



Customer-Led Network  
Revolution

# Switch on the Customer-Led Network Revolution

Regional Knowledge Sharing Event

21<sup>st</sup> May 2013



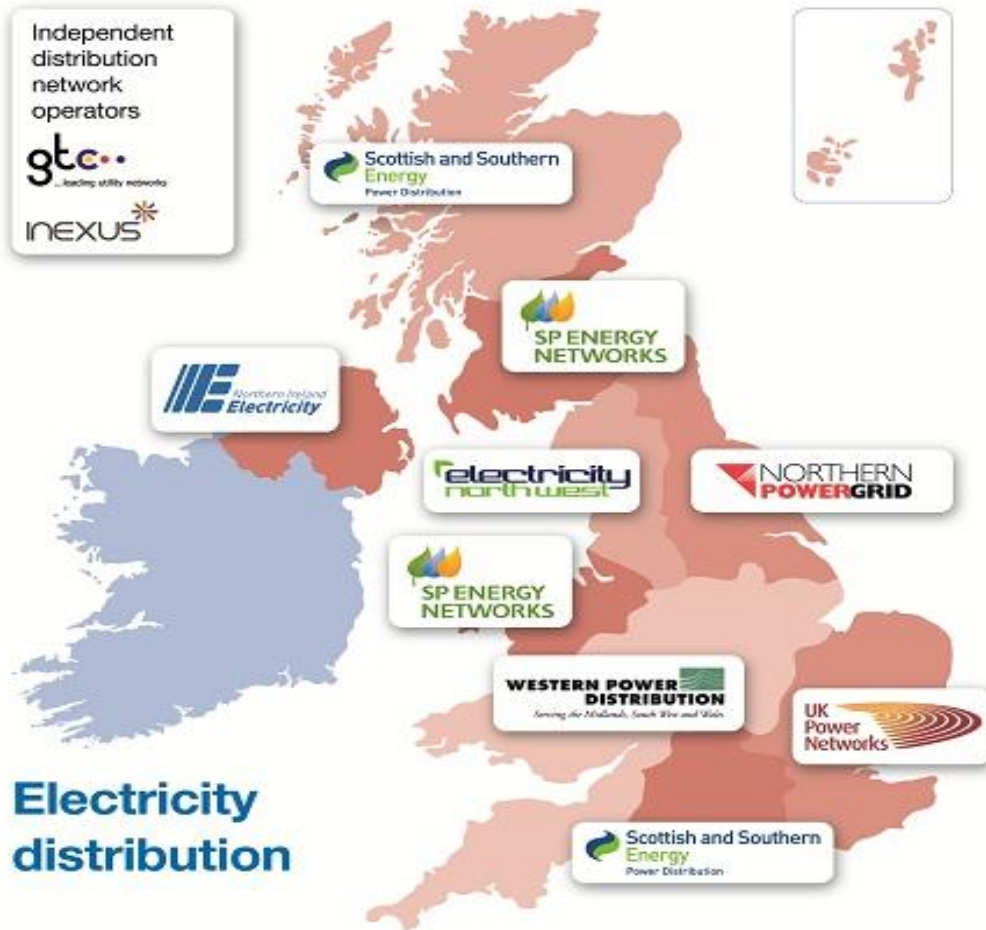


# Customer-Led Network Revolution

Regional Stakeholder Event  
Liz Sidebotham & Jon Bird  
21<sup>st</sup> May 2013

 Customer-Led Network  
Revolution

# Electricity distribution in the UK



## Northern Powergrid

- Regulated distribution network operator
- Northeast & Yorkshire
- 31,000 substations
- 33,000 km of overhead line
- 66,800 km of underground cable
- 2,500 employees
- Annual capital investment £280 m
- Annual operating expenditure £180 m

# The Customer-Led Network Revolution

- Combining customer engagement & network technology to drive the low carbon future
  - Led by Northern Powergrid, in partnership with British Gas, Durham University & EA Technology Ltd.
  - Trials are taking place mainly in the Northeast & Yorkshire regions
- Part-funded by Ofgem's Low Carbon Network Fund
  - Making available £500 million over the next 5 years for projects which will help all DNOs understand what they need to do to provide security of supply at value for money as GB moves to a low carbon economy
- Aiming to find solutions for key 21<sup>st</sup> Century energy challenges and;
  - Mitigate or defer the need for widespread network reinforcement
  - Help to accelerate the uptake of low carbon technologies



# The project has 5 main learning outcomes;

1. Monitoring: What are the current, emerging and possible future customer load & generation characteristics?
2. Customer flexibility: To what extent are customers flexible in their load and generation, and what is the cost of this flexibility?
3. Network flexibility: To what extent is the network flexible and what is the cost of this flexibility?
4. Optimum solutions: What are the optimum solutions to resolve network constraints driven by the transition to a low-carbon economy?
5. Effective delivery: What are the most effective means to deliver optimal solutions between customer, supplier and distributor?



# Integrating customer & network technology solutions

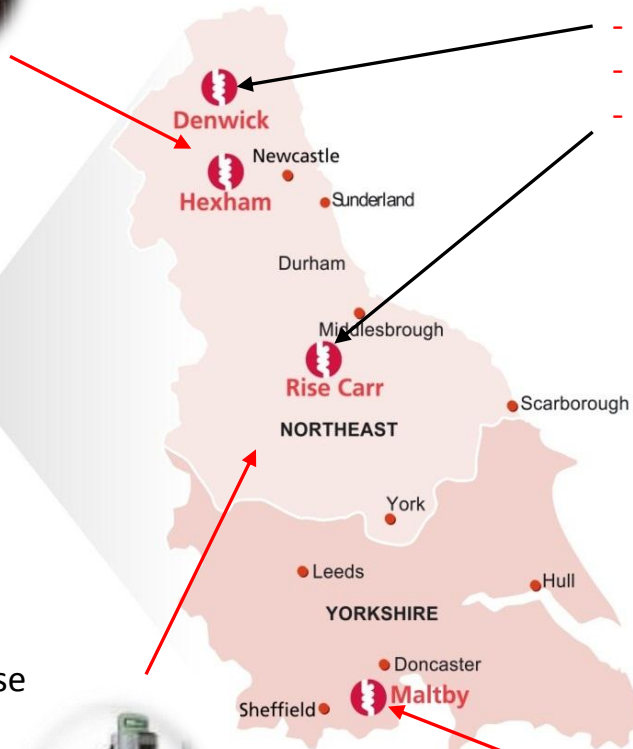


National smart meter data offers baseline profiles



Active customer participation to minimise electricity costs through flexibility

- Smart meters
- Restricted hours & direct control
- Demand side response



Focused, integrated network technology installed on rural and urban networks

- Real-time thermal rating
- EAVC
- Electrical energy storage



# Project highlights to date;

- *Ca.* 12,000 customers recruited, with *ca.* 900 of those actively participating in flexibility trials
- *Ca.* 1000 residential & SME customers surveyed, in-depth social interviews conducted with a further *ca.* 200 by Durham University & NEA, producing important insights into energy practices
- Analysed 12 months' data for *ca.* 4800 smart meter customers
- Over 400 heat pumps installed with DECC funding support, 18 with innovative thermal store technology
- Monitoring load & generation profiles of clusters of solar PV users (Maltby), assisting them to make better use of their own generation
- Monitoring of EV user load profiles & installation of 150 extra EV charging points in homes across the Northeast, part of the 'plugged in places' initiative
- Network technology installed at all voltage levels across the Northern Powergrid network. Trials of real-time thermal rating & EAVC underway, electrical energy storage begins May 2013
- Demand-side response trials underway with industrial and commercial customers
- Shared learning from the project at conferences, via academic papers and published reports

