Industrial & Commercial Demand Side Response and Distributed Generation

Session 3a

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UK Power Networks & Smarter Grid Solutions

Low carbon LONDON
Energising change

UK Power Networks
Delivering your electricity

In Partnership with:

smarter grid solutions

Agenda

- Timeline of DSR and DG design standard development
- Low Carbon London: DSR trials and partners
- Results from the trials
- Contribution to DSR industry discussion
- Next steps – BAU rollout
- Distributed Generation in London
- LCL DG trials
- Security of Supply and Active Control

Timeline of DSR and DG

Design standard development

P2/5

P2/6 need identified to consider DG

ETR130 introduced: Focused on passive, industrial CHP
Based on 18 sites

LCL and DNO industry trials active demand side services

LCN Fund
Low Carbon Networks

Low carbon LONDON
Energising change

Customer-Led Network Revolution

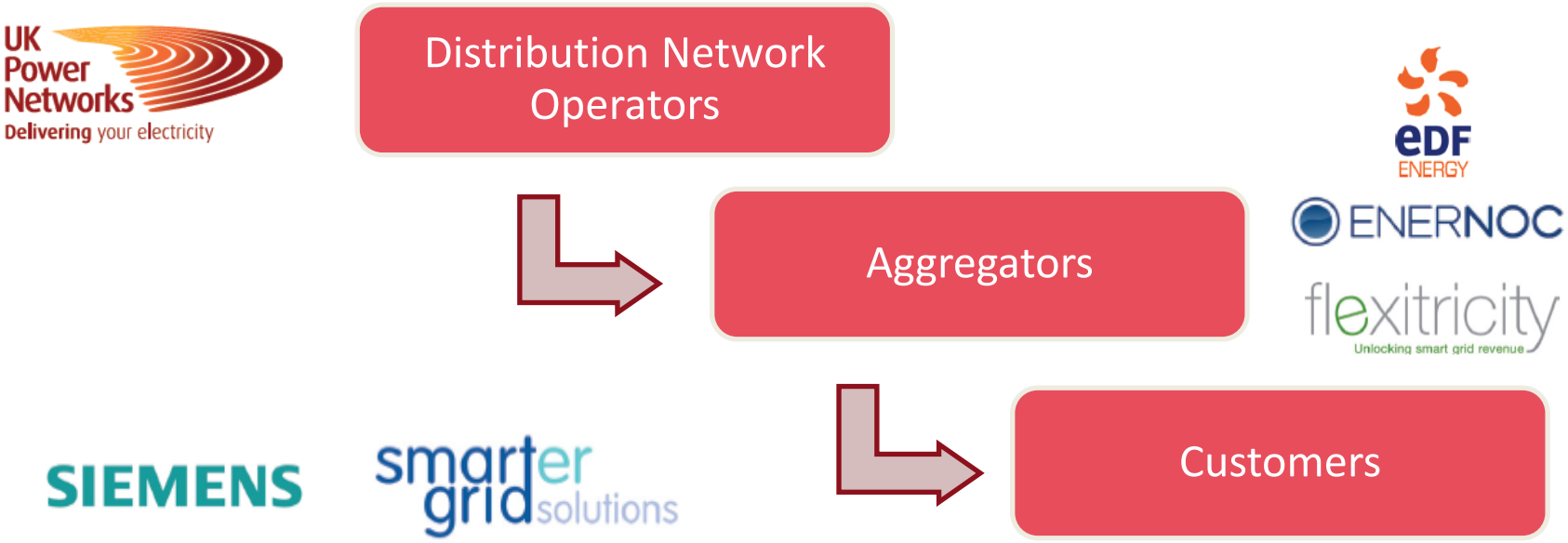
C2C
Capacity to Customers

Concrete recommendations from LCNF Projects

P2/6 Review

Low Carbon London
Trial objectives

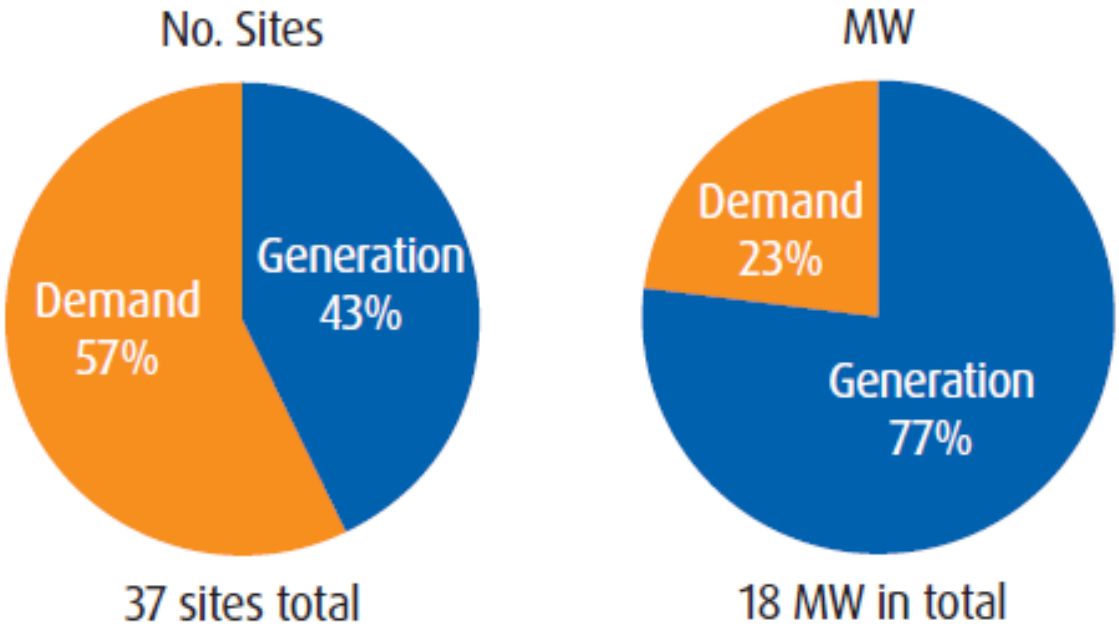
- Investigate the ability of Commercial Aggregators to provide demand response services tailored to the requirements of distribution networks through the control of I&C customers' demand.



I&C DSR Trials

Overview

- 37 sites, 185 unique events
- 372MWh total delivered response



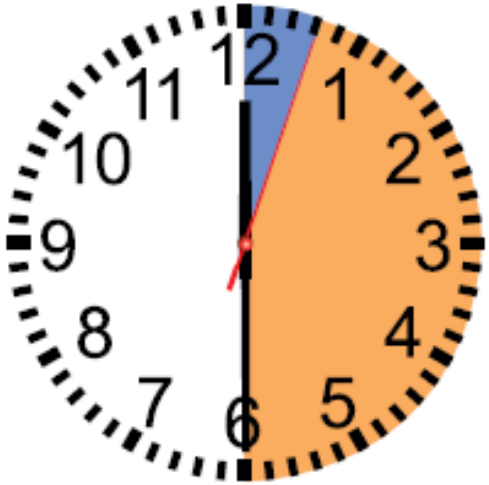
Source: LCL Report A4

I&C DSR Trials

Results

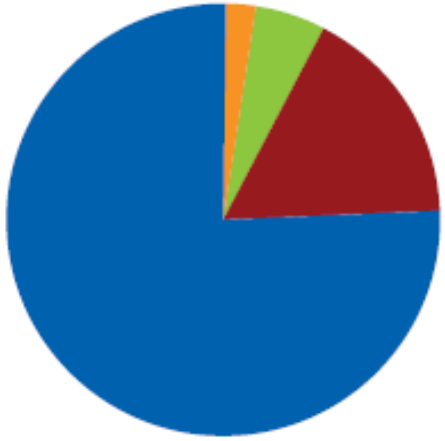
- 16.5MW total demand reduction available in summer 2013 trial
- 90% of events returned a measurable response

