

## First Tier Pro-forma

<b>Notes on completion</b>
<b>Before completing this form, please refer to the LCN Fund Governance Document. Please use the default font (Verdana font size 9) 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 4 <u>pages</u> in total.</b>
<b>Project title</b>
Low Voltage Network Solutions
<b>DNO</b>
Electricity North West
<b>Participant DNOs</b>
<b>Project summary</b>
<p>The decarbonisation of transport, heating and electricity generation suggest changes in the network requirements of LV-connected customers. These will introduce significant challenges for the networks from higher and more variable loading. The generic problems associated with changes in demand and generation on the future LV network are well known. What is not clear is when the problems arise, and how DNOs will address these problems in an economic and sustainable way. The potential solutions are expected to comprise new technologies and operating techniques. This project will deploy a range of distributed measurement, sensing and analogue recording instrumentation which will provide Electricity North West with greater understanding of the existing operating characteristics and demands of its LV networks and the tools to manage these issues.</p> <p>Electricity North West will identify a statistically meaningful sample of representative LV network feeders from its total population of over 120,000 feeders, and use these to map the characteristics of the total population. This data is essential to better understand how the LV networks are able to cope with future demands and to capture the effectiveness of new technology (i.e. reactive compensation, demand side management, automation and storage) and operating methods to address expected future issues. Electricity North West will use the data to develop planning and modelling tools and techniques, which will be essential to allow DNOs to manage these complex networks more appropriately in the future. The Project will allow Electricity North West to use and validate the results of WPD's Tier 2 LCNF Low Voltage Template project, for application to the Electricity North West network.</p>
<b>Problem(s)</b>
<i>Please provide a narrative which explains the Problem(s) which being addressed by the Project.</i>
<p>The transition to a low carbon future will affect distribution networks in many ways. It is expected that demand for electricity will rise as transportation is decarbonised by electric vehicles. Further demand will result from the electrification of heating in the form of heat pumps, which are expected to replace increasingly expensive to operate oil-fuelled and gas-fuelled heating systems. At the same time, rising retail prices and energy-efficient behaviour and appliances e.g. LED lighting, may mitigate some of the demand increase. In addition to changes in demand, government incentives such as feed-in-tariffs will encourage high penetration of various forms of generation on LV networks.</p>

<b>Problem(s) continued</b>
<p>In order to begin to understand what these changes will mean to networks, network operators will need to measure the existing demand and voltage characteristics of networks at an increasingly granular level, and to develop models which enable them to forecast the effects of future scenarios for the penetration of customers' low-carbon technologies. At present, analogue data such as voltage and current is not routinely captured beyond the primary substation level. However, it is expected that as demands increase, it will be the low voltage networks that will experience both thermal and voltage problems ahead of the higher voltage networks. Given this, it is paramount that network operators quickly begin to fill the gaps in their understanding of the characteristics of low voltage networks and assets.</p>
<b>Method(s)</b>
<p><i>This section should set out the Method or Methods that will be trialled in order to solve the Problem. The type of Method should be identified where possible e.g. technical or commercial.</i></p> <p>To address the Problem, Electricity North West intends to perform analysis on a representative sample of LV feeders. Electricity North West will install a range of metering equipment on the sample feeders, and fit voltage recording devices at distributed locations along the length of associated low voltage feeders. Electricity North West will also install power quality measurement devices to capture harmonics at selected locations to develop understanding of power quality issues. This data will be used to inform learning on the best available technologies needed to obtain the necessary data and the extent of instrumentation needed for enduring purposes.</p> <p>Electricity North West will populate a database of network demand and voltage. This will hold time series data across the selected networks, including full network connectivity related to MPANs, over at least 18 months and possibly more. Electricity North West will develop capacity models of future low-carbon customer behaviour and their potential effects on networks, and use the obtained data from the measurement devices to calibrate these models. Using this Project, Electricity North West will ultimately develop new designs (incorporating new technologies) and operating practices which will help address future customer needs, without the need for extensive and potentially expensive network reinforcements in future price control periods. The focus of the project is on developing monitoring and learning to manage future network requirements, rather than to offset planned spending in the DPCR5 period.</p>
<b>Scope and Objectives</b>
<p><i>Please describe the scope and objectives of the Project should be clearly defined including the benefits which should directly accrue to the Distribution System.</i></p> <p>The project will deploy measurement, sensing and analogue recording instrumentation which will provide Electricity North West with greater understanding of the existing operating characteristics and demands of its LV networks. Electricity North West intends to identify a statistically meaningful sample of representative LV network feeders from its total population which will be used to map the characteristics of the total population. A number of phases will then follow: Phase 1 - Measurement and data collection; Phase 2a - Network modelling; Phase 2b - Calibration of models using measured data and other data; Phase 3 - Developing appropriate LV future network solutions and validating the conclusions from other LCNF LV trials for the Electricity North West network.</p>
<b>Success Criteria</b>
<p><i>Please give details of how the DNO will evaluate whether the Project has been successful.</i></p> <p>Identification of a statistically meaningful sample of representative LV networks; Establishing a database of network demand and voltage as time series data across the selected networks, including full network connectivity with MPANs; Construction of an LV/HV capacity model utilising newly obtained data and other existing data; Establishing minimum LV instrumentation requirements needed to support future network operation, the preferred technology types and their installation methods; Developing options for future operating practice and control, to help address future network requirements and assess the effectiveness of alternative technologies; Validate results of other LCNF projects such as the WPD Tier 2 Low Voltage Template project.</p>