# What's driving this revolution?

- The bigger picture ...
- EU 20-20-20 target: 20% cut in carbon emissions, energy to be 20% from renewables, 20% increase in energy efficiency by 2020
- UK 2008 Climate Change Act: World's first legally binding climate change target to cut emissions by 80% by 2050
- Electricity prices are likely to rise by 2020
- One quarter of the UK's generation will close within 10 years
- Balancing supply and demand is set to become increasingly more complex and expensive
- Our stakeholders told us to;  
*"Ensure the powergrid is ready for the uptake in low carbon technologies but to invest only in areas where we are confident that customers will benefit"*





# Incentives to meet UK carbon reduction targets

## Incentives

Feed in tariff

Renewable heat incentive

Plugged in places

Plug-in car grant scheme

CRC energy efficiency scheme

Green Deal / ECO



Solar photovoltaic (PV)

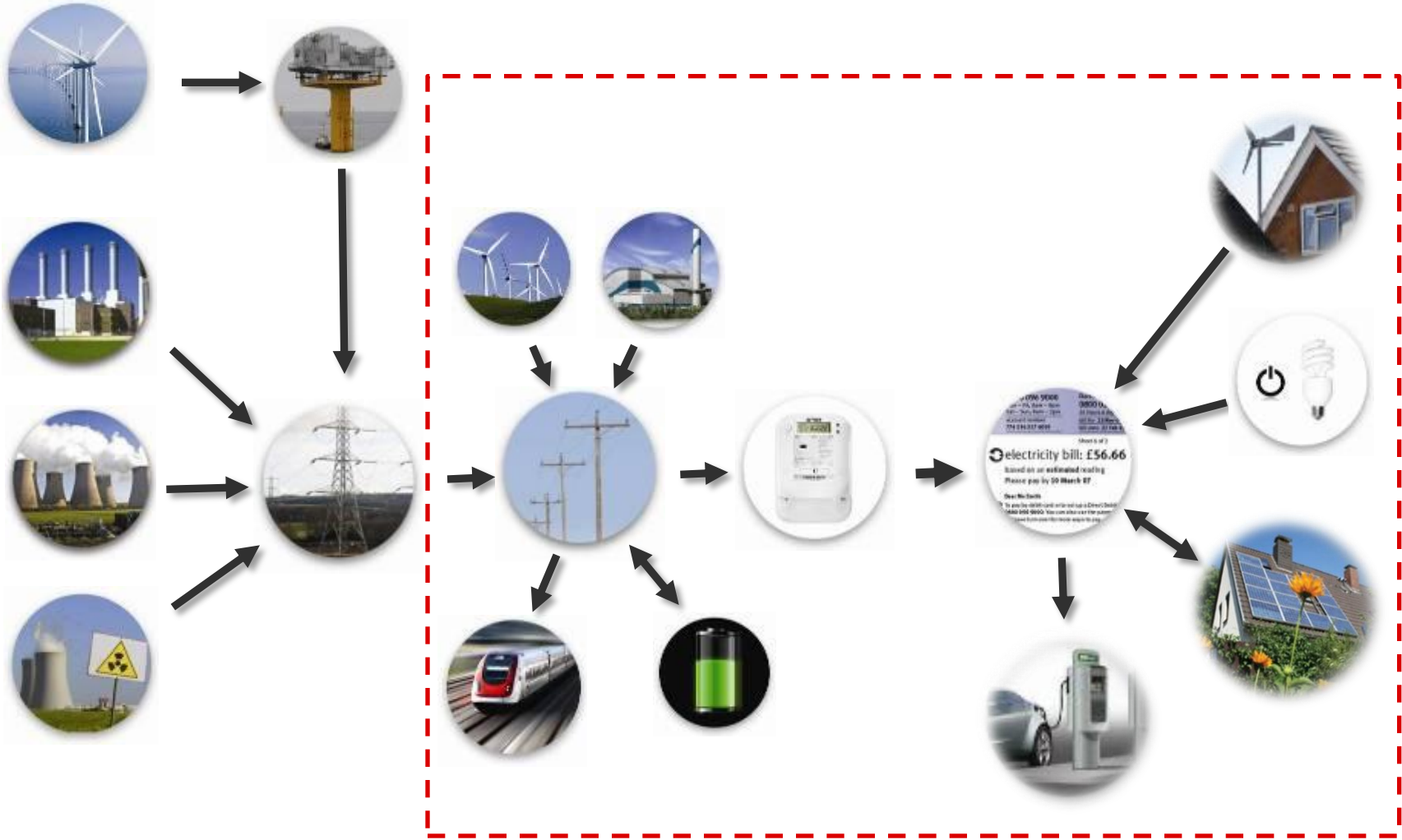


Electric Vehicles



Heat Pumps

# Power generation & usage is changing



# Our customers use of electricity is changing

- 2010 feed-in tariff led to a massive increase in micro-generation installations in the Northern Powergrid area
- Significant increase in the number of domestic heat pumps being installed, with the renewable heat incentive set to encourage more
- Full UK smart meter roll by 2020
  - *Ca.* 3.8 million in the Northern Powergrid distribution area
- The Government estimates that by 2023, there could be in the UK:
  - 1-2.5 million domestic heat pumps
  - Up to 3 million electric vehicles
  - Up to 5 million domestic solar panel installations
- ... But why does this matter?



# Why does this matter?

- Network operators have a duty to ensure that everyone's power supply remains within statutory limits
- Networks are currently designed to an average demand of 1.5W and no generation
- Heat pumps and EV charging use more than this over sustained periods
- Solar panels will push up the local voltage
- Traditional solutions will prove expensive, we need to operate smarter
- Power quality issues and phase imbalance

# Customer-Led Network Revolution gets social...



[www.networkrevolution.co.uk](http://www.networkrevolution.co.uk)

- First part of call for the latest CLNR related information, reports & findings
- Refresh due in summer 2013



[Twitter@CLNRUK](https://twitter.com/CLNRUK)

- Daily tweets, links & updates



[YouTube.com/CLNRUK](https://www.youtube.com/CLNRUK)

- A range of project & network technology specific videos



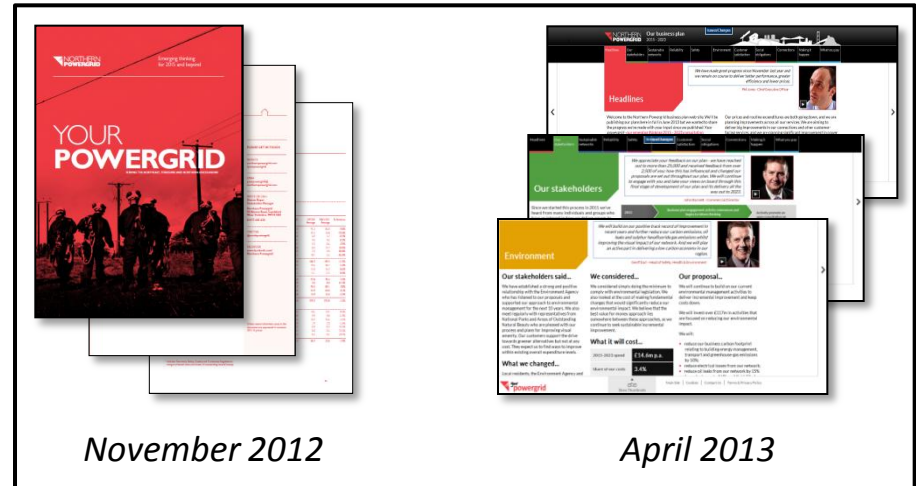
[Customer-Led Network Revolution Group](https://www.linkedin.com/groups?gid=1157793)

- Topical industry discussions



# Our engagement with stakeholders is delivering clear messages

- Contain costs and avoid price shocks
- Maintain general reliability but target weak spots
- Shorten power cuts – but don't spend more
- Deliver faster connections and better information
- Provide a customer experience more like the best non-utilities
- Help priority customers more during power cuts
- Support the low-carbon transition and smart meter roll-out
- Use your balance sheet to help customers
- Run a safe workplace and protect the environment



