Customer-Led Network Revolution – CET2001 - Addendum

Proforma box number/ Spreadsheet	**Where the latest information can be found**
Appendix 4_CET2001_Methodology	Version 2 of this appendix has been updated to provide a legible version of the table on page 58.
CET2001_Full Submission Pro Forma	Project cost section in box 3 of version 2 of this pro forma has been updated to provide project costs in regulatory years as opposed to calendar years.
Appendix A_CET2001_Full Submission Spreadsheet	Costs worksheet in version 2 of this appendix contains the project costs in regulatory years as opposed to calendar years.
CET2001_Full Submission Pro Forma	Response to supplementary question CE002 provided a corrected view of the net benefits associated with the project. Boxes 15 and 16 of version 3 (track changed) of the pro forma are reflective of these changes.
Appendix A_CET2001_Full Submission Spreadsheet	Response to supplementary question CE002 provided a corrected view of the net benefits associated with the project. Version 3 of this appendix contains a revised net benefits worksheet that is reflective of these changes.
Appendix 6_CET2001_Business Case	Response to supplementary question CE002 provided a corrected view of the net benefits associated with the project. Version 2 of this appendix (track changed) is reflective of these changes.
CET2001_Full Submission Pro Forma	Response to supplementary question CE019 provides a revised view of successful delivery reward criteria for the project. These are contained in the document CET2001_Full Submission Proforma Box 13 revised v1_0.

Low Carbon Networks Fund
Full Submission Pro-forma

In completing this proforma DNOs should consider the regulation, governance and administrative processes set out in the LCN Fund Governance Document

Section A: Project details

Project Summary

Box 1: Please provide details of the Project, the Method and Solution

CET2001 CUSTOMER-LED NETWORK REVOLUTION

The problem: The move to a low-carbon economy, in particular the growth in low carbon technologies (LCTs), will place additional strain on electricity distribution networks. If innovative solutions are not found this will require significant extra network investment and could delay the take-up of LCTs. This will start to be a problem on pockets of network by 2015 and a wider more significant issue from 2020. Therefore knowledge gained over the next three years will be relevant to the DPCR6 period. (See further detail in Appendix 1 on Vision.)

The solution: The network costs associated with mass uptake of LCTs could be significantly reduced, and delivery accelerated, by using a combination of:

- new network technologies; and
- flexible customer response from both demand and generation.

This will only happen if new commercial arrangements between suppliers, DNOs and customers are developed.

The method: While network management and demand response technologies exist and are well documented, they have not been deployed at distribution level in a market with the degree of vertical separation of Great Britain (GB). This project will provide the knowledge and experience to bridge this gap. It does this by bringing together GB's largest regional wires-only distributor (CE) and largest national unaffiliated energy retailer (British Gas) to test a range of customer-side innovations (innovative tariffs and load control incentives in association with different LCTs) alone and in combination with network-side technology (including voltage control, real time thermal rating and storage). The project has been designed to deliver robust learning that is applicable to a high percentage of GB networks and demographic groups, including the fuel poor.

The project: The project leverages the strengths and expertise of the project partners. Through British Gas's industry-leading smart meter programme (currently extending to 110,000 meters and set to rise to 2 million by the end of 2012) we will engage with a range of domestic customers, both with and without LCTs, as well as industrial and commercial customers who have generation and controllable load. The British Gas smart meters are in place and gathering data today, enabling early delivery of nationally-applicable results. Durham Energy Institute (Durham University, an internationally recognised institution) and EA Technology (consultants with extensive experience of industry trials) have helped design the trials for this project to ensure that they will provide statistically robust results with repeatable and scalable learning. Sustainability First (experts on household demand response and related customer, commercial and regulatory issues) is providing advice on tariff design and commercial interactions. National Energy Action is advising on aspects of the trials concerning the fuel poor. All these parties will be involved in the Project from trial design, through implementation, to analysis of results and identifying learning

outcomes.

Our project is based on the generation of five specific learning outcomes. To achieve each learning outcome we have designed a series of trials (detailed in our Appendices 3 and 4) each of which examines a discrete combination of customer propositions and network technologies.

Learning Outcome 1 (LO1): What are current, emerging and possible future customer (load and generation) characteristics? We will construct a detailed understanding of customer consumption and generation profiles across a representative cross-section of customer and demographic groups. This will build on existing consumption profile data and research, including from the Energy Demand Research Project (EDRP) trials. It will involve monitoring the consumption and generation profiles of *ca.* 11,000 domestic customers (general, heat pumps (HP), photovoltaics (PV), CHP, electric vehicles (EVs)); 2,250 small commercial customers; 14,000 industrial & commercial (I&C) customers and 250 merchant generators. For selected sub-groups this will include voltage and power quality monitoring, in addition to half hourly metering. This will allow us to update the industry's current understanding of demand profiles and analyse the impact of LCTs on consumer demand profiles.

Learning Outcome 2 (LO2): To what extent are customers flexible in their load and generation, and what is the cost of this flexibility? This will look at testing different customer propositions, such as static and dynamic time of use tariffs and direct control tariffs, for customers with different LCTs. The aim is to assess what the cost of different types of customer flexibility will be. To do this we will introduce customer interventions involving *ca.* 3,450 domestic customers; 450 small commercial customers; five I&C customers and 10 merchant generators.

Learning Outcome 3 (LO3): To what extent is the network flexible and what is the cost of this flexibility? This will look to understand how new technology can optimise the use of installed network capacity. This will involve trialling the integration of primary and secondary Enhanced Automatic Voltage Control (EAVC), real time thermal rating (RTTR) and Storage network equipment and associated monitoring and control systems.

Learning Outcome 4 (LO4): What is the optimum solution to resolve network constraints driven by the transition to a low carbon economy? We will combine the outputs from LO1-3 with desktop modelling, simulation and emulation to identify combinations not piloted in the field to identify the best solutions. For each form of network constraint and each customer type we will consider the optimal solution.

Learning Outcome 5 (LO5): What are the most effective means to deliver optimal solutions between customer, supplier and distributor? Here we will prepare the tools needed to progress from the pilot study towards business as usual. This includes novel commercial arrangements and the development of policy, guidance and tools for GB distribution networks. These tools will identify the most efficient solution from the range of non-network and network options available for particular circumstances.

Most of the funding that we are seeking is associated with LO2 (customer flexibility) and LO3 (network flexibility).

All trial designs have been signed off by Durham University as being expected to deliver the learning outcomes. We have also taken advice from those with experience of the EDRP trials. The trials themselves are set up in such a way that there is a contingency in the event that customers drop out. We will continue to utilise Durham University's expertise throughout the Project to ensure that the results from the trials are rigorous and statistically significant.

