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

Feb 2014

Project Reference Number

NIA_SPT_1301

Project Registration

Project Title

Electrical Power Research Institute Programme Engagement

Project Reference Number

NIA_SPT_1301

Project Licensee(s)

SP Energy Networks Transmission

Project Start

January 2013

Project Duration

3 years and 1 month

Nominated Project Contact(s)

James Yu (Future Networks Manager)

Project Budget

£239,540.00

Summary

In 2013, EPRI's Grid Operations research programme offer a focused research portfolio with the following objectives:

- Improving system reliability and reducing operational risks through the improved situational awareness of operators, including the incorporation of equipment health information into the control room and the identification of operating boundaries and margins
- Supporting operators in identifying potential voltage stability concerns in real-time and ensuring that steady-state and postcontingency system voltage performance is maintained, utilising the optimal mix of available reactive resources
- Reducing the risk of wide-area events and improving restoration time and reducing outage costs through identifying optimal blackstart capability requirements and developing restoration optimisation methods and guided control decision –making when separation may be the best choice
- Developing advanced analysis algorithms that utilise emerging hardware and software enabled approaches to increase computational efficiency of control room applications while increasing the resolution of the calculations to take advantage of new inputs such as synchrophasor data to support operator situational awareness and decision support.

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

In many ways, today's power system must be operated to meet objectives for which it was not explicitly designed. Today's transmission system is operated to transfer larger amounts of energy than were considered when it was built, and it is operated much closer to the margin. Generation resources are more constrained and increasingly more variable and uncertain.

Under these circumstances, it is imperative that network operators and network owners are provided with good information based on real-time data regarding the status of the system, as well as decision-making support information to respond to rapid changes in the

future. The emergence of new sources of real-time data that are becoming available from synchrophasor measurements, asset health sensors, and forecasts of future load and variable renewable output levels enable the possibility of providing operators with increased situational awareness and advanced decision-support tools. These tools enable operators to reliably and economically operate the system in the face of emerging challenges.

On the contrary, there is limited knowledge or experiences regarding how to use the information effectively at transmission level. Mathematic model for network, complicated estimation technology and data transfer limitations have to be studied. In that case, there is currently a gap (hence a clear need) to comprehensively understand the reliability and characteristics of data from different sources and to define a clear (and realistic) functions list for software (and/or hardware) for the transmission industry.

Method(s)

The membership will enable the participation of Electrical Power Research Institute (EPRI) Grid Operations research programme. This programme is reviewing the industrial standards and the latest R&D information at international level, exploring potential software development strategies based on non-linear estimation methods. The outcomes will feed into specifications (including functions for future proofing) to make full use of synchrophasor measurements data for assessing system stability, reactive power support, and the capabilities to manage the grid through extreme events and to restore the system in the event of an outage.

Scope

In 2013, EPRI's Grid Operations research programme offer a focused research portfolio with the following objectives:

- Improving system reliability and reducing operational risks through the improved situational awareness of operators, including the incorporation of equipment health information into the control room and the identification of operating boundaries and margins

- Supporting operators in identifying potential voltage stability concerns in real-time and ensuring that steady-state and post-contingency system voltage performance is maintained, utilising the optimal mix of available reactive resources

- Reducing the risk of wide-area events and improving restoration time and reducing outage costs through identifying optimal blackstart capability requirements and developing restoration optimisation methods and guided control decision –making when separation may be the best choice

- Developing advanced analysis algorithms that utilise emerging hardware and software enabled approaches to increase computational efficiency of control room applications while increasing the resolution of the calculations to take advantage of new inputs such as synchrophasor data to support operator situational awareness and decision support.

Objective(s)

EPRI's Grid Operations research program delivers value using the shared experiences and understanding of its utility and independent system operator (ISO) members in conjunction with the expertise of EPRI's staff and network of top-level contractors.

The program conducts research projects that lead to prototype methods and tools that can be utilised by system operators to validate the methods that are then distributed to commercial vendors that supply and support member applications. EPRI also engages with external industry standards, regulatory, and research efforts to ensure that the EPRI research program is taking advantage of broader industry efforts and advancing the state of the art.

