NIA Project Registration and PEA Document

Date of Submission

Mar 2015

Project Reference Number

NIA_NGET0158

Project Registration

Project Title

EPRI Research Collaboration on Overhead Transmission Lines Project

Project Reference Number

NIA_NGET0158

Project Licensee(s)

National Energy System Operator

Project Start

January 2014

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Iliana Portugues

Project Budget

£550,000.00

Summary

This project is divided into 4 tasks:

New Version of OHTL Inspection and Assessment Methods (IAM) Reference Guide (Yellow Book): This guide helps initiate a new overhead transmission line inspection and assessment program or refine an existing one. It focuses on degradation and inspection of line components, and procedures and technologies for inspecting and assessing components.

Methods to Assess the Condition of Overhead Electric Transmission Lines: Analytical tools/methods to assess overhead line performance in a more protective and risk based approach. Different methods are used to evaluate and compare the overall condition and operational status of their overhead transmission line assets to better manage and assess where inspection and maintenance resources should best be applied to reduce the risk of line failures. In 2013 work was initiated to collect information and understand what approaches are being employed by utilities to manage transmission assets, establish asset maintenance and inspection priorities and condition assessment. The plan this year is to use this information to develop and recommend an approach for establishing TL asset condition metric.

Population Assessments of Line Components: Currently no common methodology exists for the inspection and assessment of a population of all the various overhead line components in-service. This task aims to develop these techniques and build upon the initial concepts put forth for polymer insulators and compression connector line components. Employing these methodologies and procedures should enable us to detect, in a systematic and cost effective way, line components that are high risk as well as mitigate the effects of these high-risk units.

Overhead Transmission Line Component Performance Summaries: Over recent years EPRI has developed a number of

overhead transmission line component performance databases (e.g. polymer insulators) containing actual failure data or information from line components removed from service for various reasons. This technical update report will provide a synopsis of findings resulting from a periodic analysis of the data contain in each line component database.

Third Party Collaborators

Electric Power Research Institute

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

The electricity industry faces challenges that National Grid recognises are more cost-effectively and efficiently dealt with through international collaboration initiatives. In particular, challenges whose solutions require statistically diverse data sets and/or significant trialling and testing in different environments, under various conditions and/or diverse ways.

The Electric Power Research Institute (EPRI), with its wide international membership, is one of the routes through which these initiatives can be delivered and stakeholder value maximised. This approach of managing collaborative projects is beneficial to National Grid and our customers, providing valuable information, learning and knowledge, which would be more expensive to formulate on an individual basis.

In the area of overhead lines, utilities need to maintain consistent reliability standards, need to understand the condition of our overhead transmission lines and effectively manage and maintain them at their designed level of performance and safety. In order to do this, inspection and assessment is needed to understand the current condition of transmission assets, extend the life of those assets while keeping the aging infrastructure performance at levels that meet the reliability expectations of our consumers. New inspection and maintenance management practices and tools are continuous being developed and they can be effciently tested, trialled and reviewed through a collaboration with other networks with similar needs.

Method(s)

Inspection, Assessment, and Asset Management of Overhead Transmission Lines

The project will employ a tiered approach to develop a number of materials and then help to quickly incorporate those tools into everyday work practices. This research project will perform the following tasks:

1. Develop and document an understanding of component degradation, indicators and symptoms of impending failures, as well as effective inspection practices and technologies in the *Inspection and Assessment Methods (IAM) Reference Guide*, the EPRI Yellow Book.

2. Develop computer-based instruction systems to help in technology transfer of assessments, technologies, and components.

3. Develop and improve field guides for field personnel that help identify and provide information on the condition of components and remedial action if necessary.

4. Develop fleet management approaches to assess the overall health and condition of overhead transmission assets.

5. Develop and host hands-on tech transfer workshops and conferences.

6. Develop techniques for systematically inspecting and assessing an in-service population of various line components to identify the at-risk component classes.

7. Provide a statistical analysis of overhead transmission line component history contained in EPRI's databases.

Scope

This project is divided into 4 tasks:

New Version of OHTL Inspection and Assessment Methods (IAM) Reference Guide (Yellow Book): This guide helps initiate a new overhead transmission line inspection and assessment program or refine an existing one. It focuses on degradation and inspection of line components, and procedures and technologies for inspecting and assessing components.