Box 2: Please provide a description of the Project

Geographical location: The project is based in the North East of England to utilise its diverse but typical mix of urban and rural geographies (and therefore distribution network topologies), demographics and socio economic groups. This ensures we will be able to gain statistically significant results from the trials that will be applicable to at least 80% of electricity networks in GB. Further, the North East's position as an early adopter of low carbon technology (in particular in the installation of heat pumps, PV and EVs) means that we shall have access to a wide range of households with LCTs. The trial participants for LO1 (profiling) and LO2 (customer flexibility) will be drawn from this region. The trials associated with LO3 (network flexibility) will take place on two test networks within this region. The first is likely to be located at Denwick, Northumberland which is a 20kV network serving a sparse rural area, with a load curve dominated by storage heating and a consumption peak after midnight. The second is likely to be located at Rise Carr, Teesside which is a 6kV dense urban network, with a classic mixed load curve and an early evening peak. (Network diagrams are included in Appendix B and further details on location are included in Appendix 5.)

Network technologies to be trialled: The main network technology solutions being trialled are EAVC, Real Time Thermal Rating (RTTR) and network storage. EAVC offers two significant enhancements over current approaches, namely; measuring and responding to voltage at the point of delivery rather than deep in the network, remote from customers; and ensuring that series active voltage control devices, e.g. primary substation on-load tap-changers and HV series voltage regulators, act in harmony. RTTR uses a combination of measurement and estimation to assess the power flow headroom on a given asset. The project will develop and test an integrated solution for RTTR, EAVC, customer response and network storage. The link between RTTR and customer response/storage means that if an asset is in danger of overheating, an appropriate response can be activated to reduce the load on it. Customer response/ storage can also be used in conjunction with EAVC where the customers and network connected to a given active controller are not homogenous. For example, if a primary substation has one feeder with a large load and another with a large generator, an EAVC scheme at the primary substation cannot always reconcile voltages along both feeders. Changing power flows by calling customer response can change feeder voltage profiles to resolve the conflict. (Further details of each of the technical components can be found in Appendix 3.) So as not to place customers at increased risks from the deployment of new network technologies, all trials will take place on networks that are fundamentally sound. For the purposes of the trials we will simulate network constraints by calibrating the network controls to artificially tight bands. There will therefore be no observable impact on customers.

Customer engagement: The primary commercial route for engaging customers in the trials, with the aim of changing their behaviour, will be through the use of supply tariffs (a range of non-commercial approaches is also planned and described below). We envisage utilising the following three different tariff approaches. Pure economic time of use tariffs, with up to 1,250 domestic and 150 small commercial customers, will test customers' ability and propensity to move their discretionary load to low-rate price periods. Restricted hours tariffs, akin to Economy 7, with up to 800 domestic and 150 small commercial customers, will test customer's willingness to accept a default time-based restriction on discretionary load, and also the degree to which they exercise the over-ride that we shall provide. Direct control tariffs, with up to 800 domestic and 150 small commercial customers, will test customers' willingness to have discretionary load directly controlled by suppliers (sometimes in response to distributor need) in return for a financial incentive. In addition, new commercial

propositions will be developed to support in-premises balancing for up to 600 domestic PV customers, offtake reduction for around five I&C customers and network support from around 10 merchant generators.

We understand that maintaining engagement with customers over lengthy trials is key to ensuring the delivery of results and to demonstrating the core principle of our proposal – that successful engagement of customers will be critical to deployment of technologies required for the successful transition to a low carbon economy. Appendix 2 explains in greater detail how we will select and engage consumers and then maintain engagement through the cycle of the project. Through engagement of local community partners we will have access to a range of customers who are keen to take part in trials or who already have LCT installed. Together with the British Gas CESP, CERT and sales programmes, this regional activity will provide a valuable source of customers for our trials on both clustered and dispersed installations. Our customer engagement plans will manage customers recruited from all such sources. Working through established supplier/customer interfaces, British Gas will leverage their existing customer communication, sales, installation and support infrastructure to ensure the engagement of their customers in the trials. As we intend that the trials will be associated with British Gas's supplier brand, we have proposed partial funding of these activities as part of the £2.3m contribution by British Gas to the project.

Commercial arrangements: The project will synthesise the outputs and conclusions from LO1-4 to detail the extent that network technology solutions and customer behavioural changes can be deployed within the energy value chain to offset network reinforcement, reduce the requirement for peak generation capacity and provide energy and system balancing services. This will be used as the basis for recommending changes to industry codes, network regulation and distribution charging methodologies needed to accelerate the deployment of distributed resources and to facilitate the optimal deployment of demand side response. Scenarios and role-play analysis will be used to simulate and test how the different players in the value chain could achieve an efficient allocation of demand side response. Where possible real commercial arrangements will be trialled in controlled environments by engaging all parties to agree the principles, rules and standards.

Customer privacy and security: Due to the close interaction with domestic customers the project could raise concerns about privacy and data security. Customers will be made aware and will give consent to our use of their data in the trial. Data Protection Act legislation will apply to all data management within the project.

External funding: The external funding of £22.2m is largely comprised of the customers' or other funding organisations' own costs for the installation of LCTs (heat pumps £10.5m and PV £8.9m). Further, there is the British Gas contribution of £2.3m that predominantly comprises the provision of smart meters through the ongoing rollout programme (domestic £1.6m and commercial £0.4m). The provision of smart meter data provides a significant saving for the project by avoiding the need for bespoke monitoring equipment.

Box 3: Please outline the changes which you have made to the Project since the Initial Screening Process

Does the high level Solution being demonstrated and the high level Method being trialled in the Project remain the same as that contained in your Screening Submission? Yes/No

Yes. Although there have been changes to the Project costs as a result of a final review of the size and scope of the trials to ensure the results are statistically robust and provide best value for money to customers, there have been no further material changes to the high level Solution and Method originally described in the Initial Screening Submission.

Project Costs

These should be the same amounts as detailed in the Full Submission Spreadsheet tab entitled 'Second Tier Funding Request' included as Appendix A

Total Project Cost	£ 52,620K
External Funding	£ 22,227K
DNO Extra Contribution	£0
DNO Compulsory Contribution	£ 3,039K
Second Tier Funding Request	£ 27,353K
Project Completion date	12/2013

Derogations or exemptions

If awarded funding, will you require a derogation, licence consent or exemption, or any change to the regulatory arrangements in order to undertake the Project or cater for contingencies? Yes/No

Box 4: If Yes, DNOs must provide a summary of the details of the derogation, licence consent or exemption, or change to the regulatory arrangements required

No.

Section B: Project Management

DNOs must provide an organogram outlining roles and responsibilities in the Project and the organisational structure. This must be included as Appendix C.

Contact details of DNO Principle Project Manager:

Name and Title:	**Jim Cardwell, Head of Regulation and Strategy**
Telephone:	**01977 605938**
Email:	**jim.cardwell@ce-electricuk.com**
Address:	**CE Electric UK** **98 Aketon Road** **Castleford** **WF10 5DS**

Box 5: Please provide details of your Project plan

DNOs should outline up to ten key milestones associated with their Project.