Response



2 sites - 3 min response
35 sites - 30 min response

Duration

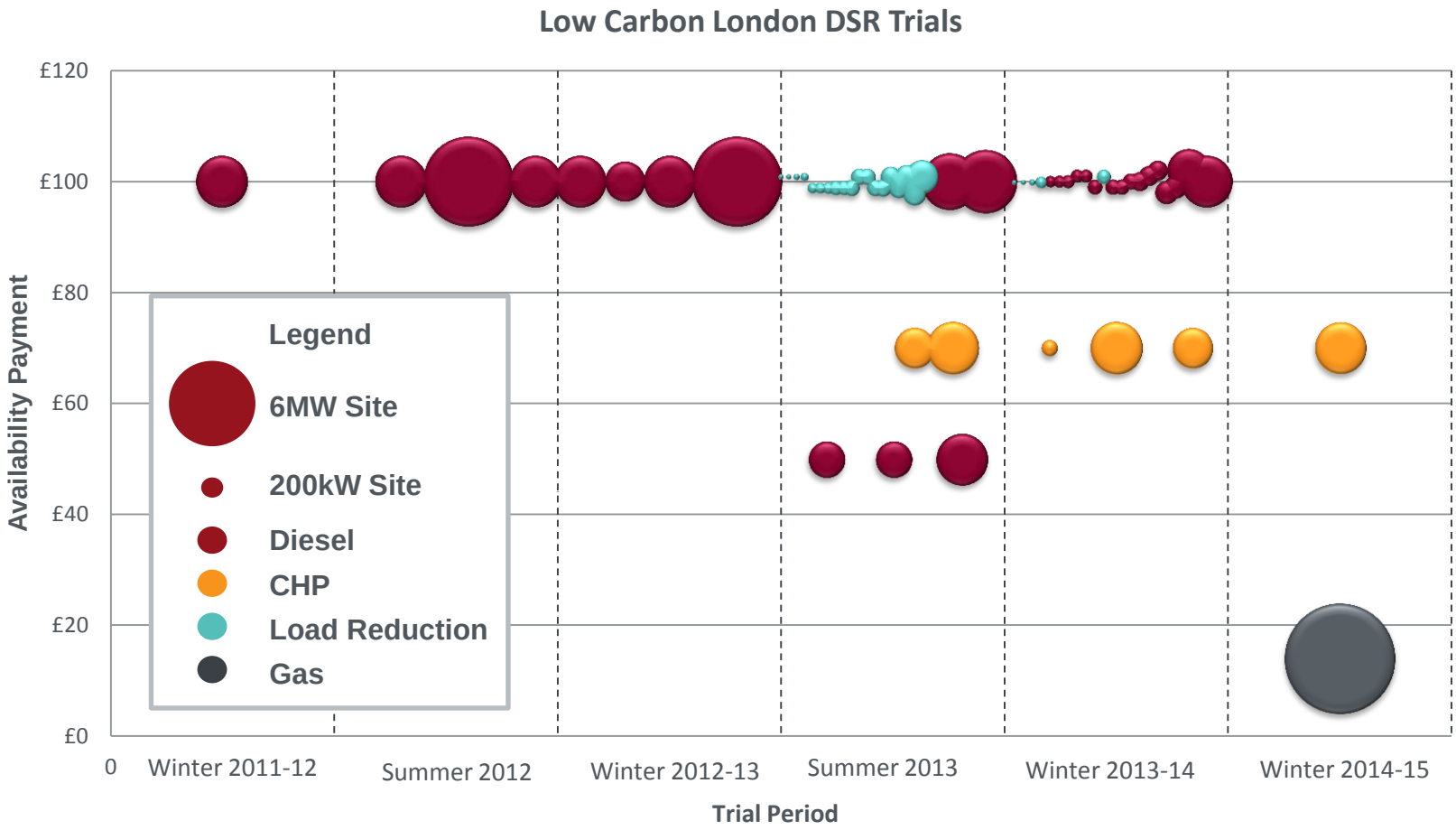


30 min minimum event
1.26 hour average event
4 hour maximum event

Source: LCL Report A4

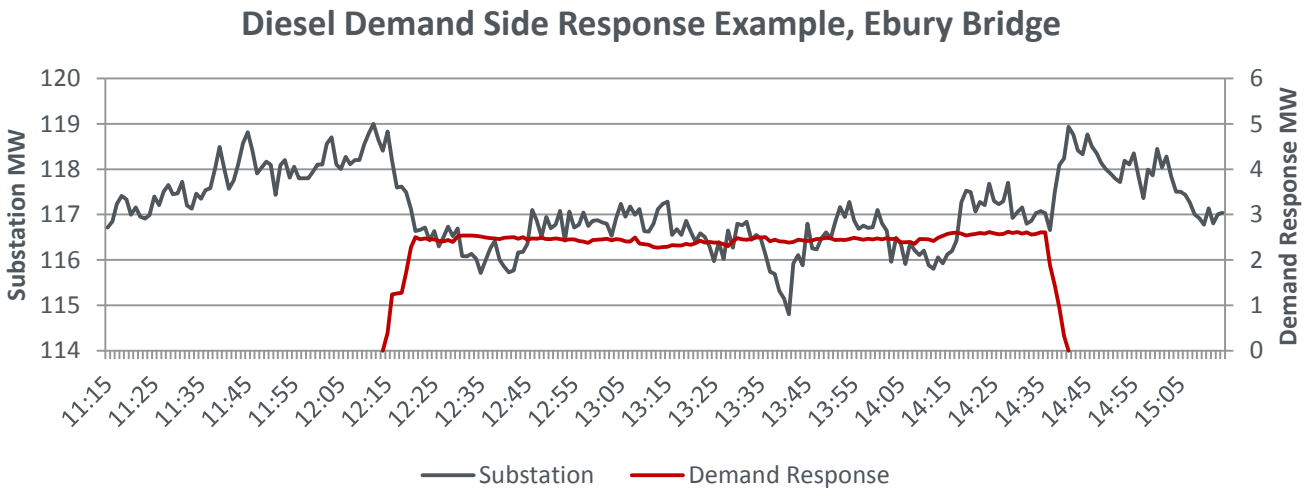
I&C DSR Trials

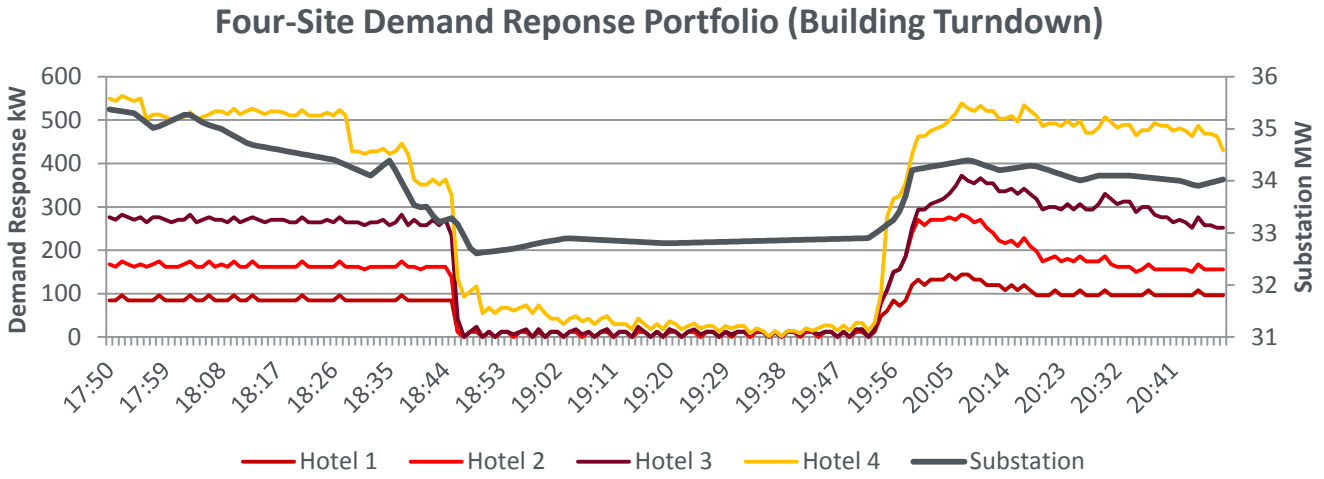
Participation history



