CNT2001 MK*Smart*2020 Addendum

Proforma box number/ Spreadsheet	Where the latest information can be found
Appendix A – Project Costs	Response to CN001 provides the underlying calculations supporting the figures presented in the Second Tier Funding Request tab of Appendix A.
Appendix A – Direct Benefits	Response to CN002 provides the underlying calculations of direct benefits presented in the Direct Benefits tab of Appendix A.
Appendix A – Net Benefits	Response to CN003 provides any underlying calculations supporting the figures presented in the Net Benefits tab of Appendix A.
Box 5 and Appendix D	Response to CN011 provides a summary of those activities still outstanding for the establishment of the governance structure.
Box 10	Response to CN013 elaborates on the IPR costs and its alignment with box 13.
Box 24	Response to CN014 provides clarification on who will be developing the learning models.
Appendix A	The response to question numberCN021 and Appendix 9 provides clarification to the carbon benefits.
Appendix A and box 16	Response to question number CN022 provides clarification on the gross and net benefits for the project.
Box 4/Appendix 12	The response to question CN045 provides further clarification on charging derogations.

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

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MK*Smart*2020 – Facilitating Low Carbon Living in Milton Keynes

The Problem: Meeting climate change targets will lead to a significant uptake of electric vehicles, heat pumps and distributed generation (DG). These lead to local constraints on the network. Overcoming these constraints using conventional techniques would require extensive network reinforcement.

The Solution: The solution is to use smart grids to facilitate the uptake of low carbon technologies and help reduce the cost of network reinforcement required. This, in addition to demand response measures, reduces the cost of the low carbon economy for the customer. The project will enable the citizens of Milton Keynes to adopt a low-carbon lifestyle and provide us with relevant insights to use across the UK.

The Method: MK*Smart*2020 has four themes:
1. New challenges: establish an early '2020 representation' of low carbon adoption: Electric Vehicles (EV), heat pumps and DG, through close coordination with Milton Keynes' Low Carbon Living Programme (LCLP).

2. Increased visibility: provide real-time and granular network data from a subset of the 20,000 smart meters installed by 2012 and sensors at selected primary and secondary substations. This provides an enhanced understanding of the 'as is' network state and the impact of low carbon technologies. It also enables active network management in response to low carbon adoption.

3. Increased control: trial and evaluate new technical and commercial mechanisms to optimise network utilisation and asset health and maintain power quality whilst facilitating the cost effective and reliable connection of low carbon technologies for the customer. This will include: demand response, dynamic voltage control, dynamic rating and condition based monitoring. All these capabilities will be brought together to understand whether the sum is greater than the constituent parts (appendix 7.1). Enabled by an integrated centralised and distributed IT architecture (appendix 7.2).

4. Market integration: provide time and location based network charges for customers participating in a 50-60 low carbon Homes Demonstrator (includes electric heating, EV charging and smart appliances). A variety of tariffs and commercial propositions will be offered to the 20,000 customers with smart meters. Industrial and Commercial (I&C) load control contracts for network management with available load offered-up for national system balancing (appendix 6). Integration of smart grid communications and data platform with energy retailers to support the smart meter deployment whilst capturing synergies with network infrastructure (appendix 5).

These themes are supported by comprehensive programmes of research and knowledge dissemination (appendix 3) and customer engagement and empowerment (appendix 5).

The Project: MK*Smart*2020 will support the Low Carbon Living Programme (appendix 2) which will deliver significant uptake of low carbon technologies (for example 1,200 new low carbon homes, a fleet of electric buses, an EU funded PV array on the bus station, Government funded EV charging infrastructure and energy efficiency for social housing). MK*Smart*2020 (appendix 1) will deliver increased sensing, visibility and control to measure and manage the network effects of this low carbon adoption. We will also trial new arrangements and technologies which could help reduce the cost of the low carbon economy to the customer. There are a series of individual sub-projects:

Retrofitting and replacement of secondary substations (~200 substations), and retrofitting and new build of primary substations (5 and 2 respectively): enhancement of substation sensing and targeted distributed intelligence (appendix 7.4). Five secondary substations will be fitted with voltage regulators to investigate LV voltage control and one primary substation will be installed with transformer monitoring.

Smart metering: MK*Smart*2020 includes a large-scale roll-out across Milton Keynes delivered by retailers. We have agreed with E.ON that they will deploy 20,000 meters and we are discussing involvement with other retailers (appendix 10). Some of these meters will enable data from the meter to be used to help us run the network more efficiently (load and voltage), and we will investigate the potential to use the same communications system both for metering and network management. The metering deployment will be combined with focused customer engagement efforts supported by Milton Keynes Council and the Open University to empower individuals and communities to become active and informed power system participants (appendix 5).

Active network management: the project will include a Low Carbon Intelligent Network Architecture (LCINA), enhancements to Central Networks Distribution Management System (PowerOn^{Fusion}) and a series of new applications that will combine with enhanced substation sensing and control and demand response capabilities to actively manage the network (appendix 7.2).

Industrial and commercial demand response: we want to encourage as many companies as possible in Milton Keynes to take part, and we will be working closely with Milton Keynes Council, Milton Keynes Partnership and the Low Carbon Living Programme to achieve this. We have already engaged with several local businesses and public sector organisations receiving significant interest. MK*Smart*2020 will include installing technology within offices and other business premises to control electricity loads such as air conditioning. Commercial arrangements through the customer's electricity supplier will enable us to manage these loads, which will include an element of offering-up demand response to National Grid for system balancing to ensure the scheme is self financing in the future. Whether this is done through the supplier, an aggregator or by the DNO will be evaluated (appendix 6).

Time and location network tariffs: working via the customers' electricity retailers, we will trial tariff structures based on time and location with the 50-60 customers participating in the Homes Demonstrator trial. Our aim is to see whether customers will change their consumption behaviour and electricity demand in response to simulated tariffs reflecting expected future constraints on the network (appendix 6). Further commercial propositions will be trialled on a larger scale by retailers with all their smart meter enabled customers able to participate.

Box 2: Please provide a description of the Project

The location for MK*Smart*2020 is Milton Keynes. This location ensures the smart grid techniques we develop are replicable and transferrable throughout the UK. We believe that during the lifetime of the project, Milton Keynes will be representative of a UK city in 2020 with all the societal, commercial and technological challenges which characterise a low carbon world. MK*Smart*2020 also enjoys significant support from local entities which will help ensure successful delivery of the project. (appendix 11)

We are committed to giving customers value for money in relation to their investment in MK*Smart*2020. The project will enable us to trial a variety of approaches on a part of our network, that will be undergoing early low carbon adoption, and which will resemble what networks will look like in 2020. We will evaluate these approaches and will share what we learn with the rest of the industry. Whenever we find an approach that works, we will also make sure that we start using it as soon as we can on other parts of our network. We believe that smart grids and demand response are more cost effective solutions than conventional reinforcement.

