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Section 1: Project Summary

1.1   Project Title: Vulnerable Customers and Energy Efficiency (VCEE)

1.2   Funding DNO: London Power Networks Plc

1.3   Project Summary: The government's Low Carbon Transition Plan necessarily has an impact on customers' energy bills. Those with the potential to be hardest hit include the 4.5 million fuel poor in the UK (2011, DECC), of which a significant number are also vulnerable in some way.

Separately, the Distribution Network Operators (DNOs) are forecasting increasing and more uncertain demands on their networks as the result of the electrification of heat and transport and the increased reliance on micro-generation and distributed generation (DG). The more customers that participate in providing time-shifting or Demand Side Response (DSR) and the more customers that can achieve sustained energy savings, the more it will help to mitigate this substantial challenge.

VCEE reflects UK Power Networks' desire to support these customer groups and allow them to fully participate in DSR and energy saving opportunities, reducing their own bills, accessing offers, and playing a small but socially important role in supporting the network. It will provide DNOs with evidence-based learning on the extent that fuel poor can engage in such activities and consequently how their move and reduction in demand benefits the network by deferring or avoiding network reinforcement.

VCEE will run in the London Borough of Tower Hamlets; which has a high penetration of fuel poor customers, social housing and tower blocks. We will conduct two trials: demand reduction and demand shifting, by providing 550 households in 2 groups with a smart meter, simple energy saving and energy shifting devices, energy advice and Time-of-Use tariffs. The trials will research the effectiveness of techniques and capture learning on the:

- level of response from fuel poor to smart meter data & price signals;
- energy cost savings achieved from customer interaction and network benefits;
- improved demand profiling for these customers; and
- what engagement material & channels were effective in supporting their behaviour.

In future, these activities will largely be replicated through existing supplier obligations. The additional activities for the DNO are relatively low cost, providing a positive cost-benefit for DNO customers overall and significant benefits to the communities affected. The project has attracted substantial external funding.

1.4 Funding

1.4.2 LCN Funding Request (£k):   **£3,322k**

1.4.3 DNO Contribution (£k):   **£431k**

1.4.4 External Funding - excluding from NICs (£k): £1,244k

1.4.5 Total Project cost (£k):   **£5,490k**

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1.5 Cross industry ventures: If your Project is one part of a wider cross industry venture please complete the following section. A cross industry venture consists of two or more Projects which are interlinked with one Project requesting funding from the Low Carbon Networks (LCN) Fund and the other Project(s) applying for funding from the Electricity Network Innovation Competition (NIC) and/or Gas NIC.

1.5.1 Funding requested from the Electricity NIC or Gas NIC (£k, please state which other competition):

1.5.2 Please confirm if the LCN Fund Project could proceed in absence of funding being awarded for the Electricity NIC or Gas NIC Project:

☐ **YES** – the Project would proceed in the absence of funding for the interlinked Project

☐ **NO** – the Project would not proceed in the absence of funding for the interlinked Project

1.6   List of Project Partners, External Funders and Project Supporters:

Project Partners: British Gas, CAG Consultants, University College London (UCL-Energy Institute), Tower Hamlets Homes, Poplar HARCA, Bromley–by-Bow Community Centre and the Institute for Sustainability.

Project Supplier: National Energy Action

Project Supporters: British Red Cross (Critical Friend) and Consumer Futures (Critical Friend)

Additional details on the above project partners can be found in Appendix G.

1.7 Timescale

1.7.1 Project Start Date:	**1.7.2 Project End Date:**
January 2014	December 2017

1.8 Project Manager Contact Details

1.8.1 Contact Name & Job Title:	**1.8.3 Contact Address:**
Lynne McDonald, Low Carbon Project Manager – Future Networks	UK Power Networks, Newington House, 237 Southwark Bridge Road, London, SE1 6NP
1.8.2 Email & Telephone Number: lynne.mcdonald@ukpowernetworks.co.uk 07875 11 24 38	

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Section 2: Project Description

This section should be between 8 and 10 pages.

Context

2.1   Aims and objectives

The overarching aim of this project is to understand the requirements of the fuel poor (which have a significant overlap with those who are vulnerable) and explore the means to encourage their increased participation in energy efficiency and in Time-of-Use (ToU) tariffs. This in turn will have the effect of suppressing network loads and shifting their energy usage away from peak demand periods.

The project's six core objectives are to research and build evidence-based learning on:

- how to identify and use existing trusted social resources to effectively engage fuel poor customers in the adoption and use of smart metering technologies;
- the amount of energy savings (in energy and monetary terms) arising from a set of intervention measures tailored to the specific resources and needs of the trial area community;
- the amount of energy shifting arising from a package of intervention measures tailored to the specific resources and needs of the trial area community;
- the impact on network reinforcement from reduction or shift in energy consumption;
- improved demand profiling for these customers; and
- what engagement material and communications channels were effective in reinforcing and supporting their behaviour.

This will allow UK Power Networks and its project partners to:

- Realise the potential contributions and benefits of energy efficiency and load shifting from these domestic customer groups in a sustained manner to help DNO management of increasing and uncertain demands on the network;
- Explore and understand the specific needs of fuel poor with regard to their energy usage;
- Work closely with suppliers and community actors to better identify and assist these groups and explore synergies with existing obligations;
- Understand and develop the specific customer engagement measures required to ensure that fuel poor customers are effectively assisted as smart technology and energy saving and shifting devices evolve;
- Explain and provide tools to these customers to ensure that they fully understand what they can do to reduce their energy consumption and energy bills;
- Identify what opportunities there are for Time of Use tariffs and load shifting for this customer group, and hence what network reinforcement can be avoided;
- Validate the current Priority Service Register (PSR) data and processes that rely on it; and
- Pro-actively identify how the quality and completeness of the PSR can be improved in the process of the low carbon transition.

Wider benefits are also expected to result from VCEE as a result of a better understanding of fuel poor customers, both for UK Power Networks and across GB due to its social theme and replicability. As Ofgem has noted, consumer vulnerability is influenced by a wide range of life factors that include, but extend beyond, aspects of energy use. VCEE brings together a unique set of project partners, including social housing landlords and third-sector organisations, who work with and support fuel poor customers. The project's delivery, and learning outputs, will build a much better understanding of how DNOs and suppliers can

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work together with these stakeholders to optimally serve such customers. For example, the project will inform more holistic partnership strategies for identifying and communicating with fuel poor customers and for linking energy service and saving activities with wider community initiatives. All GB DNOs and suppliers can use VCEE project learning to work in greater synergy with the communities they serve.

2.1.1 The problem(s)

Fuel poor customers need the benefits from the low carbon transition the most but have the least ability to access the potential benefits

The government's Low Carbon Transition Plan is necessarily having an impact on customers' energy bills. Those with the potential to be hardest hit and that are the most sensitive to price rises are the fuel poor (which has a significant overlap with those who are vulnerable). It is widely accepted that fuel poor customers are the group that:

- is least able to access the potential benefits of the low carbon transition;
- needs these benefits the most; but
- requires the most assistance to realise them.

Analysis has shown that these customers typically:

- Are most likely to be on prepayment meters thereby facing higher tariffs and making it harder to switch supplier;
- Have more pressing demands on their money than buying energy saving and shifting devices;
- Often do not have bank accounts to enable them to pay by direct debits and receive the corresponding cost reduction;
- May not have access to the internet, may not know how to use it or are wary of using it for financial activity, thereby preventing discounts for online tariffs;
- Are less likely to implement energy saving measures without assistance to do so;
- Are already likely to have reduced their energy consumption where they can;
- Are less able to afford and install micro-generation or fuel pumps, or own electric vehicles due to financial restriction and as they do not own their property; and
- face unique risks e.g. they often live in tower blocks which are difficult to meter or face challenges that limit their ability to safely save energy.

For these reasons it is particularly vital that these customers are able to achieve the predicted level of benefits from industry initiatives, which includes the smart meter rollout programme, as they are least able to absorb any bill increases; many already experiencing significant difficulty with their energy bills.

Collective responsibility of the energy industry to support fuel poor customers through the transition to a low carbon economy

The government has made a commitment to eradicate fuel poverty by 2016 and is also legally bound to cut emissions across the whole UK economy by 50% by 2025, and further by 2030 as part of the move to a low carbon future.

Moreover, the government has embarked on a multi-billion pound programme to rollout smart meters to all customers by 2020. This presents an opportunity for customers to participate in energy saving and shifting activities, with the potential to make energy cost savings through better understanding and control of their energy use.

Picking up on previous issues highlighted in the Smart Metering prospectus and DECC stakeholder workshops, the Smart Metering Impact Assessment (IA No: DECC0009 2013-01-24) raises a number of issues relating to the rollout of smart meters and vulnerable

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customers (noting the overlap with the fuel poor). These include:

- the provision of information, including advice and support needed for customers to use and understand the information provided by the in-home display (IHD);
- the potential for customer confusion as a result of the greater amount of energy-related information from smart metering and of the possibility of more complex energy tariffs;
- with respect to the policy's Equality Duty, long term issues relating to the customer engagement in the market and complexity of tariffs are addressed; and
- through the mandated Central Delivery Body, that suppliers must deliver customer engagement activities that ensure that "…vulnerable, low income and pre-payment consumers are appropriately engaged to help them realise the benefits of smart meters while continuing to maintain an adequate level of warmth and meet their other energy needs."

This collective responsibility of the wider energy industry, including DNOs to support fuel poor customers through the transition to a smarter energy system is significant, and to date has received little direct research and operational attention. It has been the focus of considerable interest from charities, social enterprises, consumer groups and the media and will be an issue on which the success of the smart meter rollout and the realisation of customer and network benefits, is judged.

Fuel poor customers are the most difficult to engage with

Fuel poor customers require additional help and support to engage with smart meters and energy efficiency devices to enable them to access the range of benefits available to them. The realisation of energy cost savings is particularly important to the fuel poor.

Significant strides will need to be taken to assist the fuel poor realise smart meter benefits, as experience has shown that these customers are the most difficult to engage with and the best approach has yet to be determined. UK Power Networks' management of its PSR and Low Carbon Network Fund Tier 2 project - Low Carbon London, indicates that these customers need to be approached in a different and more appropriate manner. In the Low Carbon London trials, the Inner City Adversity ACORN group was the most prevalent to refuse to have a smart meter, owing to it being too technical / confusing.

Supporting fuel poor customers to realise their energy saving and load shifting potentials will benefit all DNOs in their management of increasing and uncertain demands from the low carbon transition.

New area for DNOs to have direct liaison with end customers

Noting the significant overlap of those who are fuel poor with those that are vulnerable. As part of RIIO-ED1, Ofgem is placing new obligations on DNOs, requiring them to play a full and pro-active role in addressing consumer vulnerability. The Ofgem Consumer Vulnerable Strategy (published: 4 July 2013) further clarifies Ofgem's expectation that DNOs should take an active role in the assistance of vulnerable customers, and develop best practice operational processes to support them.

Direct liaison between UK Power Networks and the end customers is predominantly a new area (except in the resolution of power outages and new connections). Historically, apart from their PSR obligations, DNOs have had a limited role in initiatives addressing the needs of vulnerable customers as contact with these groups has been minimal and primarily via suppliers. To date initiatives to alleviate fuel poverty and address vulnerable customer needs have focused on government and supplier efforts.

Looking ahead to the rollout out of smart grids, it is essential that DNOs can balance the overall demands on their networks at all times, to deliver a cost effective, reliable grid that supports the wide-scale use of low carbon technologies whilst still protecting the energy

supply of each individual customer. Networks have to be designed to cater for the maximum expected load required during peak times. As energy demands increase, networks will either need to be reinforced, or sufficient load will need to be shifted away from peak periods into less peak periods, to further avoid expensive reinforcement. The more customers that the electricity industry can get to participate in providing load-shifting or Demand Side Response (DSR) and the more customers that can achieve sustained energy savings, the more it will help to mitigate this substantial challenge.

These problems therefore require a project that:

- identifies and demonstrates how to leverage the existing social resources to effectively and sustainably engage fuel poor customers in the adoption and use of smart metering technologies;
- inform a strategy for a DNO to establish a holistic partnership with suppliers, customer specialists, charity bodies, social housing landlords and third-sector organisations to work with and support fuel poor customers;
- provides fuel poor access to energy saving and shifting technologies and techniques to facilitate their involvement in the low carbon economy and unlock the potential benefits that are available;
- researches the amount of energy saving and shifting levels that fuel poor can engage in as a result of a package of intervention measures (including a smart meter, IHD, simple energy saving and shifting devices, and Time of Use (ToU) tariffs); and
- measures the impact on network reinforcement from the fuel poor customers' engagement with energy saving and load shifting activities.

2.1.2 The Method

In response to the problems outlined above, we propose a method of working collaboratively with a key electricity supplier, and working with local community actors, charitable bodies and partners that are specifically engaged with fuel poor customers, to enable them to participate in the demand-shifting and energy efficiency market to realise the maximum benefit from smart meters; but in a way that is sustainable within DNO and supplier obligations and recognised within existing incentive/obligation schemes.

Although some smart meter trials and energy efficiency studies have been undertaken previously, UK Power Networks firmly believes that the VCEE project takes an innovative approach to assisting these customer groups as a whole, providing benefits to both customers and networks. Furthermore, this is the first Low Carbon Network Fund project to specifically address the need of fuel poor customers.

2.1.3 The Trial(s)

The project aims to recruit and maintain the participation of 550 households during the trials. The project will focus on the fuel poor and this has significant overlap with those who are vulnerable. The customer recruitment pool will be fuel poor residents of Tower Hamlets Homes and Poplar HARCA both of which are in the London Borough of Tower Hamlets. These residents reside in Multiple Dwelling Unit (MDU) buildings and a proportion have Pre-Payment (PPM) services.

The same 550 households divided into two groups will participate in two sequential 12-month trials. The trials are:

- Trial 1 - Energy Saving: Identifying the magnitude of energy savings when participants have access to smart metering solutions and simple affordable energy saving devices and energy advice.
- Trial 2 - Energy Saving & Shifting: Identifying the magnitude of energy shifting and

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saving taking place in parallel.

A learning benefit of Trial 2 is testing roll out approaches: the 'big bang', when the smart meter, in-home display, energy saving & shifting products, Time-of-Use (ToU) tariff and energy advice are provided all at once, compared with the 'drip feed' approach where they are staggered.

Both trials will test a package of interventions provided to an 'intervention group' against a 'control group' that does not have access to them. Therefore, the effect of both trials will be quantified in a similar way through comparing the findings from the intervention group(s) to the control group(s). Recruited participants will be randomly allocated to Group 1 and Group 2. Each Group will experience a different trial journey as part of the project but ultimately all participants by the end of the two trials will have access to energy saving and shifting solutions that could lead to them economising on their household energy usage and spend. Participants that are part of the with-in trial groups will receive compensation payments for disruption. The trials will be structured as follows:

		Trial 1 – Energy Saving	Trial 2 – Energy Saving & Shifting
With-in the VCEE trials	Group1	**Intervention Group** *Intervention package:* Provision of SMETs meters with IHDs, energy saving devices and energy advice.	**Intervention Group** *Intervention package:* Provision of energy shifting devices and Time of use tariffs (ToU). This is in addition to the previously installed equipment for Trial 1 (SMETs meters with IHDs and energy saving devices).
	Group 2	**Control Group** Only the installation of data loggers.	**Intervention Group** Provision of SMETs meters with IHDs, energy saving devices, energy advice, energy shifting devices and ToU tariffs.
	Monitoring	**Network Monitoring:** Monitoring at both Primary and Secondary level. **Temperature monitoring:** For both trial participant groups, to ensure that they maintain an acceptable level of warmth whilst reducing and shifting their energy consumption.	
Out-with the VCEE trials	Smart meter customers	**External Control Group**	**External Control Group**

Table 1 – Structure of the Trials

2.1.4 The Solution

The overall solution from the project will provide a strategy for DNOs to work collaboratively with electricity suppliers and community actors to better identify, understand the needs, assist and deliver services to the fuel poor, within existing obligations.

The customer recruitment and engagement strategy will allow us to:

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- Achieve the potential contributions and benefits of energy efficiency and load shifting from these domestic customer groups in a sustained manner to help DNOs to manage the increasing and uncertain demands on the network; and

- Understand and develop the specific customer engagement measures that are required to ensure that fuel poor customers are effectively assisted, as smart technology and energy saving and shifting devices evolve.

The aim of the energy saving and shifting trials is to identify and demonstrate, using the project's package of interventions, what opportunities the fuel poor have to participate in the energy efficiency and DSR market. Subsequently, the level that they are able to reduce and shift demand, and hence if network reinforcement is able to be avoided.

2.2   Technical Description of the Project

The project has been organised into four workstreams:

WS1: Customer Recruitment and Engagement   **WS3:** Customer and Network Insights

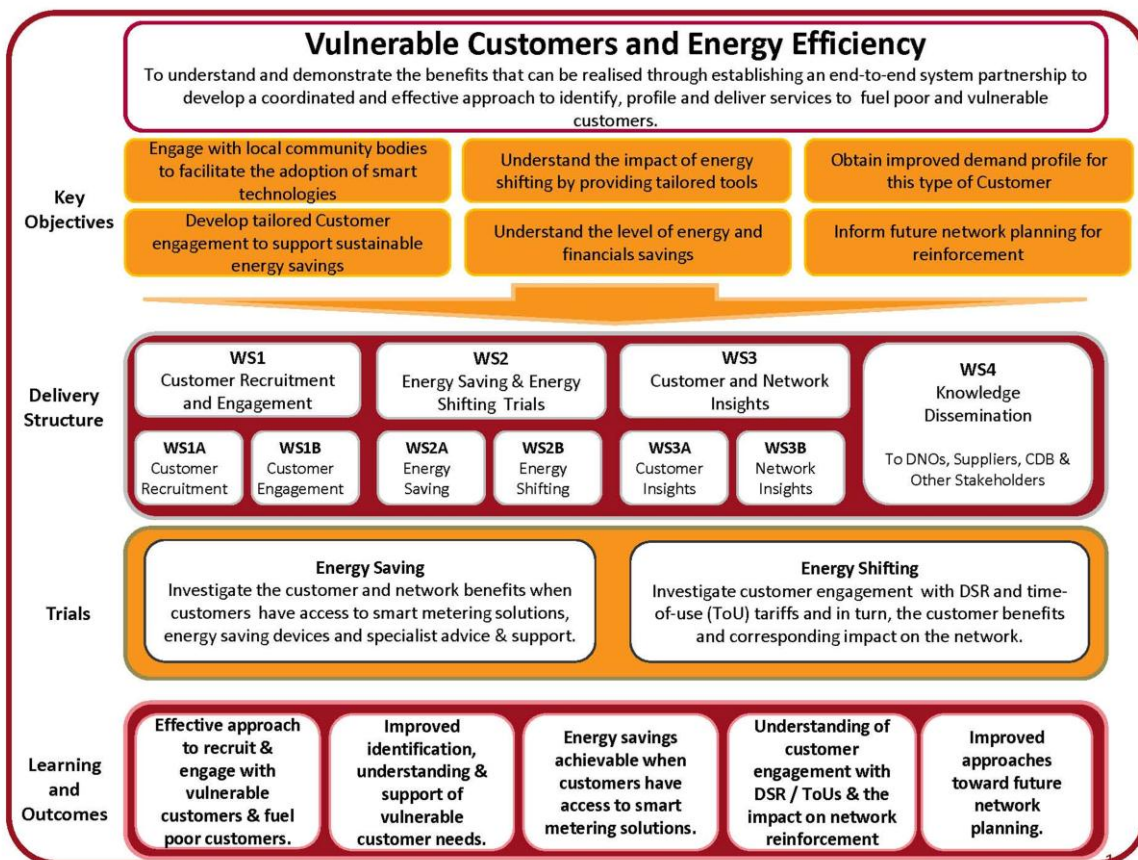**WS2:** Energy Saving and Shifting Trials   **WS4:** Knowledge Dissemination

Figure 1 - Project Workstreams

2.2.1 High level work stream activities:

WS1 – Customer Recruitment and Engagement

Identification of fuel poor households

It is understood that fuel poor and vulnerable are different categories, and are not interchangeable, although the two issues overlap. The priority of the project will be to

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recruit participants who are fuel poor. However, it is difficult to identify which households are fuel poor as one would need to know: (a) their 'required fuel costs' and (b) their income. Therefore, we will adopt a multi-staged approach.

- Firstly, creating a list of British Gas customers who are residents of either Tower Hamlets Homes or Poplar HARCA.
- Secondly, using available data to screen and identify the pool of potential eligible participants who are likely to meet current definitions of fuel poverty.

To do the second, we will draw upon an agreed set of proxies, including indicators of both fuel poverty and vulnerability, to identify households that are likely to be in, or at risk of, fuel poverty. Criteria for inclusion could therefore be based on: the efficiency of a householder's property, as according to DECC's latest fuel poverty report (DECC, 2013), a householder in a low rated property (F or G) is likely to be in fuel poverty; also the efficiency of the householder's property, e.g. the E or D band combined with them being in receipt of benefits, such as, the Warm Homes Discount.

The outcome of this process will be a secure database of the specific households that fulfil the criteria for the trials and could potentially participate; compliant with the Data Protection Act 1998.

Having identified the pool of eligible trial participants, the targeted and invitation-led customer recruitment process will be run. If during the process, some customers that were initially identified as eligible, turn out not to fit the criteria, a letter will be sent to these households explaining why they cannot be included, together with energy saving advice.

Customer recruitment and engagement strategy

The strategy aims to recruit and maintain the participation of 550 households who will be divided into two groups and will each participate in VCEE's two sequential 12-month trials. The proposed strategy has been developed using evidence from research activities that the project partner CAG Consultants undertook, building in best practice and refined in response to consultation within workshops from those involved with the project. This includes:

- *Low Carbon Network Fund (LCNF) DNO Factsheet:* Issuing a LCNF Factsheet to DNOs who had previously been awarded LCNF funding for projects that included engagement and recruitment. This was to frame learning on best practice and what worked well and less well from their project experience;
- *Literature review:* Researching and identifying best practice in terms of recruiting and engaging fuel poor and vulnerable customers based on the findings of other work in the field, applying the Campbell Systematic Review; and
- *Partner skills audit:* Reviewing and identifying each of the partners skill sets via a partner skill discovery questionnaire and follow-up interview. The purpose was to identify and best place roles and responsibilities.
- *Workshops:* Two workshops were held to review the proposed recruitment and engagement strategy; one for the project partners and suppliers and a separate one for UK Power Network's internal Customer Services and bid team.

It is intended that the strategy will be further refined, both before and during the project to ensure best fit with customer needs and expectations on the ground. Please refer to Appendix I for the strategy summary and evidence of the research activities can be found in Appendix J, K and L.

WS2 – Energy Saving and Shifting Trials

For *Trial 1 – Energy Saving*, the interventions provided to the intervention group i.e. Group 1 will include: smart meters, in-homes display (IHDs), energy saving devices and energy advice. The energy saving from Group 1 will be compared with the within trial control

group, Group 2 that will only have data loggers installed. The robustness of the within trial control group will be assessed against the external control group of British Gas smart meter customers. The difference between the two groups is therefore the effect of the trial and this will be measured, including the network impacts.

For *Trial 2 – Energy Saving & Shifting*, both Group 1 and Group 2 will be intervention groups. Interventions made available will include: smart meters, IHDs, energy saving devices, energy shifting devices, energy advice and a Time-of-Use (ToU) tariff. The difference between the two within trial groups is the timing that the interventions have been released. Group 1 will experience the 'drip feed' approach whereby the ToU tariff and energy shifting devices have been provided after they have access to a smart meter, IHD and energy saving devices for a year. Whilst Group 2 will experience the 'big bang' approach whereby they receive all the energy saving and shifting interventions at once. Comparisons will be made between the two within trial intervention groups to see if providing participants with energy saving, and energy shifting interventions at different times has an effect on their energy shifting and subsequent network impacts. The effect of both groups will be compared to the external control group to allow for determining the size of the effect, and to allow for controlling for external effects such as energy price rises.

Monitoring

For both trials, network monitoring will be conducted so as to measure the impacts of the interventions on the electricity network. Furthermore, temperature monitoring of the within trial groups households to ensure that an acceptable level of warmth is maintained whilst they reduce and shift their consumption during the trials.

Investigate enhanced services during power outages

VCEE will explore opportunities for enhancing the services during power outages with the British Red Cross who is a critical friend of the project and already provides services to UK Power Networks' customer base. As a VCEE project supporter, the British Red Cross will provide an independent sounding board for further development and enhancement, suggest ideas and links for services that may include; provision of a phone call to a Priority Service Register customer's relative regarding a power outage.

WS3 – Customer and Network Insights

A range of both qualitative and quantitative research methods will be used, applying tools developed in WS1 and WS2 as well as additional tools specific to WS3.

Customer information will be gathered via a range of methods for example face to face interviews, focus groups, telephone interviews and mail surveys.

Key information to be gained includes:

- Ways to engage with fuel poor customers to maximise the efficacy of smart meter installations;

- How to design and deliver an engagement strategy and communication materials that help fuel poor customers through the introduction of smart metering and demand-side management technologies; and

- Customer protection in the introduction of smart metering solutions and ToU tariffs. Also for those on prepayment services.

Furthermore a model will be tailored to the needs of the project and populated with trial specific data to assess the impact of a reduction or shift in consumption observed by trial participants in the trials on the distribution network.

Key learning from the model will be:

- An understanding of the magnitude of the energy, carbon and customer cost savings

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arising from the interventions (engagement, smart metering and demand-side management technologies) achieved by fuel poor customers within the trials; and

- An understanding of the scope for power and network related cost savings arising from the engagement strategies, smart meters and demand side management technologies used in the trials across the wider population of fuel poor.

WS4 – Knowledge Dissemination

The project will generate a wealth of knowledge and benefits to the wider DNO community and energy industry. In order for the full value of the project to be realised, UK Power Networks has established a dedicated workstream to share the knowledge and learning captured from the project. The first task will be to draw up a knowledge dissemination roadmap. The roadmap will define the key stakeholders and target audience, outline the knowledge to be shared, based on the outputs from the other three workstreams, and will propose the appropriate communication channel that will be used. The roadmap will also contain a timetable of activity for knowledge dissemination across the life of the project and will be regularly reviewed throughout that lifespan.

2.3   Description of the design of trials

Trials designed to ensure all trial participants can gain significant benefit

To have academic significance, any trial needs a control group against which to measure results. Considering the vulnerability of customers in the VCEE trials, UK Power Networks believes it inappropriate to engage customers in trials without offering them all benefit. Accordingly, we have designed the trials to ensure all customers can gain significant benefit.

This approach gains maximum learning, as well as ensuring that all customers participating in the trials have the opportunity to interact in energy efficiency and DSR activities. We will also establish an external control group from British Gas customers who already have smart meters installed.

Academic validation of the research design by University College London

This research design has been developed as a balanced response to the need for robust findings that can be generalised to UK Power Networks and GB, tensioned against the costs to the project and the logistical constraints of working with fuel poor customers in a constrained geographical area.

The design of the trials has been based on the two main objectives that are key to designing statistically sound and sufficiently robust trials that can capture learning.

Firstly (internal validity), to say how likely it is that the effects of the interventions are real, not just due to random fluctuations in energy use between those who received the interventions (the 'intervention group') and those who didn't (the 'control group').

Secondly (external validity), to be able to say how likely it is that the energy savings and shifting we see in those who received the interventions apply generally, i.e. would it happen if we did the same interventions elsewhere.

Considerable care has been taken in both the research design of this trial, and in the calculation of sample sizes for distinguishing between the intervention and control groups and for generalising to the wider population. Based on University College London's studies (see Appendix O) the recommendation is therefore for a participant pool of 550 and to randomly allocate half (275) into the Intervention Group and half into the Control Group to ensure that the two groups are identical except for the presence of the interventions. This technically good 'research design' provides assurance that the results couldn't have arisen for any other reason.

In addition to this, we will include an external control group that will run throughout both trials. This will be a group of British Gas customers outside the trial who are already on

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smart meters. This external control group will allow us to assess external influences e.g. energy price changes that arise.

Further supporting this, compensation payments for disruption to trial participants have been designed purposely to not instil any bias, by ensuring compensation payments are reflective within each of the VCEE customer groups. The external control group will not receive any compensation.

Item	Payment	Cust.	Payments	Total	Details
Household compensation					
Trial Compensation	£20	550	6	66,000	3 per trial
- Per survey/visit completed	£10	550	5	27,500	2 surveys per trial + 1 visit
- Per focus group meeting	£10	20	9	1,800	
Customer panel reps					
- Per panel attended	£20	12	7	1,680	
Total cost of compensation				**£96,980**	

Table 2 – Compensation Framework

2.4   Changes since Initial Screening Process (ISP)

Trials: At ISP, we proposed three sequential customer trials using: (a) basic SMETS1 smart meters; (b) followed by SMETS2 meters including prepayment functionality plus energy efficiency devices; and finally (c) time-of-use tariffs. Since ISP submission: UK Power Networks has obtained the support of British Gas as a supplier partner (subject to the agreement of contract terms) and we have learnt that they will have meters available with all the functionality required for trials (a) and (b) by quarter 4 2014. Working with British Gas we have determined that there was only a small difference between the learning from trials (a) and (b) above, and little benefit for the fuel poor customers in running them separately. As a result, our proposed trials have been restructured: Energy saving (including smart meters, prepayment and energy savings devices altogether; and Energy shifting (including time-of-use tariffs). The benefits of this are: customers will be able to gain benefits from energy saving at an earlier date; and DSR trial learning is timely.

Costs: The Total Project Costs have increased as a result of the addition of firm information regarding the costs and partner contributions and contingency to the project.

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Section 3: Project Business Case

This section should be between 3 and 6 pages.

The VCEE business case has focused on two key areas and acknowledges a third (Refer to Appendix H – Cost Benefit Analysis for detailed calculations): (1) Network Benefits, (2) Customer Benefits and (3) Wider Benefits. The business case headlines are:

Network Benefits

Energy shifting

- £413k to £825k saving over 45 year asset life for 2.5MVA to 5MVA 10 year reinforcement deferral.
- £1.05m to £2.1m saving over 45 year asset life for 2.5MVA to 5MVA indefinite reinforcement deferral (no reinforcement over life of asset).