I&C DSR Trials

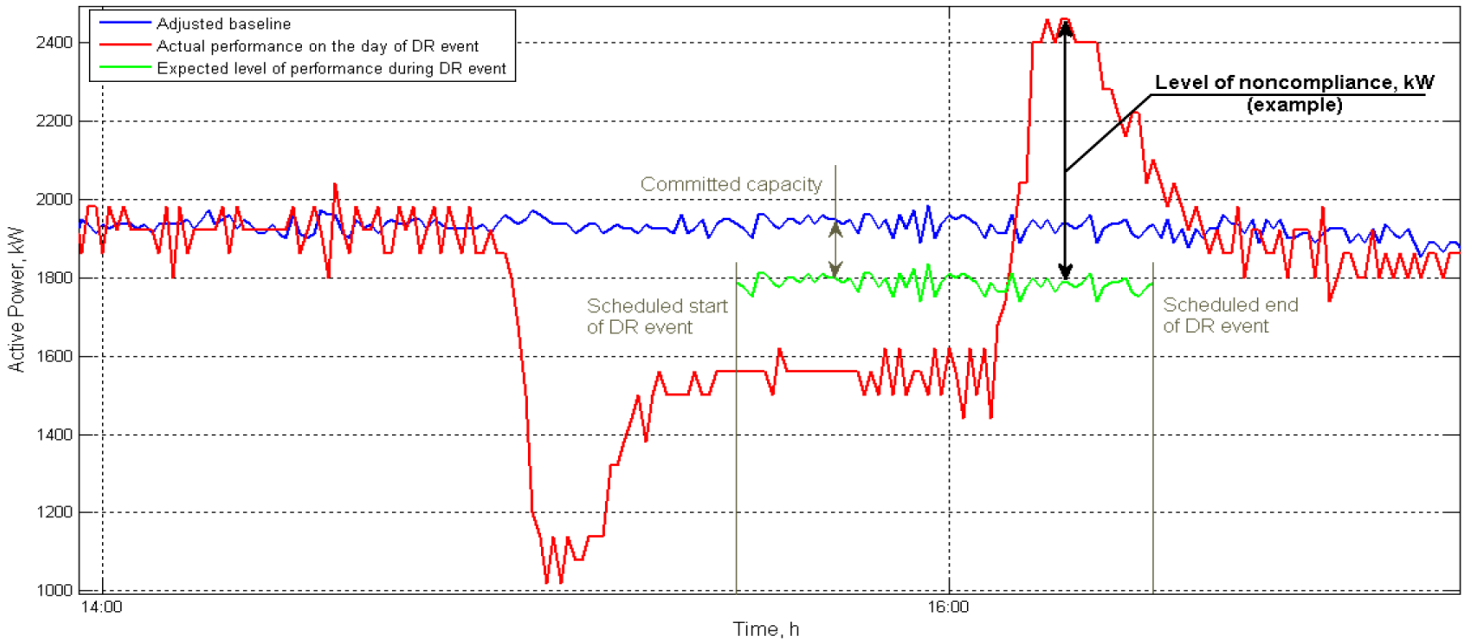
Results





I&C DSR Trials

Payback



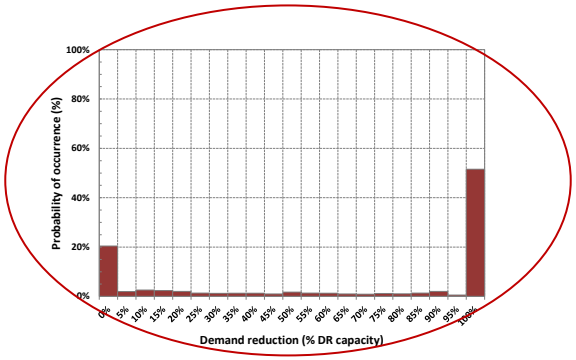
Source: LCL Report A7

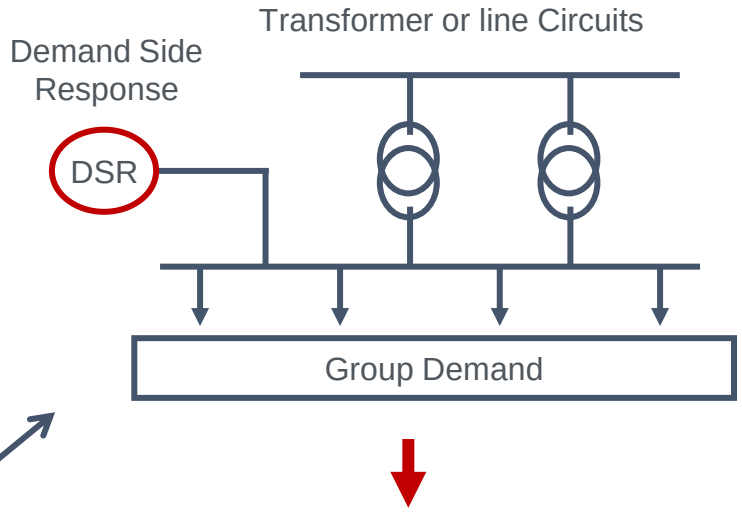
*M. Woolf, T. Ustinova, E. Ortega, H. O'Brien, P. Djapic, G. Strbac, "Distributed generation and demand response