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

Sep 2018

Project Reference Number

NIA_NPG_029

Project Registration

Project Title

Pragmatic Security

Project Reference Number

NIA_NPG_029

Project Licensee(s)

Northern Powergrid

Project Start

September 2018

Project Duration

2 years and 4 months

Nominated Project Contact(s)

Alan Creighton

Project Budget

£280,000.00

Summary

The project proposes to investigate the use of smart and non-network solutions to provide a like for like economic and technical comparison with traditional approaches.

Nominated Contact Email Address(es)

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Problem Being Solved

Security of supply in distribution networks is a complex topic. Customer supplies can be secured through a combination of network assets and non-network assets, including distributed generation, energy storage systems, demand side response, and load transfer. However, there are several key challenges which must be addressed to enable design engineers to effectively evaluate these solutions:

· Exhaustive cost-benefit analyses are complex and time consuming; a pragmatic method is required to enable fair and meaningful comparisons between the available means of providing security of supply.

· There are many uncertain and variable parameters associated with the assessment of security of distribution networks, including those related to failure rates, demand profiles, demand growth, and generator outputs. In many cases there is a lack of understanding around how these parameters vary and their impact on the security of supply experienced by customers.
Many networks share common characteristics, and therefore it should be possible, within a pragmatic method, to represent the majority of real networks using a small number of tables or factors. This will require identification of the common factors which enable this approach, and clear rules enabling design engineers to know which tables or factors should be used for a given network.

Method(s)

This project will involve Imperial College London and Newcastle University working together with Northern Powergrid to develop the following new learning:

· Developing a new, easy to apply method to calculate the security contribution from network reconfiguration (transfer capacity),

distributed generation and demand side response, including the use of non-firm connections;

· Extending the method to account for interactions between several (i) non-network solutions and (ii) network and non-network solutions; and

· Validating the methods using a comprehensive, risk based analysis to ensure that additional capacity released does not cause the risk to security of supply to exceed either the existing risk, or the maximum permissible risk under ER P2/6.

This project will develop an easy to apply pragmatic tool that design engineers can use to assess the technical equivalence of network and non-network solutions, so that the most economical solution that meets the technical requirements can be identified.

Scope

This project will consider information from the EHV and HV network, distributed generation and demand side response providers connected to them to assess their potential security contribution. The types of distributed generation will include wind farms and dispatchable distributed generation in addition to energy storage. The security contribution from network transfer capacity, demand side response and combinations of network and non-network solutions will be assessed.

Objective(s)

The objective of the project is to utilise smart network and non-network solutions as an alternative to traditional reinforcement. This project addresses calculating the security contribution from such solutions so that they can be compared on an equal basis to traditional network solutions.

The project will be delivered in four separate phases, each acting as stage-gates for progress to subsequent stages. The deliverables from each stage are set out below:

Stage 1: Literature review and data acquisition. The deliverables from this stage are a:

· Report on the literature review establishing what work has already been carried out in this area, to establish the best approach for assessing network security;

· Quantified risk assessment of supply interruptions, based on the best practice approach identified by the literature review, for the two substations (one single transformer & one double transformer substation) initially analysed in detail; and

· List of the network parameters that are the mort material in assessing network risk.

Stage 2: Smart solution capacity assessment and feasibility study. This stage is to carry out a feasibility study, focussing on a limited subset of network designs and capacity contributions. The deliverables from this stage are a:

· Quantified assessment of the risk of supply interruptions for the two substations initially analysed in detail with the present level of network loading and as the network demand increases;

· Quantified assessment of various means of mitigating the increased in risk and their effectiveness; and

· Methodology for establishing the circuit equivalence of a non-network solution.

These results will give a first indication of the effectiveness of a pragmatic method based on these types of studies, rather than carrying out a bespoke cost benefit analysis in each case. They will also provide an initial set of values for the pragmatic methods, and will inform which variables are critical within the pragmatic method.

Stage 3: Pragmatic method development and validation. This stage will apply the assessment method to further substations to refine. The deliverable from this phase will be:

· A refined and simplified pragmatic assessment process and metrics, based on the application of the Phase 2 methodology to a further eight substation.