Energy saving

- £180k saving from a 52.4GWh reduction in energy distributed.

Customer Benefits

Energy saving

- £38 to £61 bill saving potential for households when participating in energy efficiency.

Wider Benefits

- Fills a gap in present research and demonstration, as VCEE is targeting involvement from a customer groups that have not been subject to previous trials.
- Trial area residents live in multiple dwelling unit buildings and a number are on prepayment services. Therefore technical solutions for 'hard-to-reach' customers will be trialled and invaluable learning gained on customer protection in the interaction with smart metering solutions.

Context

The timing of the take up of low carbon technologies and the installation of distributed generation is uncertain as they are market and incentive driven. This is illustrated in Figure 2, which demonstrates uncertainty about which of UK Power Networks' "best view" or the various DECC scenarios, will materialise, as well as uncertainty about whether the 10-years ahead view will occur earlier and quickly succeed the 5-years ahead view, or be pushed back. Under UK Power Networks' "best view" scenario, on which we have based our RIIO-ED1 business plan estimates: 2.6GW of photo-voltaic generation will be added to our network over the next 10 years, 294,500 additional charge posts for electric vehicles and 379,100 additional heat pumps will be connected to the LV network over those 10 years[1].
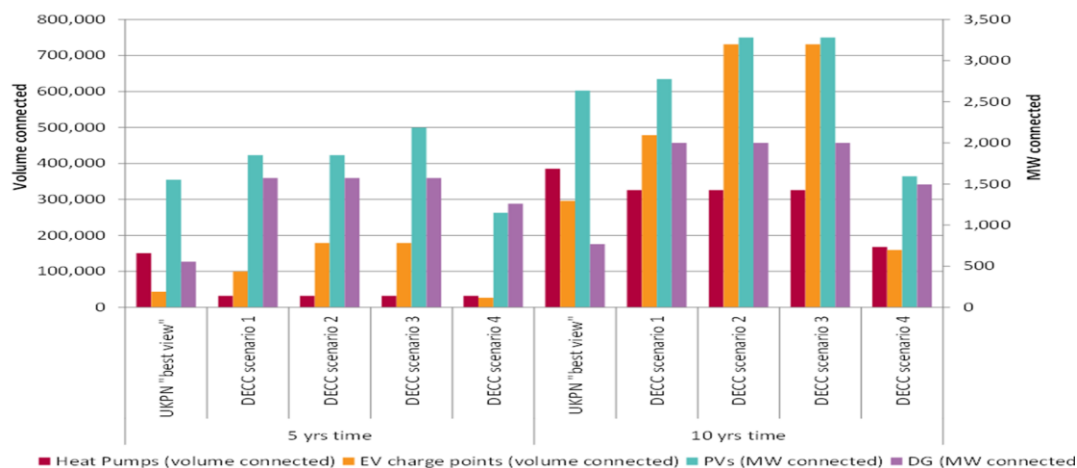

Figure 2 – Low Carbon Technology Uptake

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This could require as much as £132.6m of network reinforcement during the RIIO-ED1 period if reinforced by conventional means[2].

Within our RIIO-ED1 business plan, the network reinforcement and demand side management required to resolve a 1MVA constraint costs approximately £0.53m[3].

As such, the DNOs are seeking flexible alternatives to reinforcement. UK Power Networks has committed to using Demand Side Response (DSR) to deliver savings of £38.2m within our RIIO-ED1 business plan[2] by deferring a number of capital projects.

UK Power Networks has forecasted savings from DSR, with the majority of DSR likely to be obtained from Industrial & Commercial customers who are most likely to engage and be best placed to interact with DSR tariffs and contracts. Minimal contribution from domestic customers is anticipated, with fuel poor having least opportunity to interact.

However, the more customers that participate in providing time-shifting or DSR and the more customers that can achieve sustained energy savings, the more it will mitigate the substantial challenges facing DNOs from increasing and more uncertain demands.

[1] UK Power Networks' Business Plan Data Template (BPDT), table CV103

[2] UK Power Networks' Smart Grid Strategy, published in the RIIO-ED1 business plan

[3] Unit cost calculated from dividing total cost by total volume of secondary network reinforcement reported on table CV101 of our Business Plan Data Template (BPDT)
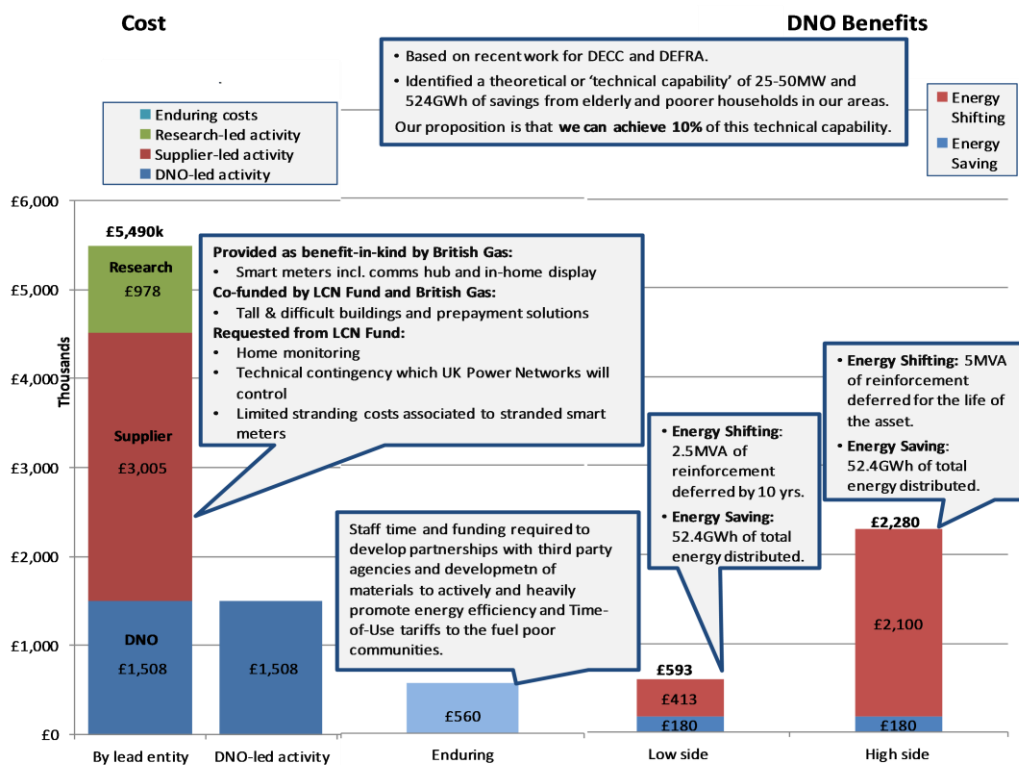
VCEE business case

Figure 3 – Business Case Waterfall Chart

The project costs in the left-most column of the business case waterfall match the full

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submission spreadsheet and represent the full project costs, including the items of scope which are being funded by UK Power Networks and the partners. The premise of the project has been that, if it can be shown that fuel poor customers respond to Time-of-Use tariffs and energy efficiency campaigns, then the more customers who participate, the better for the DNOs.

The enduring costs represent the present value incurred over an eight-year price control period for UK Power Networks to actively and heavily promote energy efficiency and Time-of-Use tariffs to the fuel poor communities in its three licence areas. It consists of an estimate of the staff time and funding required to develop partnerships with third party agencies such as social housing landlords and NGOs to carry out marketing campaigns. The campaigns would be to a level that can realise 10% of the technical potential of energy efficiency and load shifting that these communities may be capable of.

Network Benefits

The network benefits were calculated against two key categories (Refer to Appendix H):

1. *Energy Shifting:* Incentivising DSR through the introduction of a ToU tariff to encourage the fuel poor to shift their energy usage away from periods of peak demand.
2. *Energy Saving:* Reduction in the overall energy consumed by the fuel poor through energy saving advice and access to energy saving devices. Resulting in the suppression of network loads and an impact on asset utilisation.

The low-side estimate assumes that customers' behaviour is maintained for ten years and therefore that the effect of suppressing demand through energy efficiency and shifting peaks is maintained for that length of time. The high-side estimate assumes these behaviours are essentially permanent.

For both network benefit calculations, findings were based on the Household Electricity Usage Study (HEUS) household report undertaken on behalf of DECC and DEFRA and focused on two of the Experian Mosaic Groups. These two groups were (1) Households dependant on benefits and (2) Households dependant on state pension.

For Energy Shifting: *From the HEUS household report-* the GB wide technical peak shifting availability from the two groups was approx. 50-100MVA each, giving a combined potential of the two groups at 100-200MVA. UK Power Network serves approx. 25% of GB domestic customers. Therefore out of this GB wide technical potential, UK Power Networks (all three licences) has the potential for 25-50MW total technical peak shifting from the combined two groups. Hence, UK Power Networks is exploring the possibility of 2.5–5MVA additional energy shifting.

- *Low side energy shifting figure:* This is where the period of deferred demand is set to 10 years and the level of demand deferred taken as 2.5MVA, the lower end of the estimated rage of benefits. It is assumed there are no avoided costs from Industrial and Commercial (I&C) customer DSR. Anticipated saving £413k.

- *High side energy shifting figure:* This is where the period of deferred demand is set to indefinite (the lifetime of the asset) and the level of demand deferred taken as 5MVA, the higher end of the estimated rage of benefits. It is assumed there are no avoided costs from Industrial and Commercial (I&C) customer DSR. Anticipated saving £2.1m.

For Energy Saving: *From the HEUS household report* - The technical potential within the segment dependent on the state pension is estimated to be 655kWh/annum per household and the segment in receipt of benefits is estimated to be 353kWh/annum per household. In both cases, these rise to well over 1000kWh/annum when aspects of heating load are included. Therefore, the range of potential savings approximately matches the 655kWh/year figure. Thus 655kWh/year was selected for the VCEE project.

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- *Low side and high side energy saving figure:* The percentage reduction in energy distribution was calculated. The calculation was made using UK Power Networks 2011 figure of 83216GWh distributed level over the three licence areas and taking the number of fuel poor customers across UK Power Networks as 800,000 (based on the Sub-regional Fuel Poverty Levels, England (DECC, 2011)). This outputted a percentage saving of 0.063% (52.4GWh) of UK Power Networks total energy distributed. Using the 2011 total reinforcement spend across UK Power Networks in 2011 at £282m and applying the 0.063%, results in an anticipated saving of £180k.

Network System Development

Project learning will facilitate construction of electricity load profiles specific to customer groups. Through analysis of behaviour it may be possible to identify a common profile or convey subsets within the group. Fuel poor customers are one of the least understood groups in terms of consumption profiles, thus classifying their consumption behaviour first should provide the broadest body of learning.

A more informed planning process has the opportunity to facilitate enhanced configuration of the network, using load profiles of demographic and identified customer groups to distribute load across Low Voltage (LV) feeders and surrounding transformers in the most efficient manner. Achieving this could reduce peak loads, resulting in smoother load profiles at the secondary substation level. Through reducing load peaks, reinforcement deferral of some sites could be possible. Peak reduction will also reduce losses on the network. As network benefits will be more localised at the LV network, where losses are at their highest, there could be a notable saving.

Presently schemes are planned without the visibility of demographic or customer level load profile. If the task comprises of a transformer upgrade at a distribution level, maximum demand has historically been the data on which to base capacity requirements. Distribution data from across the LPN network has been used to construct typical load profiles for residential, commercial and night time consumption (see Figure 2 of Appendix B). More informed comparisons between secondary substations can be achieved, increasing confidence in network planning, whilst providing limited assistance at the individual secondary substation level. Transparency down to transformer load level is broadening; load composition of each LV feeder is still relatively undefined.

VCEE project timing will enable a framework to be in place during early stages of the Smart Meter rollout programme. Hence, if enhanced granularity is proven useful, profiles could be built for each demographic using the trialled methodology and Smart Meter data and this data linked to substations as necessary. The VCEE project will enable the potential of using these demographic profiles to be assessed and inform optimisation of the classes derived.

Customer Benefits

Direct Financial

At present there are a number of initiatives designed to help customers make the move to low carbon energy, yet some groups may not be able to access or fully benefit from these:

1. Retail Market Review – benefits are largely related to providing clearer information and choices. It is believed that this will lead to an increase in customers switching supplier and or tariff. Fuel poor customers are least likely or able to change supplier or tariff, so may not gain any direct financial benefit from the review.

2. ECO – benefits are predominantly from the energy savings for a customer as a result of the installation of insulation and boiler repairs or replacements. Whilst many of the properties of the fuel poor require these measures, they may not always have been installed; hence the customers may not be gaining the benefits that would result.

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3. <u>Smart Meters</u> – The stated estimate of energy saving per customer as a result of smart meters in the DECC SMIP impact assessment is 2.8%. This equates to £9.80 per year for electricity for a typical fuel poor customer.

   Another stated SMIP benefit is that all customer bills will be based on actual consumption rather than estimates. Most fuel poor are already on prepayment meters, which already operate on actual consumption; they would see no difference as a result.

   Most of the other benefits of SMIP would initially fall to the energy supplier who would in due course pass these to the customers via lower tariffs, but these would happen over time rather than immediately.

To assist our fuel poor customers make the transition to a low carbon economy, a range of tools have been selected that will tackle four of the six main shifting or saving opportunities in fuel poor households. Please refer to Appendix H. VCEE customers are predicted a £38 to £61 annual bill saving, the latter possible in the most highly engaging households.

Engagement

As consumption of these customers is assumed to be already significantly below average, and it is a reasonable assumption that they have already reduced their consumption where possible, it is widely thought that the potential opportunities for further savings are fairly limited. However, there may be opportunities for Time-of-Use tariffs to be introduced alongside smart meters to shift some energy usage into less expensive time bands.

The first and most vital step to realising any potential benefits for fuel poor customers is to successfully engage with them and gain their trust. Only once this is done can the energy savings and load shifting be achieved. This is the foundation of our VCEE project.

Wider Benefits

The most valuable benefit from this project will be the insight that it will deliver to DNOs, suppliers and other stakeholders regarding the behaviours of fuel poor customers, and their interaction in demand reduction and demand shifting. The VCEE trials have been designed with academic rigour in mind to ensure that the trial is statistically significant to ensure that the findings can be generalised. Additionally, gaps in present research can be filled. Research by RAND for DECC into ways of changing customer behaviours has identified a number of gaps in evidence available, including that there is little evidence on how different socio-demographic groups respond to different interventions. Typically studies have not been designed in a way that gives insight into this. They have either had small sample sizes that do not allow judgements to be made on whether differences are statistically significant, or have not collected the data necessary to undertake the analysis. (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69797/6921-what-works-in-changing-energyusing-behaviours-in-.pdf)

Potential Increases in Energy Bills

The economic climate has seen the price of energy, and hence the customer's energy bill, increase significantly at a time when the real term value of wages is decreasing. The Fuel Poverty Advisory Group has highlighted that fuel price rises have far outstripped increases in household income and have hit the poorest the hardest. Predictions for the coming years show that energy bills will rise further unless the projected benefits of the various initiatives are realised for all customers.

Wholesale Energy Price: Government predictions are that the price of wholesale electricity will rise by a further 21% between 2013 and 2021. This predicted increase in the wholesale cost of energy is between 2013 and 2021 from 5.7p/kWh to 6.9p. For a low usage customer, this equates to an increase of £28.80 over 8 years. Thus retail price increase of £11.75 per year for each customer.

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(https://www.gov.uk/government/publications/2012-energy-and-emissions-projections)

Smart Meters: The GB government has embarked on a multi-billion programme to roll out smart meters to all customers by 2020. Whilst there is a positive business case for the smart rollout overall by 2030, in the short term, the development, implementation and operational costs will further increase customers' bills. Government predicts that these increased costs will be more than offset by the benefits that can be achieved as a result, based on an assumption that the average customer will be able to save 2.8% of its energy costs. (DECC IA DECC0009 - https://www.gov.uk/IA-Feb.pdf). Analysis of this impact assessment suggests that the cost of this programme will be a minimum of £23.12 per customer per year. For the purpose of this analysis, the equipment costs have been spread over the period of rollout and the programme costs spread over an 18 year period, as per the SMIP impact assessment.

Energy Company Obligations: The costs of both renewable energy sources and the reduction of carbon emissions will initially manifest themselves as an increase in the end customer bills. The Energy Companies Obligations (ECO) places obligations on suppliers to achieve carbon and cost savings in respect of three targets by 31 March 2015. DECC estimated that the ECO would cost energy suppliers £1,300 million per year, about £53 per customer per annum.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42984/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf.

Retail Market Review: As stated by Ofgem the Retail Market Review proposals add an estimated £2.52 per year to each customer's bill plus a one-off setup cost in the first year of £2.18. (http://www.ofgem.gov.uk/RMR-Final-Impact-Assessment.pdf) The costs of delivery of these and other projects (including LCNF projects) are also funded via the customer's bill, assuming that the customer benefits outweigh the costs.

The Impact Assessments (IA) for the above projects quote costs and benefits per customer, simply by dividing the total cost of implementation by the customer base. This does not take into account that all customers are not able to access the benefits at the same level.

Smarter Networks: UK Power Networks has modelled its networks to support the current and future low carbon technologies and to provide DSR using ToU tariffs and price messaging. The cost of this network reinforcement by UK Power Networks is defined in the company's business plan as an increase to its cost base; networks costs are passed to customers as DUoS charges. The equivalent cost base increase per UK Power Networks customer of these network developments is expected to be £6.43 per year (Annex 10: Smart Metering from UK Power Networks RIIO-ED1 business plan).

All of the above initiatives equate to a potential increased cost per customer per year of £99.33. See below table for breakdown:

Total increase in bills			
Category	**Item**	**Basis**	**Per customer per year**
Energy costs	Retail energy increase in price	26.8p between 2013 - 2021 from Gov't price growth doc	£11.75
	Cost of powering smart meter	2.6w constantly as quoted in DECC SMIP IA	£2.52
Smart meters	SMIP Costs	From DECC SMIP IA	£22.47
	Other	From DECC SMIP IA	£0.64
	Distribution smart network costs	UKPN ED1 business plan	£6.43
Other Initiatives	Energy Company Obligation	From ECO IA	£53.00
	Retail Market Review	From RMR IA	£2.52
		Total increase	**£99.33**

Table 3 – Predicted bill increases

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Section 4: Evaluation Criteria
This section should be between 8 and 10 pages.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing Customers

The proposed VCEE project conforms to the principles for tackling climate change set out by the government as part of the Carbon Plan.

Firstly it utilises an effective approach to achieve climate change and energy security goals. It uses smart meter functionality (Carbon Plan, Part 3, 3.13, 3.14 and 3.15) to better understand behavioural aspects of how fuel poor customers can engage in energy efficiency and DSR activities. This will help customers to economise their household energy and spend. This in turn will have the effect of suppressing network loads and shifting their energy usage away from peak demand periods

Secondly, it will help to ensure the costs of climate change and energy security are distributed fairly, providing fuel poor customers with tools to assist with household energy management, thereby enabling them to participate in the transition to a low carbon economy.

Thirdly, VCEE will provide a framework to influence sustainable community behavioural change (Part 3, 3.3). Our engagement will inform them of the source and impact of the energy consumption that they currently use.

Base Case Assumptions

DNOs are forecasting increasing and more uncertain demands on their networks as the result of the electrification of heat and transport and the increased reliance on micro-generation and DG. The current conventional approach to managing increases in demand on the network is through network reinforcement. The capital spent to reinforce the network across UK Power Networks three licence areas if the project aim (of realising 10% of the technical potential of load shifting and energy efficiency that the fuel poor customers are capable of) were not achieved would be: £1.23m. This is in the middle of the low to high benefits case in the waterfall; Section 3, Figure 3. This is related to £1.05m of 2.5MVA demand deferred indefinitely (Refer to Appendix H, Case(b)) and £180k from a saving of 52.4GWh of the total energy distributed.

Method Cost Assumptions

The more customers that participate in providing time-shifting or DSR and the more customers that can achieve sustained energy savings, the more it will mitigate the substantial challenges facing DNOs. Challenges include increasing and more uncertain demands. As a consequence, DNOs are seeking flexible alternatives to reinforcement, such as, DSR and customer participation in energy efficiency activities. The premise of VCEE has been that, if it can be shown that fuel poor customers respond to Time-of-Use tariffs and energy efficiency campaigns, then the more customers who participate, the better for the DNOs. The method cost (referred also as the enduring cost) is £560k over an eight-year period for UK Power Networks to actively and heavily promote energy efficiency and Time-of-Use tariffs to the fuel poor communities in its three licence areas. It consists of an estimate of the staff time and funding required to develop partnerships with third party agencies, such as social housing landlords and NGOs, and to carry out marketing campaigns, to a level that can realise 10% of the technical potential that these communities may be capable of through energy efficiency and load shifting.

Potential for replication

There are 4.5million fuel poor in the UK, of which a significant number are also vulnerable in some way. These customers are dispersed across GB's DNOs and electricity suppliers, therefore learning can be widely applied and the method replicated.

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Once the trial findings have been reviewed and the data has been validated, the learning will be captured by UK Power Networks, and the knowledge obtained disseminated to all stakeholders. This will contain principles that each DNO and supplier can implement into its business, and that the smart metering programme's Central Delivery Body can use for the smart metering rollout. UK Power Networks will facilitate stakeholder workshops to present, and answer questions on the project findings, tailored to each audience.

It is envisaged that templates such as commercial agreements for any DNO partner services in relation to additional support services provided for the fuel poor will be shared. Guidelines and templates for interacting with the fuel poor will be shared as part of the project's knowledge dissemination so that the VCEE processes can be replicated by other parties e.g. for resolving issues encountered from multiple dwelling unit building installations, typical/specialist engagement required for when installing smart meters.

Carbon emissions savings, calculations and assumptions

Carbon savings: The VCEE project will deliver 93.51 tCO_2 emission savings by 2017, on average 0.11 tCO_2 emission per customer. Scaling this up to the 4.5 million fuel poor in the UK (2011, DECC), of which a significant number are also vulnerable in some way, emission savings could equate to 153,017 tCO2 (Refer to Appendix N).

Table 4 below outlines the tools that we plan to implement with the associated carbon savings. The appropriate technology tools will be selected for each customer based on their understanding of energy management and type of property occupied.

Tool		kWh/yr saving	Carbon saving (RIIO-ED1)			Comments
			ED1 2015 351.4 20	ED1 2016 334.7 22	ED1 2017 317.9 24	
CFL Bulb - 11W		89.43	0.031	0.030	0.028	11W (60W equ.)
Plug in thermostat		80.30	0.028	0.027	0.026	0°C to 35°C Thermostat socket
Solar phone / gadget charger	normal charge	4.38	0.002	0.001	0.001	A phone charges at around 4W. 4000mAh built-in battery.
	full charge waste	7.15	0.003	0.002	0.002	
PC standby saver		58.47	0.021	0.020	0.019	Cuts power to a computer and any associated accessories.
TV standby saver	Television	39.42	0.014	0.013	0.013	Switches off TV & accessories when standby button pressed.
	Set-top box	177.39	0.062	0.059	0.056	Additional saving by including a 'Set-top Box' on standby.
Energy Saving Socket with Timer	Small appliances	27.38	0.010	0.009	0.009	Switches off attached appliances - 3 time settings
	Laptop overcharge	40.29	0.014	0.013	0.013	
			0.18	0.18	0.17	tCO2

Table 4 – Energy Saving Devices

(b) Provides value for money to distribution customers

Fuel Poor Customer – Bill Changes

As part of the move towards a low carbon energy sector, the distribution network must facilitate connection of distributed generation, energy storage systems and electric vehicles.

To achieve this, investment is necessary, some of which may impact slightly on DUoS charges and ultimately the customer's bill. The contribution is a percentage change in their bill; all groups should observe the same percentage. Fuel poor customers are contributing

to the costs of moving to a low carbon energy sector, yet they are the least likely of groups to benefit. They are less likely to have access to the funding and knowledge required to install and benefit from low carbon technologies, tending to only have access if a scheme is community led.

Other areas of the final customer bill are also set to change if current consumption is maintained. Although government predicts that the price per kWh is set to rise, bills are anticipated to witness a lower percentage change as a result of the benefits associated with each new smart grid technology or initiative. In total, the anticipated rise in electricity bill for the average customer is £99.33 (full details presented within Section 3). While some customer groups will be able to adequately engage, making the most of available tools and services, the fuel poor are again less likely or able to take advantage.

Through engagement and the provision of energy saving tools, this project aims to have a direct benefit on the fuel poor, enabling them to economise on their household energy and spend. Additionally, through educating this group of the move towards a low carbon energy sector and highlighting the opportunities available, customers may become more able to access the wider benefits of the low carbon transition. Analysis undertaken suggests that an average fuel poor customer utilising a number of tools to their full advantage could reduce the impact of an annual £99.33 increase by approximately one third. With the appropriate engagement and education, further savings may be realised. Time of use tariffs will be trialled during the second trial period, and while designed to reduce points of peak load on the overall electricity system, they may also result in a positive overall cost impact.

It should be noted that although each customer should benefit, this may not be financial. As mentioned, a customer may maintain a similar bill value, but improve their quality of living. Presently this behaviour is not known and will only be determined through conducting the VCEE trials.

Fuel Poor Customer – Service

A fundamental aspect of this project is customer engagement. The fuel poor are a relatively unknown group when it comes to energy behaviour and are believed to have less resilience to changes in the sector. Fuel poverty has the potential to become a greater problem in the near future if a greater understanding of the group is not obtained. One to one interaction is necessary to determine their needs and assist engagement with low carbon technologies.

Fuel poor customers have a significant overlap with those who are vulnerable. Vulnerable customers should be listed on the DNOs Priority Service Register (PSR), which is a customer opt in register, to ensure care is provided during a power outage. The British Red Cross are currently informed of an outage affecting anyone who UK Power Networks have recorded as a vulnerable customer, and mobilise a team to assist. The VCEE project brings together partners and associates with a wealth of experience across a broad field, equipped with the resources necessary to test improvements to increasing PSR awareness. Comparisons with British Gas's PSR will identify initial discrepancies which can feed into the wider engagement strategy. Development of DNO and supplier understanding of vulnerable customers can enhance the PSR as it stands and consider potential improvements to the system and processes. Thus, through a high level of interaction, UK Power Networks and its project partners are better placed to help this community, helping to ensure vulnerable customers in need are adequately assisted during power outages.

Wider Customer Base

Customer groups are not generally profiled by DNOs at present. Generic profiles have been generated from monitored network behaviour. No customer group is associated with each profile as this level of granularity is not available. It is only through interaction with a particular group that this level of detail can be achieved. As the fuel poor community is very

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diverse, analysis of their energy utilisation patterns could inform whether identified profiles closely correlate with specific demographic groups. Such knowledge has potential benefit across the customer base, improving the planning process. Enhanced customer understanding could enable more accurate and informed planning which should facilitate better network configuration. The ability to connect new customers or low carbon technologies at the low voltage level is improved as planning could take into account the customer demographics, potentially improving accuracy of estimates. Total impact is dependent on the spread of customer behaviour observed and their ability to utilise the tools available.

Customer Engagement

A wider commitment for VCEE is developing a cost effective programme that demonstrates value for money. Therefore, the project has adopted a highly participative approach to the customer engagement strategy based on best practice. In particular this approach represents cost effectiveness and value for money in the following key areas:

- **Recruitment:** through using local, trusted partners and initiation-led recruitment, with invitations coming from trusted organisations, the recruitment process will be sped up, with a higher percentage opt-in.

- **Reducing dropout rates:** several aspects of the engagement approach will combine to reduce dropout rates. This will reduce the initial recruitment effort and the impact on the trial of repeated tranches of recruitment. In particular, our proposed process will provide high levels of support and will be led by known local people.

- **Reducing the customer dissatisfaction and volume of complaints:** by working hard to reduce disruption for householders and providing support to the most vulnerable during times of disruption, we will reduce the volume of complaints that may arise and therefore reduce effort in complaint handling.

- **Legacy and embedding:** the VCEE project recognises that it is taking place in a real community and, as such, aims to leave a legacy of increased cooperation between organisations, around a holistic service delivery approach that serves the needs of the fuel poor customers.

A significant **added value impact** of the programme will be the production of learning reports, case studies and a strategy of engaging with fuel poor households; a current significant challenge for DNOs.

c) Generates knowledge that can be shared amongst all DNOs

The VCEE project will provide significant incremental learning to a range of stakeholders, including VCEE project partners, customers, all DNOs and suppliers, the smart metering programme's Central Delivery Body organisation, and Ofgem.

VCEE will therefore provide one of the widest sets of incremental learning outputs of any LCNF project. The applicability of this learning is also the widest possible from an LCNF project, as the learning will be applicable to any stakeholder with an interest and/or an obligation towards fuel poor and vulnerable customers.

It will also address a key gap in the knowledge about customer behaviours with smart meters (research by RAND for DECC into ways of changing customer behaviours (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69797/69 21-what-works-in-changing-energyusing-behaviours-in-.pdf).

Currently the industry has a limited understanding of the needs of the fuel poor customers, especially in the context of the transition to the low carbon economy. VCEE will develop a greater understanding of the specific needs of this segment of the customer base. These needs must be better understood in order that both DNOs and suppliers can understand the

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services that they should provide as part of the transition to the low carbon economy.

VCEE will develop a customer engagement approach specifically tailored for fuel poor customers, and refine it to ensure that they will deliver maximum engagement levels in a sustainable and cost-efficient manner. These models can then be used by all suppliers and DNOs to deliver sustainable benefits to customers across GB.

Significantly, the learnings from the customer engagement will provide clarity on how suppliers and DNOs should work with other stakeholders in the community to maximise engagement. Ultimately, the successful engagement of fuel poor customers in the low carbon economy will deliver benefits to these customers in the form of reduced impact on energy bills.