services for the smart distribution network", Report A7 for the "Low Carbon London" LCNF project: Imperial College London, 2014.

Demand Side Response

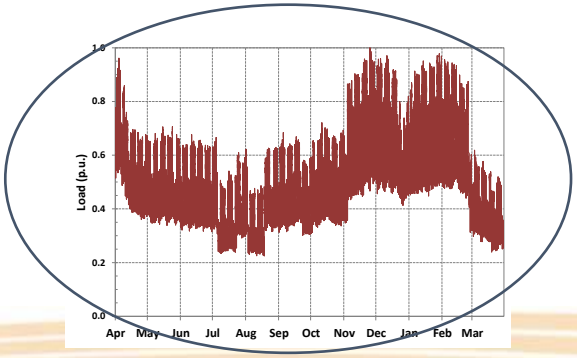
P2/6 Compliance

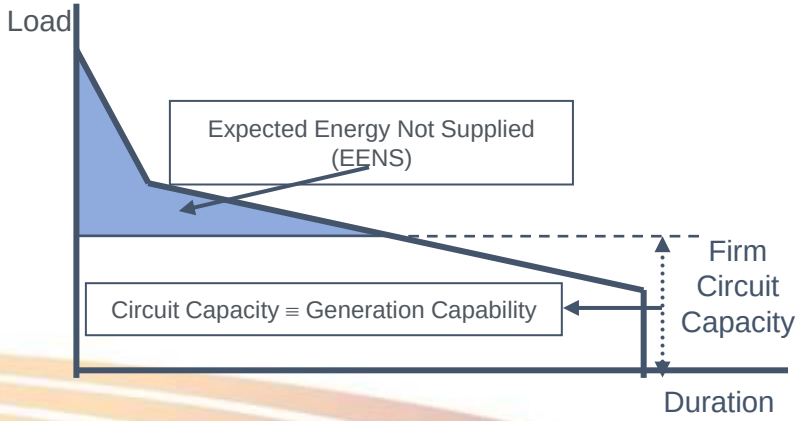
Reliability distribution defined on DSR contract performance (LCL data)





