WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

Date of Submission

August 2019

NIA Project Registration and PEA Document

Notes on Completion: Please refer to the **NIA Governance Document** to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 7 pages in total.

Project Registration

Project Title

PCB Sniffer

Project Reference

WPD_NIA_042

Funding Licensee(s)

Western Power Distribution

Project Start Date

September 2019

Project Duration

Years	Months
0	8

Nominated Project Contact(s)

Steven Pinkerton-Clark

Project Budget

£110,000

Contact Email Address

wpdinnovation@westernpower.co.uk

Lead Sector

Electricity Distribution	☒	**Gas Transmission**	☐
Electricity Transmission	☐	**Gas Distribution**	☐

Other Sectors

Electricity Distribution	☐	**Gas Transmission**	☐
Electricity Transmission	☐	**Gas Distribution**	☐

Research Area

Network improvements and system operability	☐
Transition to low carbon future	☐
New technologies and commercial evolution	☒
Customer and stakeholder focus	☐
Safety, health and environment	☒

Problem(s)

Proposed changes to European Regulations on Polychlorinated Biphenyls (PCBs) have the potential to require all UK DNOs to test or replace all of their pre-1987, potentially contaminated, oil filled assets (the vast majority of which are transformers) by 2025. These assets were accidentally contaminated with PCBs before the Stockholm Convention banned them in 1987 (The 'Stockholm Convention' is an international environmental treaty that aims to eliminate or restrict the production and use of persistent organic pollutants). This would be in excess of 300,000 pole mounted and ground mounted items across the UK, of which around 94,000 are owned by WPD. While the ground mounted items could be tested in situ without considerable cost and inconvenience, the vast majority of the 300,000 items are pole mounted and essentially inaccessible.

Most UK DNOs use simple "Clor-N-Oil" test kits to sample a small quantity of oil for the presence of the chlorine within the PCB. This test removes the chloride from the PCB parent molecule which can then be colorimetrically determined. However, nothing is available to test live equipment either by accessing the oil or by testing vapours/emissions from the overhead equipment.

The ENA has calculated that replacement of all potentially contaminated items before 2025 could cost up to £1.8bn. Whilst transformer manufacturers have indicated that they could not meet the demand required by such a program.

Method(s)

The project will consist of the following elements:

1) A Paper Study to capture the state of the art learning in relation to the problem of optical spectroscopic detection and quantification of PCB molecules.

2) Laboratory measurements of some of the main PCB sub-elements to enable the provision of robust estimates of detection sensitivity of optical spectroscopic methods. This activity will be required only if the high-resolution spectroscopic data of PCB are too scarce or non-existent. The output of the activity 1) will inform the decision on activity 2).

3) Assuming spectroscopic data is available we will develop a model of the detection instrument and detection scenario to understand the prospects and limitations of various approaches and down-select the best solution given cost, timescale, performance and operational constraints in a laboratory environment.

Scope

This project has one phase, that is to carry out paper studies and laboratory testing for the detection of Polychlorinated Biphenyls (PCBs) in transformer oil vapor. The outcomes of this phase will feed into a second project where field trials will take place to optimize the method to test assets in situ whilst not interrupting customer supplies

Objective(s)

The objectives are:

1) To come up with a solution to test network assets which have been identified as having potential contamination of PCB's
2) Develop a central database of known contaminated assets to enable a targeted replacement programme which removes all contaminated assets before 2025
3) Share the potential learning across all DNO's to help facilitate the removal of all contaminated assets

Success Criteria

1) Demonstrating a potential solution to the wide scale replacement of assets is achievable; and

2) Demonstrating to the wider community that us and the industry are actively investigating solutions to this issue

Technology Readiness Level at Start	Technology Readiness Level at Completion
TRL 3	TRL 4

Project Partners and External Funding

In order to maximise the potential for success of the project, two organisations have been selected to undertake this work,

1) Willow (in partnership with RAL Space) and;
2) National Physical Laboratory (NPL).

Potential for New Learning

It is expected that the parties involved will learn to what degree this solution and associated methodology can accurately test transformer oil for the presence of PCB's without the need to gain access directly to the transformer oil and do so without interrupting customers supply.

Scale of Project

The project proposes that 2 separate companies carry out laboratory testing to confirm whether or not sufficient data can be retrieved from oil vapor to correctly identify PCB's within network assets, this lab testing is proposed to last a period of 8 months.

The key to the project's success is identifying that the vapor testing results correlate to physical samples, creating new parameters for a pass/fail solution when testing network assets.

Each project partner will work independently to each other to ensure that the results from the testing are blind and potentially multiple solutions could be found

Geographical Area

This project will not focus on a particular geographic area as the testing is laboratory based, but the implications will have an impact on all DNO's.

Revenue Allowed for in the RIIO Settlement

£0

Indicative Total NIA Project Expenditure

The project budget is £110,000, of which £99,000 is NIA expenditure and the remaining £11,000 is WPD expenditure.

Project Eligibility Assessment

Specific Requirements 1

1a. A NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

A specific piece of new (i.e. unproven in GB, or where a Method has been trialled outside GB the Network Licensee must justify repeating it as part of a Project) equipment (including control and communications systems and software)	☒
A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)	☐
A specific novel operational practice directly related to the operation of the Network Licensees System	☐
A specific novel commercial arrangement	☐

Specific Requirements 2

2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees ☒

Please answer one of the following:

i) Please explain how the learning that will be generated could be used by relevant Network Licenses.