- Enhanced by an early view of outputs and costs
- Much greater reach due to use of digital channels
- Externally facilitated, structured feedback
- One-to-one meetings for 'professional stakeholders'
- Focused groups for 'common interest' stakeholders
- Direct and extensive engagement with suppliers
- Detailed challenge from three expert panels

# DECC growth scenarios

Scenario 1 (Medium)	Scenario 2 (Medium)	Scenario 3 (High)	Scenario 4 (Low)
<ul style="list-style-type: none"><li>• HP – High</li><li>• EV – Medium</li><li>• PV – Undefined</li><li>• DSR – Medium</li><li>• Generation – Gone Green</li></ul>	<ul style="list-style-type: none"><li>• HP – Medium</li><li>• EV – High</li><li>• PV – Medium</li><li>• DSR – Medium</li><li>• Generation – Gone Green</li></ul>	<ul style="list-style-type: none"><li>• HP – High</li><li>• EV – High</li><li>• PV – High</li><li>• DSR – High</li><li>• Generation – Gone Green</li></ul>	<ul style="list-style-type: none"><li>• HP – Low</li><li>• EV – Low</li><li>• PV – Low</li><li>• DSR – Low</li><li>• Generation – Slow Progression</li></ul>

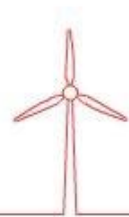
# Our approach to low carbon technologies

## The 'no regrets' approach

- Low growth scenario but consider the possibility of higher uptake in solar PV

## Wide range of relevant factors for solar PV

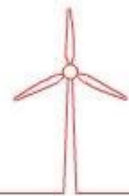
- The price of panels continues to fall
- European levy on Chinese panels
- Socialisation of reinforcement costs for landlords connecting low carbon technologies
- Number of social landlords planning PV schemes
- Possible change to Government policy? Contain cost and avoid price shocks





# Our questions to you...

- Do you think we have taken the right approach in our business plan to deal with growth of low carbon technologies (LCTs) ?
- Why?
- What ideas do you have for ensuring we have good data on the growth of LCTs?





# Customer-Led Network Revolution

Planning for Britain's Energy Future

## Customer Recruitment and Early Insights

*Date: 21<sup>st</sup> May 2013*

# Customer Recruitment and Early Insights: Introduction & Agenda

## Allan Row

Project Manager, Customer Operations

## Stavros Sachinis

Project Manager, Trial Delivery

## Agenda

1. The Role of British Gas
2. Trials Overview
3. Domestic and SME DSR
4. The Customer Journey
5. Early Results & Insights

# The role of British Gas, leveraging our Smart Customer base to innovate in Smart Grid

- 14,000 customers
- 22 Customer-Led trials
- Historic data for over 11,000 Smart Meter customers



Essential data and insight for 2/5 key Learning Outcomes:

- LO1: Understanding of current, emerging and possible future customer (load and generation) characteristics
- LO2: To what extent are customers flexible in their load and generation, and what is the cost of this flexibility?

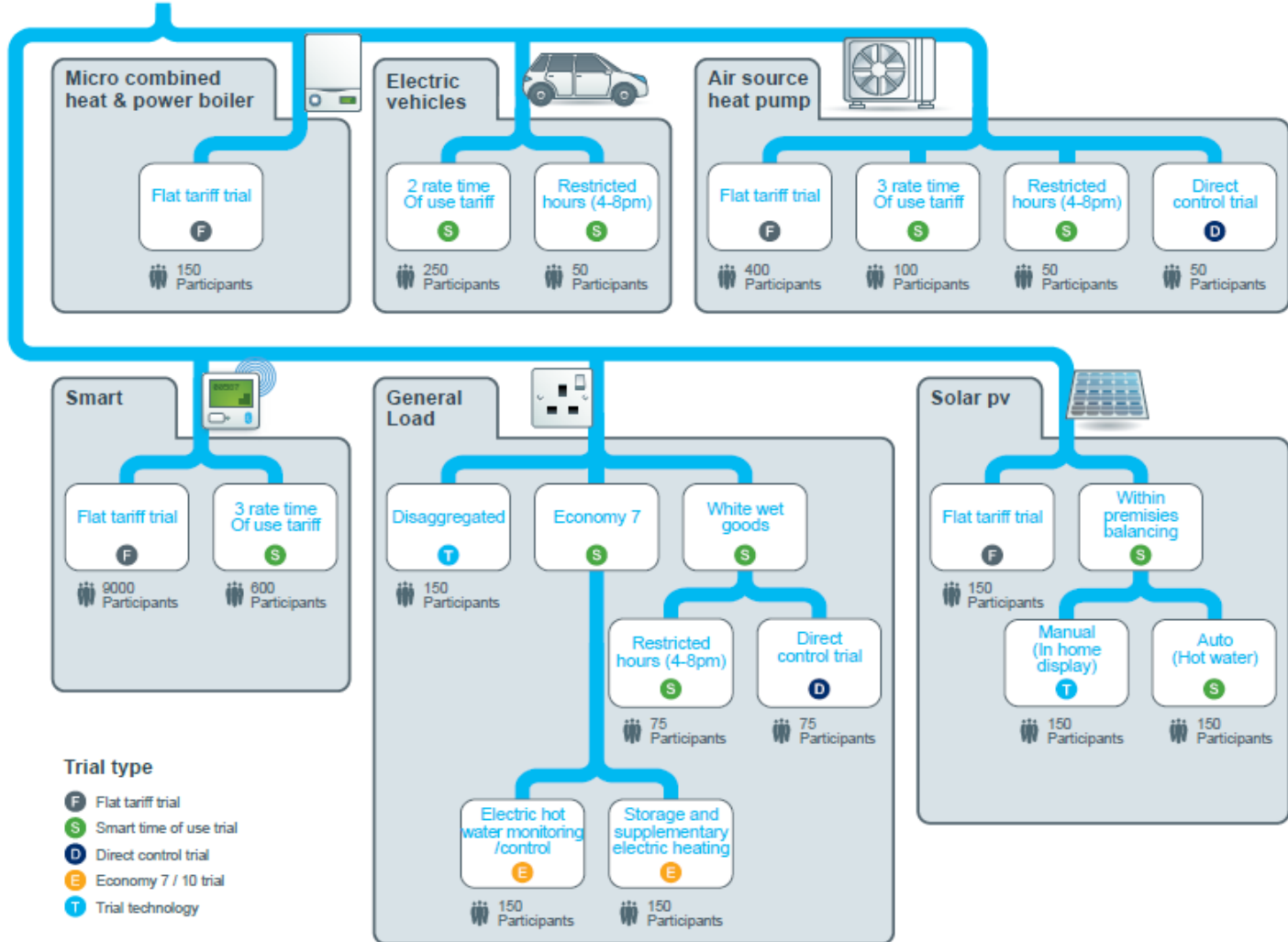
# On Track to deliver Learning Outcomes from our Customer Trials

- ✓ Over **12,000** customers currently monitored
- ✓ Equipment installed in over **1,000** homes and business
- ✓ Over **600** customers live on our Off-Peak Saver 3-Rate Time of Use Tariff
- ✓ Secured **£2.8 million** DECC R&D grant and installed almost **450** new heat pumps
- ✓ Connected to our first smart appliances via our smart grid platform



