

Low Carbon Networks Fund Screening Submission Pro-forma

Notes on completion			
<p>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 <u>10 pages</u> in total.</p> <p>Ofgem will publish all the information contained within the Screening submission.</p>			
DNO Group			
Scottish and Southern Energy Power Distribution			
Participant DNOs			
Southern Electric Power Distribution (SEPD)			
DNO area(s)			
Southern Electric Power Distribution			
Project title			
Low Energy Automated Networks - LEAN			
Project summary			
<i>The DNO must provide an approximate Project start and end date.</i>			
<p>The LEAN project seeks to demonstrate two novel methods of reducing the electrical losses on our 11kV network; these involve periodically de-energising 33/11kV transformers (similar to the 'Stop Start' engine controls used in modern day cars) and dynamically reconfiguring the 11kV network by selectively operating feeder Normal Open Points.</p> <p>Studies on part of our network show that the loss reduction may be comparable with that which may be achieved by migrating from 11kV to 20kV but at far lower costs.</p> <p>This project aims to deliver significant 11kV network loss savings without impacting customers' quality of supply or our transformers' long-term asset health. Our project will also encourage equipment suppliers to identify and develop components that can be retrofitted to an existing network to provide the substantial reduction in losses.</p> <p>The project builds on learning from two recent SEPD IFI projects, (i) 2011_16 Advanced Radio Controls, which are evaluating communications around Distribution Automation Switchgear and (ii) 2013_04 Losses Reduction Study (desktop), losses reduction interventions and a combination of these interventions.</p> <p>This project will start 1st January 2015 and run to 31st December 2018. This will enable us to validate the scale of loss reductions and confirm that there is no impact on our asset lives through repeated switching.</p>			
Estimated Project funding			
<i>The DNO must provide an approximate figure of the total cost of the Project and the LCN Funding it is applying for.</i>			
Total cost of Project	£7.3m	LCN Funding requested	£6.8m
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.

In preparation for RIIO-ED1, there will be additional focus on network losses with a proposed new licence obligation requiring DNOs "to design and operate their networks to ensure that losses are as low as reasonably practicable" (OFGEM Outputs, Incentives and Innovation Strategy Decision, 4 March 2013, paragraph 5.5).

Many of the recent IFI and LCNF "smart" innovations and commercial arrangements that have been developed in the last few years will allow existing electrical networks to be operated harder than ever before, increasing network load factors with potential for a corresponding increase in annual network losses.

We anticipate that there will be further increases in power flows associated with expected economic development and due to increased low carbon technologies as indicated in the DECC Low Carbon Transition Plan.

This project will explore the value of dynamically reconfiguring networks and substations to reduce losses while factoring in low carbon technologies and supply reliability. International experience in losses reduction includes that reported by ESB, Ireland where a move from 10kV to 20kV has delivered a 75% losses reduction in its MV network but at significant cost. In comparison, our IFI project findings indicate that we can achieve ~80% of the loss savings for about 1% of the cost of the upgrade to higher voltages.

A project location will be identified to provide a variety of customer mixes, 33/11kV transformers and substations in order to ensure that we reflect the range of conditions which exist now and in the future throughout GB.

This project will concentrate on trialling new operational practices, evaluate methods and quantify the potential reduction in the level of electrical losses while maintaining supply reliability and asset condition.

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 LEAN project has identified two methods of reducing losses on 11kV networks:

(i) "Auto Stop Start" Systems – Where one of a pair of 33/11kV transformers can be safely de-energised. Auto Stop Start Transformer operation has not been installed on any GB networks to date. The trial will assess network losses reduction, and at the same time any impact on transformer asset life expectancy, and supply reliability. We will develop control algorithms to balance the needs for electrical losses, supply security and asset life.

(ii) Network Re-configuration – Automatic switching at the 11kV feeder Normal Open Points (NOPs) to further reduce losses and maintain system availability during any faults. Further use of high performance switchgear at NOPs is expected to help us deliver the necessary quality of supply without any need to replace all of the existing feeder protection schemes.

Method(s) continued

Network Re-configuration has been deployed in various parts of the world but the method identified is yet to be deployed or trialled in GB. We will evaluate conventional switchgear deployments alongside more advanced switchgear to understand the practical and relative merits of both deployment approaches. We aim to utilise this learning to support the LEAN project.

Overall benefits focus on reduced network losses, however we also expect to learn about asset deterioration, dynamic network configuration policies and benefits of advanced switchgear.

