Low Carbon Networks Fund
Screening Submission Pro-forma

Notes on completion
Before completing this form, please refer to the LCN Fund Governance Document. Please use Verdana font size 10 in your submission, 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 9 pages in total.   **Ofgem will publish all the information contained within the Screening submission**.

DNO Group
Western Power Distribution

Participant DNOs
Western Power Distribution (East Midlands)

DNO area
Western Power Distribution (East Midlands)

Project title
FALCON (Flexible Approaches for Low Carbon Optimised Networks)

Project summary
LCNF projects have been instrumental in initiating work to address the impact of a low carbon transition on LV and primary networks. This project will build on these foundations and focus specifically on the 11kV network, the backbone of the local grid. This Project will deliver new Methods for mitigating predicted network constraints, facilitating the uptake of low carbon technologies for our customers.   A comprehensive toolkit and guidelines will be developed to identify and address 11kV constraints in a more cost-effective and timely manner compared with traditional reinforcement. The Project will deliver an innovative visualisation model, the purpose of which is to identify existing and predicted 11kV constraints and provide a basis for investment decision making. In addition, six innovative Intervention Methods will be developed to increase utilisation and flexibility of existing and new 11kV networks. The Project will then perform a quantitative evaluation of these Intervention Methods. Each will be evaluated against consistent quantitative measures including customer satisfaction, effectiveness, cost, implementation time and applicability to the GB 11kV networks. Based on these results, a set of industry best practice guidelines will be developed, detailing the most appropriate Method(s) to apply in a wide range of circumstances.   The learning, methods and model developed in this project will be disseminated through a comprehensive programme with relevant stakeholders, industry forums and academic partners. This project builds upon our comprehensive future networks programme and further enhances our leading position as a network innovator.

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	£15.1m	**LCN funding requested**	£12.8m

Problem

Please provide a narrative which explains the Problem(s) which the Project is seeking to address.

Traditional electricity network design standards and system operating techniques are anchored on solid engineering assumptions, used to preserve the integrity of the local grid. Two such core assumptions for the system are low annual load growth (typically around 1%) and reliance on diversity of consumption (i.e. netting of high individual consumption peaks - e.g. kettle/shower usage - with low usage by other customers at the same time).

New low carbon technologies such as distributed generation, heat pumps and electric vehicles will require high power to be delivered for many hours at a time. These technologies have the potential to dramatically increase total consumption and amplify peaks, at local level, thus challenging these core assumptions.

At present DNO's have no means to evaluate the alternative ways of addressing constraints on the 11kV network, with no industry standard way of comparing the appropriateness of standard reinforcement versus the viability of, for example, managing the demand side at the location. Our Project uses proven technologies to address this issue, and provides the means for all DNO's to accurately and consistently make informed business decisions, at lowest cost to the customer.

Whilst most ongoing LCNF projects are investigating the impact of low carbon technologies on the low and primary voltage networks, more work is required to investigate the impact on the 11kV network, the backbone of the local grid.

The imperative to act on climate change, supported by the UK Low Carbon Transition Plan, suggests the changes for GB homes and businesses could be much quicker than normal network refresh rates. In this scenario, today's 11kV networks and substations will not be able to cope as they were not designed to cater for these changes.

This Project will trial intervention Methods to increase utilisation of both existing and new 11kV network, to meet the potentially rapid, uncertain changes in customer demand. To assess the applicability of each intervention Method, a clear understanding of the current capacity of the 11kV network has to be determined as traditional 11kV network design has, to date, not required monitoring. No such understanding currently exists; this will be developed as part of the Project. We will focus this Trial on areas of the network with known constraint issues.

Method(s)

Please describe the Method(s) which are being trialled. Please outline how the Method(s) could solve the Problem. The type of Method should be identified where possible e.g. technical or commercial.

Method 0 - This Method will create a network investment model for quantifying and predicting available capacity on the 11kV network. The model will be populated with data from existing industry sources, and verified through data obtained through the WPD Tier 2 South Wales project. The model will also support constraint prediction using forecast take-ups of low carbon technologies.

