

Low Carbon Networks Fund Screening Submission Pro-forma

Notes on completion

Before completing this form, please refer to the LCN Fund Governance Document, which details in full the information that you are required to provide. Please use the default font (Verdana size 10) in your submission, the text entry areas are predetermined and should not be changed. The full-completed submission should not exceed 10 pages in total.

Ofgem will publish all the information contained within the Screening submission.

DNO Group

Electricity North West Limited

Participant DNOs

DNO area(s)

North West of England

Project title

Fault Level Active Response (FLARE)

Project summary

The DNO must provide an approximate Project start and end date.

Problem

To facilitate the UK's carbon reduction targets, Distribution Network Operators (DNOs) will need to connect growing numbers of new low carbon technology (LCT) loads on their networks as heating and transportation are decarbonised. In addition, increasing volumes of all types and sizes of low carbon distributed generation (DG) will be connected to distribution networks either as a commercial venture or as part of combined heat and power (CHP) installations. These changes are expected as a result of the Carbon Plan and DECC's Community Energy Strategy. The connection of LCTs has already increased network fault levels across the GB electricity distribution assets, a situation which is set to continue.

Question

How can a DNO deploy and use advanced fault level response techniques to facilitate demand growth and the low cost connection of LCTs whilst minimising fault level reinforcement costs?

Method

This four year project, starting January 2015, will employ innovative techniques to show that a DNO can, through greater utilisation of existing assets together with new advanced software, increase the capacity available for connection of LCTs whilst minimising their adoption costs.

Estimated Project funding

The DNO must provide an approximate figure of the total cost of the Project and the LCN Funding it is applying for.

Total cost of Project	£6 million	LCN Funding requested	£5.4 million
Cross Sector Projects: Requested funding from Electricity NIC, Gas NIC or NIA?	If yes, please specify		

Problem

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

Low carbon considerations

As the UK seeks to achieve its carbon reduction targets, the electrification of heating and transport requirements means that a greater demand for electricity is probable. DNOs anticipate accommodating new LCT demand and low carbon or renewable DG, as a result of the Carbon Plan¹ and DECC's Community Energy Strategy², that promotes local energy production. Planning authorities have implemented carbon reduction policies and the five North West cities are promoting CHP plants for new developments.

Managing rising fault levels across distribution networks

Fault current flows in networks when an electrical fault condition occurs. It is several dozen times larger in magnitude than the load current that normally flows and if not removed quickly can overstress equipment. Network equipment must be rated to withstand the effects of fault current and safely disconnect faulty equipment or circuits.

Demand from new LCT load and generation connecting to the network contributes to the fault current and can ultimately push the fault level on the network above the equipment rating; this is more likely to affect densely populated networks. Rising fault levels can require DNO intervention in the form of costly network reinforcement.

Economic Considerations

Distribution network operators' spend for fault level related reinforcement is expected to reach £60 million by the end of DPCR5. The RIIO-ED1 submissions forecast that this will rise to £130 million during the eight years from 2015 to 2023.

Fault level reinforcement costs driven by the connection of a customer are paid in part by the connecting customer with the remainder funded by all customers; whereas fault level reinforcement required from general load growth is wholly funded by all customers. The important environmental benefits of DG, particularly CHP are expected to be instrumental in reducing the carbon burden of modern society. But a high cost to connect low carbon generation is in conflict with planning authority policies as developers attempt to implement low cost, carbon efficient projects eg CHP in urban areas. Facilitating timely access to the network whilst minimising costs of connection using new solutions will financially benefit all distribution customers and help realise the benefits to the UK of adopting these decarbonisation technologies.

¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf

²https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf

Method(s)

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

The Method will trial three innovative solutions that enable quicker and lower cost LCT connections for customers. These solutions will not constrain the customers' operation under normal conditions by regulating fault current in real time across HV and EHV distribution networks thus increasing fault level headroom and releasing capacity.