We anticipate deployable losses related learning to emerge early in the project with asset deterioration learning emerging towards the end.

To maximise the learning from elsewhere in the world and achieve maximum value for this project it is proposed to tender for a large part of the project content. The tendering exercise will be conditional on a positive business case, taking into account the whole life benefits compared with the total cost of the solution.

The project will select a variety of transformer types and substation configurations from throughout our network to ensure we can extrapolate our results throughout GB. As well as losses it will include an assessment of the impact on supply reliability and of impact on the ability of the network to accommodate distributed/ embedded generation.

The project will also provide useful information about 11kV network losses that will assist OFGEM and the industry in the development of any improved losses incentives.

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 cost is £7.3m and we are seeking funding of about £6.8m.

The project cost and LCN funding request have been developed from a set of component project deliverables; their accuracy will be further refined prior to final submission. Where possible, the project will leverage funding from partners, local and national sources.

The funding required includes costs associated with intelligent switchgear and stop start transformers/systems together with condition, losses monitoring and communications equipment which will support the solution and provide data to support our project business case.

As a large part of the project work will be tendered, the project costs and funding requests proposed here may still vary at the final bid stage due to certain funding alternatives materialising partly through the tendering exercise. Some project deliverables will be subject to scope and scale clarification prior to full submission.

We will also develop a financial hurdle above which we would not proceed; this hurdle will be driven by the anticipated Cost Benefit Analysis of a Business as Usual roll out of the solution.

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

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.*

This project is expected to deliver a new methodology that will provide opportunities for reduced network electrical losses, reduced carbon intensity and continued/maintained network performance for the benefit of existing and new customers.

As such, the LEAN project is directly aligned with making significant contributions to the Low Carbon Transition Plan by:

- Demonstrating what is required for the deployment of intervention technologies; the project will deliver a consistent approach to deploying and integrating these solutions that can be readily replicated;
- Enabling the dynamic reconfiguration of the network to minimise losses while accommodating embedded generation.
- Using network re-configuration and “stop start transformer/system” operation to increase network utilisation; the project will investigate how the combination of technologies can be deployed to minimise system losses while maintaining quality of supply and allowing increased network utilisation;
- the project will investigate and trial innovative planning and procurement processes, building on previous SEPD and LCN funded project learning, to explore the competing requirements of network utilisation, quality of supply and losses.

Initial studies (across GB) indicate that we will achieve approx:

	Reduction in Losses (MWh/yr)
(i) Primary (33/11kV) Transformers	640,000
(ii) Re-configured Networks	160,000
(iii) Combination	800,000

This is equivalent to approx. 413,000 tonnes CO2 per year.

We have estimated the NPV of the method extrapolated throughout SSEPD at £159m; in the same way, if the method is extrapolated across GB, the NPV is approximately 1.1bn.

Our calculation of NPV made use of OFGEM’s RIIO-ED1 Cost Benefit Analysis workbook which includes energy price estimates modified by the carbon price and adjusted to reflect the future decarbonisation of electricity over a 45-year period.

The above results will be tested during the project and all implementation costs and benefits extrapolated across GB networks.

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.

This project will demonstrate whether the deployment of the methods described above can deliver a cost-effective means to meet our new licence obligation that is, to "ensure that losses are as low as reasonably practicable". The project will also demonstrate how we continue to meet the anticipated quality of supply requirements and growth in low carbon generation and demand. This will have a direct impact on how SEPD and other DNOs address future network planning and associated technical and commercial arrangements.

This project will identify potential barriers and produce draft amendments to operational documents, e.g. the Distribution Code of Practice and Planning Manual.

The Direct Impact will be seen as:

- Reduction of losses, with associated financial and carbon benefits;
- Better visibility of network performance and assets condition, including long-term transformer health;
- Quantifying electrical losses caused by changes in configuration of existing networks operating under low carbon scenarios;
- Maintain our commitments to improved customer quality of supply during RIIIO-ED1;
- Development of switching strategies for optimising typical network configuration and customer mixes;
- Making use of knowledge generated from other LCNF projects;
- Striking the right balance between renewable integration, supply reliability and network losses;
- Changes to the way we manage the addition of renewable generation to meet thermal, voltage and fault level constraints;
- Development of a cost effective strategy for losses reduction on the 11 and 33kV network.

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:

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

This project will demonstrate how the methods described can be deployed on GB networks substantially to improve the existing system's ability to optimise network losses and maintain customer's quality of supply. This solution has not been deployed in GB before. Losses will be calculated using a combination of on-site monitoring together with network analysis as in our earlier IFI project.