Network Profile defines duration of capacity requirements





Source: LCL Report A4

Demand Side Response
Key LCL Contribution

- DSR procurement needs to take into account the risk of the required level of DSR not being available in the required timeframe
- We do this by establishing F factors which are dependent on DSR technology and a number of facilities available

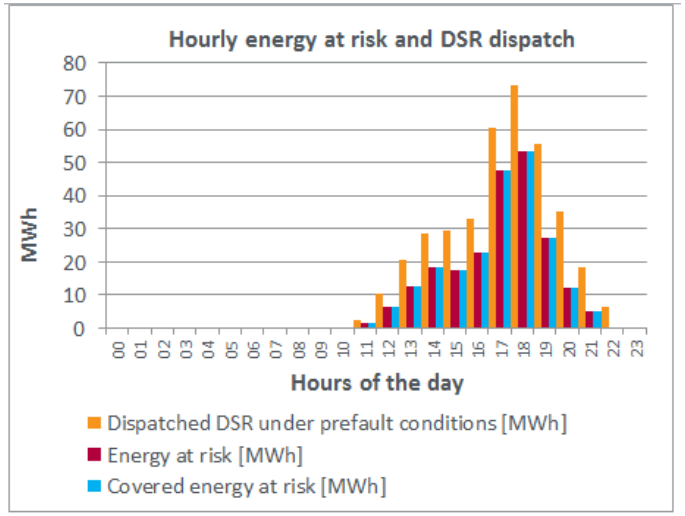
$$DSR\ Required\ to\ be\ Procured\ [MW] = \frac{DSR\ Required\ to\ Meet\ Energy\ at\ Risk\ [MW]}{F\ Factor\ [\%]}$$

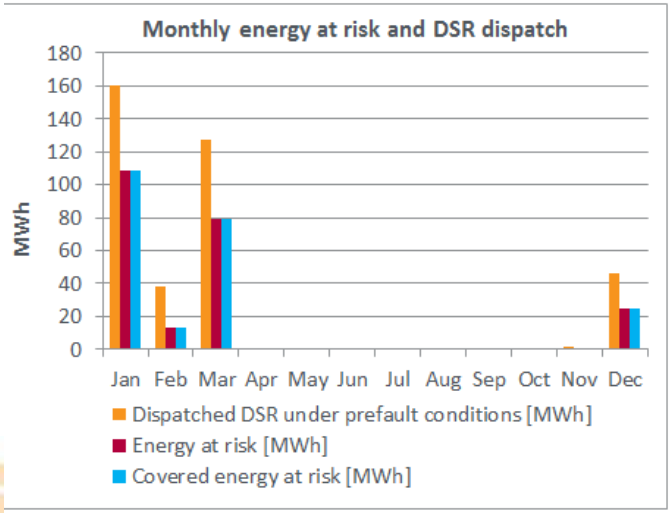
Trial results:

	Number of DSR facilities				
DSR technology type	**1**	**2…**	**5…**	**9**	**10**
Diesel	70%	72%	78%	80%	**81%**
Demand Reduction	**54%**	58%	62%	63%	64%

Demand Side Response
Assessment tool

Demand-side response parameters	
DSR unit characteristics	
DSR type	Diesel
Average unit capacity [MW]	1
Average availability factor [%]	98%
Average reliability factor [%]	88%
Required testing events per year	1
Portable diesel chararacteristics	
Unit capacity [MW]	
Average reliability factor [%]	
Hire fee [£/MW/h]	
Running costs [£/MWh]	





Source: DSR Assessment tool

Demand Side Response
Contract templates

LCL:

- Developed key commercial terms
- Tested baselining methodology
- Produced contract templates

	One off service	Extended Timeframe
DNO : Direct Customer	✓	✓
DNO : Aggregator	✓	✓

Demand Side Response

Next Steps

- Committed to £43m savings in the next 8 years of RIIO-ED1
- Service requirements to be fully detailed prior to engaging the market
- Procurement strategy:
  - Aligned with forecasting and network investment
  - DSR suppliers day and consultation held in January 2015

Distributed generation and security of supply

Low Carbon London set out to address the challenge of enabling and integrating Distributed Generation:

Enabling and Integrating Distributed Generation:

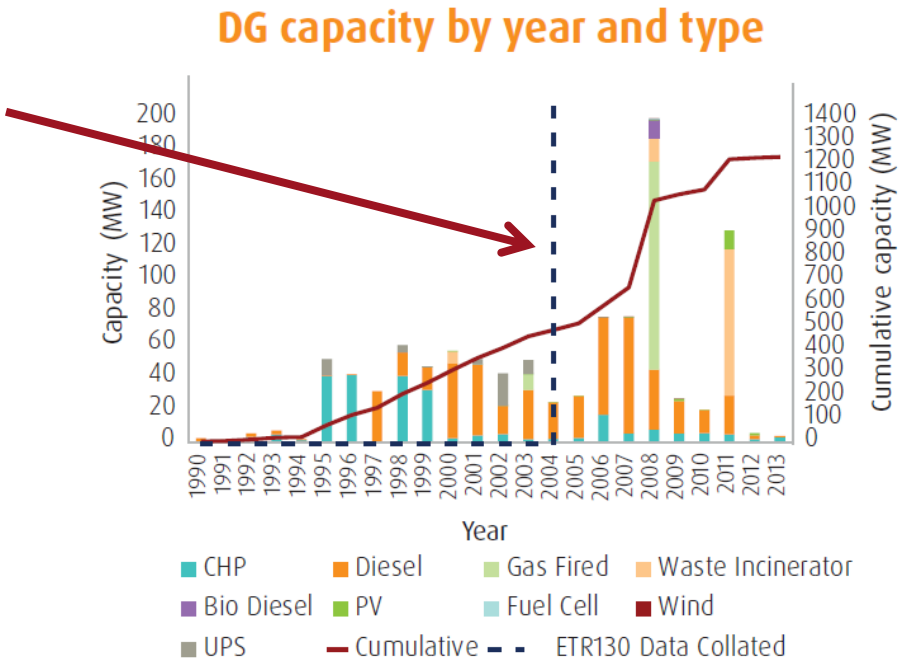
- U02.1 – Monitor and Facilitate DG Connections to the LV and HV Distribution Networks
- U02.2 – Active Management of DG to address security of supply and postpone network reinforcement

Distributed Generation

The DG scene in London

Growth in DG has been rapid and is expected to continue. The diversity of DG has also changed.

ETR130 data collected up to this point



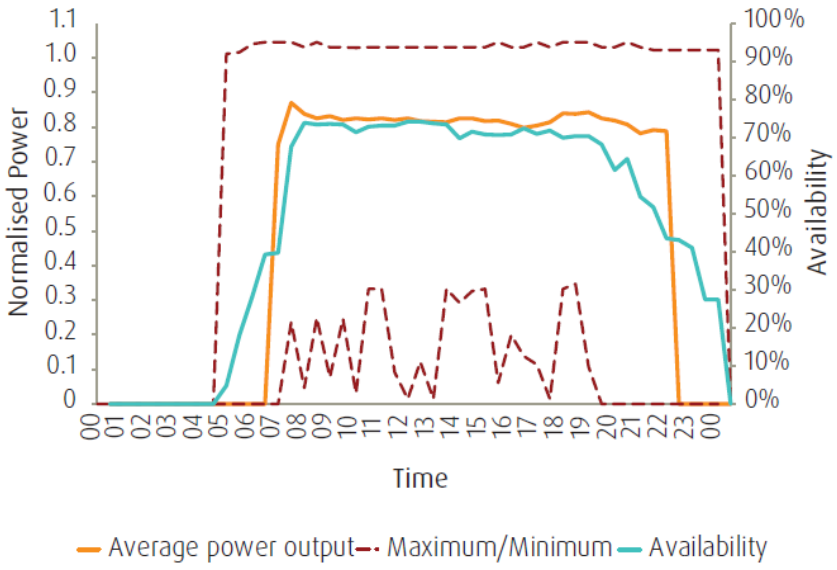
Source: LCL Report A8

Low Carbon London trials

Data monitored

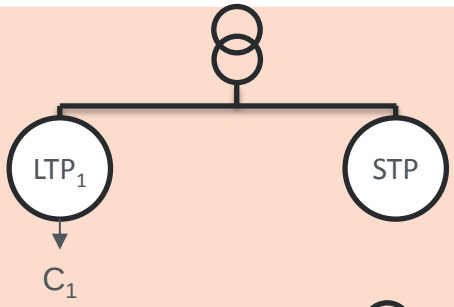
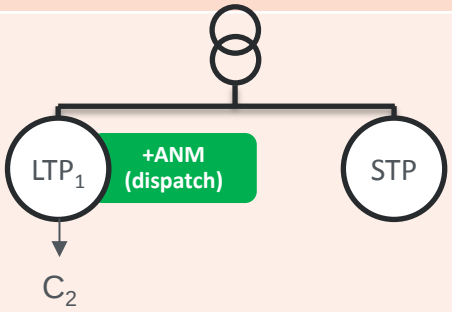
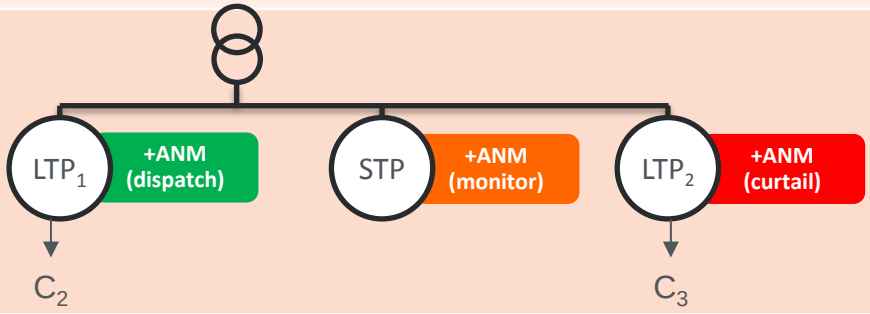
- As part of the LCL monitoring trial, 15 sites were fitted with ANM:
  - 13 CHP
  - 2 PV generators
- Extrapolated behaviour profiles were established using these sources enhanced by other data sets
- ANM trials for 2 sites one CHP and one gas turbine