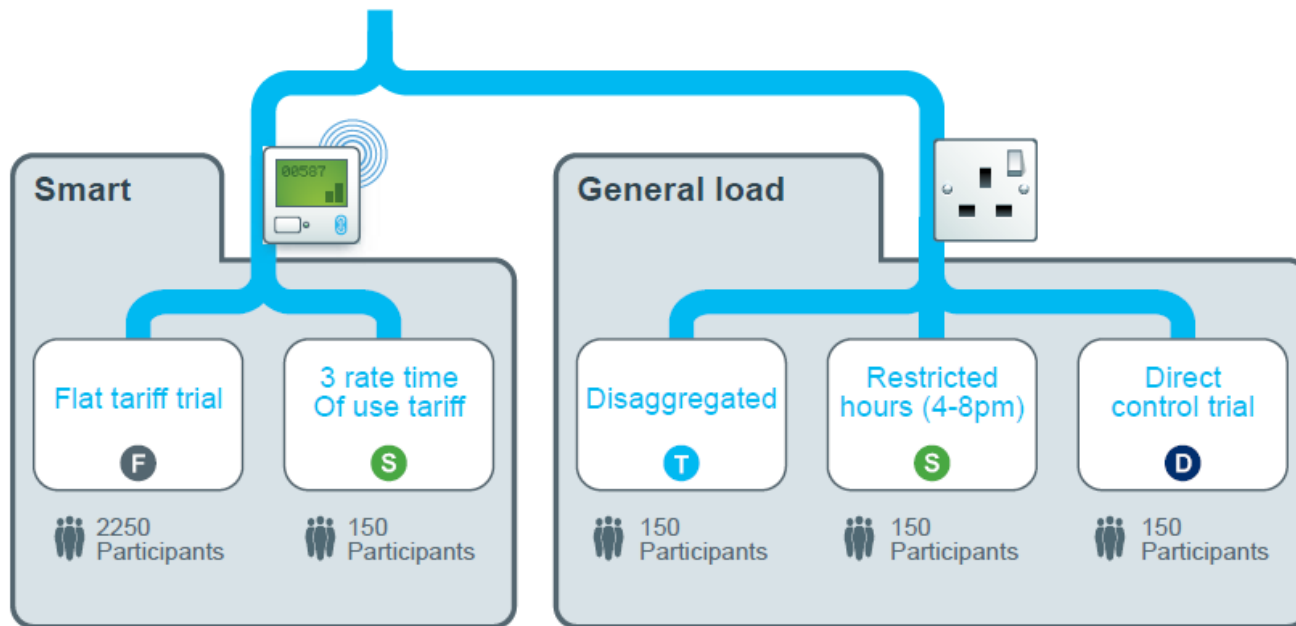
# 17 Residential Trials Involving a range of Low Carbon Tech and Demand Side Response

## LO1/L02



# Our SME Trials look at Exploring the Same Themes, through a Smaller set of 5 Trials

## LO1/LO2



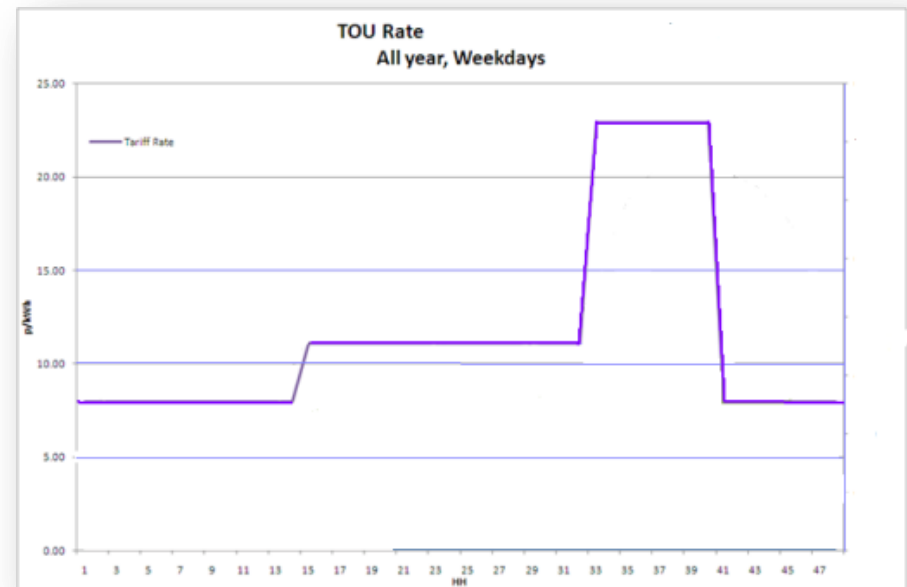
### Trial type

- F** Flat tariff trial
- S** Smart time of use trial
- D** Direct control trial
- T** Trial technology

# Off-Peak Saver 3 Rate Tariff (Smart Time of Use)

Modelled on 2020 Distribution Charges

Period	Time	Rate vs. Standard
Day	7am – 4pm	- 4%
Peak	4pm – 8pm	+99%
Nights	8pm – 7am	-31%
Weekend	Night Rate Applies	
	25p Standing Charge p/d	



**20 hours Reduced Rate Electricity during Weekdays**

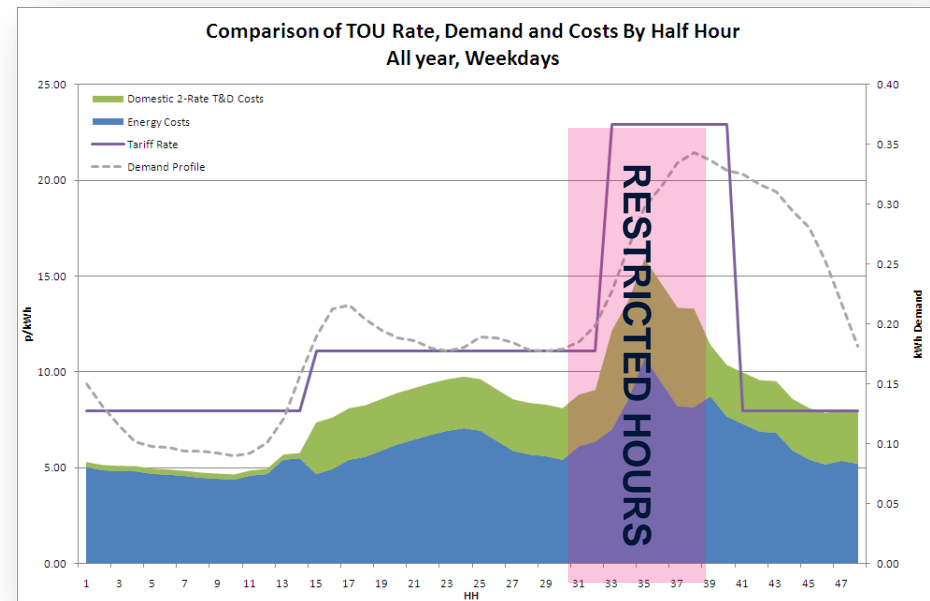


# Peak Electricity Saver (Restricted Hours)

Time of Use Tariff with appliance automation to help avoid peak usage

Indesit Smart Washing Machine  
with automated scheduling capability

Neura Smart Heat Pump  
with automated 'turn down' capability  
for periods of up to half an hour during  
the peak period



Customers always in control - Override without penalty

# Peak Energy Supply Manager (Direct Control)

Remote appliance automation to avoid peak usage at times of network constraint

- Max 15 interruptions per year
- 1 interruption per day
- Up to 10 consecutive days
- Up to 4 hours each interruption
- Peak periods only
- Customer override without penalty



Similar implementation to Restricted Hours on Smart Washing Machines and Smart Heat Pumps

# Two types of Within Premises Balancing for Solar PV customers

## Automatic Balancing

Use of surplus solar PV generation to heat hot water electrically



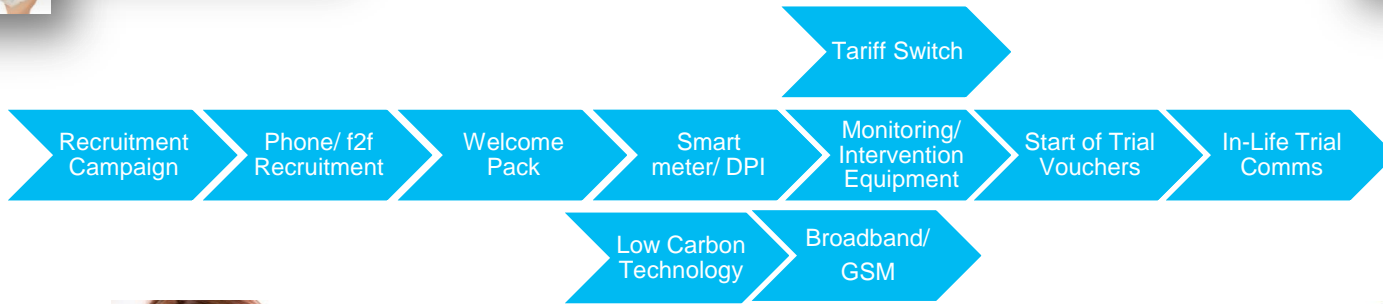
## Manual Balancing

Can real-time information encourage customers to maximize in-home use of on site generation via an IHD?

