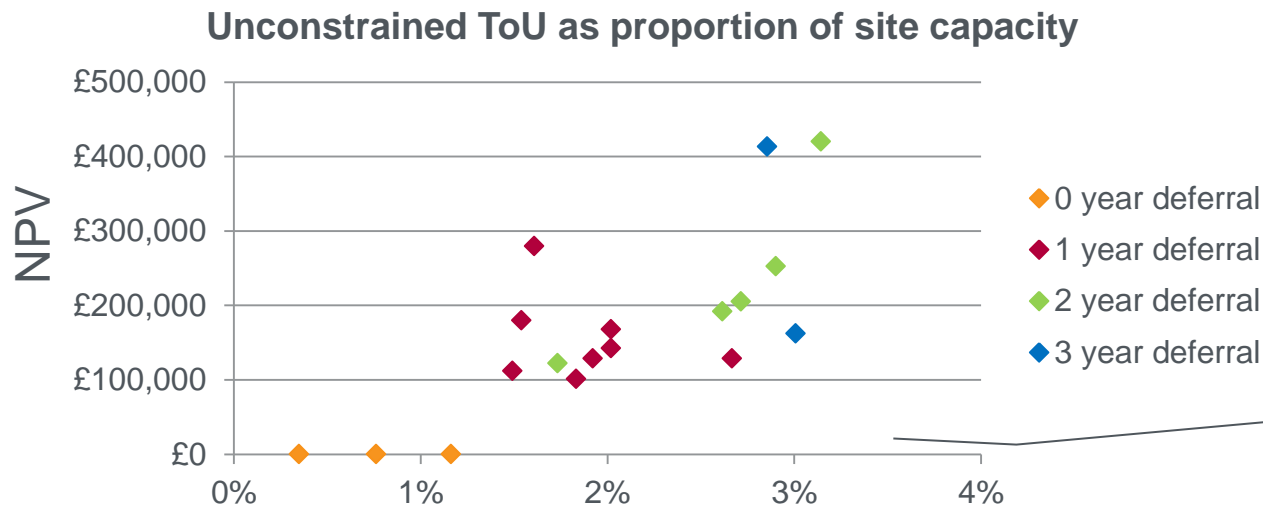
£k (real 2012/13)	NPV	Totex impact ED1	Totex impact ED2
Reinforcement deferral			
Whiston Road case study	333	1,059	(1,074)

Dynamic Time of Use Tariffs

Extrapolative Analysis



- The benefit available from a dToU price response will be higher where there is a higher domestic consumer population signed up
- Before considering implementation costs, **£2.13m of benefits** could be available to the DNO through deferring reinforcement



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

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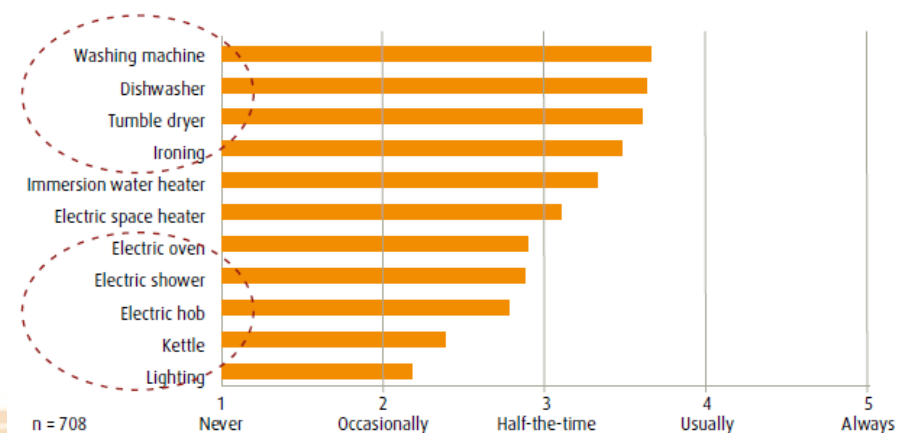
Dynamic Time of Use Tariffs

Low Carbon London Results



- Highly engaged households (low rank index) tend to decrease their consumption in response to high price signals and increase in response to low price signals
- Customers appear to be keen to participate in Time of Use tariffs

Appliances for which households reported flexibility in avoiding high prices on the tariff



Positive statement on dToU tariff	% agree or strongly agree	% disagree or strongly disagree
Greater sense of control	71	24
Worth the hassle	67	28
Enjoyed some aspects	55	39
No reduction in quality of life	75	19
Do not find tariff complex	79	16
Effort sustainable long term	79	15
Good for motivating us to get chores/activities done	80	7
Helped planning/organising/remembering activities/chores	77	10
Taught young about the cost of energy	71	14