Date	Milestone
01/2011	Initial mobilisation completed
08/2011	Commence installation & commissioning of network equipment relating to learning outcome 3
11/2012	Learning outcome 1 – existing and future load outputs signed off
02/2013	Learning outcome 2 – customer flexibility outputs signed off
03/2013	DPCR6 infeed report produced
09/2013	Learning outcome 3 – network flexibility outputs signed off
09/2013	Learning outcome 4 – optimum solution outputs signed off
09/2013	Learning outcome 5 – most effective delivery outputs signed off
09/2013	Commence decommissioning activities
12/2013	Project close down report produced

A full Project plan, presented as a Gantt chart, must be provided as Appendix D: DNOs must include a month by month breakdown of the activities associated with a Project; milestones, delivery of outputs and deliverables, dependencies, critical path, responsibilities, phases and key decision points.

Project Budget

DNOs must complete the Full Submission Spreadsheet tab entitled 'Second Tier Funding Request' and include it within Appendix A

Box 6: Please provide a breakdown of your total employment costs for the total Project which you are project managing and highlight where these are funded by, or provided by others

Total employment costs should include all the costs used for labour, including pensions but excluding Contractors (whose costs are detailed separately). Personnel with the same role can be grouped together

Staff type	Total Costs	Person days	Funding
Project Manager	£984K	2,706	90% LCN funded/10%DNO
Senior Policy Engineer	£347K	848	90% LCN funded/10%DNO
Technical Engineer	£1,120K	3,080	90% LCN funded/10%DNO

Staff type	Total Costs	Person days	Funding
Project Accountant/ Procurement	£240K	660	90% LCNF funded/10%DNO
Administrator	£210K	1,320	90% LCNF funded/10%DNO
Commercial Analyst/ Manager	£480K	1,509	90% LCNF funded/10%DNO

Box 7: Please outline the main Equipment costs required for the total Project which you are project managing

Item description & No. of units	Function in Project	Cost per unit	Total Cost	Funding	Direct Benefit
1500 Heat pump installations, 810 Solar PV installations	These provide the main new sources of network load and microgeneration that the project will use to understand customer / network interaction for EAVC and RTTR. Costs are based on average for complete installation.	£7K heat pump, £11K PV	£10,500K Heat pumps, £8,910K Solar PV	Fully externally funded through BG	No direct benefit
1 off First in class 2.5MW/5MWh storage	Network based storage as for network profile smoothing.	£4,596K	£4,596K	90% LCNF/10%DNO	No direct benefit
11,250 Smart meter installations	Customer profiling, tariff provision, some demand response.	£180	£2,025K	Fully externally funded through BG	No direct benefit
600 systems for direct management of PV export	Reduce network peaks through microgeneration.	£1,630	£978K	90% LCNF / 10%DNO	No direct benefit

Item description & No. of units	Function in Project	Cost per unit	Total Cost	Funding	Direct Benefit
450 'smart energy' systems	Demand response for customer installations.	£650	£293K	90% LCNF / 10%DNO	No direct benefit
1,670 detailed energy profiling systems	Monitor profile of loads to build accurate customer energy profiles for specific load types.	£250	£417K	90% LCNF / 10%DNO	No direct benefit
600 Load Controllable white goods	Refrigeration and washing machine appliances with load control functionality used to provide demand response to distribution network signals. Includes comms gateway costs.	£660	£397K	67% customer / 30% LCNF / 3%DNO	No direct benefit
1 off First in class 100kW/200kWh storage	Network based storage as for network profile smoothing.	£241K	£241K	90% LCNF / 10%DNO	No direct benefit

Box 8: Please outline the Contractor costs required for the total Project which you are project managing

Contractor	Role in Project	Funding	Expected length of contract	Total Cost
British Gas	BGs primary role is as the interface with the customer in the trial. The main LCNF funded element of this role is in the supply and installation of controls, metering, monitoring and some appliances that will be used to implement and monitor the customer response. Additional activities include customer recruitment and commercial development.	Funding indicated here is LCNF but British Gas is also providing funding of substantial elements of the program	3 years	£6,881K
EA Technology Limited	Design, support, management of monitoring, EAVC, RTTR and storage systems to be installed to the network. Development of updated policy documents and design tools. Development of training packages.	90% LCNF / 10%DNO	3 years	£4,860K
Durham Energy Institute (Durham University)	Detailed trial design (sampling strategy etc), detailed analysis of profile and related trial data, customer feedback capture and analysis, reporting and dissemination on key learning outcomes.	90% LCNF / 10%DNO	3 years	£2,695K

Box 9: Payments to users or Customers

Please outline the details of any payments you wish to make to users or Customers as part of the Project.

Type of user or Customer	Payment per User	Total Payment	Funding
Domestic customers	Average £150 per customer. This will be for customers involved in the time of use, restricted hours and direct control trials.	£520K	90% LCNF / 10% DNO
Small commercial customers	Average £500 per customer. This will be for customers involved in the time of use, restricted hours and direct control trials.	£225K	90% LCNF / 10% DNO

Box 10: Other costs for the total Project which you are project managing. This should be categorised into the following categories: IT costs, Contingency costs, IPR costs, decommissioning costs, abnormal travel costs and costs associated with public engagement and dissemination of learning

Cost Category	Cost Item	Cost
IT Costs	IT component of network data monitoring systems	£140K
Contingency	Primarily price uncertainty on equipment as firm contracts not in place, and also project management resource uncertainty	£3,342K
Decommissioning	Removal of trial equipment from domestic premises after trial completion	£676K
Decommissioning	Removal of trial equipment from commercial premises after trial completion	£123K
Dissemination	National industry knowledge sharing (papers, web blogs and journal articles)	£34K
Dissemination	Demand side potential for GB work programme	£113K
Dissemination	Annual industry stakeholder forum	£32K
Dissemination	Regional stakeholder panel	£30K
Dissemination	DNOs annual visit to review project (Durham)	£30K
Dissemination	Establish and maintain website	£20K

Cost over-runs & Unrealised benefit

Box 11: Please detail any cost over-run you anticipate requiring for the Project and express this as a percentage of the funding you are requesting

DNOs must outline (as a percentage of the Second Tier Funding Request[1]) the level of protection they require against cost over-runs

0%

We are not asking for any cost protection. Customers will therefore face no risk from cost over-runs. We are confident of our ability to deliver this Project, and its learning, to the costs outlined in this pro forma.

[1] In the LCN Fund Governance Document the term Approved Amount is used since the description relates to the implemented Project.

Box 12: Please detail the level of protection required against Direct Benefits in excess of the DNO Compulsory Contribution

DNOs must outline the level of protection against Direct Benefits that they wish to apply for

%

We do not expect to generate any Direct Benefits from this Project.

