Low Carbon Networks Fund: Screening Submission Pro-forma

Notes on completion
Before completing this form, please refer to the LCN Fund Governance Document. **The typeface, font size and colour for the text entry areas are predetermined and should not be changed. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 6 pages in total.** **Ofgem will publish all the information contained within section 1.1 following the ISP deadline and we will publish the information contained within section 1, 2 and 3 following the Full Submission decision.**

Section 1: Project outline

1.1. Project summary

Project title
MK*Smart*2020 - Facilitating Low Carbon Living in Milton Keynes

Project purpose
Provide a narrative that explains the problem the Project, is seeking to address and the solution it is using to solve the problem. Detail how the project meets one or more of the specific requirements set out in paragraph 2.8 of the Initial Screening Process chapter of the LCN Fund Governance Document
Milton Keynes aspires to be Europe's leading low carbon city. It has set out an ambitious plan to achieve this aspiration called the Low Carbon Living Programme (LCLP). The LCLP encompasses the electrification of heating and transport, renewable distributed generation (DG), new-build low-carbon homes, retrofit of inefficient housing stock, demand response and customer behaviour change. Delivery of the LCLP is made possible through the development of a smart grid and access to the LCNF will allow this ambitious plan to become a reality. MK*Smart*2020 is an ambitious programme to facilitate this transition whilst evaluating the solutions to the resulting network related issues that will be commonplace in many parts of the UK by 2020, but largely unique to Milton Keynes in the period to 2015. The project will enable the citizens of Milton Keynes to adopt a low-carbon lifestyle and provide learning that can be applied elsewhere within Central Networks' regions and across the UK. The anticipated network issues arising from the LCLP include impact on power quality, voltage, power factor, fault currents and utilisation. The project will also tackle wider system balancing aspects. The solutions employed will address these and other challenges and meet all the stated requirements for LCNF projects: • *New pieces of equipment*: comprehensive grid state sensing equipment linked to a routing and computing platform for distributed intelligence within substations • *Novel applications of existing equipment*: using network assets to dynamically manage network constraints given increased penetrations of electric vehicles (EV), DG and, electric heating • *Novel operational practices*: demonstration of city wide active network management techniques including dynamic voltage management and lower loss network configurations • *Novel commercial arrangements*: commercial contracts for demand response and evaluation of commercial arrangements with GB System Operator (GBSO) to support system balancing

Estimated Project funding			
Please provide an approximate figure of the total cost of the project and the LCN funding you are applying for			
Total cost of Project	£23,500,000	**LCN funding requested**	£21,150,000

1.2. Additional Project details

Funding commentary

Provide a commentary on the accuracy of your funding estimate. If the Project has phases, please identify the approximate cost of each phase

The funding estimate has been generated through a high level but rigorous approach covering, IT (architecture, systems integration, software, hardware and system support), assets, communications, knowledge management, customer engagement, detailed design, installation, system operation and project management. This approach provides confidence in the accuracy of the funding estimate. The analysis has identified a number of key sensitivities, which will continue to be developed in the period to final submission and during project delivery:

- The number of secondary substations included in the trial, which is dependent upon customer adoption of low carbon technology and its physical location and concentration
- The number of IT applications, the necessary level of customisation and the complexity of the associated system integration activities to deliver the target functionality
- The degree to which commercial arrangements will cover the costs of demand response
- The commitment from retailer(s) to deploy smart metering infrastructure within the project timescales

Milton Keynes' Low Carbon Living Programme presents a unique opportunity due to the anticipated concentrations of low carbon adoption. Whilst MK*Smart*2020 seeks to obtain significant low carbon network learning, insight and capability development from these concentrations it can be expected that as the project progresses other opportunities may be identified. As this occurs Central Networks will look to leverage the initial investment from this project and Milton Keynes' unique levels of adoption by pursuing LCNF funding for further phases of activity if appropriate.

Project solution

Provide specific details of the solution which you are trialling, including details of specific network conditions where the trial is taking place

A targeted deployment of smart grid solutions in locations across the growing municipality of Milton Keynes – an opportunity to trial on a network with relatively high and increasing utilisation. The solution spans four underlying themes supported by a common data and communications architecture and a single programme of academic research and learning dissemination (delivered through local universities):

New challenges: Establish a '2020 representation' of low carbon technologies: EVs, heat pumps and DG, through close coordination with the Low Carbon Living Programme.

Increased visibility: Provide real-time and granular network data from smart meters and sensors at selected primary and secondary substations. This provides an enhanced understanding the current network state and consequently the impact of low carbon technologies. It also enables active network management in response to low carbon technologies (such as voltage adjustment, losses minimisation, movement of open points, etc). The element includes the telecommunications and data collection infrastructure to facilitate the creation of the smart grid.