This research program also strives to provide members both near-term, mid-term, and long-term value. For example, the 2013 Grid Operations research program will finalize the development of prototype tools for supporting identification and mitigation of potential voltage stability concerns and deliver prototype tools and guidelines for identifying the optimal blackstart capability needed to restore the system after an outage during a time when many system are re-evaluating blackstart/restoration plans given the evolving generation mix. At the same time, we will continue development/evaluations of advanced data processing, computing technologies, and solution algorithms to improve the performance of all operational analytics and decision making.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

A success criteria is for ScottishPower Transmission engineers to engage fully with the EPRI research programme and apply relevant outcomes to business activities and innovation projects.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The scope of the research programme is shaped by the members, and represents a consensus of collective wisdom of the scope of pressing grid operational issues that should be addressed. The scale of a project is determined by the research money available and members' project ranking in order to extract maximum value for the benefit of all.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

Applicable to UK and international transmission networks through technical expert interaction.

Revenue Allowed for the RIIO Settlement

Not applicable.

Indicative Total NIA Project Expenditure

Total expenditure for the three year Grid Operations programme is £239,540 (based on the US $/£ exchange rate on 19th June 13).

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)

Predominantly research however the key benefits of being involved with EPRI research include:

· Gain access to a wide range of R&D initiatives both underway and planned (membership gives access to $9m worth of projects)

· Participate in multi-user discussion and networking including setting the direction of applicable EPRI projects

· Commercialisation of R&D into products that can be purchased with minimum risk due to knowledge gained in R&D

· Trials comparing diagnostic tools – benefit gained from collaboration as ScottishPower would not support this activity individually

· Trials comparing new technologies, e.g. advanced conductors

· Technology watches and user group forums.

· Access to experts – required due to limitations of in-house specific technical skills

· Access to reference guides (the "coloured" books) compiling years of technical knowledge

· $134k of existing products – both reports and intellectual property/applicable knowledge,

Expenditure to gain access to a similar portfolio of research would cost an estimated 17 times as much.

Access to Technology Innovation programme with significant leverage ($36m portfolio) obtained at no additional cost and inputting to the R&D Strategy for the UK Transmission business.

The key benefits to ScottishPower of being actively involved in the EPRI programme include:

- Gain access to a wide range of R&D objectives both underway and planned
- Participate in multi-user discussion and networking including setting the direction of applicable EPRI projects
- Commercialisation of R&D into products that can be purchased with minimum risk due to knowledge gained in R&D
- Trials comparing diagnostic tools – benefit gained from collaboration as ScottishPower would not support this activity individually
- Evaluation of benefit from application of techniques/software currently in development through EPRI projects
- Establish further opportunities for tailored collaboration for demonstrations and trials with further shared risk and cost sharing
- Access to experts with complementary skills to in-house specialists
- Access to existing products (value up to 10% of contracted costs) – both reports and intellectual property/applicable knowledge
- To influence the direction of the EPRI programme to ScottishPower's best interests through participation in EPRI project working groups and advisory councils.
- Significant leverage on funds
- Access to EPRI information is open to all ScottishPower Transmission employees with a password enabling access to the specifically funded projects and the technology innovation projects.
- The ScottishPower selection from the EPRI programme delivers applied research with defined benefit toScottishPower's assets including improved transformer analysis, SF6 leakage recommendations and substation monitoring via antenna array technology based at Strathclyde University.

Please provide a calculation of the expected benefits the Solution

Research therefore N/A

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

Learning has been agreed to be disseminated in conjunction with EPRI through annual conferences.

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

N/A, learning via business as usual.

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

Implementation continues to be via the appropriate technical representative – specified for each project within the programme. Projects will report annually in line with NIA requirements not as a complete programme.

In addition to this, SPT specific project work will be conducted under the 3 year funding scheme.

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

Through the extent of the EPRI portfolio, projects address the majority of the areas identified in the Innovation Strategy including, safety, reliability, environment and strategic.

☑ 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