Stage 4: Develop descriptions and examples of the method for ease of use. A crucial aspect of this project is the transition of the methods developed into business as usual. Consequently, the methods developed will be clearly described, including all assumptions and limitations, and the methods will be delivered in a format in which it can easily be used by network design and planning engineers. Where appropriate, this will be developed in consultation with appropriate engineers from within Northern Powergrid.

The deliverable from this phase will be a:

· Plain-English description of the method for assessing the security contribution from network and non-network solutions suitable for design engineers; and

· Spread sheet or lookup table-based tool to that can be applied by design engineers.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

A successful project will be one in which each of the above deliverables are either successfully completed or if not there is a clear explanation of why the deliverable transpired to be unachievable.

Project Partners and External Funding

None

Potential for New Learning

The project will build upon the existing learning to develop increased understanding of the security contribution from non-network solutions and combinations of network and non-network solutions. The understanding will presented in such a way that it can be readily understood by design engineers so that it can be applied as BAU. This is important as DNOs transition to DSOs and proactively seeks alternative, more efficient means of securing customer demand.

Scale of Project

The project is desktop scale and does not involve the large scale deployment of network equipment.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project is desktop in development. Implementation will impact the whole of the Northern Powergrid network particularly for EHV and HV systems.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£280,000

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)

Implementing the findings from this work, delivering a saving of £200k per annum delivers a financial benefit of £1.0m over 16 years. If the findings were implemented across the whole of the GB network would provide a financial benefit of £8.26m. This assumes that the solution is applicable to the 14 DNOs regions, which we believe that it is.

Please provide a calculation of the expected benefits the Solution

Not required. Project currently at TRL 3 – "Active research and development is initiated. This includes analytical and laboratory studies to physically validate analytical predictions or models of separate elements of the technology. Examples include components that are not yet integrated or representative but operate in a standalone basis. (ie Low System Readiness Level, SRL)".

However, assuming that the project is fully successful, the benefit to Northern Powergrid over 16 years from commencement of the project and in accordance with the Ofgem CBA tool, is an NPV of £1.0m.

This is not a risk adjusted figure and assumes that the solution is applicable to sufficient load related reinforcement schemes to deliver an overall 5% reduction in capital expenditure. Any degree of applicability that delivers a saving above £35k pa provides a positive NPV over 16 years.

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

The nature of the proposed method is that it is entirely replicable across the whole of the GB electricity network when customer connection related and other reinforcement options are being assessed

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

The pragmatic methodology is intended to be easily applied could be rolled out without any significant expenditure. The methodology could be included as part of review of industry standard documentation on system security.

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 Network Licensees will be able to use the learning generated as the outcomes will be relevant to all individual Network Licensees. The problem issue is shared by all operators.

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

The Northern Powergrid innovation strategy specifically details the requirement to improve network reliability and availability and to reduce costs associated with running the network. This project contributes to those requirements. .
☑ 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.

No similar projects have been identified as having been conducted on the GB network. As far as can be ascertained no similar pragmatic assessment criteria have been developed or implemented in any other part of the world.
This project builds on the platform provided by the body of knowledge developed through other LCNF/NIA[1] funded activities and is designed to create value added impact from that previous work through refinement and further development

[1] For example CLNR concluded that the security contribution should be reviewed rather than what the security contribution should be; http://www.networkrevolution.co.uk/project-library/review-distribution-network-planning-design-standards-future-low-carbon-electricity-system/

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

The propject involves understanding the impact of technologies, available both singly and in combination, which have only recently become available as alternative methodologies for providing system security.

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 proejct is not business as usual and contains considerable risk that it will not succeeed in delivering the objectives. This is reflected in the low initial TRL.

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

Alternative sources of funding are not available for this type of work. No current approriate calls for funding appplications could be identified with UK research funding organisations. Alternative approaches through, for example universities, would not deliver at the required TRL in the required timescale.

This project has been approved by a senior member of staff

☑ Yes