Successful Delivery Reward Criteria

Box 13: Please set out your proposed Successful Delivery Reward Criteria

Successful Delivery Reward criterion	Evidence
The following project milestones will be achieved to the timescales below: • Commence installation & commissioning of network equipment relating to learning outcome 3 – September 2011; • Existing and future load outputs signed off – November 2012; • DPCR6 infeed report produced – March 2013; and • Project close down report produced – December 2013.	• Details of expenditure relating to network equipment installation activities • Recommendations for update to industry load profiles standard • DPCR6 infeed report • Project close down report
Delivery of the following arrangements relating specifically to the dissemination of learning: • Project website up and running and updated in line with project developments; • Industry stakeholder forum held on an annual basis; • DNO Project review meetings held on an annual basis; and • Regional stakeholder panel meeting held on an annual basis.	• Website content and breakdown of composition of updates • Meeting minutes in relation to DNO Project review meetings, regional stakeholder panel meetings and industry stakeholder forum • Materials presented in support of the above meetings
Provision of the following data sets: • Demand profiles grouped by customer type; • Demand profiles grouped by "low-carbon" equipment type; • Output profiles of existing generation types; • Output profiles of load demand before and after a range of interventions; and • Network data showing performance of selected network technologies.	• Provision of data sets in an open and useable format. • Recommendations for update to ACE49 • Recommendations for update ETR130
Provide an understanding of how advanced voltage control, thermal ratings and storage may be integrated to enable more low-carbon technologies to be accepted on the network. Provide a view of the costs associated with these arrangements.	• Recommendations for optimum solutions as they differ by network topology

Successful Delivery Reward criterion	Evidence
Undertake a critical review of how commercial models and arrangements between DNO and supplier may evolve to facilitate customer-side response.	• Recommendations to raise change requests for DCUSA, CDCM and related industry codes

Section C – Evaluation Criteria

Accelerates the development of a low carbon energy sector

Box 14: Outline how the Solution accelerates the development of a low carbon energy sector

We expect our Solution to accelerate the development of a low carbon energy sector in two ways. First, we will develop planning tools to allow today's network to be adapted faster to support the requirements of existing and future LCTs. Second, it will make investments in LCTs more affordable by discovering commercial mechanisms that allow customers to access the value of their contribution to network load management. This should accelerate the take up of LCTs.

Our quantification of carbon savings is therefore based on accelerating the uptake of LCTs, rather than claiming carbon benefits associated with their implementation. We recognise that quantification of the level of carbon that could be saved is subjective, but believe our Project is well placed to deliver significant savings given that it has been specifically designed to:

- provide learning that could be employed on at least 80% of the distribution networks in GB (as set out in Appendix 6); and
- test a range of different LCTs across a wide customer demographic.

This means that for any acceleration in the speed of transition that this Project can achieve, it will be applicable to both a large proportion of GB and a selection of LCTs.

We have taken Government forecasts, where available, of the take-up rates of EVs, HPs and PVs and calculated the carbon saving that could occur if these forecasts were delivered one year sooner than would otherwise have been the case. We have calculated this benefit from 2020 since although we believe the learning will have been disseminated and some of this put into practice from 2015 it is only this later date when widespread changes in practices would be necessary. Given that we believe our learning is applicable to at least 80% of GB networks, we have scaled the benefits down by this factor. This would deliver 43.5MT of carbon savings, equating to £6.00bn.

Our detailed calculations are set out in Appendix 6 and our assumptions are listed in Appendix E. We believe that we have been conservative in our assessment.

As we discuss in Box 15, the Solution should also lead to a greater level of DSR than would otherwise be the case. There may also be a carbon saving resulting from this category of load shifting, although this depends on the relative carbon intensity of the replacement, and displaced, generation. We note that Ofgem's Demand Side Response (2010) paper shows that there can be a carbon saving associated with DSR. However, we have assumed that the net impact of DSR on carbon emissions is zero, given our conservative approach to benefit estimation.

Has the potential to deliver net benefits to existing and/or future customers

DNOs must complete the spreadsheet tab 'Net benefits' within the Full Submission Spreadsheet and include as Appendix A.

Box 15: Please provide a qualitative account of the net benefits which the Solution has the potential to deliver if rolled out across GB.

We expect our Solution to deliver significant net benefits to customers. As described in Box 14, we expect it to accelerate the take-up of LCTs. We also expect it to optimise the use of installed network capacity and promote the use of DSR. To quantify the customer net benefits from these, we have separately quantified network cost savings, generation capital cost savings and carbon emission savings (described in box 14).
We have concentrated our efforts on calculating the network benefits of our Solution. To do this we developed a bottom-up analysis of representative urban and rural networks using the LV design tool used by all GB DNOs. This analysis:

- calculates the number of connections of LCTs that can be accommodated by the networks without reinforcement;
- when reinforcement would be required, it compares the cost of standard methods of reinforcement against alternative methods that will be trialled in this Project (such as direct load control); and
- it then scales any saving by 80% to reflect the proportion of the GB distribution network that we expect our Solution to be replicated on.

Our analysis concludes that the network will absorb the expected penetration of HPs, EVs and PVs until 2025 when significant new solutions will be required. We believe this is a conservative estimate. Contemporary experience and other studies suggest that local clusters of LCTs will require new solutions to become available in the DPCR6 period, with more widespread deployment of solutions then required from 2020.

The benefit we calculate for generation capital cost savings is associated with an increase in the level of DSR provided by customers. We have taken the analysis provided in Ofgem's Demand Side Response report (2010) and assumed that our Solution could increase a DSR from domestic customers at peak by an additional 2.5%.

In total, the sum of these customer net benefits for our Solution to 2050 come to £16.83bn. Our detailed calculations are set out in Appendix 6 and our assumptions are listed in Appendix E.

In addition, we believe there are further benefits associated with our Solution that we have not quantified. For example, it should result in a much greater level of monitoring and control on the network which will improve quality of supply and power quality. The increased DSR ability will also help to maintain secure and sustainable supplies at times of low variable generation output.

The scale of our Project, in terms of number and types of trial and our supporting work, has been chosen to provide value for money to customers by delivering learning that can be replicated across a large proportion of GB. As discussed in Box 14, we believe our results will be applicable to at least 80% of GB distribution networks and across a wide demographic of customers for the key LCTs. Further, Durham University was involved in determining the appropriate size of the trials to ensure they were appropriately sized to provide statistically significant results.

Direct Impact on the operation of the Distribution System

Box 16: Explain the way in which the Project/Solution has a Direct Impact on the Distribution System

The Project is aimed at introducing a number of important and necessary changes to the way we plan and operate the distribution network.

The first is to demonstrate the engagement of suppliers and selected end-users in the operation of the network. Ofgem's recent paper "Demand Side Response" and in Sustainability First's study on "Smart Tariffs and household Demand response" (2010) both recognise the importance of supplier, distributor and end-user co-operation in delivering the Low Carbon Transition Plan This project will address a range of issues identified in those papers and develop recommendations for commercial frameworks to be applied UK-wide. Sustainability First will contribute to this.

Second, the project will trial the use of new network hardware, including:

- new voltage-control relays;
- new/additional voltage-control devices;
- new real time thermal rating monitors;
- new energy-storage devices;
- use of smart meters to provide data in operational and planning timescales;
- new communication channels between smart meters and network controllers; and
- integration of enhanced voltage control and real time thermal rating devices with SCADA, with suppliers' demand response systems, and directly with end-users' plant controls.