# A Complex but Flexible Customer Journey was Developed to Maximize our Trial Population



**50,000+ Engaged**



**12,000+ Monitored**



# Encouraging Response from Residential Customers on our Smart Meter Trials

Lower than expected Opt-Outs  
**<1%** on our Control Trial

Direct Marketing Success  
**8%** response rate for Time of Use

Time of Use Trial Oversubscribed  
**600+** still remain

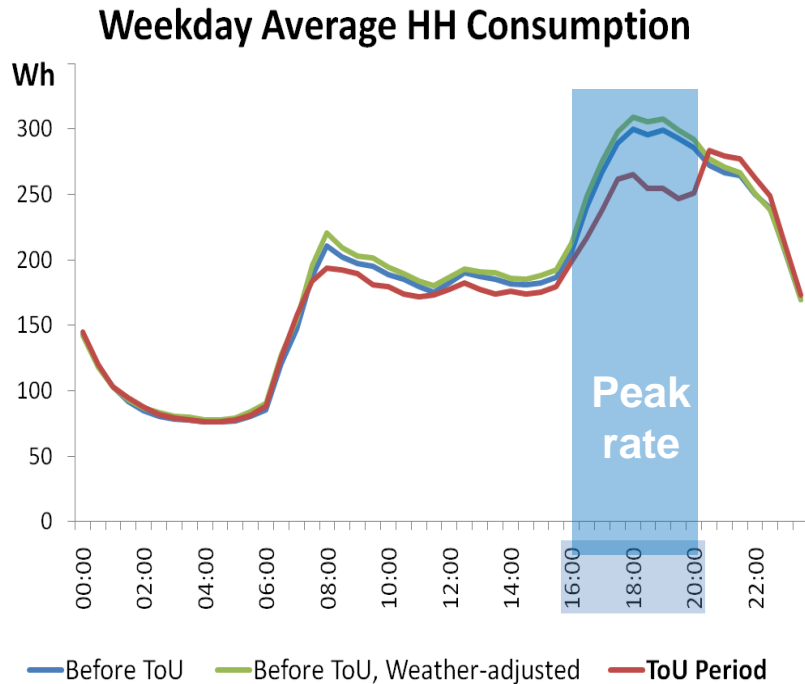
Smart Meters an incentive for customers  
Smart Eligible recruitment rates **11%** higher than Existing

Saving Money through behaviour change  
**Overwhelming** reason for sign up

Your new Off-Peak Saver 3-Rate Tariff trial explained



# Early Results show Customers Shifting Peak and Reducing overall Demand



Customers are using less during peak  
Average **14%** reduction

Customers are using less not just  
shifting it

**71%** customers have slightly lower bills  
On average **2.5%** lower  
Highest users saved the most, **£20**

Behaviour is consistent over 6 months  
Reduced consumption at weekends  
**Despite no price incentive**

Low SME take up  
**Impact on operating hours**

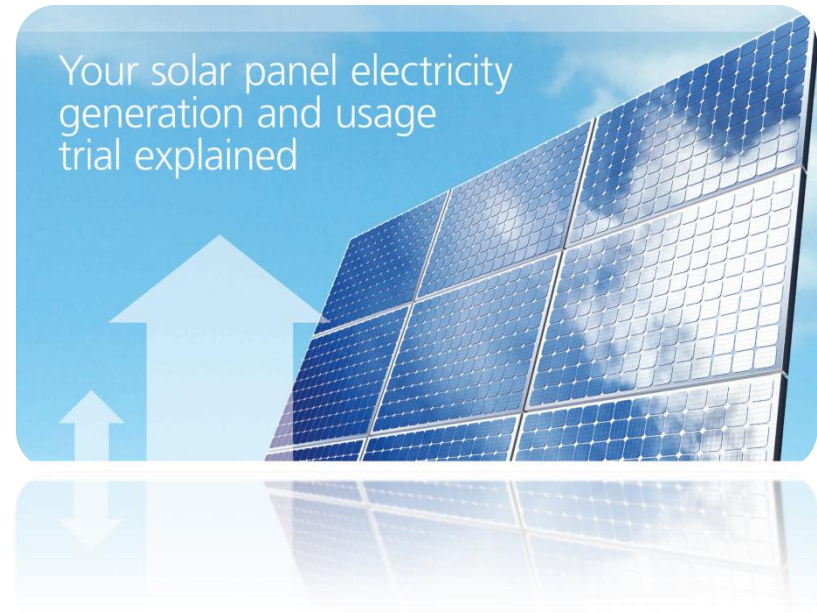
# Solar PV customers appear to be the most engaged in their energy usage

Exceptional Direct Marketing Success  
**11%** response rate for Solar PV trials

Though oversubscribed, 300+ rent-a-roof customers had to be removed

Customers Appear Highly Engaged in their Energy Usage/Generation

Interest in real time generation vs. Usage  
Customers have recently enquired about keeping IHD's



## Will/can this engagement turn into action?

# We've had to Change and Adapt our Trials to Reflect what we've Learnt about our Customers

Abandoned Restricted Hours and Direct Control for Hot Water

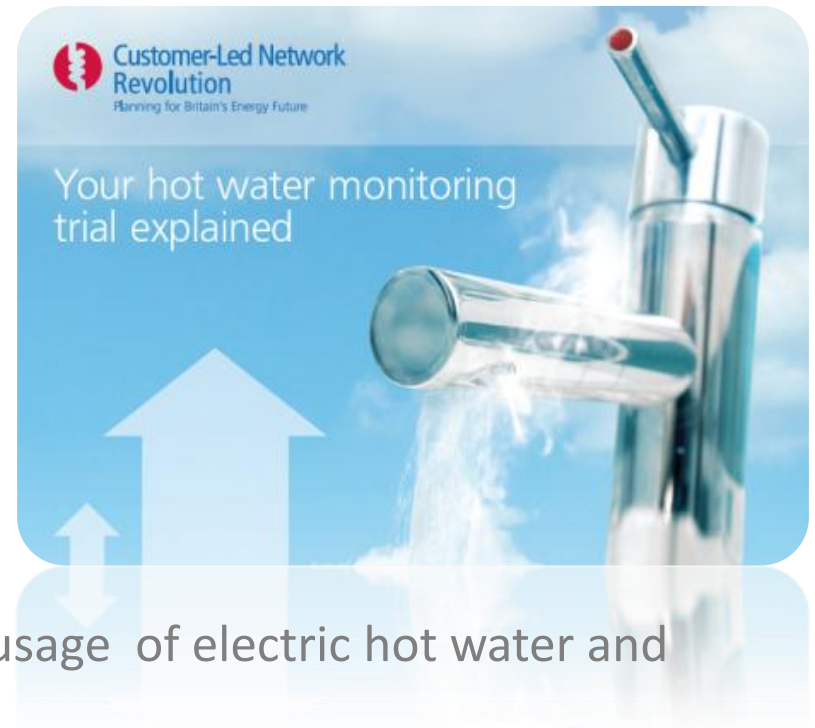
<1% heated water during peak hours  
Predominantly on Economy 7 tariffs

Limited knowledge around electric hot water usage in the UK

1/3+ customers on E7 are on gas

Re-designed trials to understand detailed usage of electric hot water and storage heaters

Is there an opportunity for DSR?





