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NIA Project Registration and PEA Document

Date of Submission

Aug 2019

Project Reference Number

NIA_WPD_042

Project Registration

Project Title

PCB Sniffer

Project Reference Number

NIA_WPD_042

Project Licensee(s)

National Grid Electricity Distribution

Project Start

September 2019

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Steven Pinkerton Clark

Project Budget

£110,000.00

Summary

This project will demonstrate an alternative approach to testing for PCBs 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.

Third Party Collaborators

Willow (in partnership with RAL)

National Physical Laboratory

Problem Being Solved

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.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

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.

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.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

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 the RIIO Settlement

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 Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

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 benefits the Solution

n/a

Please provide an estimate of how replicable the Method is across GB

The method (if proven successful) will be widely replicable across all GB DNOs 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.

n/a

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 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 system 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

RIIO-2 Projects

- A specific piece of new equipment (including monitoring, control and communications systems and software)
- A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven
- A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)
- A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology
- A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution
- A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

Contaminated assets are an issue for all DNOs as each licence area would have a large number of potentially contaminated assets with no solution to test so far as is reasonably practicable 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 DNOs.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

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 PCBs.

- Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

- Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

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

Whilst testing for PCBs 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 And Document Upload

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 laboratory 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.

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and 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.

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.

This project has been approved by a senior member of staff

Yes