

The UK **energywise** project and beyond: Smart metering as an enabling platform for changing consumers' relationship with energy

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Overview

- **Energywise**
 - Smart metering and the fuel poor
- Smart Meter Research Portal ('SMRP')
 - National access point to smart meter data for research with $\geq 10,000$ participants
- Blockchain P-2-P community energy trading
 - Siemens, UKPN, BP, ESC and others





**Awarded £3.3m
in 2013
(Total project
cost £5.5m)**

British Gas

Tower Hamlets Homes

POP LAR HARCA
Making Poplar a better place to live

bromley by bow centre

NEA
Action for Warm Homes

CAG
communities • regeneration • sustainability

UCL

elementenergy



energywise trial design

- Randomised control design
- Two year-long trials:
 - Trial I: energy saving – 2016
 - Trial II: energy shifting (time of use tariffs) - 2017
- 550 participants recruited (~40% response rate)
- High drop-out rate (~300 remaining)
- Highly ethnically and linguistically diverse community (~40% Bangladeshi community)



energywise at a glance

		Trial 1: Energy Saving		Trial 2: Energy Saving & Demand Side Response			
Group allocation	1						
	2						



Customer engagement



**Dedicated, locally based
Customer Field Officer team:**



- Lead on recruitment and engagement
- Support British Gas in booking appointments and facilitating access to properties where required
- Delivery of energy efficiency devices

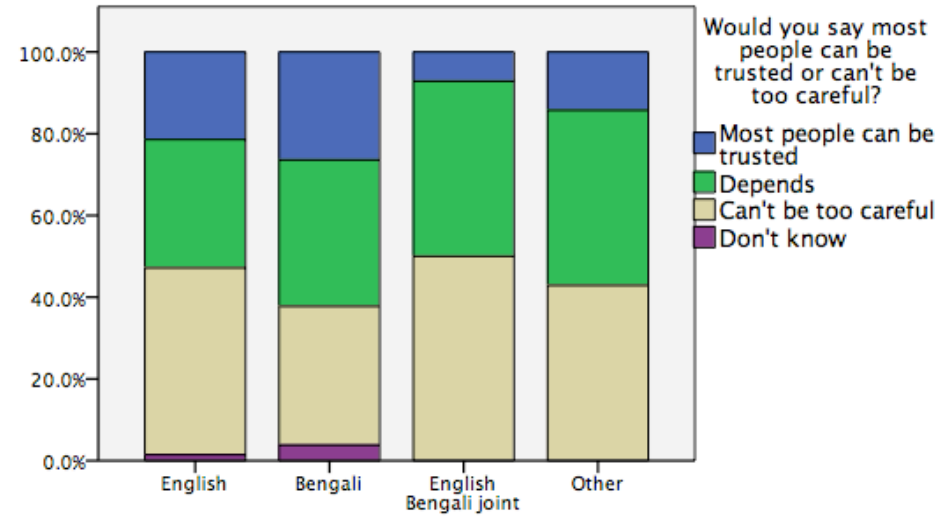
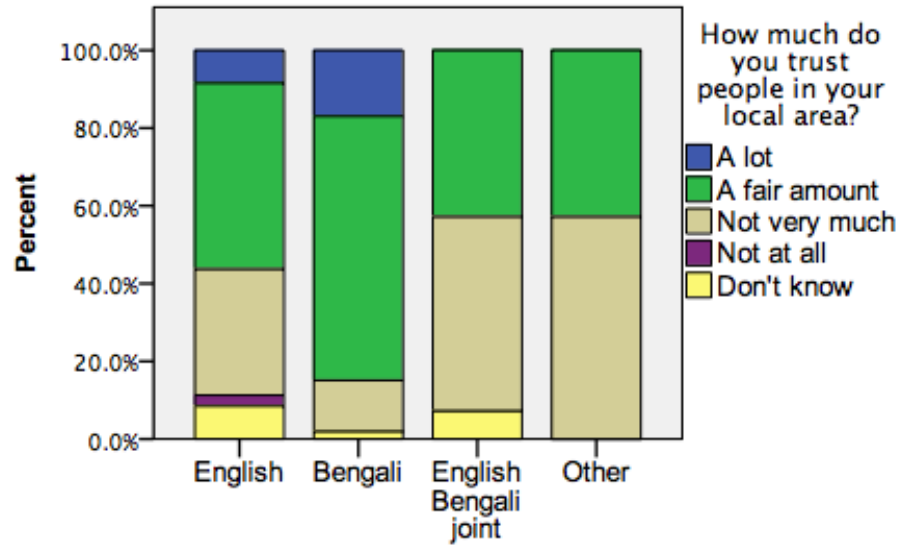