VCEE will also develop real learning for DNOs and suppliers on the potential impact of customer behaviour of this particular segment of the customer base. This is particularly important because trials previously undertaken on projects such as Low Carbon London and the Energy Demand Research Project have not targeted or segmented these specific socio-demographic groups and therefore there is no statistically significant data available from which to develop a detailed understanding of the behaviour of this segment of the customer base compared to others.

From the perspective of the DNO, VCEE will provide a new level of understanding on the network benefits that can be achieved through customer engagement on energy efficiency and demand side response. These could include benefits in terms of reducing peaks.

As VCEE will include the installation of smart meters, it will provide valuable learning for the supplier partner on engagement with fuel poor customers for the smart metering rollout. This learning will be applicable to the Smart Metering Programme as a whole, so will benefit all suppliers and the Smart Metering Programme Central Delivery Body. Additionally, the nature of the properties (e.g. tower blocks) is likely to provide a number of data communications challenges, so VCEE supplier partner learning on overcoming communications issues in such properties will also be applicable to all other suppliers who will need to overcome similar challenges.

Currently, one of the key areas of interaction between the DNO and vulnerable customers is concerned with the Priority Services Register (PSR). Ofgem's recent Customer Vulnerability Strategy, and the reports prepared which informed the strategy, identify that customers are not always aware of the PSR and what services are provided to those registered on it, or their eligibility to register. VCEE provides an opportunity for UK Power Networks to engage with vulnerable customers and find improved ways of making such customers aware of the existence of the PSR and to increase the customer registration to it (i.e. ensure that a high proportion of eligible customers are registered). The learning from this process will be shared with other DNOs and Ofgem.

Finally, VCEE will provide UK Power Networks with an improved understanding of typical demand profiles of fuel poor customers, which can be used to improve the accuracy of demand modelling for planning purposes. This learning is highly applicable to other DNOs and will be shared with them.

(d) Involvement of other partners and external funding

(i) Rationale for selecting the project ideas and potential partners for this year's bid

Based on previous years' experiences, we have now delivered continuous improvement in our project selection and formulation processes.

We have on-going contact with our current and new partners and suppliers. This continuous engagement is important for us, not just for the Low Carbon Network Fund process but also to keep abreast with the latest developments, new upcoming solutions and to 'test' draft

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documents before final publication, such as our Innovation Strategy as part our ED1 Business plan submission. We engage with them in a structured way via 'Critical Friends Panels', representing academia, manufacturers and other stakeholders. We also engage with them via conferences and other power sector functions adhoc.

For the selection of our Low Carbon Network Fund Tier 2 2013 solutions, relevant project partners and suppliers were leveraged via existing relationships and approaches were also encouraged from new third parties. The selection for the bid was developed from an initial list of six projects. This drew on: Our recently published Smart Grid Strategy, unsolicited approaches from potential project partners, renewed approaches to partners who provided ideas in 2012, new potential partners (identified through our RIIO-ED1 stakeholder consultation panels) and business led ideas.

This list of six projects was consulted on with a wide range of stakeholders within UK Power Networks representing operational, IT, asset management and connections viewpoints. A further project then was received via an unsolicited approach from an additional project partner (Siemens), bringing the total to seven. To complement this process, we carried out an assessment of previous projects that were awarded funding under LCNF Tiers 1 & 2:

	User Solutions									Data			Network solutions						
	Smart meters	DG (e.g. PV / heat pumps)	EV support	DSR (Commercial arrangements)	Capacity sharing	Matching of local demand / gen	Small scale energy storage	Energy efficiency	Stakeholder engagement	Network monitoring	Substation monitoring	Network modelling	Closure of network open points	Network Automation	Voltage control	Fault level mitigation	Dynamic ratings	Use of meshed network	Grid scale energy storage
Tier 2 Year 1	3	2	2	1				3		1					1				
Tier 2 Year 2	1	2		2	1		3			2		2	1	4	1	1	2	1	
Tier 2 Year 3			1		1	1			1	1	1	1			1	1	1		1
Tier 1		1		2			5		1	9	2	2		5	2	1	1		
Total	4	5	3	5	2	1	8	3	2	13	3	5	1	9	5	3	4	1	1

Potential areas: Capacity sharing, energy efficiency, engagement, meshed network

Table 5 – Previous LCNF Project Coverage

In this respect, we were keen to identify potential gaps in terms of areas related to the transition to a low carbon economy that had not previously been explored under the Low Carbon Network Fund and to highlight projects that could deliver value for money for existing and future consumers. Our assessment highlighted a number of areas in which limited assessment had been taken forward. In particular, energy efficiency and end customer engagement were two areas where there had been limited focus. Also limited work had been completed to understand the role that capacity sharing between different parts of the network could play in optimising network operation.

The combination of these two activities led us to the decision to develop further the VCEE and FUN-LV projects. We consider that these projects will allow us to explore solutions to two key problems that are evident with respect to the transition to a low carbon economy and could help to facilitate this as value for money for customers.

When the final projects were chosen we assessed each partner involved in the selection process relevant to the projects on their own merits of what knowledge or skills, experience and delivery capability they could contribute to the project.

(ii) Identification and procurement of project partners

Our partners, suppliers and supporters in VCEE have been selected both on the strength of their existing relationships with the relevant customer base, fuel poor and vulnerable and

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for their strong credentials in the areas of customer engagement, trials and data protection. Our partners and their roles are shown below and in Appendix G.

Moreover, as local trusted organisations are vital for customer engagement, local partners such as social housing landlords and local community centres will provide instrumental support and assistance when engaging with fuel poor householders as they have good local knowledge and high levels of trust. The governance structure is as below:
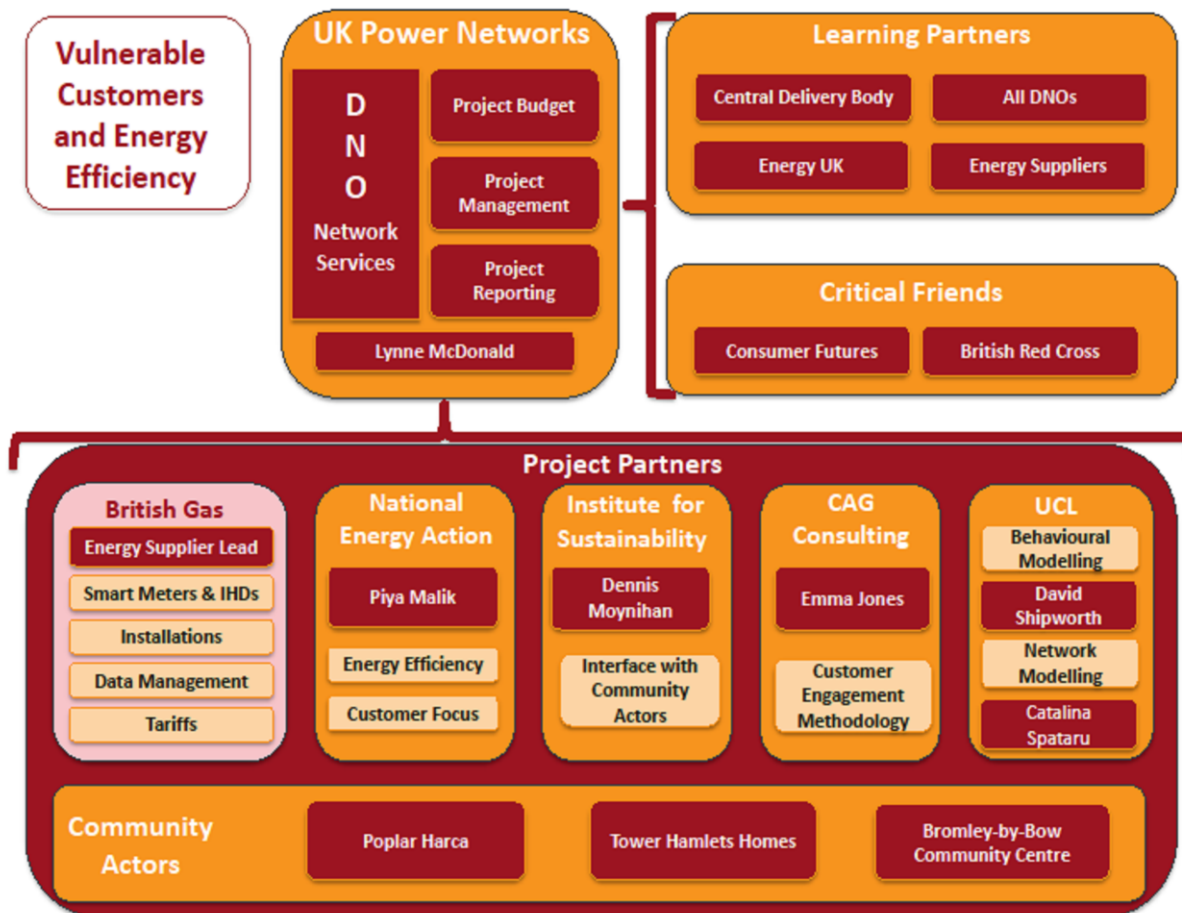
Figure 4 – VCEE Project Governance

Furthermore, for the appointment of the customer specialist, CAG Consultants, UK Power Networks followed its established procurement process by which an invitation for response in respect of steering the customer recruitment and engagement strategy was issued to bodies proposed by partners and those previously involved in the LCN Fund. A series of Q&A workshops were held followed by the submission of respondents final proposals. These were evaluated against fixed criteria and the suitable candidate appointed.

For the involvement of an electricity supplier as a project partner, UK Power Networks went out widely to the 'Big Six' and smaller independent energy suppliers. This followed an invitation for response against a developed VCEE Terms of Reference. This process resulted in UK Power Networks choosing to partner with British Gas.

Table 6 overleaf outlines each partner's benefit in-kind contributions in recognition of the benefits that their customers and their organisation will realise from VCEE participation.

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Partner	Potential benefits from involvement	Benefit
British Gas	1. Provides an opportunity for British Gas to validate their Smart Metering solutions for fuel poor customers, particularly those living in tall and difficult buildings 2. VCEE requires British Gas to bring forward their trialling of smart meter installation solutions for tall and difficult buildings in advance of the launch of the Data and Communications Company helping them to accelerate the development of a viable market solution to support the GB Smart Meter roll out programme 3. An increased understanding of smart meter benefits for distribution networks for fuel poor customers, particularly the load shifting impact of Time of Use tariffs	£1,121,861
CAG Consultants	1. CAG will benefit from VCEE by adding to their knowledge base on best practice and effective working with hard to reach communities, which will go on to benefit the wider community.	£4,596
Institute for Sustainability	1. Helps IfS to drive forward innovation in delivery of sustainable communities, consistent with their charitable mission 2. Aligns with their wider initiatives to promote "smart home" technologies for energy efficiency and wellbeing, particularly in support of fuel poor and social housing residents 3. Strengthens local stakeholder relationships in support of community sustainability and resilience	£25,650
University College London	1. Increases their understanding of the role of fuel poor customers in delivering demand side management within smart grids 2. Production of conference and journal publications 3. Collaborative learning with a cross section of institutions engaged in delivering smart energy solutions to customers 4. Access to high time resolution energy data married to socio-demographic and building demographic data	£82,295
Social Housing Landlords	1. Opportunity for their tenants to reduce their energy bills 2. Contributes to their wider understanding of how the fuel poor and vulnerable can be supported	£9,360
	Partner Total	**£1,243,762**
UK Power Networks	This is an extra contribution over and above the 10% compulsory contribution.	£431,151
	Grand Total	**£1,674,913**

Table 6 – Partner benefit in-kind contributions

(e) Relevance and timing

Smart Meters and fuel poor customers

Government has fully committed to rolling smart meters out to all customers by 2020. The Data Communications Company operation and the start of the mass rollout of smart meters are scheduled to start in Q4 2015. The cost of the rollout of smart meters is £11 billion and much of this will be socialised to all customers but the costs will be mitigated from the

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benefits that smart meters unlock.

The Central Delivery Body (CDB) was established on 1 July 2013 to define the strategy and plan for the engagement and rollout of smart meters to all customers.

Prior to mass rollout, our partner British Gas is already installing smart meters for some of its customers using its own systems and service providers to support them during this Foundation period. By Q4 2014, their meters will include prepayment services.

It is widely recognised that the fuel poor are a difficult group to engage with and that they will require additional support to actively engage with smart meters and obtain the available benefits. They are also a group that is less likely to have electric vehicles and micro-generation with the benefits these bring.

Many of these customers live in buildings that are considered 'difficult buildings' (i.e. where it is difficult to install satisfactory communications networks). As a result, these more complicated installations are likely to be left until the latter part of smart rollout.
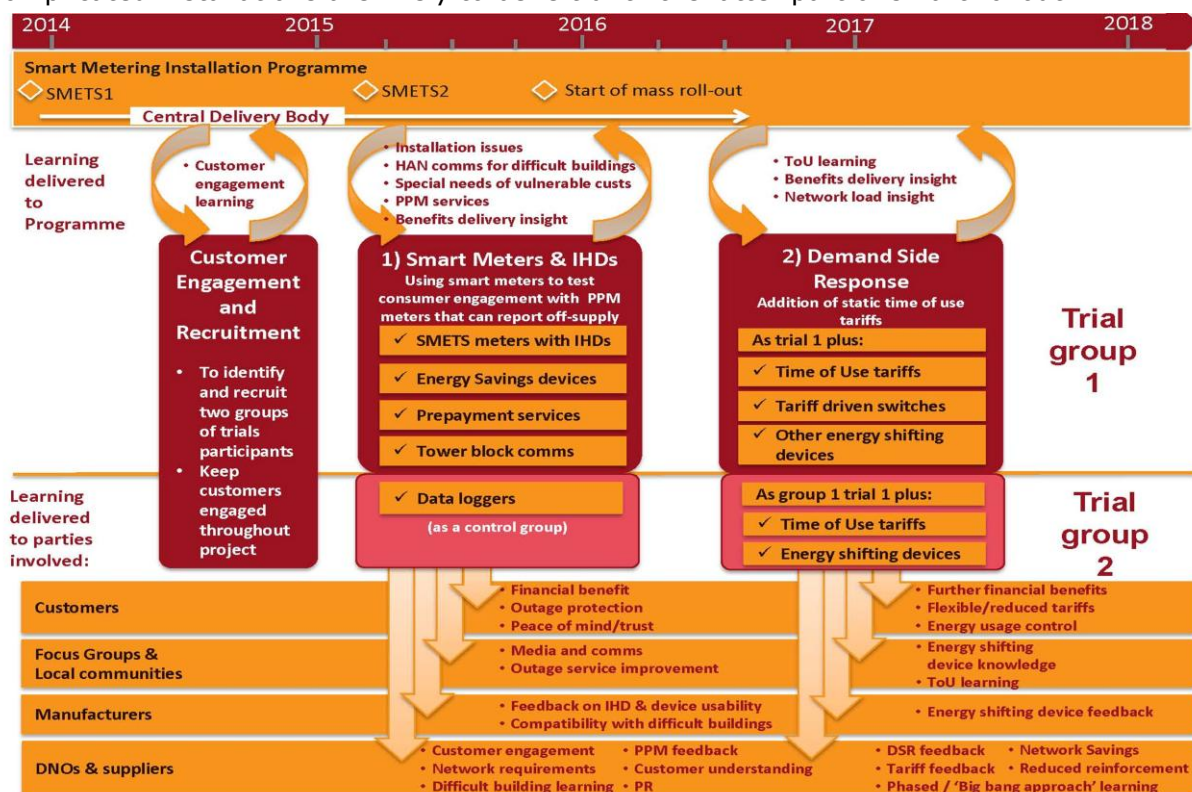
Figure 5 – Trials Overview

The VCEE project trials have been designed to be timely in delivered learning. Any earlier and the smart meters would not have the required key prepayment services that the fuel poor customer group predominantly uses. Any later and it would be too late by stakeholders to use the project findings during the smart meter rollout.

VCEE has been carefully designed to align with the Smart Metering Implementation Programme and the readiness of contributing technologies. It will generate cross platform learning that can produce benefits to fuel poor customers, energy suppliers and DNOs. The key project learning points will be:

Strategy for the engagement of the fuel poor: The initial strategy will be available mid-2014 and will provide valuable input to the Central Delivery Body's overall customer engagement and rollout strategy.

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Understanding of what works and what doesn't for engagement of this customer group: This will provide valuable cumulative learning for suppliers, DNOs and the Central Delivery Body, throughout our project. Suppliers must successfully engage with this customer group in order to achieve their rollout licence conditions and the learning that VCEE will collect, will contribute to their success.

Proving of difficult building communications: These will be installed in Q1 2015 and used for both VCEE trials. Learning will be collected throughout the project which will assist energy supplier installations.

Proving of prepayment operation: These will be installed in Q1 2015 and proven during trials 1 and 2. Assurance will be provided throughout the project.

Understanding of energy savings that this group can achieve: This will provide valuable input to network modelling for all DNOs in early 2016 after our first trial.

Understanding of the engagement of these customers with ToU tariffs and the resulting energy load shifting that this group can achieve: Again this will provide valuable input to network modelling for all DNOs, and will be available mid 2017 after our energy shifting trial.

UK Power Networks' Customer Services

The VCEE project will be conducted in parallel with a number of proposed UK Power Networks activities in partnership with National Energy Action (NEA). Outputs from these business as usual programmes will inform VCEE and enhance the project activities. For instance these potential programmes may include:

Young Carers Support - With one in twelve children under the age of 16 caring for a dependent adult (source BBC/University of Nottingham study), there is a significant percentage of UK Power Networks domestic customer base in need of additional support. There is a risk that young carers will not be aware of the support available to them such as ECO affordable warmth funding or our own PSR. NEA and UK Power Networks will work in partnership to develop a strategy for young carers support. The engagement and education of this group will run on a trial basis, yet if successful it could be built into each of the two VCEE trials.

Customer Champion Training: UK Power Networks is seeking to further develop their customer champion service, where the champions respond to customer complaints and power outages through further recruitment of additional champions, customer liaison officers and energy awareness training. These champions and customer liaison officers may have direct contact with VCEE trial participants, and from their training could assist in reinforcing energy messages.

School resources: UK Power Networks presently engages with schools to deliver health and safety advice around electricity. Young carers support will focus on a particular group within the vulnerable arena. Hence it is proposed UK Power Networks will provide resources (in the form of presentations, posters or onsite activity days) to a school fed by the VCEE trial area during the two trial periods. Learning will help inform future engagement with school pupils and future customer support projects.

Priority Service Register (PSR) box/welcome pack: A PSR box designed for registered PSR customers that are reliant on medical equipment, has been developed and funded through UK Power Networks business as usual. It contains: analogue phone, torch, welcome pack and aluminous sticker detailing the contact number to report a power outage. If the VCEE project discovers additional eligible PSR customers, the PSR service will be promoted and upon customer opt-in they too will be provided with, at minimum a PSR welcome pack and if reliant on medical equipment, the PSR box as well.

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Section 5: Knowledge dissemination

This section should be between 3 and 5 pages.

☐ Please cross the box if the Network Licensee does not intend to conform to the default IPR requirements.

UK Power Networks recognises that, if successful, the outcomes from each of the VCEE project areas will provide invaluable learning to all DNOs and other organisations working in the energy sector with the fuel poor and vulnerable. These areas include:

- Engaging and involving these customer groups in the low carbon economy whilst ensuring their protection;
- Investigating the extent to which any energy saving or shifting realised by these groups can support/influence network reinforcement planning;
- Testing the impact of introducing relatively simple technologies on the energy consumption and usage pattern of this group; and
- Investigating the effect of static time-of-use tariffs on the consumption behaviour of this group.

In order for the full value of the project to be shared UK Power Networks will establish a Knowledge Dissemination workstream dedicated to knowledge dissemination activities.

This workstream will build on the knowledge dissemination practices already undertaken by other UK Power Networks LCNF projects, particularly those which have directly involved the recruitment of, and direct interaction, with customers, such as Low Carbon London.

The Knowledge Dissemination workstream will aim to:

a. Identify all appropriate individuals and organisations with a potential interest in the project and its outcomes;
b. Ensure that any knowledge learnt by UK Power Networks and its partners is readily available to any interested parties; and
c. Disseminate the knowledge learnt using the most appropriate channels.

Dissemination Activities, Roles and Responsibilities

- All activities will be planned by the project's dedicated knowledge dissemination lead;
- Using best practice from previous LCNF projects, a knowledge dissemination roadmap will be developed at the start of the project to produce a clear plan for effective learning dissemination activity;
- UK Power Networks will work with project partners to identify the full set of relevant stakeholders who would benefit from the project's learning and determine the appropriate mechanisms for disseminating information to each of them.
- Activities will be planned and executed in coordination with the UK Power Networks' Future Networks department to ensure synergy with dissemination activity carried out by other projects and to avoid conflict and duplication. This will include, where possible, coordination with other DNOs carrying out similar dissemination activity;
- It is anticipated that all dissemination activities will receive the full support from the project partners throughout the duration of the project; this aim will be included in each partner's Memoranda of Understanding (MoU), to be entered into with UK Power Networks;
- UK Power Networks undertakes to ensure that, where learning from the project can make a material and positive difference to the operation of its networks and those of other DNOs, it is presented in a way that can translated into business-as-usual solutions.

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Methods and Areas of Knowledge Capture

To ensure that all relevant and appropriate knowledge is made widely available, the VCEE project team, supported by the knowledge dissemination lead, will ensure that learning is captured as the project progresses. We expect the type of knowledge to fall into four groups:

- **Stakeholder engagement knowledge** connected to the recruitment and on-going engagement, of this notoriously difficult to reach demographic group. This information will be captured initially through the recruitment phase and then through the engagement activity that is planned throughout the project via face-to-face meetings with trial participants and through the surveys they will be asked to complete at various stages of the two trials. The outcomes of workstream 1 will provide much of the material for this type of knowledge dissemination.

- **Technical knowledge** from the installation and data collected from the smart meters and other technical devices installed in customer premises. The information captured will be analysed to determine the suitability of such equipment to provide useful information for the management of the network.

- **Network knowledge** about the impact of the trials on distribution network, and the ways in which these interventions can contribute to reducing capacity constraints if rolled out on a larger scale.

- **Customer protection knowledge** about how the customer journey and customer is safeguarded in the interaction with smart meters and Time-of-Use tariffs, and dependant on the service they are on, such as, prepayment.

Planning for dissemination

Knowledge dissemination techniques and channels are well established within UK Power Networks due to the various LCNF projects it has prepared and delivered. Building on our knowledge and best-practice approach a detailed knowledge dissemination roadmap will be developed at the start of the project. This will ensure that a well-structured approach will be taken and communicated to the project team, including partners, and appropriate members of the wider Future Networks team within UK Power Networks. This roadmap will also allow for the coordination of the various knowledge dissemination activities between all LCNF projects led by UK Power Networks and, where possible, other DNOs, to maximise the effectiveness of knowledge dissemination activity.

Target audience

The target audience for dissemination activities is anticipated to include but not be limited to the following list:

- UK Power Networks staff
- All other GB DNOs
- Ofgem
- DECC
- Energy Networks Association (ENA)
- All GB electricity suppliers
- The smart metering Central Delivery Body
- Organisations working with vulnerable and fuel poor customers such as, housing associations, charities, community, customer and advisory groups
- Customers taking part in the trials and their carers
- The vulnerable and fuel poor community as a whole

- Industry and Government led working groups such as those overseen by the Smart Grid Forum and Smart Grids GB
- Academic Institutions
- Local Government Authorities

Dissemination Products

Throughout the project, logs of lessons learned will be maintained by the Project Manager supporting the continual capture and transfer of knowledge to partners and external stakeholders to feed the dissemination products.

The knowledge captured throughout the project will be disseminated through a range of products including, but not limited to:

- Trial design and the definition and identification of participant fuel poor customers (linked to SDRC 9.1)
- Strategy of how to recruit and engage with fuel poor customers. Additionally, learning on customer protection. (linked to SDRCs 9.2 and 9.4)
- Reports on the engagement of the fuel poor customer group with:
  - Smart meter and IHDs;
  - Energy Saving devices;
  - Time of Use tariffs; and
  - Energy shifting devices.

  (linked to SDRCs 9.3 and 9.5)
- Focus groups and one-to-one meetings with participating customers to explain the impact and results of energy efficiency products used in the trials (linked to SDRC 9.6)
- Workshops for those working with fuel poor and vulnerable customers to discuss and present successful engagement activity (linked to SDRC 9.6)
- Workshops for the DNO community to share the impact of project interventions on the operation and management of the electricity network (linked to SDRC 9.6)

Dissemination Channels

Due to the nature of the project and the wide range of stakeholders the style of dissemination must be tailored to best suit the audience's requirements. Knowledge dissemination should be approached from a stakeholder engagement point of view and should be a bi-directional process to ensure the learning opportunities are maximised and UK Power Networks can be sure that knowledge has been transferred and understood by all stakeholders. A bi-directional approach also gives stakeholders the chance to feedback and UK Power Networks to incorporate external views to increase the value of the project.

The knowledge obtained through the project will therefore be disseminated using a variety of methods and communications media, including but not limited to:

For external stakeholders including other DNOs and suppliers:

- Regular project stakeholder meetings
- Conferences and workshops – organised by UK Power Networks and project partners
- Speaking opportunities at externally organised conferences
- Newsletters
- Blueprints and reports
- Technical reports and analysis
- Contribution to industry working groups and forums

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Dedicated project pages on UK Power Networks Innovation website For customers participating in the project and possibly others in the same demographic group:

- Focus groups
- One-to-one meetings with participating customers
- Frequently asked questions document

Wider external audience:

- Reports and other knowledge dissemination products (as outlined above)
- Press releases
- Website pages
- Social media communications such as Twitter

For internal UK Power Networks stakeholders:

- Internal newsletters and briefing notes
- Workshops
- Technical reports and analysis

IPR Arrangements

The project will conform to LCNF IPR requirements, and an MoU will be put in place and signed with each project partner that reflects acceptance of these arrangements in full.

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Section 6: Project Readiness

This section should be between 5 and 8 pages.

Requested level of protection require against cost over-runs (%):N/A

Requested level of protection against Direct Benefits that they wish to apply for (%):N/A

Evidence of why the Project can start in a timely manner

A number of key activities have been initiated / completed during the preparation of the full submission which ensures that the project is ready to fully start at the beginning of January 2014:

- The project has progressed through UK Power Networks business as usual internal business change governance process, Project Governance and Control (PG&C). This ensures that all the relevant internal stakeholders are fully engaged and formally committed to the project throughout the preparation of the full submission.

- In depth analysis of the project objectives and requirements has been undertaken, resulting in the development of project scope and work stream high level activities.

- In order to demonstrate value for money and optimum preparation for a timely project start, we have already commenced and selected through competitive tender the customer specialist required by the project. During the course of the preparation of the full bid submission, we issued a request for proposal, held Q&A workshops, received and evaluated customer specialist responses, and selected the preferred specialist, CAG Consultants.

- CAG Consultants have during the course of the preparation of the full bid submission, undertaken extensive work to draft the proposed approach for the recruitment and engagement strategy for the VCEE project using the results of four exercises to inform its development: Low Carbon Network Fund factsheet, literature review, partner skills audit and two workshops, one with partners and one internally with UK Power Networks. Please refer to Section 2 of the full bid submission for full details.

- Considerable effort has been undertaken by the University College of London during the preparation of the full bid submission, structuring and designing the project with academic and statistical rigour. A key component of the analysis was to identify the customer trial size.

- The bid team undertook extensive research and analysis to shortlist the identified energy saving devices that were suitable and preferable to trial participants. We will continue to refine this with British Gas during the evaluation period. Therefore, by the start of the project we will have finalised the specifications and prices with the preferred product suppliers to undertake a procurement process to uphold value for money and for the delivery of these products for Trial 1 that will be executed January 2015.

- During the preparation for the full bid submission, the location of Tower Hamlets has been identified for recruitment of customer participants and trials to be conducted.

- Key to the success of this project is the use of organisations that already work with the fuel poor and vulnerable and are intermediaries that will be trusted. The project successfully brought together in the preparation of this full bid, a comprehensive partner, supplier and supporter group. These include - University College London, British Gas,

CAG Consultants, National Energy Action, Tower Hamlets Homes, Poplar HARCA, Bromley-by-Bow Community Centre, the Institute for Sustainability, British Red Cross and Consumer Futures.

- Continual engagement with the Project Directors and Project Managers of UK Power Networks existing portfolio of LCN funded projects ensures a detailed understanding of the lessons learnt on these projects and how these can be applied to this project. Significantly, the project governance and management processes developed and implemented on the Flexible Plug and Play project and subsequently on the Smarter Network Storage project, have been used as the basis for the project handbook that defines the governance and management arrangements from project kick-off.

- A detailed project plan identifying the key activities and milestones has been produced in consultation with our partners and is included in Appendix C. This plan will be continually reviewed and refined during the submission evaluation period to ensure that it is maintained as a fully comprehensive, accurate and up-to-date plan for project delivery starting at the beginning of January 2014.

- A risk register has been prepared with key risks potentially affecting the project delivery, with mitigation and contingency plans in place. Shown in Appendix D. As with the project plan, this will be continually reviewed and refined during the submission evaluation period to ensure that it is maintained as a fully comprehensive, accurate and up-to-date reflection of project risks and mitigations in place for project delivery starting at the beginning of January 2014.

- Furthermore, University College of London completed a study into the overarching project risks arising from under-recruitment of participants applying three scenarios shown in Appendix E. Such a study will be re-run on the recruited customer base number in year 1 of the project to understand the impact that it will have firstly, on being able to distinguish between the intervention and control groups and secondly, being able to generalise to populations out with the trial to ensure learning is replicable.

- A clearly defined project organisation has been developed and included in Appendix F, which reflects the governance and management arrangements that will be defined in the project handbook. This demonstrates that we have the people in place that have the authority, responsibility and knowledge to make the key decisions in an effective and timely manner. Through the submission evaluation period we will transition from the bid team to the enduring project team. The enduring project team members are in the main also part of the bid team, with a few exceptions as noted in Appendix F. This transition process will be managed such that the handover is complete by the end of November 2013, and the enduring project team is in place to commence at the beginning of January 2014.

