

**Fuel Poverty Forum  
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**CLNR: Key Findings**



*Action for Warm Homes*

# Presentation outline:

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1. Background to research and methodology
2. CLNR
  - Key findings
3. NEA's future work with DNO's future for networks – engagement/ consider network reinforcement Vs behaviour change.



# Setting the context: NEA's past work on DNO issues

5 years ago NEA Research Assessed 30 ASHP installations in Blyth (Northumberland)

Early large scale clustered deployment, set the scene and helped us understand grid load challenges:

- Manufacturers
- Installers
- LA's
- DNOs
- Householders.

Huge implications for fuel poor clients.



*Campaigning for Warm Homes*

Air-source Heat Pumps – Assessing the implications for the electrical distribution system



David Lynch (NEA Research Officer)  
April 2010



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# CLNR: Background

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## Customer-Led Network Revolution



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# “The Customer-led Network Revolution (CLNR)”

- Project awarded under Ofgem’s Low Carbon Network Fund December 2010.
- Ofgem – £27 million contribution, largest award made when 4 awards were announced in Dec 2010.

Other successful DNOs were:

- UK Power Networks
- Central Networks and
- Western Power Distribution

CLNR Key Aim: To develop low carbon technologies and customer engagement.



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# Partners





# Customer-Led Network Revolution

## Learning Outcome 1 (LO1)

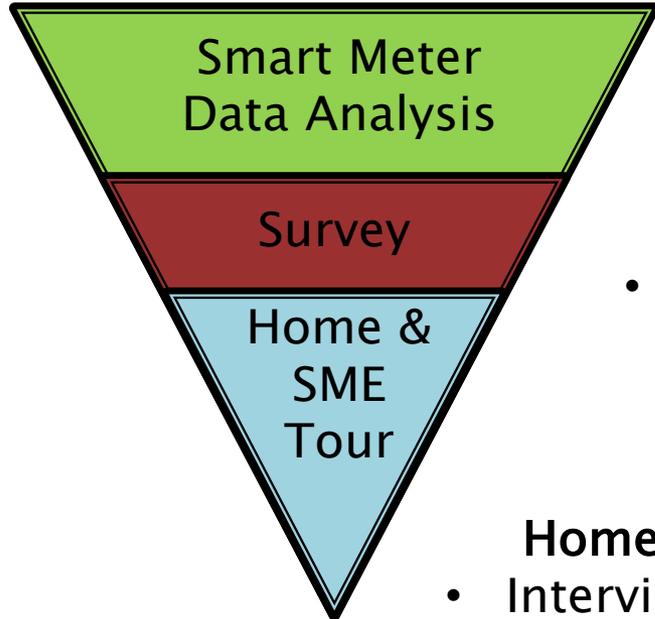
*“What are the current, emerging and possible future customer (load and generation) characteristics?”*

## Learning Outcome 2 (LO2)

*“To what extent are customers flexible in their load and generation, and what is the cost of this flexibility?”*



# Social Research: Key activities to date



## Smart Meter Data

- Used with the survey to search for larger social trends



## Survey

- Participants invited to fill out online survey (700 resp)



## Home Tours

- Interviews
- Photographs
- Audio Recording
- Floor Plans



## Looking Forward

- Smart appliances interviews (2014)



## Qualitative interviews: Sample (96)

- Smart meter & IHD..... (18)
- Time of use tariffs (ToU)..... (32)
- SM/IHD + Solar PV .....(14)
- SM/IHD + EV..... (17)
- SM/IHD + Smart Washing Machine....(15)





# Customer-Led Network Revolution

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## Key Findings



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# Customer-Led Network Revolution

## ToU

ToU tariffs effective moving some practices outside of 4-8pm period

- ▶ Washing machine
- ▶ Tumble dryer
- ▶ Dish washer

ToU, largely not effective moving cooking times outside of 4-8pm – some exceptions. Non working households.

Higher income groups more responsive to ToU than low income, shifting charging of appliances/ devices.



# Solar PV

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- ▶ Flexibility of Chores
  - Timers deployed to take advantage of solar
- ▶ Storage / battery charging; laptops, vacuum cleaners
  - Demand for products which 'fit' solar.
  - Significant potential for consumers to be flexible in charging battery powered equipment.
- ▶ IHD aids reflection and heightened awareness of electricity
  - Move from ethical / financial benefits to smarter use of the power. Realisation of the opportunity to use power and the financial benefits of on-site use.
  - Feel good factor – producing and using solar energy.