Summer average power output and availability profiles for cyclic CHP



Source: LCL Report A8

Models to improve security of supply

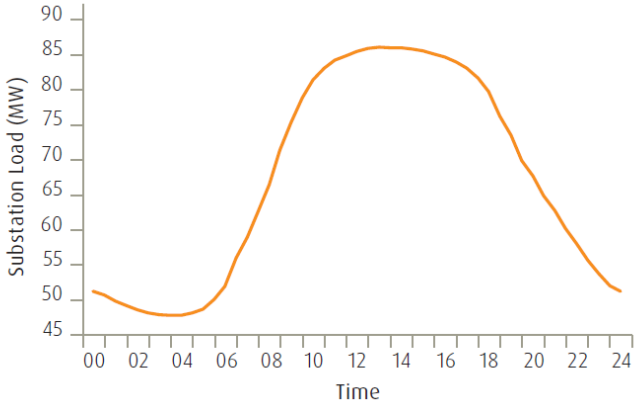
Monitor / Control	Diagram
Passive network management	
Active Network Management - Active Dispatch	
Active Network Management - Active Dispatch and facilitation of Maximum Demand	

Source: LCL Report A8

Distributed Generation

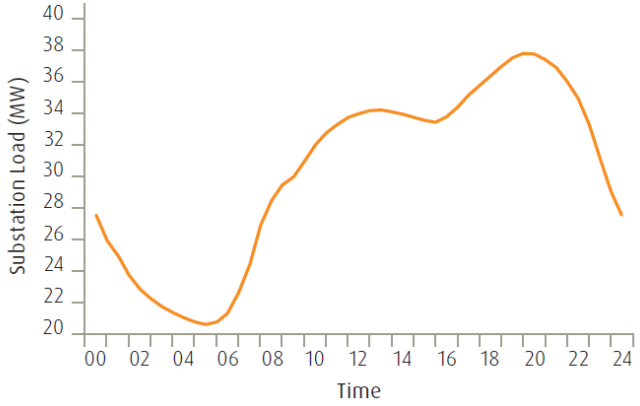
Passive vs. Active Management

Average network load curve at Duke Street primary substation



If there is high confidence that DG will operate through the day and help meet an ‘n’ shape peak, then passive network management may be sufficient

Average network load curve at King Henry’s Walk primary substation



Alternatively, with an ‘m’ shape profile, active network management may better provide the necessary certainty that DG turns on early enough and stays on late enough to satisfy both peaks

Source: LCL Report A8

Distributed Generation

ANM Facilitating DG connections

- Urban networks – fault levels are a barrier to DG growth in urban networks
- Rural networks – ANM can facilitate DG connections in rural areas with thermal and voltage constraints

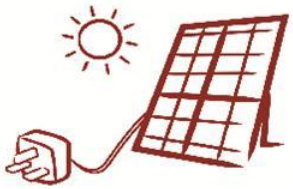
ANM-enabled DG capacity unlocked by network reconfiguration and STP generation

	Using ANM to recognise network reconfiguration	Using ANM to recognise the status of STP generation	Both methods in combination
Number of substations where additional headroom can be accessed	74	32	92
Total acceptable new DG capacity	437 MW	182 MW	619 MW
Average acceptable new DG capacity	5.91 MW	5.68 MW	6.73 MW

Source: LCL Report A9

Conclusions

- DSR and DG uptake will be particularly relevant to urban settings in the near future
- DG uptake will be a key enabler for landlords achieving 25% renewable target in dense networks



- DSR forecast savings of £43m will accrue to all UK Power Networks' customers
- There is potential to assist new DG and distributed energy connecting to the network

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The findings from **Low Carbon London** represent a step change in understanding the electricity network required for a low carbon future.

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