Section on Senior Management commitment

The project has been developed in conjunction with UK Power Networks senior management who have both demonstrated management commitment and ensured the availability of input and support from a number of in-house specialists. The former has been achieved through regular presentation of the project at Executive Management Team meetings and also at Senior Management team meetings within relevant directorates, and compliance with UK Power Networks Project Governance & Control process throughout the development of the full submission, thus ensuring formal senior management commitment. The latter has been achieved through regular project meetings with senior managers and other senior discipline leaders with expertise in a number of areas including Customer Services. UK Power Networks has a developing portfolio of existing LCNF projects and this experience is

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also being brought to bear through engagement with the relevant Project Directors and Project Managers.

We have engaged with our own senior management and with our partners' senior management, each of whom have provided inputs on the project scope, delivery phases and success criteria. The experiences and guidance in their areas of expertise has enabled a robust project to be prepared.

Partner roles and areas of expertise are detailed in Appendix G. UK Power Networks and the project partners have the experience and capability to successfully deliver a project specifically involving vulnerable and fuel poor customers. The combined experience and capability will support the effective delivery of the project to time, costs and quality. Whilst ensuring that all practicable steps are taken to ensure that customers' best interests remain a primary concern at all times.

A letter of intent has been received from British Gas and UK Power Networks is in the process of agreeing an MoU with them. Through the submission evaluation period, UK Power Networks and the project partners will progress and agree the MoU terms between themselves. This provides further confidence that the project can start in a timely manner with the full support of all the project partners. This will ensure to provide further confidence that the project can start in a timely manner with the full support of all the project partners.

Evidence of how the costs and benefits have been estimated

To ensure robust and realistic costs, they have been calculated with a bottom-up approach across each of the project work streams. The UK Power Networks costs estimates are based on:

- Inputs from a number of UK Power Networks experts for labour requirements, including for procurement, legal and dissemination activities;

- Inputs from UK Power Networks experience from Low Carbon London and other LCN Fund tier 2 projects ;

- Quotations received from the partners and suppliers, utilising independent expertise in specific areas to challenge costs. This approach has led to significant refinement and the removal of duplicated costs through the submission preparation; and

- A cost and scope review to ensure that costs are accurate and provide value for money.

Evidence of the measures a DNO will employ to minimise the possibility of cost overruns or shortfalls in Direct Benefits

To support the delivery of a quality project both to budget and timely delivery, project management will be based on industry leading and proven UK Power Networks' delivery methodologies, based on Prince 2, and established governance processes. The project has a procurement component and establishing suitable suppliers and identifying competitive costs has been a key focus during the full submission preparation. In addition, a risk register has been prepared which details the identified risks and mitigation strategies, and included in Appendix D.

Project delivery and governance controls are defined fully in the project handbook, based on the approach used on both the Flexible Plug and Play and Smarter Network Storage projects.

These will include:

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- A Project Steering Group comprising the key stakeholders and decision makers within UK Power Networks, including the Project Sponsor Ben Wilson and chaired by Senior Responsible Owner Martin Wilcox, will meet initially monthly and less frequent as trials are underway. Where necessary, project partners will also be invited to attend. This group is ultimately responsible for the project and will make decisions that have an overall impact on the benefits and outputs that the project will deliver. They will assess major change requests, review the impact on the project business case, and identify and review risks and issues associated with major change requests.

- Monthly reporting to the UK Power Networks' Executive Management Team by the Project Sponsor to provide regular review points and allow full financial and project control.

- A Project Board comprising the Project Sponsor, Project Manager, Work Stream Managers and Programme Management Office, will meet fortnightly. The Board is responsible for the operational management of the project, focused on reviewing progress against plan, and resolving risks and issues. They will also approve change requests within a defined tolerance and prepare change requests for submission to the Steering Group for major changes.

- Regular risk reviews will be undertaken by the Project Manager with results reported to the Project Sponsor and Project Steering Group.

- A Customer Authority will review and approve all key project deliverables, with ultimate responsibility for the overall solutions being delivered by the project. Change requests may be initiated by the Customer Authority directly or by the Work Streams. Change requests initiated by the Work Streams will be reviewed by the Customer Authority prior to submission.

- Management of work streams in accordance with detailed project plans, the risk register and a clearly defined list of deliverables from each work stream. Each of these will be produced and a mitigation plan developed in consultation with our project partners to ensure a strong foundation for clarity of scope, objectives, approach and early identification of project risks or issues.

- A robust change management procedure to ensure that change request impacts are fully analysed at the appropriate level of authority depending on the scale of the change.

- Quarterly knowledge sharing meetings with project partners and suppliers.

Accuracy of information

UK Power Networks has endeavoured to ensure all of the information included within this full submission is accurate. Information included within the proposal has been gathered from within UK Power Networks, the project partners, suppliers and other subject matter experts. All of this information has been reviewed to confirm and refine understanding, whilst evaluating the validity and integrity of the information.

A bid team, incorporating a full time bid lead and design authority have worked with partners to prepare and review the bid. Project partners have also ensured information provided by them has been through a thorough internal review and approval process before being provided to UK Power Networks.

Risks to project learning

Throughout the project, details of lessons learned will be maintained by the Project Manager supporting the continual capture and transfer of knowledge to partners and internal / external stakeholders. This will build upon the experiences and best practice emerging from

prior UK Power Networks' LCNF projects.

As detailed in Appendix D, the risks and mitigation strategies have been identified against the delivery of each Successful Delivery Reward Criteria and related learning. Furthermore, the overarching project risk for under-recruitment of customer participants into the trials has been tested under plausible under-recruitment scenarios by project partner, University College London demonstrated that it does not pose a significant risk for project findings (refer to Appendix E).

The processes in place to identify circumstances where the most appropriate course of action will be to suspend the project, pending permission from Ofgem that it can be halted

As part of the UK Power Networks internal governance there are a number of processes in place to identify, assess and manage any issues that may affect the project. These processes help to maintain the smooth running of the project, whilst also aiding identifying the most appropriate course of action at any point.

The internal UK Power Networks business change governance process, Project Governance and Control (PG&C), is based upon the PRINCE2 methodology, with a gate approval process which reviews the project at critical stages throughout its life-cycle. The project must meet the mandatory entry/exit criteria for any particular gate (which takes into account risks, issues, benefits realisation and financial position), which the Project Manager will need to provide evidence. At a more detailed level, the project governance and management controls defined in the project handbook provide further assurances that the appropriate processes are in place.

A risk management and contingency plan is used to identify, analyse, control and review all of the risks, whilst calculating the potential cost impact. The Project Manager is responsible for ensuring all risks and issues are effectively managed and those above the agreed tolerance are escalated to the Project Steering Group. The Project Steering Group has overall responsibility to determine whether the most appropriate course of action would be to suspend the project.

Discretionary Funding for cost overruns or shortfalls in Direct Benefits

For VCEE, UK Power Networks have removed the project from the protection mechanisms available within the LCNF for cost overruns and the non-realisation of direct benefits.

Discretionary Funding Mechanism

UK Power Networks have excluded VCEE from this mechanism , therefore we will not seek discretionary funding mechanism awards for the project. UK Power Networks believe it to be an important strategic project to protect fuel poor customers and wish to minimise the overall LCNF costs, which are passed on to customers. The project will deliver and drive exceptional value, generating particular learning to help the DNOs and industry to understand what investment and operating strategies should be in place when delivering services to the fuel poor.

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Section 7: Regulatory issues

This section should be between 1 and 3 pages.

☐ Please cross the box if the Project may require any derogations, consents or changes to the regulatory arrangements.

We do not foresee any derogations or changes to the regulatory regime to support these trials.

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Section 8: Customer impacts
This section should be between 2 and 4 pages.

UK Power Networks recognises that the trials will impact on trial participants and on their premises. As a starting point for reducing any negative results of these interactions, we have developed an initial recruitment and engagement strategy (refer to Appendix I) that puts the customer at the heart of the process. We have also ensured that all activities are tailored to vulnerable customers and the fuel poor. The specific interaction for all participants within the trials include: Receipt of letter of invitation; Home visit and attendance at a fun launch event; Surveys; Focus group attendance within trials; and Installation of equipment.

To support participation and reduce negative impacts, the engagement governance structures will include participants, providing opportunities to feed into, reflect on and shape the process. In addition participants will have access to a range of support including:

- **Face to face** contact, which will be provided by trained customer field officers who will be available to visit householders where a need for high level support is identified, or at key points in the process.
- **Arm's length contact**, which will be provided by a phone line, text, email, free post address, webchat / social media, or, if necessary, through an individual's carer.
- **Arm's length information**, which will be provided via the VCEE website providing general information on the programme and the individual trials, FAQs, general energy efficiency information and all information that participating households have received.

To further reduce negative impacts, UK Power Networks and our partners will ensure that we use best practice and establish protocols in programme. Such practices will build upon the experiences and codes in place for UK Power Networks' Low Carbon London project.

These will include:

- **Data sharing between partners** - project partners will develop information sharing protocols, setting out what must and must not be done with any research data supplied by and / or about fuel poor households. These will include protocols compliant with the Data Protection Act 1998.
- **Codes of practice** - for the success of the project, a code of practice will be developed and implemented. Such a code can draw from existing established and recognised codes, some of which the project partners are already working within.
- **Accountability and transparency** - the customer recruitment and engagement strategy will be further developed. This will clearly allocate roles and responsibility, and will be shared with all those involved in delivering. Those responsible will be accountable to uphold the set out guidelines.

Privacy group established - The group (proposed to be composed of a representative of UK Power Networks legal team, Information System Architect and UK Power Networks Business Manager) will oversee all privacy and data protection requirements for the project. Its task is to oversee and ensure that privacy and data sharing controls and protocols are adhered to. It will act as a point of contact for the project and provide any on-going privacy and data protection advice to work streams and partners.

Furthermore, in accordance with version 6 of the LCNF governance document, VCEE will submit to Ofgem a communications strategy and plan of how the project and partners will engage and impact upon customers.

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Section 9: Successful Delivery Reward Criteria

This section should be between 2 and 5 pages.

Successful Delivery Reward Criteria

UK Power Networks has defined six SDRC points for our VCEE project.

9.1   Trial Design and Identification of Customer Participants

Criterion (9.1)

Detailed design of energy saving and energy shifting trials incorporating definition and identification of fuel poor customers

Evidence (9.1)

- Approved Trial Design Report
- Agreed set of fuel poverty / vulnerability indicators and targeted customer pool.

Timing (9.1)

By end of October 2014

9.2   Customer Recruitment

Criterion (9.2)

Effective recruitment of fuel poor customers

Evidence (9.2)

- A review of best practice in fuel poor customer recruitment.
- Identification of trusted intermediaries within the trial area community and their relationships with trial participants.
- A quantitative mapping of participants' energy knowledge resources (energy social capital survey) within their social networks i.e. where they turn to, and who they trust, for knowledge about energy.
- Findings from customer focus group testing of clarity and acceptability of recruitment communication materials.
- Statistics on recruitment success rates and reasons for non-participation.
- Qualitative evidence on the efficacy of different recruitment channels, strategies and materials.

Timing (9.2)

By end of April 2015

9.3   Energy Saving

Criterion (9.3)

Impact of energy saving trial interventions - level of fuel poor participation and network impacts

Evidence (9.3)

- Quantitative analysis of Trial 1 energy savings through within-trial intervention-group to control-group comparison.

- Quantitative analysis of Trial 1 control-group contamination effects through within-trial control-group to external to trial control-group comparison.
- Statistical generalisation of the energy savings to the wider UK Power Networks, British Gas and national fuel poor customer base.
- Representation of network impacts through half-hourly network modelling within the trial area.
- Comparison of realised energy savings against previous estimates of technical potential energy savings in the fuel poor customer group.
- Insights on customer protection during the trial.

Timing (9.3)

By end of June 2016

9.4   Customer Engagement

Criterion (9.4)

Effective engagement with fuel poor customers

Evidence (9.4)

- A review of best practice in fuel poor customer engagement.
- A review of best practice in trial panel maintenance (i.e. Methods to minimise participant dropout), particularly in trials with vulnerable participants.
- Quantitative analysis of longitudinal survey of participants' energy knowledge resources (energy social capital) within their social networks and how these have changed over time.
- Findings from interviews with trial participants on the efficacy of different engagement activities conducted throughout the trials.
- Statistics on participation attrition and reasons for participant drop-out.

Timing (9.4)

By end of August 2017

9.5   Energy Shifting

Criterion (9.5)

Impact of energy shifting trial interventions - level of fuel poor participation and network impacts

Evidence (9.5)

- Quantitative analysis of Trial 2 energy shifting difference between Group 1 and Group 2 through within-trial intervention-groups comparison.
- Quantitative analysis of Trial 2 energy shifting through pairwise comparison between intervention Group 1 and the external to trial control-group, and intervention Group 2 and the external to trial control-group comparison.
- Statistical generalisation of the energy shifting to the wider UK Power Networks, British Gas and national fuel poor customer base.
- Representation of network impacts through half-hourly network modelling within the

trial area.

- Comparison of realised energy shifting against previous estimates of technical potential energy shifting in the fuel poor customer group.
- Insights on customer protection during the trial.

Timing (9.5)

By end of October 2017

9.6   Knowledge Dissemination

Criterion (9.6)

Effective dissemination of new knowledge generated from the project's captured learning.

Evidence (9.6)

- 1x external learning event carried out for SDRC 9.1 – 9.5, and presentation materials shared
- 2x internal learning events carried out per SDRC, and presentation materials shared
- 2x thank-you events carried out for trial participants
- 1x end of project customer learning event completed for trial participants, and presentation materials shared
- Presentation of the project at least twice a year at external seminars / workshops, with presentation materials shared

Timing (9.6)

By end of December 2017

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Section 10: List of Appendices

The following appendices are attached to our VCEE bid submission:

Appendix A – Full Submission Spreadsheet: Excel file in Ofgem template.

Appendix B – Maps and Network Diagrams

Appendix C – Project Plan

Appendix D – Risk Register and Mitigation Plan

Appendix E – Overarching Project Risk of Under-recruitment

Appendix F – VCEE Organogram

Appendix G – Project Partners

Appendix H – Cost Benefit Analysis

Appendix I – Customer Recruitment and Engagement Summary

Appendix J – LCNF Factsheet: Recruitment learning factsheet

Appendix K – Literature Review: Literature review conducted to date

Appendix L – Partner Skills Audit: Summary of the skills that partners can bring to the project

Appendix M – Letters of Support

Appendix N – Carbon Evaluation

Appendix O – Description of Design of Trials

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Appendix A – Full Submission Spreadsheet

As per Ofgem guidance this is submitted as a separate Excel file.

Appendix B – Maps and Network Diagrams
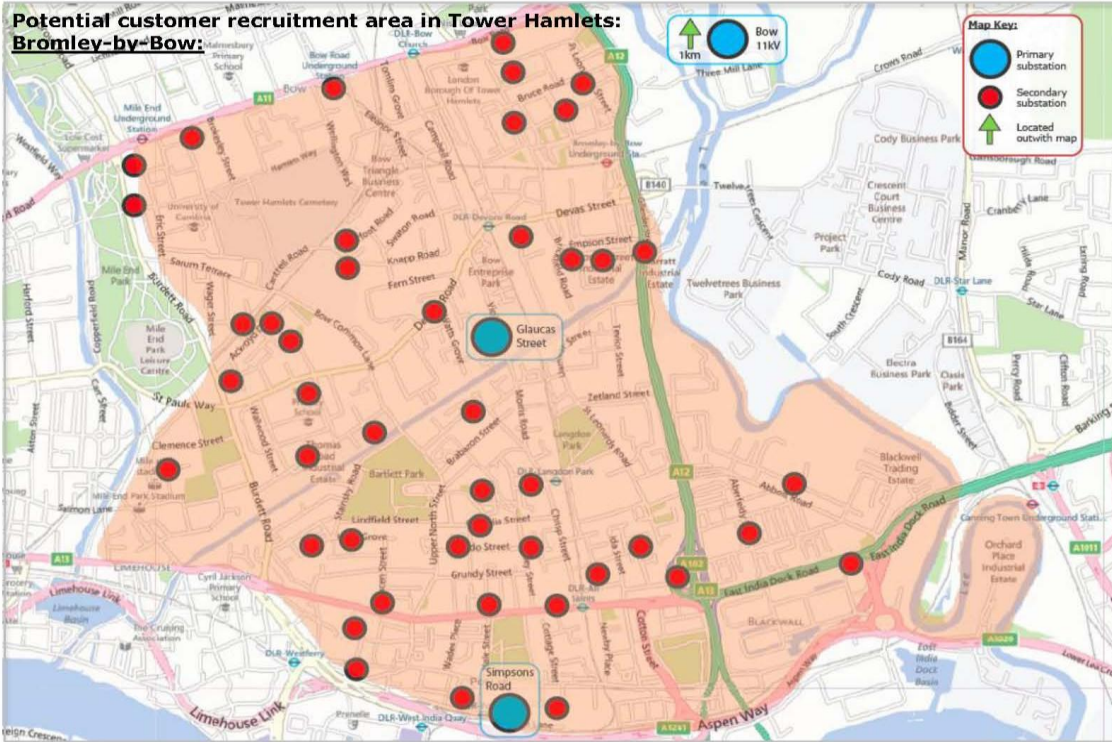
Figure 1: Potential customer recruitment area within Tower Hamlets and associated feeder substations

Bromley-by-Bow: Identified Transformer Profiles

Each secondary substation identified as a feeder in the potential trial area within Tower Hamlets is depicted below. The daily load profiles, designed to represent common patterns found at distribution substations across the London network, have been assigned to the corresponding substation. The 15 defined profiles give an indication as to whether load is predominately Residential, Commercial, or distributed at night. Border thickness relates to variation of defined profile. The greater the thickness the more variation found from the data present.

Figure 2: Load profiles associated with each secondary substation

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Bromley-by-Bow: Transformer Utilisation – 100% Max Load

Each secondary substation identified as a feeder to the proposed trial area is depicted below. All nodes are filled with a colour representing a particular level of asset utilisation. The utilisation level range is set at 0% to 100%, emphasising those sites operating out of firm at peak. The values upon which utilisation is determined correspond to peak kVA reached by the transformer over a set period. In this case, period is set at one year – January 2012 to January 2013.
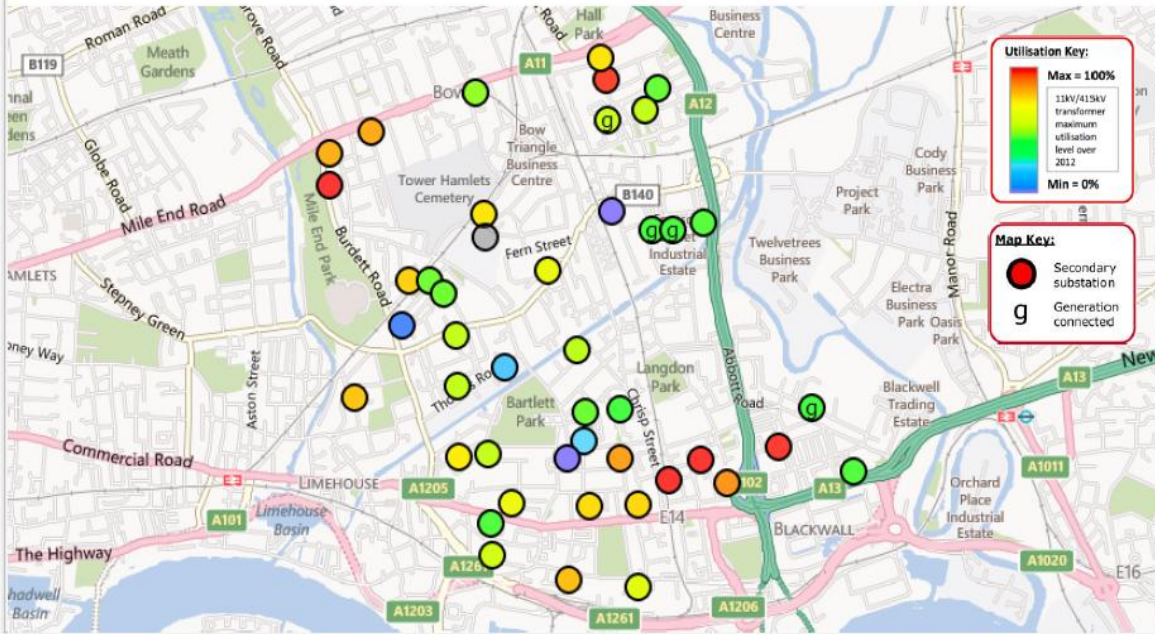
Figure 3: Max load transformer utilisation in potential customer recruitment area.

Bromley-by-Bow: Transformer Utilisation – 100% Mean Load

The values upon which utilisation is determined correspond to mean (average) kVA reached by the transformer over a set period. In this case, period is set at one year – January 2012 to January 2013.

High utilisation based on average loads emphasise sites where transformer load is consistently elevated. Sites with high average utilisation are of key interest as they may require reinforcement in the foreseeable future. Interestingly, some of the most utilised are located close to those relatively lightly loaded.

Figure 4: Mean load transformer utilisation in potential customer recruitment area.

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APPENDIX C – Project Plan

Project: VCEE project plan
Date: Fri 09/08/13

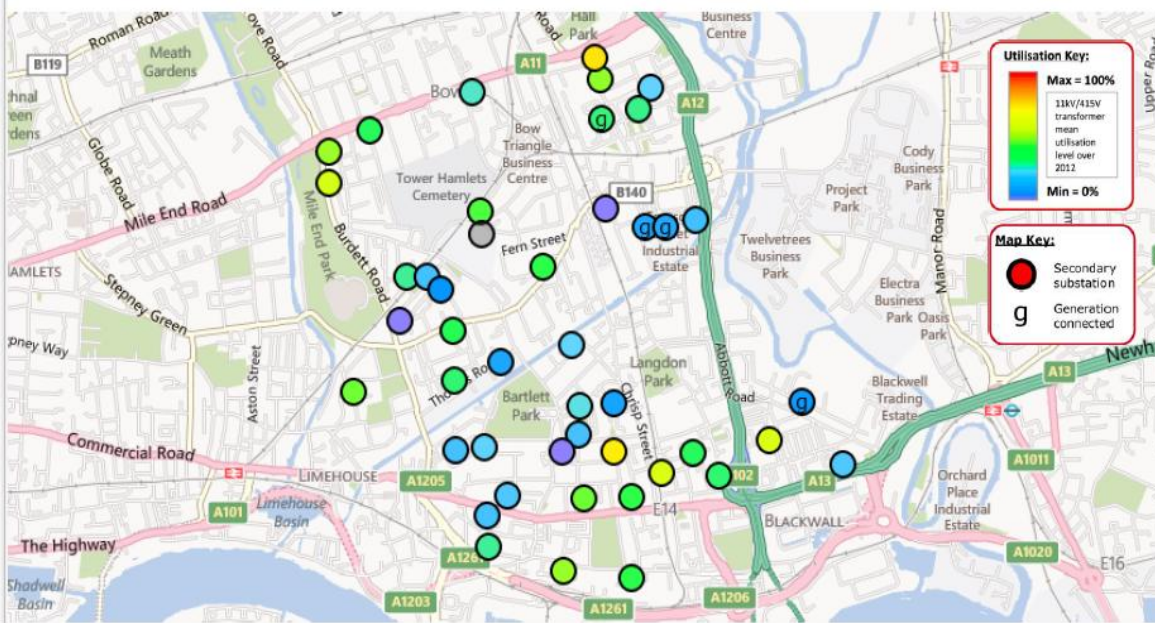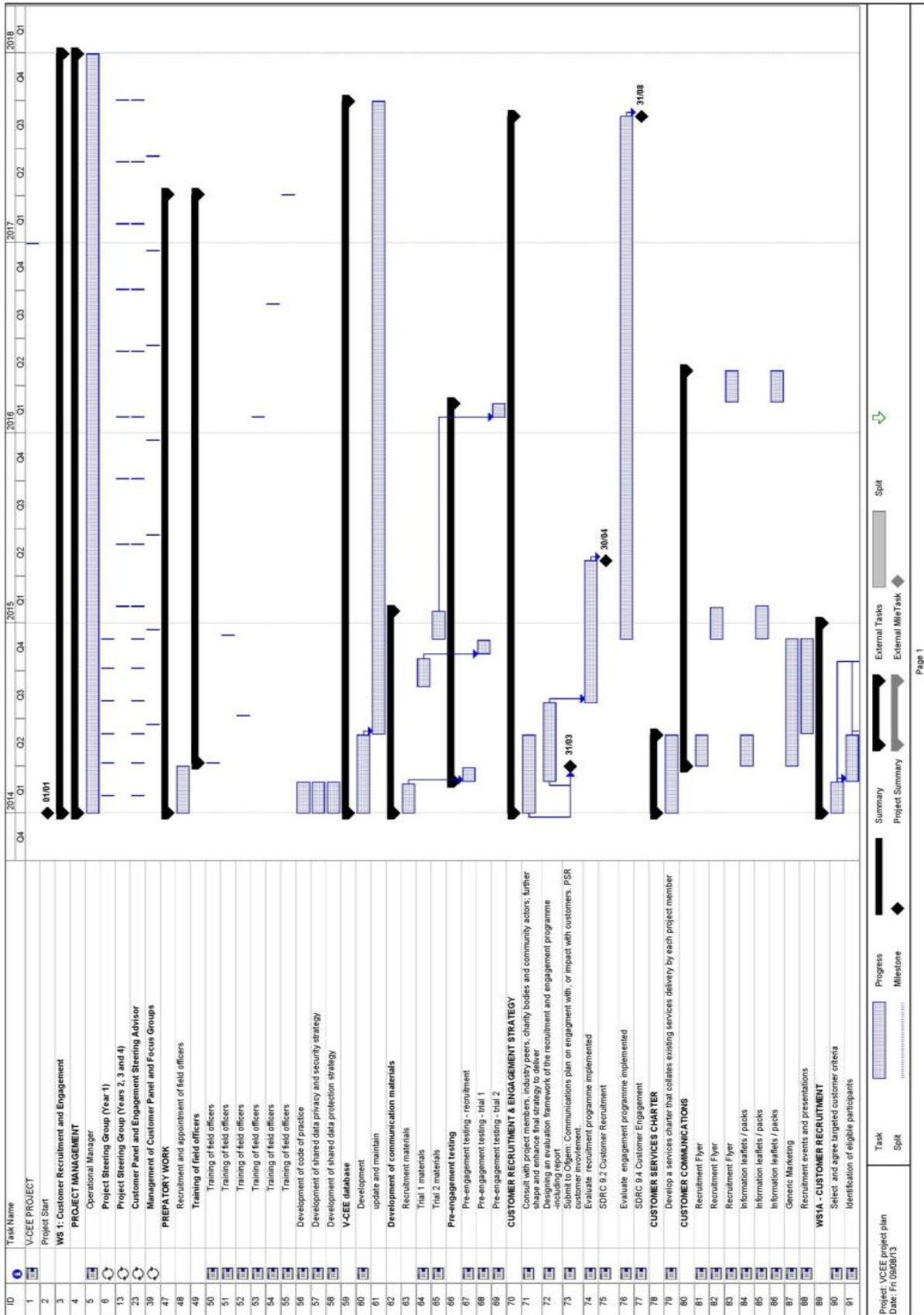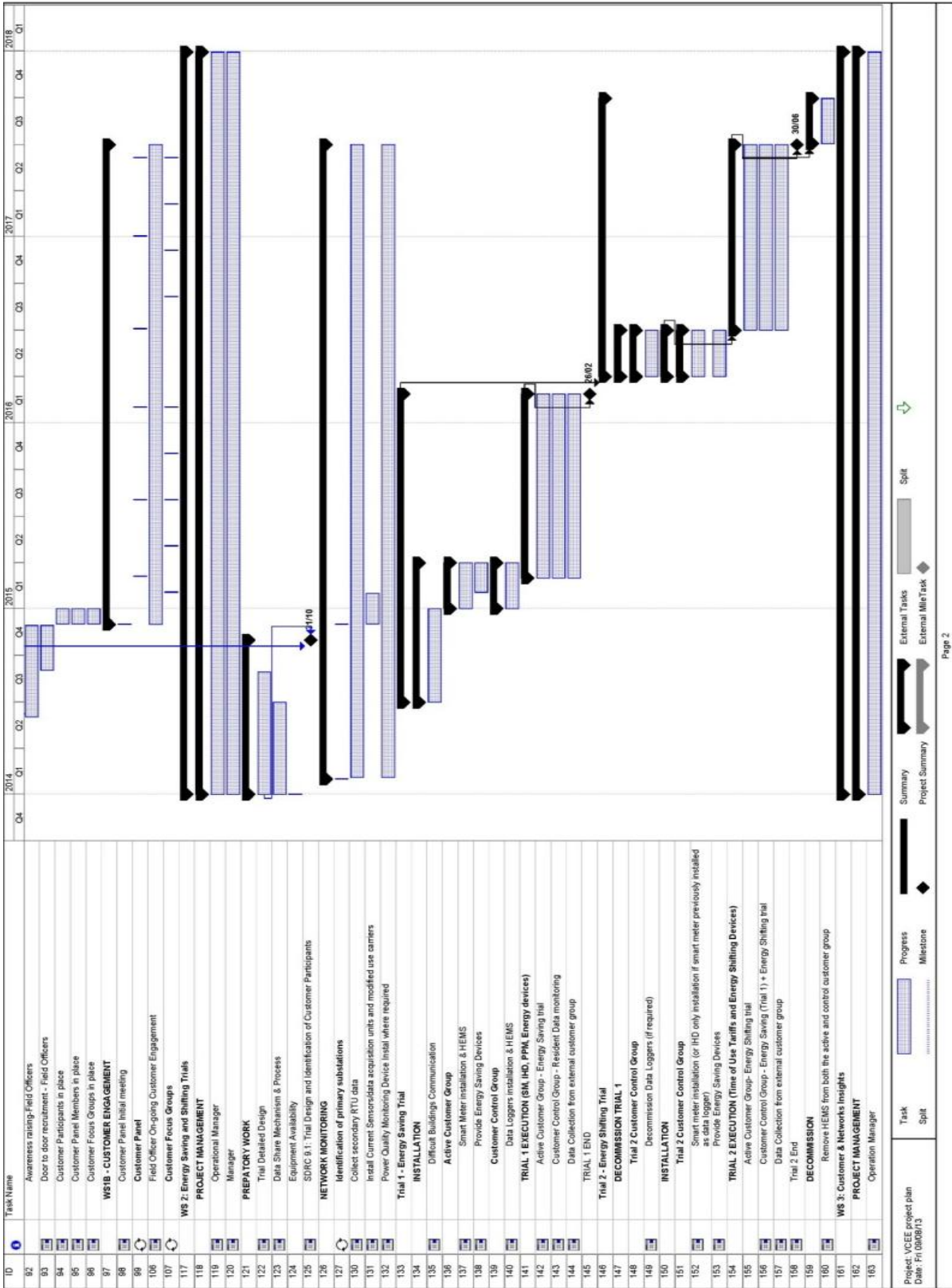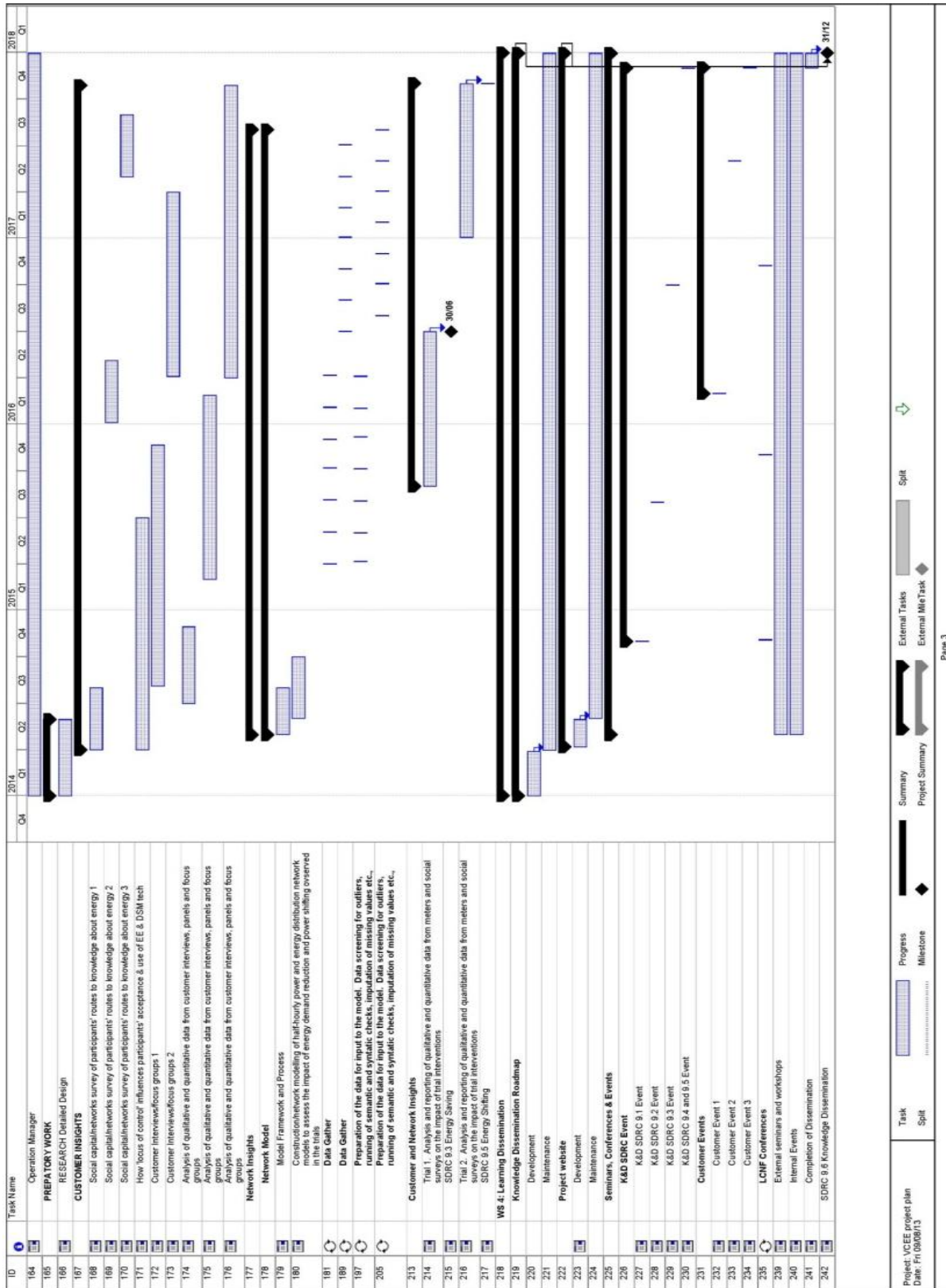| ID	Task Name
92	Awareness raising-Field Officers
93	Door to door recruitment - Field Officers
94	Customer Participants in place
95	Customer Panel Members in place
96	Customer Focus Groups in place
97	**WS1B - CUSTOMER ENGAGEMENT**
98	Customer Panel Initial meeting
99	**Customer Panel**
106	Field Officer On-going Customer Engagement
107	**Customer Focus Groups**
117	**WS 2: Energy Saving and Shifting Trials**
118	**PROJECT MANAGEMENT**
119	Operational Manager
120	Manager
121	**PREPATORY WORK**
122	Trial Detailed Design
123	Data Share Mechanism & Process
124	Equipment Availability
125	SDRC 9.1: Trial Design and Identification of Customer Participants
126	**NETWORK MONITORING**
130	Identification of primary substations
131	Collect secondary RTU data
132	Install Current Sensors/data acquisition units and modified use carriers
133	Power Quality Monitoring Device Install where required
134	**Trial 1 - Energy Saving Trial**
135	**INSTALLATION**
136	Difficult Buildings Communication
137	**Active Customer Group**
138	Smart Meter installation & HEMS
139	Provide Energy Saving Devices
140	**Customer Control Group**
141	Data Loggers installation & HEMS
142	**TRIAL 1 EXECUTION (SM, IHD, PPM, Energy devices)**
143	Active Customer Group - Energy Saving trial
144	Customer Control Group - Resident Data monitoring
145	Data Collection from external customer group
146	**TRIAL 1 END**
147	**Trial 2 - Energy Shifting Trial**
148	**DECOMMISSION TRIAL 1**
149	**Trial 2 Customer Control Group**
150	Decommission Data Loggers (if required)
151	**INSTALLATION**
152	**Trial 2 Customer Control Group**
153	Smart meter installation (or IHD only installation if smart meter previously installed as data logger)
154	Provide Energy Saving Devices
155	**TRIAL 2 EXECUTION (Time of Use Tariffs and Energy Shifting Devices)**
156	Active Customer Group- Energy Shifting trial
157	Customer Control Group - Energy Saving (Trial 1) + Energy Shifting trial
158	Data Collection from external customer group
159	Trial 2 End
160	**DECOMMISSION**
161	Remove HEMS from both the active and control customer group
162	**WS 3: Customer & Networks Insights**
163	**PROJECT MANAGEMENT**
	Operation Manager