The knowledge gained as a result of this project will demonstrate:

- how DNOs can use this solution to improve the losses management on the Network;
- the quantification of the losses reduction achieved in a number of typical network deployment scenarios;
- how DNOs can use technology to improve losses while maintaining quality of supply for existing and new customers, including renewable generation schemes;
- new operation and planning process that can benefit from the capacity created and performance improvement from deploying this solution.

The knowledge will be shared via a comprehensively planned and managed learning and communication strategy which will be developed as part of the bid submission stage. We anticipate this strategy will prioritise deployable early learning to our industry partners, it will reflect engagement with existing LCNF projects, projects from outside GB and project partners to ensure all learning is collected and extracted from the project. The knowledge will be disseminated via a range of media.

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

It is the intention that the work undertaken using LCNF funding will adhere to the LCNF default IPR arrangements. However, this will be subject to confirmation depending upon the final outcome of the commercial negotiations with equipment suppliers, our project partners etc. If appropriate we will provide further details in the full submission.

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 methods to be deployed in this project are currently not considered when designing networks due to a number of risks which make this investment unattractive without the protection of the LCNF (shown below):

- Uncertainty of network behaviour when scaled up beyond existing R&D trials; we are particularly concerned to ensure that any short term gain does not impact the long-term health of our 33/11kV transformers or have a negative supply reliability impact;
- No direct mechanism by which a DNO receives reward for technical losses reduction.

In recognition of these issues, our focus will include a practical assessment of the possible impact of transformer magnetising inrush currents on customer quality of supply and asset lifetimes. Our earlier IFI project has confirmed the possible loss savings and we have, as a consequence, identified how high performance switchgear can mitigate the level of inrush currents during transformer energisation.

The project will select a variety of transformer types and substation configurations from throughout our network and this requires us to undertake a Tier 2 project so as to ensure we can extrapolate our results throughout GB.

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.

This project will bring together technologies and companies with relevant expertise to create a solution that have never been deployed before. This provides us with the opportunity to prove that the total benefits are greater than the sum of the parts.

The Project Partners will be chosen for their knowledge and experience gained from working on projects in the UK and across the world. The large part of the project will be tendered to maximise value and to gain learning from outside the UK, including the following roles:

- Project Partners and Suppliers;
- Project Management Design and Support;
- Analysis Support;
- Learning Support.

This project builds on the previous IFI trials including high-speed MV switchgear and distributed-intelligence, automated feeder self-healing software on the Isle of Wight as a means to reduce the impact of faults on CI and CML measures.

SEPD anticipates funding (both 'benefit in kind' and direct financial contributions) from our project partners.

Derogations or exemptions

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

While we intend to make significant changes to the operation of our 11kV network, our project success criteria includes avoiding any transgressions of existing network planning and operating standards. As a consequence, we do not envisage that the project will require any derogations or exemptions. Future changes to the regulatory arrangements, where these would further assist DNOs in loss optimisation, may be highlighted through the project findings.

We will pay particular attention to Planning Standards ER P.2/6 and any impact of our proposed methods to operate MV networks in novel configurations.

We aim to confirm and/or clarify the statements above at the Bid Submission stage.

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).

While this project involves minimal direct customer engagement, SEPD has identified the following areas of customer impact:

- Power quality monitoring at selected networks locations;
- Enhanced monitoring of network CML/CI in the study areas;
- Support for existing embedded generation on our 11kV networks.

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

The LEAN project will demonstrate and evaluate how a novel operation of interventions can be used to reduce electrical losses on large parts of GB's 11kV network.

This project has evolved from the learning gained in two existing IFI projects (Desktop losses study and Distributed Automation) on the Isle of Wight network.

Our earlier project work indicates that the method to be trialled may deliver almost as much loss saving as moving from 11kV to 20kV network operation while only requiring a small fraction of the investment.

The project is planned to operate over four years to ensure results are statistically valid; this will allow us to take into account variability due to adverse weather and network changes to accommodate the connection of further renewables. Project work will include a phased roll-out of monitoring, intelligent switchgear devices and stop start transformer/ systems.

The success of the LCNF projects will rely on how well the learning is shared between DNOs and through continued communications with the other DNOs we intend to actively share and gather information from the other LCNF and global low carbon projects.

Due to the scale and complexity of this project, the project will follow SSEPD's Large Capital Project Governance Procedure (LCP). This procedure will ensure that the project receives the necessary amount of project management and financial rigour to ensure seamless delivery.

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