<b>TRL</b>	7
<i>This should be between 5-8 to be eligible for Tier 1 Funds.</i>	
<b>Predicted start and end dates.</b>	
<i>DNOs should provide an estimate of the expected project starting and completion dates.</i>	
Start Date: 04/2011	End Date: 03/2014
<b>Project partners and external funders</b>	
<i>Please give details of actual or potential Project Partners and External Funding Support as appropriate</i>	
<p>There are no Project Partners or External Funding for this Project. The University of Manchester will be a Project Supplier, contributing to the Project with circuit selection, analysis of the obtained data and modelling. Further academic and equipment suppliers, and project supporters, may also be approached as the project scope is further developed.</p>	
<b>Potential for new learning</b>	
<i>Detail what the parties hope to learn and how the learning will be disseminated.</i>	
<p>The Project will develop understanding of the current operating characteristics of low voltage networks and of tools to predict how these networks will cope with future user requirements. This will clarify requirements for monitoring of LV networks and support the development of operating practices and control methodologies. In addition to annual reports, the close-down report, and participation in the annual LCNF conference, dissemination will be via the Electricity North West website, the University of Manchester and industry liaison.</p>	
<b>Risks</b>	
<i>The DNO should highlight any material, known risks that could impact the Project's costs and/or programmes.</i>	
<p>There is a risk that the selected low voltage circuits are not representative of the wider population of low voltage networks. The selection criteria to be used are expected to mitigate this risk as they will be designed (with academic support) to ensure that all of the relevant parameters are given appropriate consideration. The installation of measurement devices and other related equipment may in certain cases require interruptions to supply. Electricity North West will take appropriate action to mitigate customer interruptions where applicable.</p>	
<b>Scale of project</b>	
<i>Please justify the scale of the Project. In particular, the DNO should explain why there would be less potential for new learning if the Project were a smaller scale.</i>	
<p>Given the importance of ensuring that the sample of low voltage feeders is statically meaningful, a study of the total population will be performed in order to identify common features and characteristics which will inform the exact scale of the deployment. Initial expectation is that equipment will be installed at 200 substations and along 1,000 associated LV feeders. Deployment is expected to be based on characteristics such as radial v. mesh, heavy v. light loading, industrial v. domestic, areas without mains gas, new developments, presence of existing or expected electric vehicle charging, heat pumps or distributed generation.</p>	
<b>Geographical area</b>	
<i>Details of where the Trial(s) will take place. If the Project is a collaboration, the DNO area(a) in which the Trial(s) take place should be identified.</i>	
<p>The exact geographical areas to be targeted during this trial will be determined following completion of the statistical review of existing LV networks and identification of representative low voltage feeders. It is anticipated that a total of 200 distribution substations and 1,000 associated LV feeders will be monitored, across several sub-regions within Electricity North West's Distribution Service Area.</p>	

Estimated Project funding			
An indication of the revenue allowed for within the DPCR5 settlement that is likely to be saved as a result of the project.		An indication of the total Allowable First Tier Project Expenditure that the DNO expects to reclaim the for the whole project.	
Revenue allowed for in the DPCR5 Settlement (£)	0	Indicative total Allowable First Tier Project Expenditure (£)	£1,490,000
Please tick if the project involves making payments to related undertakings			<input type="checkbox"/>
<p>The DNO must set out all payments that it proposes to make to itself or any Related Undertaking. Further, if a payment is to be made to any Related Undertaking that is a Distribution System User, the DNO must demonstrate that it has offered the same terms to similar Distribution System Users on the part of the network that is within the Project boundary and has used reasonable endeavours to identify such Users.</p>			
Please tick if the project conforms to the default IPR arrangements set out in the LCN Fund Governance Document?			<input checked="" type="checkbox"/>
<p>The DNO should indicate if the Project does not conform to the default IPR conditions. A justification for alternative arrangements and why the Project should still be approved must be provided, in accordance with paragraph 2.18 of the Governance Document.</p>			
Please tick if you do not consent to the First tier pro-forma being published in full.			<input type="checkbox"/>
<p>If you do not consent please identify any information in the completed First Tier LCN Project Registration that you do not wish to be published.</p>			
<p>The DNO must demonstrate that it (or its Project Partners) will face commercial harm from its disclosure and that information is considered eligible for exemption under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004.</p> <p>All information submitted within the First Tier LCN Project Registration Pro-forma will be made available on the Ofgem website, unless Ofgem has agreed otherwise as part of the Registration process set out above.</p>			