Task		Milestone	◆	Summary	Project Summary	External Tasks	External Milestone	◆
Split		Progress		Split				

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ID	Task Name
164	Operation Manager
165	**PREPATORY WORK**
166	RESEARCH Detailed Design
167	**CUSTOMER INSIGHTS**
168	Social capital/networks survey of participants' routes to knowledge about energy 1
169	Social capital/networks survey of participants' routes to knowledge about energy 2
170	Social capital/networks survey of participants' routes to knowledge about energy 3
171	How 'locus of control' influences participants' acceptance & use of EE & DSM tech
172	Customer interviews/focus groups 1
173	Customer interviews/focus groups 2
174	Analysis of qualitative and quantitative data from customer interviews, panels and focus groups
175	Analysis of qualitative and quantitative data from customer interviews, panels and focus groups
176	Analysis of qualitative and quantitative data from customer interviews, panels and focus groups
177	**Network Insights**
178	**Network Model**
179	Model Framework and Process
180	Construction/network modelling of half-hourly power and energy distribution network models to assess the impact of energy demand reduction and power shifting ovserved in the trials
181	**Data Gather**
189	**Data Gather**
197	Preparation of the data for input to the model. Data screening for outliers, running of semantic and syntatic checks, imputation of missing values etc,,
205	Preparation of the data for input to the model. Data screening for outliers, running of semantic and syntatic checks, imputation of missing values etc,,
213	**Customer and Network Insights**
214	Trial 1. Analysis and reporting of qualitative and quantitative data from meters and social surveys on the impact of trial interventions
215	SDRC 9.3 Energy Saving
216	Trial 2. Analysis and reporting of qualitative and quantitative data from meters and social surveys on the impact of trial interventions
217	SDRC 9.5 Energy Shifting
218	**WS 4: Learning Dissemination**
219	Knowledge Dissemination Roadmap
220	Development
221	Maintenance
222	**Project website**
223	Development
224	Maintenance
225	**Seminars, Conferences & Events**
226	**K&D SDRC Event**
227	K&D SDRC 9.1 Event
228	K&D SDRC 9.2 Event
229	K&D SDRC 9.3 Event
230	K&D SDRC 9.4 and 9.5 Event
231	**Customer Events**
232	Customer Event 1
233	Customer Event 2
234	Customer Event 3
235	**LCNF Conferences**
239	External seminars and workshops
240	Internal Events
241	Completion of Dissemination
242	SDRC 9.6 Knowledge Dissemination

Project: VCEE project plan
Date: Fri 09/08/13

Task		Progress	Summary	External Tasks
Split		Milestone	Project Summary	External Milestone

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APPENDIX D – Risk Register and Mitigation Plan

AREA	REF NO.	Overall Risk Status	RISKS & IMPACT Description	Probability Level	PROBABILITY	MITIGATING ACTIONS
PROJECT DELIVERY	R002	On track	Final Funding may not be awarded. Therefore, the project would not be able to be carried out in 2014.	Moderate	20%	Ensure quality bid submission through regular review, clear differentiation and stakeholder engagement.
PROJECT DELIVERY	R003	On track	Project partner(s) withdrawing their participation at the start of the project, leading to delays.	Low	10%	(a) Letter of intent from British Gas and in discussion on MoU (b) Letters of support from each local community actor (c) Other partners engaged and attended two project partners meetings (d) Project partner sessions during evaluation process to invite local community actor partners on to partner meetings (e) MoU discussions with all partners during evaluation process (f) NDAs in place for most partners, need to get an NDA in place with local community actors
SDRC 9.1	R008	On track	Recruitment and engagement strategy not adequately tested with wider industry. Therefore not fit for customer audience.	Low	10%	(a) Advanced invite to review workshops, following UK Power Networks stakeholder processes (b) Invite representatives who deliver and interface directly with vulnerable and fuel poor (c) Draw upon the learnings from literature review and LCN Fund factsheet (d) Expert partner secured to lead on recruitment and engagement (e) Appropriate pre-engagement testing included in plan
SDRC 9.2	R009	On track	Poor response to energy social capital surveys. Therefore dilutes quality of findings.	Moderate	30%	(a) Application of best practice survey administration ("Dillman method") (b) Use of trusted intermediaries to deliver follow-up survey reminders (c) Face to face reminders through engagement events
SDRC 9.2	R010	On track	Poor turn-out rate to focus group trialling customer acceptability of recruitment materials. Therefore communication materials have a higher likelihood of not being well received by customer audience and not being effective.	Low	10%	(a) Use of trusted intermediaries to host focus groups (b) Use of non-trial vulnerable and fuel poor to participate in focus groups
SDRC 9.2	R011	On track	Poor response to non-participation questions during recruitment process. Therefore, limited understanding / learning for recruitment strategy not being effective.	Moderate	30%	(a) Follow-up a sample of non-participants with telephone interviews (b) Invite non-participants to engagement events and discuss reason for non-participation (c) Discuss reasons for non-participation with community leaders and key members of trusted intermediary groups.
SDRC 9.3	R012	On track	High attrition to successive waves of energy social capital survey. Therefore, limited understanding / learning for where the customer audience looks to for energy advice.	Moderate	30%	(a) Application of best practice survey administration ("Dillman method") (b) Use of best practice in panel survey maintenance (c) Use of trusted intermediaries to deliver follow-up survey reminders (d) Face to face reminders through engagement events
SDRC 9.3	R013	On track	Poor participation in interviews by trial participants during the trials. Therefore, limited understanding / learning of customer journey.	Moderate	30%	(a) Use of data from social capital surveys to identify participants' trusted parties for energy advice and engaging trusted parties in interviews enrolment. (b) Piggy-backing interviews onto wider participation engagement events to minimise participant disruption.
SDRC 9.3	R014	On track	Poor response to reasons for attrition questions when participants' elect to leave the trial. Therefore, limited understanding / learning of their drop in interest.	Low	10%	(a) Follow-up a sample of trial leavers with telephone interviews (b) Invite trial leavers to engagement and thank-you events and discuss reasons for leaving the trial (c) Discuss reasons for trial attrition with community leaders and key members of trusted intermediary groups.
SDRC 9.4	R015	On track	Differential attrition between the within-trial intervention and control groups. Therefore, could bias findings.	Moderate	30%	Telephone interviews with participants who withdraw from the trial for their reasons. Analysing these interviews to see if there are substantial differences in reasons for withdrawal from the intervention and control groups. Mapping these reasons onto existing explanatory theories of energy demand to see if they are likely to bias the findings from the study. Estimating the magnitude of any such potential biases from the findings of previous studies.
SDRC 9.4	R016	On track	Participants being unwilling to be randomly allocated to intervention and control groups. Selection bias introduced.	Low	10%	Interviews with participants requesting allocation to either the intervention or control group to determine the reason for their request. Mapping these reasons onto existing explanatory theories of energy demand to see if they are likely to bias the findings from the study. Estimating the magnitude of any such potential biases from the findings of previous studies.
SDRC 9.4	R017	On track	Failing to meet recruitment targets for the intervention and control groups. Impacts generalisation of findings.	Moderate	30%	Use post-hoc statistical power estimation to determine the statistical confidence with which results can be generalised *(see under-recruitment risk scenarios- Appendix E)*
SDRC 9.4	R018	On track	Metering failures resulting in higher than expected levels of missing data for network modelling. Network model findings compromised.	Moderate	30%	Analysis of missing data to check for systematic versus random errors. Imputation of missing values using expectation maximation (EM) methods. Estimation of the biasing effects of missings on network modelling findings.
SDRC 9.5	R019	On track	Differential attrition between the two within-trial intervention and control groups in Trial 2. Introduction of bias.	Low	10%	Telephone interviews with participants who withdraw from the trial for their reasons. Analysing these interviews to see if there are substantial differences in reasons for withdrawal from the intervention and control groups. Mapping these reasons onto existing explanatory theories of energy demand to see if they are likely to bias the findings from the study. Estimating the magnitude of any such potential biases from the findings of previous studies.
SDRC 9.5	R020	On track	Significant participant dropout between Trial 1 and Trial 2 and its impact on sample sizes. Impacts generalisation of findings.	Modearte	30%	Use post-hoc statistical power estimation to determine the statistical confidence with which results can be generalised *(see under-recruitment risk scenarios- Appendix E)*
SDRC 9.5	R021	On track	Metering failures resulting in higher than expected levels of missing data for network modelling. Network model findings compromised.	Moderate	30%	Analysis of missing data to check for systematic versus random errors. Imputation of missing values using expectation maximation (EM) methods. Estimation of the biasing effects of missings on network modelling findings.
SDRC 9.6	R022	On track	Poor turn-out rate at customer thank-you / learning events. Learning not disseminated effectively to the customer audience.	Low	10%	(a) Use of trusted intermediaries and communications channels to promote event (b) Instruct field officers who have built a trusted interface to rally customers for attendance (c) Send a thank-you and learning update leaflet at the end of each trial
SDRC 9.6	R023	On track	Learning not disseminated effectively to all stakeholders as different parties will have different interests and learning styles. Leads to learning being lost.	Low	10%	(a) Design of a dissemination roadmap that identifies targeted stakeholders and their preference in style and interest (b) use pre-testing activities and customer focus group to test learning materials and discover their preference
PROJECT DELIVERY	R023	On track	Due to the nature of the buildings in which the smart meters will be installed, communications difficulties are encountered	Moderate	30%	(a) Supplier project partner has already succesfully completed trials of communications solutions specifically for difficult buildings (tower blocks) and has strong interest in further enhancing the solution to inform smart meter rollout (b) Significant time and effort allocated in the project plan to identify and resolve any difficult buidling communications issues prior to installation of smart meters
PROJECT DELIVERY	R024	On track	Availability of smart metering equipment not realised, therefore delay to trial 1.	Moderate	30%	(a) Supplier project partner has confirmed that smart metering equipment with necessary functionality will be available by Q4'14, and installation planned for latter part of Q415 and early part of Q1'15 to allow for some delay
PROJECT DELIVERY	R025	On track	MoU cover with all partners.	Low	10%	(a) Obtained the support and letter of intent from British Gas (b) Obtained expressions of support from the other partners and all have been working collaboratively (c) Pursue the agreement of mutually acceptable contract terms with all partners

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APPENDIX E – Overarching Project Risk

University College London investigated 3 scenarios of under-recruitment: 500, 450 and 400.

1. Capacity to distinguish between intervention & control groups (Internal validity)

At an alpha (Type I) error rate of 0.25 the statistical power declines slowly as sample size falls.
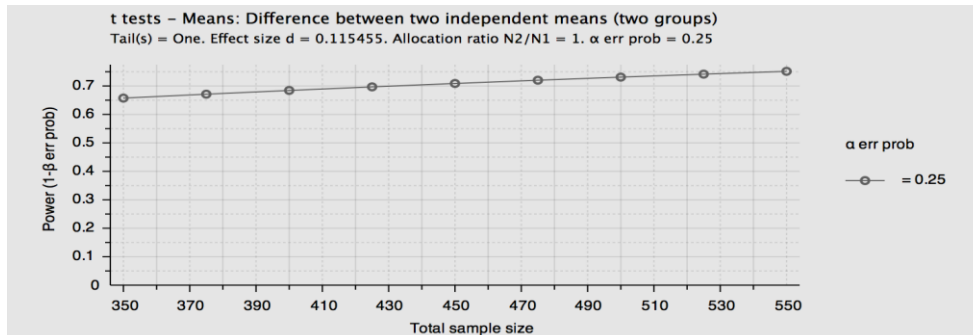

Figure 5: Graph of Statistical Power against Sample Size

Results were computed using Post hoc statistical power analysis using t-tests for difference between two equal and independent group means in *G*Power 3.1 software*. Effect size '*d*' was calculated as follows:

Mean of group 1	=	3586 (From HEED+Energy data)	
Mean of group 2 @ 6.6% savings	=	3332	
SD group 1	=	2200	
SD group 2	=	2200	
Inputs: Tail(s)	=	One	
Effect size d	=	0.1154545	
α err prob	=	0.25	

Scenario	Number recruited	Output:
Scenario 1:	**500** (250 per group)	Power (1-β err prob) = 0.7310646
Scenario 2:	**450** (225 per group	Power (1-β err prob) = 0.7087645
Scenario 3	**400** (200 per group)	Power (1-β err prob) = 0.6842886

2. Capacity to generalise to populations outside the trial ('External validity')

Inputs to scenarios:

N = The population was set at 260,000 based on information from UK Power Networks on the number of people on the Priority Services Register. While this is an underestimate, sample size does not change for population sizes above this value.

P = 0.5. This is assuming that half the population will save more than the estimated median energy savings of 6.5% and 50% will save less than 6.5%.

A = Precision required is ±5%

Scenario	Number recruited	Output:
Scenario 1:	**500** (250 per group)	Statistical confidence achieved **= 88.5%**
Scenario 2:	**450** (225 per group)	Statistical confidence achieved **= 86.5%**
Scenario 3	**400** (200 per group)	Statistical confidence achieved **= 84%**

Conclusion: For both internal and external validity of the findings, under-recruitment over plausible ranges does not pose a significant threat to the project findings given input assumptions of acceptable levels of false positives (Type I errors) and a 90% level of confidence of generalisability of finding.

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APPENDIX F – VCEE Organogram

LCNF Tier 2 Bids

Overall Project Structure v0.1

Legend:
- UKPN Internal
- Partner
- Operational Partner

Project Sponsor
Ben Wilson

Senior Responsible Owner
Martin Wilcox

Project Steering Group

Customer Engagement Authority

| CAG Consultants | Critical friends: *British Red Cross, Consumer Futures* |

Project Manager
Lynne McDonald

Programme Management Office

Project Office Manager Nicci Davies	**Comms Manager** Vidia Pallaram
Financial Support Shahbaz Hussain	**Legal Support** Andrew Chester
Project Admin Ruby Alabi	**Procurement Support** Preethi George

WS 1 Lead
Customer Recruitment & Engagement

WS2 Lead
Energy Saving and Shifting Trials

WS3 Lead
Customer & Network Insights

WS4
Knowledge Dissemination

Project Partners

| **Energy Supplier** British Gas | **Recruitment & Engagement** CAG Consultants | **Academic Assurance** University College London-Energy | **Community Interface** Institute for Sustainability | **Community Actors** Poplar HARCA, Tower Hamlets Homes and Bromley-by-Bow Community Centre | **Vulnerable and Fuel Poor Expertise** National Energy Action |

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APPENDIX G: - Project Partners

Organisation Name	CAG Consultants	
Organisation Details	**Customer Specialist:** one of the UK's leading sustainability, climate change and community engagement consultancies. Established for over 30 years, the organisation has eight partners, each of whom has substantial expertise in these fields. Recognised expertise in the fields of fuel poverty and customer engagement. Excellent track record, working on projects related to fuel poverty and customer engagement for clients including Consumer Focus, Circle Housing, DECC, the Environment Agency and various local authorities (including Tower Hamlets).	
Role and Responsibility	CAG Consultants will provide specialist support, guidance, mentoring, training and evaluation of recruitment and engagement with vulnerable and fuel poor customers. Responsibilities include: 1. Customer Panel and Customer Engagement Steering Advisor. 2. Shape & enhance engagement strategy through consultation with VCEE project associated parties.	
Prior experience brought to Project	CAG Consultants has extensive experience in working with clients to design and implement research projects that produce client focused results; they have particular experience in communities, behaviour change and climate change. CAG work in complex environments on projects with many partners, often reviewing innovations and new ways of working within the context of fuel poverty and engagement in communities.	
Contractual Relationship	Yes. MoU discussions will take place during the evaluation period	
External Collaborator benefits from the Project	CAG will benefit by adding to their knowledge base on best practice and effective working with hard to reach communities, which will go on to benefit the wider delivery community.	

LCN Fund
Low Carbon Networks

Project Code/Version No:
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Organisation Name	Institute for Sustainability	Institute for Sustainability
Organisation Details	An independent charity established in 2009 to support cross sector collaboration and innovation. Their mission is to significantly accelerate the delivery of economically, environmentally and socially sustainable cities and communities. They do this by driving innovative demonstration projects and developing projects to actively capture & share learning & best practice.	
Role and Responsibilities	Institute for Sustainability will provide: • Interface with Community Actors and overseeing local delivery • Supporting learning output development and dissemination Responsibilities include: • Co-managing customer field officers with the social landlords • Generic marketing, recruitment events and presentations.	
Prior experience brought to Project	The Institute works closely local stakeholders and residents on projects related to energy efficiency and community initiatives. Relevant activities include partnership in LCNF Low Carbon London, chair and sponsor of Tower Hamlets Total Community Retrofit Steering Group, member of the Smart London Board, UK co-chair of the EIT Climate Knowledge and Innovation Community, and delivery of several EU Framework Project, Interreg, and ERDF funded projects.	
Contractual Relationship	Yes. Non-Disclosure Agreement in place. MoU discussions will take place during the evaluation period	
External Collaborator benefits from the Project	The expected primary benefits to the Institute for Sustainability are: • Driving forward innovation in delivery of sustainable communities, consistent with their charitable mission • Aligns with their wider initiatives to promote "smart home" technologies for energy efficiency and wellbeing, particularly in support of vulnerable and social housing residents • Strengthens local stakeholder relationships in support of community sustainability and resilience • Provides learning that can be widely replicated within, and beyond, the energy sector	

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Organisation Name	National Energy Action	NEA Action for Warm Homes
Organisation Details	NEA is the national fuel poverty charity which aims to eradicate fuel poverty and campaigns for greater investment in energy efficiency to help those who are poor and vulnerable. NEA's work to improve and promote energy efficiency brings social, environmental, housing and employment benefits. NEA works in partnership with central and local government, fuel utilities, Installers and manufacturers, renewables companies, local authorities, housing providers, consumer groups and other third sector organisations,	
Role and Responsibilities	National Energy Action will provide: • Energy Efficiency • Customer Focus • Responsibilities include: • Training of customer field officers before recruitment commences. • Develop a services charter, collating project member deliveries. • Attend Customer Focus Groups.	
Prior experience brought to Project	Past experience of delivery of the Low Carbon Network Funded Customer Led Network Revolution in the North East. 30 years' experience of campaigning and of service delivery for and to those at risk of or in fuel poverty.	
Contractual Relationship	Yes. Non-Disclosure Agreement in place. MoU discussions will take place during the evaluation period	
External Collaborator benefits from the Project	The expected primary benefits to National Energy Action: • Ability to improve outcomes for fuel poor and vulnerable households in the specified geographical location of the project • Increased knowledge and understanding of the impact on fuel poverty that Smart Metering and Static Time of usage can make • Ability to extrapolate good practice examples to disseminate learning more widely	

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Organisation Name	University College London	
Organisation Details	Since its foundation in 2009 UCL-Energy has developed a strong national and international reputation for research in energy demand and energy systems. It hosts the only Doctoral Training Centre in Energy Demand.	
• Role and Responsibilities	UCL will provide: • Ensuring trials are set-up and executed to stand academic rigour • Analysis and recommendation on the trial's customer pool and volume • Engagement in the qualitative assessment of consumer response to smart energy interventions. • Behavioural Modelling • Network Modelling Responsibilities include: • Assist in recruitment & engagement evaluation plus framework. • Engagement – Customer Panel, Focus Groups. • Joint detailed trial design and data share mechanism. • Customer & Network insights modelling and analysis.	
Prior experience brought to Project *Please edit as appropriate*	Dr. David Shipworth's work (who is directly involved in VCEE) focuses on how technology and behaviour interact to influence energy use, and its representation with socio-technical models. His research is highly multidisciplinary (spanning the social and physical sciences), and empirical (based on analysis of data and construction of models from data). He was academic advisor to DECC on the Energy Demand Reduction Project trials, technical lead on the DECC 'Smart Meters Evaluation Data Framework – consumer impacts' project, and was academic lead on 'social aspects of smart energy systems' in the recent FCO SIN/UKERC Smart Energy Systems academic & trade mission to Japan (Mar 2012).	
Contractual Relationship	MoU discussions will take place during the evaluation period	
External Collaborator benefits from the Project *How will your organisation benefit from collaborating on this project?*	The expected primary benefits to UCL: • Increase their understanding of the role of vulnerable customers in delivering demand side management within smart grids • Production of conference and journal publications • Collaborative learning with a cross section of institutions engaged in delivering smart energy solutions to customers • Access to high time resolution energy data married to socio-demographic and building demographic data	

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APPENDIX H – Cost Benefit Analysis

Network Benefit

Load related reinforcement during RIIO-ED1 and predicted demand side management are estimated to cost £115.61m for 215.9MVA of headroom, equating to an approximate £0.53m spend to resolve a 1MVA constraint.

Using CV101, London network reinforcement and demand side management costs can be broken down in terms of asset type (high level):

Asset Level	Unit of Measurement	Reinforcement Cost
Substation level	215.9MVA (HV/LV)	£29.5m
HV circuits	204km	£49.3m
LV Circuits	270.8km	£36.81m

Table 7: RIIO-ED1 reinforcement costs for each asset group

To achieve 215.9MVA of reinforcement, 474.8km of underground cables must be replaced. Due to the high price of road works required to lay such lengths of new cables, £86.11m is estimated. Combining this cost with substation reinforcement results in the total of £115.61m.

Energy Shifting

Work has recently been carried out on behalf of the Department for Energy and Climate Change (DECC) and the Department for the Environment, Food and Rural Affairs (DEFRA) into the total capability (or the 'technical potential') for various segments of the community to shift their electricity usage or to achieve energy efficiency savings. From this, the GB wide technical peak shifting availability from households dependent on the state pension or dependent on benefits can be stated at approximately 50–100MW. This is several times less than higher potential peak shifting groups.

UK Power Networks serves approximately 25% [28%] of GB's domestic customer base (our 7.8m domestic customers from 27m GB households). Therefore, across our network portfolio there is the potential for 12.5–25MW total technical peak shifting availability from each of the two groups, totalling 25–50MW.

Our proposition is that the best practice developed by the VCEE project, once rolled out, is likely to allow the fuel poor to get 10% closer to achieving the levels of energy saving and shifting they are capable of.

Thus, if the VCEE project were to enable an additional 10% of this technical capability to be reached in each of the two community segments across UK Power Networks' licence areas, then a total of 2.5–5MW of Demand Side Response would have been added to the DSR portfolio.

Cost Benefit Analysis (CBA)

UK Power Networks' approach to using Cost Benefit Analysis to evaluate and justify a number of our key investment areas, in order to ensure a robust and justifiable expenditure plan, has been utilised to ensure an accurate view consistent with our ED1 submission. All network calculations have been performed using Discounted Cash Flow studies.

Using the RIIO-ED1 CDA spread sheet – the following Discounted Cash Flow cost benefit studies were performed:

Case (a) – Network reinforcement deferred for a definite time period from realising potential technical peak shifting availability of households dependent on the state pension or dependent on benefits.

Fuel poor Domestic

- The period of deferred demand is set to 10 years. Level of demand deferred has been taken as 2.5MVA, the lower end of the estimated range.
- It is assumed there are no avoided costs from I&C customer DSR.