We shall also trial new commercial relationships between distributors, suppliers and third parties such as aggregators and end-users. For example, we will identify services that can be traded between them, and deploy these services in managing networks; develop new network tariff models that reflect better the value of changes in end-user behaviour; and develop new technical tools (such as policies, codes of practice, design tools, standards, etc.). These will be made possible through a significantly improved understanding of:

- customer profiles associated with different demographics, LCTs, smart meters and tariffs and load management;
- system response from enhanced voltage control and real time thermal rating outcomes;
- power quality issues from substation-level monitoring; and
- the costs and benefits of various network and non-network solutions.

The ratio of aggregate distribution system benefit to requested funding, at 2010 prices, is 242:1.

This figure represents the ratio of the combined benefits, developed across the entirety of the GB distribution network, over the 40-year period up to 2050 (£6.63bn) to the funding requested to successfully deliver the project (£27.353m).

Looking at the same ratio but discounting the benefits back (£2.534bn), using the Ofgem recommended discount rates of 3.5% and 3.0%, gives a ratio of 93:1.

Generates new knowledge that can be shared amongst all DNOs

Answers to this section should be detailed in boxes 17 to 19

Box 17: Explain the new learning which will result from a successful Project

Learning outcomes: As discussed in Box 1, the Project is built around five key Learning Outcomes:
What are current, emerging and possible future load and generation characteristics?

To what extent are customers flexible in their load and generation, at what cost?

To what extent is the network flexible and what is the cost of this flexibility?
What is the optimum solution to resolve network constraints driven by the transition to a low carbon economy?
What are the most effective means to deliver optimal solutions between customer, supplier and distributor?

Applicability to other DNOs: Voltage and thermal issues caused by increased volumes of low-carbon technologies will be generic to all distribution networks The learning outcomes above will enable us to develop a set of tools that can be extrapolated and used by all DNOs,. We expect this learning will comprise:

- Improved knowledge of customer demand patterns and responsiveness to price incentives, and the impact this will have on DNOs and other market participants.
- Implications of smart grid requirements to feed into the deployment of smart meters.
- Knowledge of integrated packages of network technology in the form of hardware and associated application guides, policies and industry standards
- New commercial models for the relationship between distributors, suppliers and end-users, through proposed modifications to industry codes and distribution-charging methodologies.

Durham University and EA Technology will ensure that the results from the trials are statistically and technically sound, reliable and verifiable. Since the Project combines testing of customer response, smart-meter deployment, an independent network company and supplier working together, it will offer a robust basis for rapid policy and regulation development.

Learning capture: The project will adopt a five-stage iterative approach to knowledge management:

- Data Capture: Includes data definitions (power flow, power quality, network performance, operational performance, customer engagement and economics); data collection methods (quantitative and qualitative), frequency of collection and responsibility for collection
- Data Analysis: Analysis techniques (statistical; technical; emulation, simulation and modelling methods); control groups and responsibility for carrying out the analysis
- Knowledge Synthesis: Types of knowledge (network planning and management, customer appetite and attitudes); methods to develop and validate knowledge from the data analysis (academic research, consultancy input and stakeholder forum review)
- Knowledge Dissemination: see box 18 below
- Feedback**:** refining future trial design, deployment of structured tools and processes to effect the effective sharing of knowledge within the project

Underpinning the five-stage approach will be a robust data governance structure that will ensure the data quality, data management and security of all data collected and processed.

Box 18: Outline the arrangements for disseminating learning from the Project

The project will utilise a variety of channels to disseminate knowledge to other DNOs and other industry parties, at both a regional and national level.

At the **regional** level:

- We shall establish **a regional stakeholder panel** of experts in a range of relevant disciplines to advise on the design of the project, to influence the direction of our work and as a means of disseminating the learning. Those organisations and individuals who have already agreed to take part include Energy Saving Trust, Durham County Council, Sunderland City Council, Kirklees Council, National Energy Action, Community Foundation for Tyne and Wear, CORE, One North East, National Renewable Energy Centre, North East Chamber of Commerce, Consumer Focus, and Teesside University.

At the **national** level:

- We shall hold an **annual industry stakeholder forum**, facilitated by Sustainability First, with industry and national thought leaders to discuss the emerging outcomes from this project and similar learning taking place elsewhere. We shall also be inviting Ofgem and DECC to take part.
- We shall supplement these forums by encouraging dialogue and debate with interested parties on an ongoing basis through the establishment of a **project website** with associated blogs and message board.
- The knowledge derived from this project will be of particular use to the DNO engineering design community across the country. We shall therefore be introducing the material to the relevant ENA engineering group for discussion and establishment where appropriate of **new national standards**.
- Further, we shall hold an annual **DNO project review** to which other DNOs will be invited. This will include site visits to network locations involved in the project. The first such review will take place at Durham University.
- Where appropriate we will engage with appropriate **broadcast and print media** to publicise the benefits of this project.
- The knowledge derived from the information gathered from the trials will be also used as the basis for **papers in journals and conferences**. Production of this material will be the responsibility of Durham Energy Institute (Durham University) and EA Technology.

We will also ensure that data and learning from this project are used in other and **wider smart grid-related** projects:

- Subject to data privacy constraint, all data produced by this project will be openly shared (with the exception of detailed British Gas customer segmentation which will be available to the project at no cost).
- The project will provide a significant input into the first year of a three-year cross-industry project by Sustainability First on the demand-side potential for Great Britain. This work will benefit national policy making by starting to identify what role demand side participation may make along side other low carbon energy sector policy options.
- Finally, we shall engage with a wide range of industry stakeholders e.g. DECC, Ofgem, generators, suppliers, DNOs, etc. to:
    - Further develop the recommendations for changes to industry codes and distribution charging methodologies using input from multiple market participants and customers;
    - Understand the practicalities of implementing the recommended changes to industry codes and distribution charging methodologies; and
    - Provide insight for the development of the national smart meter and smart grid implementation strategy.

Box 19: Outline the arrangements for Intellectual Property Rights (IPR)

Does the Project conform to the default arrangements for IPR? Yes/No

Yes.

The Project and trials have been designed, where possible, to use available technologies and solutions - the Background IPR of these components will reside with the inventors.

It is not the intention of the Project to intentionally develop any new IP that would require formal protection through patents, trademarks, registered designs or similar. Where this is a collateral outcome, ownership will be assigned by the consortium to the most appropriate of collaborating parties who in turn will licence such IP to qualified parties. If, however, relevant foreground IP is generated and this is deemed to be relevant to the dissemination of learning, it will be made available to the qualified parties identified in the governance document, through licences, if appropriate, or other forms of information sharing.

Learning outcomes, the methodologies used to generate the learning, and aggregate data created by those methodologies will all be made available.

Involvement of External Collaborators and external funding

Does the Project involve External Collaborators and/or external funding? Yes/No

Box 20: If you have been unsuccessful in attracting External Collaborators and/or external funding to the Project, please detail your endeavours to do so

We have had no difficulty in attracting external collaborators to this Project. British Gas has been keen to work with an independent DNO to understand and help develop the UK's evolution in energy use and supply. Partners who are introducing customers to the Project are keen to be involved in a project that has the potential to help them and their customers make the transition to a low carbon economy.