The six Intervention Methods to be trialled are listed below:

Method 1 - (technical) Dynamic calculation and utilisation of 11kV asset ratings to free up unused capacity previously constrained by design ratings; further enhancing the techniques used in the WPD Lincolnshire Low Carbon Hub project.

Method 2 - (technical) Automatic load transfer between 11kV feeders within primary substations to increase available capacity on the 11kV network. This builds on algorithms currently used to manage interruptions and quickly restore customer supply.

Method 3 - (technical) Implementation and operation of a meshed (interconnected) 11kV network in suburban and rural areas in order to maximise capacity.

Method(s) continued

Method 4 - (technical) Deployment of new battery technologies using innovative chemistry with increased portability, capacity and scalability which will alleviate 11kV constraints. These units will be located in distribution substations.
Method 5 - (commercial) Control of distributed generation to increase capacity on the 11kV network using innovative commercial arrangements.
Method 6 - (commercial) Control of customer demand to increase capacity on the 11kV network through the use of innovative commercial arrangements, such as a centralised auctioneer.

The intervention Methods will be quantitatively and qualitatively assessed and regularly monitored. The assessments will be against five criteria; customer satisfaction, effectiveness (e.g. the likely % capacity increase); cost (e.g. £/MW); speed of implementation and applicability (estimated proportion of GB 11kV network to which Method can be applied).

This project will deliver a decision support tool enabling future network design and operating decisions to be made based on an accurate understanding of alternative costs and benefits. Understanding these alternatives will minimise costs and disruption to customers, thus enabling a greater, timelier uptake of low carbon technology.

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 Project will be implemented in three overlapping phases. Phase 1 will determine the specific areas of the network to apply each intervention Method and develop the first iteration of the network investment model. Early learning from the development of the network investment model will be shared. This phase is estimated to cost £1.4m.

Phase 2 will further enhance the network investment model and implement the six Intervention Methods on the 11kV network. This phase is estimated to cost £13.0m

Phase 3 will analyse and report on the Intervention Method assessment criteria. During this phase the learning and knowledge gained from the project will be disseminated to relevant stakeholders. This phase is estimated to cost £0.7m.

These costs are based on assessments made by WPD specialists and our project partners. The accuracy of these costs will be further refined prior to final submission.

Specific Requirements (please tick which of the specific requirements this project fulfils)

A specific piece of new (i.e. unproven in GB) equipment (including control and communications systems and software) that has a Direct Impact on the Distribution System)	★
A novel arrangement or application of existing Distribution System equipment (including control and communications systems software)	★
A novel operational practice directly related to the operation of the Distribution System	★
A novel commercial arrangement	★

Accelerates the development of a low carbon energy sector
The DNO must demonstrate that the Solution makes a contribution to the Low Carbon Transition Plan.

The Low Carbon Transition Plan aims to help the UK achieve its climate targets through encouraging the uptake of low carbon technologies. This project will enable our customers to adopt Low Carbon technologies whilst keeping 11kV investment cost as low as possible.
For example, the Low Carbon Transition Plan aims to:
 • Encourage households and businesses to adopt low carbon technologies for heat and electricity: this Project will alleviate predicted network constraints caused by the uptake of these technologies.
• Enable funding for communities to pioneer green initiatives: this Project supports the work of our partner, Milton Keynes Council, and their Low Carbon Living programme.
• Underpin Economic growth through the development of the low carbon industry: this Project will develop skills and capabilities within WPD, our partners and the wider supply chain.
• Reduce the carbon footprint associated with construction activities: this Project will demonstrate alternatives to traditional network designs, reducing the number of assets needing to be constructed.
This project will complement WPD's other 2011 Tier 2 submission, which is focussing on the integration of low carbon technologies on the LV network and customer premises.

Deliver net financial benefits to existing and/or future customers
The DNO must demonstrate that the Method(s) they are trialling has the potential to deliver the Solution at a lower cost than alternative methods.