Performing a CBA study from the above specification, the net present value (NPV) **= £413k benefit to DUoS customers over a 45 year asset life.**

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Fuel Poor Domestic and I&C

- The period of deferred demand is again 10 years. Level of demand deferred has again been taken as 2.5MVA, the lower end of the estimated range.
- It is assumed there is a £0.2m saving from I&C customer DSR. From Low Carbon London it is possible to define £0.09m/annum to defer £5m DSR I&C investment thus £1m deferral results in £0.02m/annum. Hence over a ten year period, a £0.2m saving could be realised.

Performing a CBA study from the above specification, the net present value (NPV) and saving achieved through I&C customer DSR participation over 10 years

= £613k cost saving to DuoS customers over a 45 year asset life.

Case (b) – Network reinforcement deferred indefinitely from realising potential technical peak shifting availability from households dependent on the state pension or dependent on benefits and sustaining that level and type of demand side response activity.

Fuel Poor Domestic

- The period of deferred demand is set to indefinite, out with the lifetime of the asset. Level of demand deferred has been taken as 2.5MVA, the lower end of the estimated range. It is assumed there are no avoided costs from I&C customer DSR.
- It is assumed there are no avoided costs from I&C customer DSR.

Performing a CBA study from the above specification, the net present value (NPV)

= £1.05m cost saving to DuoS customers over a 45 year asset life.

Energy Reduction

From the work recently carried out on behalf of the DECC and the DEFRA into the technical potential for energy saving and shifting in various segments of the community, it is possible to quantify energy reduction potential across the network. The table below presents summarised figures from this research.

Mosaic group	Potential savings from adopting energy efficient appliances (kWh/household)	Potential savings from adopting energy efficient appliances in the UK (GW
Ex-council community	719	1804
Terrace melting pot	877	1843
Claimant culture	353	541
Elderly needs	655	1047

Table 8: Technical potential for energy saving and shifting.

The technical potential within the segment dependent on the state pension is estimated to be 655kWh/annum per household and within the segment in receipt of benefits is estimated to be 353kWh/annum, and both rise to well over 1000kWh/annum when aspects of heating load are included.

As previously stated UK Power Networks estimates that the best practice developed by the VCEE project, once rolled out, is likely to allow this customer group to get 10% closer to achieving the levels of energy saving and shifting they are capable of.

The 10% of the 655kWh/annum per household technical potential would be delivered through direct engagement and use of energy saving tools. If rolled out across the 800,000 households of this community in our three licence areas, the additional saving amounts to around 0.063% (52.4GWh) of our total energy distributed. Savings were calculated using the equation shown below.

$$Percentage\ savings = \frac{10\% \times Technical\ potential \times No.\ customers}{GWh\ distributed \times 1000000} \times 100$$

Equation 1: Determines percentage savings on total distributed energy.

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The variables used to calculate the 0.063% (52.4GWh) saving of UK Power Networks total energy distributed are listed.

- <u>Technical potential</u> – 655kWh/annum as detailed above.
- <u>No. customers</u> – Estimated number of fuel poor customers across the three UK Power Networks license areas.
- <u>GWh distributed</u> – UK Power Networks distributed 83216GWh over the three licence areas (2011 figures).

Total reinforcement spend across UK Power Networks was £282m in 2011. Taking 0.063% of this figure results in an anticipated saving on a 282m reinforcement spend. **Saving through energy saving amounts to £0.18m.**

Network Benefit Summary

The targeted total peak shifting of households dependent on the state pension or dependent on benefits is 2.5MVA to 5MVA. Hence, from the scenarios demonstrated:

- <u>Minimum benefits</u> – £0.59m for a 2.5MVA shift and the savings reduced demand. Scaling this up to 5MVA shows a £1.01m saving.
  Figures based on £413k benefit to DUoS customers for 2.5MVA and £180k saving through demand reduction.
- <u>Maximum benefits</u> – £1.23m for a 2.5MVA shift and the savings reduced demand. Scaling this up to 5MVA shows a £2.28m saving.
  Figures based on £1.05m benefit to DUoS customers for 2.5MVA and £180k saving through demand reduction.

The following figure graphically displays the benefits from technical potential available within the segment dependent on the state pension and the segment in receipt of benefits.
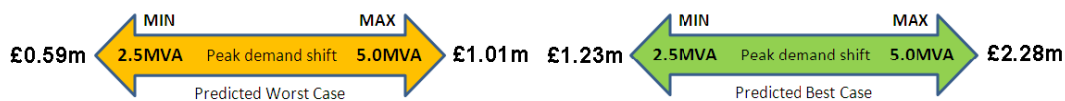
A total saving of between £0.59m and £1.01m could be realised. If reinforcement could be deferred indefinitely, the best case saving increases to between £1.23m and £2.28m.

<u>Customer Benefit</u>

Energy Reduction

To assist our fuel poor make the transition to a low carbon economy, a selection of energy saving devices have been identified that would target four of the six main shifting or saving opportunities in fuel poor households.

Tool	Applications		Cost		Benefits		Assumptions	
			Total	£/y/cust. (UKPN 7.8m)	Watt Saving	£/yr	Time h/day	Price £/kWh
CFL Bulb - 11W	Replacement to Incandescent light bulbs		£4.38	£0.06	49	£11.32	5	0.1266
PC standby saver	Computer and related accessories		£15.99	£0.33	8.9	£7.40	18	0.1266
Plug in thermostat	Fans and heaters that plug into 3 pin mains socket.		£25.50	£0.25	2200	£10.17	0.1	0.1266
Solar phone / gadget charger	Mobile, tablet, etc.	Charging	£19.79	£0.21	4	£0.55	3	0.1266
		Full charge			2.8	£0.91	7	0.1266
TV standby saver	Television and related accessories	Television	£20.99	£0.30	6	£4.99	18	0.1266
		Set-top box			27	£22.46	18	0.1266
Energy Saving Socket with Timer	Irons, elec. blankets, Laptops, ...	Iron, tongs	£8.38	£0.11	750	£3.47	0.1	0.1266
		Laptop			15.77	£5.10	7	0.1266

Table 9: Energy efficiency tools and their benefits.

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Six tools believed to enable participation in energy saving in the home are presented in the table above. To calculate benefit of energy saving tools, the following equation was used.

$$Tool\ benefit\ =\ Watt\ saving\ \times\ h\ day\ \times\ £\ kWh\ \times\ \frac{Days\ in\ year}{1000}$$

Equation 2: Determines benefit of energy saving device.

- Watt saving – the power saved when the tool is active.
- h/day – Number of hours utilised each day. This is an average as some benefits are seasonal.
- £/kWh – 12.66p/KWh customer electricity unit price. This value is the actual average peak unit price in 2012.(Source: the-impact-of-variable-consumption)
- Days in year – 365 days for a standard year.

It is not clear how VCEE customers will engage and to what extent they will be able to participate; this is to be determined through project learning. Thus, to provide 'Watt saving' and 'h/day' utilisation figures, predictions and assumptions have been made.

CFL Bulb – 11W

- 5h/day utilisation, 365 days of the year. This number is derived by taking summer and winter use as 2h/day and 8h/day respectively. Assumes lighting (natural or electrical) is required between 17:30hrs and 23:30hr. Lighting in the morning has also been accounted for. (Source: timeanddate)
- Device cost per unit of £4.38. This is the unit price for an order of 40+ units.
- Cash benefit to the customer through longer lifespan. 8,000h op. life span not included (1000 - 2000h of traditional incandescent).
- Saving of 49W. The 11W bulb is equivalent to a 60W incandescent, hence the 49W saving. (Source: RS Components - RS: 499-188 / Orbitec – 8833)

Plug in Thermostat

- 0.1h/day utilisation, 365 days of the year. This number equates to 6 minutes/day, which is 36.5 hours a year. It was assumed the device would only be used during the winter period, thus said saving was split over 3 months. It is therefore suggested that this device would turn off a heater for 3h per week in winter through limiting the temperature at which it operates.
- Device cost per unit of £25.50. This is the unit price for an order of 5 or more.
- Saving of 2.2kW for defined period. This is typical rating of an electric heater.

Solar phone / gadget charger

- 3h/day utilisation, 365 days of the year. Assumed gadget would replace mains charging of one device in the home every day. Older phones could last for 5 days without the need to charge, while smartphones often require a daily charge. Likelihood that more than one gadget will need charging during a typical day. A figure of 3h/day was deemed reasonable.
- 7h/day 'waste charge', 365 days of the year. Most phones / gadgets only require approx. 3 hours to charge, yet they are often left plugged in and switched on for substantial periods of time. Much of this is during the night, thus the typical daily sleep period was chosen.
- Device cost per unit of £19.79. This is the unit price for an order any amount. No volume discount.
- Saving of 4W for defined period of charging. This is the typical rating of a mobile phone. Saving of 2.8W for defined period of 'waste charge'. (Source: standby)

TV standby saver

- 18h/day utilisation, 365 days of the year, assumed a TV is on for an average of 6h/day
- 7h/day 'waste charge', 365 days of the year. Most phones / gadgets only require approx. 3 hours to charge, yet they are often left plugged in and switched on for substantial periods of time. Much of this is during the night, thus the typical daily sleep period was chosen.

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- Device cost of £20.99. This is the unit price for an order any amount. No volume discount.
- Saving of 6W for defined period of television standby. This is the typical rating for a modern television. (Source: http://standby.lbl.gov/summary-table.html)
- Saving of 27 W for defined period of set-top box standby.(Source: http://standby.lbl.gov/summary-table.html)

PC standby saver

- 18h/day utilisation, 365 days of the year. It is assumed that the home computer is on for 6h/day and left connected to the mains for the rest of the day.
- Device cost per unit of £15.99. This is the unit price for an order of 1 or more units. Discounts for large orders would be possible but are subject to quotations.
- Saving of 8.9W for defined period. (Source: http://standby.lbl.gov/summary-table.html)

Timer Socket

- 0.1h/day utilisation, 365 days of the year. This number equates to 6 minutes/day, or 36.5 hours a year. It was assumed the device would save energy a few times a year, when a device is left on for a sustained period.
- 7h/day utilisation, 365 days of the year. In this case, the timer is being used to limit charging time. A laptop computer or equivalent device is often left on charge continuously, even when not being used and in 'sleep' mode.
- Device cost is £8.38. This is the unit price for an order any amount. No volume discount.
- Saving of 750W for defined period of charging – the typical rating of an iron. Saving of 15.77W for defined period in 'sleep' mode. (Source: standby)

It is understood that uptake of all devices is unlikely. Furthermore, true understanding of the fuel poor customer base is unknown; therefore only high level scenarios could be generated for the energy saving devices when determining customer benefits.

Eleven energy efficiency device scenarios were generated, see Table 10. These acknowledged that households of the targeted customer base would have different dynamics / tendencies, availability of household appliances and that some of the energy saving devices may be more relevant hence more than one offered of that type. The approach taken for Table 10 was as follows:

- **Household dynamic**: (a) Elderly couple; (b) Family household – with young children; (c) Family household – with teenage children; and (d) Single middle-aged.

- **Household tendency**: For household dynamics (a) through to (c) three likelihoods of uptake were applied – low, medium and high. For household dynamic (d) only two likelihoods of uptake were applied – medium and high.

- **Type of energy saving device**: Drawing upon the six proposed energy saving devices that the project may make available, we attributed which device would be relevant to each of the household dynamics and their variant household tendency by what we best believed the appliances types they would have in the home.

- **Number of energy saving devices:** For some of the household dynamics and associated household tendency we allocated more than one device as we believed that they would be more inclined and make more use of some due to their increased availability of certain household appliance types.

	CFL Bulb - 11W	PC standby saver	Plug in thermostat	Solar phone charger		TV standby saver		Saving Socket & Timer		Result
				Charge	Overcharge	Television	Set-top Box	Iron/Heater	Laptop O.C.	
Elderly Couple (low technology uptake)	1		1			1				£26.48
Elderly Couple (medium technology uptake)				1	1	1	1	1		£32.37
Elderly Couple (high technology uptake)		1		1	1	1	1			£36.31
Family Household (young children, low tech.)	1			1	1	1		1		£21.24
Family Household (young children, med tech.)		1		1	1	1	1	1		£39.78
Family Household (young children, high tech.)				2	2	1	1	1	1	£38.94
Family Household (teenage children, low tech.)	1			2	2	1		1		£22.70
Family Household (teenage children, med tech.)		1		2	2	1		1		£18.78
Family Household (teenage children, high tech.)		1		3	3	1	1	1	1	£47.80
Single Middleaged Occupant (med tech.)	1	1	1	1	1	1				£35.34
Single Middleaged Occupant (high tech.)				1	1	1	1		1	£34.01
Low Participation	1					1				£16.31
High Participation	1	1	1	1	1	1	1	1		£61.26
						High / Low Average				**£38.79**

Table 10: Energy efficiency device scenarios.

There is a large variation in ability to reap rewards, yet even with minimal participation, a saving of over £16 can be realised over the year. The maximum perceived benefit is £61, assuming almost all tools are used to their full potential by a householder.

Averaging the two figures depicts a £38.79 saving per household; approximately one third of the cost per customer associated with the move toward a low carbon energy sector.

VCEE will demonstrate and provide research on the savings (in energy and monetary terms) that customers could attain through the use of simple energy saving devices whilst at the same time how their participation will drive network benefits to the DNO. The calculation focused on savings from the energy saving devices but we also recognise that customers of the project will not only have access to energy saving solutions, they will also have access to shifting solutions and this could also lead to them to economise their household energy usage and spend.

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APPENDIX I – Customer Recruitment and Engagement Summary

Introduction

The VCEE project aims to explore and develop options to enable fuel poor customers to manage their energy consumption and reduce their energy costs. This will be carried out by the provision and trialling of a range of equipment, technologies and support. Underpinning the research work is UK Power Networks' recognition that, to enable active customer participation in the project, all practicable steps must be taken to ensure that customers' best interests remain a primary concern at all times.

This recruitment and engagement strategy presents the proposed approach for the VCEE project. It is intended to mesh smoothly with the research activity and the trials by ensuring that participants are at the forefront of the intervention and are equal partners within it.

The strategy has been developed using evidence from our literature review and other research activities (Refer to Appendix J, K and L), building in best practice, and refined in response to consultation inputs from partners. It is intended that the strategy will be further refined, both before and during the project, to ensure the best possible fit with customer needs and expectations on the ground.

The strategy aims to recruit and maintain the participation of 550 households who will be divided into two groups and will each participate in two 12 -month trials. Participant households will be required to:

- Grant permission to allow access to their property for the following:
  - Survey at the start of the trial;
  - Installation of equipment at the start of each of the trials (involving some disruption);
  - Survey post trial; and
  - Removal of equipment at end of the trial where appropriate.
- Agree to provide feedback via completion of surveys, attending customer feedback sessions, receiving support and advisor visits in their homes.

Target area

VCEE will be recruiting and engaging with fuel poor customers in the London Borough of Tower Hamlets. We will be seeking to involve in the trials tenants of two of the borough's main social housing providers: Tower Hamlets Homes (which is the Arm's Length Management Organisation of the London Borough of Tower Hamlets, managing the council's housing stock on its behalf) and Poplar HARCA (a Registered Social Landlord that operates as an independent non-profit charity, separate from the local authority).

Demographics

The target community in Tower Hamlets is made up of diverse demographics and characteristics and this composition reflects that of many urban communities across Great Britain. It is classified by Acorn as 'urban adversity', with much of the area falling within the 'struggling estates' sub-category - a classification that applies to over 7% of the UK (see map, Figure 6, for an idea of their distribution).

Within this classification, the tenants we will be targeting will live predominantly in areas with the following Acorn classifications:

- Multi ethnic, purpose built estate (1% of the UK's population)
- Deprived and ethnically diverse in flats (1% of the UK)
- Low income terraces (1.2%)

Figure 6

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The project is focused on the fuel poor and customers experiencing fuel poverty will be an entry requirement to the project. Many fuel poor customers are also hard to reach and vulnerable; therefore the recruitment and engagement strategy has been designed bearing in mind the needs and circumstances of such households. Barriers that make customers hard to reach found in Tower Hamlets reflect those of other UK communities experiencing fuel poverty and include;

- Isolation; for example, householders who are living alone and who do not leave their home often (either through choice or because they are unable to).
- Language; across the UK as a whole, there are 4 million residents who do not speak English as their main language (8% of the population).
- Struggling to understand written information; this could be for a range of reasons including low literacy levels, learning difficulties or visual impairment, as well as language barriers.
- Reluctance to allow strangers into the home to undertake surveys or install measures.
- Reluctance to ask for help when struggling with fuel bills, perhaps due to pride and a reluctance to be seen as not being able to cope.

Recruitment and engagement lessons will therefore have wide applicability in terms of how to engage with all fuel poor households.

Engagement project team

Governance and leadership

UK Power Networks will manage and lead the project and will be responsible for reporting to Ofgem.

The project will also have two governance structures, as shown in the Figure 7.

Partners

Local, trusted organisations are vital for engagement. The most effective way to find people who are hardest to reach is through organisations that are likely to have contact with them; and through word of mouth in the community. Local partners such as housing associations and local
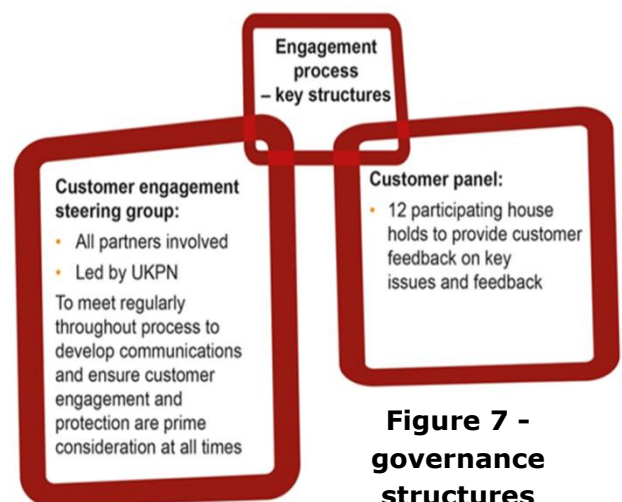
Figure 7 - governance structures

community centres can assist with engaging fuel poor householders as they have good local knowledge and high levels of trust.

Our partners and suppliers in VCEE have been selected both on the strength of their existing relationships with relevant groups of customers and for their strong credentials in the areas of customer engagement and data protection.

Those involved in VCEE are depicted in Figure 8.

Engagement principles

The approach to the trials adopts proactive engagement as a foundation to the research.

Figure 8 - VCEE Involvement

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The trials effectively use a consumer engagement approach to enhance the success of and learning from the project. This process will be underpinned by a recognised set of engagement principles. We recommend that the project adopts the 'spirit' of the AccountAbility principles as defined in the AA1000 stakeholder engagement standard. We use 'spirit' here because the AccountAbility principles apply to the governance of organisations, but have some transferability to how a project of this type must be run effectively.

The three accountability principles are inclusivity, materiality and responsiveness. These require a defined process of stakeholder engagement that provides comprehensive and balanced involvement and results in outcomes that address and respond to issues and impacts in an accountable way.

The engagement strategy

Pre-delivery activities will include:

- Setting up of key structures;
- Recruitment and training of customer field officers;
- Development of draft resources;
- Setting up the project web site; and
- Initiation of the generation of the customer / participant pool.

To ensure that our processes are effective, we will run a set of focus groups before we start work to ensure that the key messages, branding, compensation payments, methods for recruiting participants, interventions and communication methods will be effective with the target groups. The focus groups will be held in existing community organisations, made up of participants who broadly reflect the target audience. These focus groups will be fully participative. The location of the meetings will be very close to the homes of participants, thus minimising the need to cover any travel expenses.

Results from the customer focus groups will be used to refine and finalise the final approach, compensation payments and communication resources and materials.

Identification of fuel poor households

The project is focused on fuel poor residents of Tower Hamlets Homes and Poplar HARCA both of which are in the London Borough of Tower Hamlets. To achieve the desired learning from the project it is essential that we specifically recruit fuel poor households. Our preferred method is to identify the potential participating households and work to recruit those households rather than adopting a blanket marketing approach.

To achieve this, we will adopt a staged process. The first stage of identification will be to identify British Gas electricity customers: we understand that British Gas has 26.5% of electricity customers in the borough. At the second stage, this data will be matched to known data to identify households who fit the fuel poor criteria.

This matching process will draw on a pre-agreed set of criteria based on

Figure 9 – Indicators of fuel poverty /vulnerability

indicators of fuel poverty / vulnerability.

Figure 9 before shows a number of indicators of fuel poverty/ vulnerability, according to the different organisations that use these definitions, and the organisations that are likely to hold data relating to them.

In addition to identifying households that fall into the target audience through this selection model, we will also be able to draw out some early information around communication needs. For example we will be able to identify what the specific language or translation challenges might be.

Segmentation of participants will be guided by UK Power Networks, British Gas and University College London.

The **outcome** of this process will be a secure database of the specific households that fulfil the criteria for the trials and could potentially participate.

Recruitment

UK Power Networks will work with project partners to recruit customers to participate in the trials.

Approach to recruitment

The research carried out to inform the development of this strategy has shown that the recruitment process should be kept as simple and easy as possible to maximise uptake.

In order to ensure the robustness of the research, and minimise self-selection bias, British Gas customers who fit the project eligibility criteria will be identified and a sample of 1100 drawn. Recruitment will then target those 1100 customers. The sample of 1100 assumes a recruitment success rate of 50% thus giving the final required sample size of 550. This process will allow calculation of the non-response rate for the project and help in assessing the uncertainty arising from non-response bias.

For specifics, we recommend that the approach to recruitment should:

- Be 'invitation' led;
- Be predominantly face to face, with an out of hours service (e.g. early evenings and weekends) to maximise the effectiveness of door knocking;
- Adopt a planned and systematic approach involving an initial visit (with information left for householders to look at) and follow up visit(s) at which householders can sign up to take part;
- Deploy very simple questionnaires, terms and conditions;
- Be timely in terms of a short lead-time between recruitment and activity; and
- Be supported by high-quality and effective communications and participant information.

Recruitment process

Initial recruitment will utilise two channels:

- Direct, personalised invitations to households from the project, and
- Invitations through British Gas.

The most effective method to recruit this target audience to projects is making face to face contact through door knocking, supported by local events. Therefore, initial invitations (sent from B or housing provider) will invite potential participants to:

- Request a visit;
- Attend a fun event;

Register online or via text / phone.

This process will be run in a series of tranches to

Figure 10 - Schedule of Visits

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ensure the ideal numbers are reached. Some customers may register who are not eligible. A letter will be sent to these households explaining why they cannot be included, together with some information on energy saving.

Consideration should also be given to the possibility of inviting participants to recommend others that they think might be interested in taking part. The appropriateness of this will depend on the design of the research.

Once the audience has been defined, the trained customer field officers will then visit potential participants' homes, by appointment, with supporting materials to introduce themselves and the project. Visits will be reconfirmed by phone 24 hours ahead of the appointment. Visits will be designed to be friendly and informative emphasising the benefits to the household of being part of the project.

A schedule of visits will be developed. The first contact visits will follow an agreed protocol with the purpose being to:

- Promote the advantages of being part of the project;
- Encourage the householder's confidence in the project and what they will get from it, emphasising potential financial savings to them;
- Introduce the compensations for the project;
- Outline the terms and conditions;
- Explain what happens next and work through the installation process.
- Outline the support they will receive and what they need to do;
- Find out the householder's preferred method of contact (text, phone, email, post); and
- Secure full customer consent.

The visit will be supported by an engaging and well-designed welcome pack. This may be quite basic at this point, with more information being supplied as the process progresses.

The **outcome** of the recruitment process will be a group of participating households who are enthused and informed about the process and have all the information they need, with customer field officers being aware of their specific and potential support requirements. Consideration needs to be given to whether participants need a 14 day 'cooling off period' during which they can decide not to take part. This would be used primarily as reassurance for householders who are considering whether to sign up, since any householder can drop out at any time, if they wish to.

On-going customer engagement and support
The objective of the on-going support will be to create a sense of community and to keep all participants feeling involved, as well as supporting participating households to continue in the process and be part of data collection processes.

As with many fuel poor households and communities, the participants in the trials will be vulnerable and are likely to face on-going daily challenges with energy and domestic finances. They may therefore need a range of support to enable them to participate fully in the process, in particular to achieve savings by changing energy use and to participate in research activities. For example, participating households may become unable to pay their bills. It is essential that strong support systems are in place to support participating households facing particular challenges as a seamless process of the support service delivery.

The research suggests that if face to face support and events can be delivered, participants will gain more from the project, dropout rates will be reduced and project results improved. To ensure full participation and reduce dropout rates, three types of on-going support will be offered. These will include: Face to face contact; Arm's length contact; and Arm's length information.

Face to face contact will be provided by trained customer field officers who will be available to visit householders where a need for high level support is identified, or at key points in the process. This will be particularly useful in identifying and offering support that might be needed to minimise the fear of or actual disruption during the meter change. These customer field officers will accompany surveyors/installers on all household visits, to provide information,

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advice and reassurance for the householder. In addition, face to face contact will be the first option for dealing with any complaints. Consideration will need to be given to ensuring the safety and security of these customer field officers. The research indicates that a few participants will require a lot of support, whilst the majority will need only a little.

Arm's length contact will be provided by a phone line, texts, email, free post address, web chat/social media, or if necessary, through an individual's carer. (Each householder's preferred method of contact will be established at the initial visit.) This will be a focal point for any participant's queries, comments or complaints.

Arm's length information will be provided via the VCEE website, providing general information on the project and the individual trials, Frequently Asked Questions, general energy efficiency information and all information that participating households have received.

At all contact points, participants will be given a clearly stated option to contact us ahead of the installation visit to cancel their participation in the trial.

The **outcomes** of the on-going support will be: A lower dropout rate; and participation in activities including data collection.

Data collection

As part of the on-going support and engagement, there will be a range of data collection activities within the trials. At all stages, households will be given support to participate in data collection activities. Specific activities will include: Pre and post survey completion; and participation in customer focus groups.

Installation

Installers will adhere to standard industry regulations and guidance governing smart meters throughout the installation process.

Participants will be able to choose a date and time that is convenient for them. This will be confirmed (via the participant's preferred means of communication) at the time the appointment is made and then reconfirmed 24 hours before the appointment.

We recognise that there are significant cost savings to be gained by block installations. Therefore, there may be a significant delay between sign up and installation. Such a delay is a challenge to the trials in terms of increasing potential dropout and reducing enthusiasm. To mitigate this challenge, the installation dates will need to be established before recruitment begins, ensuring that participating households are aware of any wait.

Customers will be given a customer user-guide during the installation visit which will include relevant energy efficiency information. Customers will have the equipment installed and demonstrated. They will also be given advice on how they can use their equipment to improve their understanding of how they use energy. The user guide will include customer service information so that customers are clear about who to contact if they identify a fault on any of the equipment following installation and who is responsible for rectifying the fault.

The installation visits may be used to offer customers supplementary energy efficiency information associated with VCEE, but will not be used as a sales opportunity for other products and services that fall outside the project's scope.

Tailoring the service to fuel poor customers

Engaging with and addressing the needs of the fuel poor, who may also be vulnerable, during VCEE will be a priority for the project. The installation visit may raise particular concerns, including security concerns, for some vulnerable people. Some protection is already provided through the Priority Services Register (PSR), although many vulnerable customers are not on the register. Action to support engagement will be as follows:

- Ethical considerations will be taken into account to protect all participating households from any possible negative impacts of the research including, for example, being part of a control group or being unable to meet the costs of energy during the project life;
- The Project Manager will work with partners to distribute a leaflet explaining the UK Power Networks' and British Gas PSR to all customers in the VCEE trial areas via existing VCEE

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communications (e.g. newsletters and community groups). A digital version of the leaflet will also be included on the VCEE website;

- Communications will be made available in a variety of media and languages that are appropriate and to groups such as vulnerable and fuel poor customers and those on the PSR
- The customer field officers will arrange, where appropriate, for customers to be accompanied (by a second customer field officer, family member of other trusted individual) during the installation and other visits. This may include providing someone who can translate; and
- Customer field officers will provide 'code' words to allow participants to identify legitimate installers.

Thank you event
At the end a fun event should to be held to say thank you to all participants for their contribution. This could be hosted by one of the local delivery partners and would involve bringing together all participants to share with them the top level results of the project and celebrate their involvement. This would involve providing lunch, children's activities (e.g. an entertainer or bouncy castle) and some fun activities for adults too (to be discussed with local delivery partners).

Compensation for payment
The offer of technology and the prospect of reduced energy bills should help to attract participants.

However, for fuel poor customers, our research suggests that additional incentives will be required to encourage participation and to compensate participants for the time and inconvenience caused. This should be payable in stages and should be in the form of vouchers rather than cash (for food or shopping more generally; ideally participants should be given a choice of vouchers). No compensation payments will be made to the external control group of existing British Gas customers. The proposed compensation payments are as follows:

Item	Payment	Cust	Payments	Total	Details
Household Compensation					
Trial Compensation	£20	550	6	66,000	3 per trial
- Per survey/visit completed	£10	550	5	27,500	2 surveys per trial, 1 visit
- Per focus group meeting	£10	20	9	1,800	
Customer panel reps					
- Per customer panel attended	£20	12	7	1,680	
Total cost of compensation				**£96,980**	

Table 11: Compensation Framework

Communications
To support the engagement programme, a communications plan will be developed. It will:

- Support the engagement with a range of materials for recruitment and participant information;
- Communicate in a timely manner, especially explaining delays or project changes;
- Tailor information to the different audiences within the target group;
- Use communications that are accessible and adaptable to the target audience and participating households;
- Support the face to face and other contact points with up to date and reliable resources and information;
- Encourage on-going participation through use of local media and 'good news' stories in community media; and
- Provide on-going feedback to customers.

Frequently Asked Questions

A Frequently Asked Questions document will be developed, based on feedback from the pre-delivery focus groups. This will be updated with feedback from participants and the customer panel throughout the duration of the trial. This will be posted on the VCEE website and provided to all staff involved in delivering the trial.