Box 21: Where funding is provided by a third party that is not an External Collaborator, DNOs should provide details of the funder. If there is more than one External Funder, details of others can be included as an appendix:

Organisation name	
Type of organisation	
Amount of funding	
Funding arrangements	
When funds will be provided	
Conditions of funding	
Risks/uncertainties	
Details of contract or agreement	

Box 22: Details of External Collaborators

DNOs should provide details of the 6 main parties who are collaborating with them on a Project. Details of any further External Collaborators should be included as an appendix.

Organisation Name	**British Gas**
Relationship to DNO (if any)	N/A
Type of Organisation	British Gas, part of the Centrica Group, supplies gas and electricity to 16 million domestic and small business energy accounts, making it the UK's largest energy supplier. In addition, it offers a distinctive range of home energy solutions and low carbon products and services and is the UK's leading Home Services provider with over 8.5 million relationships (at the end of 2009) and 8,500 gas, electrical and plumbing engineers.
Role in Project	BG is the UK leader in the deployment of smart metering and technology, with over 100,000 smart meters deployed to date and plans in place to install 2 million for domestic and SME customers by the end of 2012. BG will lead on the following key areas: **Customer Engagement:** customer propositions, selection and recruitment, sales and after sales support **Customer Technology:** selection and installation of customer equipment including smart meters **Commercial Arrangements:** new commercial arrangements between DNOs, suppliers and customers for DSM etc.
Prior experience brought to Project	BG has extensive experience of trialling and productising new tariffs and technologies e.g. **Energy Saving Report:** A free report that has been completed by over 2 million customers since its introduction in 2005; **Energysmart:** Proposition combines energy management and monthly billing and has been taken up by over 150k households since its introduction in 2009**;** **myEnergy Solutions:** Helps customers choose the right renewable energy system for their home (PV, micro-CHP, heat pumps, micro-wind etc.) carries out the installation and ensures customers are registered on the Clean Energy Cashback scheme.
Funding	Commitment of *ca.* £2.3m of resource and meter system assets (excluding overheads and operating costs).
Contractual relationship	Memorandum of understanding in place and contract being developed.
External Collaborator benefits from the Project	BG will benefit from the Project by developing a better understanding of: - Customer uptake and adoption levels of new low carbon products and services; - How customers' demand will change and what impact this will have for both Network Operators and Suppliers; - How to integrate smart meters and smart technologies into smart grids for maximum benefit; New commercial arrangements and regulatory models between Networks, Suppliers and Customers needed to underpin the low carbon energy market

Organisation Name	EA Technology
Relationship to DNO (if any)	None
Type of Organisation	EA Technology has evolved from the Electricity Council's Research and Development Centre in the mid-1960s focussing on distribution and use of electricity, to its present position as an independent limited company, working on behalf of clients in the electricity, energy, infra-structural and associated sectors.
Role in Project	EA Technology will utilise their in-depth technical expertise and international contacts in the following key areas: Monitoring and analysis of low carbon equipment and its impact on the network; delivery and communication of key messages to identified audiences; Knowledge transfer including dissemination and training in developing and implementing new energy management techniques; Delivery of new policy documents and supporting strategies for DNOs – potentially inputting to National or International Standards. They will undertake a supporting role in the management and oversight of the project including: reviewing live projects to maximise the learning opportunities of these or future projects; supporting the dissemination of results across the electricity distribution sector.
Prior experience brought to Project	EA Technology has extensive knowledge of distribution networks, micro-generation, heat pumps and demand-side management. It has broad experience of practical trials and experience including: Facilitation and co-ordination of technology trials, demand side management, integration of system studies, provision of monitoring, communicating, policy writing, provision of training.
Funding	None.
Contractual relationship	Memorandum of understanding in place and contract being developed.
How funding relates to benefits from Project	EA Technology's involvement in the project will primarily be a contractual relationship. However, it is recognised that this is likely to deliver other secondary benefits, e.g.: •**New product development**: Identifying market opportunities in areas of instrument or service development. •**Delivery of skills**: Identify and develop new areas of vocational and higher education training courses. •**Relationships**: Building on the activity with CE Electric and looking to new opportunities and projects with collaborative partners.

Organisation Name	Durham Energy Institute (Durham University)
Relationship to DNO (if any)	None
Type of Organisation	Durham Energy Institute is part of Durham University. It covers the spectrum of energy research and consists of internationally recognised leading researchers, who specialise in research areas that combine the traditional technical disciplines with the social sciences and humanities.
Role in Project	In addition to their academic input, Durham University Science Campus and the wider Durham University estate will also host key elements of our trials (see Section 8 and Section 9 for further details). Durham Energy Institute will utilise their academic breadth and depth to: •Contribute to the design of robust test plans and analysis methodology •Oversee the academic process •Generate core hypothesis •Analyse trial results and draw conclusions •Develop and publish academic papers •Develop recommendations for market structures
Prior experience brought to Project	Durham Energy institute has extensive experience of trialling technology in wide range of situations e.g. trials of demand response on Scottish islands, Greek islands and in Uganda; Gen AVC controller; closed loop EdF networks; web based demand response techniques; real time thermal rating equipment; storage devices (850kVA, 2 hours); Gilesgate community, energy monitors, energy diaries, awareness raising. For most of the trials Durham Energy Institute designed the hardware, designed the trials, recruited participants, carried out algorithm development, modelling, simulation, loop closure confidence building, extrapolation and dissemination.
Funding	None.
Contractual relationship	Letter of support in place. Contract being developed.
How funding relates to benefits from Project	Durham Energy Institute will benefit from their involvement in the Project in the following main ways: •Energy and carbon savings •New energy infrastructure •Funding for Researchers •A large multi-disciplinary research project •Science site becomes a unique research facility •Significant kudos and publicity

Organisation Name	Sustainability First
Relationship to DNO (if any)	None
Type of Organisation	Sustainability First's primary focus is on developing sustainability-related policy and solutions within the UK but draws on experiences and initiatives both within and outside the UK. It develops implementable ideas in key policy areas such as energy, waste and the roles of economic and other regulators in sustainable policy. It undertakes research; publishes papers and organises seminars and other events to promote its ideas.
Role in Project	Provide a highly informed expert challenge function to the project to ensure that it poses and addresses the key questions that will develop maximum learning. including: trial design; monitoring and evaluating outcomes; assessing the response of different customer groups including low income and fuel poor. Contribute to knowledge sharing and the dissemination of information to other DNOs and other interested parties, including: stakeholder workshops, web blogs, writing journal articles and contributing to annual and final reports. Demand-side potential for GB work programme: launch a three-year cross-industry project to benefit national policy making by identifying what role demand side participation may make along side other low carbon energy sector policy options.
Prior experience brought to Project	Sustainability First brings significant knowledge and insight in the fields of demand response, smart metering and smart energy tariffs gained from carrying out four major multi-sponsor GB household smart meter projects over the last five years plus a further study on the consumer implications. In particular these projects provided in-depth analysis of commercial, regulatory and consumer issues. Their recent study *"Smart Tariffs and Household Demand for Great Britain"* explored the potential contribution smart energy tariffs may make to carbon emissions reduction, energy saving and affordability. It also considered the implications on different market participants and customers.
Funding	None.
Contractual relationship	Proposal received and being discussed.
How funding relates to benefits from Project	Sustainability First will benefit from their involvement in the Project in the following ways: •Provides an evidence base for further research •Participate in a large multi-party research project •Ties into Sustainability First plans for creating a new Smart Demand Forum, which seeks to understand and develop the realisable potential of a GB electricity demand side