Key areas of innovation

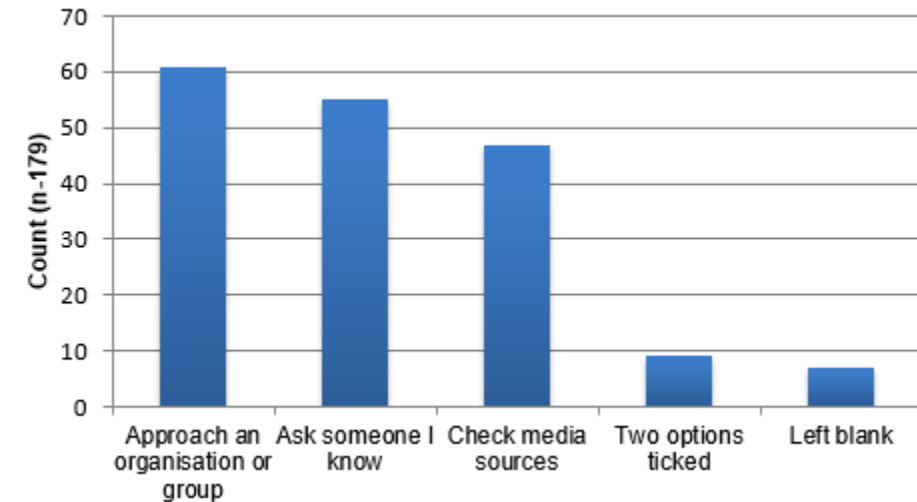
- **Customer insights:**
 - Fuel poor customers' energy savings and shifting response to smart meters and time of use tariffs.
- **Network insights:**
 - Evaluating the impact of this on network reinforcement.
- **Customer recruitment & engagement:**
 - Testing fuel poor engage strategies on saving and shifting including the most effective messages and approaches.
- **Innovative partnerships:**
 - Working with trusted local intermediaries to support those in fuel poverty.
- **Non-punitive time of use tariffs:**
 - Trialling non-punitive time of use tariffs for both credit and prepayment fuel poor customers.