The Solution being trialled in this Project is expected to reduce the cost and time required to alleviate constraints on the 11kV network anticipated from the uptake of low carbon technologies. The Methods being trialled in this Project offer the prospect of substantially reduced costs and lead times from traditional methods of reinforcement.

• Method 0 offers the ability to better target investment through improved visibility of emerging network constraints.
• Methods 1 (dynamic rating), 2 (automated load transfer) and 3 (interconnected 11kV system) are focused on increasing the utilisation of existing assets, thus reducing the need for investment.
• Method 4 (storage) offers the prospect of far shorter lead times to increase available capacity on the 11kV network, allowing customers to financially benefit from the early adoption of their low carbon technologies.
• Methods 5 and 6 (Distributed Generation and Demand Response) explore the potential of utilising commercial solutions with customers to eliminate 11kV constraints thus avoiding the need and cost of traditional network reinforcement.
Based on a £25k per substation traditional reinforcement cost, the Base Case Cost of traditional reinforcement of all of WPD's substations would be £4.6bn. Costs GB wide would be three times this. We anticipate the deployment of the proposed Method to be substantially less than the Base Case Cost, as this Project will verify.

Has a Direct Impact on the operation of the distribution network

A Second Tier Project must demonstrate that the Method(s) being trialled will have a Direct Impact (as defined in v.4 of the Governance Document) on the operation of a DNO's Distribution System.

Method 0 is a modelling activity that will deliver a repeatable solution for providing invaluable insight into the current and future state of the 11kV network. It is an essential pre-cursor to the assessment of the six Intervention Methods and, by extension, to applying the toolkit of Methods that this Project will deliver.
The six intervention Methods all have a Direct Impact on the operation of WPD's distribution system and will enable all DNOs to utilise the most appropriate means to remedy constraints. It will deliver increased network capacity and flexibility, it will deliver tools to enable better decision making leading to more optimised and efficient networks delivering cost benefits for the customer.

• Method 1 (dynamic rating) will deliver increased network capacity through smarter utilisation of network assets.
• Method 2 (automated load transfer) looks at achieving the same goal through automated switching of load between 11kV feeders within primary substations.
• Method 3 (interconnected 11kV system) looks at how additional 11kV capacity can be made available through re-configuration of the existing network.
• Method 4 (storage) will also increase network capacity by utilising novel battery storage deployed on the 11kV network and will provide a "fast response" capability for addressing constraints.
• Methods 5 and 6 (Distributed Generation and Demand Response) will trial ways of operating the 11kV network through agreeing commercial solutions with customers.

Generate knowledge that can be shared amongst all network operators

The DNO must explain the learning which it expects the Method(s) it is trialling to deliver. The DNO must demonstrate that it has a robust methodology in place to capture the learning from the Trial(s).

The Project is designed to facilitate customer uptake of low carbon technologies. It will allow us to generate and capture valuable knowledge for Customers, DNOs and other industry participants. This knowledge will enable GB DNOs to understand the performance and constraints on the 11kV network and demonstrate cost effective and timely methods of creating additional flexible capacity.

The Methods we are trialling will deliver new learning for DNOs and customers, including the following: What operational constraints will we face?; How can we avoid the cost of conventional reinforcement?; How will we reduce the cost of the low carbon economy for the customer? They will be deployed on GB representative sections of the 11kV network in the South Midlands region and tested against defined customer segments.

Building on established processes we have, with our academic partners, developed a robust method for capturing and disseminating this learning.
Our academic partners will perform key roles within the project. For example, the Open University; customer focussed data collection and dissemination, Cranfield University; initial design and modelling, and dissemination, Aston University; trialling technical aspects and dissemination.

![LCN Fund - Low Carbon Networks]

Please tick if the project conforms to the default IPR arrangements set out in the LCN Fund Governance Document?	✓

If the DNO wishes to deviate from the default requirement for IPR then it must demonstrate how the learning will be disseminated to other DNOs.