Involving customers and providing them with benefits is central to MK*Smart*2020. We believe that customers would benefit from becoming more active participants in the power system through minimised distribution network charges (due to less reinforcement) and direct bill reduction incentives that reflect the local network and national system balancing value of active load management (realised by participating customers mainly but with a secondary saving for other customers through reduced peak requirements).

The deployment of network technology will align with customer low carbon adoption, network utilisation, asset condition and DPCR5 capital plan alignment. The trial will also cover a variety of network hardware, network configurations and customer demographics – areas of social and private housing, multiple occupancy and individual dwellings of both ultra-modern and existing housing stock dating back to the 70's. This will provide robust data and will support statistical comparison. Further details, project maps and network line drawings are provided in appendix 7.4 and appendix B.

The installed network functionality covers a portion of the network that supplies approximately 23,000 customers, with smart meters fitted in 20,000 homes and businesses. The smart meters will support customers in reducing their energy consumption and carbon footprint and will enable them to participate in advanced tariffs and commercial arrangements. Customer commercial arrangements will work in conjunction with commercial arrangements with retailers, the GB System Operator (GBSO) and aggregators to provide learning in relation to:

- Propositions required to deliver solutions for network management purposes
- Customer behavioural changes in relation to price signals and load management contracts
- Optimised industry allocation of demand side resources – for local network and national system balancing requirements
- Practical interactions between industry participants – DNOs, GBSO, aggregators and retailers – and I&C customers
- The level of savings which customers can realise
- The degree of intervention required to deliver the available savings

There are other commercial arrangements in addition to those associated with the smart metering deployment and these are outlined in the table below.

Activity and Description	Customer Numbers & Benefits	LCNF Value Proposition	Commercial Arrangements
• 50-60 "Homes Demonstrator" properties • EV charging – trickle and rapid – with control and automation • Electric heating with demand response • Smart appliances with demand response • Properties also include renewable DG	• 50-60 • Enable customers to pursue diverse aspects of a low carbon lifestyle	• Evaluate network and commercial implications of cost effectively integrating concentrations of customers making multiple low carbon choices	• MK LCLP includes arrangement for tenants to rent these homes for two years if they participate in low carbon trials through commercial arrangements • Time and location tariffs and direct load control through retailers with actual control managed by Central Networks
• I&C demand response • Direct load control for interruptible loads e.g. air conditioning	• 10-15 • Support customers in understanding the potential opportunities around demand response • Provide near term commercial benefits	• Evaluate opportunity to use large interruptible loads to optimise local networks • Evaluate the potential to balance and optimise the use of the demand side for local network needs	• I&C customers allow load control with contractual bounds e.g. temperature • Commercial payments through retailer • Retailer or aggregator calls on available load for national system balancing and Central Networks enact the control
• Fleet / employee EV charging • Achieve a localised concentration of EV charging through arrangements with local companies – fleet or employee vehicles	• 2-3 examples with 5-20 vehicles each • Charging points subsidised by Plugged-in-Places • Support companies and their employees to reduce their transport carbon footprint	• Evaluate impact of concentrated EV charging and commercial means to manage	• Arrangement with company to manage EV charge scheduling within defined bounds – no payment to the customer • Plugged-in-Places subsidy for charging points contingent upon participation • Milton Keynes free parking as adoption incentive

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

There have been a number of changes since the ISP, which we believe significantly enhance the project proposition. The total funding request is £20.25m, the same as the ISP request of £21.15m when the Ofgem's updated NPV treatment is taken into account.

A number of External Collaborators have formally joined (appendix 10) the project:

- E.ON will be funding and delivering a roll-out of 20,000 smart meters across Milton Keynes

- Accenture will be providing all UK DNOs with a free licence for a Low Carbon Intelligent Network Architecture (LCINA) to help accelerate subsequent smart grid pilot project design

- GE will providing a series of contributions in relation to enhancement of network capabilities

- Cisco will be providing a series of contributions in relation to distributed intelligence and data routing capabilities

With the contributions from these External Collaborators now confirmed, the total value of the project has risen to £33.24m, the funding request is £20.25m and the percentage of the total project cost funded by the customer has fallen to 61% from the initial 90% which we outlined in the ISP. We have made every effort to maximise the value for money which the customer, through the LCNF funding mechanism, will receive.

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	£ 33.24m
External Funding	£9.74m from External Collaborators
DNO Extra Contribution	£0m
DNO Compulsory Contribution	£2.35m
Second Tier Funding Request	£20.25m
Project Completion date	10/2014

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

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

Tariff structures will be trialled via customers' retailers. The customers will be those who live in the Homes Demonstrator properties. (See appendix 12 for further details)

We believe that the most appropriate tariff signal for the purposes of this arrangement would be half hourly or hourly tariffs. It provides us with an appropriate market-based view of how customers would change their behaviour to accommodate increased wholesale prices and DuOS charging.

This will also allow us to understand the network potential of customer responses to new tariff structures. Of particular importance is the predictability of the customer's response. Network operators need to have certainty to maintain reliable supply particularly in a smart grid world where network utilisation is increased to defer and avoid network reinforcement.

As MK*Smart*2020 is an early representation of the world in 2020, we would use a pricing signal to the house that would be proportionate to the avoided capex in relation to the uptake of EV and heat pumps which we anticipate in the region in 2020. This avoided capex is then translated into a pricing signal. This price signal would be sent directly to the customer via the smart meter. The customers would be charged differently to other customers and we would require derogation from the current SLC13 charging methodology license condition.   We will ensure that the overall impact on the customer is neutral through payment at outturn.