# Delay to RHI meant that Social housing became a critical recruitment channel for

16 Social Landlords, 3,000 properties, 950 surveys, **450** new installs

Most projects replacing storage heaters

Price conscious, technically astute market

100 tenant refusals

“Happy with existing system”

“Unsure about new technology”

“Installation upheaval”

Only 8 sales in ‘able to buy’ market

~4,500 DM campaign to key off-grid target market yielded <4 surveys

85 detailed site surveys overall (yielded 8 sales)



**Community engagement essential to successful installations**

# Award winning smart Heat Pump solution, may be too early for UK market

Load reductions are possible  
Up to 0.5kW modelled during evening peak



High technology readiness but significant constraints  
Size and weight unsuitable for UK homes  
Overwhelming complexity – customers & installers

# What's next from British Gas on CLNR...

- Complete final installations of equipment by end of Q2 2013
- Test Direct Control and Restricted Hours on heat pumps and washing machines
- Test innovative communications and customer energy reports
- Disseminate results and insight across our business and industry
- Talk to our customers about their experience





# Demand side response

Regional Stakeholder Event  
Preston Foster  
21<sup>st</sup> May 2013

 Customer-Led Network  
Revolution

# Demand Side Response (DSR)

## What is Demand Side Response?

- Any program which encourages shift in demand for energy by end customers
- Participation is a response to factors such as incentive pricing, new tariffs, greater awareness or increased sense of responsibility
- End consumers agree to be involved, but their actual participation might be active behavioural changes or passive through automated responses

## What DSR is the CLNR project trialling?

- Industrial and Commercial customers (I&C)
- Domestic Customers (direct control test cells)
  - 'Smart' washing machines
  - Heat-pumps with thermal store

# Customer flexibility - I&C DSR trials Winter 2011-12



## Customer 1: Mining



- Contracted DR: 2 MWh
- DR Type: CHP Generation
- Availability: 3pm - 6pm, weekdays
- Response Time: 15 minutes
- Season: January - February 2012



## Customer 2: Refrigeration



- Contracted DR: 0.75 MWh
- DR Type: Load Reduction
- Availability: 3pm - 7pm, weekdays
- Response Time: 20 minutes
- Season: January - February 2012



## Customer 3: Web-Hosting



- Contracted DR: 0.8 MWh
- DR Type: Diesel Generation
- Availability: 3pm - 7pm, weekdays
- Response Time: 20 minutes
- Season: February 2012

# I&C Winter 2011-12 DSR trials - Contract performance

- Instruction log

- 4 – 1-day events called across 3 sites
- 1 – 4-day event called across 2 sites

- Successful events

- 9 successful DSR events from 13 instructions

- Failure events

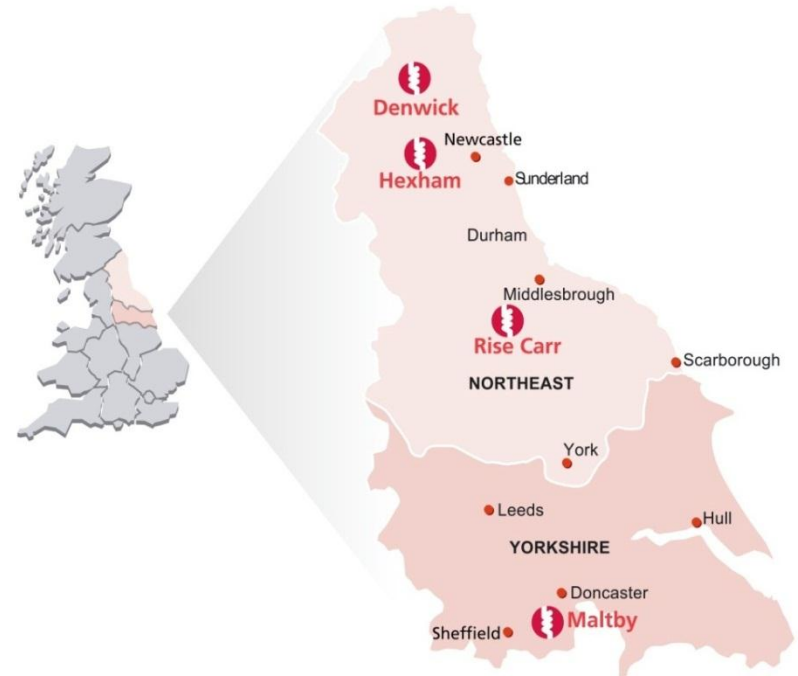
- Fire on site which removed one site for the winter 2011/12 trial period
- Generator failure on 1 day, site resumed full availability following day
- Event failure vs. contractual parameters – DSR already provided for Triad (although load reduction was achieved from a DNO perspective)
- Demand reduction delivered but not at the contractual level



# I&C Winter 2011-12 DSR trials - Contract performance

## Geographical customer recruitment

- Reviewed sample group of substations forecast to operate at >100% of firm capacity
- Aggregators tasked with engaging customers with DSR in these areas
- Customers unlikely to be recruited within timescales for the trials
- Decision taken to widen scope to include all I&C customers in the Northern Powergrid area



## Control system interface

- Incorporate the I&C DSR contracts into the grand unified scheme (GUS)
- Design and run the 2<sup>nd</sup> I&C DSR trials (2013-14)
- Complete the learning documentation



# Customer flexibility - I&C DSR trials Winter 2011-12



## Smart Washing Machines

- Recruitment: 75 customer in target network areas of Denwick and Rise Carr
- DSR type: Direct Control\*
- Incentives: Wet-white goods (WWG), £50 at end of trial
- Availability: 4pm-8pm, Weekdays
- Contracted DSR: 15 maximum, 4 hours each interruption
- Messaging: mobile phone, in-home display or WWG



## Heat Pumps with Thermal Store

- Recruitment: 18 customers from original target of 100
- DSR type: Direct Control
- Incentives: DECC subsidy (average £3,500) £50 at start and end of trial, free broadband during trial
- Availability: 4pm-8pm, Weekdays
- Contracted DSR: 15 maximum, 1 hour each interruption
- Messaging: mobile phone or in-home display

# Domestic 2013-14 DSR trials - Plan

## Learning

- Customers actively playing a role in helping us provide answers for future demands of the network

## Scope

- Equipment procurement, installation and technical knowledge
- Customer recruitment journey
- System reliability (including GUS interface)
- Customer behaviour
- Consecutive weekday interruptions
- Complete learning capture
- Document DSR trials and disseminate

