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

May 2018

Project Reference Number

NIA_NGTO005

Project Registration

Project Title

EPRI Research Collaboration on Information and Communication Technology

Project Reference Number

NIA_NGTO005

Project Licensee(s)

National Grid Electricity Transmission

Project Start

January 2018

Project Duration

2 years and 6 months

Nominated Project Contact(s)

Linwei Chen

Project Budget

£278,090.00

Summary

This project collaborates with the Electric Power Research Institute (EPRI) on workstreams below:

- Substation Data Management and Infrastructure
- Extraction and Integration of Data Sources
- Interoperable Communications Architectures, Device Management and Standards
- Assessing Augmented Reality for the Electricity Industry
- Integrated Network Model Management

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

National Grid recognises that the challenges faced by the electricity industry can be more efficiently and cost-effectively addressed when approached through international collaboration initiatives. It is particularly useful when addressing challenges where the 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, thereby maximising stakeholder value. The approach of managing collaborative projects within an internationally driven research and development initiative is beneficial to National Grid and consumers alike, because it provides valuable information, learning and knowledge that would be considerably more expensive if approached on an individual basis.

We are increasingly deploying monitoring, communications, computing, and information technologies to enable transmission system modernisation applications such as wide area monitoring and control, asset management, distribution automation, integration of distributed energy resources, and demand response. We face significant challenges when deploying these technologies, including:

· selecting the technologies that best meet current and future business needs, while minimizing the risk of early obsolescence and vendor lock-in

· creating an overall architecture that integrates the many intelligent devices, communications networks, and enterprise systems to leverage resources and provide information to all users

· managing the tremendous amount of data that is generated

· managing a growing network of intelligent devices that have different capabilities and use different protocols and data formats in a way that optimizes performance

· creating pervasive, resilient communications networks that can enable multiple applications.

Following an internal review, National Grid have determined that the largest leverage for the UK consumer can be achieved through involvement in the following three project areas:

· P161.046: Substation Data Management and Infrastructure

· P161.047: Extraction and Integration of Data Sources

· P161.048: Interoperable Communications Architectures, Device Management and Standards

National Grid also believe there is an advantage from participation in the following two supplemental projects:

· Assessing Augmented Reality for the Electricity Industry
Integrated Network Model Management

Method(s)

· P161.046: Substation Data Management and Infrastructure

We are making large investments in various sensor technologies to provide real-time information for managing the grid and grid assets. In addition, as more devices are put online and provide increased amounts of data back to operations, utilities will need to consider upgrading their analytic tools to turn the raw data into useful, actionable information. This project will evaluate data management methods implemented by participating members and provide recommendations to improve the operational efficiency and management of the infrastructure.

· P161.047: Extraction and Integration of Data Sources

There is an ever increasing capture of operating and asset condition data within substations that tends to be in proprietary formats and requires vendor specific tools to obtain. While this data is valuable in its own right for its intended purpose, greater value can be obtained when the data is combined with other information to give it better context.

· P161.048: Interoperable Communications Architectures, Device Management and Standards

Substations are evolving to becoming critical data hubs. They are capable of generating a wide variety of data from asset conditions sensors, traditional operations measurement that support SCADA, and event-driven data such as fault records. Capturing and communicating all of this data to all the needed locations within and external to the substation is challenging since these sources tend to have discreet standards that define how each device should communicate. Bringing the output of these standards together into a holistic approach can bring operational benefits to the utility.

· Assessing Augmented Reality for the Electricity Industry

Augmented reality (AR) technology overlays information in real-time onto a person's view of the world through the use of mobile computing devices and graphics. AR goes beyond mobile computing and GIS technologies being used today. AR is developing rapidly and has the potential to improve the productivity and safety of our operations teams.

· Integrated Network Model Management
This project will analyse the requirements and develop solution strategies for integrated power system network model management within the transmission system.

Scope

EPRI research projects span across multiple years. Because of this approach, not all of the deliverables for this project will be in 2018. Nevertheless, there is scope for the delivery of a number of valuable outputs, reports and guidance documents in 2018. The full scope of research within each work-stream is listed below:

· P161.046: Substation Data Management and Infrastructure

This R&D will assess and document the various approaches that have been used to implement data management methods. The project will investigate two areas: data classes and data linkages. Data classes are the macro groups of data such as analogue measurements, binary status, images, etc. The data linkages will investigate the relationship between the transmission system and other, related network data such as equipment state, and identify gaps in the ability to link related data together.

· P161.047: Extraction and Integration of Data Sources

This project will seek out specific opportunities to investigate actual datasets from substations to further expand the industry knowledge associated with asset condition, reliability, and other metrics. Specifically, it will seek to gather digital fault records, asset health monitor and other substation data, and manipulate it into useful data models and databases to develop industry leading analytics.

· P161.048: Interoperable Communications Architectures, Device Management and Standards

The project will begin with a survey to gather information regarding the variety of protocols used in member substations, and plans for near term additions. The results of the survey will be used to establish a baseline set of requirements. These requirements would then be applied to a set of architectures (compatible with the legacy state) in order to allow for a systematic migration to a more supportive and comprehensive substation communication approach.

The project will also assess and establish the corresponding approach to migration which will consider requirements for device management and their related standards. Remote device management will be a critical service requirement as the volume of intelligent electronic devices expands and creates a non-sustainable manpower requirement. Much like other industry advances such as telephony, remote management is the norm and a standard way of doing business.