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:	Roger Hey, Energy Projects Manager
Telephone:	02476 185927
Email:	CNUKEnergyProjects@central-networks.co.uk
Address:	**Central Networks,** **Herald Way,** **Pegasus Business Park,** **Castle Donington,** **DE74 2TU**

Box 5: Please provide details of your Project plan

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

Date	Milestone
03/2011	EV Infrastructure Scheme (ELVIS – Plugged-in-Places) first phase deployment
07/2011	Finalise I&C commercial arrangements
08/2011	Open University (OU) Virtual Engagement go-live
12/2011	Telecommunications network acceptance
01/2012	Network hardware installed
06/2012	20,000 smart meters installed
06/2012	IT System go-live
06/2012	Knowledge dissemination portal go-live
06/2012	Homes Demonstrator properties leased
06/2014	Final research outputs

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
Network Engineering	£1,537,377	4,356 estimated person days over duration of project (based on 220 working days per year)	No internal staff costs are funded by External Collaborators. This is funded by a share of the DNO compulsory contribution and the LCNF contribution.
IT	£370,569	1,320 estimated person days over duration of project (based on 220 working days per year)	No internal staff costs are funded by External Collaborators. This is funded by a share of the DNO compulsory contribution and the LCNF contribution.
Telecoms (Internal)	£303,733	1,623 estimated person days over duration of project (based on 220 working days per year)	No internal staff costs are funded by External Collaborators. This is funded by a share of the DNO compulsory contribution and the LCNF contribution.

Staff type	Total Costs	Person days	Funding
Telecoms (External)	£2,200,000	Cost to be validated at person day level	External Telecoms labour costs will be funded by the External Collaborators.
Smart Metering	£309,733	1,100 estimated person days over duration of project (based on 220 working days per year)	No internal staff costs are funded by External Collaborators. This is funded by a share of the DNO compulsory contribution and the LCNF contribution.
Project Management Office	£2,742,075	8,756 estimated person days over duration of project (based on 220 working days per year)	No internal staff costs are funded by External Collaborators. This is funded by a share of the DNO compulsory contribution and the LCNF contribution.

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
Sensors (1950)	Variety of current transformers and temperature sensors to provide measurement capability at primary and distribution sites	£95	£186,000	Combination of LCNF and External Collaborator contributions	Yes
RTU's (5)	An upgrade to existing Remote Terminal Units at a selection of the primary substations. Using the latest technology to provide advanced/robust data processing capabilities and to test new previously unused protocols.	£30,000	£150,000	Combination of LCNF and External Collaborator contributions	Yes
Transformer monitoring (4)	To provide transformer monitoring and diagnostics at 2 primary substations (1 new, 1 existing, heavily loaded)	£50,000	£200,000	Combination of LCNF and External Collaborator contributions	Yes
Intelligent Processing (50)	Enhanced processing boxes for distributed intelligence	£2,000	£100,000	Combination of LCNF and External Collaborator contributions	Yes

Item description & No. of units	Function in Project	Cost per unit	Total Cost	Funding	Direct Benefit
IED (133)	Provides the interface between the new sensors and the backhaul comms	£492	£327,000	Combination of LCNF and External Collaborator contributions	Yes
Microwave inc antennas (16)	High capacity point to point radio communication link. This will consist of an antenna and transmission equipment at each end of the link.	£7,200	£115,200	LCNF	Yes
Smart Comms Box (200)	This is a concentration point for several remote data measurement devices	£2,800	£560,000	Combination of LCNF and External Collaborator contributions	Yes

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
Cranfield and Open University Research	Research, engagement, solution development and papers	LCNF	36 and 48 Months	£950,000
Telecoms	Installation & commissioning of various telecommunication components	LCNF	18 months	£921,700
Smart Meter Installations	Procurement and installation of smart meters by suppliers	External Collaborator	18 Months	£3,250,000
GE	Custom Development Services	This is will be funded by collaborators.	24 Months	£1,572,190

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
Industrial and Commercial and SME	Negotiated percentage of electricity bill to drive participation – approximately 10% annual bill	Limit to £200K in total payments Intend to limit and self-fund through GBSO balancing value	LCNF
Homes Demonstrator Domestic	Customer bill neutral. Outturn payment to counteract increased bills.	Cost neutral	Cost neutral

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	Hardware	£500,000
IT costs	Systems design and development	£7,300,000
IT costs	Systems Enhancement	£1,500,000
IT costs	Systems Delivery and Maintenance	£3,000,000
Travel and Expenses	Travel and expenses for contractors	£813,240
Other	Communication and PR for internal and	£490,000
Other	Training and Recruitment	£26,000
Other	Accommodation	£480,000
IPR Costs	Patent Applications	£60,000
Contingency		£1,175,000
Decommissioning		£0

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

> 5%

We are happy to comply with the default position.

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[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

n/a

Our direct benefits are not greater than our 10% compulsory contribution, and hence direct benefit protection is not applicable.

Successful Delivery Reward Criteria

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

Successful Delivery Reward criterion	Evidence
Meet project milestones: • EV Infrastructure Scheme (ELVIS – Plugged-in-Places) Deployment of network sensing equipment at phase one charging posts • Finalise I&C commercial arrangements • Open University (OU) Virtual Engagement go-live • Telecommunications network acceptance • Network hardware installed	Confirmed delivery through project management and governance processes including quality assurance (appendix 8)
Meet project milestones: • Demonstrate initial smart meter data functionality • IT System go-live • Knowledge dissemination portal go-live • Develop commercial proposition for Homes Demonstrator properties • Final research outputs	Confirmed delivery through project management and governance processes including quality assurance (appendix 8)
Delivery of functionality and capabilities (appendix 7.1) • Enhanced network planning	Functional requirements met within technical design and delivery and capability outcomes evaluated as part of research agenda – real world demonstration of capability. • Review half hourly metering data against current network design standards (load assumptions)
• Meter data and retailer integration • Maintain statutory voltage • Persistent voltage reduction	• Meter data to retailer MDMS and network systems through joint data architecture • Data showing voltage impact of dynamic voltage management • End point voltage data and associated energy impact

Successful Delivery Reward criterion	Evidence
• Comprehensive grid state observability • Condition based operation and maintenance	• Multiple grid state data items within data architecture • Condition based data collected and analysed and algorithms to predict impact of different operational regimes on asset health and life
• Dynamic asset rating • Outage and fault intelligence	• Asset temperature data collected and algorithms to manage relationship with loading potential • Simulation of capability to detect faults and manage restoration
• Load management and optimisation • Enable and optimise EV charging • DG integration	• Data on interruptible load availability and network impact of dispatch • EV network impact data, customer scheduling data and managed scheduling network impact • DG network impact – grid state data
• Integrated network optimisation • Market integration and optimisation	• Network impact of integrated active network management • Customer response data to time and location tariffs and commercials • Command and load impact data flows for national system balancing demand response (including industry interaction)

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

MK*Smart*2020 and Milton Keynes' Low Carbon Living Programme present a unique opportunity for us to understand how we can best accelerate the development of a low carbon energy sector. Milton Keynes will be representative of the full combination of low carbon technology, the electricity network is typical, the population and community are a demographic microcosm of the UK, and the smart grid solutions reflect the level of integration we expect to see in the future.