Capacity and resources

The project's customer field officers will need four sets of skills and knowledge which will underpin the success of the project. These will include:

- Knowledge about the project.
- Skills in working with vulnerable and fuel poor households, their needs and expectations.
- Expertise in providing energy saving advice.
- Awareness of the wide range of local support services available, so that they can offer broad support to fuel poor customers in the trials.

Within these subject specific set of skills there are some 'soft skills' required. These include listening skills, skills to develop rapport and skills in delivering information in a professional manner to different audiences (where the level required may vary). These skills have been demonstrated to be of key importance to successful engagement in projects and need to be a significant part of the recruitment criteria and subsequent training and supervision.

Process for review and evaluation

The engagement process will be reviewed by the Project Board and customer panel. The evaluation will review the efficiency and effectiveness of key elements of this strategy against outputs, outcomes and key performance criteria using qualitative and quantitative indicators.

An evaluation plan and a step-by-step guide will be developed summarising the process including:

- The aim of the evaluation.
- Evaluation questions.
- Data collection methods.
- Reporting.

- Evaluation objectives.
- Methodology.
- Data analysis methods.

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APPENDIX J: LCNF Factsheet

The VCEE project during full bid preparation developed a specific Low Carbon Network Fund (LCNF) factsheet, sent to DNOs' LCNF coordinators, who previously had been awarded LCNF funding, and undertaken customer recruitment and engagement. The purpose was to frame their learning and use the findings to inform the development of VCEE's customer recruitment and engagement approach.

Please see below for the full list of questions contained in the factsheet:

PROJECT NAME
Project information
Objective of project?
Project contact (name/phone/email):
Did the project engage with domestic customers?
What was the objective of this engagement?
What was the target audience (e.g. high energy users, fuel poor, elderly, credit meters, tenure, ethnicity etc.)
How did you segment customers? E.g. by Acorn groups, Census segments or if other please specify. Which group(s) within you customer segmentation did you work with most?
How were householders recruited to the project, e.g. via direct mail, phone calls, door to door visits, through community events?
Were partners (e.g. local intermediaries) involved in the recruitment and if so who and what was their role?
Which did you find to be the *most* effective recruitment method and why?
Which did you find to be the *least* effective recruitment method and why?
Were there any challenges with recruitment? If so, what where they and how were they addressed?
Maintaining engagement
What methods were used to maintain customer engagement throughout the project? For example rewards, celebrations and / or fun activities
Was an incentive offered to customers to take part? If so, please specify what incentive was applied e.g. Sainsbury voucher?
How many customers participated? What was the drop-out rate? Were any particular groups within your customer segmentation found to be among those that dropped out?
Were there any challenges in maintaining involvement? If so, what where they and how were they addressed?
Learnings
What do you think were the *most* successful elements of your approach to customer engagement?
What do you think were the *least* successful elements of your approach to customer engagement?
If you were doing the project again, is there anything you would do differently?
Would you be happy for us to contact you for further clarification if necessary? What is the best way for contact e.g. direct call or email?
Costs
Can you provide us with any details of the costs of recruitment/engagement?
Documentation
Please can you provide formal documentation in relation to the recruitment and engagement activities associated to your project e.g. customer engagement and recruitment plan, customer segmentation template, lessons learned register or other related files.

Table 12: LCNF Factsheet issued to DNOs

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Before issuing the factsheet to DNOs' LCNF coordinators for completion (giving them one week to return) it was partially populated using the following sources: (a) presentation slides from the smart grid forum workstream 6 meeting on the 4th June, 'Propositions for domestic and SME customers' (b) slides from the 2011 and 2012 LCNF annual conferences and (c) the ENA Smarter Networks Portal.

Factsheets were returned from the following eight projects and one where sufficient information was gleaned from the initial information sources:

DNO	LCNF Tier	Project
Scottish Power Energy Networks *(SPEN)*	Tier 1	Ashton Hayes Smart Village
Scottish and Southern Energy Power Distribution *(SSEPD)*	Tier 2	Northern Isles New Energy Solutions *(NINES)*
	Tier 2	*Thames Valley Vision
Northern Powergrid *(NP)*	Tier 2	Customer-Led Network Revolution *(CLNR)*
Western Power Distribution *(WPD)*	Tier 2	SoLa Bristol
Electricity North West Limited *(ENWL)*	Tier 2	Customer Load Active System Services *(CLASS)*
	Tier 2	Capacity to Customers *(C2C)*
UK Power Networks	Tier 2	Low Carbon London *(LCL)*
	Tier 1	Validation of Photovoltaic *(PV)* Connection Assessment Tool

Table 13: LCNF Projects

*Factsheet populated from initial information gather

Findings

Recruitment

Recruitment methods depended on the nature of the project. Community-level projects tended to recruit through a combination of leaflets, door to door visits and community events, usually in collaboration with a local partner. For example, SSEPD's NINES project was run in partnership with a local housing association, with a housing association development officer helping to recruit social tenants as participants. Similarly, WPD's SoLa project recruited social tenants through a local media and arts company which had a good local presence and strong local knowledge. Literacy rates in the local area were low, so as well as providing written materials, the partner organisation used face to face methods (e.g. door to door visits and an open day).

In contrast, a number of projects were working over a wide area, recruiting large numbers of participants. These projects tended to use direct mail, followed up by telephone calls with interested customers. For example, the UK Power Networks' LCL project used direct mail with follow-up calls by EDF Energy's call centre team. The call centre team was felt to be effective because the team were well-briefed, using scripts and FAQ information. In contrast, some information events run with communities in London, at an early stage of the LCL project, were felt to be much less useful because they could not be specifically targeted at EDF Energy customers (a pre-requisite for the project).

Some projects used a combination of methods. For example, SSEPD's Thames Valley Vision project was publicised through 'low carbon open days' at a local low carbon centre, but recruitment of participants was primarily achieved through mailshots to 20,000 domestic customers. From these mailshots 534 participants were signed up.

SPEN's Ashton Hayes project was unusual in that SPEN was 'recruited' by the village community, rather than the other way round. The community members had been active in low carbon activities for some time and were reported to be 'organised, motivated, educated and skilled'.

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A small number of projects used segmentation as part of their recruitment process. For example, NP's CLNR project used a 22 test-cell model developed by Durham University: most of the test cells were defined by the type of intervention to be trialled, but some of the domestic customer cells were segmented on the basis of thermal efficiency, age, household income, tenure and rurality. The segmentation data was drawn from British Gas's customer database. Similarly, UK Power Networks' LCL project matched its recruitment to London's profile using Acorn groupings. They found that a higher number of telephone calls were needed to recruit members of the 'High Rise Hardship' and 'Inner City Adversity' groups.

Both NP's CLNR project and WPD's SoLa project mentioned the challenge of managing expectations for households which were keen to participate but turned out not to have homes appropriate for the proposed intervention. CLNR dealt with this problem by moving such households to another test cell which offered a more compatible intervention. In contrast, WPD's SoLa project – which was only offering one type of intervention – dealt with this problem through close support and communication with the individuals involved, through the local media and arts company.

Several projects highlighted the value of using pre-engagement activities to inform the design of communication approaches and incentives. For example, ENW's C2C project used 'Engaged Customer Panels', stratified to be representative of the wider population, to explore how the C2C initiative should be communicated to domestic customers. The main focus of this project was with industrial and commercial customers, but their learning may still be relevant: that telephone and face to face communication worked best in communicating complex issues, while direct mail worked least well. One of the main findings of the engaged customer panels, which did include two domestic customer groups, was that it was challenging to communicate the role of DNOs.

A final challenge was around issues of ownership of properties and equipment, such as PV equipment in UK Power Networks' PV project. NP's CLNR project dealt with these issues by involving the local authority and social landlords to access housing stock for heat pump installations.

Maintenance of engagement

Nearly all of the nine projects reviewed used incentives to encourage and maintain engagement. Some, such as NP's CLNR project and UK Power Networks' LCL project, treated smart meters as being an incentive in themselves. But typical incentives ranged from £150 for UK Power Networks' LCL project and ENW's CLASS project, to £450 for UK Power Networks' PV project. Payments were often spread over the project, with part-payment on installation and subsequent payments on completion of monitoring activities through the project. In some cases, specific incentives were offered for surveys (e.g. £20 for smarter meter customers surveyed as part of UK Power Networks' LCL project). Little information was provided on how incentives were paid but NP's CLNR project specified that incentives were paid in the form of Marks & Spencer vouchers.

A few projects, such as WPD's SoLa project and ENW's C2C project, provided participants with a free tablet for monitoring energy use. WPD explained that these were not seen as a major incentive in themselves, as the main incentive for social tenant participants in this project was reduced energy bills. Other incentives used by C2C included donation to a charity of the customer's choice, and entry into a prize draw to win a mini iPad.

SPEN's Ashton Hayes project provided tailored support to the community as its incentive. This included reports on village energy use and PV operation, as well as technical support (e.g. a report into the high load profile of the community shop). The DNO developed a high level of trust and understanding with the community, which resulted in a good level of awareness of the role of DNOs. The relationship has culminated in the development of a community video as part of its support package. One lesson from the project is that community-led projects require patience, flexibility and understanding from the DNO: project timing was subject to the availability of volunteer time and community funding. SPEN was sensitive to its role in the

project: for example, SPEN did not push for a profile of who is engaged in the project, as it felt this would cross the boundary from being community-led to DNO-led.

Several community-level projects used on-going workshops, meetings and one-to-one support to maintain engagement. For example, WPD's SoLa project involved on-going support by the local arts and media company, including a focus group with a meal and a fact-finding trip to see the equipment in situ at another location, before installation. Further workshops and get-togethers are planned. Similarly, the NINES development officer maintained written communications and phone calls, and undertook a home visit with participants.

NP's CLNR project has invested resources in on-going engagement through a customer contact centre. This will include letters, monitoring and surveys, including follow-up studies by Durham University to research the effectiveness of communications in influencing energy use and generation.

Drop-out rates varied across the project. Many projects, such as ENW's CLASS project and ENW's C2C project, assumed a 10-15% drop-out rate over the project. WPD's SoLa project has maintained high levels of engagement with its 30 participating households, but two left the project because they moved out of the area, representing a 7% drop-out rate.

WPD's SoLa project reported that responding quickly to complaints was important in retaining participants. For example, two participants complained that they were not saving any money on their fuel bills. Prompt investigation revealed that their equipment had been switched off, but dealing with this issue enabled these participants to be retained. Similarly, SoLa ensured that there was good communication with participants to explain delays that occurred in installing some of the equipment.

SSEP's Thames Valley Vision project found that participant retention depended on moving fast from initial sign-up to booking installation. From a mailing of 20,000, the project signed up 534 participants, of whom 329 had installations booked, resulting in final installations in more than 250 households. This represents a drop-out rate of 39% from sign-up to booking. This high-level of drop-out appears to be due to the fact that the call centre was dependent on incoming calls, and was not able to chase participants by telephone.

Costs
Budgets for customer engagement also varied widely, depending on the scale of the project. At the high end, ENW's C2C project involved communication of C2C across its domestic, industrial and commercial customer base, and has a budget of nearly £400,000. SPEN's Ashton Hayes village project had a budget less than £50,000. But projects such as UK Power Networks' PV project involved a cost of only £1,500 for the development of recruitment material, in addition to the payment of incentives.

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APPENDIX K: Literature Review

CAG Consultants performed a literature review aimed to research and identify best practice in terms of recruiting and engaging vulnerable and fuel poor customers based on the findings of other work in the field and to use the review results to inform the development of the VCEE recruitment and engagement strategy.

The scope of the review

In undertaking the rapid literature review CAG Consultants ensured that the work:

- Built on existing learning outcomes from existing customer engagement projects with the target audience;
- Explored value for money for customers;
- Provides academic rigour to proposal for an engagement plan; and
- Demonstrates project management in line with best practice.

To ensure that the review was rigorous and was effective in seeking out and analysing relevant data we established a set of review protocols, using the principles of a Campbell Systematic Review. These included inclusion criteria, lines of enquiry and researchers' protocols.

A Campbell Systematic Review is meant to review and synthesise evidence on social and behavioural interventions and public policy, including education, criminal justice, and social welfare, among other areas. The primary concern is with evidence on overall intervention or policy effectiveness and how effectiveness is influenced by variations in process and implementation, intervention components and recipients, as well as other factors. See http://www.campbellcollaboration.org/artman2/uploads/1/C2_Protocols_guidelines_v1.pdf.

Inclusion criteria

CAG Consultants used recognised review methods to ensure that the literature review was carried out in ways that were transparent, can be replicated and where bias is reduced. In developing project protocols they established the following inclusion and exclusion criteria:

- **Nature of what is being studied** - engagement with customers on energy efficiency measures or particularly relevant learning to engaging the target audience;
- **Population** – fuel poor groups as defined in the brief;
- **Language** - work in English; and
- **Date of research** - produced in the last five years.

Lines of enquiry

We established a set of lines of enquiry, during review all literature was scrutinised for evidence in each enquiry area and relevant data was collated in a review database. We included:

- Types of recruitment and engagement used, with a focus on what worked well and what worked less well including lessons:
    - Recruitment;
    - Engagement;
    - Maintenance;
    - Number of participants; and
    - Dropout rate.
- Delivery costs:
    - Costs; and
    - Cost benefits of holistic / partnership approach to UK Power Networks and partners.
- Methods used to measure outcomes and impact, and how 'what worked well' was assessed.
- Codes of Practice used.

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Summary findings

CAG Consultants research team analysed the collated data from the literature review and drew out key lessons to inform the development of the engagement strategy. These key lessons are summarised below.

The research suggests that there are some key considerations that need to be built into **planning the recruitment** of fuel poor customers, including:

- **Identifying fuel poor households** – especially when they might not define themselves as such and given that being fuel poor is not a fixed state.
- **Overcoming mistrust** – through working with local intermediaries and ensuring that those who have direct contact have the skills and knowledge required to build trust.
- **Resources required** – ensuring that the front loading of resources to recruitment is enshrined in the project.
- **Finding the right methods to recruit** – including considering combining a variety of methods to ensure customer reach.
- **Getting the message right** – hooking into the motivations of fuel poor households and the vulnerable.
- **Addressing barriers to recruitment** – through having a full understanding of the challenges faced by the target audience.
- **Seeking out existing opportunities** – both to be in contact with target households and to influence behaviour.

In terms of defining and identifying fuel poor households where there is significant overlap with the vulnerable, Ofgem has recently published its vulnerable consumer's strategy (Ofgem (2013) Consumer Vulnerability Strategy). It identifies a number of risk facts that can put customers into vulnerable positions. There are a range of circumstances that customers can be in that can put them in vulnerable positions. These risk factors include, but are not limited to, the following.

Personal circumstances

- Living alone
- Being on a low income
- Being a full-time carer
- Leaving care for the first time
- Being unemployed or being made redundant
- Not having internet access
- Being a lone parent
- Experiencing relationship breakdown
- Experiencing bereavement

The property

Living in a rural area and off the gas grid
- Living in private rented accommodation
- Living in a cold, inefficient home

Methods of recruitment

The research has suggested that there are no 'right' ways to recruit, but has identified some useful recruitment methods to draw on. In summary these include;

- **Finding the most appropriate way to reach the target audience** - different communication methods will be appropriate for different audiences.
- **Working with local organisations with day to day contact with fuel poor and vulnerable groups** - Hargreaves reports that local authorities and housing associations can be used to recruit low-income and elderly households.
- **Testing the impact of the messaging** - ensuring that information is provided in a form that customers can understand is important.
- **Taking it out to the people** – The Energy Saving Trust ((2011) Renew Rollout Evaluation Report 2011-12) reported that the London-wide RE:NEW project found that direct door to door engagement, supported by wider engagement to raise the level of awareness about the scheme, was the most effective approach to recruitment.

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- **Working with the most appropriate intermediary** – this could include the local authority, social housing provider, fire service, the energy supplier and/or local third sector organisations.

Messages/motivations

A large number of studies indicated that how the message is conveyed is an important consideration in recruitment. For example finding what motivates people can be useful in opening doors provided the message is tailored accordingly. Hargreaves found that participants in a smart meter trial had four motivations – financial, environmental, information gathering and technological. Low income users had financial considerations uppermost in their mind.

Barriers

In order to develop an effective engagement strategy it is essential that full consideration is made of the potential barriers to recruitment. The research has identified key barriers including;

- **Survey issues** - Raw and Ross ((2011) Energy Research Project, Final Analysis, AECOM; SSE findings) found that reasons for not participating included the recruitment survey being lengthy, other survey issues and fears were also cited.
- **Lack of broadband access** - Institute for Sustainability ((2013) Home Energy Systems Trials - part 2 - TSB funded project) found that a major barrier to recruitment was the requirement to have broadband access, which many social tenants did not have.
- **Perceived drawbacks of the technology** - Lewis et al (Nottingham Trent University (2013) Final Report: Exploring the role of marketing as a tool to aid smart meter adoption amongst fuel poverty and vulnerable group) found that perceived drawbacks of smart meters included: fear of a financial charge for installation; concern that the device might be inaccurate or use energy itself; fear of change; and concern that having a smart meter might affect the consumer's energy tariff.
- **Language** - Agnolucci et al ((2012) Fuel Poverty: Evidence from an inner London borough) found that a key barrier to recruiting households in an inner London Borough was language (particularly for those ethnicities without a considerable presence in the borough). The Energy Saving Trust found that employing assessors who are able to speak several languages and producing literature in a range of languages is important.
- **Short term tenancies** - Agnolucci et al further found that private rented sector were difficult to recruit due to tenants having short contracts and therefore being unlikely to reap the benefits of energy efficiency improvements, and/or fear of retaliatory eviction from their landlord if they ask for improvements.
- **Addressing practicalities** – for example the Department of Energy and Climate Change (DECC, 2012, What Works in Changing Energy-Using Behaviours in the Home? RAND Europe) lists barriers that prevent or limit changes in behaviour to include comfort, aesthetics and the physical layout of the home.

Approaches to maintaining engagement

Once householders are successfully recruited, engagement with them needs to be maintained over the life time of the intervention. Here we have collected the research data to outline the methods used and challenges faced. An overarching finding is that it appears to be essential to take the service to the client; they often can't, or don't choose to use other services due to language, health, confidence or financial barriers (Bates I, Allen D & Rogers M (2013) Reaching the fuel poor - a how to guide, Umbrella Fair).

Other key factors include;

- Communicating the right messages that 'hit home' with the audience;
- Providing face to face key worker support;
- Building in cycles of feedback that underpin learning;
- Ensuring delivery staff are trained, knowledgeable and skilled;
- Providing incentives; and

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- Addressing challenges (Bates).

Challenges

The research evidence suggested some key challenges that need to be addressed to ensure that participant involvement is maintained. These include:

- **Frustrations** - Hargreaves reported that some low income participants in a smart meter trial were frustrated that the savings were very small. Frustrations were also expressed that rising energy prices had prevented the behavioural changes they were making translating into savings.
- **Privacy and security** - addressing concerns around privacy and security through open and honest communication around the measures undertaken to protect consumer data (O2 (2013) Effectively engaging consumers to ensure smart meter success).

Anticipating drop outs – some level of drop out is inevitable. The Institute for Sustainability reported that in one trial, three of the 12 recruited householders dropped out before installation (due to specific health issues) and another two during survey. Warm Zone pilots (NEA, EST & CSE (2005) Warm Zones External Evaluation, for Defra and DTI) reported a drop out rate of 3% (after households had accepted having measures installed).

Cost information

The research has been informative in bringing clarity to the overarching issue that effective engagement requires significant investment in resources and time. Darby found that community projects can be highly effective, sometimes involving a relatively high cost in time and resources (Darby S (2010) Literature review for the Energy Demand Research Project Environmental Change Institute, University of Oxford, published for Ofgem). Key areas for which costs need to be built in have also emerged from the review. These include:

- Delivering appropriate communication;
- Employing and training staff, skilled in energy saving and softer skills such as developing rapport;
- Providing on-going and face to face support to households;
- Developing tailored and appropriate resources;
- Providing incentives; and
- Resourcing formative evaluation of impact and reach.

Codes of practice

Ofgem suggests that suppliers and distributors adopt BSI Standard BS 18477 'Inclusive service provision – requirements for identifying and responding to consumer vulnerability' (Ofgem (2012) Proposals for a new Consumer Vulnerability Strategy). It states that the Standard is a useful indication of the types of behaviour that we expect from suppliers and distributors and it adopts a perspective of vulnerability that it based on understanding risk factors. The Standard gives guidance on how organisations can interact with all customers so that no-one is inappropriately excluded and helps organisation to identify and assist those customers who could be vulnerable or at risk of disadvantage.

Beyond this industry standard and the customer engagement standard AccountAbility 1001, the literature review looked at sources from organisations that work closely with vulnerable customers and the fuel poor. But we found only limited reference to specific codes of practice. Most notably the NHS good engagement practice guide defines some Principles of Good Practice (NHS (2011) Engaging protected and vulnerable groups: Good engagement practice guide for the NHS Equality Delivery System). These include:

- Addressing barriers in both planning and delivery;
- Promoting activities well and in appropriate ways;
- Using multiple methods to recruit and engage while being proportionate;
- Going to the people rather than expecting them to come to you;
- Combine efforts and resources with partners to maximise effort; and
- Offer opportunities to participants to input into design and evaluation at all stages

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APPENDIX L: Partner Skills Audit

Based on the literature review and best practice, CAG Consultants established that there were a key set of skills required to ensure effective delivery of the VCEE recruitment and engagement strategy.

Face to face interviews were conducted with, and skills audits were completed by, representatives with four of VCEE's partners and associates: National Energy Action, Institute for Sustainability, University College London, British Red Cross and UK Power Networks.

Skill sets included: Planning community engagement activities; Delivering community engagement activities; Supporting community engagement activities; Communication and marketing; and Analysis, reporting and feedback.

Through drawing together the information from both data sets it was established that, combined, the partners and associates have high levels of experience and skills in the area of engaging with communities, with one project partner, for example, stating that community engagement and evaluation with this customer group is their 'bread and butter' work.

The role of the partner and associate organisations in relation to fuel poor customers

- **National Energy Action** (NEA) specifically focuses on preventing fuel poverty as well as fuel poverty alleviation and has done since it was set up over 30 years ago. They undertake campaigning to influence policy and legislation e.g. establishing the parameters of ECO and undertake research and evaluation in order to identify innovation and good practice in eradicating fuel poverty. NEA takes a lead role in Media and PR campaigns and is supporting DNOs to implement the Ofgem Vulnerability Strategy. NEA delivers accredited, CPD training and is a recent Ashden Award Winner. They have also worked on the LCNF Customer-Led Network Revolution Project, assessing fuel poor household appetite for in home interventions that can reduce peak-time energy use. They are currently working with all DNOs on priorities identified in their business plans from 2015.

- **Institute for Sustainability** was set up in 2009 with a purpose of identifying best practice and pushing replications. Its role is to develop projects related to resource efficiency and behavioural aspects of resource use. They are involved in 'neighbourhood demonstrators' project in Tower Hamlets, which includes funding a member of staff in the housing provider Poplar HARCA to do community and resident engagement. They are also involved in trialling home energy management systems and facilitating a stakeholder-resident conference.

- **University College London's** key expertise is evaluation. They are involved in smart meter evaluation framework for DECC, including consideration of the impact of smart meters on vulnerable and fuel poor customers. They are also experienced in looking at different control systems for social tenants to manage their energy and have expertise on setting up networks of groups.

- **British Red Cross** works with individuals who are in crises and vulnerable. They are contracted by UK Power Networks to supply emergency callout for power outages - identifying those customers as vulnerable at that time. This involves supplying blankets, hot drinks, notifying relatives etc. They are constantly engaging with communities to identify volunteers and residents in need. Key groups include food banks, refugees, shelters, youth, community first aid, therapeutic care, home from hospital etc.

- **UK Power Networks** manages and maintains a Priority Services Register (PSR), which is a register of vulnerable customers and those registered receive a priority service during a power outage. Working with British Red Cross vulnerable customers on the PSR and identified at site are supported in the event of a power outage. UK Power Networks have customer champions that respond to faults and customer complaints, supporting and identifying vulnerable customers. They have previously as part of their RIIO-ED1 stakeholder engagement set up a workshop with stakeholders to look at offerings to the vulnerable, and in partnership with the National Energy Action will be sponsoring a range of projects on this theme. UK Power Networks have committed in their RIIO-ED1 business plan to providing energy saving tips and demand side response. They are currently identifying

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where there are high levels of deprivation amongst customers. They will also be offering additional training for frontline staff on energy awareness.

Planning community engagement activities

The skills audit results suggest that four of the seven project partners are very confident or comfortable in planning engagement activities.

Additional information from the skills audit and the partner interviews in respect of planning community engagement activities:

- Through their fuel poverty forums, **NEA** has developed an extensive network with local practitioners that can be deployed to undertake a scoping exercise in the final community of delivery. Their experience and skills also underline the importance of utilising partnerships; harnessing the potential of locally trusted services and intermediaries.
- **Institute for Sustainability** (IFS) have been involved in the planning and development design of engagement; for example they are currently delivering the face to face engagement. However, they do recognise the skills of their local delivery partners and other specialists, such as Groundwork, in delivering successful engagement. They identify their core skills as design and development of projects, identifying objectives and best practice approaches. IFS further underline that to be successful engagement needs to be collaborative with local partners and locally driven.
- **UK Power Networks** have made significant investment in developing engagement skills and in a short space of time. To achieve this shift they have brought in some very experienced people and thus have many key skills in-house. They have developed processes for engagement events, including some KPIs such as publishing a transcript within 24 hours, assign actions to it, and within four weeks publish a response with actions. Their activity over the last two years means that the UK Power Networks mechanism behind their stakeholder engagement have been thoroughly tested.

Delivering community engagement activities

Responses to the skills audit suggest that most partners are very confident in delivering community engagement and the four partners involved in these exercises are and have been involved in this work to a greater or lesser extent.

Additional information from the skills audit and partner interviews in respect of delivering community engagement activities:
- **National Energy Action** (NEA) have demonstrated significant activity in delivering engagement activities with fuel poor customers and related stakeholders. The organisation's fuel poverty forums have a minimum of 60 attendees made up of frontline staff, from insulation, manufacturers, Citizens' Advice Bureaux, local authority workers, local and national charities, Age UK staff, schools and teachers. In this context, NEA's role will be to carry out timely policy briefings, relaying all relevant changes in government policy, including new obligations, e.g. on the Housing Health and Safety Rating System, the Green Deal and ECO, thus ensuring partners are sufficiently updated.
- Across their team and based on experience in this area, **Institute for Sustainability** are also confident that they have key skills sets needed to support and deliver engagement and have tried and tested several methods to engage with different stakeholder groups, often on complex subjects.
- Despite the significant work competed over the last two years around corporate engagement, recruitment and engagement of householders is a completely new sphere for **UK Power Networks**. Key skills they can bring to this part of the wider process are knowledge from previous work within the Low Carbon Network Fund such as the Low Carbon London and Validation of PV Assessment Tool project and strong relationships with key charities. UK Power Network recognises that they currently have limited interaction with domestic customers, but are committed to learning the skills required.

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Supporting community engagement activities

Skills audit responses to providing supporting activities to community engagement were mixed with some key gaps emerging in language and translation skills, designing technical information, developing and designing databases, publicity materials and conflict management.

Additional information from the skills audit and the partner interviews in respect of supporting community engagement activities:

- **University College London** suggested that for a project this size and with the data streams from smart meters and data loggers, the data could be easily transferred into collation and analysis packages that they use and are familiar with. Their skills range from simple spreadsheets to much more complex data manipulation.
- As part of their work with individuals **British Red Cross** teams are trained and well equipped with a number of transferable skills that will support community engagement, including: Developing teams and partnerships across multi-agencies; Listening skills; Language and translation skills; Conflict resolution methods; and Working with vulnerable customers and diverse audiences.

Communication and marketing

Although the majority of partners in the skills audit process were very confident or comfortable with communicating with diverse audiences, there was less confidence in the planning of marketing processes.

Additional information from the skills audit and the partner interviews in the communication and marketing area:

- Communication in engagement is a large part of **Institute for Sustainability's** role. For example, using their skills in their area worked very well with TSB on Retrofit for the Future. In this case, the Institute challenged TSB on how they were going to disseminate the significant findings to SMEs and others, as a result which TSB commissioned University College London to produce some summary findings.
- **University College London** noted their experience in presenting complex information in simpler formats, for example on the CaRB (Carbon reduction in buildings) project (http://www.ucl.ac.uk/carb/), UCL designed a booklet showing how you read the many different types of meters that exist in order to help participants read there meters. However, UCL also noted that this was not a key focus of their work or their skills.

Analysis, reporting and feedback

Responses to the key skills in this area were mixed, but overall the partners were very confident or comfortable.

Additional information from the skills audit and the partner interviews in respect of analysis, reporting and feedback:

- **University College London** particularly focused on their skills in this important area. They are very engaged in the analysis of social data, processing of quantitative data and parametric data. The named social researcher on the project (McMichael) has direct experience of processing both qualitative and quantitative on community energy trials from surveys, focus groups and interviews, as well as presenting this to community groups, industry personal and the academic community in appropriate formats. She is also a recognised expert in social capital and social networks and their influence on the uptake of energy efficiency interventions having advised both industry and government on this issue.

Key engagement skills gaps

The partner interviews and the skills audit suggest that there are some skills gaps and some areas where skills exist but specialist support would further enhance the effectiveness of the process. These include:

- Communications and marketing to local communities and participants both for recruitment and maintenance;
- Language and translation skills;
- Skills around the particular engagement needs of specific cultures, again depending on the needs of communities within the final locality;

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- Particular skills in engaging groups from different demographics and therefore having different needs and types of vulnerability; and
- People on the ground with key people and 'soft' skills.

These identified skills gap from the interview and partner skill audit would be fulfilled by the other VCEE partners – Tower Hamlets Homes, Poplar HARCA and Bromley-by-Bow Community Centre for their local experience and with the involvement of an experienced electricity supplier, British Gas.