Focus on Methods that are at the trialling stage

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.

This Project will provide a diverse toolkit with which to accommodate the anticipated, growth in low carbon technologies and predicted future constraints on the distribution network. To date this Solution has not been required.

Given their innovative nature, these Methods carry with them a certain degree of risk making the LCNF funding mechanism appropriate. We anticipate that the learning generated from this Project will ensure that the toolkit is available to all DNOs in readiness for the anticipated growth in low carbon technologies.

Recognising that isolated testing has taken place on some aspects of the Methods, this project builds on the learning and provides a unique opportunity to evaluate this disparate range of Methods in a controlled and robust framework.

The Methods demonstrated in this Solution fall within Technology Readiness Levels appropriate to LCNF, and delivers them to a prototype demonstration in an operational environment.

Project Partners and external resourcing/funding

The DNO should provide details of any Project Partners who will be actively involved in the Project and are prepared to devote time, resources and/or funding to the Project. If the DNO has not identified any specific Project Partners, it should provide details of the type of Project Partners it wishes to attract to the Project.

In developing the Project we have identified roles for a range of project partners to bring specific expertise and knowledge to defined areas. These are:

Cranfield University and their Boeing IVHM Centre will lead on the development of the network investment model (simulation tool). Aston University will provide network engineering expertise across several of the Methods. The Open University will be responsible for customer segmentation, customer satisfaction and overall stakeholder engagement activities.

Alstom will support the network demonstrations and provide practical engineering expertise to our academic partners. GE Digital Energy and their subsidiary Beta R&D Limited are working with us on the demonstration of an innovative storage device for 11kV substations.

CISCO have been selected as project partner for telecommunications aspects including cyber security compliance. ElectraLink are developing aggregated substation load information based on existing industry data flows.

Thamesway Energy have agreed to participate in the demand response and distributed generation Methods using their CHP plant. Milton Keynes Council has invited WPD to be fully involved in their Low Carbon Living Programme which is promoting the uptake of green technologies in the city and wider region.

Logica are working with WPD to develop this LCNF submission building on their previous experience of developing UKPN's 2010 Low Carbon London project.

Derogations or exemptions

The DNO should outline if they consider that the Project will require any derogations, exemptions or changes to the regulatory arrangements.

We are considering the requirements for derogations associated with Methods 5 and 6 (Distributed Generation and Demand Response).

At this time, we believe that parallel arrangements could be put in place with customers without the need for derogations from SLC13.

This position will be verified prior to final bid submission.

Customer impact

The DNO should outline any planned interaction with Customers or Customer's premises as part of the Project, and any other direct customer impact (such as amended contractual or charging arrangements, or supply interruptions).

WPD will contract commercially with 11kV customers participating in Methods 5 and 6 (Distributed Generation and Demand Response) either directly or through energy suppliers or market aggregators. These customers will participate in the Project on an entirely voluntary basis.

Customers living in the areas selected for demonstrating the Intervention Methods may be affected by the installation of substation equipment. Where planned outages are required, these will be minimised by leveraging the experience gained by WPD in South Wales through the 2010 Tier 2 project.

A detailed customer engagement and communication plan will be developed as part of this project.

Please use the following section to add any further detail you feel may support your submission.

WPD is a long standing participant in the Strategic Technology Partnership run by EA Technology. Through our portfolio of IFI projects we are currently engaged on many topics supporting this Project. This Project addresses a significant gap in current LCNF registered projects.

This Project will deliver significant new learning and the delivery of a prototype network investment model and insight into the suitability of the Intervention Methods for mainstream deployment.

We recognise that this Project will lead on to further opportunities for LCNF innovation. For example, new market models which may ultimately be needed to provide DNOs fair access to Distributed Generation and Demand Response. We therefore propose to conduct a follow-on LCNF Tier 2 project in 2012 that will build on the learning from this project. A project of this complexity should only proceed once the operational value of commercial Methods 5 and 6 (Distributed Generation and Demand Response) have been confirmed.

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