· Assessing Augmented Reality for the Electricity Industry

This project will hold a series of workshops that will bring the electricity industry and AR technology providers together with the objective for us to understand the possibilities of the technologies and the AR technology companies to understand the working environment of the electricity industry. These workshops will seek to identify activities that would benefit from AR and collaboratively develop use cases, assessment protocols and the required standards around priority activities.

· Integrated Network Model Management

The objective of this project is to assess the current business practices related to network model data management across transmission system operations, planning and protection and to develop an overarching model management process that may reduce model errors, improve overall data quality and minimise maintenance labour. This project will investigate the network model data needs of common transmission system applications and propose new approaches to coordinated transmission network model maintenance.

Objective(s)

The objectives for 2018 include the delivery of a selection of associated reports and guidance documents. Key deliverables include:

P161.046: Substation Data Management and Infrastructure

This project will develop the necessary metadata required to track and assure that the data being used has a traceable path from it source. Besides linking the data to provide better context the project will also develop mechanisms to assure that the version of the data used is correct for the situation under consideration. It will also identify mechanisms and commercially available tools to support these activities.

P161.047: Extraction and Integration of Data Sources

This project will investigate business enhancement opportunities that arise when data from various substation sources is extracted from its native source and combined with other relevant data in standardised formants that are easily analysed. The expected result is a comprehensive data management approach leading to a long-term standards-based solution suitable across the utility industry. The development of extraction tools needed to transform the data for analysis in open platforms will be placed in the appropriate open source repositories for benefit of the public.

P161.048: Interoperable Communications Architectures, Device Management and Standards

This project will work to establish integrated data capture and replay methods that will allow for better situational awareness, post-event analysis, and establish standardised approaches to interrogate the device operating characteristics, through the use of device management software tools.

Assessing Augmented Reality for the Electricity Industry

The objective of this project is to bring AR technology developers and electric utilities together to assess the application of augmented reality solutions for the electricity sector.

Integrated Network Model Management

The outcome of this assessment is expected to be a common process for the management of transmission power system network model data across the transmission enterprise.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Key success criteria include the delivery and presentation of:

P161.046: Substation Data Management and Infrastructure
Substation Data Management – Initial Assessment Tech Update - Initial assessment of substation data management use case requirements

P161.047: Extraction and Integration of Data Sources
Substation Data Mapping Tech Update - Initial substation data map presenting preliminary data linkages and gaps

P161.048: Interoperable Communications Architectures, Device Management and Standards
Interoperable Communications Architectures Tech Update - Interoperable Communications Architectures with Device Management Considerations

Assessing Augmented Reality for the Electricity Industry
Use cases and requirements for activities that may benefit from AR
AR technology assessment framework
Several technology assessments based on demonstrations
Regular utility / AR developer forums
Benefit-Cost analyses of technologies and use cases demonstrated in the project

Integrated Network Model Management

The final report will cover:
Existing Situation - Documentation of existing network model information flows.
Proposed Solution – Description of a network model management architecture meeting the requirements and situation of the utility. Business process impacts and potential benefits are considered.
Potential Implementation Strategies – Overview of several 'next steps' the utility might take to start down the path toward improved network model data management.

Project Partners and External Funding

Each project facilitated by an EPRI programme is funded through collaborators, including National Grid, that contribute to the development of the project portfolio and then express interest in to be involved with a specific project once the portfolio is decided. The total contribution to P161 and the two supplemental programmes in 2018 is $6m.

Potential for New Learning

EPRI's varied programme enables National Grid to generate new learning relating to Information and Communication Technologies. Each project provides opportunities for extensive learning.

Scale of Project

The project work-streams associated with this project are predominantly laboratory or desk based projects, with a minimal amount of site trials, if and when required. Because of this approach, 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

TRL3 Proof of Concept

Geographical Area

The research undertaken by EPRI is predominantly carried out in the US, with some work in the UK, although the programme also reviews the latest research from across the world. Additional testing facilities in Canada may be used, where appropriate.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total NIA expenditure is £278,090.

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 work-stream will have different financial savings based on the outcomes and potential benefits gained. Each EPRI programme that National Grid joins has been through several 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 Lead 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.
The work-packages within P161 and the two supplemental projects are 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

Each project will generate learning which can be applied to all of the GB Electricity Networks where Information and Communication Technology has been deployed across the transmission and distribution networks.

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 of the GB Electricity Networks are increasingly deploying monitoring, communications, computing and information technologies to enable grid modernisation applications. Therefore, the learning from EPRI ICT Project 161A will be relevant to all network Licensees.

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 (chose from below) value area of the Electricity Innovation Strategy:

- Managing Assets - Managing assets throughout their lifecycle

☑ 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.

By participating in collaborative projects through EPRI National Grid can ensure that unnecessary duplication with other projects under NIA is avoided.

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

National Grid is increasingly deploying monitoring, communications, computing and information technologies and, therefore, research of this nature is critical to help shape our understanding of how we can best employ this data to drive grid modernisation.

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

The nature of a research programme means it inherently carries a risk that the research may be unsuccessful and/or identify unforeseen barriers to implementation and National Grid is unable to consider research of this scale as business-as-usual. However, the risks associated with EPRI research programmes are mitigated by the consortium approach and, therefore, this project meets the criteria for NIA funding.

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

The approach of managing collaborative projects within an internationally driven research and development initiative is beneficial to National Grid and consumers alike, because it provides valuable information, learning and knowledge that would be considerably more expensive if approached on an individual basis. This learning will be relevant to all Network Licencees and will be shared appropriately to benefit the industry and is, therefore, best and appropriately supported by the NIA.

This project has been approved by a senior member of staff

☑ Yes