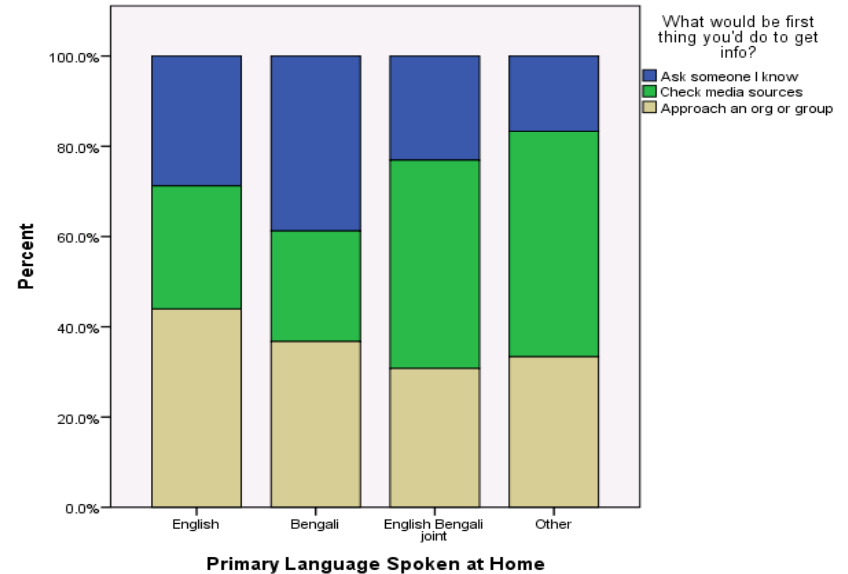
Energy Social Capital survey



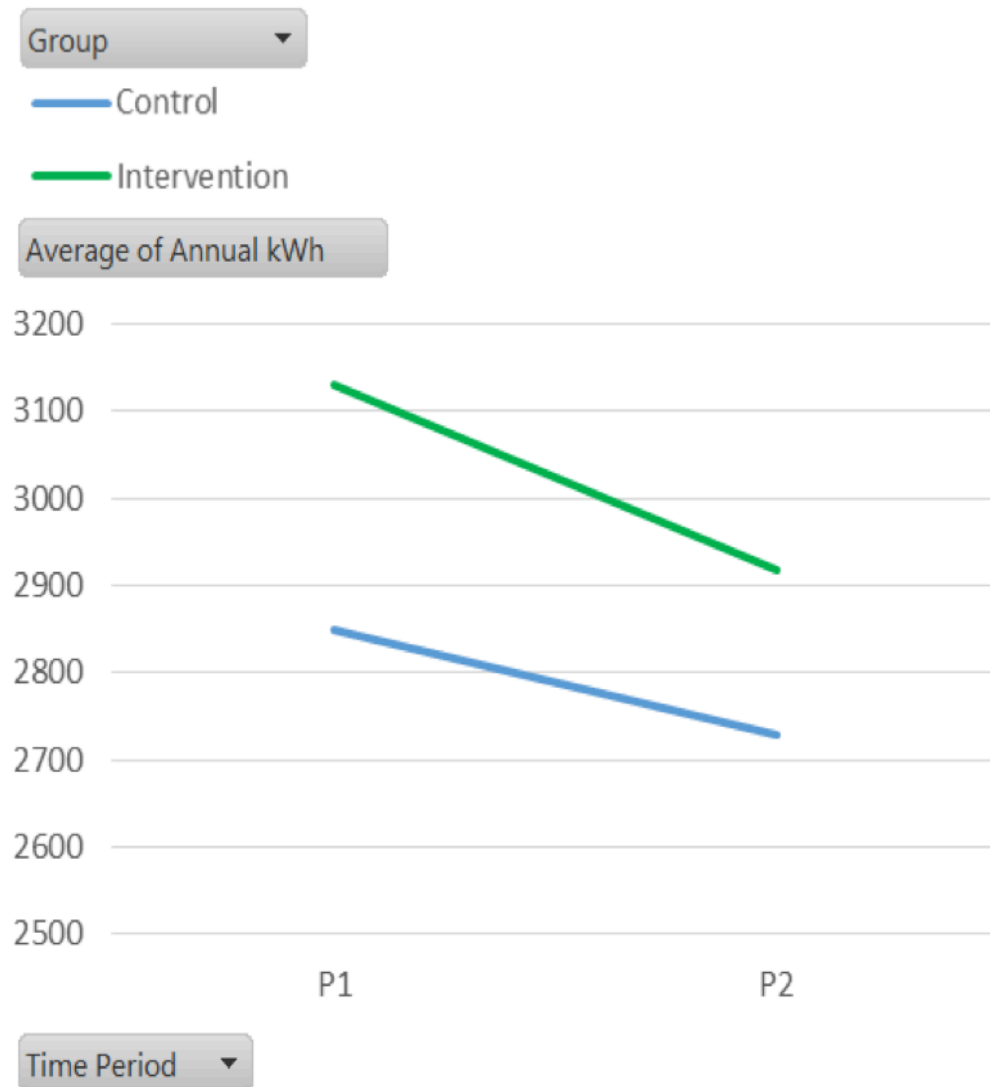
Primary language spoken at home



Primary Language Spoken at Home



Energy savings (trial I results)