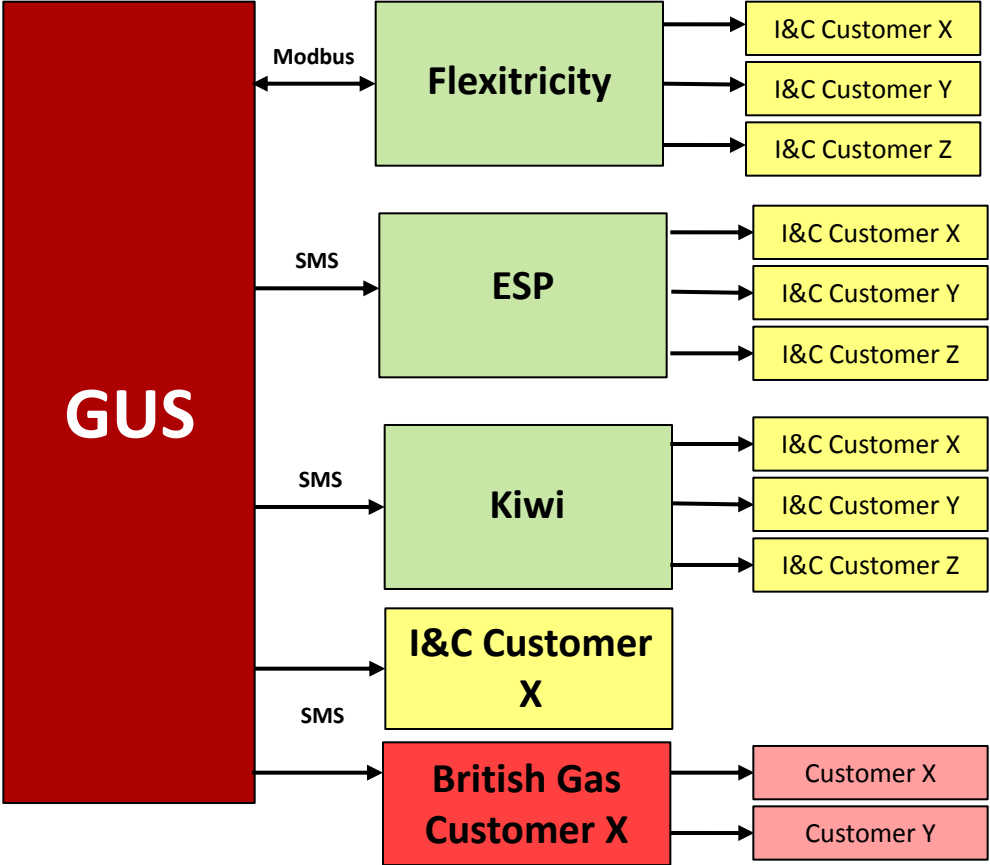
# Domestic 2013-14 DSR trials – grand unified scheme interface

## What is GUS?

- Active control system for dynamic distribution networks

## *Integrated* control of enhanced network devices

- Demand side response
- Real-time thermal rating
- Enhanced automatic voltage control
- Electrical energy storage
- Network monitoring



# Initial findings to support customer demand interventions

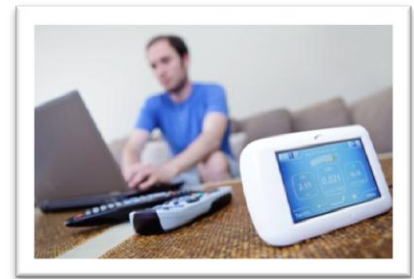
## Industrial & commercial (I&C) DSR

- DNOs can strike deals with I&C customers to deliver ancillary services that benefit distribution networks' customers
- There are synergies between ancillary services for distribution and transmission
- Limiting factors include cost, disruption and committing to repeat interruptions
- Short Term Operating Reserve (STOR) contracts can prove more attractive



## Initial findings from customer 'interventions'

- Interim analysis of five domestic intervention test cells
- Data from 576 customers on a Time of Use tariff use less energy in the early evening with shift in peak demand immediately afterwards
- Customers with PV flat-rate (no interventions) use more energy through day while PV is generating
- PV customers with automated load to hot water moved more consumption into the day reducing consumption in early evening



# What's next?

## DSR Trials

- Plan and execute domestic DSR trials (GUS interface)
- Capture trial results
- Produce trial learning

## Domestic & SME Trials

- Continuing to collect monitoring data on customer trials
- Further interim analysis on data (LCTs)
- System reliability (including GUS interface)
- Social science (interviews and survey) interim results (customer behaviour)
- Further assessment of load and generation profiles
- Capture trial results and produce trial learning

# Interim project learning

Can be found in the project library @ [www.networkrevolution.co.uk](http://www.networkrevolution.co.uk)



Project reports



Technical specifications



Academic papers



# Durham Energy Institute

- Teaching
  - Centre for Doctoral Training in Energy
  - Energy and Society Msc
- Impact
  - Policy Audience / Leadership
  - Industry Partners
  - Community Engagement
- Research ... Smart energy



# NEA Who are we?

National campaigning and lobbying charity with the aim to eradicate fuel poverty through:

- Research and analysis into the causes and extent of, and solutions to, fuel poverty
- Developing policies to address the problem
- Advice and guidance to stakeholders on delivering energy efficiency services to low-income consumers
- Developing educational resources and national qualifications to improve standards of practical work & energy advice

# NEA: Our role in CLNR

- Support social science team at DEI
  - Review literature, contribute to design of research tools (survey/ fieldwork tools)
  - Conduct interviews (60 carried out to date)
  - Analysis and coding
  - Protect data
  - Dissemination, briefings, journals and media activities, NEA events etc...

# Customer-Led Network Revolution

## Why?

1. Enable the electrification of energy services  
- e.g., heat, mobility
2. Enable decarbonisation
3. Enable decentralisation of electricity (renewables)
4. Smart Investment to re-integrate value across the industry and communities
5. Energy Affordability



# Understanding Energy Use

## Individual Motivations

- Money, Attitudes (Economics, Psychology) - Energy is a commodity and consumers adapt in response to price signals
- ToU tariffs, rewards

## Socio-technical

- Practices, we wash, we cook, we do our laundry. (Shove 2003, 2009, 2010.)
- Qualitative Research

# Research Objectives

1. Current and future load profiles
2. Flexibility of demand, costs of flexibility
3. Flexibility of supply, costs of flexibility
4. Optimum solution to overcome network constraints?
5. Optimum means of delivery of these solutions to end users?

# The Data

<b>Data Type</b>	<b>Details</b>	<b>Scale</b>
Survey	~2k	Individual
Qualitative Tours	~250	Individual / Household
Smart Meter Data	~11k, whole house, some disaggregated, >1bn data points	Household
Network Data	Thermal Rating Enhanced Harmonics	Community

Integrated  
Analysis

# Progress

- Survey 1 (over 900 responses)
- 220 Face to Face interviews
- Consumption data for over 8k
- Now Moving into Analysis Phase



POWER PRODUCTION AND USAGE														
START	Solar	Am'T	Pwr	Note	DATE	Solar	Am'T	Pwr	Note	DATE	Solar	Am'T	Pwr	Note
01/09/2012	3811	9	5	away	01/10/2012	4000	20	2.5	3.6	01/11/2012				
02/09/2012	3820	9	5	away	02/10/2012	4000	20	2.5	3.6	02/11/2012				
03/09/2012	3829	9	5	away	03/10/2012	4000	20	2.5	3.6	03/11/2012				
04/09/2012	3838	9	5	away	04/10/2012	4000	20	2.5	3.6	04/11/2012				
05/09/2012	3847	11	11		05/10/2012	4000	20	2.5	3.6	05/11/2012				
06/09/2012	3856	15	11		06/10/2012	4000	20	2.5	3.6	06/11/2012				
07/09/2012	3873	5	11		07/10/2012	4000	20	2.5	3.6	07/11/2012				
08/09/2012	3878	10	11		08/10/2012	4000	20	2.5	3.6	08/11/2012				
09/09/2012	3888	9	11		09/10/2012	4000	20	2.5	3.6	09/11/2012				
10/09/2012	3897	15	11		10/10/2012	4000	20	2.5	3.6	10/11/2012				
11/09/2012	3912	5	8		11/10/2012	4000	20	2.5	3.6	11/11/2012				
12/09/2012	3917	11	8		12/10/2012	4000	20	2.5	3.6	12/11/2012				
13/09/2012	3928	8	8		13/10/2012	4000	20	2.5	3.6	13/11/2012				
14/09/2012	3936	15	8		14/10/2012	4000	20	2.5	3.6	14/11/2012				
15/09/2012	3951	14	8		15/10/2012	4000	20	2.5	3.6	15/11/2012				
16/09/2012	3965	12	8		16/10/2012	4000	20	2.5	3.6	16/11/2012				
17/09/2012	3977	14	8		17/10/2012	4000	20	2.5	3.6	17/11/2012				
18/09/2012	3991	23	8		18/10/2012	4000	20	2.5	3.6	18/11/2012				
19/09/2012	4014	22	8		19/10/2012	4000	20	2.5	3.6	19/11/2012				
20/09/2012	4036	21	8		20/10/2012	4000	20	2.5	3.6	20/11/2012				
21/09/2012	4057	5	8		21/10/2012	4000	20	2.5	3.6	21/11/2012				
22/09/2012	4062	4	8		22/10/2012	4000	20	2.5	3.6	22/11/2012				
23/09/2012	4068	15	8		23/10/2012	4000	20	2.5	3.6	23/11/2012				
24/09/2012	4083	20			24/10/2012	4000	20	2.5	3.6	24/11/2012				
25/09/2012	4103	19			25/10/2012	4000	20	2.5	3.6	25/11/2012				
26/09/2012	4122	13			26/10/2012	4000	20	2.5	3.6	26/11/2012				
27/09/2012	4135	15			27/10/2012	4000	20	2.5	3.6	27/11/2012				
28/09/2012	4150	13			28/10/2012	4000	20	2.5	3.6	28/11/2012				
29/09/2012	4163	17			29/10/2012	4000	20	2.5	3.6	29/11/2012				
30/09/2012	4180	19			30/10/2012	4000	20	2.5	3.6	30/11/2012				
					31/10/2012	4000	20	2.5	3.6	31/11/2012				