Organisation Name	National Energy Action
Relationship to DNO (if any)	None
Type of Organisation	NEA works throughout the entire UK and is the UK's leading fuel poverty and energy efficiency charity. It develops and promotes energy efficiency services to tackle the heating and insulation problems of low income households. Working in partnership with central and local government; with energy utilities, housing providers and health services; and with consumer organisations.
Role in Project	As a key partner, NEA will contribute to the project in the following main ways: •Utilising their established links with social housing providers, academic institutions and third party installers to identify a range of suitable projects to monitor •Assist in identifying CERT and CESP projects •Utilising their established client liaison expertise to advise the Project where appropriate •Gaining feedback from customers on their experiences with smart meters and smart tariffs
Prior experience brought to Project	It has recently undertaken research on behalf of DECC to assess the implications of Air Source Heat Pump Technology on the distribution network infrastructure. This work was the first of its kind and was well received across the energy sector. In addition NEA has also been involved in a host of micro-generation trials, involving working with third party installers, social housing providers and monitoring the performance and suitability of emerging technologies in a range of household types.
Funding	None.
Contractual relationship	Proposal received and being discussed.
How funding relates to benefits from Project	In order to protect the ongoing interests of the fuel poor it is necessary for NEA to work at all levels of the energy sector including Network Operators, Suppliers and Customers. NEA's involvement in the Project provides an insight into the challenges facing all three, and specifically into the future commercial and technical relationships that will be required to successfully deliver the transition to a low carbon economy.

Organisation Name	
Relationship to DNO (if any)	
Type of Organisation	
Role in Project	
Prior experience brought to Project	
Funding	
Contractual relationship	
How funding relates to benefits from Project	

Box 23: Other partners

The partners identified below will be contributing clustered installations of low carbon technologies to the Project. They will neither be paid nor make a payment to the Project. They will gain access to the results relating to their part of the trials.

Community Energy Solutions (CES) is a not for profit company operating throughout the North East and Yorkshire, delivering cheaper heating alternatives to communities off the gas main. One of CES's major strategies is the installation of air source heat pumps. CES has installed to date over 700 air source heat pumps and will be contributing customer groups with installed heat pumps at Lukes Lane, S Tyneside, Cockfield and North Blyth. They are also involved in installations of PV and will contribute a project involving 26 bungalows at Auckland Homes in Sunderland. The majority of the customers will be fuel poor.

Sunderland City Council is submitting a Smart Homes project for funding through the European Regional Development Fund to improve 65 houses in Sunderland with PV, smart meters or heat pumps.

Gentoo, a social housing provider in Sunderland, delivers core housing management services and maintenance to approximately 70,000 customers in 30,000 homes. It is installing PV as retrofit to the 26 bungalows referred to above, and to 37 new build properties, including exploring zero carbon homes with up to 5kW of PV per house, at Racecourse Estate, Sunderland.

Kirklees Council has been awarded funding under the Low Carbon Communities Challenge (LCCC) Fund, as one of 12 winning entries from 300 entrants, to install PV on 42 homes, small businesses and community centres in the Hillhouse community in Huddersfield.

Future Transport Systems (FTS)/One North East are installing 240 domestic electric vehicle chargers in connection with the Plugged In Places trial. Monitoring equipment for our trial will be installed alongside the chargers. FTS is also involved in an ERDF bid for the Yorkshire region for a similar number of domestic chargers.

North East Chamber of Commerce will be working with the project partners to identify suitable SME candidates, both involving demand and generation, for participation in the project.

In developing the project we have remained agnostic on which **suppliers** should provide the equipment. One of the most significant suppliers will be the provider of the control and communications architectures to link:

- novel control devices (EAVC and RTTR) and remote network sensors;
- EAVC and smart meters providing real-time voltage signals;
- EAVC/RTTR and CE's demand response management system;
- CE's demand response management system and the demand response management system of suppliers (initially BG); and
- BG's demand response management system and BG smart meters.

We have received a proposal from GE for an integrated end-to-end solution, which we are evaluating against other options.

Relevance & Timing of Project

Box 24: Please outline why the learning from the Project is relevant to Network Operators

Relevance: This project addresses challenges relating to the increasing amount of LCTs, particularly at the domestic level and particularly in local concentrations, on the electricity network. It will make use of new technology and customer response in addressing these issues. This is a national issue and the project has been designed to deliver learning outcomes that are of relevance to all other GB DNOs[2].

Business planning: The learning outcomes for this project will be turned into engineering guidelines and codes of practice for use more widely by the engineering design community. As part of the revised low voltage design manual, the results will inform system planning and hence future business plan submissions. Equally important will be the impact on the price to customers of new and amended connections.

This project is not only timely (see below) but, as a three-year programme with initial learning outcomes arising within the first year, it will have the ability to influence business plans for DPCR6.

Timeliness: It is important that this project is funded in this LCN round for the following reasons:

- This project seeks to maximise the leverage from British Gas's early roll out of smart meters.
- The Government's feed in tariff and proposed support for renewable heat is already increasing the number of applications for microgeneration and heat pumps. This will continue over time. Improving the cost effectiveness of the network response through the use of new technology and customer response is therefore pressing.

However, we recognise that the future is uncertain and we have taken this into account in our project design. We will trial different conditions to provide outcomes that are robust to different views of the future. We will also take account of new information that becomes available during the trial period, such as the learning from the EDRP smart meter trials. We will work with EA Technology, Durham University and Sustainability First to ensure that our trial design takes this new information into account so as to avoid replication and maximise new learning.

[2] *Electricity Network Scenarios for Great Britain in 2050: Final Report for Ofgem's LENS Project (2008) Ault, Frame and Hughes*

Demonstration of a robust methodology and that the Project is ready to implement **(answers should be detailed in boxes 25 to 27)**

Box 25: Please demonstrate that the Project has a robust methodology and can start in a timely manner

The Project has a robust methodology and CE is ready to take it on. As a distribution-only company, it has a stable business, an experienced management team, and top level Board commitment to delivering this Project. The Project methodology has been established by expert review and robust challenge by our project partners. We are in a position to start the Project in accordance with the Project plan (Appendix D):

Project resource: Key roles in this project have been identified (ref Appendix C) and individuals possessing the required skills have either been identified or will have been identified prior to the initiation of the Project. Job descriptions will be drafted to support this activity and we will engage with HR to facilitate this process.

