Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Jun 2015

Project Reference Number

NIA_ENWL004

Project Registration

Project Title

Combined On-line Transformer Monitoring

Project Reference Number

NIA_ENWL004

Project Licensee(s)

Electricity North West

Project Start

September 2014

Project Duration

8 years and 1 month

Nominated Project Contact(s)

Electricity North West Innovation Team

Project Budget

£200,000.00

Summary

Previous research carried out under an IFI project defined an oil regeneration window for transformers at the end or near the end of their design life to extend it by approximately 10 years. The First Tier project deployed online monitoring equipment at six sites where the oil regeneration technique will be used.

This NIA version of the First Tier project will validate the data from the monitoring equipment and calibrate the previous IFI research.

These results will be fed into data visualisation software that will be developed to allow consistent comparison.

Electricity North West will work closely with an academic resource to validate the data and calibrate the life extension results.

Preceding Projects

PRJ_518 - Oil Regeneration

Third Party Collaborators

Camlin

Nominated Contact Email Address(es)

innovation@enwl.co.uk

Problem Being Solved

As part of operating an efficient network Distribution Network Operators need to maximise the use of existing assets. This forms a key part of our Innovation strategy for RIIO ED1.

Electricity North West has proposed that approximately 50% of the 132kV and 33kV transformers that traditionally would have been due for renewal in the RIIO-ED1 period will now be refurbished and the oil regenerated to improve the Health Indices.

These targeted transformers will be operating beyond their original design life and under a first Tier funded project Electricity North West installed online Dissolved Gas Analysis and Partial Discharge condition monitoring on six transformers to monitor their condition and assess their actual condition compared to academic research.

This approach also aims to extend the life span of the transformers at or near their original design life thus deferring their replacement and/or also avoiding de-rating based on age.

There is now a need for data visualisation of the results as well as further research into validating and calibrating the data from the installed on-line condition monitoring research into exploring the optimum life of a transformer.

Method(s)

The project will use the online DGA and PD monitoring equipment already installed under First Tier funding to further monitor the condition of the six 132kV transformers. This data will allow further academic research to develop an understanding of the effects of life extension on failure modes and maintenance requirements of assets. The actual data will calibrate the theoretical research data to prove that oil regeneration life extension is a safe, reliable and cost effective asset management technique.

The combination of these techniques would represent a holistic interpretation of transformer condition in near real-time and investigate the optimum life of a transformer which would be able to be utilised in future asset management strategies.

Scope

Previous research carried out under an IFI project defined an oil regeneration window for transformers at the end or near the end of their design life to extend it by approximately 10 years. The First Tier project deployed online monitoring equipment at six sites where the oil regeneration technique will be used.

This NIA version of the First Tier project will validate the data from the monitoring equipment and calibrate the previous IFI research.

These results will be fed into data visualisation software that will be developed to allow consistent comparison.

Electricity North West will work closely with an academic resource to validate the data and calibrate the life extension results.

Objective(s)

This project is split into two distinct phases:
Phase 1 is the development of a dashboard/ decision tool to be used by Electricity North West
This phase to be completed by April 2016.

Phase 2 is the Data validation of existing research into life extension by oil regeneration
This phase to be completed by Sept 2017

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Completion of dashboard and decision tool utilising the online results

Validate and calibrate the actual end of life oil regeneration results against research

Project Partners and External Funding

Camlin Power and the University of Manchester

Potential for New Learning

This project will lead to improved detection of early deterioration in assets that are approaching or have exceeded their design life as well as refurbished and oil regenerated units.

More accurate and up to date Health Indices of the assets

Contribute towards the RII0 Transformer Management strategy

Scale of Project

The project has been designed to allow a robust statistical sample of transformers sites.

As changes in oil chemistry can be slow the 3 year duration of the project is considered significant to allow modelling of the effects of oil regeneration over time as changes in oil chemistry can be slow.

Also running the project over a 3 year period will allow seasonal changes to be taken into account and to compare measured oil results to theoretical results over a number of years.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Electricity North West

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£200,000

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)

It is estimated that the saving with be £8.5 million by refurbishing and extending the life of 132kV and 33kV transformers at the end of their design life by a further 10 years.

Please provide a calculation of the expected benefits the Solution

The financial benefits of the project are based on the capital replacement deferment cost saving in the RIl0 1 period of seventeen 132kV and one hundred and nine 33kV transformers by 10 years. The cost of the any transformer refurbishment work, condition monitoring installation and monitoring cost have been deducted from the potential savings on a NPV basis.

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

Oil regeneration monitoring and life extension will be applicable to all the other DNOs with similar transformers which are within the oil regeneration window. Therefore it could be rolled out across all DNOs

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

Unknown

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

☐ 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

The project will produce all Policies and Procedures relating to the installation and operation of the condition monitoring equipment which will be made publically available to all DNOs. In addition will we also provide the necessary information to allow DNOs to conduct their own analysis of the data and decide when intervention needs to occur

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

Maximizing the use of existing assets by extending their life

☑ 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.

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

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

- [x] Yes