## Practices / Loads

### Most Flexible

- Laundry
- Dish washing
- Chores
- Refrigeration
- Heat Storage (Tanks)

### Possibly flexible

- Cooking
- Showering

### Inflexible

- Lighting
- Eating
- Child Bath / Meal times

## Enablers of Flexibility

- Dual fuel customers have more options (but less load)
- Non 9-5 work pattern
- Active use of timers on white goods
- Engagement with the In Home Display (IHD) enables flexibility
- Experience of the ‘workings’ of the grid makes people more willing to be flexible
- Effective communication
- The absence of sales messages builds trust

# Time of Use

1. Perceived inflexibilities are low intensity
  - TV, entertainment, bathing, “you need some pleasures”
2. Flexibility varies across practices and groups
3. Gender

# Flexibility varies between practices and between customer groups

- An example:

	Cooking and Dining	Laundry and Dishwashing
9-5, Families	<ul style="list-style-type: none"><li>• Currently in the peak (Q1)</li><li>• Inflexible (LO2)</li></ul>	<ul style="list-style-type: none"><li>• Currently sometimes in the peak (Q1)</li><li>• Same-Day flexible (Q2)</li></ul>
Non 9-5 / Families	<ul style="list-style-type: none"><li>• Currently in the peak (Q1)</li><li>• Potentially Process Flexible, and Same Day (Q2)</li></ul>	<ul style="list-style-type: none"><li>• Currently not in the peak (Q1)</li><li>• Inflexible (LO2)</li></ul>

# Gender and Role Allocation

- Gender biased role allocation persists (although affected by age, Employment)
- Male roles more likely to include being ‘the bill payer’
  - Plus practices which carry less valuable flex (hobbies, repair / maintenance, computing, outdoor chores)
- Female role more likely to include those with more flexibility
- **Inconvenience will fall on/innovation must come from women, at least, as much as men.**
- **Suppliers have only an indirect relationship with the flexible energy user.**

# Solar PV

## 1. Most Flexibility, Most Engagement

- Chores, Timers
- Storage / battery charging; laptops, vacuum cleaners Demand for products which 'fit' solar.
- Realisation of the opportunity to use power and the financial benefits of on-site use.

## 2. Trigger for 'spill over' effects

## 3. Over time initial investment case moves out of focus, and their role in the grid and sustainability is foregrounded.

# Emerging Theme: Households in transition

## Questions:

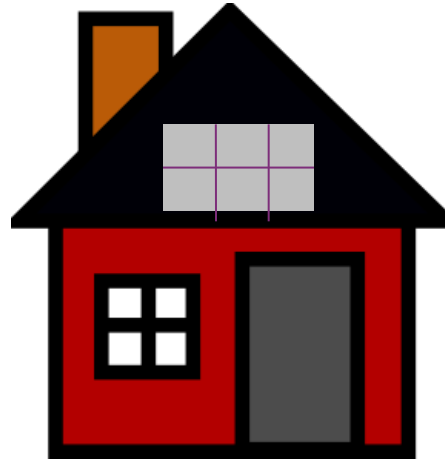
1. To what extent do changes in household composition and living arrangements (household transition) over time influence domestic electricity consumption levels?
2. Do changes in household composition affect or shift times at which electricity is used?

# Households in transition...Examples

Sandwich  
Generation

3 or 4 generation HH

Birth



Death

Caring for  
Elderly

Illness

Boomerang  
Children

- Temporary or Long Term
- Human factors
- Driven by social trends

# Households in transition likely to increase...

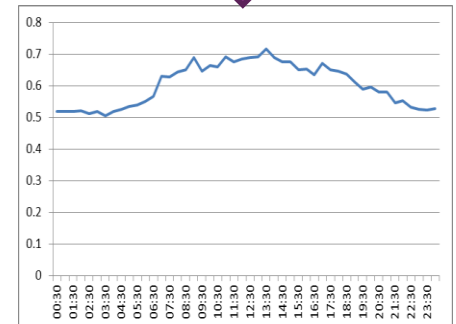
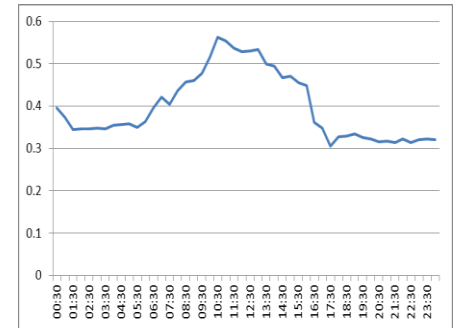
## ONS statistics

- 2011, Almost 3 million people aged 20-34 living with parents an increase of 20% on the number in 1997.
- Link to Demography:
  - 1985-2010, the number of people aged 65 and over in the UK increased by 20% to 10.3 million; in 2010, 17 per cent of the population were aged 65 and over.
  - By 2035 the number of people aged 85 and over is projected to be almost 2.5 times higher than in 2010.
- Important statistics for health, social care, pensions ...and energy!



# Value of this research to the wider CLNR programme

- LO1: An improved understanding of households in transition (characteristics, prominence) and their electrical characteristics.
- LO2: Understanding the potential role households in transition can play in generating flexibility via propositions such as low-carbon technology or new tariff propositions. (Are they more or less flexible)
  - Tempo: Consumer segmentation doesn't consider household transition. Assumes tidy households / neat classification.



# Dissemination Activities

- Association of American Geographers Annual Meeting
- European Association of Social Anthropologists, Annual Meeting
- Royal Geographic Society, Annual Meeting
- Institute for Advanced Study of Society and Technology Studies
- Nordic Environmental Social Science Annual Conference
- Energy Systems in Transition, Conference, Karlsruhe Germany
- Beyond Behaviour Change Symposium, Melbourne
- Society for Anthropological Sciences
- NEA Annual Conference, Harrogate
- Interim Reporting, Working Papers

# Group Work: Flexibility

1. What **tools** are required to **enable** consumers to be flexible in their domestic electricity consumption?
2. How can we **encourage** consumers to be **flexible** in their domestic electricity use?
3. What determines the **degree of flexibility** different types of household(s) may be able to demonstrate?



# Customer-Led Network Revolution

## Thank you

### Regional Knowledge Sharing Event