	1980		1981		INC %	1982		INC %	1983		%
GAS	70.00		87.69			95.13			109.17 <sup>10.11%</sup>		
	42.80	182.30	47.33	204.76	12.32%	45.45	219.69	7.29%	63.82 <sup>10.11%</sup>	243.97	11.05%
	20.65		25.07			27.40			26.83		
	48.85		44.67			51.71			44.15		
ELEC	34.59		30.20			31.30			33.89 <sup>10.5%</sup>		
	17.62	96.28	23.87	98.06	1.85%	25.28	104.83	3.55%	28.43 <sup>12%</sup>	111.76	6.6%
	18.20		21.29			23.13			23.13 <sup>2%</sup>		
	23.87		22.70			25.12			26.31 <sup>7%</sup>		
G.P.O	21.21		25.81			26.76			29.86 <sup>11%</sup>		
	15.67	74.47	26.91	<del>97.37</del>	<del>30.75</del>	26.84	101.54	4.28%	22.69 <sup>18%</sup>	104.75	3.2%
	17.48		23.38			25.11			23.97		
	20.11		21.27			22.83			28.27		
WATER	32.27	64.53	36.94	73.87	14.5%	41.42	82.85	12.2%	43.67	87.35	5.43%
	32.26		36.93			41.43			43.68		
RATES	90.14	180.27	106.40	229.23	27.16%	130.19	260.37	13.58%	133.30	266.59	2.3%
	90.13		122.83			130.18			133.29		
INS.	56.76		61.11	61.11	7%	64.74		5.9%	71.75	10.5%	
TV. L	34.00		34.00	34.00	0	46.00		35.3%	46.00	46.00	Same
TOTAL	688.61		798.31	803.40	16.6	880.02	9.54%			924.31	5.3%

## ELECTRICITY

## GAS

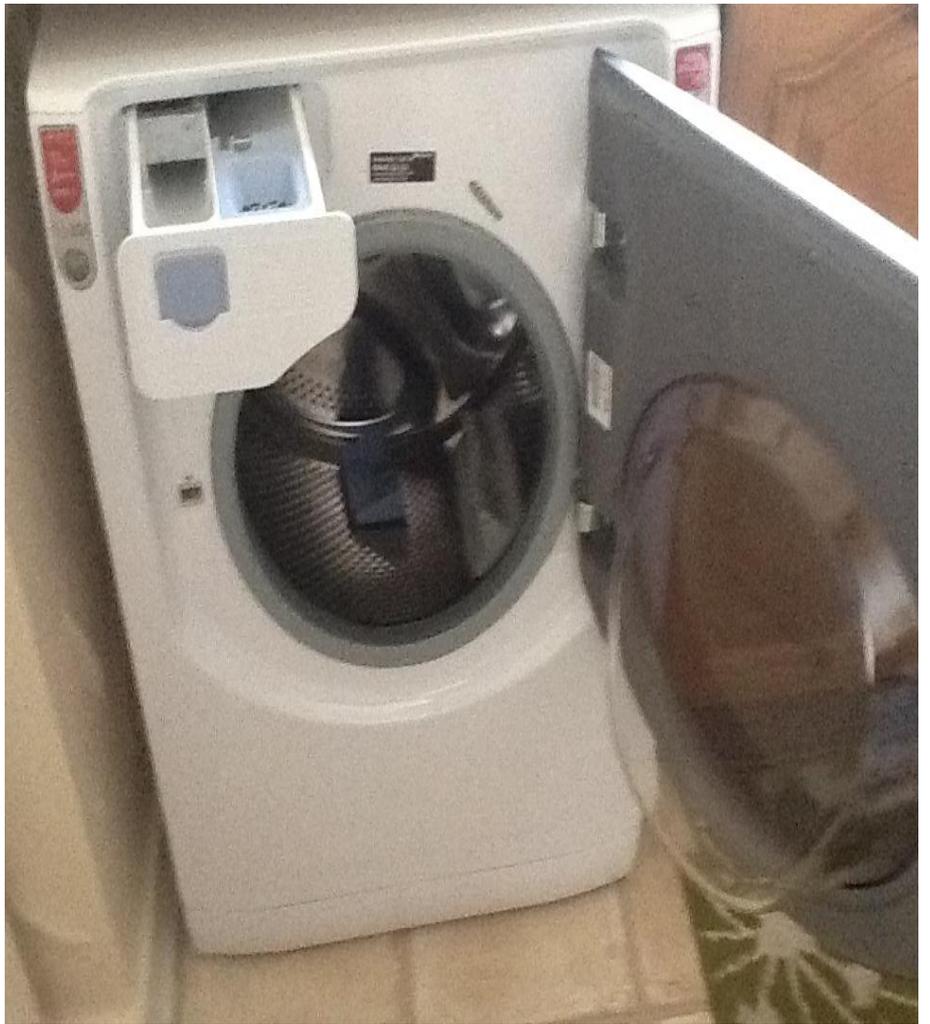
9 NOV 2011	LOW	50630	1 NOV 11	06716
	HIGH	95976	31 JAN 12	07171
31 JAN 2012	LOW	51131	19 APR 12	07540
	HIGH	97217	16 JULY	7721
19 APR 2012	LOW	51387		
	HIGH	97556		
16 JULY 2012	LOW	57612		
	HIGH	97785		

# Wet White Goods

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- ▶ Smart washing machine installed free of charge
- ▶ Set of consumers on ToU (4-8pm)
- ▶ Set of consumers on 'Direct Control'
  - Communications equipment installed monitoring use
  - So far, very positive response
  - Able to shift washing cycles before 4pm or after 8pm
  - Size of drum (11kg) particularly welcomed = bigger loads, less washes.
  - Some dissatisfaction the machine cannot wash at 90 degrees.