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Time of Use tariffs

Lessons Learned

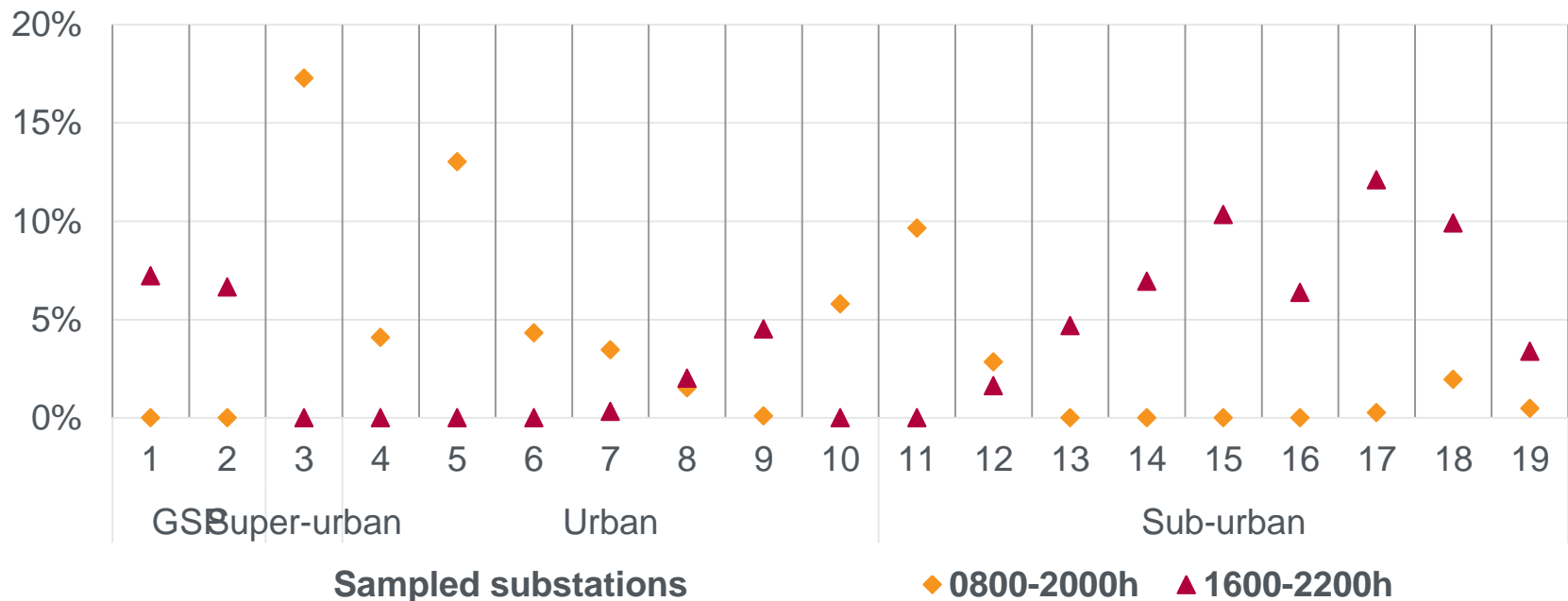


- The trial results suggest that on average $dToU$ customers provided a response of c. 50 W, and that the best responders provided a response of three times this size
- Customers understand and engage with Time of use tariffs
- However, for DNOs, the use of $dToU$ tariffs to realise network benefits is also likely to be less cost-effective than using I&C Demand Side Response

Network benefits of supplier led tariffs

- There is potential for peak load to be reduced by static ToU tariffs at many substations in the sample

Substation peak reduction (%) if peak is shifted outside of targeted time slice



Dynamic Time of Use Tariffs

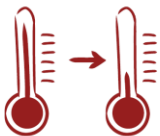
When would a dToU tariff work for a DNO?



In future, the business case for DNO applications of dynamic ToU tariffs might be revisited, if at least some of the following criteria were met:

- Uptake of dToU tariffs is close to 100%
- Regulation allows for cross-supplier coordination of DNO ToU price events
- In-home automation leads to higher levels of response
- Other stakeholders (e.g. the SO) are also able to apply ToU price signals through the tariff
- Suppliers already have dToU-ready billing systems in place

Trial outcomes of Low Carbon London



Winter I&C DSR trial completed: 130 MWh contracted - 120 unique events (119 MWh from generation / 11MWh from demand turn-down).



We have analysed driving and charging behaviour for **72 residential and 54 commercial charging points**



We have end to end network monitoring of 3 Engineering Instrumentation Zones by monitoring 106 LV pot end locations



We created the biggest smart meter dataset in the UK: 5,510 EDFE + 10,000 British Gas smart meters across London



Residential dynamic time of use trial completed in February: Over 1,100 people on the 'dToU' trial with a further 4,900 control group.



We secured £420,000 of external revenue by licensing the programme's central trial database and ANM systems for use on another project

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

Partners:





Thank you

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