Logistics: We believe that co-location of resource from the different Project partners has been instrumental in producing this bid and therefore we would look to continue this approach throughout the Project. A suitable project space has been identified and will be made available should this bid be successful.

Governance: The constitution of the Project board and the Project management structure are agreed (Appendix C), and the Project Executive has been assigned. The lead times are such that all the roles can be assigned by 1 January 2011.

Partners: The lead partners (identified in boxes 21 to 23) are supportive, at executive leader level, of our project and the roles and responsibilities for the partnership. All necessary contractual partner arrangements should be in place by 1 January 2011.

Procurement (Technology): The required equipment is commercially available and does not need further technological development. Equipment providers have been reviewed by EATL and lead times for procurement have been built into the project plan. Where not already prepared, technical specifications are continuing to be prepared prior to the result of the bid being announced.

Trial customers: British Gas will already have rolled out 110,000 smart meters by the end of 2010. As such we already have much of the basic monitoring capability required to deliver the profiles in Learning Outcome 1. Recruitment of additional customers to enable Learning Outcome 2 will commence in April 2011. We have effectively recruited a number of customers through local partners for this project and in many cases the deployment of required equipment (e.g. heat pumps) is already committed.

Costs: Costs of the project have been reasonably estimated and been through a number of reviews by our expert partners. For example, to obtain best estimates of budget prices from candidate suppliers of EAVC equipment, a seven-page high level Request For Information (RFI) was issued to nine companies to obtain approximate costs for the equipment.

Tariff subsidies have been proposed (detailed in Appendix 3) at a level we believe will be required to engage customers with the project. The project will test the customer response to different pricing levels and it may be found that the full subsidy is not required. In this instance there would be a small reduction in overall project cost.

Box 26: Please provide details of the risks associated with the Project

The key risks associated with the delivery of the project have been identified as follows:

1. Network equipment (EAVC, RTTR and storage) fails to operate as specified

Risk Mitigation: Bench testing, test bed operation, small scale trial followed by a phased roll out have been built into the project timescales. Trials have been designed to contain different combinations of equipment and network applications in order to diversify the overall risk of single point technical failure.

Contingency: Alternative equipment suppliers identified for each key component.

2. Failure to deliver the integrated demand response system which links the network with the customers' equipment

Risk Mitigation: Bench testing, test bed operation, systems integration testing (including communication and control systems) activities have been incorporated into the project timescales. Trials have been designed with different combinations of equipment and therefore will require different levels of integration. This approach serves to mitigate against the risk of single point failure.

Contingency: Alternative equipment suppliers identified. Review the definition and number of trials. Consider if simulation and modelling is a suitable alternative to cover the trial scheme.

3. Insufficient numbers of customers are recruited to populate the individual test cells

Risk Mitigation: Strong customer propositions developed including sufficient incentive payments. Effective customer engagement strategy (customer selection, engagement and support) in place supported by BG's established sales and customer service infrastructure. Prioritised list of customers and types developed. Links to identified local partners utilised to provide willing trial participants. Nationally BG are currently installing ca. 750 smart meters per day which will continue to ramp up over the duration of the trial – 9,000 represents a small proportion of the installation programme. Trial populations have been sized to take account of customer drop out.

Contingency: Sufficient time is built into the planning timescales for LO1 and LO2 to accommodate additional recruitment activities. Increase customer payments. Reduce the sample size in affected test cells (still remain within acceptable confidence levels). De-scope affected elements of the trial(s).

4. British Gas withdraws from the project

Risk Mitigation: Memorandum of understanding in place. Contractual agreements will be in place between CE Electric and BG prior to the commencement of the project .

Contingency: Attempt to secure another suitable supplier. Close down the project and return remaining funds to Ofgem.

5. Emerging findings indicate a major change of project scope is required

Risk Mitigation: Stage boundary reviews planned in at key points in the project. Emerging findings will be regularly reviewed by the Project Executive Board and Project Board as part of the overall Project Governance framework.

Contingency: The project will be suspended and a request for a change to the Project Direction will be made to Ofgem.

Box 27: Please provide details of the risk monitoring procedures you will put in place for the Project

The risk monitoring procedures described here will enable early identification of events or circumstances which may affect the ability of CE Electric to deliver the project and/or the consequent realisation of benefits.

The Project will be monitored through regular monthly and quarterly progress reports by the Project manager and by end of stage reports, including an assessment and report on project risks. The Project Board will review progress against plan and budget, undertake a formal review of the risk register and the issues register, and, where progress has deviated from plan, decide on actions to be taken to rectify the position or, where necessary, suspend the project or parts of it.

A key component of the risk and issues management processes will be the Project risk register. This register will be maintained centrally by the Project office and will include the following information about each identified risk:

- Risk owner – this will be an appropriate member of the project team;
- Risk category;
- Risk definition including a summary definition;
- Assessment of the impact, probability and inherent level of risk;
- Details of the risk mitigation plan;
- Assessment of the impact, probability and residual level of risk;
- Details of the contingency plan for each risk should the risk materialise.

Each risk owner will be responsible for monitoring those risks assigned to them, ensuring that the necessary actions are undertaken and updating the register. The Project Board is responsible for approving proposed mitigating actions and contingency plans.
The risk register will be formally reviewed by the Project Board at each stage boundary and also in response to any emerging risk which materially affects the delivery of the project or its consequent benefits (the risk could either represent a threat to achieving the expected benefits or provide an opportunity to increase the benefits). In such a situation, CE Electric would notify Ofgem promptly in writing of these events or circumstances, and would suspend the project pending consideration by Ofgem as to whether the project should be re-scoped or halted. In the event that the project is halted, the project will continue to comply with the other requirements of the Governance Document, and a Close-Down Report will be provided.

If CE Electric considers that there has been a material change in circumstance that requires a change to the Project direction (for instance if re-scoping would allow the project to deliver better benefits to customers) it will submit a request for change to Ofgem. This request will provide sufficient detail to allow Ofgem to decide whether the change would be appropriate in the circumstances, including whether it would be in the best interest of customers.

As described in Box 11, we will not be applying to Ofgem for increased funding in the event of a cost over-run.

Section D: Appendices

Please list all the appendices you have attached to this pro-forma and outline the information which they provide. Where these appendices support any information provided in the pro-forma, that information should be adequately referenced

Appendix A	**Full Submission Spreadsheet**
Appendix B	**Maps and network diagrams**
Appendix C	**Organogram**
Appendix D	**Project plan**
Appendix E	**Information sources referenced in Box 14**
Summary	If DNOs include further information attached to this Pro-forma than that required by Ofgem then they must provide an executive summary of that information in less than 1000 words which should be attached to this pro-forma after Appendix E, and before the numbered appendices. All further details in the numbered appendices must be clearly referenced in the text in the pro-forma.
Appendix 1	**Vision**
Appendix 2	**Customer Engagement**
Appendix 3	**Components**
Appendix 4	**Methodology**
Appendix 5	**Location**
Appendix 6	**Business Case**