The uptake of renewable generation, heat pumps and EVs will help to decarbonise electricity, heat and transport. Smart grid will allow us to do this faster and more cost effectively. This project will deliver new techniques that will enable more demand and generation to be connected to UK distribution networks whilst minimising conventional reinforcement and reducing the cost to customers. The project will also provide a view to GBSO of how we can, as an industry, tackle the future challenges around system balancing, considering the intermittency of wind and the inflexibility of nuclear.

MK*Smart*2020 combines multiple forms of active network management with market based demand response. Conventional solutions would not address the challenges of the industry in a holistic manner which our project does through (appendix 7.1):
- The growth and allocation of demand response between local grid management and GBSO national system balancing
- The deferral and avoidance of the reinforcement associated with low carbon choices – electrification of heating and transportation and DG
- The delivery of smart metering infrastructure that cost effectively drives behaviour change including the adoption of demand response

MK*Smart*2020 integrates all of these elements in the context of new home development and retrofitting some of Milton Keynes' existing homes and businesses. It also engages customers to understand their preferences and stimulate low carbon adoption with the Open University's virtual engagement platform. (appendix 3). This will support MK*Smart*2020 in having a national impact upon low carbon adoption and drive support for customer involvement which underpins low carbon networks. MK*Smart*2020 will disseminate low carbon learning across the industry allowing the project's insights to be adopted throughout the UK (appendix 3) and will integrate with our DPCR6 activities to accelerate adoption on our own network (appendix 4).

We have produced a GB-wide business case (appendix 9). This business case includes carbon benefits in relation to persistent voltage reduction and the displacement of back-up generation (electricity price assumed to include cost of tradable carbon). It does not include the carbon reduction associated with heat pumps and EVs as smart grid reduces the cost of these changes rather than decarbonising the heat and transport sectors.

Our predictions for the NPV of deploying the MK*Smart*2020 solution across the UK is £8.6bn. This is based upon a 75% adoption of heat pumps and EVs by 2050, together with 24GW of renewable DG by 2035. This level of saving will contribute significantly to the acceleration of the development of a low carbon energy sector. There may be situations across UK networks where customer low carbon adoption is delayed by the existence of network constraints because of the lead time associated with conventional reinforcement. In these situations the smart grid capabilities trialled in MK*Smart*2020 could avoid these delays and so directly accelerate low carbon adoption.

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.

MK*Smart*2020 delivers benefits to all UK customers by providing networks for customers to cost effectively and reliably decarbonise their homes and businesses. Benefits come in the form of deferred and avoided distribution network reinforcement reflected in network charges. Further benefits accrue from the displacement of more expensive national system balancing solutions by the demand side, reflected in wholesale electricity prices. The project accelerates the uptake of low carbon technologies by ensuring that lower connection charges would apply than if conventional reinforcement was used.

MK*Smart*2020 will deliver these benefits to UK customers through cross-industry learning and capability development reflected in the project's hypotheses (appendix 3). This includes specific efforts to integrate project learning into our DPCR6 submission and operating model so the benefits are realised as efficiently as possible (appendix 4). MK*Smart*2020 will deliver net benefits to existing and future customers by (quantified benefits – Appendix A and 9):
- Identifying and industrialising network and demand side solutions to defer and avoid network reinforcement by maximising network utilisation whilst maintaining security of supply and enabling customers to make low carbon choices
- Understanding the means to optimally allocate demand response and distributed generation between network optimisation and national balancing requirements.
- Informing the deployment of smart meters with the potential to increase network benefits and realise synergies
- Supporting the development of commercial and operational arrangement that enable customers to capture the benefits associated with interruptible load or dispatchable DG
- Supporting customer engagement and education that will empower individuals and communities to become active power system participants who look to save energy (supported by Open University's extensive virtual engagement platform – appendix 3 and the MK*Smart*2020 Project document – appendix 1)

MK*Smart*2020 is a representation of the world in 2020. The project is being deployed at this scale for a number of reasons:
- The scale and scope ensures that the project will provide significant amounts of incremental learning
- Need to align with Milton Keynes' Low Carbon Living Programme
- A city is a logical unit for resolving low-carbon challenges and an integrated and a city-wide trial is a more compelling UK flagship project
- The number of customers is significant enough to get a reasonable take-up of EVs and demand-side management
- The level of network sensing is comprehensive enough to capture the impact of low-carbon adoption across a variety of network contexts
- The network data volumes are of sufficient scale to test 'to be' IT architecture

We do not believe that the benefits obtained from upgrading every substation in Milton Keynes would justify the level of investment required. We have targeted a subset of Milton Keynes' network using a set of criteria that seek to maximise the incremental learning from every pound spent (appendix 7.4).

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

MK*Smart*2020 will provide learning and benefits relating to the planning, development and operation of an efficient distribution system through a research agenda focused on robustly testing hypotheses related to these issues (appendix 3). New transferable capabilities will be developed including: planning and design standards, technical standards, algorithms and analytics, modelling and simulation tools, training materials and business processes. Hypotheses to be tested:

- Deployment of smart grid technologies (especially retrofit) can be complex and requires new skills and capabilities
- DNO operating models will require evolutionary changes across multiple dimensions in order to cost effectively deliver low carbon networks
- DNOs need to adopt new IT architectures to effectively handle smart grid data volumes, applications and levels of integrated optimisation
- Network planning methodologies and standards will have to change to maximise smart grid benefits and to respond to a changing power system
- Asset management principles and processes will need to alter to maximise the deferred and avoided reinforcement benefits from smart grid
- DNOs need to develop a series of commercial capabilities in order to deliver demand side benefits and play an effective role as part of a wider low carbon power system
- More complex and comprehensive real time network management will require new skills and capabilities
- Smart grid will require rigorous security standards and operation
- Smart grid solutions can be used to overcome localised network constraints in a variety of circumstances making them a viable alternative to traditional methods in DPCR6

These hypotheses will be tested through MK*Smart*2020's response to a variety of low carbon network challenges. This response will include a variety of integrated low carbon network capabilities (appendix 7.1). These capabilities will entail fundamental changes to the day-to-day operation of the Milton Keynes network. The changes will be progressively layered across a phased deployment of capabilities built upon network sensing, communication and distributed intelligence platform (appendices 7.2 and 7.3):

- Distribution management system extended into the low voltage (LV) network providing visibility of LV grid state and asset data
- Open low carbon network integration architecture – data management, integration platform and cyber security
- Enhanced control enabling individual capabilities
- Centralised and distributed intelligence for integrated active network management
- Integrated network operation with multiple capabilities working together in an optimised way

The GB-wide business case for the deployment of MK*Smart*2020 capabilities across the UK shows that the vast majority of the benefits (approximately 75%) are attributable to the distribution system (appendix 9).