The project scope has been defined in full consideration of the FlexDGrid project (a current Second Tier project being undertaken by Western Power Distribution) to ensure no overlap. This project will look to build on appropriate and relevant outputs for fault level mitigation disseminated from FlexDGrid and explore the fault level mitigation techniques not included in the aforementioned project; it will also extend the range of substation and customer types included in the trials and maximise the incremental learning from both projects.

Method(s) continued

The Trial will include significant customer engagement to test one of the three Solutions proposed. A representative sample of the customer base will provide robust data to prove the business case and analyse the extent to which the Solution is transferable.

Trials

The trials to demonstrate this Method will occur on a sample of substations which are representative of the type of sites contained in RIIO-ED1 investment plans. Key pieces of research which will be performed in the trials will explore:

1. How technology can be applied to existing assets to limit the fault current;
2. How technology can be harnessed to provide low cost solutions; and
3. Does the Method benefit the customer, in terms of carbon and costs savings?

Funding commentary

The DNO is to provide a commentary on the accuracy of its funding estimate. If the Project has phases, the DNO must identify the approximate cost of each phase.

The project will run for four years and has been split into 3 phases with a total cost of £6 million (including project management and contingency). The cost estimates have been developed in collaboration with potential project partners and incorporate unit cost and market prices for commodity equipment.

Phase 1 Technology (£3.4 million)

- 1A Technology procurement;
- 1B Installation of fault level mitigation technologies; and
- 1C Testing and commissioning of technologies.

Phase 2 Field Trials (£0.75 million)

- 2A Perform customer survey and analysis;
- 2B Evaluate and analyse use of the fault level mitigation equipment; and
- 2C Undertake business case and carbon benefit analysis.

Phase 3 Learning & Dissemination (£0.25 million)

- 3A Establish dissemination channels; and
- 3B Deliver learning through multiple and varied dissemination activities.

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)	Y
A specific novel arrangement or application of existing Distribution System equipment (including control and communications systems software)	N
A specific novel operational practice directly related to the operation of the Distribution System	Y
A specific novel commercial arrangement	Y

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

The DNO must demonstrate that the Solution makes a contribution to the Carbon Plan and has the potential to deliver financial benefits.

In line with requirements of the LCN Fund Governance Document, the DNO should provide the following to demonstrate compliance with this criterion:

- i. *How the proposed Project will make a contribution to the Carbon Plan. In particular the DNO should outline:*
 - *The aspect(s) of the Carbon Plan which the Solution(s) facilitates.*
 - *The contribution the roll out of the Method(s) across GB can play in facilitating these aspects of the Carbon Plan.*
 - *How the roll out of the Method(s) across GB will deliver the Solution(s) more quickly than the most efficient method currently in use on the GB Distribution System.*
- ii. *The financial benefits of the Method(s) being trialled. Financial benefits should be calculated as set out in Section Two, paragraph 2.13, of the LCN Fund Governance Document.*

The Carbon Plan sets out targets for carbon emission cuts of 34% on 1990 levels by 2020 rising to 80% below 1990 levels by 2050. The predicted impact on the network is that it may need to support up to double the amount of electricity passing through it and two way energy flows from the installation of distributed generation. This project will help to deliver the plan and accelerate the low carbon energy sector through supporting changes that are critical and fundamental to achieving these objectives.

Secure, sustainable and low carbon energy

Around a quarter of existing electricity generating plant is set to close; to replace it and generate sufficient low carbon electricity will require small scale distributed generation to connect to the distribution network. This is incentivised by schemes like the Renewable Heat Incentive, Feed in Tariffs and Power Purchase Agreements.