Contaminated assets are an issue for all DNO's as each license area would have a large number of potentially contaminated assets with no solution to test so far as is reasonably particle every overhead asset without imposing a significant financial burden and health and safety risk to their employees to meet the proposed deadline of removing all PCB contaminated assets by 2025. This solution looks to target high risk assets that were commissioned prior to 1987 to definitively conclude which assets would need replacing as opposed to replacing all assets at a potential cost of £1.8bn across all GB DNO's.

ii) Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

WPD's Innovation Strategy seeks to identify and test ideas that show the potential to improve the efficiency and effectiveness in the way we deliver our services to customers. These innovation ideas are developed as part of a balanced programme of projects grouped by WPD around three main categories (Assets, Customers and Operations) and across five innovation themes that are common to the ENA's Innovation Strategy.

The proposed project (assessment of an alternative and lower cost approach to testing for PCB's in network assets for targeted replacement) fits in with the assets category and aligns with 'Network Improvements' and 'Safety, Health and Environment' themes.

Specifically, this project has the goal of further developing asset management strategies to minimise the cost of replacing network assets. This should be seen in the current context of existing strategies, which are to replace all assets of a certain age which are thought to be contaminated with PCB's.

Is the default IPR position being applied?

Yes	☒
No	☐

If no, please answer i, ii, iii before continuing:

i) Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties

N/A

ii) Describe how any potential constraints or costs caused, or resulting from, the imposed IPR arrangements

N/A

iii) Justify why the proposed IPR arrangements provide value for money for customers

N/A

2b. Has the Potential to Deliver Net Financial Benefits to Customers ☒

Please provide an estimate of the saving if the Problem is solved.

Solving the Problem (cost effectively identifying contaminated network assets without interruption of supply) would lead to improved CI and CML performance as current methods are intrusive and require the asset to be made dead in order for these testing methods to be carried out.. Having the ability to carry out this testing allows us to target the replacement of contaminated assets as opposed to replacing all assets of a certain age, the savings will be as a result of a reduction of equipment and installation costs, as well as disposal of hazardous waste and potential fines for failing to meet the requirements set by EU regulatory bodies.

Please provide a calculation of the expected financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost – Method Cost, Against Agreed Baseline).

Please provide an estimate of how replicable the Method is across GB in terms of the number of sites, the sort of site the Method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

The method (if proven successful) will be widely replicable across all GB DNO's as the application of the method will be aligned with the model distribution safety rules.

Please provide an outline of the costs of rolling out the Method across GB.

2c. Does Not Lead to Unnecessary Duplication ☒

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

Whilst testing for PCB's can be done by using oil samples, it cannot be replicated in a safe and cost effective manner on the overhead network due to access, this current method cannot be carried out without encroaching the safety and access clearances for live overhead conductors.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

N/A

Additional Governance Requirements

Please identify that the project is innovative (i.e. not business as usual) and has an unproven business case where the risk warrants a limited Research, Development or Demonstration Project to demonstrate its effectiveness ☒

i) Please identify why the project is innovative and has not been tried before

The testing for PCB particles in oil vapor is theoretical and therefore must be proven in a lab before

development of the testing method can be produced, technology already exists for the detection of particular contaminants but it is unknown what the level of detection will be, and is it sufficient enough to give a clear indication of contamination.

ii) Please identify why the Network Licensee will not fund such a Project as part of its business as usual activities

Given the current Technical Readiness Level of the product is 3, it is not yet appropriate to roll out such a method as part of business as usual activities.

iii) Please identify why the Project can only be undertaken with the support of the NIA, including reference to the specific risks (e.g. commercial, technical, operational or regulatory) associated with the Project

The requirement for this testing method has been driven by regulatory change (the removal of PCB contaminated assets by 2025 and the 'Stockholm Convention'), if a safe and cost effective method for testing live OH assets for PCB's is not found then DNO's will be forced to turn off supply to test or replace all assets that were commissioned prior to 1987.

Additional Registration Questions

These are required for summary section of registration; some areas can be copied from sections above.

Technologies (select all that apply)

☐ Active Network Management	☒ Environmental	☐ Network Monitoring
☒ Asset Management	☐ Fault Current	☐ Overhead Lines
☐ Carbon emission Reduction Technologies	☐ Fault Level	☐ Photovoltaics
☐ Commercial	☐ Fault Management	☐ Protection
☐ Condition Monitoring	☐ Harmonics	☐ Resilience
☐ Community Schemes	☒ Health & Safety	☐ Stakeholder Engagement
☐ Comms & IT	☐ Heat Pumps	☐ Substation Monitoring
☐ Conductors	☐ High Voltage Technology	☐ Substations
☐ Control Systems	☐ HVDC	☐ System security
☐ Cyber Security	☐ Low Carbon Generation	☐ Transformers
☐ Demand Response	☐ LV & 11Kv Networks	☐ Voltage Control
☐ Demand Side Management	☐ Maintenance & Inspection	☐ Gas Distribution
☐ Distributed Generation	☐ Measurement	☐ Gas Transmission
☐ Electric Vehicles	☐ Meshed Networks	☒ Electricity Distribution
☐ Energy Storage	☐ Networks Automation	☐ Electricity Transmission

Project Short Name

PCB Sniffer

Project Introduction

This project will demonstrate an alternative approach to testing for PCB's within network assets, this project will focus on the ability to carry this testing whilst the asset remains live therefore guaranteeing supply to our customers. This project will then feed into a second project where field trials will commence to prove the solution and develop a cost effective network asset management programme.

Project Benefits

The project aims to provide a better, more cost effective solution for testing PCB's in network assets, as a result customers will benefit through a reduction in supply interruptions due to the ability to test whilst the assets remain live, reducing customer inconvenience. These same avoided interruptions also have a benefit for WPD through the regulatory Interruption Incentive Scheme (IIS). Other benefits include removing known environmentally hazardous assets from our network and by correctly identifying these assets will have financial benefits by targeting replacement where there is known contamination.

PEA Version	1		
	Name and Title	**Signature**	**Date**
Prepared by			
Approved by			