The project value of £33.24m will deliver a total net benefit of £27.4bn when the learning is extrapolated to all UK networks (a 82431% ratio of net benefit to project cost). This takes into account DNO related benefits from the GB wide case as well as the project's direct benefits. This does not include the potential displacement of generation capacity due to increased demand response but which have been calculated in the benefits case. Any reduction in reserve market requirements have also not been taken into account.

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

The incremental learning relates to the testing of a series of hypotheses across three dimensions, which are expected to play an important role in informing future low carbon networks. Central Networks believe that the learning stemming from these hypotheses will be highly relevant to other DNOs and to ensure this is the case, MK*Smart*2020 will engage with all UK DNOs and a number of global utilities through Accenture's funded and proven Smart Grid Leadership Network. Hypotheses to test (appendix 3):

Actively facilitating the cost-effective electrification of heating and transportation and connection of DG whilst maintaining standards of service (subset of total hypotheses)
- Localised concentrations of electrification of heating and transportation & DG can present issues for maintaining standards of service that require a DNO response
- Dynamically managing the network voltage using data from the LV network and on load tap changers at the primary can allow voltages to remain within the statuary bounds as new low carbon technologies are connected to the distribution network
- Targeted load control can avoid network overloading whilst deferring and avoiding reinforcement
- Customer responses to time and location specific tariffs are sufficiently predictable and probable for them to be a viable means to avoid and defer network reinforcement
- With low carbon adoption, outage risks could rise due to the unpredictable nature of new power flows (EV and DG) creating a compelling case for advanced outage and fault intelligence
- Integrating multiple dimensions of active network management with scenario based low carbon network simulation and enhanced network planning methodologies can allow DNOs to systematically defer and avoid reinforcement as new low carbon network challenges emerge

Supporting optimal growth and allocation demand response between local grid management and national system balancing
- The DNO is an appropriate owner of demand side load control and should sit at the top of the control hierarchy
- It is possible to aggregate remaining demand response capacity and offer it for national system balancing after local network needs have been met

Maximising smart meter network benefits and synergies
- A smart grid ready smart metering communications solution can be delivered at an equivalent cost to other options
- Using smart meter data it is possible to enhance long run network planning and to deliver significant benefits through real time network management

Capturing raw data, analysing it and generating knowledge is a critical part of MK*Smart*2020: structured research agenda integrated into core plan and data architecture designed to support data capture, organisation and access (separate research data base as integrated part of overarching data architecture – appendix 7.2).

The sample size for the evaluation of network impact and technologies will be robust (7 primary, ~200 secondary and 20,000 smart meters – covering a variety of network circumstances). The scale of the customer sample is dependent upon the level of customer adoption, which will be supported by the Low Carbon Living Programme and the deployment of the 20,000 smart meters with associated engagement efforts and new tariffs and propositions. This is discussed in more detail in appendix 3.

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

MK*Smart*2020 will employ a comprehensive and innovative approach for disseminating knowledge that will draw upon the proven and specialist capabilities of Cranfield University, The Open University and Accenture (appendix 3):

- *Research Data Architecture and Portal*: research and knowledge dissemination is an integral part of the overarching IT architecture. The Low Carbon Intelligent Network Architecture (LCINA) data architecture will include a focused database for research data. Fields will be defined by the research agenda with data transferred from operational databases and buses. This database will be available to other DNOs and academic institutions through a security protected portal with a process for other parties to request additional data (appendix 7.2).
- *Cranfield University and Open University Dissemination*: publishing of academic papers in peer reviewed journals and academic conferences drawing on Cranfield's capabilities in asset monitoring and management and Open University's expertise in customer behaviour
- *Accenture Points of View*: publishing of joint Central Networks and Accenture "points of view" providing key business insight and learning drawing on Accenture's global smart grid experience and high performance utility assets
- *Open University Virtual Engagement*: a variety of innovative engagement techniques building upon Open University's proven virtual platforms including OUverte, the new Open University Online Community for environmental, social and economic sustainability and the Open University's iTunesU pages (the first university worldwide to hit 20 million downloads)
- *Accenture Smart Grid Leadership Network*: this global network of utilities and cities will provide review and assessment of the data and knowledge generated and a proven platform for UK DNO and city engagement to compliment the ENA and ENSG

We will be demonstrating our commitment to knowledge dissemination from the start. If we are awarded funding Central Networks and our External Collaborator, Accenture, will be sharing the LCINA high level smart grid architecture (appendix 7.2). This piece of intellectual property will be derived from Accenture's Intelligent Network Data Enterprise (INDE) asset developed and proven at SmartGridCity in Boulder Colorado. The architecture will be customised to meet UK needs and the high level architecture design will be provided on a free license to all the UK DNOs (appendix 10). We hope that this will support UK DNOs in accelerating the cost effective delivery of low carbon distribution networks.

Knowledge dissemination will be delivered through a systematic and integrated process:
1. Generate hypotheses and refine through engagement with industry and academia
2. Detailed design with knowledge dissemination integrated into overarching project design and planning
3. Capture raw data and perform analysis and review
    o Cranfield University – asset monitoring and management
    o Open University – customer behaviour and preferences
4. Disseminate raw data through the Research Portal
5. Test hypotheses and refine data requirements
6. Develop and refine processes, algorithms, technical solutions and software
7. Identify and codify intellectual property
8. License and share IPR
9. Disseminate knowledge, insight and learning and receive feedback
    o University hosted seminars
    o Peer reviewed journals
    o Industry bodies

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

Does the Project conform to the default arrangements for IPR? Yes

No agreements on IPR have been signed at this stage of the project development. Central Networks will seek to enter into agreements which are in keeping with the IP principles set out by OFGEM on 15 April 2010. Early discussions with our bid partners have highlighted some areas which they would wish to discuss in more detail including the definitions of foreground and background IPR, the scope of license grants and warranties.