Methods to Assess the Condition of Overhead Electric Transmission Lines: Analytical tools/methods to assess overhead line performance in a more protective and risk based approach. Different methods are used to evaluate and compare the overall condition and operational status of their overhead transmission line assets to better manage and assess where inspection and maintenance resources should best be applied to reduce the risk of line failures. In 2013 work was initiated to collect information and understand what approaches are being employed by utilities to manage transmission assets, establish asset maintenance and inspection priorities and condition assessment. The plan this year is to use this information to develop and recommend an approach for establishing TL asset condition metric.

Population Assessments of Line Components: Currently no common methodology exists for the inspection and assessment of a population of all the various overhead line components in-service. This task aims to develop these techniques and build upon the initial concepts put forth for polymer insulators and compression connector line components. Employing these methodologies and procedures should enable us to detect, in a systematic and cost effective way, line components that are high risk as well as mitigate the effects of these high-risk units.

Overhead Transmission Line Component Performance Summaries: Over recent years EPRI has developed a number of overhead transmission line component performance databases (e.g. polymer insulators) containing actual failure data or information from line components removed from service for various reasons. This technical update report will provide a synopsis of findings resulting from a periodic analysis of the data contain in each line component database.

Objective(s)

This project aims to document the latest inspection and sensing technologies for overhead transmission lines, as well as early adopters' experiences with these technologies. Some technologies are tested and evaluated and results disseminated. Test results and demonstrations aim to help us make more informed decisions when deciding whether to implement / deploy such technologies.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

On successful completion of this work, the following 4 deliverables will be developed successfully:

1) A technical guide reviewing OHTL Inspection and assessment methods: This work focuses on the degradation and inspection of line components, procedures and technologies for inspecting and assessing components.

2) A technical guide detailing methods to assess the condition of overhead electricity transmission: This deliverable details the output of the work conducted to develop an analytical tool to assess overhead line performance in a more protective and risk-based approach.

3) A technical report looking at population assessments of line components: This report will detail techniques and methodologies for the inspection and assessment of a population of all the various overhead line components in-service.

4) A technical report summarising the performance of overhead transmission line component performance: This report will provide a synopsis of findings resulting from periodic analysis of the data associated with the performance of each component.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

These projects are predominantly laboratory or desk based projects, with a minimal amount of site trials as required and as such there is no scope to reduce the scale of the projects any further.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The research undertaken in the EPRI Overhead Lines programme is predominantly carried out in the UK and the US, although the programme also reviews the latest research from across the world.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

NGET NIA £50,000

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)

Each project will have different financial savings based on the outcomes and potential benefits gained. Each EPRI programme that National Grid joins has been through three stages of review that consider the potential to deliver financial benefits.

In the first instance, within EPRI's governance, the Research Advisory Committee provides guidance on policies and issues that impact the power industry to inform the content of the research programmes.

Within National Grid, the Technical Leader for each aspect of the GB Transmission Network undertakes a review of the proposed EPRI programme relevant to their technical expertise and responsibilities and evaluates which provide potential value from a GB perspective as part of an annual review of which programmes to participate in.

This project is expected to generate valuable learning which can improve and maintain the reliability of the system.

Please provide a calculation of the expected benefits the Solution

Not required for research projects.

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

Overhead lines are all around the UK. All Licensed Network Operators have overhead lines at various voltages which could benefit from the work being conducted here.

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

The direct cost of making a policy or procedure change could range from as little as ten thousand to hundreds of thousands of pounds depending on the complexity of the change implications. The wider cost implications arising from such changes will be dependent on the specific outcomes generated from the project and typically will be subject to further stages of demonstration prior to roll out. Further information regarding roll out costs can be provided prior to demonstration stage.

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

All GB electricity licensees own and manage overhead conductors. They all face similar challenges around estimating remaining life and managing the assets whilst maintaining reliability standards.

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

This project addresses our challenge and objective of delivering reliable electricity to our consumers whilst managing our assets in the most cost-effective manner.

☑ 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.

n/a

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

☑ Yes