NIA Project Registration and PEA Document

Date of Submission

Jan 2014

Project Reference Number

NIA_NGET0140

Project Registration

Project Title

OHL Condition Assessment

Project Reference Number

NIA_NGET0140

Project Licensee(s)

National Grid Electricity Transmission

Project Start

February 2014

Project Duration

2 years and 5 months

Nominated Project Contact(s)

Fan Li

Project Budget

£217,250.00

Summary

The project scope is to provide optimised condition assessment sampling for OHL conductors and improve the way National Grid makes use of existing data by applying it across the England and Wales Transmission network. This methodology allows other measures of asset condition to be incorporated into the model, and also has the potential to be applied to the condition assessment of other transmission assets.

Nominated Contact Email Address(es)

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Problem Being Solved

National Grid need to understand the condition of lead assets on the transmission system in order to ensure security of supply and to maintain a fit-for-purpose transmission system. These condition based assessments inform Asset Management decisions, and play a vital role in deciding which work is prioritised. For Over Head Line (OHL) conductors, National Grid currently takes samples on a targeted basis to understand the condition of the conductor. However the sampling technique is invasive and can be subject to operational constraints. National Grid have a need to infer condition on thw whole of the network based on existing sample results and to understand where best to target future sampling.

Method(s)

Research

Existing data can be used to assess conductor condition on other parts of the network, such as, but not limited to, similar types and ages of conductors that are located in similar environments and experience similar operational conditions. Brunel University will use a technique called Bayesian network statistical modelling, a technique that deals with probability inference: using the knowledge of prior information to predict future information. The Bayesian network will combine qualitative engineering knowledge with existing quantitative sample data to maximise the use of information.

A further technique known as active machine learning - a learning algorithm that is able to interactively query the information source to obtain the desired outputs at new data points - will be explored. This measures the uncertainty in the Bayesian network model. The highest level of uncertainty in this model will form a feedback loop which will determine the locations across the network where future sampling should be undertaken. This will improve the efficiency of future sampling programmes.

The techniques will be applied for National Grid's overhead line transmission network distributed across England and Wales and especially sites connected with ACSR conductors installed during 60s and 70s.

This project will engage with consumers through Ofgem's RIIO regulatory framework and innovation reports.

Scope

The project scope is to provide optimised condition assessment sampling for OHL conductors and improve the way National Grid makes use of existing data by applying it across the England and Wales Transmission network. This methodology allows other measures of asset condition to be incorporated into the model, and also has the potential to be applied to the condition assessment of other transmission assets.

Objective(s)

- Refined understanding of the condition of National Grid's OHL system by extracting maximum value from existing data
- Optimisation of National Grid's future OHL conductor sampling programme
- Refined deteriation models that can be used to better forecast network risk

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project is successful if it delivers:

- Report detailing the application of proposed methodology within the National Grid Electricity Transmission business.
- England & Wales OHL Conductor Condition Assessment Model identifying varying degrees of uncertainty, focussed on ACSR circuits, 30-50 years old.
- The tools and techniques to inform a National Grid policy change with regards to the OHL conductor condition assessment based on the outcome of the above two deliverables.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project is being delivered in a University, as a desk based study. The scale of the project cannot be reduced further without compromising the possibility of meeting the objectives.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project is being delivered at Brunel University, London.

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£217,250

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)

Unreliable or inconsistent condition data of OHL conductors on the transmission system may result in inefficient investment. Premature investment could cost up to £20,000 per circuit km over ten years.

Please provide a calculation of the expected benefits the Solution

Research project - Not required.

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

This methodology can be applied to the whole of the GB OHL transmission system.

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

This work will provide a methodology that can be applied to the whole of the GB Transmission system. Roll out costs are expected to be limited to training personnel, which will be covered in the normal operations of the company.

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

n/a

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 the following parts of the National Grid Electricity Transmission Innovation Strategy:

Reliability : Optimising Asset Management

Connections : Smarter Transmission Philosophy

System Operability : Smarter System Operation

☑ 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