Saving energy in homes and communities

The recently published Community Energy Strategy paper aims to promote and assist community energy groups. The paper estimates that generating electricity at community level could provide enough electricity for 1 million homes by 2020. The renewable technologies encouraged, such as district heating schemes, will all contribute to fault level which will require costly network reinforcement or installation of expensive fault current limiting technology to mitigate. Community groups have raised the particular issue about the speed and cost of connection to a DNO network as being a major barrier to getting projects started. This project will enable low carbon energy projects to access connection to the network at significantly lower cost and with greatly reduced lead times.

Reducing emissions from business and industry

By increasing the network's resilience to fault level issues this project can advance the business case for investment in low carbon technologies and encourage greater uptake from multiple industry sectors for fault level response thus enhancing the return on investment.

Delivering net financial benefits

The cost of replacing primary switchgear for each fault current issue is around £0.5 million on the Electricity North West network. We will identify lower cost solutions to existing fault level mitigation techniques. By managing fault current, we can enable LCTs to connect cheaply and more quickly whilst still deferring or delaying fault level reinforcement.

Base case cost	£500k	Method cost	£100k to £400k	Benefit	Up to £400k
Base case planning & installation time	1 to 2 years	Method planning & installation time	3 to 6 months	Benefit	Up to 21 months

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 the Governance Document) on the operation of a DNO's Distribution System.

The proposed Method introduces alternative fault level mitigation techniques to HV and EHV networks not yet considered in previously submitted Second Tier LCN Fund projects thereby increasing the portfolio of potential solutions available to DNOs. The enhanced network management system will provide DNOs with the functionality to monitor and prepare the systems to manage network fault currents to mitigate reinforcement costs for new and existing customers. This will be achieved whilst maintaining the high level of security expected of these networks.

The Method will also enable DNOs to access new solutions for limiting fault current contributions to mitigate the rise in fault levels from the connection of new distributed generation and the growing uptake of LCTs, including micro-generation in a practical and scalable manner.

The Solution has the potential to redefine the design and operation of HV and EHV networks for fault level mitigation in the UK.

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).

In line with the LCN Fund Governance Document, the DNO should provide the following to demonstrate compliance with this criterion:

- i. How the Method(s) being trialled will generate new knowledge.*
- ii. What methodology will be used to capture results from the trial and disseminate that learning to all DNOs.*

This project will challenge operational norms and builds on the knowledge and experience of network operators in GB and abroad; it will deliver new learning that will support new solutions for fault level issues experienced across the DNO community.

Detailed studies will attempt to:

1. Recalculate the current withstand capability of network equipment;
2. Examine the options for integration of these new fault level mitigation techniques both in combination and with existing operational methods;
3. Show how to combine the new technologies to achieve fault level mitigation.

Knowledge will be captured using the best practice methods employed on existing Second Tier LCN Fund projects. There will be a distinct Workstream with responsibility for ensuring that the data and learning is disseminated to all stakeholder groups using multiple communication channels.

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

Y

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 taking into account any potential constraints or costs caused by or resulting from the proposed IPR arrangements.

Focus on Methods that are at the trialling stage

The DNO must demonstrate that the proposed Project would not be performed in the DNO's normal course of business.

In line with the LCN Fund governance document, DNOs should provide the following to demonstrate compliance with this criterion:

- i. How the Method(s) being trialled are untested at scale and circumstance in which the DNO wishes it to be deployed.*
- ii. Why the scale of the Project is required to deliver the learning and why the Project would not have been an appropriate First Tier Project.*
- iii. Why it has not previously used this Method to solve the Problem (including where the Method involves commercial arrangements) and why LCN Funding is required to undertake it. This must include why it would not run the trial as part of its normal course of business and why the Solution is not R&D.*

The fault level mitigation technologies used in the Method are known and mature albeit in other applications, but have never been employed on a GB distribution network or in a manner designed to deliver the Solution. A First Tier LCN Fund project (Fault Current Active Management – FCAM) has been undertaken to confirm the application of these alternative fault level mitigation technologies in preparation for the delivery of a Second Tier LCN Fund project.