Involvement of External Collaborators and external funding

Does the Project involve External Collaborators and/or external funding? Yes

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

This project does involve External Collaborators.

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	E.ON Energy
Relationship to DNO (if any)	Both organisations are part of E.ON UK
Type of Organisation	E.ON is an Energy Retailer and supplies the largest proportion of electricity customers within Milton Keynes
Role in Project	E.ON has worked with us to develop the smart metering aspects of the project, and subsequently requested the opportunity to be involved in the delivery phase. E.ON has now committed to rolling out 20,000 "DNO suitable" smart meters as part of MKSmart2020 at their cost. (All other UK registered suppliers have also been invited to support the project. We have received positive responses from British Gas, EDF Energy, Scottish Power and Spark Energy. We are currently agreeing the nature of their engagement)
Prior experience brought to Project	E.ON are supporting Ofgem's Energy Demand Research Project (EDRP) smart meter trial examining how customers respond to better information about their energy consumption. They are responsible for fitting smart meters to about 12,000 of their customer's homes. Information and learning gained by E.ON from participation in this project have been fed back to Ofgem through presentations and regular report submissions. These are available on the Ofgem website.
Funding	£3,000,000
Contractual relationship	**Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?** Yes. Meetings and workshops have been held with E.ON to ensure their understanding. We have written confirmation of their commitment.
External Collaborator benefits from the Project	The project provides E.ON with the ability to test a variety of hypothesis around customer behaviour, and to gain valuable experience of mass rollout of Smart Meters.

Organisation Name	Accenture
Relationship to DNO (if any)	No relationship
Type of Organisation	Accenture is a global management consulting, technology services and outsourcing company. They have substantial experience of the energy sector and have played in leading role in many of the world's largest smart grid demonstration projects (eg Boulder, Amsterdam)
Role in Project	Acting as Bid Partner Accenture have jointly developed the MK*Smart*2020 proposal with Central Networks. This includes substantial contributions to the systems and data architecture, as well as helping to define hypothesises to be tested in the accompanying research programme. We fully expect to continue working with Accenture as Delivery Partners following project award. As a Delivery Partner, Accenture will take on the role of Systems Integrator, including the development of a standard IT architecture for UK smart grids building upon a proven methodology developed in 'SmartGridCity'. They will also support research and knowledge dissemination efforts by drawing on their global network, including utilities and smart grid specialists.
Prior experience brought to Project	Their involvement in the widely acclaimed 'SmartGridCity' project with Xcel Energy in Boulder, Colorado demonstrates Accenture's experience around Smart Grids and associated strategies, technologies and thought leadership. Accenture was the strategic and technical advisor and chief consulting engineer, as well as the systems integrator, for the SmartGridCity programme. The Lead Technical Architect of 'SmartGridCity' has been part of our team developing MKSmart2020.
Funding	£1,870,000
Contractual relationship	**Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?** Yes. Specific service delivery and consultancy contract for pre-award phase. Memorandum of Understanding in place for delivery and mobilisation.
How funding relates to benefits from Project	Accenture will provide their contribution irrespective of realising project benefits. The Accenture contribution is dependent upon Accenture being selected as the delivery partner for systems integration. Subject to agreement, assets developed within the project could be offered globally by Accenture. MK*Smart*2020 can be used as a customer reference site, where Accenture can showcase for its global customer base, organize conferences and develop marketing materials referencing the project. The deployment of the project could help accelerate deployments elsewhere in the UK and the rest of the world.

Organisation Name	General Electric (GE)
Relationship to DNO (if any)	No relationship
Type of Organisation	GE is a multinational conglomerate corporation. They are an incumbent supplier to Central Networks, including Network Control Systems and substation equipment.
Role in Project	As Bid partner, GE has brought its experience and knowledge of our legacy IT system interfaces to evaluate the most effective migration path for optimum integration of Smart Grid technologies and future solution scalability. They have also helped to develop our target IT system architectures, defined the necessary extensions of communications protocols and planned the substation elements for the smart grid telemetry at substations. As a Delivery Partner, GE will take on the necessary enhancements to our Network Management and Control Systems. They will also continue to contribute to our engineering design authority
Prior experience brought to Project	GE has been involved with several end-to-end smart grid projects worldwide, e.g. Energy Australia, KEPCO, City of Miami, Southern California Edison and American Electric Power It also has significant experience in Real-Time, distributed-architecture solutions (Protection, Automation and Control) and has deployed over 350 digitized substations (including: IEC 61850 design and deployment, condition-based monitoring, distributed analytics and visualization, distributed generation management, etc.).
Funding	£2,669,690
Contractual relationship	**Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?** Yes. Specific service delivery and consultancy contract for pre-award phase. Memorandum of Understanding in place for delivery and mobilisation.
How funding relates to benefits from Project	GE will provide their contribution irrespective of realising project benefits. The GE contribution is dependent upon GE being selected as the delivery partner for extensions to Network Management and Control Systems. Subject to agreement, assets developed within the project could be offered globally by GE. MK*smart*2020 can be used as a customer reference site, where GE can showcase for its global customer base, organize conferences and develop marketing materials referencing the project. The deployment of the project could help accelerate deployments elsewhere in the UK and the rest of the world.

Organisation Name	Cisco
Relationship to DNO (if any)	No relationship
Type of Organisation	Cisco is a global corporation, specialising in IT Networks, Data Management and Security. Cisco are an existing supplier of networking infrastructure to Central Networks, although the application to our operational telecommunications is a new dimension. Cisco are supporting only a small number of "lighthouse" projects globally, including MKSmart2020 for the UK.
Role in Project	As Bid Partner, Cisco has supported the development of the IT architecture, and has also provided specialist assistance to our other Bid Partners. We fully expect to continue working with Cisco as Delivery Partners following project award. Cisco will offer smart grid routing and switching equipment for MK*Smart*2020 Furthermore they will provide the project with specialist support and services during the network design, build and subsequent phases. In addition, it is likely that MKSmart2020 will become a base for field testing of new products, aimed specifically at the smart grid market, positioning the UK at the forefront of smart grids in Europe.
Prior experience brought to Project	Cisco is worldwide leader in communications networking. Over the past 25 years, Cisco has helped several industries transition from proprietary networks to standards based communications. Cisco sees its role in Smart Grid as providing best in class communications network from the generation of electrons to consumption in home, business, or industry. Cisco has e.g. worked with US based Duke Energy to Design an end-to-end secure Smart grid architecture and home energy management system that allowed the utility to better understand customer behavior (response to price signals and energy and carbon monitoring)
Funding	£2,200,000
Contractual relationship	**Will the DNO have a contract in place which ensures the External Collaborator complies with the LCN Fund Governance Document?** Yes. A memorandum of Understanding is in place for delivery and mobilisation.
How funding relates to benefits from Project	Cisco will provide their contribution irrespective of realising project benefits. Subject to agreement, aproducts and services developed within the project could be offered globally by Cisco's SmartGrid consultants. MK*smart*2020 can be used as a customer reference site, where Cisco can showcase for its global customer base, organize conferences and develop marketing materials referencing the project. The deployment of the project could help accelerate deployments elsewhere in the UK and the rest of the world.