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APPENDIX M: Letters of Support

BritishRedCross

London Area Office
28 Worple Road
Wimbledon
London SW19 4EE

Tel: 020 8944 0246
Fax: 020 8971 8340
www.redcross.org.uk

06 August 2013

Lynne McDonald MEng MIET
Low Carbon Project Manager
Future Networks
UK Power Networks
Newington House
237 Southwark Bridge Road
London
SE1 6NP

Dear Lynne
RE: V-CEE Project

The British Red Cross in London is pleased to be involved as a critical friend in the UK Power Networks V-CEE project. We support the initiative's objectives to enhance services to the most vulnerable in London. We particularly welcome the opportunity to investigate how the services we already provide can be developed in support of this project.

As a critical friend the British Red Cross in London will be available to consult on aspects of the project when it involves vulnerable individuals and groups. The Red Cross will investigate how to enhance the services that we deliver to vulnerable individuals during power outages and how we can assist local communities to improve their resilience.

The British Red Cross is a humanitarian organisation that assists vulnerable individuals and groups during times of crisis. The organisation additionally assists communities to increase their resilience to natural and man-made disasters through a range of services. In all the services that we provide our beneficiaries come first.

The British Red Cross wishes the project, and anticipates every success for all beneficiaries.

Yours sincerely,

Senior Operations Manager
BRC- London

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Consumer Futures

Lynne McDonald MEng MIET
Low Carbon Project Manager
Future Networks
UK Power Networks
Newington House
237 Southwark Bridge Road
London
SE1 6NP

06 August 2013

Dear Lynne

RE: V-CEE Project

Consumer Futures is the statutory watchdog for energy consumers in GB and we have particular responsibilities with regards to vulnerable customers. We are pleased to be involved as a critical friend in the UK Power Networks V-CEE project.

We believe that this is a very valuable project:

- DECC estimates that around 20% of customers will be on some form of static time of use tariff by 2020 in addition to the estimated 19% that are on one now. It is essential that low income and vulnerable customers can and do access the benefit of these new smarter deals.
- Very little research has been carried out on the impact of DSR on vulnerable customers. Our own research found that almost 40% of customers on today's relatively basic time of use tariff tariffs were probably not on the right deal for them. Many did not understand how to engage with these offers. Vulnerable customers in particular may struggle to engage with more complex deals and tend to be more sticky – less likely to switch and take up new offers.
- Both DECC and Ofgem have committed to carry out an evaluation of the impact of smarter tariffs on low income and vulnerable customers. This research can help to inform that work and the ongoing activity of the smart metering central delivery body.
- With rising energy prices it is important to understand what interventions can help vulnerable and low income customers achieve sustained energy reductions.

As a critical friend Consumer Futures will be available to consult on aspects of the project.

Yours sincerely,

Zoe McLeod

Head of Smart and Sustainable Energy Markets

London	**Glasgow**	**Cardiff**	**Belfast**
Victoria House	Royal Exchange House	Portcullis House	Elizabeth House
Southampton Row	100 Queen Street	21 Cowbridge Road East	116 Holywood Road
London	Glasgow	Cardiff	Belfast
WC1B 4AD	G1 3DN	CF11 9AD	BT4 1NY
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Jim Fitzpatrick MP
House of Commons
London
SW1A 0AA

Martin Wilcox
Head of Future Networks
UK Power Networks
Newington House
237 Southwark Bridge Road
London
SE1 6NP

7 August 2013

Dear Martin,

UK Power Networks, Vulnerable Customers and Energy Efficiency LCNF Tier 2 Project

I am pleased to offer my support for the UK Power Networks Vulnerable Customers and Energy Efficiency project, which would provide 550 vulnerable and fuel poor households in Tower Hamlets with smart meters, simple energy saving and energy-shifting devices, and time-of-use tariffs.

I welcome the opportunity this would provide for my constituents to reduce their own electricity bills, while contributing to a wider understanding of how vulnerable and fuel poor households can be supported to save money by improving their energy efficiency.

Energy bills are a big worry for many of my constituents.

I therefore wish the project and its participants every success, and look forward to the benefits it will deliver for many of the vulnerable and fuel poor households in Poplar and Limehouse.

Yours sincerely,

Jim Fitzpatrick MP
Member of Parliament, Poplar and Limehouse

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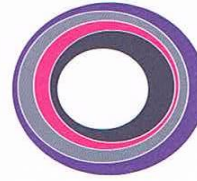
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Lynne McDonald MEng MIET
Low Carbon Project Manager
Future Networks
UK Power Networks
Newington House
237 Southwark Bridge Road
London
SE1 6NP

01 August 2013

Dear Lynn

UK Power Networks, Vulnerable Customers and Energy Efficiency, LCNF Tier 2 Project.

The Bromley by Bow Centre is pleased to be a partner in the UK Power Networks Vulnerable Customers and Energy Efficiency. We support the initiative in developing an energy efficiency and behavioural change programme with some of the most vulnerable residents of Tower Hamlets.

The Bromley by Bow Centre has worked in Tower Hamlets for thirty years, working with and supporting many of the most vulnerable in our community to individually and collectively to harness their social assets to regenerate their communities.

We fully support the project's intentions of developing an energy efficiency programme that seeks to create and understand the interaction between new technologies and behavioural change by engaging with vulnerable clients and diverse communities such ours.

This project will build on the work that we and other local partners have been developing across Tower Hamlets over many years.

Yours sincerely,

Dan Hopewell
Director of Strategy

Tower Hamlets Homes

5 August 2013

Lynne McDonald MEng MIET
Low Carbon Project Manager
Future Networks
UK Power Networks
Newington House, 237 Southwark Bridge Road
London SE1 6NP

Dear Lynne

RE: Vulnerable Customers and Energy Efficiency Project

Tower Hamlets Homes is pleased to be involved and associated with the UK Power Networks Vulnerable Customers and Energy Efficiency Project.

We support the opportunity of exploring and developing options to enable vulnerable and fuel poor residents to manage their energy consumption and reduce their energy costs, through the provision of a range of technologies and extensive engagement and support structures.

The scheme will be recruiting and engaging vulnerable/fuel poor social housing tenants of Tower Hamlets Homes and Poplar HARCA.

Tower Hamlets Homes is particularly excited about the opportunity of engaging residents who live in 22,000 Tower Hamlets Homes managed properties across entire Borough of Tower Hamlets.

We wish all the best to the project team and all stakeholders.

Yours sincerely,

[signature]

Sarah Pace
Head of Business Development & Investment Planning

Tower Hamlets Homes
Jack Dash House
Lawn House Close
London E14 9YQ

Contact
020 7364 5015
www.towerhamletshomes.org.uk
contactus@towerhamletshomes.org.uk

LCN Fund
Low Carbon Networks

Project Code/Version No:
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POPLAR HARCA
Making Poplar a better place to live

Lynne McDonald MEng MIET
Low Carbon Project Manager
Future Networks
Newington House, 237 Southwark Bridge Road
London SE1 6NP

August 6, 2013

Dear Lynne

Re: Vulnerable Customers and Energy Efficient Project

Poplar HARCA is pleased to be involved and associated with the UK Power Networks Vulnerable Customers and Energy Efficiency Project.

We support the opportunity of exploring and developing options to enable vulnerable and fuel poor residents to manager their energy consumption and reduce their energy costs, through the provision of a range of technologies and extensive engagement support structures.

We are very excited that the project is focused on utilising local stake holders to recruit and engage vulnerable and fuel poor households in the area, placing the understanding and needs of residents at the heart of the piece.

We wish all the best to the project team and all stakeholders.

Yours sincerely

Paul Augarde
Places & Services Coordinator
Tel: 020 7005 7618
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Head Office:
167A East India Dock Road, London E14 0EA
Freephone:0800 035 1991 Fax: 020 7510 0550

Technical office:
Unit 3 Quebec Wharf, 14 Thomas Road
London E14 7AF. Please note Quebec Wharf does not have a reception.

Poplar HARCA is the trading name of Poplar Housing and Regeneration Community Association Ltd ■ Poplar HARCA is a company registered in England and Wales under registered number 3249344 ■ Housing Corporation registration number L4170 ■ Registered office: 167A East India Dock Road, London E14 0EA ■ Poplar HARCA is a registered charity number 1064397

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APPENDIX N: Carbon Evaluation

Carbon emissions savings

The VCEE project will deliver **93.51 tCO$_2$ emission savings by 2017**, on average 0.11 tCO$_2$ emissions per Customer. Scaling this up to the 4.5 million fuel poor in the UK (2011, DECC), of which a significant number are also vulnerable in some way, emission savings could equate to 153,017 tCO2.

The anticipated savings have been modelled based upon categorisation of types of customers, number and types of energy efficiency devices that would be deployed with the differential in savings blended to reflect the trial demographic. The table below outlines the tools that are planned to be implemented and associated carbon savings.

Tool		Assumptions			Carbon saving (RIIO-ED1)			
		£/yr	Price £/kWh	kWh/yr saving	ED1 2015	ED1 2016	ED1 2017	
					351.4	334.7	317.9	g/kWh
					20	22	24	£/tCO2
CFL Bulb - 11W		£11.32	0.127	89.43	0.031	0.030	0.028	
Plug in thermostat		£10.17	0.127	80.30	0.028	0.027	0.026	
Solar phone / gadget charger	Charging	£0.55	0.127	4.38	0.002	0.001	0.001	
	Full charge	£0.91	0.127	7.15	0.003	0.002	0.002	
PC standby saver		£7.40	0.127	58.47	0.021	0.020	0.019	
TV standby saver	Television	£4.99	0.127	39.42	0.014	0.013	0.013	
	Set-top box	£22.46	0.127	177.39	0.062	0.059	0.056	
Energy Saving Socket with Timer	Iron	£3.47	0.127	27.38	0.010	0.009	0.009	
	Laptop OC	£5.10	0.127	40.29	0.014	0.013	0.013	
					0.18	0.18	0.17	tCO2

Table 14: Carbon Savings

A carbon saving has been calculated for each tool and are displayed in tonnes of carbon dioxide (tCO$_2$). It should be noted that this is the base case and assumes a lossless network; hence actual emission savings could be higher. Each saving reflects the CO$_2$ emissions associated with the production of the device's kWh/yr saving at the generator. Appendix H conveys the process followed to derive depicted kWh/yr savings.

The total saving, assuming that each device is utilised to its predicted potential, equates to 0.17tCO$_2$ in 2017. This figure is only 0.01tCO$_2$ less than the previous two years at the start of RIIO-ED1. Although the grams of CO$_2$ for each kWh generated decreases, the cost associated with each tonne increases, thus little change is evident. Moving forward to the end of RIIO-ED1, total potential saving reduces to 0.12tCO$_2$ per annum.

As emphasised, said figures present the base case. Taking network losses into account should result in a greater saving per customer. Savings are achieved at the customer end, yet due to losses energy is lost in transit.

Energy saving devices will have a positive impact on CO$_2$ reduction. Implementing a Time of Use (ToU) tariff could also have an associated carbon benefit, albeit to a much lesser extent. Through introducing a ToU tariff and educating customers of the price parameters, it is expected that consumer demand will shift. The overall effect is peak demand at the substation will be reduced and with analysis will determine what level of network reinforcement can be deferred. Further CO$_2$ emission savings will be achieved via reduction of network stress, transmissions losses and generation output.

Carbon emissions calculations

It is not accurate to assume a base case saving of 0.17tCO$_2$ for the average project trial customer provided with energy saving tools. This is the maximum potential if all tools were used and each realised the kWh/yr saving derived. Feeding this data into our carbon emissions analysis and applying it to the VCEE project enables trial totals to be

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calculated. The following analysis is based on 2016 and 2017 predictions. The tables below depict results from this analysis.

	Trial 1	Trial 2	Total Saving (£)	Total CO2 (tCO2)	Price of CO2 savings (£)
Sample Group 1	0	275	£18,250	71.16	£1,611
Sample Group 2	275	275	£36,501	121.82	£2,625
Total			**£54,751**	**192.98**	**£4,236**

Table 15: Best Case Scenario

The table above highlights the best-case savings within each trial. To enhance analysis a number of scenarios were constructed in an attempt to increase output reliability. Appendix H presents such scenarios with the bill saving range achievable per customer.

	Trial 1	Trial 2	Total Saving (£)	Total CO2 (tCO2)	Price of CO2 savings (£)
Sample Group 1	0	275	£8,843	34.48	£781
Sample Group 2	275	275	£17,687	59.03	£1,272
Total			**£26,530**	**93.51**	**£2,053**

Table 16: Blended Scenarios

Taking all scenarios created into account, a blended view was produced. As anticipated, savings are greatly reduced, yet more realistic. A notable $93.51tCO_2$ emission savings by 2017 through the two VCEE trials is estimated.

Division of this saving by the total number of customers in the trials and multiplying it by the total number of fuel poor UK Power Networks customer base produces the total estimated annual saving. Hence, if rolled out to all vulnerable customers, $90676.36tCO_2$ could be saved across the three UK Power Networks licence areas.

Carbon emissions assumptions

To calculate carbon benefit, the following data sources were utilised.

Carbon Emissions

All data presented in this summary is taken from "Electricity Market Reform, Analysis of policy options" produced by Redpoint Energy in association with Trilemma UK. The full document can be accessed via the link:

1043-emr-analysis-policy-options.pdf

- Electricity generation sector CO_2 emissions amounted to **186 million tonnes** in 2009.
- On a unit output basis, averaged across the sector, **452 g/kWh** is produced from the electricity generation sector (this was 496 g/kWh in 2008).
- DECC's baseline scenario predicts carbon intensity of 200 g/kWh in 2030.
- CCC suggest that power sector CO_2 emissions of less than 100 g/kWh by 2030 is required if the UK is to meet 2050 targets.

Cost of Carbon

In 2011, the Government's Budget announced the introduction of a carbon price floor from the start of the 2013 financial year. The information stated can be referenced to the document "Carbon price floor consultation: the Government response":

carbon_price_floor_consultation_govt_response.pdf

- The price floor targets £30/tCO_2 in 2020 and £70/tCO_2 in 2030.
- The floor begins around **£16/tCO_2** and rises by approximately £2/tCO_2 until 2020.
- The price floor has been designed to drive a £30-£40 billion of new investment in low-carbon technologies. Equivalent to 7.5 – 9.3 GW of new capacity).

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APPENDIX O: Description of Design of Trials

Summary: The project will be structured around two sequential 12-month trials. Each trial will have an intervention and a control group with random allocation of participants between groups. There will be an external control group running throughout both trials. The sample size will be 550 with equal sized intervention and control groups (275 each).

Recruitment will be by invitation from a sample frame of British Gas customers who meet the project criteria for fuel poor status and who fall within the case study area. The target non-response rate is 50%. The statistical power level for differentiating between the intervention and control group is 0.75 as the risks (i.e. Probability times consequences) of Type I errors is judged to be low. The statistical confidence used for generalising the findings to the population is 90%.

This research design has been developed as a balanced response to the need for robust, generalisable findings tensioned against the costs to the project and the logistical constraints of working with fuel poor customers in a constrained geographical area.

Objectives of the research design: The design of the trials has been based on two main objectives. Firstly, to be able to say how likely it is that the effects of the interventions are real, that is not just due to random fluctuations in energy use between those who received the interventions (the 'intervention group') and those who didn't (the 'control group'). Secondly, to be able to say how likely it is that the energy savings and/or energy shifting we see in those who received the interventions apply generally, that is would happen if we did the same interventions elsewhere.

In terms of trial design these two issues are known as 'internal validity' and 'external validity' respectively, and are the key to designing statistically sound and sufficiently robust trials that can capture the learning from the project.

Trial internal validity - Ensuring the results of the interventions are real:

Ensuring the energy savings and/or energy shifting observed in the trials are real comes down to two things. Firstly, ensuring they couldn't have arisen for any reason other than the trial interventions. Secondly, ensuring that they couldn't have arisen by chance.

1) Ensuring the observed energy savings and/or shifting couldn't have arisen for any other reason.

Ensuring they couldn't have arisen for any other reason relies on designing the research properly (technically good 'research design'). The standard way to do this is to use intervention and control groups that are the same in every way except for the intervention. VCEE will do this.

We will recruit 550 participants and randomly allocate half (275) into the Intervention Group and half into the Control Group. This ensures the two groups are identical except for the presence of the interventions.

The trial is designed with a strong project of community engagement and support for the participants and because the trials will occur within a small geographical area there is a risk of 'leakage' between the intervention group and the control group. There is a risk that this level of community engagement provided for the Intervention Group (Group 1) may influence the behaviour of the Control Group (Group 2) thus reducing their efficacy as a control.

Secondly, Trial 2 is designed to assess the effect of providing a range of interventions either all at once (Group 2) or staggered over two years (Group 1) in this design the

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Control Group in Trial 1, becomes the 'all-at-once' intervention group in Trial 2, this leaving Trial 2 without an internal control group. In order to assess any external influences on the trial (such as the effect of sudden energy price changes) that might arise during Trial 2 an external control group to the trials will be used. This design, of making the Control Group in Trial 1 the 'all-at-once' intervention group in Trial 2, has been adopted to address ethical concerns of not providing a significant group of fuel poor customers with energy management support over a prolonged period (2014-2017).

The provision of the external control group, and the making Control Group in Trial 1 the 'all-at-once' intervention group in Trial 2, also allow us to:

- Provide equal payments to both the intervention and control groups, thus eliminating financial biasing effects arising from differential participation payments.
- Reduce intervention-group control-group rivalry and/or demoralisation through providing the Control Group in Trial 1, with the intervention-set in Trial 2.
- Reduce differential attrition between the Intervention and Control groups in Trial 1.

Note that while Trial 1 and Trial 2 both run for the same duration of 12 months, they start at different times of year. Because the trial is targeting changes in electricity profile class 1 customers, I.e. Those who do not use electricity as a primary source of heating, it was felt that different start times of the trial was unlikely to impact of savings because the target loads for energy savings and energy shifting were not themselves strongly seasonal.

2) Ensuring the observed energy savings and/or shifting couldn't have arisen by chance.

This is determined by statistical sample size calculation for differentiating between the intervention and control groups. The aim of this sample size calculation is to ensure we can legitimately say there is a statistical difference between the intervention and control group. The sample size calculations were done using the G*Power 3.1.7 sample size calculation software (http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/) as reported in:

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41, 1149-1160.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39, 175-191.

The following inputs were used:

1. Current distribution of electricity consumption in the population was taken from Ofgem (2013) 'Review of typical domestic consumption values' consultation document. Ofgem Ref: 113/13. 3 July 2013.

UK Profile class 1 electricity consumption has the following characteristics:

- Median: 3200 kWh
- Average inter-quartile for 2011: (1200+1600)/2=1400
- Ratio of interquartile range to standard deviation range is 34%/25%=1.36
- SD is therefore estimated at 1.36*1400 = 1900kWh

These figures were adjusted to allow for the fact that fuel poor customers living in social housing are a subpopulation of all UK Electricity Profile Class 1 customers. They will

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probably have a lower Median and a narrower degree of spread (i.e. Lesser standard deviation)

The following adjustment assumptions were made:

 - VCEE participants will have a Median electricity consumption of 3000 kWh
 - VCEE participants will have a SD around that median of 1500 kWh

2. Effect size.

Data on effect size was taken from: Ref: AECOM (2011) Energy Demand Research Project: Final Analysis, Ofgem. Section 1.4 'Energy demand reduction seen in EDRP' - '1.4.2 Interventions with smart meters' - 'Real-time displays' (p.4).

www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=21&refer=Sustainability/EDRP.

Based on the findings of this report, and because of the extent of the intervention anticipated in the VCEE trial, we have assumed an energy saving of 6% from the intervention group in Trial 1. This makes the mean of Group 2 in Trial 1 3000kWh*0.94 = 2820 kWh. We assume the SD remains the same at 1500 kWh.

Calculation of sample size was done using an a priori power analysis using standard one-tailed t test, testing for the difference between two independent means (the intervention and the control groups).In order to determine the statistical power appropriate for this context an approach which assessed the **risk** (probability times consequences) of Type I and Type II errors was adopted.

The consortium was asked:

"Tell me, in percentage terms how sure you want to be that an intervention actually delivers the savings we measure?"

> A) On the balance of probabilities (i.e. 50-65% confident)

> B) Pretty confident (i.e. 65-80% confident)

> C) Beyond reasonable doubt (80-95% confident)

> D) Almost certain (>95% confident)

"Tell me, in percentage terms how sure you want to be that we don't reject an intervention that actually works?"

> A) On the balance of probabilities (i.e. 50-65% confident)

> B) Pretty confident (i.e. 65-80% confident)

> C) Beyond reasonable doubt (80-95% confident)

> D) Almost certain (>95% confident)

The consensus was that, on both the risk of 'false positives' and 'false negatives' that the group wanted to be 'pretty confident' which was translated into a Power level of 0.75.

We recognise that a statistical power level of 0.75 is low compared with the default value of 0.95. We feel it is important in this context to emphasise that in the context of smart meter installation a range of factors need to be taken into consideration with regards to the 'consequences' component of a risk based estimate of Type I (False positive) and Type II (False negative).

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Type I (False positive) errors are the chances of thinking the intervention works when in actual fact it doesn't.

Type II (False negative) are the chances of thinking the intervention doesn't work when in actual fact it does. In the context of an EU mandated roll-out of smart meters which is enacted in UK legislation, and for which much of the benefits outlined in the Governments' smart metering business case arise for reasons other than the energy savings arising from individuals, it was felt that an overly high degree of certainty on the evidence of the magnitude of the savings was unwarranted, particularly for the fuel poor group.

From the perspective of DNOs and Suppliers whether to supply smart meters to this group is not a question, they are obligated to do so both legally and ethically.

While understanding the magnitude of the savings is important, learning how to constructively engage with this group, and support their participation in a future, more actively demand managed grid, is more so. For this reason VCEE has a strong emphasis on learning about engagement and customer support and this places emphasis on issues of community participation and hence leads to this trial's focus on a smaller, geographically co-located, more intensively supported intervention group from which such lessons can be learned. In the context of the trial, and smart metering's more general benefit-suit to the energy supply system as well as customers, we feel that this lower statistical power on testing the energy savings is justifiable.

The output of the analysis was as follows:

Analysis: A priori: Compute required sample size

Input:				Output:			
Tail(s)	.=	One		Sample size group 1	=	253	
Effect size d	.=	0.12		Sample size group 2	=	253	
α err prob	.=	0.25		Total sample size	=	506	
Power (1-β err prob)	.=	0.75		Actual power	= 0.7501215		
Allocation ratio N2/N1.	=	1					

Trial external validity: Ensuring the results of the interventions are generalisable

Ensuring the results are generalisable from the sample to the population relies on correct survey research design (sampling strategy) and application of inductive statistics (sample size calculations).

The key issues to address in survey research design are to ensure the sample selected is representative of the population is it is drawn from. Within VCEE, the aims of the research, and the logistic of engaging with fuel poor customers place constraints on applying conventional random sampling techniques.

In addition, no single definition of 'vulnerability' exists, and definitions of 'fuel poverty' vary over time, and individuals move into, and out of, fuel-poverty as fuel prices and their circumstances change. The sampling strategy adopted in VCEE is one of identifying all British Gas customers who meet the VCEE qualification vulnerability and fuel-poverty criteria, within the prescribed geographic area, and this will form the sampling frame (i.e. List from which participants are drawn).

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Given the above constraints it is likely that all members of that list will be personally invited (through invitation) to join the trial. VCEE is aiming for a very high participation rate (50% invitee to acceptance ratio) although we acknowledge this is ambitious. The strong research design advantage of this approach is that we will be able to report a known non-response rate and undertake non-respondence surveys if needed.

The key issue to address in sample size calculations is to be able to calculate the intervention group sample size so that with a known degree of statistical confidence it can be said that what we observe in that group will apply in the wider population.

For sample size statistics for induction to the population the standard sample size formula was used. (For example see: Appendix 3: 'An Equation for Determining Final Sample Size' from 'Program Evaluation Tipsheet #60 - How to Determine a Sample Size' from PennState University (Ref: http://extension.psu.edu/evaluation/pdf/TS60.pdf.)

$$n = \frac{\left(\dfrac{P[1-P]}{\dfrac{A^2}{Z^2} + \dfrac{P[1-P]}{N}} \right)}{R}$$

Where:

n = sample size required

N = number of people in the population

P = estimated variance in population, as a decimal: (0.5 for 50-50, 0.3 for 70-30)

A = Precision desired, expressed as a decimal (i.e., 0.03, 0.05, 0.1 for 3%, 5%, 10%)

Equation 3: Standard Size Sample.

Z = Based on confidence level: 1.96 for 95% confidence, 1.6449 for 90% and 2.5758 for 99%

R = Estimated response rate, as a decimal

The inputs used in this inductive statistics calculation for the VCEE project were as follows:

N = The population was set at 260,000 based on information from UK Power Networks on the number of people on the Priority Services Register. While this is an underestimate, sample size does not change for population sizes above this value.

P = 0.5. This is assuming that half the population will save more than the estimated Median energy savings of 6% and 50% will save less than 6%.

A = 5%

Z = 1.6449 for 90%

This produces a value of 'n' of 271 survey participants required in the Intervention group. This has been rounded up to 275 in the advised sample size requirements.

Conclusions:

Considerable care has been taken in both the research design of this trial, and in the calculation of sample sizes for distinguishing between the intervention and control groups and for generalising to the population. The sample size calculation for internal validity generates an intervention group and control group size estimate of 253 each. i.e. 506 in total. The sample size calculation for external validity generates an estimate of 271 for the intervention group alone. Based on this the recommendation is therefore for a participant pool of 275*2=550 participants.

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External Control Group:

An external control group will be constructed from British Gas smart meter customers. British Gas have around one million smart meters installed in UK homes, the largest number of any supplier, but to date they have not undertaken installations for pre-payment, fuel poor and vulnerable customers. This lack of experience with this sector is what motivates British Gas's interest in this project, but it makes constructing a matched fuel poor external control group drawn from existing British Gas customers impossible. Because of the benefits arising from an external control group an alternative approach is suggested. Analysis of the HEED+Energy database conducted under the New Empirically-Based Models of Energy Use in the Building Stock (EBBS) project (EPSRC Ref: EP/I038810/1) at University College London (Refer to Table 11 and Figures 11 and 12), the distribution of electricity Profile Class 1 customers listed as belonging to the priority group ("Priority Group = N" in figures) is surprisingly similar to the distribution of electricity Profile Class 1 customers listed as not belonging to the priority group (non-priority group customers "Priority Group = Y" in figures) . While this data is based on DECC Annualised Quantity data for the year 2007, it is interesting to note that the Median value for the non-priority group of 3276 kWh is similar to the Median for the whole of Profile Class 1 (priority and non-priority group) customers for 2011 as published in recent Ofgem Review of Typical Domestic Consumption Values (TDCV) consultation (Ofgem Ref: 113/13, July 2013). This would indicate that there has not been significant movement in the Median energy consumption of this group over recent years.

It is also notable that the Median for the priority group only differs from the non-priority group by 6%. The Ofgem Review lists current TDCVs for electricity Profile Class 1 as 'Low' = 2100 kWh, 'Medium' = 3300 kWh and 'High' = 5100 kWh. Here 'Low' differs from 'Medium' by 36%. This both highlights the importance of one of VCEE's aims of providing better profile class information for fuel poor customers, as well as indicating that the energy consumption of this group differs little from the wider pool of electricity Profile Class 1 customers.

In the context of the VCEE project, the role of the external control group is to be able to control for events outside the trials, i.e. To help ensure that the energy savings and/or shifting observed within the trial couldn't have arisen for reasons external to the trial, such as changes in energy price, and to check for any 'leakage' between intervention and control groups within Trial 1. In order to fulfill this function, the control group needs to respond in the same way to any such external fluctuations as the groups within the trial. By far the most likely such external fluctuation is changes in energy price. In order to control for the effect of possible changes in energy price, we intend to analyse the energy consumption of an external control group of British Gas Profile Class 1 customers using quantile regression techniques and compare changes found in energy demand as a function of price across a range of quantiles of demand against changes observed in the within-trial intervention groups. Quantile regression techniques are currently best-practice in assessing the impact of external factors on energy demand (see Kaza 2010). This will allow us to test whether external influences, such as energy price changes, impact differently on different segments of energy customers. As Kaza (2010) notes: "[Quantile regression] estimates the effects of individual independent variables on specific quantiles of the dependent variable and therefore offers a simple method to estimate how different tiers of energy customers respond to changes…" (p.6576). Given the unavailability of a specific fuel poor external control group, we feel confident that using this method will allow us to robustly assess the impact of external energy price

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shock on the findings of the trials. Ref: Kaza, N. (2010). "Understanding the spectrum of residential energy consumption: A quantile regression approach." Energy Policy 38(11): 6574-6585.

Priority Group	N Obs	Minimum	Maximum	Mean	Std Dev	Lower Quartile	Median	Upper Quartile
N	229457	0	14999	3741.27	2273.89	2144	3276	4824
Y	28590	0	14989	3568.45	2199.6	2022	3087	4620
Diff				5%	3%	6%	6%	4%

Table 17: Analysis of HEED+Energy Database

Figure 11 - Distributions of electricity profile class 1 demand for priority and non-priority groups in HEED+Energy database
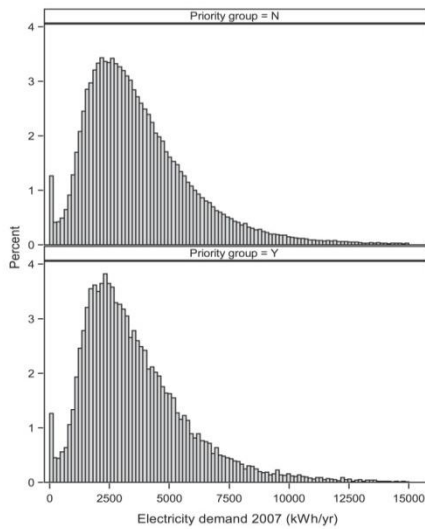
Figure 12 - Box-plots of electricity profile class 1 demand for priority and non-priority groups in the HEED+Energy database