

NIA Project Registration and PEA Document

Date of Submission

Sep 2014

Project Reference

NIA_NGET0147

Project Registration

Project Title

Condition Monitoring of Power Assets (COMPASS)

Project Reference

NIA_NGET0147

Project Licensee(s)

National Grid Electricity Transmission

Project Start

October 2014

Project Duration

1 year and 6 months

Nominated Project Contact(s)

Carl Johnstone & Ian Kerr

Project Budget

£540,000.00

Summary

The overarching aim of this project is to create an holistic approach to the currently discrete and separate power asset condition monitoring systems in order to optimise the introduction of improved power asset condition monitoring and diagnostics whilst reducing the costs and risks of delivery. This project also aims to develop the processes to enable a continuous improvement system for future technology evaluation, implementation and gap analysis.

In order to achieve this, the project will research existing and develop enhanced capabilities to convert data monitoring systems into actionable information for asset management and policy generation. Based on this, systems capable of measuring all required parameters will be developed and demonstrated.

Nominated Contact Email Address(es)

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Problem Being Solved

The challenge dealt with in this proposal arises as a result of an increasingly ageing fleet of assets on the system and their replacement with novel equipment from new-entry suppliers. Large parts of the Electricity Transmission network were constructed between the 1950's and 1970's. The conventional approach to maintaining the reliability of the transmission system as equipment reaches the end of its designed operational life is to remove them completely and replace them on a new for old basis. Some of these

low-cost replacement options nowadays come from new, inexperienced markets. Although replacement will continue to be the most appropriate solution in some cases, National Grid has been increasingly adopting alternatives including refurbishment and managed life extension accompanied by enhanced monitoring and maintenance regimes to manage risks.

Fundamental to making the best decisions about which option to adopt is reliable, objective and evidence based information about the condition and therefore potential remaining operational capability of the transmission assets.

Whilst National Grid Electricity Transmission has a very good understanding of the characteristics of the transmission asset fleet, significantly aged assets alongside new, untested ones carry with them a greater level of uncertainty and risk requiring an increased amount of testing, monitoring and maintenance. This has led to an increased demand for quicker, more informed and quantitative decisions about asset condition. In parallel, technological capabilities are increasing at an exponential rate with a growing number of systems entering the market and very little published evidence of the comparative performance between them as well as a lack of clarity about which technologies work under what conditions, or perhaps more importantly which ones don't work reliably under certain conditions.

By developing a body of evidence about what diagnostic technologies are available and how well they perform, Utilities will be able to make informed decisions in order to implement the most optimised solution. It is also foreseen that incorporating these technologies, not as isolated solutions, but integrated as part of business processes will enable better implementation and allow future enhancements to be identified. This full integration of systems and technologies has the potential to reduce the lead-time for the introduction of individual technologies and is likely to lead to greater overall benefit.

This strand of the overall COMPASS strategy will develop integrated, autonomous surveying radio frequency (RF) and infrared (IR) tools capable of simultaneously monitoring both variables and tagging the output to individual assets.

Method(s)

Research, Development and Demonstration

The method proposed is divided into six distinct phases:

1. Development of prototype systems capable of integrating RF and IR diagnostic technologies and visualising their output.
2. Development of improved algorithms with confidence metrics for both detection and location to allow a better understanding of the information and data obtained.
3. Research and development of a data and information gateway to allow standardisation.
4. Development of data and information standards for data collection, processing and visualisation.
5. Testing and analysis of novel autonomous technologies including various location tagging possibilities.
6. Development of procedures and technical guidance notes to allow these new methods to be incorporated into business as usual.

Scope

The overarching aim of this project is to create an holistic approach to the currently discrete and separate power asset condition monitoring systems in order to optimise the introduction of improved power asset condition monitoring and diagnostics whilst reducing the costs and risks of delivery. This project also aims to develop the processes to enable a continuous improvement system for future technology evaluation, implementation and gap analysis.

In order to achieve this, the project will research existing and develop enhanced capabilities to convert data monitoring systems into actionable information for asset management and policy generation. Based on this, systems capable of measuring all required parameters will be developed and demonstrated.

Objective(s)

The main objective is to develop a novel condition monitoring tool integrating various technologies and automating the process so as to provide more efficient substation surveying and reduce the possibility of errors at the time of analysis and tagging results to particular assets.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be evaluated on the following criteria:

- Better understanding of high value benefit areas for follow up development
- Delivery of de-risked prototype systems: A standalone 3-D location system with automatic camera tracking capability and an autonomous, hand-held surveying tool
- Successful evaluation of capabilities and limitations of solutions and R&D technology
- Successful integration of solutions into quickly deployable and intrinsically safe monitoring systems and associated data processing system.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project involves the development and testing of prototype combined RF and IR condition monitoring equipment. As such, we cannot reduce the scale further and provide benefits to customers.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The project will be mostly delivered within the Midlands Area though also demonstrated and tested in other parts of Great Britain's transmission network.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

£540,000 National Grid Electricity Transmission NIA 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)

The solutions being developed through this project have the potential to deliver savings, through reduced cost of repair/refurbishment and replacement, of up to £19m over ten years.

Please provide a calculation of the expected benefits the Solution

The average expected life of the majority of high voltage assets is of 40-60 years. It is estimated that successful implementation of this technology could possibly lead to substation life extension allowing for better outages to be planned and staggered. Hence, the base cost could be estimated to be up to £2M per annum.

The method cost once full development, testing, productisation and training has been complete would be in the order of £1M.

If we spread the financial benefits over a period of 10 years,

$$B-M = £20M - £1M = £19M$$

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

This methodology can be applied to every GB Transmission asset.

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

An approximate roll-out cost is in the order of £1.5M

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

RIO-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 (RIO-1 only)

n/a

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