- Overall savings (Credit + PPM) ~3.3%
 - Treatment of outliers important
- Pre-payment appeared to save more ~8%
 - Concerns over small numbers and data quality

Smart Meter Research Portal 'SMRP'

Vision

- Consistent, ongoing channel for accessing energy data.
- Energy data at monthly, daily or half-hourly resolution.
- Evidence base for intervention, observational and longitudinal studies across the socio-technical spectrum.
- Data linking service for contextual data.

Grant (Awaiting EPSRC letter of offer)

- £6m over 5 years - 2017-2022
- UCL + 6 Academic Partners & EST.
- Proposal combines infrastructure & research.
- Portal hosted on UKDA's Big Data Platform.
- BEIS support recruitment through government surveys



Smart Meter research Portal ‘SMRP’

Portal programme

- A secure, consistent and trusted channel for researchers to access high resolution (half-hourly) energy data
- Strictly voluntary participation with regular informed consent
- Governance - accredited researchers accessing anonymized data
- Mechanism to collect data alongside other variables or future surveys (e.g. EHS) – 10,000 sample collection
- Data linking service e.g. to EPC’s
- Energy Advice Service for participants from the EST

Research programme

- Data quality, analytics and engagement and governance
- Academic research on energy demand
- Government research on the efficacy of policy
- Industry research on the low carbon transition



A key behaviour change application: outcome-based policy metrics

- Regulating outcomes (performance in use) not inputs (laboratory performance of components)
- Advantages vis-à-vis input-based approach
 - Factors in manufacturing, environmental, and user impacts on performance
 - Therefore high ecological validity
 - Therefore lower overall system (e.g. whole building; whole heating system; etc) performance uncertainty
 - Essential for understanding operational (field) performance.
 - Best measure of customer relevant operational costs
- Disadvantages vis-à-vis input-based approach
 - Medium/high costs (depending on how implemented)
 - Higher product performance uncertainty (harder to disentangle other impacts on performance)



Peer-to-peer community energy trading using blockchains

- Advantages of community energy trading
 - Community energy autonomy
 - Increased energy salience and engagement
 - Localising economic benefits
 - Community energy poverty alleviation
 - Local business CSR and community engagement
 - Local area grid resilience
 - Minimising transmission losses
 - Efficient use of grid infrastructure and minimising reinforcement costs
- Enabling technologies
 - Bi-directional smart metering at \geq half-hourly resolution
 - Generation assets (PV; Wind, CHP; Hybrid heat-pumps; DSR)
 - Storage (preferable)
 - Half-hourly settlement and time of use tariffs (preferable)



Blockchains as an enabling technology

- P-2-P community energy trading requires:
 - A financial transaction layer that:
 - Supports product and service innovation
 - Minimises or eliminates transaction costs
 - An IoT control architecture that:
 - Is compatible with component APIs
 - Supports an ecosystem of smart-controls (smart-contracts; distributed computing, fog computing)
 - Is distributed to minimise latency and energy, and enhance privacy.
- Blockchains provide that transaction and control layer



Current activities at UCL

- Engage government and the regulator to understand the policy and regulatory constraints. (Grant application submitted)
- Test different consumer value propositions (national survey experiments)
- Assess cyber-security and privacy considerations (with computer science)
- Survey and engage Industry (replicate German survey)
- Engage in Energy System Architecture debate (with ESC and ENA)
- Scope blockchain system architectures
 - Public vs Private?
 - Consumer vs DSO focused?
 - Disruptive vs evolutionary energy system roles?
- Scope blockchain entry points within existing UK energy market
 - C2C – e.g. peer to peer trading?
 - B2C – e.g. household to energy service providers and HEMS providers?
 - B2B – e.g. energy service providers to distribution system operators?
- Establish a substantial physical demonstrator