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	

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

Cranfield University

Cranfield University will be bringing its experience, expertise and assets in condition based monitoring and predictive maintenance developed through its work in aerospace (critical assets with a high cost of failure) and other vehicles.

The Boeing Company has launched an Integrated Vehicle Health Management (IVHM) Centre located at Cranfield University. Boeing has been joined by BAE Systems, Rolls-Royce, Meggitt, Thales, the Ministry of Defence and Alstom Transport. The increasingly important area of IVHM technology informs existing concepts of vehicle maintenance, repair and overhaul by offering a total health check for high-tech, high-value vehicles such as aircraft, ships, high-speed trains and high-performance cars.

We aim to apply theses IVHM technologies to the MK*Smart*2020 in order to evaluate the potential to combine condition based monitoring, predictive models, dynamic rating, enhanced network control and advanced simulation and planning to defer and avoid network reinforcement and optimise asset replacement. We also hope to develop algorithms, visualisation techniques, simulation models and planning and design standards that allow what works to be rapidly scaled across the UK.

The Open University

MK*Smart*2020 will draw upon both the Open University's expertise for public engagement through mass and web-based media and its specific experience in the engagement of users of low carbon technologies. The University has large and well established resources on energy and environmental issues that support its teaching, research and outreach work in Environment and Energy issues.

The OU will also contribute to a programme of local engagement activities. The University is already working on the Milton Keynes Electric Vehicles project, helping to identify pioneer business fleet users and how EVs can present business development opportunities.

Overall, the customer engagement approach will be developed and implemented by a team including key people engaged with the University's energy and environment programmes, IT experts and the Institute for Social Marketing, a world renowned academic research centre in social marketing run by the Open University and the University of Stirling.

The OU team will also include people with specific expertise in programmes to promote low carbon domestic technologies. An OU team under Professor Robin Roy has worked with the Energy Savings Trust to conduct interviews and focus groups with households concerning their adoption and use of a range of low carbon domestic technologies (CHP, solar PV, solar thermal, heat pumps, biomass etc.). This social monitoring of users has helped identify how users shift from being passive into being engaged and seek active involvement in the new technology. This work has provided an understanding user factors that drive the adoption of carbon saving technologies, result in user satisfaction and realise the full carbon saving potential. This experience and established method will be taken forward and used for the MK*Smart*2020 programme to analyse the relationship between the customer and low carbon networks.

(Please see Appendix 10 for a full list and details on our external project collaborators)

Relevance & Timing of Project

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

MK*Smart*2020 targets a number of salient and probable low carbon challenges driven by policy, consumer preferences and technological development including: the electrification of heating and transportation (consumer incentives for EV's, Coalition Agreement commitment to EVs and the Renewable Heat Incentive) growth of the demand side for national system balancing given increasing levels of inflexible generation (2020 targets for low carbon generation) and the roll-out of smart meters (Government mandate). In particular MK*Smart*2020 recognises the immediate need to understand the network opportunities around the imminent scale deployment of smart meters.

Central Networks is targeting year one LCNF funding to maximise the learning impact of this project on the DPCR6 submissions. MK*Smart*2020 will test the following hypothesis as part of the DPCR6 planning process: smart grid solutions can be used to overcome localised network constraints in a variety of circumstances making them a viable alternative to traditional methods in DPCR6. If new solutions are shown to be viable from focused project analysis a process will be put in place to integrate smart grid evaluation into the core DPCR6 planning process.

The outputs of MK*Smart*2020 will be integrated into DPCR6 and subsequent price controls through a number of means:
- New simulation and planning methodologies integrating the potential of smart grid capabilities
- Economic analysis tools to evaluate smart solutions against traditional approaches
- Communications and IT roadmap to progressively develop a core ICT platform with increasing levels of functionality to match to emerging opportunities
- Customer behaviour models to understand potential for demand response (through tariffs and direct control arrangements) for local network management
- Employee and organisational learning and experience (rotation to ensure those involved with DPCR6 planning exposure to MK*Smart*2020)
- Smart grid risk evaluation tools
- Commercial templates and approaches and processes for industry integration (particularly around the allocation of demand response)
- Approach for maximising the network value associated with smart metering including the use of more granular consumption data (feeding into generic customer consumption profiles)

The changes we expect to see include:
- A move away from reinforcement with smart grid solutions and active network management
- Displacement of capex by opex
- Consideration of a broader set of outcomes across our network employing MK*Smart*2020 learning
- Coordinated efforts to use smart meters to realise network benefits (persistent voltage reduction and active network management)
- The first phases of a move to a new communications backbone and enhancement of our core IT systems (scaling of integration architecture and new distribution management system (DMS) functionality)
  Provision of a platform for smart metering communications

The linkage to DPCR6 and the development of the supporting capabilities embedded in Central Networks' operating model (to ensure that new methods can scaled-up and delivered cost-effectively) is covered in more detail in appendix 4.

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

We have already carried out a number of activities to accelerate delivery (appendix 8):
- High level technical design already completed (appendix 7)
- Detailed telecommunications analysis and design as part of two year programme of work that MK*Smart*2020 will build upon (appendix 7.3)
- Engaged with Unions over staffing implications of network engineering delivery
- Met with Milton Keynes business customers (SME 'Breakfast Club' presentation and individual meetings with I&C customers set-up by Milton Keynes Partnership)
- Internal Central Networks approval for staffing new positions
- Had series of meetings across MK*Smart*2020 and Low Carbon Living Programme workstreams to establish formal and informal governance structure. Attended by representatives from: Milton Keynes Council, Milton Keynes Partnership, Cranfield University, the Open University and Central Networks
- Detailed project plan completed (appendix D)

We will also be able to draw upon the experience and scale of our External Collaborators who have previously delivered similar projects and have global networks of experienced specialists to call upon. For example, Accenture bring a proven IT architecture and blueprinting solution that can be rapidly applied to MK*Smart*2020 accelerating the IT detailed design process.