The Method complements the in-flight FlexDGrid project and this project aims to trial these techniques in small number of HV and EHV network configurations to demonstrate their application and transferability thereby extending the portfolio of solutions to UK distribution network operators.

To understand the viability of a specific fault current limiting technique, the project proposes to survey industrial and commercial customers across Electricity North West's network.

The likely installation costs of these alternative fault level mitigation techniques in a small number of HV and EHV trial sites exceed the limit for a First Tier project. The necessary involvement and co-ordination with multiple stakeholders places this outside of business as usual and renders this a Second Tier LCN Fund project.

The Method can be easily implemented by all DNOs through low cost extension to or adaptation of their existing systems

Project Partners and external resourcing/funding

The DNO must provide evidence of how Project Partners have been identified and selected, including details of the process that has been followed and the rationale for selecting participants and ideas for the project.

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.

Electricity North West encourages innovation ideas from stakeholders through multiple channels including partnership with the Energy Innovation Centre, the Electricity North West website and our innovation engineers who seek new developments in technical and commercial approaches by discussing ideas with industry colleagues, product developers and consultants. Our Future Networks Steering Group assesses project suggestions on merit and decides on which to take forward.

Each Second Tier LCN Fund project requires different specialist skills to achieve the highest degree of learning and deliverables from the project and we maintain a neutral and accessible approach when searching for new partners and suppliers to work with. In February 2014 we issued an expression of interest on the ENA LCN Fund portal for organisations that have the appropriate resource and experience to support each phase of this project. Costs for equipment and services will be collected by conducting open, fair and accessible processes through requests for information and tenders during the bid development period or in project delivery.

This project will require Project Partners and suppliers in the following areas:

IT applications: a software provider will deploy on the Electricity North West Network Management System a fault level analysis tool which will evaluate network fault levels and initiate actions to apply the fault level mitigation techniques.

Fault level mitigation technologies: several equipment and technology providers will provide their devices for the trials of fault level mitigation techniques.

Technological consultancies: subject matter experts in the electrical modelling and analysis of distribution networks, business case development, including carbon impact assessment and safety case assessments.

Customer engagement: a provider of customer survey services will engage with selected customer groups and provide analysis of the responses.

I&C customers: will provide input to the trials through technology engagement and/ or customer survey completion. We have engaged with ENER-G who is the number one name in the cogeneration business across Europe.

Learning and dissemination: all the partners and suppliers will assist with the capturing of learning and the knowledge dissemination (for example in the areas of installation and application methodologies, standards updates, etc) and we will seek specialist support for disseminating the knowledge across a range of media channels.

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 do not, at this early stage in the development of the project, believe that we or any of the partners require a derogation or exemption to implement the project.

Over the bid development timeline we intend to detail the safety case for the installation and operation of the new fault level mitigation equipment. The Full Submission will detail how we will prove the safety case in the project for the use of the new fault level mitigation equipment in the operation of a distribution network. At the end of the project we will make available to the UK DNOs and the Health & Safety Executive the risk assessments and safety cases for the use of the new fault level mitigation equipment on a distribution network.

Customer impact

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

Stakeholder information

We will publicise this project as part of our wider carbon agenda and project information will be available to download from our website.

Customer impact

We do not expect that the installation of the new fault level mitigation equipment within our distribution network will require planned supply interruptions. Where equipment installation is required at a customer's premises this will be completed within the normal maintenance cycle and in agreement with the customer to avoid a supply interruption.

Customer engagement and Customer Engagement Plan

All interactions with customers will be managed through a Customer Engagement Plan which will be outlined as part of the Full Submission.

Details of cross sector aspects

The DNO should complete this box only if this Project forms part of a larger cross sector Project that is seeking funding from multiple competitions (ie Electricity NIC, Gas NIC or LCN Fund). The DNO should explain about the Project it will be collaborating with, how it all fits together, and must also add a justification for the funding split.

Not applicable.

Any further information the DNO feels may add to the submission**Contact name**

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