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# EV – Nissan Leaf

- Very positive consumer experience
- Innovative, quiet, limited costs to run (2p per mile)
- Frustration around charging infrastructure, socially and at work
- High income consumers choosing - : Aston Martin Vs Nissan Leaf
- Remote digitised operation – heating on defrost windscreen via smart phone!
- Often used as a second vehicle
- Range anxiety, limited range <100 miles circa 60 in WINTER!
- New EVs launched Tesla from USA now in UK.





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## Practices / Loads

## Enablers of Flexibility

### Most Flexible

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

### Possibly flexible

- Cooking
- Showering

### Inflexible

- Lighting
- Eating
- Child Bath / Meal times

- 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

# Factors that shape the use of domestic electricity?

The data suggests that practices are most heavily structured by the following:

1. **Materiality:** Technologies, building fabric and other physical conditions constraint and structure the ways in which people use energy and can engage with new propositions
2. **Temporal structures:** Shifts, school days, TV schedules and other routines were found to shape consumption patterns more than attitudes, or beliefs etc.
3. **Household dynamics:** We found lots of households in the data set were 'in transition', that is, family members living together temporarily (boomerang / sandwich generation)

This is in contrast to mainstream economics / psychology accounts of energy behaviour in which people follow price signals or 'nudges'.



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# What does flexibility in energy use mean?

At a broad level the analysis suggests that customers can be flexible in a three ways:

1. Practice Flexibility: Changes in the when and where energy consuming activities take place. This could be
  - a. Intra-day practice flexibility day
  - b. Inter-day practice flexibility
  - c. Locational practice Flexibility
2. Load Flexibility: This involves changing the means of achieving an energy dependent outcome (e.g. a hot meal by using gas rather than electricity)
3. Practice Abstention or Curtailment



# Factors determining flexibility:

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- Households with fewer commitments or to work or family offer greater potential for flexibility.
- Those with a higher degree of know-how about appliances are more able to be flexible about their energy use.
- Those on ToU tariffs or using PV were more likely to develop new conventions concerning how and when and by whom household work is undertaken.
- Social trends influencing electricity use – growth in IT, mobile technology, home working.



# Limitations

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- Ethnicity gaps – Approximately 85% sample White British
- Low representation of ethnic minority groups (lack of cultural patterns influencing energy use)
- Further work ongoing to explore these – VCEE programme by UKPN demand response amongst fuel poor consumers.

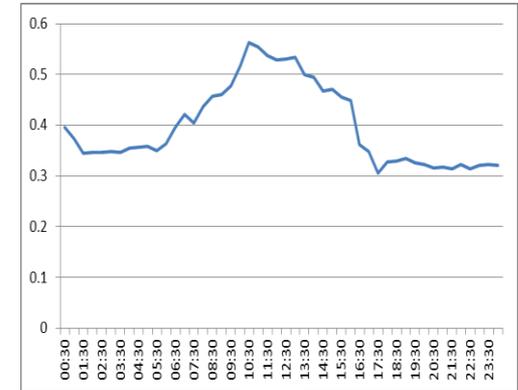


# Customer outputs from CLNR

An understanding of how to define “customer flexibility” and how we can use this in network planning and management.

A theoretical base for explaining how customers interact with energy and smart grids concepts.

New load profiles for customers using low-carbon technologies and interacting with new tariff propositions.



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# Early Policy Implications

- Arguably, too much policy as of late has focused on helping to improve the accuracy of information in relation to energy consumption.
- Supplier tariff structures don't really serve nor do they respond to temporal needs of households in transition.
- Where the cost in supplying electricity to can be reduced through innovation/network efficiencies, it is imperative, low income consumers benefit from reductions in their electricity bills.
- Risk of digital exclusion amongst cogs and dials.



# Conclusion (1)

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- ▶ Interesting trends emerging from our CLNR work.
- ▶ Further work required e.g. ethnic minority communities.
- ▶ Going forward, NEA is keen to support DNOs to deliver social action supporting work to alleviate fuel poverty and assist vulnerable consumers.
- ▶ Key to this will be the ability to develop and integrate DNO social obligations, we look forward to working with industry stakeholders to achieve this.



# Conclusion (2)

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- ▶ Behaviour based changes in energy use carry major advantages. They can be very fast unlike major infrastructure changes that can take years or even decades. A 1% gain today is worth more than a 1% gain tomorrow.



# Many thanks

David

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