We believe that the project cost and direct benefit estimates are robust for a number of reasons:

- Robust technical design process linking research agenda to capabilities, to functional requirements to high level technical design (achieved through a series of technical workshops containing experienced smart grid practitioners from GE and Accenture as well as Central Networks engineers)
- Use of real world cost data provided by GE, Accenture and BT
- Telecommunications costing supported by two year programme of telecommunications analysis that Central Networks has already completed
- Partners able to sense check estimates against other projects they have been involved in around the globe
- The cost estimates have gone through E.ON's own Investment Proposal evaluation process to test their robustness
- Direct benefits generated with the support of network engineers with intimate knowledge of the Milton Keynes' distribution network

We believe the key uncertainties and sensitivities and appropriate mitigating actions to be as follows (also reflected in our contingency calculations):

- Network hardware installation costs due to varying asset circumstances (pre-installation asset analysis and option to change assets covered if significant delivery risk)
- Systems integration costs due to potential complexity and number of integration points (use of robust and proven integration architecture and appropriate level of detailed design and testing built into plan and estimation)

A discussion of GB-wide benefits case sensitivities is included in appendix 9.

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

There are a number of key interdependencies that could manifest as significant project risks:

1. MKSmart2020 and Milton Keynes Low Carbon Living Programme including the build of the Homes Demonstrator and customer uptake of low carbon technologies
2. The ability to procure the relevant resources and skills to be able to deliver to time, cost and quality
3. Telecommunications, network engineering, IT and smart metering are all interrelated and require a high degree of coordination

A series of contingency actions will be taken to deal with these risks:

1. If aspects of the Low Carbon Living Programme are delayed, cancelled or have their scope cut MK*Smart*2020 will be able to employ simulation of low carbon network conditions and can cut back on the proportion of the network where smart grid functionality is installed
2. Functionality can be layered enabling aspects of the build to begin prior to full completion of design and procurement
3. Other communications solutions such as GPRS could act as a contingency option, the IT deployment can be phased and network coverage can be adapted if issues are encountered
4. Draw upon the global capabilities and expertise of our partners

Risk	Mitigating action
• Smart Metering roll out is not implemented in the timescales required by MK*Smart*2020	• The smart metering Project Manager will form part of the core project delivery team to ensure roll out is closely coordinated and issues/risks/dependencies are managed effectively
• Following the election, the ongoing role of Milton Keynes Partnership is unknown. Central Networks has built many strong relationships within the partnership and the decision could delay the delivery of the Low Carbon Living Programme	• Pre bid submission, work is being done to strengthen Central Networks relationships with Milton Keynes Council. This strengthening will continue post submission
• Assumed that there will be line of slight between the radio sites	• An initial radio plan activity has been undertaken
• Planning permission may not be granted for the radio tower	• Start the application early • Contingency plan to use a fixed line link until the planning permission is granted
• Smart grid IT involves large data volumes, a high degree of system integration and a number of new applications	• Use Accenture and GE's proven solutions as foundations • Central Network IT has a proven track record of delivering complex IT solutions
• Integration and interoperability of equipment	• Work closely with partners and vendors to ensure interoperability • Effective contracts to ensure that all vendors work together to resolve integration issues
• Network installation challenges	• Perform review of target assets prior to installation • Series of pilot installations generate key lessons and develop capabilities for scaling

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

Risk monitoring and management will be embedded within the project governance structure. This structure will support identification or risks, evaluation of probability and impact, identification of mitigating actions, escalation and risk management and resolution (appendix 8).

The governance structure will include processes for day to day management as well as those required to determine when it may be appropriate to suspend the project or flag to Ofgem that it may have to apply for a cost over-run. The project governance structure has a number of elements:

- Project Board (meets monthly)
  - Members: Project Manager, Central Networks senior management, senior External Collaborator Representatives and representatives from Milton Keynes Council and Partnership
  - Roles and Responsibilities: addressing critical cross programme delivery risks and issues, coordinating cross partner responses, owning the suspension and cost over-run process, tracking against high level milestones, coordinating across Central Networks, financial tracking and control and reviewing against Successful Delivery Reward Criteria
- MK LCLP Steering Group (meets quarterly): coordinates activities between MKLP and MK*Smart*2020. Feeds into LCLP governance structure
- Project Team (meets weekly)
  - Members: Project Manager, workstream leads (External Collaborator representatives and Low Carbon Living Programme representatives as required)
  - Roles and Responsibilities: workstream management, DPCR6 feed in as required, developing Project Board inputs, financial tracking and management and delivery tracking and escalation
- Technical Design Authority: ownership of solution, alignment with objectives and research plan and ongoing review and management against the target solution. Contains technical experts from Central Networks, E.ON and External Partners.
- Delivery and Operational teams: manage workstream risks, issues, plan, costs and milestones (standard weekly reporting template to feed into Project Board)
- Central Network's Customer panel (Meets 6-montly) progress against achievement of customer benefit will be reviewed by a panel of independent Domestic and Business customers.

The governance structure will be supported by a Project Management Office (PMO) which will, in addition to other responsibilities, anticipate, manage risks and issues through the governance and delivery process. The PMO will establish the detailed risk management processes, templates and logs as part of the project mobilisation phase.

There will be a specific process for where urgent action needs to be taken, such as suspension and cost over-run management:

- Risk and issue log categorisation to identify potential for cost over-run. Standard risk and issue review will include evaluation of whether issues could lead to cost over-run
- Review paper produced
- Project Team assessment, response plan and escalation to Project Board
- Project Board review followed by suspension and flag or mitigating action with focused ongoing management to resolution

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	An executive summary of the additional appendices is included with this pro-forma and the compulsory appendices after Appendix D.
Appendix 1	The MK*Smart*2020 Project
Appendix 2	Milton Keynes Low Carbon Living Programme
Appendix 3	Research Themes, Knowledge Capture and Dissemination
Appendix 4	DPCR6 Linkages and Capability Development
Appendix 5	Smart Metering and Customer Empowerment
Appendix 6	Commercial Propositions and Supporting Technology
Appendix 7	Technical Design and Delivery
Appendix 8	Project Readiness and Delivery
Appendix 9	Benefits Case
Appendix 10	External Collaborators
Appendix 11	Letters of Support
Appendix 12	MK*Smart*2020 – Derogations