Increased control: Trial and evaluate new technical and commercial mechanisms to optimise network: utilisation, health and outage performance. This will facilitate the cost effective and reliable connection of low carbon technologies including demand response, DG dispatch, dynamic ratings, innovative commercial agreements and interactions with other fuel vectors. This element includes an integrated IT architecture with centralised and distributed intelligence to analyse the data and provide enhanced control.

Market integration: Provide time and location based network charges for customers participating in a 50-60 low carbon demonstrator homes (includes electric heating and EV charging). Plan to operate demand response contracts for network management and explore opportunities to aggregate the residual flexible demand at the GSP for GBSO system balancing. Market integration also includes incorporation of the smart grid communications and data platform with energy retailers to support smart meter deployment whilst capturing synergies with network infrastructure.

Section 2: Eligibility criteria

In the space provided below, please demonstrate below how your project meets all of the following eligibility criteria:

Accelerates the development of a low carbon energy sector

Demonstrate how the Project makes a contribution to the UK's Low Carbon Transition Plan, as set out by DECC. Outline carbon benefits which the Solution you are trialling delivers and explain why the solution accelerates the realisation of these benefits over and above conventional solutions. These benefits can be explained in a qualitative manner for the purpose of screening

Combining MK*Smart*2020 with the Low Carbon Living Programme aligns low carbon network solutions with the needs of a rapidly decarbonising city – bringing early learning that can be applied UK wide. MK*Smart*2020 accelerates benefit realisation by ensuring the network can support local low carbon choices whilst maintaining the integrity and reliability of the local grid. The project also explores how a local smart grid can support GBSO in cost effectively managing a system with large amounts of inflexible low carbon generation.

MK*Smart*2020 combines active network management with the market integration of demand response. This is expected to be an improvement on conventional solutions as it holistically addresses many of the challenges associated with delivering a cost effective low carbon transition:

- The growth and optimal allocation of DG and demand response between local grid management and GBSO 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 energy efficiency and behaviour change including the adoption of demand response

By addressing challenges together synergies can be realised and trade-offs optimised in a manner that accelerates the UK's low carbon transition. MK*Smart*2020 integrates all of these elements both in the context of new home development (including 50-60 demonstrator properties with deep low carbon functionality) and retrofitting some of Milton Keynes' existing homes and businesses. It also engages customers to understand their preferences and stimulate low carbon adoption. MK*Smart*2020 disseminates low carbon learning across the industry.

Has a direct impact on the operation of the distribution network

Set out the Solution you are trialling and make a clear case as to how the Solution described in Section 1 directly impacts on the operation of your network

MKSmart2020 has direct network operation impact at its core. Milton Keynes' Low Carbon Living Programme – electric vehicles (public and private charging including both trickle and rapid), DG and electrification of heating – will impact power quality, volt / reactive power, asset utilisation, asset health, fault currents and network reconfiguration under fault conditions.

MKSmart2020 will respond to these network changes with new and innovative solutions including: demand response, time and location DUOS charges, dynamic voltage control and network reconfiguration using 11KV open points. Day-to-day operation of the Milton Keynes' network will change in a number of ways with progressively deepening impact as solutions are layered and expanded:

- SCADA extended into the LV network with enhanced DMS operation
- Enhanced control including dispatch of demand response and DG
- Centralised and distributed intelligence for integrated active network management
- Linkage between active network management within prevailing network constraints and offering of demand side capacity to GBSO

Standard network design and operation standards will be assessed as Central Networks delivers a low carbon network to major new developments of low carbon homes. Measuring network impact will be an integral part of MK*Smart*2020 with sensing across the grid providing data on how low carbon changes impact the network.

Focuses on a network solution which is at the trialling stage and which requires Second Tier funding

Demonstrate why you have not previously used this Solution (including where the Solution involves commercial arrangements) and why LCN funding is required to undertake it. This must include why you would not run the trial as part of your normal course of business and why the Solution is not R&D

The citywide deployment of integrated sensing, control and commercial arrangements in response to substantial penetrations of emerging low-carbon challenges is entirely new and allows Central Networks to test and learn ahead of widespread need. MKSmart2020 extends well beyond R& D as it deploys a set of individual technologies that are ready for commercial deployment and which will be integrated and customised in a new and innovative way.

The project is being deployed at this scale for a number of reasons:

- Milton Keynes' Low Carbon Living Programme is city-wide and MKSmart2020 needs to match this
- 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 uptake of EVs, DG and demand-side management, the level of network sensing is comprehensive enough to capture the impact of low-carbon adoption and the network data volumes of sufficient scale to test a representative 'to be' IT architecture
- The commercial arrangements being trialled require LCNF funding because there is:
    - A higher degree of risk and complexity associated with pursuing demand-side solutions to manage network constraints when compared to conventional solutions
    - Uncertainty over the appropriate division of roles and hierarchy of control between retailers, DNOs, GBSO, virtual power plant providers and others for demand-side management

The scale and complexity of this programme along with the new roles and commercial concepts preclude the adoption of such an approach within the existing framework, and without the availability of the LCNF Tier 2 funding.

