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NIA Project Registration and PEA Document

Date of Submission

Dec 2018

Project Reference Number

NIA_NGTO029

Project Registration

Project Title

Assessment of Wireless Technologies in a Substation Environment

Project Reference Number

NIA_NGTO029

Project Licensee(s)

National Grid Electricity Transmission

Project Start

January 2019

Project Duration

1 year and 6 months

Nominated Project Contact(s)

Linwei Chen

Project Budget

£150,000.00

Summary

Wireless Solution adoption rates are growing in providing communications infrastructure across industries that increases flexibility and opportunity to provide/improve services. Along with increasing take-up rates comes with the challenge of more cyber threats to gain access to data and control assets. National Grid wants to explore the capabilities of wireless technology within a substation environment to identify/support innovative opportunities. While exploring these opportunities, utilities need to be aware of the levels of threat to the transmission network depending on the types of wireless solutions identified. This project will investigate opportunities of using wireless applications and develop the associated cyber threat models to understand impacts on substation security.

Nominated Contact Email Address(es)

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Problem Being Solved

With the current wireless technology and the onset of 5G wireless environment the opportunity to utilise this capability will increase to find cost-effective solutions and opportunities to provide customer value on the way National Grid manages the Transmission Network. With increase in its usage comes with the increase in the challenge of cyber threats due to the potential of providing more access points to our data/communications networks.

For national critical infrastructure to benefit from the wireless technologies it requires significant confidence that proposed solutions are robust and will be resilient to cyber attacks. The project will provide an approach to realizing these benefits.

Method(s)

The use of an external supplier provides National Grid with a wider breadth of information and access to specialised knowledge on the topic of Wireless Solutions and their associated threats of implementation.

- Phase I – Substation Environment – understand the data flows from a selection of different types of substations.
- Phase II – Technology Options – identify wireless solutions that will provide benefits/opportunities and their associated threats to implement.

- Phase III – Regulatory Considerations – identify any gaps in Cyber Security frameworks regulatory/non-regulatory that would prevent full implementation of identified solutions.

The above method has been developed in addressing the project outcomes in a systematic approach with checkpoints when each phase is completed.

Scope

This project will be carried out through a staged approach, including the following work packages (WPs).

WP1

- Models of different types of substations, including assets, current and future processes and information flows.
- Presentation of the deliverables from Phase I for feedback and agreement.

WP2

- Evaluating technology options with auditable analyses determining the preferred option and associated performance improvements.
- Developing the Threat Model for the preferred technology option.
- The results from a series of desk-based simulations to demonstrate how cyber-attacks would be detected and blocked.
- Presentation of the deliverables from Phase II for feedback and agreement.

WP3

- Documentation of how the preferred solution adheres to the regulatory requirements.
- Documentation of 'gaps' in the regulatory requirements and recommendations of mitigation methods.
- Presentation of the deliverables from Phase III for feedback and agreement.

Objective(s)

To explore how wireless communication, especially considering the emerging technologies, within the substations could realise operational and commercial benefits while also ensuring that the required levels of security are met or surpassed.

- The current and emerging wireless technology choices that could be suitable for electricity substation needs of today and the future;
- The relative, technical merits of each option;
- The security, commercial and operational requirements that need to be achieved;
- The most appropriate Threat Model;
- The alignment of the solution with the programmes being undertaken by the Centre for Protection of National Infrastructure (CPNI), including their work with the National Cyber Security Centre (NCSC), Cabinet Offices and lead Government departments and agencies.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project success will be based upon:

- Demonstration of a thorough understanding of the information and technology and operational Substation environment complete with current and future needs.
- A selection of suitable wireless technologies that provide benefits and opportunities for electricity substations with the associated threats identified coupled with regulatory gaps that would prevent implementation.

Project Partners and External Funding

N/A

Potential for New Learning

This project will enhance our understanding of the viability of using wireless technologies to improve asset monitoring and maintenance activities, e.g. automatic data collecting processes to reduce site access. In addition, the cyber threats associated with substation communication systems could be better understood and used to support investment decisions on mitigation methods.

Scale of Project

The project duration is estimated at 4 to 6 months and will require several workshops with National Grid personnel to complete the discovery phase 1, then for solutions proposal and technical report will be completed at the supplier office.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

Desk Based with possible visits to an operational substation for further learning on its operation.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total NIA project expenditure is £150,000.

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)

This project provides values to the customer:

1. Ensure that the use of wireless solutions to manage the transmission network does not impact reliability, availability and security of service.
2. Provide opportunities to utilise wireless technology to reduce the cost of operating transmission networks.
3. Improve management decisions and planning through a much richer, more detailed understanding of the operational data;
4. Enhance health and safety as there is less reliance on people having to maintain cables and infrastructure, often located in hazardous environments;

The resulting commercial benefit will be analysed in WP2 for each proposed wireless solution.

Please provide a calculation of the expected benefits the Solution

Not required as this is a research project.

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

The methodology will be able to be applied to other transmission/distribution networks as it is developing a process of assessing system digital performance requirements and then mapping to wireless solutions and identifying cyber threats.

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

Unable to provide costs at present until a technical solution is identified which can be used to formulate a cost of implementation across the network.

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

As the focus to ensure that transmission/distribution networks are resilient to Cyber attacks any positive outcomes from this project can be shared with other Network Licenses to increase awareness.

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 fits within the Managing Assets value area of the Electricity Innovation Strategy.

- 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.

The project is targeting specific research to an approach on how to assess substation digital requirements and to identify suitable wireless solutions. There are several mentions of utilising wireless communication on the Smarter Network portal but do not consider the cyber resilience of the solutions identified as in this project. Also, previous researches focused on specific applications for condition monitoring, while this project will explore a wider range of opportunities to use wireless technologies.

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

This project looks at the historical operational environment of different types of substations to understand the required performance in communication/data/access needs and to link these individual elements to tailored wireless solutions coupled with their benefits and cyber security threats. The approach is not to provide one sized fit solution but different solutions to meet the needs of the applications.

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

National Grid has already developed standards for communications/data flows for substation operation and will require significant rigour and governance approval for the use of wireless technology to ensure network integrity. The NIA funding offers the most appropriate route for the National Grid Electricity Transmission (NGET) to: • identify suitable wireless technologies for all communications and data flows, • understand the proposed wireless solution performance against cost, cyber security and implementation challenges.

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

This project needs to be undertaken through NIA funding due to several risks Technical – there is a risk that proposed wireless solutions do not meet National Grid Substation operational standards. Operational – there is a risk that wireless solutions will deteriorate substation operational performance. Regulatory - there is a risk that wireless solutions will not meet cyber security frameworks/standards by governing bodies.

This project has been approved by a senior member of staff

Yes