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

Demonstrate that the Solution you are trialling has the potential to deliver net carbon and financial benefits to existing and /or future GB energy customers

MK*Smart*2020 delivers value to current and future citizens of Milton Keynes by actively facilitating their Low Carbon Living Programme. It delivers benefits to wider UK customers by providing the network foundations that allow individuals and communities to cost effectively decarbonise their homes, businesses and lifestyles.

Indirect benefits to UK customers due to cross-industry learning and capability development:

- Identify and industrialise network and demand side solutions to defer and avoid network reinforcement by maximising network utilisation whilst enabling customers to make low carbon choices
- Evaluate and develop means to optimally allocate distributed energy resources between system balancing and network optimisation. Also factor in the wider power system opportunity cost of network constraints into network planning decisions
- Inform the smart metering deployment programme with the potential to increase network benefits and realise synergies
- Develop a commercial platform that empowers customers to capture the benefits associated with interruptible load or dispatchable DG

Milton Keynes' direct benefits – captured largely by the citizens of Milton Keynes:

- The smart metering deployment will support customers of participating retailers in reducing their energy consumption
- Industrial and commercial customers will benefit from demand response and DG dispatch contracts that provide commercial incentives
- Network optimisation activities may deliver direct energy and carbon savings
- Public engagement and marketing activities will inform customers of opportunities available to reduce their carbon footprint and benefit from a variety of local and central Government incentives e.g. UK Government Feed-in-Tariffs and free parking in Milton Keynes for those with EVs

Creates new knowledge that can be shared amongst DNOs
Explain the learning which you expect the Solution you are trialling to deliver. Describe the methodology you will use to capture the learning from the trial
Central Networks has defined a draft, overarching research agenda to cover the questions that are central to a cost-effective low-carbon transition: • What can be done to actively facilitate the cost-effective electrification of heating and transportation and connection of DG whilst maintaining standards of service? • How can network smart metering benefits and synergies be maximised? • How can DNOs support the optimal growth and allocation of DG and demand response between local grid management and GBSO system balancing? The MK*Smart*2020 knowledge creation and dissemination approach sits at the centre of project design and delivery and follows a structured knowledge management approach. The project is geared toward generating knowledge that is both salient and readily applicable for all network operators through an end-to-end process as follows: 1. Generation of hypotheses to test, followed by engagement with the industry and academia to refine 2. Creation of Central Networks' research and dissemination plan with support from local academic institutions (Open University, Cranfield University and University Centre Milton Keynes) 3. Alignment of detailed project design with research and dissemination agenda with open data platform for industry and partners to access defined project output data 4. Collection and analysis project outputs in order to test hypotheses, engage with industry and refine hypotheses 5. Dissemination of knowledge through seminars, open data access, papers and university research

Does the project conform to the default IPR arrangements set out in the LCN Fund Governance Document? (Y/N)	YES
If no, then please describe the IPR arrangements and demonstrate how the learning from the Project can be disseminated to other DNOs taking into account any potential constraints or costs caused or resulting from, the proposed IPR arrangements	
No agreements on IPR have been signed at this stage of the project development. Prospective partners are aware of the IP principles set out by Ofgem on 15th April 2010 and Central Networks will seek to enter into agreements which are in keeping with these principles.	

Section 3: Additional information

Please use the following section to add any further detail you feel may support your submission
Milton Keynes' Low Carbon Living Programme offers a unique foundation for MK*Smart*2020 by delivering rapidly changing low carbon network conditions allowing real network testing and evaluation of new solutions: • Funding from Plugged-in-Places for public and private charging infrastructure and free local parking for EVs • Milton Keynes provision of municipally owned land for new low-carbon homes with 50-60 of these homes leased on the basis of customers participating in a two year low-carbon trial • Establishment of a joint working team between MK Council and MK Partnership (the local Regional Development Agency) and cross-party support within the Local Authority • Collaboration with the local universities (Cranfield University, Open University and University Centre Milton Keynes) to develop a comprehensive and public low-carbon city research and dissemination plan

Section 4: External Collaborators

External Collaborators' details
Please use the space below to provide the name and business type of any External Collaborators who have contributed funds and /or resources to a Project, or describe the type of External Collaborators you may be seeking to attract
A number of organisations have supported Central Networks in the development of this project (alphabetical order): • *Accenture*: provider of systems integration and management consultancy services • *GE*: provider of network hardware and software • *Milton Keynes Council*: local council responsible for the Low Carbon Living Programme • *Milton Keynes Partnership:* Regional Development Agency working with the council on the Low Carbon Living Programme Central Networks will be working with a number of organisations to deliver MKSmart2020, and developing competitive commercial terms. These will include the electricity retailers, ESCOs, aggregators, housing associations, telecommunications providers, system integrators and network technology providers, in particular seeking to include appropriate products from the SME community.

Section 5: DNO details

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